PREAMBLE TO MOTOR VEHICLE SAFETY STANDARD NO. 100

Controls and Displays
[Docket No. 1-18; Notice 31]

ACTION: Final rule; response to petitions for reconsideration.

SUMMARY: In a final rule published in the *Federal Register* on February 3, 1987, NHTSA amended a number of the requirements of Standard No. 101, *Controls and Displays.* In response to petitions for reconsideration, this notice amends Part 571 to permit compliance with either the earlier version of the standard or the amended standard until September 1, 1989. The agency will address other issues raised by petitioners in a separate notice.

EFFECTIVE DATE: The amendments made by this rule are effective March 9, 1987.

SUPPLEMENTARY INFORMATION: In a final rule published in the *Federal Register* (52 FR 3244) on February 3, 1987, NHTSA amended a number of the requirements of Standard No. 101, *Controls and Displays.* The agency received several timely petitions for reconsideration. The petitioners expressed particular concern about the March 5, 1987, effective date for certain of the amendments.

While the primary purpose of the amendments was to permit greater flexibility in the illumination and identification of controls and displays, NHTSA recognized that some of the amendments could result in the need for manufacturers to modify existing designs. The agency adopted an effective date of September 1, 1989, for these amendments in order to provide adequate leadtime for such modifications.

Other amendments relieved restrictions and were not believed to result in the need for design modifications. The agency concluded that an effective date of 30 days after publication in the *Federal Register,* i.e., March 5, 1987, was in the public interest for these amendments. However, several petitioners stated that some of these latter amendments also result in the need for design modifications and requested that the effective date for these amendments be extended to September 1, 1989.

As is clear from the preamble to the February 1987 final rule, it was not NHTSA's intent to require manufacturers to make design modifications within 30 days. While the agency is still analyzing some of the arguments made by petitioners, it has determined that one or more of the amendments effective March 5, 1987, will require some design changes. Accordingly, NHTSA has decided to permit compliance with either the earlier version of the standard or the amended standard until September 1, 1989.

NHTSA is reissuing the earlier version of Standard No. 101, redesignated as Standard No. 100, to apply to vehicles manufactured before September 1, 1989. The application section of the standard makes it clear that manufacturers have the option of meeting the requirements of Standard No. 101 for any control or display as an alternative to Standard No. 100's requirements. Conforming amendments are made to the application section of Standard No. 101.

While the petitioners were particularly concerned about the March 5, 1987, effective date for some amendments, they also raised several other issues. Those issues will be addressed in a separate notice.

NHTSA notes that the notice number of the February 1987 final rule, Docket No. 1-18, Notice 28, had already been used on two occasions. The number of this notice is therefore 31.

The effect of the amendments made by this notice is to delay the effective date for the new requirements established by the February 1987 final rule until September 1, 1989. NHTSA finds, for good cause, it is in the public interest to provide immediately for optional compliance with the new requirements and to make those requirements mandatory on September 1, 1989. In the absence of an immediate effective date, manufacturers would be unable to certify that some of their vehicles currently being produced comply with Standard No. 101. The amendments impose no new requirements but instead increase manufacturer flexibility by extending the effective date for certain requirements. The September 1, 1989, effective date will give sufficient time for manufacturers to redesign their vehicles to meet the new requirements.

The agency has analyzed these amendments and determined that they are neither "major" within the meaning of Executive Order 12291 nor "significant" within the meaning of the Department of Transportation regulatory policies and procedures. The agency has determined that the economic effects of the amendments are so minimal that a full regulatory evaluation is not required. Since the amendments impose no new requirements but simply add compliance alternatives until September 1, 1989, any cost impacts would be in the nature of slight, nonquantifiable cost savings.

In consideration of the foregoing, 49 CFR Part 571 is amended as follows:

1. Section 571.100 is added to read:

§ 571.100 Standard No. 100. Controls and displays.

S1. *Scope.* This standard specifies requirements for the location, identification, and illumination of motor vehicle controls and displays.

S2. *Purpose.* The purpose of this standard is to ensure the accessibility and visibility of motor vehicle controls and displays and to facilitate their selection under daylight and nighttime conditions, in order to reduce the safety hazards caused by the diversion of the driver's attention from the driving task, and by mistakes in selecting controls.

S3. *Application.* This standard applies to passenger cars, multipurpose passenger vehicles, trucks, and buses, manufactured before September 1, 1989. At the option of the manufacturer, motor vehicles may comply with the requirements of Federal Motor Vehicle Safety Standard No. 101, *Controls and Displays*, instead of the requirements of this standard, for any control, display, or illumination.

S4. *Definitions.*

"Telltale" means a display that indicates, by means of a light-emitting signal, the actuation of a device, a correct or defective functioning or condition, or a failure to function.

"Gauge" means a display that is listed in S5.1 or in Table 2 and is not a telltale.

"Informational readout display" means a display using light-emitting diodes, liquid crystals, or other electro illuminating devices where one or more than one type of information or message may be displayed.

S5. *Requirements.* (a) Except as provided in paragraph (b) of this section, each passenger car, multipurpose passenger vehicle, truck and bus manufactured with any control listed in S5.1 or in column 1 of Table 1, and each passenger car, multipurpose passenger vehicle and truck or bus less that 10,000 pounds GVWR with any display listed in S5.1 or in column 1 of Table 2, shall meet the requirements of this standard for the location, identification, and illumination of such control or display.

(b) For vehicles manufactured before September 1, 1987, a manufacturer may, at its option—

(1) Meet the requirements in this standard to use identifying words or abbreviation or identifying symbol for a control by using those specified in Table 1(a) instead of Table 1. If none are specified in Table 1(a), none need be used for the control.

(2) Meet the requirements in this standard to use identifying words or abbreviation or identifying symbol for a control by using those specified in Table 2(a) instead of Table 2. If none are specified in Table 2(a), none need be used for the display.

S5.1 *Location.* Under the conditions of S6, each of the following controls that is furnished shall be operable by the driver and each of the following displays that is furnished shall be visible to the driver. Under conditions of S6, telltales and informational readout displays are considered visible when activated.

HAND-OPERATED CONTROLS

(a) Steering wheel.
(b) Horn.
(c) Ignition.
(d) Headlamp.
(e) Taillamp.
(f) Turn signal.
(g) Illumination intensity.
(h) Windshield wiper.
(i) Windshield washer.
(j) Manual transmission shift lever, except transfer case.
(k) Windshield defrosting and defogging system.
(l) Rear window defrosting and defogging system.
(m) Manual choke.
(n) Driver's sun visor.
(o) Automatic vehicle speed system.
(p) Highbeam.
(q) Hazard warning signal.
(r) Clearance lamps.
(s) Hand throttle.
(t) Identification lamps.

FOOT-OPERATED CONTROLS

(a) Service brake.
(b) Accelerator.
(c) Clutch.
(d) Highbeam.
(e) Windshield washer.
(f) Windshield wiper.

DISPLAYS

(a) Speedometer.
(b) Turn signal.
(c) Gear position.
(d) Brake failure warning.
(e) Fuel.
(f) Engine coolant temperature.
(g) Oil.
(h) Highbeam.
(i) Electrical charge.

S5.2 *Identification.*

S5.2.1 Vehicle controls shall be identified as follows:

(a) Except as specified in S5.2.1(b), any hand-operated control listed in column 1 of Table 1 that has a symbol designated in column 3 shall be identified by that symbol. Any such control for which no symbol is shown in Table 1 shall be identified by the word or abbreviation shown in column 2, if such word or abbreviation is shown. Words or symbols in addition to the required symbol, word or abbreviation may be used at the manufacturer's discretion for the purpose of clarity. Any such control for which column 2 of Table 1 and/or column 3 of Table 1 specifies "Mfr. Option" shall be identified by the manufacturer's choice of a symbol, word or abbreviation, as indicated by that specification in column 2 and/or column 3. The identification shall be placed on or adjacent to the control. The identification shall, under the conditions of S6, be visible to the driver and, except as provided in S5.2.1.1 and S5.2.1.2, appear to the driver perceptually upright.

(b) S5.2.1(a) does not apply to a turn signal control which is operated in a plane essentially parallel to the face plane of the steering wheel in its normal driving position and which is located on the left side of the steering column so that it is the control on that side of the column nearest to the steering wheel face plane.

S5.2.1.1 The identification of the following need not appear to the driver perceptually upright:

(a) A master lighting switch or headlamp and tail lamp control that adjusts control and display illumination by means of rotation, or any other rotating control that does not have an off position.

(b) A horn control.

S.5.2.1.2 The identification of a rotating control other than one described by S5.2.1.1 shall appear to the driver perceptually upright when the control is in the off position.

S.5.2.2 Identification shall be provided for each function of any automatic vehicle speed system control and any heating and air conditioning system control, and for the extreme positions of any such control that regulates a function over a quantitative range. If this identification is not specified in Table 1 or 2, it shall be in word or symbol form unless color coding is used. If color coding is used to identify the extreme positions of a temperature control, the hot extreme shall be identified by the color red and the cold extreme by the color blue.

Example 1. A slide lever controls the temperature of the air in the vehicle heating system over a continuous range, from no heat to maximum heat. Since the control regulates a single function over a quantitative range, only the extreme positions require identification.

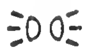
Example 2. A switch has three positions, for heat, defrost, and air conditioning. Since each position regulates a different function, each position must be identified.

S5.2.3 Except for informational readout displays, any display located within the passenger compartment and listed in column 1 of Table 2 that has a symbol designated in column 4, shall be identified by that symbol. Such display may, in addition be identified by the word or abbreviation shown in column 3. Any such display for which no symbol is provided in Table 2 shall be identified by the word or abbreviation shown in column 3. Informational readout displays may be identified by the symbol designated in column 4 of Table 2 or by the word or abbreviation shown in column 3. Additional words or symbols may be used at the manufacturer's discretion for the purpose of clarity. The identification required or permitted by this section shall be placed on or adjacent to the display that it identifies. The identification of any display shall, under the conditions of S6, be visible to the driver and appear to the driver perceptually upright.

S5.3 *Illumination.*

S5.3.1 Except for foot-operated controls or hand-operated controls mounted upon the floor, floor console, or steering column, or in the windshield header area, the identification required by S5.2.1 or S5.2.2 of any control listed in column 1 of Table 1 and accompanied by the word "yes" in the corresponding space in column 4 shall be capable of being illuminated whenever the headlights are activated. However, control identification for a heating and air-conditioning system need not be illuminated if the system does not direct air directly upon windshield. If a gauge is listed in column 1 of Table 2 and accompanied by the word "yes" in column 5, then the gauge and its identification required by S5.2.3 shall be illuminated whenever the ignition switch and/or the headlamps are activated. Controls, gauges, and their identifications need not be illuminated when the

Table 1
Identification and Illumination of Controls

Column 1	Column 2	Column 3	Column 4
Hand Operated Controls	Identifying Words or Abbreviation	Identifying Symbol	Illumination
Master Lighting Switch	—	 [5]	—
Headlamps and Tail lamps	(Mfr. Option)[2]	(Mfr. Option)[2]	—
Horn	—	 [4]	—
Turn Signal	—	 [3] [5]	—
Hazard Warning Signal	—	 [5]	Yes
Windshield Wiping System	—		Yes
Windshield Washing System	—		Yes
Windshield Washing and Wiping Combined	—		Yes
Heating and or Air Conditioning Fan	—	 or 	Yes
Windshield Defrosting and Defogging System	—		Yes
Rear Window Defrosting and Defogging System	—		Yes
Identification, Side Marker and or Clearance Lamps	—	 [2] [5]	Yes
Manual Choke	Choke	—	—
Engine Start	Engine Start[1]	—	—
Engine Stop	Engine Stop[1]	—	Yes
Hand Throttle	Throttle	—	—
Automatic Vehicle Speed	(Mfr. Option)	—	Yes
Heating and Air Conditioning System	(Mfr. Option)	(Mfr. Option)	Yes

[1] Use when engine control is separate from the key locking system.
[2] Separate identification not required if controlled by master lighting switch.
[3] The pair of arrows is a single symbol. When the controls for left and right turn operate independently, however, the two arrows may be considered separate symbols and may be spaced accordingly.
[4] Identification not required for vehicles with a GVWR greater than 10,000 lbs., or for narrow ring-type controls.
[5] Framed areas may be filled.

TABLE 1(a)
Identification and Illumination of Controls

Column 1	Column 2	Col. 3	Col. 4
Hand Operated Controls	Identifying Words or Abbreviation	Identifying Symbol	Illumination
Headlamps and Tail Lamps	Lights	 [2] [4]	—
Turn Signal	—		—
Hazard Warning Signal	Hazard	 [4]	Yes
Clearance Lamps System	Clearance Lamps or Cl Lps	 [3] [4]	Yes
Windshield Wiping System	Wiper or Wipe		Yes
Windshield Washing System	Washer or Wash		Yes
Windshield Washing and Wiping Combined	Wash-Wipe		Yes
Heating and/or Air Conditioning Fan	Fan		Yes
Windshield Defrosting and Defogging System	Defrost, Defog or Def		Yes
Rear Window Defrosting and Defogging System	Rear Defrost, Rear Defog or Rear Def		Yes
Engine Start	Engine Start[1]	—	—
Engine Stop	Engine Stop[1]	—	Yes
Manual Choke	Choke	—	—
Hand Throttle	Throttle	—	—
Automatic Vehicle Speed	(Mfr. Option)	—	Yes
Identification Lamps	Identification Lamps or Id Lps	—	Yes
Heating and Air Conditioning System	(Mfr. Option)	—	Yes

1 Use when engine control is separate from the key locking system.
2 Use also when clearance, identification, parking and/or side marker lamps are controlled with the headlamp switch
3 Use also when clearance lamps, identification lamps and/or side marker are controlled with one switch other than the headlamp switch
4 Framed areas may be filled.

Table 2
Identification and Illumination of Displays

Column 1	Column 2	Column 3	Column 4	Column 5
Display	Telltale Color	Identifying Words or Abbreviation	Identifying Symbol	Illumination
Turn Signal Telltale	Green	Also see FMVSS 108	 [1] [6]	——
Hazard Warning Telltale	Red[4]	Also see FMVSS 108	 [2] [6]	——
Seat Belt Telltale	Red[4]	Fasten Belts or Fasten Seat Belts. Also see FMVSS 208.	 or 	——
Fuel Level Telltale	Yellow	Fuel	 or 	——
Gauge	——			Yes
Oil Pressure Telltale	Red[4]	Oil		——
Gauge	——			Yes
Coolant Temperature Telltale	Red[4]	Temp		——
Gauge	——			Yes
Electrical Charge Telltale	Red[4]	Volts, Charge or Amp		——
Gauge	——			Yes
Highbeam Telltale	Blue or Green[4]	Also see FMVSS 108	 [6]	——
Malfunction in Anti-Lock or	Yellow	Antilock or Anti-lock Also see FMVSS 105	——	——
Brake System	Red[4]	Brake. Also see FMVSS 105	——	——
Brake Air Pressure Position Telltale	Red[4]	Brake Air Also see FMVSS 121	——	——
Speedometer	——	MPH[5]		Yes
Odometer	——	—— [3]	——	——
Automatic Gear Position	——	Also see FMVSS 102	——	Yes

[1] The pair of arrows is a single symbol. When the indicator for left and right turn operate independently, however, the two arrows will be considered separate symbols and may be spaced accordingly.
[2] Not required when arrows of turn signal telltales that otherwise operate independently flash simultaneously as hazard warning telltale.
[3] If the odometer indicates kilometers then "KILOMETERS" or "km" shall appear, otherwise, no identification is required.
[4] Red can be red-orange. Blue can be blue green.
[5] If the speedometer is graduated in miles per hour and in kilometers per hour, the identifying words or abbreviations shall be "MPH and km/h" in any combination of upper or lower case letters.
[6] Framed areas may be filled.

Table 2 (a)
Identification and Illumination of Internal Displays

Column 1	Col. 2	Column 3	Column 4	Column 5
Display	Telltale Color	Identifying Words or Abbreviation	Identifying Symbol	Illuminate
Turn Signal Telltale	Green	Also see FMVSS 108	 [1] [6]	———
Hazard Warning Telltale	Red[4]	Also see FMVSS 108		———
Seat Belt Telltale	Red[4]	Fasten Belts or Fasten Seat Belts. Also see FMVSS 208.		———
Fuel Level Telltale	Yellow	Fuel		———
Gauge		Fuel		Yes
Oil Pressure Telltale	Red[4]	Oil		———
Gauge		Oil		Yes
Coolant Temperature Telltale	Red[4]	Temp		———
Gauge		Temp		Yes
Electrical Charge Telltale	Red[4]	Volts, Charge or Amp		———
Gauge	———	Volts, Charge or Amp		Yes
Speedometer	———	MPH[6]	———	Yes
Odometer	———	———	———	———
Automatic Gear Position	———	Also see FMVSS 102	———	Yes
High Beam Telltale	Blue[4] or Green	Also see FMVSS 108		———
Brake Air Pressure Position Telltale	Red[4]	Brake Air Also See FMVSS 121	———	———
Malfunction in Anti-Lock or	Yellow	Anti-Lock Also see FMVSS 105 75	———	———
Brake System	Red[4]	Brake Also see FMVSS 105 75	———	———

[1] The pair of arrows is a single symbol. When the indicator for left and right turn operate independently, however, the two arrows will be considered separate symbols and may be spaced accordingly.
[2] Not required when arrows of turn signal telltales that otherwise operate independently flash simultaneously as hazard warning telltale
[3] If the odometer indicates kilometers, then "KILOMETERS" or "km" shall appear; otherwise no identification is required.
[4] Red can be red orange. Blue can be blue green.
[5] Framed arrows may be filled.
[6] If the speedometer is graduated in miles per hour and in kilometers per hour, the identifying words or abbreviations shall be "MPH and km/h" in any combination of upper or lower case letters.

headlamps are being flashed. A telltale shall not emit light except when identifying the malfunction or vehicle condition for whose indication it is designed or during a bulb check upon vehicle starting.

S5.3.2 Except for informational readout displays, each discrete and distinct telltale shall be of the color shown in column 2 of Table 2. The identification of each telltale shall be in a color that contrasts with the lens, if a telltale with a lens is used. Any telltale used in conjunction with a gauge need not be identified. The color of informational readout displays will be at the option of the manufacturer.

S5.3.3 Light intensities for controls, gauges, and their identification shall be continuously variable from: (a) A position at which either there is no light emitted or the light is barely discernible to a driver who has adapted to dark ambient roadway conditions to (b) a position providing illumination sufficient for the driver to identify the control or display readily under conditions of reduced visibility. Light intensities for informational readout systems shall have at least two values, a higher one for day, and a lower one for nighttime conditions. The intensity of any illumination that is provided in the passenger compartment when and only when the headlights are activated shall also be variable in a manner that complies with this paragraph. The light intensity of each telltale shall not be variable and shall be such that, when activated, that telltale and its identification are visible to the driver under all daytime and nighttime conditions.

S6. *Conditions.* The driver is restrained by the crash protection equipment installed in accordance with the requirements of §571.208 of this part (Standard No. 208), adjusted in accordance with the manufacturer's instructions. * * *

3. Section 571.101 is amended by revising S3 to read:

S3. *Application.* This standard applies to passenger cars, multipurpose passenger vehicles, trucks, and buses. At the option of the manufacturer, motor vehicles manufactured before September 1, 1989, may comply with the requirements of Federal Motor Vehicle Safety Standard No. 100, *Controls and Displays,* instead of the requirements of this standard, for any control, display, or illumination. If no requirements are specified in Standard No. 100 for a control, display, or illumination, none need be met as a result of this standard for motor vehicles manufactured before September 1, 1989.

* * * * *

Issued on March 4, 1987

Diane K. Steed
Administrator

52 F.R. 7150
March 9, 1987

FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 100

Controls and Displays

(Docket No. 1-18; Notice 31)

S1. Scope. This standard specifies requirements for the location, identification, and illumination of motor vehicle controls and displays.

S2. Purpose. The purpose of this standard is to ensure the accessibility and visibility of motor vehicle controls and displays and to facilitate their selection under daylight and nighttime conditions, in order to reduce the safety hazards caused by the diversion of the driver's attention from the driving task, and by mistakes in selecting controls.

S3. Application. This standard applies to passenger cars, multipurpose passenger vehicles, trucks, and buses, manufactred befor September 1, 1989. at the option of the manufacturer, motor vehicles may comply with the requirements of Federal Motor Vehicle Safety Standards No. 101, *Controls and Displays*, instead of the requirements of this standard, for any control, display, or illumination.

S4. Definitions.

"Telltale" means a display that indicates, by menas of a light-emitting signal, the actuation of a device, a correct or defective functioning or condition, or a failure to function.

"Gauge" means a display that is listed in S5.1 or in Table 2 and is not a telltale.

"Informational readout display" means a display using light-emitting diodes, liquid crystals, or other electro illuminating devices where one or more than one type of information or message may be displayed.

S5. Requirements. (a) Except as provided in paragraph (b) of this section, each passenger car, multipurpose passenger vehicle, truck, and bus manufactured with any control listed in S5.1 or in column 1 of Table 1, and each passenger car, multipurpose passenger vehicle and truck or bus less than 10,000 pounds GVWR with any display listed in S5.1 or in column 1 of Table 2, shall meet the requirements of this standard for the location, identification, and illumination of such control or display.

(b) For vehicles manufactured before September 1, 1987, a manufacturer may, at its option—

(1) Meet the requirements in this standard to use identifying words or abbreviation or identifying symbol for a control by using those specified in Table 1(a) instead of Table 1. If none are specified in Table 1(a), none need be used for the control.

(2) Meet the requirements in this standard to use identifying words or abbreviation or identifying symbol for a display by using those specified in Table 2(a) instead of Table 2. If none are specified in Table 2(a), none need by used for the display.

S5.1 Location. Under the conditions of S6, each of the following controls that is furnished shall be operable by the driver and each of the following displays that is furnished shall be visible to the driver. Under conditions of S6, telltales and informational readout displays are considered visible when activated.

HAND-OPERATED CONTROLS

(a) Steering wheel.

(b) Horn.

(c) Ignition.

(d) Headlamp.

(e) Tail lamp.

(f) Turn signal.

(g) Illumination intensity.

(h) Windshield wiper.

(i) Windshield washer.

(j) Manual transmission shift lever, except transfer case.

(k) Windshield defrosting, and defogging system.

(l) Rear window defrosting and defogging system.

(m) Manual choke.

(n) Driver's sun visor.

(o) Automatic vehicle speed system.

(p) Highbeam.

(q) Hazard warning signal.

(r) Clearance lamps.

(s) Hand throttle.

(t) Identification lamps.

FOOT-OPERATED CONTROLS

(a) Service brake.

(b) Accelerator.

(c) Clutch.

(d) Highbeam.

(e) Windshield washer.

(f) Windshield wiper.

DISPLAYS

(a) Speedometer.

(b) Turn signal.

(c) Gear position.

(d) Brake failure warning.

(e) Fuel.

(f) Engine coolant temperature.

(g) Oil.

(h) Highbeam.

(i) Electrical Charge.

S5.2 Identification.

S5.2.1 Vehicle controls shall be identified as follows:

(a) Except as specified in S5.2.1(b), any hand-operated control listed in column 1 of Table 1 that has a symbol designated in column 3 shall be identified by that symbol. Any such control for which no symbol is shown in Table 1 shall be identified by the word or abbreviation shown in column 2, if such word or abbreviation may be used at the manufacturer's discretion for the purpose of clearity. Any such control for which column 2 of Table 1 and/or column 3 of Table 1 specifies "Mfr. Option' shall be indentified by the manufacture's choice of a symbol, word or abbreviation, as indicated by that specification in column 2 and/or column 3. The identification shall be placed on or adjacent to the control. The identification shall, under the conditions of S6, be visible to the driver and, except as provided in S5.2.1.1 and S5.2.1.2, appear to the driver perceptually upright.

(b) S5.2.1(a) does not apply to a turn signal control which is operated in a plane essentially parallel to the face plane of the steering wheel in its normal driving position and which is located on the left side of the steering column so that it is the control on that side of the column nearest to the steering wheel face plane.

S5.2.1.1 The identification of the following need not appear to the driver perceptually upright:

(a) A master lighting switch or headlamp and tail lamp control that adjusts control and display illumination by means of rotation, or of any other rotating control that does not have an off position.

(b) A horn control.

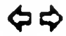
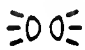
S5.2.1.2 The identification of a rotating control other than one described by S5.2.1.1 shall appear to the driver perceptually upright when the control is in the off position.

S.5.2.2 Identification shall be provided for each function of any automatic vehicle speed system control and any heating and air conditioning system control, and for the extreme positions of any such control that regulates a function over a quantitative range. If this identification is not specified in Tables 1 or 2, it shall be in word or symbol form unless color coding is used. If color coding is used to identify the extreme positions of a temperature control, the hot extreme shall be identified by the color red and the cold extreme by the color blue.

> ***Example 1*** A slide lever controls the temperature of the air in the vehicle heating system over a continuous range, from no heat to maximum heat. Since the control regulates a single function over a quantitative range, only the extreme positions require identification.
>
> ***Example 2*** A switch has three positions, for heat, defrost, and air conditioning. Since each position regulates a different function, each position must be identified.

S5.2.3 Any display located within the passenger compartment and listed in column 1 of Table 2 that has a symbol designated in column 4,

Table 1
Identification and Illumination of Controls

Column 1	Column 2	Column 3	Column 4
Hand Operated Controls	Identifying Words or Abbreviation	Identifying Symbol	Illumination
Master Lighting Switch	—	 [5]	—
Headlamps and Tail lamps	(Mfr. Option)[2]	(Mfr. Option)[2]	—
Horn	—	 [4]	—
Turn Signal	—	 [3] [5]	—
Hazard Warning Signal	—	 [5]	Yes
Windshield Wiping System	—		Yes
Windshield Washing System	—		Yes
Windshield Washing and Wiping Combined	—		Yes
Heating and or Air Conditioning Fan	—	 or 	Yes
Windshield Defrosting and Defogging System	—		Yes
Rear Window Defrosting and Defogging System	—		Yes
Identification, Side Marker and or Clearance Lamps	—	 [2] [5]	Yes
Manual Choke	Choke	—	—
Engine Start	Engine Start[1]	—	—
Engine Stop	Engine Stop[1]	—	Yes
Hand Throttle	Throttle	—	—
Automatic Vehicle Speed	(Mfr. Option)	—	Yes
Heating and Air Conditioning System	(Mfr. Option)	(Mfr. Option)	Yes

[1] Use when engine control is separate from the key locking system.
[2] Separate identification not required if controlled by master lighting switch.
[3] The pair of arrows is a single symbol. When the controls for left and right turn operate independently, however, the two arrows may be considered separate symbols and may be spaced accordingly.
[4] Identification not required for vehicles with a GVWR greater than 10,000 lbs., or for narrow ring-type controls.
[5] Framed areas may be filled.

TABLE 1(a)
Identification and Illumination of Controls

Column 1	Column 2	Col. 3	Col. 4
Hand Operated Controls	Identifying Words or Abbreviation	Identifying Symbol	Illumination
Headlamps and Tail Lamps	Lights	 [2] [4]	—
Turn Signal	—		—
Hazard Warning Signal	Hazard	 [4]	Yes
Clearance Lamps System	Clearance Lamps or Cl Lps	 [3] [4]	Yes
Windshield Wiping System	Wiper or Wipe		Yes
Windshield Washing System	Washer or Wash		Yes
Windshield Washing and Wiping Combined	Wash-Wipe		Yes
Heating and/or Air Conditioning Fan	Fan		Yes
Windshield Defrosting and Defogging System	Defrost, Defog or Def		Yes
Rear Window Defrosting and Defogging System	Rear Defrost, Rear Defog or Rear Def		Yes
Engine Start	Engine Start[1]	—	—
Engine Stop	Engine Stop[1]	—	Yes
Manual Choke	Choke	—	—
Hand Throttle	Throttle	—	—
Automatic Vehicle Speed	(Mfr. Option)	—	Yes
Identification Lamps	Identification Lamps or Id Lps	—	Yes
Heating and Air Conditioning System	(Mfr. Option)	—	Yes

[1] Use when engine control is separate from the key locking system.
[2] Use also when clearance, identification, parking and/or side marker lamps are controlled with the headlamp switch.
[3] Use also when clearance lamps, identification lamps and/or side marker are controlled with one switch other than the headlamp switch.
[4] Framed areas may be filled.

Table 2
Identification and Illumination of Displays

Column 1	Column 2	Column 3	Column 4	Column 5
Display	Telltale Color	Identifying Words or Abbreviation	Identifying Symbol	Illumination
Turn Signal Telltale	Green	Also see FMVSS 108	 [1] [6]	——
Hazard Warning Telltale	Red[4]	Also see FMVSS 108	 [2] [6]	——
Seat Belt Telltale	Red[4]	Fasten Belts or Fasten Seat Belts. Also see FMVSS 208.	 or 	——
Fuel Level Telltale	Yellow	Fuel	 or 	——
Gauge	——			Yes
Oil Pressure Telltale	Red[4]	Oil		——
Gauge	——			Yes
Coolant Temperature Telltale	Red[4]	Temp		——
Gauge	——			Yes
Electrical Charge Telltale	Red[4]	Volts, Charge or Amp		——
Gauge	——			Yes
Highbeam Telltale	Blue or Green[4]	Also see FMVSS 108	 [6]	——
Malfunction in Anti-Lock or	Yellow	Antilock or Anti-lock Also see FMVSS 105	——	——
Brake System	Red[4]	Brake. Also see FMVSS 105	——	——
Brake Air Pressure Position Telltale	Red[4]	Brake Air Also see FMVSS 121	——	——
Speedometer	——	MPH[5]		Yes
Odometer	——	—— [3]	——	——
Automatic Gear Position	——	Also see FMVSS 102	——	Yes

[1] The pair of arrows is a single symbol When the indicator for left and right turn operate independently, however, the two arrows will be considered separate symbols and may be spaced accordingly

[2] Not required when arrows of turn signal telltales that otherwise operate independently flash simultaneously as hazard warning telltale.

[3] If the odometer indicates kilometers then "KILOMETERS" or "km" shall appear, otherwise, no identification is required.

[4] Red can be red-orange Blue can be blue green.

[5] If the speedometer is graduated in miles per hour and in kilometers per hour, the identifying words or abbreviations shall be "MPH and km/h" in any combination of upper or lower case letters

[6] Framed areas may be filled.

Table 2 (a)
Identification and Illumination of Internal Displays

Column 1	Col. 2	Column 3	Column 4	Column 5
Display	Telltale Color	Identifying Words or Abbreviation	Identifying Symbol	Illuminate
Turn Signal Telltale	Green	Also see FMVSS 108	 [1] [6]	———
Hazard Warning Telltale	Red[4]	Also see FMVSS 108	 [2] [6]	———
Seat Belt Telltale	Red[4]	Fasten Belts or Fasten Seat Belts. Also see FMVSS 208.		———
Fuel Level Telltale	Yellow	Fuel		———
Gauge		Fuel		Yes
Oil Pressure Telltale	Red[4]	Oil		———
Gauge		Oil		Yes
Coolant Temperature Telltale	Red[4]	Temp		———
Gauge		Temp		Yes
Electrical Charge Telltale	Red[4]	Volts, Charge or Amp		———
Gauge	———	Volts, Charge or Amp		Yes
Speedometer	———	MPH[6]	———	Yes
Odometer	———	———	———	———
Automatic Gear Position	———	Also see FMVSS 102	———	Yes
High Beam Telltale	Blue[4] or Green	Also see FMVSS 108		———
Brake Air Pressure Position Telltale	Red[4]	Brake Air Also See FMVSS 121	———	———
Malfunction in Anti-Lock or	Yellow	Anti-Lock Also see FMVSS 105 75	———	———
Brake System	Red[4]	Brake Also see FMVSS 105 75	———	———

[1] The pair of arrows is a single symbol. When the indicator for left and right turn operate independently, however, the two arrows will be considered separate symbols and may be spaced accordingly

[2] Not required when arrows of turn signal telltales that otherwise operate independently flash simultaneously as hazard warning telltale

[3] If the odometer indicates kilometers, then "KILOMETERS" or "km" shall appear; otherwise no identification is required

[4] Red can be red orange. Blue can be blue green.

[5] Framed arrows may be filled

[6] If the speedometer is graduated in miles per hour and in kilometers per hour, the identifying words or abbreviations shall be "MPH and km/h" in any combination of upper or lower case letters

shall be identified by that symbol. Such display may, in addition be identified by the word or abbreviation shown in column 3. Any such display for which no symbol is provided in Table 2 shall be identified by the word or abbreviation shown in column 3. Informational readout displays may be identified by the symbol designated in colum 4 of Table 2 or by the word or abbreviation shown in column 3. Additional words or symbols may be used at the manufacturer's discretion for the purpose of clarity. The identification required or permitted by this section shall be placed on or adjacent to the display that it identifies. The identification of any display shall, under the conditions of S6, be visible to the driver and appear to the driver perceptually upright.

S5.3 Illumination.

S5.3.1 Except for foot-operated controls or hand-operated controls mounted upon the floor, floor console, or steering column, or in the windshield header area, the identification required by § 5.2.1 or § 5.2.2 of any control listed in column 1 of Table 1 and accompanied by the word "yes" in the corresponding space in column 4 shall be capable of being illuminated whenever the headlights are activated. However, control identification for a heating and air-conditioning system need not be illuminated if the system does not direct air directly upon windshield. If a gauge is listed in column 1 of Table 2 and accompanied by the word "yes" in column 5, then the gauge and its identification required by § 5.2.3 shall be illuminated whenever the ignition switch and/or the headlamps are activated. Controls, gauges, and their identifications need not be illuminated when the headlamps are being flashed. A telltale shall not emit light except when identifying the malfunction or vehicle condition for whose indication it is designed or during a bulb check upon vehicle starting.

S5.3.2 Except for informational readout displays each discrete and distinct telltale shall be of the color shown in column 2 of Table 2. The identification of each teletale shall be in a color that contrasts with the lens, if a telltale shall be in a color that contrasts with the lens, if a telltale with a lens is used. Any telltale used in conjunction with a gauge need not be identified. The color of informatinal readout displays will be at the option of the manufacturer.

S5.3.3 Light intensities for contorls, gauges, and their identification shall be continuously variable from: (a) A position at which either there is no light emitted or the light is barely discernible to a driver who has adapted to dark ambient roadway conditions to (b) a position provided illumination sufficient for the driver to identify the control or display readily under conditions of reduced visibility. Light intensities for informational readout systems shall have at least two values, a higher one for day, and a lower one for nighttime conditions. The intensity of any illumination that is provided in the passenger compartment when and only when the headlights are activated shall also be variable in a manner that complies with this paragraph. The light intensity of each telltale shall not be variable and shall be such that, when activated, that telltale and its identecation are visible to the dirver under all daytime and nighttime conditons.

S6 *Conditions.* The driver is restrained by the crash potention equipment installed in accordance with the requirements of § 571.208 of this part (Standard No. 208), adjusted in accordance with the manufacturer's instructions. * * *

3. Section 571.101 is amended by revising S3 to read:

S3. *Application.* This standard applies to passenger cars, multipurpose passenger vehicles, trucks, and buses. At the option of the manufacturer, motor vehicles manufactured before September 1, 1989, may comply with the requirements of Federal Motor Vehicle Safety Standard No. 100, *Controls and Displays,* instead of the requirements of this standard, for any control, display, or illumination. If no requirements are specified in Standard No. 100 for a control, display, or illumination, none need be met as a result of this standard for motor vehicles manufactured before September 1, 1989

* * * * *

Issued on March 4, 1987

Diane K. Steed
Administrator
52 F.R. 7150
March 9, 1987

PREAMBLE TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 101–80

Controls and Displays

(Docket No. 1–18; Notice 13)

Action: Final rule.

Summary: This notice expands the application of the standard for the location, identification, and illumination of driver controls and displays (e.g., gauges and meters) by establishing requirements for additional controls and by introducing selected displays which, if furnished, must be located and illuminated under specified conditions and identified by a specified symbol and/or selected word. The purpose of the requirements is to encourage international standardization and harmonization of controls and displays in order to convey information more quickly to drivers and with less chance of human error. This will reduce the interval during which a driver's attention is diverted from the roadway to his controls and displays, thus decreasing the possibility of an accident.

Effective date: September 1, 1980.

For further information contact:

Mr. Nelson Erickson, Office of Motor Vehicle Programs, 400 Seventh Street, S.W., Washington, D.C. 20590, 202–426–2155.

Supplementary information: This notice establishes new requirements for the location, identification, and illumination of controls and displays in passenger cars, multipurpose passenger vehicles, trucks, and buses. The new rule is designated 49 CFR 571.101–80, *Controls and Displays*, and becomes effective September 1, 1980. The existing rule on this subject, 49 CFR 571.101, *Control Location, Identification, and Illumination*, is amended to permit, at the vehicle manufacturer's option, compliance with that standard or the new requirements of Standard No. 101–80 before September 1, 1981.

On October 21, 1976, the National Highway Traffic Safety Administration published (41 FR 46460) a notice proposing to update the existing controls and displays standard (Standard 101) by incorporating all pertinent amendments and interpretations published since the original issuance on January 31, 1967. It also proposed to consolidate the control and display requirements of other standards in one regulation. This notice takes final action on that proposal. All comments were considered and the major ones are discussed below.

The notice issued in October 1976 proposed that most controls and displays be required to be identified with specified symbols which are internationally standardized. Words would have been permitted in addition to the symbols, although the choice of words would have been limited to ensure uniformity. Specified words would have been required for those controls and displays for which no symbols had been established.

The rationale behind the proposed requirement of symbols was that they can convey information more quickly and with less chance of human error than words. This is particularly true with respect to the large foreign language speaking population of this country. By simplifying the identification of controls and displays, the standard should reduce the problems resulting from driver's attention being diverted from the roadway to his controls and displays. An individual benefit cited in the proposed notice is that manufacturers who sell vehicles both in and outside of the United States could realize significant cost savings by utilizing internationally standardized symbols.

The National Motor Vehicle Advisory Council and the Vehicle Equipment Safety Commission did not take positions on the proposal. The majority of commenters favored the use of symbols in the interest of international standardization and harmonization. The final rule, therefore, requires the use of symbols and allows the use of additional words if the manufacturer so chooses.

One of the major concerns of manufacturers commenting was that the proposed rule would inhibit the design and development of electronic "readout" panels which can effectively present to the driver specific information concerning vehicle and environmental conditions affecting safety. These displays are currently capable of exhibiting information and warnings with word messages and not with symbols. The optional use of symbols or words will permit the continued development of informational readout displays. The NHTSA supports the development of more efficient and effective control and display information systems and has, consequently, permitted informational readout displays to be identified by words only so as to not impede the development of electronic displays.

The symbols that are permitted by this rule to identify controls and displays are those developed by the International Standards Organization (ISO). By specifying symbols adopted by the ISO, this agency is facilitating the achievement of an international uniform identification system. New symbols for five controls and eight displays are added to those presently designated in the existing standard. Additional symbols will be added when the NHTSA determines which ones will be readily recognizable, thus reducing driver diversion.

Some commenters noted that a few of the symbols such as the clearance lamp symbol, deviate slightly from those adopted by the ISO. The NHTSA, while basing its symbols on those developed by the ISO, is not specifying ISO symbols which it determines will not adequately convey the intended message. Thus, the symbols proposed in the October notice are adopted, even though some of them deviate from the ISO symbols. Some existing ISO symbols are not included in this final rule due to the fact that additional data are needed on their recognizability. When such data have been accumulated and analyzed, the NHTSA will determine whether the symbols should be added to Standard 101-80.

A few commenters suggested the deletion of the symbols for the turn signal and high beam telltales because these have long been identified by color and operate only after deliberate operation by the driver. It is the belief of the NHTSA that these symbols should be retained. They are necessary to educate new drivers, to act as reminders to those who drive infrequently, and to further the uniformity and harmonization of symbols. It should be noted that the turn signal was inadvertently omitted from Table I. It was, however, listed in S5.1 as one of the hand-operated controls and discussed in the preamble.

Another question that was raised was whether the manufacturers could use symbols that deviate from those designated in the standard. As stated in previous notices on controls and displays, minor deviations are allowed, as long as the symbol used substantially resembles that specified in the standard.

Several commenters raised concerns about the color of various symbols. The hazard warning telltale was inadvertently designated as green in the proposed rule. That color should be red and the final rule has been corrected to reflect this. Several commenters mentioned that because of the technology of light emitting diodes, telltales are technologically feasible only in yellow, green, or red. One commenter noted that neon gas discharge displays emit a characteristic neon red-orange light, rather than red. These displays rate high in intensity, durability, and reliability and are low in cost. Because of these factors, the final rule has been amended so that a designation of the color red can be either red or red-orange and the color blue may be either blue or blue-green.

Many of those commenting objected to the prohibition of any words other than the words specified in the table. The NHTSA has decided, to permit the manufacturer to use additional words, but only for clarification. For example, the manufacturer may combine an instruction with the specified identification, such as "pull to defrost," or it may use another word for the purpose of clarity, such as "unleaded fuel only."

The manufacturer will be permitted to describe the "automatic vehicle speed system" in words of his choosing because over the years customers have become used to the various descriptors, such as "cruise control" and "speed control," which manufacturers have used. The NHTSA does not believe that either descriptor is superior to the other. In addition, the manufacturer will be permitted to describe the "automatic gear position" by words of his choosing since these controls are conspicuous and automatic transmissions are not uniform, some not providing a park (P) position and others with additional gears. In response to one question, it should be noted that "automatic gear position" by virtue of its being automatic is not a hand-operated control as referred to in S5.3.1.

In accordance with the suggestions of commenters, the final rule adopts the use of "volts" or "charge" in addition to "amp" for the electrical charge telltale and gauge. Many other alternate words were suggested, but the NHTSA believes that the ones adopted in the final rule best convey the appropriate information. With the allowance of additional words, objection to those required should no longer remain.

Manufacturers of vehicles over 10,000 pounds gross vehicle weight rating (GVWR) objected to the application of this rule to their vehicles. They emphasized that with the increased number of gauges and expanded level of display information utilized by such vehicles, the application of this rule would result in panels that are a "hodgepodge of symbols." It was also asserted that this application would necessitate redesign of the instrument panels, possibly increasing driver diversion instead of decreasing it. Most heavy duty trucks comply with SAE recommendations for the location standardization of controls and displays in the operator's compartment. The operators of vehicles in the heavy duty category are professionals who are familiar with these standardized locations and do not need to read a legend or symbol. In addition, heavy duty trucks are not subject to yearly redesign or model changes. Because of these concerns, the agency has decided that vehicles over 10,000 pounds GVWR need not meet display requirements of this standard. They must, however, meet the control requirements.

A large number of commenters requested that the location of the controls and displays be uniform. An additional request was made to require common carriers to maintain illumination devices on all equipment. While these recommendations are noteworthy, they are not the subject of this rulemaking action, but will be considered for possible future rulemaking.

In the October proposal, it was specfied that the control identification be placed on or adjacent to the particular control. The display identification, on the other hand, was to be placed on the display, unless the exposed portion of the lens was in the shape of the required identification. The proposal also stated that the identification of the high-beam indicator and of any gauge could be placed on or adjacent to the display that it identified. In response to the comments that identification could be met equally well by placing the symbol adjacent to the telltale, the NHTSA has decided to leave it up to the manufacturer to determine whether the identification should be placed directly on the control or display or whether an adjacent position would be satisfactory. The final rule does require that the identification be visible to the driver. In response to one commenter, the NHTSA does recognize that the spokes of the steering wheel may at times interfere with the visibility of the controls and displays. The visibility requirement will be satisfied even if the driver needs to make minimal movements toward the front, to the left, and to the right to see the identifications. The NHTSA has determined that these minor necessary movements will have virtually no effect on the safe operation of the vehicle.

The designation of "Km" for kilometres has been corrected in the final rule to read "km". Any odometer that records distance in kilometres must be labeled "KILOMETRES" or "km" so as to avoid confusion. The October 1976 proposal provided an option regarding English or metric units for labeling speedometers. Any proposal setting forth alternatives implicitly carries with it the possibility that one or more of the alternatives may become mandatory. In light of this and in light of the decision in Federal Motor Vehicle Safety Standard No. 127, 43 FR 10919, to require speedometers to record speed in both English and in metric, this rule requires that both speed scales be labeled so as to avoid confusion. Therefore, for dual readings of MPH and km/h on speedometers the manufacturer is required to clearly label the appropriate display.

The proposed effective date for this rule was September 1, 1979. Due to the numerous comments received, indicating that more lead time would be desirable in order to permit the conversion of controls and displays to coincide with routine redesign of various vehicle models, an effective date of September 1, 1980, has been adopted.

The primary authors of this notice are Mr. Nelson Erickson, Office of Motor Vehicle Programs, and Ms. Kathleen DeMeter, Office of the Chief Counsel.

In consideration of the foregoing, Part 571 of Title 49 of the Code of Federal Regulations is amended. . . .

(Secs. 103, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.50.)

Issued on June 21, 1978.

Joan Claybrook
Administrator

43 F.R. 27541
June 26, 1978

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 101-80

Control and Display (Docket 1-18; Notice 18)

ACTION: Interpretative amendment.

SUMMARY: Standard No. 101-80, Controls and Displays, requires various safety-related controls to be identified by specific symbols. The standard requires identification of the turn signal control unless it is the only control on the left hand side of the steering column. In addition to the turn signal control, some vehicles have additional controls, such as a lever to adjust the position of a tilting steering wheel, on the left hand side of the column. This notice clarifies the identification requirement to provide that a turn signal control does not have to be identified if it is the topmost control on the left side of the steering column, the traditional position for such controls (i.e., the closest control to the steering wheel).

EFFECTIVE DATE: Date of Publication in the October 30, 1980 *Federal Register.*

FOR FURTHER INFORMATION CONTACT:

John Carson, Office of Vehicle Safety Standards, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590 (202-426-2715)

SUPPLEMENTARY INFORMATION: On June 26, 1978, the agency published a final rule establishing Standard No. 101-80, Controls and Displays (43 FR 27541). The standard, which went into effect on September 1, 1980, established new identification and illumination requirements for controls and displays in passenger cars, multipurpose passenger vehicles, trucks and buses.

One provision of the standard requires the turn signal control to be identified by a specific symbol, two horizontal arrowheads, placed on or adjacent to the control. American Motors Corporation (AMC) filed a petition for reconsideration arguing that the turn signal identification requirement was unnecessary. AMC said that the location and operation of column-mounted turn signal control levers has been standardized by industry practice and is well known to drivers. In response to the AMC petition, NHTSA amended the standard to delete the identification requirement for vehicles in which the turn signal control is the only lever mounted on the left side of the steering column. The agency explained that it was taking this action because the turn signal control has become standardized at that location and there have been no reported crashes caused by the driver's unfamiliarity with the position and use of the turn signal control (Sept. 27, 1979, 44 FR 55580).

Subsequent to the publication of the response to the AMC petition for reconsideration, General Motors (GM) wrote the agency concerning an interpretation of the modified requirements. GM said that on its vehicles equipped with tilt steering columns, there is a tilt mechanism release lever located on the same side of the steering column as the turn signal control lever. GM said that the tilt release lever is "shorter and significantly farther from the steering wheel than the turn signal lever and consequently is out of the immediate finger tip reach of a hand remaining on the steering wheel." GM said that the tilt wheel mechanism is a customer convenience, not a safety feature.

GM argued that its understanding of the agency's interpretation of the modified identification requirement was that the turn signal control only had to be identified "if it is not located and operated in what has become to be considered the standardized manner or if another functional control lever related to vehicle safety could be easily confused with it." GM said that based on that interpretation, it believed that "the presence or absence of a tilt column release lever does not determine whether the turn signal control must be identified." To assist all interested parties in interpreting the requirement, GM requested the agency to consider revising the language of the standard to clarify the agency's intent.

The purpose of this notice is to make an interpretative amendment to Standard No. 101-80 to clarify the circumstances under which the turn signal control must be identified. As an interpretative amendment, there is no need for notice and comment.

The purpose of the identification requirement is to make it easier for the driver to quickly and correctly locate various safety-related vehicle controls. One of the controls that has been standardized in its location and operation for a number of years is the turn signal control. In every car, that control is mounted on the left hand side of the steering column, is located so that it is the control closest to the rim of the steering wheel, and is operated in a standardized manner, up for right, down for left. Since the turn signal control has been standardized for such a long time, it is not necessary for the control to include an identifying symbol.

As long as the turn signal control is in its standardized location, it will be instantly recognized by drivers even if there are other controls mounted on the same side of the column, farther away from the rim of the steering wheel. Thus, to clarify the iden-tification requirements, the agency is amending the standard. The amendment provides that if the turn signal control is mounted on the left side of the steering column, in a plane essentially parallel to the steering wheel, it need not be identified if it is the control mounted closest to the rim of the steering wheel.

In consideration of the foregoing, Standard No. 101-80 (49 CFR 571.101-80) is revised accordingly.

Issued on October 22, 1980.

Frank Berndt
Acting Administrator

45 FR 71803
October 30, 1980

PREAMBLE TO AN AMENDMENT TO PART 571 STANDARD NO. 101-80

Controls and Displays
(Docket No. 1-18; Notice 20)

ACTION: Final rule.

SUMMARY: This notice amends Standard No. 101-80, *Controls and Displays.* The standard currently requires the light indicating the actuation of the headlamp high beam to be blue. (Blue is defined by the standard to include blue-green.) This amendment permits manufacturers to use the color green as an alternative to blue. The purpose of the change is to allow the use of light emitting diode technology, which at the present time cannot produce the color blue or blue-green.

EFFECTIVE DATE: January 21, 1982.

SUPPLEMENTARY INFORMATION: Standard No. 101-80, *Controls and Displays,* specifies requirements for the identification and illumination of controls and displays in passenger cars, multipurpose passenger vehicles, trucks and buses. The purpose of the standard is to ensure the accessibility and visibility of motor vehicle controls and displays and to facilitate their quick and proper identification and selection by a driver in order to reduce the safety hazards caused by the diversion of the driver's attention from the driving task, and by mistakes in selecting controls.

Among its requirements, Standard No. 101-80 specifies colors for various vehicle displays. Blue is specified for the headlamp high beam telltale (i.e., the light indicating that the high beams of the headlamps have been activated). A footnote to the standard's color requirements (contained in Table 2 of the standard) states that blue can be blue-green.

This final rule amends the standard by adding green as an alternative to blue and blue-green for the headlamp high beam telltale. This final rule was preceded by a notice proposing the amendment of Standard No. 101-80 in October 1980 (45 F.R. 71832). Several comments were received that supported the proposal, including those submitted by General Motors, Ford and Chrysler. Only one comment opposed the proposal. The NHTSA has considered all of the comments and the most significant ones are discussed below.

The agency proposed to allow the use of green as an alternative to blue in response to a petition for rulemaking from Volkswagen (VW). Blue had been selected by the agency for the headlamp high beam telltale primarily to promote international harmonization of standards regulating vehicle controls and displays. That color requirement was the same as that adopted by the International Standards Organization, the Economic Commission for Europe and the European Economic Community. VW petitioned for green as an alternative to blue in order to enable it to use light emitting diodes (LED's) for its telltales. VW stated that its testing has demonstrated that LED's are more reliable than incandescent bulbs when used for telltales and are, thus, very desirable. At present, however, LED's cannot be produced in either blue or white (which could be used with a blue filter to produce blue). VW stated that green is the only color akin to blue or blue-green which LED technology is capable of producing.

Ford stated that it supports the proposed amendment since it recognizes current technological limitations and would allow manufacturers to introduce new designs at these limits. Ford did express concern, however, that the proposed relaxation of the color requirement is in conflict with international harmonization of U.S. and European motor vehicle standards. That company recommended that the proposed amendment is issued for an interim period only—

until LED technology can provide commercially acceptable blue LED's. Ford's comment stated that it believes that blue LED's will become commercially feasible for automotive application within the next year.

A comment submitted by General Motors (GM), also supporting the proposed amendment, stated that it believes that the allowance of a green high beam telltale will effectively present the message of that telltale, particularly since it must also be identified by a symbol. According to GM, the amendment will allow incorporation of the current electronic technology involving light emitting diodes into automotive panel displays. GM stated that the allowance of green as a high beam telltale color will not affect international harmonization since blue will remain an alternative. That company noted that any manufacturer desiring to market a product worldwide can still choose to use a blue telltale and thereby meet the international requirements.

The issue of conflict with international harmonization was the basis for the only comment received in opposition to the proposed amendment. The U.S. Technical Research Company (U.S. Technical Representatives of Peugeot) stated that under the present state of technology, LED's can only display yellow, green or red. That company stated that it believes that in the near future an amendment of European regulations will require that the high beam telltale shall be either blue or yellow. According to that commenter, if NHTSA chooses to adopt green for the high beam telltale, harmonization in this field will no longer exist and domestic and foreign manufacturers will be equally affected. The U.S. Technical Research Company therefore requested that NHTSA retain the blue requirement because it is identical to the current European requirement. Alternatively, that company asked the agency to require that either blue or yellow telltales be used in anticipation of the possible change in the European requirements.

In the interest of international harmonization of standards, Renault also supported permitting the use of yellow. However, it also supported allowing the use of green as an alternative to blue.

The purpose of requiring telltales to be of a particular color is to promote standardization and thereby improve driver performance. As noted above, the agency adopted blue for the high beam telltale primarily to promote international harmonization. The International Standards Organization, the Economic Commission for Europe and the European Economic Community all maintain that color requirement.

The agency does not believe that permitting the use of green as an alternative to blue is in conflict with international harmonization. As noted by GM, any manufacturer desiring to market a product worldwide can still choose to use a blue telltale and thereby meet the international requirements. While the agency is aware that some manufacturers and some countries in Europe have sought to have international standards amended to permit use of yellow as an alternative to blue, it is by no means certain that those efforts will succeed. Indeed, the International Standards Organization rejected such a proposal in April 1980.

In light of the uncertainty of the direction in which international requirements will move on this matter, the agency determined that yellow should not be adopted as an alternative to blue. The agency agrees with VW's petition that green is the closest color akin to blue or blue-green that LED's can produce and thus, in the agency's judgment, is the best alternative color to permit. To permit use of yellow as well would defeat the purpose of having a color requirement in the first place, that of promoting standardization and thereby improving driver performance. Therefore, that alternative was rejected.

The agency recognizes that the cause of international harmonization may make amendment of Standard No. 101-80 appropriate if international organizations adopt yellow as an alternative to blue. The agency will monitor developments in this area.

In the interest of both standardization and international harmonization, the agency believes that use of green as an alternative to blue should only be permitted until LED technology develops to the point that it is possible to produce commercially acceptable blue LED's. The agency considered amending the standard to permit use of green for a specified period of time, such as three years. However, without more definite information indicating when commercially acceptable blue LED's will be available, the agency determined that it would be more appropriate to issue the amendment for an indefinite period of time. The agency will consider limiting high beam telltales to blue after blue LED technology has been developed.

The agency does not believe that this amendment will have any adverse effect on safety. Even if it did, the effect would be more than outweighed by the advantages offered by permitting industry the flexibility to use LED technology for telltales. As VW pointed out, there is evidence that LED's are more reliable than incandescent bulbs.

Comments submitted by Ford and VDO-ARGO stated that they see no adverse effect on safety as a result of this amendment. Further, as noted above, GM stated that it believes that a green high beam telltale will effectively present the message of that telltale, particularly since it must also be identified by symbol. No comments were received that suggested any adverse effect.

Also, there may be cost savings and other advantages associated with permitting LED's to be used for telltales. Standard No. 101-80 already permits LED's to be used for other displays. The standard defines displays that use LED's to give one or more than one type of information or message (i.e., using words or symbols) as informational readout displays. Recently the agency granted a petition for rulemaking from GM that requested modification in Standard No. 101-80's light intensity requirements to permit informational readout displays to be used for telltales. According to GM, such an amendment would permit integration of telltales with other instrument displays in a single electronic display panel. This step would alleviate instrument panel design problems caused by reduced space available due to vehicle downsizing and increasing amounts and types of information to be presented to the driver, offer potential for weight and cost reduction, and facilitate placing telltales adjacent to displays often consulted by the driver, making the telltales more readily noticeable. These same types of advantages are offered by permitting displays which use LED's, but are not informational readout displays (since they consist only of a colored light and do not display words or symbols), as telltales.

The agency has assessed the economic and other impacts of this final rule and determined that it is neither a major rule within the meaning of Executive Order 12291 nor a significant rule under the Department of Transportation's regulatory policies and procedures. Further, the agency concludes that the economic and other consequences of this final rule are so minimal as not to require preparation of a regulatory evaluation. The impact is minimal because the amendment does not impose any new requirements and does not affect compliance costs. Rather, it merely permits manufacturers to use an alternate color for the high beam telltale. For the same reasons, the agency finds that the amendment will have no significant environmental impact.

Although NHTSA has considered the effects of this amendment on small businesses, the agency has not prepared a regulatory flexibility analysis. Such an analysis is not necessary in this case, since the Regulatory Flexibility Act applies only to rules for which an NPRM was issued on or after January 1, 1981. The NPRM for this final rule was published in October 1980.

Issued on January 2, 1982.

Raymond A. Peck, Jr.
Administrator

47 F.R. 2996
January 21, 1982

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 101

Federal Motor Vehicle Safety Standards; Controls and Displays [Docket No. 1-18, Notice 25; No. 70-27, Notice 29]

ACTION: Final rule.

SUMMARY: Standard No. 101, *Controls and Displays*, specifies requirements for the accessibility, identification and illumination of controls and displays in passenger cars, trucks, and buses. This notice amends several of the identification requirements of the standard to improve safety by providing easily recognizable, international symbols and to relieve unnecessary restrictions on manufacturers by providing additional flexibility in their ability to identify controls and displays. This notice also responds to manufacturer petitions. The amendments include replaceing the symbol specified for headlamp/tail lamp controls that are part of master lighting switches with the International Standards Organization (ISO) master lighting switch symbol, while making the identification for headlamp/tail lamp controls that are separate from master lighting switches at the option of the manufacturer; making a minor modification in the symbol specified for the clearance lamp system control; permitting several symbols to be used in solid or outline form; specifying that horn controls, with limited exceptions, be identified by the ISO horn symbol; permitting several heating and air conditioning controls to be identified by symbols as an alternative to words, with the choice of the particular symbols left to the discretion of the manufacturer; and making minor interpretive amendments. This notice also makes minor interpretive amendments in related identification requirements of Standard No. 105, *Hydraulic Brake Systems*.

EFFECTIVE DATE: The amendments are effective on July 27, 1984. Some amendments are of an optional nature. Others are optional now and become mandatory on September 1, 1987.

SUPPLEMENTARY INFORMATION: Standard No. 101, *Controls and Displays*, specifies requirements for the accessibility, identification and illumination of controls and displays in passenger cars, multipurpose passenger vehicles, trucks and buses. The purpose of the standard is to ensure the accessibility and visibility of motor vehicle controls and displays to a driver and to facilitate their quick and proper identification and selection by a driver in order to reduce the safety hazards caused by the diversion of the driver's attention from the driving task, and by mistakes in selecting controls.

On November 4, 1982, NHTSA published (47 FR 49993) a notice of proposed rulemaking (NPRM) to update Standard No. 101 by adding or modifying several symbols to bring the standard into harmony with recent documents promulgated by the International Standards Organization (ISO). The agency also proposed minor interpretive amendments. The November 1982 notice was issued in light of changing international standards specifying symbols for the identification of controls and displays. These standards include, in addition to the ISO standard, those of the United Nations Economic Commission for Europe (ECE) and the European Economic Community (EEC). The proposal resulted in part from a petition for rulemaking submitted by Renault.

NHTSA received numerous comments on the proposal, mostly from manufacturers. Since issuing the NPRM, the agency has received several other petitions for rulemaking from manufacturers concerning Standard No. 101, some of which followed directly from the proposal. During the same time period, the agency has also been in the process of considering comments and related petitions concerning a separate earlier NPRM to amend other aspects (other than specific symbol identification) of Standard No. 101. That proposal was published in the Federal Register (47 FR 4541) on February 1, 1982.

The various comments and petitions relating to one or the other proposal raise a number of issues, many of which are closely interrelated. After reviewing all of the comments and petitions, NHTSA has decided to adopt certain limited amendments at this time from the November 1982 NPRM. This action will enable manufacturers to appropriately, and in a timely fashion, identify their controls and displays while maintaining and improving safety by adopting internationally accepted symbols for identifying these devices. The agency is postponing a final decision on the rest of the amendments proposed by the two notices pending completion of an ongoing examination by the agency of issues related to Standard No. 101. This examination is expected to be complete this summer. Although this examination will broadly cover the requirements of Standard No. 101, it is anticipated to result in a Notice of Proposed Rulemaking, final action on which will not be timely to respond to the immediate needs of the manufacturers and the public. Thus, issuance of this final rule is necessary at this time.

The amendments adopted at this time include: (1) replacing the symbol specified for headlamp/tail lamp controls that are part of master lighting switches with the ISO master lighting switch symbol, while making the required identification for headlamp/tail lamp controls that are separate from master lighting switches at the option of the manufacturer, (2) making a minor modification in the symbol specified for the clearance lamp system control, (3) permitting several symbols to be used in solid or outline form, (4) specifying that horn controls, with limited exceptions, be identified by the ISO horn symbol, (5) permitting heating and air conditioning controls to be identified by symbols as an alternative to words, with the symbols at the option of the manufacturer, and (6) making minor interpretive amendments.

As discussed below, the effective date for certain new or changed symbols is September 1, 1987. An immediate effective date is established for optional use of the new or changed symbols and for the other amendments, all of which are of an optional nature.

The discussion of issues and comments which follows is largely limited to those relating to the amendments adopted by this notice. Remaining issues will be addressed after the agency has completed its comprehensive examination of issues related to Standard No. 101.

Symbol Requirements

The November 1982 notice explained that Standard No. 101 specifies the mandatory use of certain symbols for the identification of a number of controls and displays. Additional words and symbols are permitted to be used for purposes of increasing clarity of the identification. (Standard No. 101 requires several other controls and displays, for which symbols are not specified, to be identified by words. Also, the use of words instead of symbols is permitted in informational readout displays.) The symbols specified by the standard are those developed by the International Standards Organization or similar symbols based on ISO standards. In the notice adopting the use of these symbols (43 FR 27541, June 26, 1978), the agency explained that the rationale for requiring symbols was that they can convey information more quickly and with less chance of human error than words. The agency noted that this was particularly true with respect to the large foreign language speaking population of this country. The agency also indicated that an additional benefit was that manufacturers which sell vehicles both in and outside of the United States could realize cost savings by utilizing internationally acceptable symbols.

As noted above, the November 1982 notice proposed to update Standard No. 101 by adding or modifying several symbols to bring the standard into harmony with the latest documents promulgated by the ISO. The agency stated that the changes would reduce compliance costs by promoting international harmonization and would result in safety benefits.

Almost all of the comments supported the concept of changing Standard No. 101 to facilitate international harmonization. The comments were mixed, however, with respect to some of the specific proposed amendments, especially to the extent that the number of required symbols would be increased.

While some manufacturers strongly supported the amendments essentially as proposed, others questioned the underlying safety need for the standard's requirement for symbols. Concern was expressed by some manufacturers that an increased number of required symbols could result in greater risk of producing non-conforming vehicles, with the possibility of having to recall vehicles.

General Motors expressed concern that either requiring an overabundance of symbols, or requiring symbols that offer no intuitive recognizability, would not be in the best interests of its customers or the marketability of its products. That company stated that while the existing set of required symbols does not present a significant problem, the addition of more mandatory symbols could lead to increased customer resistance and driver confusion. On this last point, General Motors stated that the symbols most recently adopted by the ISO have been adopted without testing to assure immediate recognizability, with a greater probability that the meaning of the symbols must be learned.

The agency agrees that too many symbols, or symbols that are not easily recognizable, are not in the public's or industry's interest. For this reason, the agency has postponed action on some of the additional requirements proposed in the November 1982 notice. These will be addressed in the agency's forthcoming evaluating of Standard No. 101. Thus, this final rule adds one completely new symbol (the horn symbol) to the standard and changes or modifies several others. The agency believes, based on the comments to the docket and the work of the ISO, that each of the new and modified symbols is easily recognizable. The agency also believes that the amendments will not create confusion or any other problems related to a possible "overabundance" of symbols, because of their limited nature. The agency will consider the broader issues of possible "overabundance" of symbols and of new symbols which may not offer intuitive recognizability as part of its comprehensive examination of Standard No. 101 issues.

Master Lighting Switch Symbol

As explained in the November 1982 notice, the proposal to replace the symbol specified for the headlamp/tail lamp control with the master lighting symbol resulted in part from a petition for rulemaking submitted by Renault. Renault's petition had pointed out that the symbol specified by Standard No. 101 for that control is different from that used elsewhere in the world. That petitioner noted that the Standard No. 101 symbol is that designated by the ISO for high beam headlamps, rather than for the headlamp/tail lamp control.

Most of the commenters supported changing to the master lighting symbol. General Motors stated that it supports the proposal to revise the symbols for those control and display functions which already require identification in order to bring them into harmonization with European requirements, including replacing the headlamp symbol with the master lighting symbol. Several other manufacturer comments specifically supported the change.

Renault stated that while it approves without reservation the introduction of the master lighting symbol into the standard, the list of functions corresponding to the symbol given in column 1 of Table 1 should be expanded or at best omitted altogether. The proposed wording in column 1 referred to by Renault was "Master Lighting Switch, Headlamp and Tail Lamps."

One commenter, Grumman Flxible, disagreed with changing to the master lighting symbol. That company argued that the symbol is too ambiguous, does not specifically indicate that the lamps it represents include headlamps, and also represents additional components not specifically indicated. Grumman Flxible also argued that the symbol is not immediately recognizable, due to both an initial unfamil :rity with the symbol in this country and because the pictogram is too abstract in nature. That commenter also stated that the symbol does not allow for any distinction between the headlamp mode and parking light mode, and that that issue should be addressed. Finally, Grumman Flxible stated that it finds no evidence that the symbol is used by the rest of the world for headlamps and that most foreign vehicles it is familiar with use the current Standard No. 101 headlamp symbol.

Fiat stated that identification for the headlamp control has been omitted from Table 1. According to that commenter, the headlamp symbol should be required for the identification of the high beam/low beam switch if this is separate from the master lighting switch.

This notice adopts the master lighting switch symbol for headlamp/tail lamp controls that are also master lighting switches, i.e., single controls that operate several different lamp systems. The agency continues to require identification of headlamp/tail lamp controls that are separate from the master lighting switch. However, the agency has decided that the method of identifying headlamp/ tail lamp controls should be at the option of the manufacturer.

Standard No. 101 currently specifies the same symbol for headlamp/tail lamp controls whether or not such controls are also master lighting switches. The description of the control designated in column 1 of Table 1 is "Headlamps and Tail Lamps." A footnote indicates that the symbol must also be used when clearance, identification, parking and/or side marker lamps are controlled with the headlamp switch. The type of control described by the footnote is a master lighting switch. Typical passenger cars, as well as many other vehicles, have master lighting switches instead of separate controls for various types of lamps.

The November 1982 notice proposed the use of the master lighting switch symbol for both master lighting switches and separate headlamp/tail lamp controls. The proposed description for column 1 of Table 1 referred to by Renault, "Master Lighting Switch, Headlamp and Tail Lamps", indicated that the symbol was to apply to both types of controls. Thus, the words "Headlamp and Tail Lamps" were not intended to be a list of functions corresponding to the master lighting switch.

The agency believes that the master lighting switch symbol is the most appropriate and easily recognizable symbol to identify master lighting switches. The agency does not agree with Grumman Flxible that the symbol is not immediately recognizable or that the pictogram is too abstract. The symbol in question obviously resembles a light bulb with lines representing rays of light going out in all directions. Since the control operates several different lamps, typically including at least headlamps and tail lamps, parking lamps and side marker lamps, the agency considers such a general lighting symbol to be more appropriate than one which more specifically indicates a single particular type of lamp, i.e., headlamps. With regard to Grumman Flxible's statement that the symbol does not allow for any distinction between the headlamp mode and parking mode, the agency notes that Standard No. 101 permits the use of words or symbols in addition to those required, for purposes of clarity. Thus, a manufacturer may, but is not required to, use such words or symbols to distinguish between different modes.

The agency does not understand Grumman Flxible's statement that it finds no evidence that the symbol is used by the rest of the world for headlamps and that most foreign vehicles it is familiar with use the current Standard No. 101 headlamp symbol. The master lighting switch symbol is specified by both the ISO and European Economic Community and is required for vehicles produced for sale in the European market.

The agency has decided that it would not be appropriate to require the master lighting switch symbol to be used for headlamp/tail lamp controls that are separate from a master lighting switch. The general master lighting switch symbol could be confusing in such instances. For example, a driver might see the master lighting switch symbol and believe that it operated all of the vehicle's lamps instead of only the headlamps. Also, identification which more specifically indicates headlamps, such as the symbols specified by the ISO, might be more appropriate. The agency has decided that identification should continue to be required for a separate headlamp/tail lamp control and has therefore included that control in Table 1. The agency has decided, however, that the specific identification for such a control should be at the option of the manufacturer.

Clearance Lamp Symbol

The November 1982 notice proposed a minor modification in the symbol specified for the clearance lamp system control. The notice also proposed a change in the applicability of the symbol to identification lamp and side marker lamp controls.

The notice explained that there are three very similar versions of this symbol. The reason for the multiple versions appears to be that the symbol was still under consideration by the ISO when the United States and Europe established their identification requirements, and it was not clear which specific symbol would be adopted. The agency proposed in November 1982 deleting the version currently included in Standard No. 101 and adopting the version finally specified by the ISO in the interests of cost minimization through harmonization. That is the same version specified by the European Economic Community (EEC). The third version is specified by the United Nations Economic Commission for Europe (ECE). The agency explained that, as essentially the same symbol, all three versions are equally effective at presenting their message. The agency added, however, that for purposes of optimal driver recognition and cost minimization through international harmonization, it believed that it was desirable to specify the use of only one of the three versions.

Several manufacturer commenters agreed that the ISO/EEC version should be specified by

Standard No. 101. Some commenters stated that the ECE version should not be permitted as an alternative, since it would be contrary to the anticipated goal of harmonization. It was also pointed out that the ECE version is in a draft regulation and may not be finally adopted by that organization.

GM agreed that it is desirable to have one symbol ultimately prevail and suggested that NHTSA work within the ECE to resolve differences. GM argued, however, that resolving the differences is a harmonization issue rather than a safety issue and suggested that all three versions be permitted in the meantime. GM commented that all three versions are reasonably recognizable and similar enough in form that confusion should not result. Volkswagen similarly commented that the versions are virtually identical.

While it is true that the three versions are similar, the agency believes that for purposes of easy recognition only one should be specified. The leadtime provided by this notice gives adequate time for manufacturers to make the very minor changes necessitated by adoption of the ISO version, as proposed.

Grumman Flxible suggested that the ECE symbol for parking lights be adopted in place of the clearance lamp symbol. (The ECE symbol is the same as the ISO symbol.) That commenter appeared to believe that the clearance lamp symbol must be used for the master lighting switch when it is adjusted so that all lights except the headlamps are on, or for a separate parking light control. The clearance lamp symbol need not be used in either instance. The clearance lamp symbol is only specified for a separate control for identification, side marker and/or clearance lamps. As indicated above, manufacturers may, but need not, supplement the master lighting switch symbol with additional symbols to identify the lights operated by the different adjustment positions of that switch. Thus, a manufacturer could use the ISO parking light symbol, not specified by Standard No. 101, for a particular position of a master lighting switch. Similarly, since Standard No. 101 does not specify identification for a separate parking light control, a manufacturer could use the ISO parking light symbol to identify such a control.

As noted above, the agency also proposed a change in the applicability of the symbol to identification lamp and side marker lamp controls. Standard No. 101 currently specifies the symbol for clearance lamp controls, with a footnote in Table 1 indicating that the symbol should also be used when clearance lamps, identification lamps, and/or side marker lamps are controlled with one switch other than the headlamp switch. No symbols are specified for identification of separate controls for identification lamps or side marker lamps. The notice proposed that the symbol be specified for all controls operating these three types of lamps, except for a master lighting switch. This notice adopts the amendment as proposed. If separate controls are provided for these types of lamps, a manufacturer may use additional words or symbols for purposes of clarity.

Shading of Symbols

Tables 1 and 2 of Standard No. 101 include footnotes that permit framed areas of certain symbols to be filled in. Recently, the ISO adopted variants of certain other symbols to essentially permit solid areas of those symbols to be in outline form. The November 1982 notice requested comments on whether manufacturers should be permitted to use those variant symbols. All of the comments received on this issue supported allowing the variant symbols. Some commenters stated that the ISO symbols shown in outline form are sufficiently recognizable.

The agency agrees that the outline symbols are recognizable. Therefore, this notice permits those variant symbols to be used for the heating and/or air conditioning fan, the seat belt telltale, and fuel level.

Horn Control

In proposing a requirement that the horn control be identified, the November 1982 notice explained that NHTSA has received a number of complaints over the years about difficulty in locating the horn, especially in panic situations. The agency noted that since location of the horn is not standardized either by industry practice or by regulation, identification of the horn can provide important safety benefits at a minimal cost. The agency proposed that horn controls be identified by the ISO horn symbol, which is a picture of a horn (or bugle).

Comments received on this issue were mixed. Some manufacturers supported the horn requirement essentially as proposed. Several manufacturers stated that identification is unnecessary when the horn is located in the usual place, i.e., on or near the steering wheel. Also, as indicated above, some manufacturers opposed any expansion of Standard No. 101's requirements.

This notice adopts the requirement that the horn control be identified by the ISO horn symbol, with limited exceptions discussed below. The horn is an important device in accident avoidance. Accordingly, the agency believes it is esential that drivers be able to quickly locate the horn control. In adopting this symbol, the agency concludes that it is clearly and intuitively recognizable.

For other than heavy duty vehicles, the agency does not agree that identification is unnecessary when the horn control is located on or near the steering wheel. First, horn control location within the steering wheel area may vary significantly from vehicle to vehicle, making it difficult to find the horn control in an emergency situation. Second, to the extent that manufacturers locate the horn control elsewhere, e.g., on various stalks, drivers are less likely to expect the horn in what was once the traditional location. Moreover, the absence of a horn symbol in the steering wheel area will alert drivers to look elsewhere. Finally, controls other than the horn, such as a cruise control, may be located on or near the steering wheel, making it more difficult to find a horn control in that same general area.

Some commenters expressed concern about how Standard No. 101's requirement that symbols be perceptually upright might apply to horn controls located on the steering wheel. It was noted that it is impossible for these horn symbols to be perceptually upright at all times. In response to these comments, the agency has included a provision that the horn symbol need be perceptually upright only when the vehicle, aligned to the manufacturer's specification, has its wheels positioned for the vehicle to travel straight forward, i.e., when the steering wheel is centered.

Volkswagen stated that the horns on some of its vehicles are actuated by pressing virtually anywhere on a large, cushioned pad extending over almost the entire area inside the steering wheel. That commenter stated that the proposal was unclear where a horn symbol should be placed in that situation. The agency does not agree that this is unclear. Standard No. 101 generally provides that the identification for controls be placed on or adjacent to the control. Accordingly, Volkswagen could place a single horn symbol anywhere on or adjacent to the cushioned pad.

The November 1982 notice proposed to exclude narrow ring-type horn controls from the identification requirement since there may not be sufficient space on or adjacent to such controls for the horn symbol. One commenter pointed out that the requirements of Standard No. 203, *Impact protection for the driver from the steering control system*, have largely eliminated that type of control. That standard requires that the steering control system be constructed so that no components or attachments, including horn actuating mechanisms, can catch the driver's clothing or jewelry during normal driving maneuvers. While some ring-type horn control designs are prohibited by that requirement since they can catch the driver's clothing or jewelry during normal driving maneuvers, other designs do not have that problem. The agency has therefore adopted that proposed exclusion.

Several manufacturers commented that most heavy duty vehicles, unlike passenger cars, have both a standard horn and an air horn. The air horn is typically activated by pulling on a lanyard, i.e., chain, cable or rope, above the driver's head. According to these commenters, placing a symbol on such a device would be difficult due to the small area of the lanyard. These commenters also stated that identification of such horns is unnecessary since professional heavy duty vehicle operators are familiar with this type of control. These commenters also argued that the location of the standard (electric) horn on these vehicles is standardized in the center of the steering wheel hub and that identification of these horns is also unnecessary.

The agency agrees with these commenters concerning air horns and has excluded lanyard-operated horns from Standard No. 101's identification requirements. The agency also agrees with the commenters concerning electric horns in heavy duty vehicles. Manufacturers of those vehicles have traditionally placed the electric horn in the center of the steering wheel hub and the agency therefore sees no need to regulate in this area.

Heating and Air Conditioning Controls

Standard No. 101 currently requires identification for each function of any heating and air conditioning control, and for the extreme positions of any such control that regulates a function over a quantitative range. If a symbol is not specified by the standard for such a function, the identification must be in word form (unless color coding is used.)

Standard No. 101 currently specifies symbols for several functions of a heating and air conditioning system, including the fan, defrosting and defogging, and rear window defrosting and defogging. The November 1982 NPRM proposed to add several ISO symbols to cover additional functions, including heating, air conditioning, various types of vents, and heated seat.

The agency received numerous comments which were opposed to adding these symbols to Standard No. 101. Some commenters stated that the symbols in question were inexplicit and had been adopted hastily by the ISO, without testing for recognizability. According to some commenters, there are efforts within the ISO to change the symbols. Concern was also expressed that the symbols are difficult to apply to many of the complex heating and air conditioning systems in use today or planned for the future. Several manufacturers submitted drawings of heating and air conditioning systems to illustrate the problems associated with the application of the proposed symbols. GM stated that questions of interpretation raise the concern that these particular proposed changes are not objective, since manufacturers would not have the requisite assurance that they have met the standard with any specific design.

Ford requested that controls for automatic temperature control systems be exempted from the proposed requirements. Other manufacturers expressed concern about how to identify controls with multiple functions.

Volkswagen recommended that manufacturers be permitted to use words or symbols, of their own choosing, for heating and air conditioning controls. That company argued that such flexibility would result in more meaningful symbols being utilized for various functions. Volkswagen acknowledged that such flexibility could result in lack of uniform use of the same symbol for the same control by all manufacturers and in use of symbols not consistent with international recommendations. That commenter did not believe that these would be significant problems, however, noting among other things that there is so much variety in heating and air conditioning systems that each car would still be unique, even if the proposed symbols were used.

This notice adopts an approach along the lines suggested by Volkswagen. NHTSA continues to believe that, as currently required, each function of a heating or air conditioning system should be identified. Based on its review of comments, however, the agency agrees that the proposed symbols are not adequate for defining the functions of all heating and air conditioning systems. While the agency considered simply maintaining the current requirement that words be used for functions where symbols are not specified, the agency has decided instead that both safety and cost reduction through harmonization are best served by permitting manufacturers to identify such functions by words or symbols, with the specific words or symbols at the discretion of the manufacturer.

As discussed above, the agency has previously concluded that symbols can convey information more quickly and with less chance of human error than words, resulting in safety benefits. Use of symbols appears to be particularly appropriate for identifying some functions of complex heating and air conditioning systems. For example, a relatively simple symbol can convey information about such things as the direction of air flow more readily and clearly than words.

The agency continues to believe that, for purposes of optimum recognizability, standardized international symbols should be used wherever possible. In the case of symbols for some functions of heating and air conditioning systems, however, where the agency has concluded that standardized symbols are not fully or adequately developed, the agency considers it appropriate to permit manufacturers to use symbols of their own choosing. This action may not only result in safety benefits, as manufacturers develop and use symbols for these functions, but also promotes harmonization. Manufacturers which produce vehicles for sale in non-English-speaking countries using symbols will not need to develop special designs using English words.

The agency will monitor the continued development of international symbols in this area, as well as the symbols actually used by manufacturers on their vehicles' heating and air conditioning systems. If circumstances should warrant, the agency may consider specifying standardized symbols in the future.

The agency declines to exempt automatic temperature control systems from the standard's identification requirements. The need for identification of controls for this type of system is no different than for traditional heating and air conditioning systems. However, the option of using words or symbols of the manufacturer's choosing should provide ample flexibility in identifying the controls of these systems.

Manufacturers will continue to be required to use the symbols specified by Standard No. 101 for the fan, windshield defrosting and defogging, and rear window defrosting and defogging. The option of using words or symbols of the manufacturer's choosing applies only to other functions. The addition of this option does not impose any new requirements since manufacturers are already required to identify those other functions by words.

Interpretive Amendments

This notice adopts several interpretive amendments, as proposed by the November 1982 notice and in accord with previous agency interpretations. Two footnotes concerning the turn signal control symbol are added to Table 1. That symbol, a pair of horizontal arrows pointing to the left and right, is ordinarily a single symbol. One footnote makes it clear that the two arrows may be considered separate symbols where there are independent controls for the left and right turn signals. The other footnote makes it clear that framed areas of that symbol or symbols may be filled in.

Section S5.3.5 of Standard No. 105 is amended to indicate that the words "Brake Fluid" need not be used for a separate indicator lamp for brake fluid where a vehicle uses hydraulic system mineral oil rather than conventional brake fluid. (A manufacturer is instead required to use the word "Brake" and appropriate additional labeling.)

This notice also makes related interpretive amendments of a minor nature in section S5.3.5 of Standard No. 105 and Table 2 of Standard No. 101 that were not proposed by the November 1982 notice. Section S5.3.5 currently requires that a malfunction in an anti lock system be identified by the word "Antilock". Table 2 specifies the same word but in a hyphenated form, i.e., "Anti-Lock." This notice amends the two standards to make it clear that a manufacturer may use either form of the word. Since these amendments are interpretive, notice and comment is not required.

The November 1982 notice also proposed other changes in section S5.3.5 of Standard No. 105. While the agency is not adopting any other substantive changes in that section at this time, it is adopting a new format for that section along the lines proposed by that notice.

The November 1982 notice proposed to drop the words listed by column 2 of Table 1 for controls for which a symbol is also specified. Section S5.2.1(a) provides that while the symbol specified by Table 1 for such a control is mandatory, the words listed by column 2 may be used in addition to the symbol. That same section provides further, however, that any additional words or symbols may be used at the manufacturer's discretion for purposes of clarity. Since manufacturers may use any words in addition to the required symbol, the provision that a manufacturer may use the words specified by column 2 has no legal effect. Accordingly, this notice drops those words from column 2 and makes a conforming amendment to section S5.2.1(a).

Leadtime

The amendments are effective immediately. However, some amendments are of an optional nature until September 1, 1987. The agency finds good cause for an immediate effective date for the optional identification requirements since the amendments relieve restrictions, while reducing compliance costs and promoting safety.

The November 1982 notice proposed an effective date of September 1, 1985, for mandatory use of the new symbols. Several commenters suggested that date was too early. In promulgating this final rule, the agency has determined that a date of September 1, 1987 provides adequate leadtime. The agency also finds it is in the public interest to establish such a relatively long leadtime for mandatory use of the new symbols, given the nature of the changes and since such a leadtime minimizes compliance costs.

In consideration of the foregoing, §571.101 and §571.105, Chapter V of Title 49, Code of Federal Regulations, are amended as follows:

§571.101 [Amended]

1. Section S5 is revised to read as follows:

S5. *Requirements.* (a) Except as provided in paragraph (b) of this section, each passenger car, multipurpose passenger vehicle, truck and bus manufactured with any control listed in S5.1 or in column 1 of Table 1, and each passenger car, multipurpose passenger vehicle and truck or bus less than 10,000 pounds GVWR with any display listed in S5.1 or in column 1 of Table 2, shall meet the requirements of this standard for the location, identification, and illumination of such control or display.

(b) For vehicles manufactured before September 1, 1987, a manufacturer may, at its option—

(1) Meet the requirements in this standard to use identifying words or abbreviation or identifying

symbol for a control by using those specified in Table 1(a) instead of Table 1. If none are specified in Table 1(a), none need be used for the control.

(2) Meet the requirements in this standard to use identifying words or abbreviation or identifying symbol for a display by using those specified in Table 2(a) instead of Table 2. If none are specified in Table 2(a), none need be used for the display.

2. Section S5.2.1(a) is revised to read as follows:

(a) Except as specified in S5.2.1(b), any hand-operated control listed in column 1 of Table 1 that has a symbol designated in column 3 shall be identified by that symbol. Any such control for which no symbol is shown in Table 1 shall be identified by the word or abbreviation shown in column 2, if such word or abbreviation is shown. Words or symbols in addition to the required symbol, word or abbreviation may be used at the manufacturer's discretion for the purpose of clarity. Any such control for which column 2 of Table 1 and/or column 3 of Table 1 specifies "Mfr. Option" shall be identified by the manufacturer's choice of a symbol, word or abbreviation, as indicated by that specification in column 2 and/or column 3. The identification shall be placed on or adjacent to the control. The identification shall, under the conditions of S6, be visible to the driver and, except as provided in S5.2.1.1 and S5.2.1.2, appear to the driver perceptually upright.

3. Section S5.2.1.1 is revised to read as follows:

S5.2.1.1 The identification of a master lighting switch or headlamp and tail lamp control that adjusts control and display illumination by means of rotation, or of any other rotating control that does not have an off position, need not appear to the driver perceptually upright. The identification of a horn control need not appear to the driver perceptually upright except when the vehicle, aligned to the manufacturer's specifications, has its wheels positioned for the vehicle to travel in a straight forward direction.

4. The second sentence of section S5.2.2 is revised to read as follows:

If this identification is not specified in Tables 1 or 2, it shall be in word or symbol form unless color coding is used.

5. A new Table 1 is added following section S6 to read as set forth below.

6. The existing Table 1 is redesignated Table 1(a).

7. A new Table 2 is added following Table 1(a) to read as set forth below.

8. The existing Table 2 is redesignated Table 2(a).

§571.105 [Amended]

1. Section S5.3.5 is revised to read as follows:

S5.3.5(a) Each indicator lamp shall display word or words, in accordance with the requirements of Standard No. 101 (49 CFR 571.101) and/or this section, which shall be legible to the driver in daylight when lighted. The words shall have letters not less than 1/8-inch high. Words in addition to those required by Standard No. 101 and/or this section and symbols may be provided for purposes of clarity.

(b) If a single common indicator is used, the lamp shall display the word "Brake". The letters and background of a single common indicator shall be of contrasting colors, one of which is red.

(c)(1) If separate indicator lamps are used for one or more than one of the functions described in S5.3.1(a) through S5.3.1(d), the display shall, except as provided in (c)(1)(A) through (D) of this section, include the word "Brake" and appropriate additional labeling.

(A) If a separate indicator lamp is provided for gross loss of pressure, the words "Brake Pressure" shall be used for S5.3.1(a).

(B) If a separate indicator lamp is provided for low brake fluid, the words "Brake Fluid" shall be used for S5.3.1(b), except for vehicles using hydraulic system mineral oil.

(C) If a separate indicator lamp is provided for an anti lock system, the single word "Antilock" or "Anti-Lock" may be used for S5.3.1(c).

(D) If a separate indicator lamp is provided for application of the parking brake, the single word "Park" may be used for S5.3.1(d).

(2) Except for a separate indicator lamp for an anti lock system, the letters and background of each separate indicator lamp shall be of contrasting colors, one of which is red. The letters and background of a separate indicator lamp for an anti lock system shall be of contrasting colors, one of which is yellow.

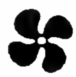
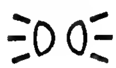
Issued on July 24, 1984

Diane K. Steed
Administrator

49 FR 30191
July 27, 1984

Table 1

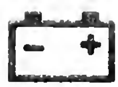
Identification and Illumination of Controls

Column 1	Column 2	Column 3	Column 4
Hand Operated Controls	Identifying Words or Abbreviation	Identifying Symbol	Illumination
Master Lighting Switch	———	 [5]	———
Headlamps and Tail lamps	(Mfr Option)[2]	(Mfr Option)[2]	———
Horn	———	 [4]	———
Turn Signal	———	 [3] [5]	———
Hazard Warning Signal	———	 [5]	Yes
Windshield Wiping System	———		Yes
Windshield Washing System	———		Yes
Windshield Washing and Wiping Combined	———		Yes
Heating and or Air Conditioning Fan	———	 or 	Yes
Windshield Defrosting and Defogging System	———		Yes
Rear Window Defrosting and Defogging System	———		Yes
Identification, Side Marker and or Clearance Lamps	———	 [2] [5]	Yes
Manual Choke	Choke	———	———
Engine Start	Engine Start[1]	———	———
Engine Stop	Engine Stop[1]	———	Yes
Hand Throttle	Throttle	———	———
Automatic Vehicle Speed	(Mfr Option)	———	Yes
Heating and Air Conditioning System	(Mfr Option)	(Mfr Option)	Yes

[1] Use when engine control is separate from the key locking system.
[2] Separate identification not required if controlled by master lighting switch.
[3] The pair of arrows is a single symbol. When the controls for left and right turn operate independently however, the two arrows may be considered separate symbols and be spaced accordingly.
[4] Identification not required for vehicles with a GVWR greater than 10,000 lbs., or for narrow ring type controls.
[5] Framed areas may be filled.

Table 2

Identification and Illumination of Displays

Column 1	Column 2	Column 3	Column 4	Column 5
Display	Telltale Color	Identifying Words or Abbreviation	Identifying Symbol	Illumination
Turn Signal Telltale	Green	Also see FMVSS 108	 [1] [6]	—
Hazard Warning Telltale	Red[4]	Also see FMVSS 108	 [2] [6]	—
Seat Belt Telltale	Red[4]	Also see FMVSS 208	 or 	—
Fuel Level Telltale	Yellow	Fuel	 or 	—
Fuel Level Gauge	—			Yes
Oil Pressure Telltale	Red[4]	Oil		—
Oil Pressure Gauge	—			Yes
Coolant Temperature Telltale	Red[4]	Temp		—
Coolant Temperature Gauge	—			Yes
Electrical Charge Telltale	Red[4]	Volts, Charge or Amp		—
Electrical Charge Gauge	—			Yes
Highbeam Telltale	Blue or Green[4]	Also see FMVSS 108	 [6]	—
Malfunction in Anti-Lock or	Yellow	Antilock or Anti-lock Also see FMVSS 105	—	—
Brake System	Red[4]	Brake, Also see FMVSS 105	—	—
Brake Air Pressure Position Telltale	Red[4]	Brake Air. Also see FMVSS 121	—	—
Speedometer	—	MPH[5]		Yes
Odometer	—	—[3]	—	—
Automatic Gear Position	—	Also see FMVSS 102	—	Yes

[1] The pair of arrows is a single symbol. When the indicator for left and right turn operate independently, however, the two arrows will be considered separate symbols and may be spaced accordingly.

[2] Not required when arrows of turn signal tell-tales that otherwise operate independently flash simultaneously as hazard warning tell-tale.

[3] If the odometer indicates kilometers, then "KILOMETERS" or "km" shall appear, otherwise, no identification is required.

[4] Red can be red-orange. Blue can be blue-green.

[5] If the speedometer is graduated in miles per hour and in kilometers per hour, the identifying words or abbreviations shall be "MPH and km/h" in any combination of upper or lower case letters.

[6] Framed areas may be filled.

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 101

Federal Motor Vehicle Safety Standards
Controls and Displays

[Docket No. 1-18, Notice 26; and Docket No. 74-14, Notice 40]

ACTION: Final rule; response to petitions for reconsideration and petitions for rulemaking.

SUMMARY: This notice responds to three petitions for reconsideration and two related petitions for rulemaking concerning an amendment to Standard No. 101, *Controls and Displays*, published in July 1984. That notice amended several of the identification requirements of the standard for the purposes of improving safety by providing for the use of easily recognizable international symbols and relieving unnecessary restrictions on manufacturers by providing additional flexibility in their ability to identify controls and displays. In response to one of the petitions, the agency has eliminated a requirement that the horn control symbol be perceptually upright. In response to another petition, the agency is permitting use of the words "FASTEN BELTS" or "FASTEN SEAT BELTS" as an alternative to the seat belt warning symbol in informational readout displays. A conforming amendment is being made to Standard No. 208, *Occupant Crash Protection*. The petitions are otherwise denied. However, in the near future, the agency plans to publish a separate notice of proposed rulemaking which will fully address the issue of the use of telltales in informational readout displays, one of the major issues raised by one of the petitions for reconsideration.

EFFECTIVE DATE: June 4, 1985.

SUPPLEMENTARY INFORMATION: On July 27, 1984, NHTSA published in the *Federal Register (49 FR 30191) a final rule amending Standard No. 101, Controls and Displays.* The notice amended several of the identification requirements of the standard for the purposes of improving safety by providing for the use of easily recognizable, international symbols and relieving unnecessary restrictions on manufacturers by providing additional flexibility in their ability to identify controls and displays.

The final rule followed two notices of proposed rulemaking (NPRM's) to amend Standard No. 101. As discussed in the July 1984 notice, the final rule did not address all of the amendments proposed by the two notices. The notice explained that the agency was postponing a final decision on some of the proposed amendments pending completion of an ongoing examination by the agency of issues relating to Standard No. 101. The notice stated that the agency's examination of the standard was expected to result in a new notice of proposed rulemaking.

The agency received three timely petitions for reconsideration of the final rule. The petitions requested changes in the requirement that the horn control on passenger cars and other vehicles with a gross vehicle weight rating (GVWR) of 10,000 pounds or less be identified by the International Standards Organization (ISO) horn symbol. Some of the petitions also requested that the agency adopt some of the amendments that were proposed by the two NPRM's but not adopted or addressed in the July 1984 final rule, rather than waiting for the completion of the agency's examination of issues relating to Standard No. 101.

The agency also received two petitions for reconsideration of the final rule, after the closing date for such petitions. Under the agency's procedural rules, such petitions are considered petitions for rulemaking rather than petitions for reconsideration. See 49 CFR SECT. 553.35(a).

This notice responds to all five petitions. The notice will first address the issues raised by the petitions for reconsideration with respect to the horn control identification requirement. It will then consider the requests to adopt at this time some of the additional proposals on which action has been deferred. Finally, the notice will address the two petitions for rulemaking.

Horn Control

The July 1984 final rule requires that the horn control on passenger cars and other vehicles with a GVWR of 10,000 pounds or less be identified by the ISO horn symbol, a picture of a horn or bugle. The agency noted that it has received a number of complaints over the years about difficulty in locating the horn, especially in panic situations. The agency noted that since location of the horn is not standardized either by industry practice or by regulation, identification of the horn can provide important safety benefits at a minimal cost.

As with the identification required for most other controls, the rule specified that the horn symbol must be perceptually upright. In response to comments on the NPRM that it is impossible for symbols on the steering wheel to be perceptually upright at all times. the agency included a provision that the horn symbol need be perceptually upright only when the vehicle, aligned to the manufacturer's specification, has its wheels positioned for the vehicle to travel forward. i.e., when the steering wheel is centered. The rule excluded narrow ring-type horn controls from the identification requirement since there may not be sufficient space on or adjacent to such controls for the horn symbol.

A petition for reconsideration submitted by Toyota requested that the agency eliminate the perceptually upright requirement for the horn control symbol. The petitioner argued that the provision for a horn control symbol, without the perceptually upright requirement, would accomplish the agency's intentions for accident avoidance. That company also stated that it is difficult to place a perceptually upright symbol on the type of narrow button that is typically used on a vertical spoke of a steering wheel hub. Toyota noted that while the symbol could be located adjacent to the control in such a situation, the cost would be three times more than if the symbol were simply located on the button.

After carefully evaluating Toyota's arguments, the agency has decided to drop the perceptually upright requirement for the horn control symbol. This decision was based on two considerations. First, unlike some symbols which must be properly oriented in order to be understood, the horn symbol is readily recognizable in any orientation. Second, a horn symbol may be printed larger and therefore be more easily perceived if it can be oriented along the longer axis of the horn button, spoke of the wheel, or along the rim of the steering wheel.

A petition for reconsideration submitted by Mercedes-Benz requested that the agency exclude passenger car horn controls located in/on the steering wheel hub from the identification requirement, provided that the horn control can be activated by pressing anywhere on the hub surface, and that there are no other controls incorporated in the hub. The petitioner argued that complaints about difficulty in finding the horn control must be attributed to controls located on stalks or other areas of the steering column rather than in the usual and conventional location in the steering wheel hub. Mercedes argued that the location in the steering wheel hub is the most obvious and the nearest and quickest to reach and to activate in an emergency situation, and that even a driver who is not familiar with a car will intuitively expect the horn control to be in the hub and check there first.

After carefully evaluating Mercedes' arguments, the agency declines to grant that company's request. The preamble to the final rule raised many concerns that are not answered by Mercedes' amendment:

> For other than heavy duty vehicles, the agency does not agree that identification is unnecessary when the horn control is located on or near the steering wheel. First, horn control location within the steering wheel area may vary significantly from vehicle to vehicle, making it difficult to find the horn control in an emergency situation. Second, to the extent that manufacturers locate the horn control elsewhere, e.g., on various stalks, drivers are less likely to expect the horn in what was once the traditional location. Moreover, the absence of a horn symbol in the steering wheel area will alert drivers to look elsewhere. Finally, controls other than the horn, such as a cruise control, may be located on or near the steering wheel, making it more difficult to find a horn control in that same general area.

The primary concern is that as manufacturers place horn controls in areas other than what was once the traditional location, drivers' expectations as to location also change. For example, a driver whose last car had the horn control on the stalk may check that location first when driving an unfamiliar car. Younger drivers may never have encountered a horn control on the steering wheel hub. Also, in the absence of a horn symbol at the steering wheel center, drivers may decide they should look elsewhere for the horn control rather than trying to activate a nonexistent control.

Suggestions for Additional Amendments

Two petitions for reconsideration requested that the agency adopt certain amendments to Standard No. 101 at this time, rather than awaiting completion of its examination of issues relating to the standard. A petition submitted by BMW requested three amendments: (1) adopt proposed language to permit the use of telltales in informational readout displays, (2) permit, as proposed, the use of the words "FASTEN BELTS" or "FASTEN SEAT BELTS" as an alternative to the seat belt warning symbol in informational readout displays, and (3) permit sequencing of messages in informational readout displays in the event of a need to display more than one telltale at the same time. Mercedes-Benz requested that the agency (1) permit, as proposed, use of the ISO brake failure symbol instead of the word "BRAKE" for brake displays, and (2) permit use of the ISO antilock symbol instead of the words "ANTILOCK" or "ANTI-LOCK" in vehicles having separate indicator lamps for that function.

The amendments requested by BMW all relate to the issue of placing telltales in informational readout displays. As discussed below, the agency has decided not to adopt the specific amendments previously proposed on this subject. This decision is largely based on the agency's analysis of comments provided by a number of manufacturers. The forthcoming separate NPRM will address the problems identified by the commenters.

The agency has also decided to adopt a final rule to permit, as proposed, the use of the words "FASTEN BELTS" or "FASTEN SEAT BELTS" as an alternative to the seat belt warning symbol in informational readout displays. The agency has decided not to adopt the other amendments requested by the BMW and Mercedes petitions. These decisions are also discussed below.

Standard No. 101's light intensity requirements for displays differ depending upon whether the display is a gauge or a telltale *and* whether the display is an informational readout display.[1] The background for this latter distinction is as follows. The 1976 NPRM for the current version of Standard No. 101 did not distinguish between traditional displays and informational readout displays. That NPRM proposed the following requirements for all displays: (1) Light intensities for gauges and their identification must be continuously variable from a position at which either there is no light emitted or the light is barely discernible to a driver who has adapted to dark ambient roadway conditions to a position providing illumination sufficient for the driver to identify the display readily under all daytime and nighttime conditions, and (2) The light intensity of each telltale shall not be variable and shall be such that, when activated, that telltale and its identification are visible to the driver under all daytime and nighttime conditions. See 41 FR 46460-46462.

The 1978 final rule adopted by the agency included language very similar to the proposed language in these areas. However, that final rule also added the term "informational readout display" and specified a number of requirements for informational readout displays. Among other things, the final rule included a requirement that informational readout displays must have at least two light intensity levels, a higher one for daytime use and a lower one for nighttime use. While the preamble did not discuss the light intensity requirements for informational readout displays, the preamble did explain that the agency was adopting a requirement to allow the use of words or symbols to permit the continued development of informational readout displays. See 43 FR 27541-27544.

Subsequent to that 1978 final rule, the agency received a petition for rulemaking from General Motors to permit incorporation of telltales in informational readout displays. In response to that petition, the agency published an NPRM in the Federal Register (47 FR 4541) on February 1, 1982. As discussed by that notice, section S5.3.3 of Standard No. 101 requires that the light intensity of telltales be invariable and must be sufficient to permit drivers to see them under any lighting conditions. The purpose of that requirement is to ensure that telltales are visible to the driver at all times when the vehicle is being operated. The same section, however, requires that informa-

[1]By way of background information, the term "display" in Standard No 101 refers to gauges and telltales "Telltale" is defined as a display that indicates, by means of a light-emitting signal, the actuation of a device, a correct or defective condition, or a failure to function The term "gauge" is defined as a display listed in the standard (S5 1 or Table 1) that is not a telltale All displays in Standard No. 101 are thus gauges or telltales Informational readout displays are a type of display which use technologies such as light-emitting diodes or liquid crystals, and which may display one or more than one type of information or message As a type of display, the term informational readout display necessarily refers to gauges and/or telltales

tional readout displays have variable light intensity. Specifically, they must have at least two light intensity values, a relatively high one for daytime use and a relatively low one for nighttime use. The notice concluded that even though other parts of the standard were written to encourage the use of informational readout displays, the standard's light intensity requirements prevent informational readout displays from being used for telltales.

In order to resolve the discrepancy and permit the use of telltales in informational readout displays, the agency proposed the following requirement:

Telltales and gauges incorporated into informational readout displays—

(a) Shall have not less than two levels of light intensity, a higher one for day and a lower one for nighttime conditions.

(b) In the case of telltales and gauges not equipped with a variable light intensity control, shall have a light intensity at the higher level provided under paragraph (a) of this section whenever the headlamps are not illuminated.

(c) In the case of telltales and gauges equipped with a variable light intensity control, shall be visible to the driver under all daytime and nighttime conditions when the illumination level is set to its lowest level.

Two comments received in response to the February 1982 notice questioned the conclusion that the standard's light intensity requirements prevent informational readout displays from being used for telltales. Ford commented that it has interpreted the standard to permit the use of telltales with single intensity illumination, as required for all telltales by section S5.3.3, when incorporated into informational readout displays. VDO-ARGO simply stated that it does not believe that the current regulations preclude the installation of telltales within an informational readout display.

Commenters expressed a number of concerns about the specific proposal. Some of these related to the proposed requirement that telltales and gauges incorporated into informational readout displays be visible to the driver under all daytime and nighttime conditions when the illumination level is set to its lowest level. Chrysler stated that its experience indicates that any illumination level which is bright enough to be visible to the driver during the day would be so bright at night that it would be unacceptable to most drivers and may be a safety hazard. That company's comments indicated that, because of this problem, it may be impossible for manufacturers to meet a requirement that telltales and gauges in informational readout displays always be visible.

According to Chrysler, it is current practice to provide two levels of illumination by means of the headlamp switch, headlamps off—daytime level, headlamps on—nighttime level. A limitation of this arrangement, however, is that the display illumination is switched from the daytime to the nighttime level whenever the headlamps are turned on, regardless of ambient lighting conditions. Thus, the minimum level of display illumination intensity for night driving is established during daytime conditions with headlamps on, with the result that the display may not be visible to the driver. According to Chrysler, driving with headlamps on is not an infrequent occurrence, even in the presence of bright sunlight. That commenter noted that while it might be possible to incorporate a photosensitive device to reliably sense daytime and nighttime conditions, neither it, nor to its knowledge any other company, had been able to develop a device which will function properly under all conditions. Similar comments were also received from other manufacturers.

Ford expressed concern that the proposed language would cause changes in the Ford electronic instrument panels now in production for three model years by prohibiting single high intensity electronic telltales. (As noted above, Ford has assumed that the standard permits the use of telltales with single intensity illumination when incorporated into informational readout displays.) Volkswagen also expressed concern that single intensity telltales would be prohibited. That company stated that some emergency warning telltales should be sufficiently obvious and blatant to immediately attract the driver's attention, which is best accomplished by single intensity telltales.

After carefully considering the comments, the agency has decided not to adopt the requirements as proposed. The agency agrees that single intensity telltales should not be prohibited in informational readout displays, since such telltales may be optimally effective for attracting attention. The agency recognizes the problems cited by Chrysler concerning the proposed requirement that gauges and telltales incorporated into informational readout displays be visible under all daytime and nighttime driving conditions. A requirement that gauges and telltales be visible under all lighting conditions when the light intensity is set at its lowest level could result in problems of glare at night, particularly for gauges, since they are ordinarily activated. On the other hand, the agency is concerned, in the absence of such a requirement, about the possibility of drivers inadvertently turning off important safety telltales, such as the brake warning telltale, by driving with headlamps on during the daytime.

The agency tentatively agrees in a general way with the view expressed by some commenters that greater flexibility for manufacturers is appropriate in this area. This issue will be addressed by the forthcoming separate NPRM.

As noted above, some manufacturers have interpreted Standard No. 101's light intensity requirements for telltales and gauges incorporated into informational readout displays differently than the agency and have produced vehicles for several years with informational readout displays which incorporate telltales. Ford, for example, has interpreted the standard to permit the use of telltales with single intensity illumination when incorporated into informational readout displays. Until the agency has completed the rulemaking action which is the subject of the forthcoming separate NPRM, it will not take any enforcement action against manufacturers under section S5.3.3 of Standard No. 101 on the basis of whether the light intensity of informational readout displays, including telltales and/or gauges incorporated into informational readout is invariable or variable. The agency will continue to enforce the requirement that, when activated, telltales and their identification be visible to the driver under all daytime and nighttime conditions, as well as all other requirements of the standard.

As indicated above, BMW's petition requested that the agency permit, as proposed by the February 1982 NPRM, the use of the words "FASTEN BELTS" or "FASTEN SEAT BELTS" as an alternative to the seat belt warning symbol in informational readout displays. The NPRM explained that Standard No. 101 was expressly written to permit words in place of symbols in informational readout displays. Section S5.2.3 of the standard states that informational readout displays may be identified by the symbol designated in column 4 of Table 2 or by the word or abbreviation shown in column 3. While column 4 of Table 2 designates the seat belt warning symbol, column 3 of the table refers to FMVSS 208. That standard only permits the use of the words "FASTEN BELTS" or "FASTEN SEAT BELTS" for vehicles manufactured before September 1, 1980. The NPRM stated that a conforming amendment was being proposed to correct that anomaly and permit those words to be used for the seat belt telltale incorporated in an informational readout display.

Commenters generally supported this proposal. While the issue of the circumstances under which telltales may be incorporated into informational readout displays will remain unresolved until the agency completes the rulemaking action noted above, the agency considers it appropriate to make this amendment at this time. The agency has determined that the standard should permit specified words to be used in place of the seatbelt warning symbol, in informational readout displays. The agency is accordingly adopting the proposal as a final rule at this time.

In its petition for reconsideration and a related request for interpretation, BMW expressed concern at Standard No. 101's requirements for informational readout displays where more than one telltale occupies the same space. This concern arises from the fact that if the underlying conditions for activation of more than one such telltale occur at the same time, information for messages beyond the first can be provided to drivers only if some method of either sequencing messages or cancelling earlier messages is provided. BMW's petition for reconsideration requested that sequencing of messages be permitted in circumstances where there is a need to display more than one telltale at the same time. BMW's request for interpretation asked whether the standard already permits such sequencing of telltales. That company also requested clarification of an earlier interpretation issued by the agency. BMW noted that the agency has concluded that telltales cannot be cancelable since Standard No. 101 requires that (1) they must be visible to the driver under all daytime and nighttime conditions, and (2) they must not be variable in light intensity. BMW asked whether that requirement applies to all telltales or just those listed in the standard.

Standard No. 101's requirements for displays are only applicable to the displays listed in the standard. Section S5, *Requirements*, states that ". . each passenger car, multipurpose passenger vehicle and truck or bus less than 10,000 pounds GVWR with any display listed in S5.1 or in column 1 of Table 2, shall meet the requirements of this standard for the location, identification, and illumination of *such . . . display*." (Emphasis added.) Telltales are a type of display. The requirements of Standard No. 101 which prevent telltales from being cancelable are thus only applicable to telltales listed in the standard. Accordingly, Standard No. 101 does not prohibit telltales not listed in the standard from being cancelable.

BMW's question concerning whether Standard No. 101 permits sequencing of telltales is germane only if using informational readout displays as telltales is itself permissible since the sequencing of telltales in the same spot in a display necessitates application of that type of technology. The previously discussed enforcement policy permitting the use of informational readout displays as telltales makes that question now germane. There is no requirement in Standard No. 101, other than those relating to the use of informational readout displays as telltales, that precludes sequencing. Therefore, designs which use sequencing telltales in informational readout displays may be used for the duration of that enforcement policy.

The agency emphasizes, however, that its consideration of sequencing for the first time in the context of a rulemaking proceeding, i.e., the proceeding relevant to the separate forthcoming NPRM, has led to the identification of various safety concerns about that design. Those concerns will be discussed in that proposal.

As indicated above, Mercedes-Benz requested that the agency permit, as proposed, use of the ISO brake failure symbol instead of the word "BRAKE" for brake displays. The agency proposed adoption of this symbol in an NPRM published in the Federal Register (47 FR 49999) on November 4, 1982.

The notice explained that the requirements for a brake display are primarily included in Standard No. 105, *Hydraulic Brake Systems*, which is referenced by Standard 101. Under Standard No. 105, a manufacturer must provide a brake warning indicator lamp which activates under certain conditions, including (among others) specified types of gross loss of pressure and on application of the parking brake. The requirements may be met by a single common indicator lamp with a lens labeled "Brake", or by separate indicator lamps. Separate labeling requirements are provided for separate indicator lamps.

In proposing adoption of the ISO brake failure symbol, the agency noted that it is part of a family of brake symbols under development by that organization. The basic brake symbol can be described as a circle with parentheses, representing brake shoes, on each side. The symbol for brake failure includes an exclamation mark inside the circle.

Mercedes' petition cited the November 1982 NPRM for suggesting an anticipated safety benefit resulting from the fact that symbols convey information more quickly and with less chance of human error, particularly for the large foreign language speaking population, an anticipated cost benefit for manufacturers selling vehicles in and outside the United States, and promotion of international harmonization.

While the agency addressed most of the amendments proposed by the November 1982 NPRM in its July 1984 notice, it decided to include the issue of the brake failure symbol in its examination of issues relating to Standard No. 101. Since the agency has now reached a conclusion with respect to that issue, it will address the issue in this notice. As discussed below, the agency has decided not to adopt the brake failure symbol in place of the word "BRAKE".

In proposing adoption of the ISO brake failure symbol, the agency stated that symbols are adopted by the ISO only after extensive international testing as to recognizability and suitability. The November 1982 NPRM specifically requested comments on the recognizability of the brake failure symbol. The NPRM also requested comments on whether there should be a requirement for owner's manuals to explain the brake failure symbol.

While manufacturer comments supported adoption of the ISO brake failure symbol, the comments called into question the agency's statement about ISO testing as to recognizability. General Motors stated:

> One school of thought in the design of symbols holds that they should be immediately recognizable without training. This position led to the studies to which NHTSA alludes when saying that ISO symbols are only adopted "after extensive international testing as to their recog nizability and suitability." However, our observation of recent ISO symbol development has revealed a tendency to agree upon symbols by consensus, without any testing to assure recognizability. Whether caused by a lack of funding for testing or by a shift in philosophy, the result is a greater probability that the symbols must be learned.

A study published by the Society of Automotive Engineers, Investigation into the Identification and Interpretation of Automotive Indicators and Controls, found the percentage recognition of statement and function of the ISO brake symbol to be only 26 percent and 21 percent, respectively, while the percentage recognition of statement and function of the word "Brake" are 87 percent and 52 percent, respectively. Given the extremely low percentage recognition for the ISO brake symbol compared to the word "Brake" and the importance for safety of drivers understanding the meaning of the brake indicator lamp, the agency does not consider it appropriate to adopt this particular ISO symbol, even if an explanation is provided in owner's manuals. Many drivers might not read their owner's manual, and drivers other than original owners would be still less likely to read or even have access to the owner's manual.

Mercedes also requested that the agency adopt a related symbol for an antilock system. That symbol is the same as the ISO brake failure symbol except that the exclamation mark is replaced by the letters ABS. Mercedes stated that the use of "ABS" as an abbreviation for "Antilock Braking System" is widespread and well known to the public and that, therefore, recognition problems are not to be expected. Mercedes did not provide any support for its contention that ABS is well known to the public as an abbreviation for antilock braking system. In any event, the agency did not propose this symbol and therefore, based on lack of notice, cannot consider the symbol for purpose of a final rule.

Petitions for Rulemaking

As indicated above, two petitions for reconsideration submitted to the agency after the closing date are being treated as petitions for rulemaking, in accordance with agency regulations.

A petition submitted by Fiat was largely along the lines of the request by Mercedes to exclude horn controls located on the steering wheel hub from the identification requirement. In addition to some of the same arguments made by Mercedes, Fiat emphasized the agency's decision to exclude horns on heavy duty trucks from the requirement.

The agency does not agree that its decision with respect to heavy duty trucks necessitates the same decision for other vehicles. The location of horn controls on heavy duty trucks appears to be more standardized than for other vehicles. Also, the agency may adopt different requirements for different types of vehicles based on many considerations, such as different driver populations, difference in magnitude of a safety problem, etc.

The other petition was submitted by a private individual, Mr. C.R. Blydenburgh. That petitioner argued that the July 1984 final rule should be delayed pending rulemaking for standardized location of controls and displays, a subject which he cited as being included in NHTSA's five year plan published in 1979. The petitioner argued that such standardization of controls and displays is necessary to avoid driver confusion when driving different vehicles. The petitioner asserted that the extended use of international symbols is counterproductive in terms of safety as it fails to utilize two important human characteristics, habit and instinct. The petitioner did not, however, address any of the specific amendments made by the July 1984 final rule or the notice's discussion of those amendments, or offer any support for an allegation that the rule could adversely affect safety.

The agency rejects the petitioner's allegation that the rule could adversely affect safety, for the reasons discussed in the July 1984 notice. While the subject of standardized location of controls and displays was included in NHTSA's five year plan published in 1979, potential action on that subject is not relevant to the issuance of the July 1984 final rule. Thus, Mr. Blydenburgh's petition will be addressed separately at a subsequent date.

For the reasons discussed above, the petition submitted by Toyota is granted, the petition submitted by BMW is granted in part and denied in part, and the other petitions, except for Mr. Blydenburgh's for which action will be determined at a later date, are denied.

The amendments are effective immediately. The agency notes, however, that the requirement that horn controls be identified by the ISO horn symbol does not become mandatory until September 1, 1987. The agency finds good cause for an immediate effective date since the amendments relieve restrictions, while reducing compliance costs and having no adverse impacts on safety.

PART 571—[AMENDED]

In consideration of the foregoing, 49 CFR Part 571 is amended as follows:

§ 571.101 [Amended]

1. S5.2.1.1 is revised to read as follows:

S5.2.1.1 The identification of the following need not appear to the driver perceptually upright:

(a) A master lighting switch or headlamp and tail lamp control that adjusts control and display illumination by means of rotation, or any other rotating control that does not have an off position.

(b) A horn control.

2. Table 2 (a) is amended by revising the designation for identifying words or abbreviation for the Seat Belt Telltale, contained in column 3, to read:

Fasten Belts or Fasten Seat Belts. Also see FMVSS 208.

3. Table 2 is amended by revising the designation for identifying words or abbreviation for the Seat Belt Telltale, contained in column 3, to read:

Fasten Belts or Fasten Seat Belts. Also see FMVSS 208.

§ 571.208 [Amended]

1. The first sentence of S4.5.3.3(b) is revised to read as follows:

In place of a warning system that conforms to S7.3 of this standard, be equipped with the following warning system: At the left front outboard designated seating positions (driver's position), be equipped with a warning system that activates a continuous or intermittent audible signal for a period of not less than 4 seconds and not more than 8 seconds (beginning when the vehicle ignition switch is moved to the "on" or the "start" position) when condition (A) exists simultaneously with either condition (B) or condition (C), and that activates a continuous or flashing warning light, visible to the driver, displaying the identifying symbol for the seat belt telltale shown in Table 2 of FMVSS 101 or, at the option of the manufacturer if permitted by FMVSS 101, displaying the words "Fasten Seat Belts" or "Fasten Belts".

2. The first sentence of S7.3 is revised to read as follows:

A seat belt assembly provided at the driver's seating position shall be equipped with a warning system that activates, for a period of not less than 4 seconds and not more than 8 seconds (beginning when the vehicle ignition switch is moved to the "on" or the "start" position), a continuous or flashing warning light, visible to the driver, displaying the identifying symbol for the seat belt telltale shown in Table 2 of FMVSS 101 or, at the option of the manufacturer if permitted by FMVSS 101, displaying the words "Fasten Seat Belts" or "Fasten Belts", when condition (a) exists and a continous or intermittent audible signal when condition (a) exists simulanteously with condition (b).

Issued on May 29, 1985

Diane K. Steed
Administrator

50 F.R. 23426
June 4, 1985

PREAMBLE TO AN AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 101

Controls and Displays
[Docket No. 1-18; Notice 28]

ACTION: Final rule.

SUMMARY: The purpose of this notice is to amend Federal Motor Vehicle Safety Standard No. 101, *Controls and Displays*, to permit greater flexibility in the illumination and identification of controls and displays. The amendments are adopted in response to several petitions for rulemaking.

The amendments allow gauges to have a two-level lighting intensity, rather than being continuously variable over a wide range. They distinguish between critical telltales, such as the turn signal indicators, which must be visible under all lighting conditions, and less critical telltales, such as the water temperature indicator, which are permitted the same range of intensity as gauges. The categorization of certain displays as informational readout displays and the specification of special illumination requirements for those displays is discontinued.

To accommodate new display technologies capable of showing information about different telltales and gauges on a single display screen, the amendments permit the cancellation of messages, but require them to be retrievable by the driver. They also permit messages to be automatically sequenced.

The amendments allow the use of specified words to identify controls and displays, as an alternative to the symbols formerly required for many controls, and permit the use of symbols "substantially similar" to those specified.

DATES: The requirements of S5.3.3(b)(1) and S5.3.3(c)(1) are effective September 1, 1989. All other amendments are effective March 5, 1987.

SUPPLEMENTARY INFORMATION: In a notice of proposed rulemaking (NPRM) published on September 12, 1985 (50 FR 37240), NHTSA responded to a number of issues related to Standard No. 101, *Controls and Displays*. These issues had been raised by petitions for rulemaking and by comments on earlier NPRM's. The notice set forth a number of proposed amendments to the lighting intensity and identification requirements of the standard. Upon reviewing the comments on the proposal, the agency has concluded that several of the proposed amendments should be adopted, but that others should not. In the discussion that follows, each amendment appears in the same order as in the NPRM.

Lighting Intensity Requirements

The NPRM dealt with several questions presented by the advent of new display technologies, among them questions about the appropriate lighting intensity for the different types of displays, the grouping of displays with differing intensity requirements into a single cluster, the need to vary lighting intensity according to the outside conditions, and the use of a common space, such as a small TV screen, to display messages in sequence.

The standard divides displays into two broad categories: telltales and gauges. It defines a telltale as

> a display that indicates, by means of a light-emitting signal, the actuation of a device, existence of a correct or defective condition, or of a failure to function.

Telltales include the turn signal indicators, the high-beam indicator, and the brake failure warning. The standard defines a "gauge" as any display listed in the standard (S5.1 or Table 2) that is not a telltale. Gauges include such displays as the speedometer and the odometer.

As discussed at greater length in the preamble to the NPRM, the current intensity requirements for telltales differ from those for gauges. The lighting for a telltale must be of a single fixed intensity that makes the telltale visible under all daytime and nighttime conditions, while the lighting for a gauge must be continuously variable over a range of intensities.

In an attempt to accommodate new display technologies capable of showing more than one message or symbol on a single screen, the agency amended the standard in 1978 to place those displays into a separate category called informational readout displays (IRD). Although IRD's were required to have two intensity levels—one for daytime and a lower level for nighttime—the fixed intensity of the telltales prevented the manufacturers from including telltales in IRD's.

In response to a petition by General Motors seeking to accommodate telltales in IRD's and a petition by BMW to include telltales among the messages displayed in sequence in a common message center, NHTSA examined the safety implications of changing the lighting intensity requirements for gauges and telltales. In the NPRM, the agency proposed several amendments to these requirements.

A. Lighting Intensity Requirements for Gauges

The NPRM proposed to amend the provisions relating to gauges and IRD's to reduce the number of different sets of lighting requirements and to ensure that drivers are provided with the means for making gauges visible under all lighting conditions. It proposed to amend S5.3.3 to apply the bilevel lighting requirements of IRD's to all gauges, so that the lighting for a gauge and its identification would no longer have to be continuously variable. One lighting level would have to be "barely discernible to a driver who has adapted to dark ambient roadway conditions," continuing that criterion from the current S5.3.3. The intensity could be adjusted either manually or automatically, and could have a level at which the gauge would not be visible under some lighting conditions. If the brightness level could be automatically adjusted, there would have to be a means to allow the driver to override manually the adjustment to restore visibility. In consequence of proposing to make the lighting requirements for gauges and IRD's identical, the NPRM proposed to delete the term Informational Readout Display and the separate IRD light intensity requirement from the standard as no longer useful.

The comments on the proposed amendment to S5.3.3 focussed on the requirement that a gauge must have at least two levels of brightness (S5.3.3(b)(1)), and on the requirement that an automatic adjustment have a manual override to allow the driver to restore visibility (S5.3.3(c)). General Motors stated that each of these requirements could require a change in hardware that had been developed to meet the IRD criteria. However, there exists general agreement among all commenters (including GM) with the proposal to require that gauges have more than one level of brightness. GM, in its comments, indicates that such a requirement will provide for good visibility of the gauges and also provide the means to prevent glare during darker ambient conditions.

However, GM also commented that when a telltale is incorporated in a cluster of gauges, and the telltale is actuated, the gauges need not be required to be variable in intensity. The agency believes that gauges should always have the capability of being adjusted and will not, for the reasons discussed below, permit the exemption that GM requested.

Although telltales are generally intended to alert the driver to an unsafe or unwanted condition and thus would not normally be illuminated for other than short periods of time, this is not always the case. Many vehicles now incorporate telltales whose nature is more related to providing general information than to denoting an emergency situation. Telltales such as, for example, one indicating the need to service emission equipment may often be illuminated for considerable driving periods. In such instances the agency concludes that the brightness of gauges should be capable of being adjusted.

GM has not presented any compelling evidence to contradict this conclusion. Having a major portion of a gauge cluster illuminated at full brightness for a lengthy time period without manual control would be inconsistent with the general consensus of the commenters, as noted above.

The agency believes that the requirements of the existing standard may be ambiguous in this regard. Because of the possible ambiguity and the need to modify any existing designs which would not comply with the new requirement, the effective date for this section of the proposed amendment (S5.3.3) is September 1, 1989.

A second question presented by GM concerning S5.3.3(b)(1) involves continuously variable lighting. As proposed in the NPRM, S5.3.3(b)(1) would require at least two levels of brightness, one of which would have to be "barely discernible to a driver who has adapted to dark ambient roadway conditions." GM asked whether a means of continuously varying the level of brightness, such as a rheostat, could have a position at which no light is emitted, as permitted by the current S5.3.3. The agency intends no change in the regulation of continuously variable lighting. By requiring "at least" two levels of brightness, S5.3.3(b)(1) implicitly permits the control to have additional levels of brightness, with no restrictions as to whether such levels are above or below the "barely discernible" level.

The remaining question raised by the comments on S5.3.3 concerns the requirement in S5.3.3(c) that if the brightness is automatically adjusted to a level where it is not visible to the driver, a means must be provided to enable the driver to restore visibility. This provision is intended to regulate systems such as those that reduce the brightness of the controls and displays when the headlamps are turned on, regardless of the ambient light conditions. If automatic brightness controls can be developed that employ photosensitive devices to provide adequate visibility under any ambient light conditions, these controls would not be subject to the provision. In proposing this requirement, the agency expressed the view that driving with headlamps on during the daytime was a sufficiently frequent occurrence to necessitate a control to allow the driver to override the effect of the headlamp control.

Notwithstanding objections from General Motors to the effect that there are no field data to indicate a safety problem from the diminished daytime visibility of IRD's, the agency regards the non-visibility of crucial information from displays as a self-evident safety problem. The remedy, a manual override control to increase the displays' brightness, is inexpensive and technically simple. The agency is accordingly adopting S5.3.3(c) as proposed, but with an effective date of September 1, 1989, to permit manufacturers whose displays lack an override to incorporate this feature in an efficient manner.

As proposed in the NPRM, the new S5.3.3 regulates the visibility of controls as well as that of gauges. The comments to the NPRM did not object to this proposal. Finally, the new S5.3.3 eliminates the use of the term "informational readout display." As proposed in the NPRM, the final rule also deletes the definition of that term from S4.

B. Lighting Intensity Requirements for Telltales

As part of the proposal to allow gauges and telltales to be more readily combined in common displays, the NPRM proposed to permit (but not require) most telltales to have the same range of lighting intensity as gauges. Means would have to be provided to make them visible under all conditions, but they could also be adjustable to levels at which they would not be visible under some driving conditions (S5.3.5). The four telltales that were considered to be critical—those for brakes, high beams, turn signals, and seat belts—could also be adjustable, but only to levels at which they would be visible under any driving condition (S5.3.4). The critical telltales would thus have to have a source of illumination separate from that of any telltale or gauge that could be reduced to a level of invisibility.

The comments supported the proposed distinction between critical and non-critical telltales, but several comments objected to classifying the safety belt telltale as a critical telltale. These objections arose mainly from the proposed S5.4, which would have prohibited the inclusion of the critical telltales in a common space, and are discussed in greater detail in the portion of this preamble dealing with that section. Sections S4.5.3.3 and S5.7.3 of Standard No. 208, *Occupant Protection*, require "a continuous or flashing warning light, visible to the driver," if a manual belt is not used or if an automatic belt is disabled. It would be inconsistent with the provisions of Standard No. 208 for Standard No. 101 to permit the safety belt telltale to be reduced in brightness to the point of invisibility. Hence, the safety belt telltale is retained as one of the telltales which may not be adjusted under any conditions to the point of invisibility.

In response to a comment by GM pointing to a potential ambiguity in the drafting of S5.3.4(b) and S5.3.5(b), the final rule makes it clear that the minimum brightness level permitted for a critical telltale varies according to the ambient light conditions. The key requirement is that at any specific level of ambient light, a critical telltale may not be adjustable to a level that is invisible.

To simplify the standard somewhat, the final rule consolidates the proposed S5.3.4 and S5.3.5 into one section, S5.3.4, and makes additional editorial changes.

C. Other Lighting Intensity Requirements

In the NPRM, the agency proposed a new section S5.3.6 to require a means of varying the light intensity for any passenger compartment illumination within the driver's forward field of view, including illumination "for purposes other than the controls and displays subject to" Standard No. 101. This illumination would have been required to provide at least two levels of brightness. Although the former S5.3.3 required a variable intensity for any illumination that is provided "when and only when the headlights are activated," the proposal would have included other illumination, such as the LED display for a clock, that is controlled by the ignition. The NPRM noted that clocks and other sources of illumination can present the same problems of glare as any of the gauges, and that these sources should be subject to a similar regulation.

This proposal drew a number of comments, most of them adverse. A common view in the comments was that the proposed requirement should not apply to light sources such as glove boxes, vanity mirrors,and under-dash courtesy lights that are rarely, if ever, illuminated while the vehicle is in motion (British Leyland, Chrysler). Many of these light sources were said to be peripheral and of low intensity, so as not to require variable adjustment (GM). Their modificaiton was predicted to entail cost and leadtime problems (GM, Ford). One commenter sought to exclude vehicles which are normally operated with the passenger compartment illuminated (Flxible). The general view was that the existing regulation was adequate.

After considering these comments, NHTSA has decided to adopt a provision closer to that of S5.3.3 as it existed before the issuance of these amendments. The amended provision, now designated as S5.3.5, applies only to those sources of illumination which are capable of being illuminated while the vehicle is in motion, thereby excluding lamps such as courtesy lamps which are actuated by opening the door. It provides that a source of illumination may have either a variable intensity, a single intensity that is barely discernible to a driver whose eyes have adjusted to dark ambient conditions, or a means of being turned off. The manufacturers may thus choose any of three options for eliminating glare from these sources of illumination. The agency believes that this combination of options meets each of the objections voiced by the comments, while maintaining essential limits on glare. In response to the comment by Flxible, the section does not apply to buses which are normally operated with the passenger compartment illuminated.

D. Multi-Message Displays

Several manufacturers have developed electronic message centers in which more than one telltale may be displayed in a single or common space. The telltales are typically displayed one at a time. Because displaying one telltale cancels any preceding telltale, a means must be provided to ensure that the driver is aware of each actuated telltale. In the NPRM, NHTSA proposed several constraints for these multi-message displays: The critical telltales—brake, high beam, turn signal, and safety belt—were not to be included; a telltale was to be displayed at the onset of its underlying condition; if the conditions for more than one telltale existed, an indication was to be given to the driver; messages were to be retrievable by the driver; messages could be cancelled automatically, subject to the driver's retrieval, but could not be repeated automatically in sequence; and a visible indication of stored messages was to be given the driver.

The proposed S5.4 drew more comments than any other portion of the NPRM, some objecting to the exclusion of the safety belt telltale from a common display (Jaguar, BMW, GM), and most objecting to the prohibition of automatic sequencing (SAAB, Jaguar, Volkswagen, American Motors, Chrysler, BMW, GM, and Ford). Upon further review, the agency concludes that these objections have merit and therefore adopts S5.4 with changes that address the objections.

The safety belt telltale is regulated by Standard No. 208, which specifies separate requirements for manual safety belts and for automatic safety belts. The telltale for a manual belt at the driver's seating position must be actuated for 4–8 seconds after the ignition is turned "on" if the driver's belt is not fastened. This telltale could be incorporated into a multi-message display, as long as it preempts other messages and is visible during the time that Standard No. 208 requires it to be actuated. The telltale for an automatic belt system at the driver's position must meet more stringent requirements. If the belt is unbuckled, if the webbing release mechanism has been actuated, or if the automatic belt positioning motor has not locked the belt into place at the anchorage point, the telltale is required to be continuous or flashing as long as the condition exists.

In view of these distinctions, the agency is limiting the reference to the safety belt telltale in S5.4(a) to a telltale associated with an automatic safety belt. Under Standard No. 208, such a telltale could not be cancellable as long as the safety belt is disabled by one of the three conditions described above. The agency has not proposed to amend Standard No. 208 to permit cancellation, and does not regard a *de facto* amendment through Standard No. 101 to be appropriate.

Upon reexamination of the issue of automatic sequencing, the agency has concluded that automatic sequencing for messages other than the critical telltales has advantages which outweigh the potential drawbacks discussed in the NPRM. The principal advantage is that automatic sequencing eliminates the need for a driver to remember how to retrieve a message in the rare event that two or more telltales are actuated at the same time. Although the NPRM mentioned the possibility that a driver might be distracted by a flashing sequence of messages, there is also a possibility that the driver could be distracted by his attempt to manually retrieve a stored message. On balance, NHTSA has concluded that automatic sequencing should not be prohibited, and is therefore deleting the prohibition from S5.4.4. In doing so, however, the agency cautions that any multi-message display conveying safety information should not be so burdened with non-safety messages as to diminish the value of the display as a safety reminder to the driver.

E. Other Display Requirements

As part of its proposal to eliminate the term "informational readout display," NHTSA proposed to apply the color requirements of S5.3.2 to the displays which would have been classified as IRD's. The agency noted that the use of the specified colors appeared to help drivers understand the meaning and importance of messages, but it invited comments on the difficulty of applying these requirements to electronic displays.

The comments on the color requirements ranged from full support (Robert Schlegel), to a request that they be discontinued for non-critical telltales (GM), to opposition to any color requirements for telltales (American Motors, Ford). Ford and GM each stated that the single-color displays permitted for IRD's had had no adverse effects on safety. GM noted that prohibiting such displays would inhibit certain new applications such as monochromatic cathode ray tubes (CRT's). Ford offered the example of its message center, which is monochromatic but offers the advantge of displaying a large amount of information in a small space.

On reviewing the value of color requirements vis-a-vis the other available means of enabling the driver to distinguish among various telltales, the agency has concluded that the color requirements should continue to apply to critical telltales, but that they need not apply to other telltales. The physical separation of the critical telltales from the other telltales, and the differing lighting intensity applicable to the critical telltales, have the effect of requiring them to have a separate source of illumination. The retention of the color requirements for these telltales should therefore be compatible with existing designs and should not require any redesign.

In a related action, the agency also proposed to amend the definition of "telltale" to delete the phrase "by means of a light-emitting signal." This proposal would permit the use of new displays, such as liquid crystals, that might have been prohibited by the deleted phrase. It received no adverse comments and the definition is therefore amended for the reasons given in the NPRM.

Identification Requirements

In response to issues raised in three petitions for rulemaking (GM, VW and BL Technology), the NPRM addressed a variety of issues concerning the identification requirements for controls and displays. Although the agency declined to adopt a suggestion by GM that the requirements be removed from the safety standard and placed in a regulation, it proposed amendments to make the requirements more flexible. The first of these was an amendment to permit the use of specified words as an alternate means of identifying controls and displays for which symbols had previously been the exclusive identification. If a manufacturer used the word or symbol specified for a control or display, the NPRM proposed to allow the manufacturer to use additional identification. Finally, the NPRM proposed to permit the use of symbols which substantially resemble those specified in the tables.

There were no objections in the comments to these proposals. Two comments, however, contained requests for the use of specific words and symbols. General Motors requested the use of "Wiper-Washer" as an alternative to "Wipe-Wash," to identify the windshield wiping and washing control, and "R-Def" as an alternative to the phrases proposed to identify the rear defroster control. The agency believes that each of these alternatives would be readily comprehended by the average driver and is accordingly including them in Table I.

Mercedes-Benz requested that three symbols—the ISO symbols for the manual choke, the heater, and the air conditoner—be listed in Table I as alternatives to the words now specified for those controls. The agency has previously considered petitions regarding each of these symbols, and has declined to permit their use as alternatives to the specified words. The agency remains convinced that none of the three symbols is intuitively recognizable by the average driver in this country. As stated in the NPRM, the effectiveness of symbols as identifiers has been called into question in recent studies. The agency finds no reason to alter its earlier decision and accordingly declines to permit the use of the symbols requested by Mercedes.

Effective Date

In view of the extensive redesign of displays required by S5.3.3(b)(1) and S5.3.3(c)(1), the agency has determined that an effective date of September 1, 1989, for these sections is in the public interest. The other amendments relieve restrictions and the agency has therefore determined that an effective date of 30 days after publication in the *Federal Register* is in the public interest.

In consideration of the foregoing, 49 CFR Part 571 is amended as follows:

1. Section S.4 is amended by removing the sentence defining "information readout display."

2. Section S.4 is amended by removing the phrase "by means of a light emitting signal" from the definition of "Telltale."

3. The first two sentences of section S.5.2.1(a) are revised to read as follows:

(a) Except as specified in S5.2.1(b), any hand-operated control listed in column 1 of Table 1 that has a symbol designated for it in column 3 of that table shall be identified by either the symbol designated in column 3 (or symbol substantially similar in form to that shown in column 3) or the word or abbreviation shown in column 2 of that table. Any such control for which no symbol is shown in Table 1 shall be identified by the word or abbreviation shown in column 2. * * *

4. Section S5.2.3 is revised to read:

Any display located within the passenger compartment and listed in column 1 of Table 2 that has a symbol designated in column 4 of that table shall be identified by either the symbol designated in column 4 (or symbol substantially similar in form to that shown in column 4) or the word or abbreviation shown in column 3. Additional words or symbols may be used at the manufacturer's discretion for the purpose of clarity. Any telltales used in conjunction with a gauge need not be identified. The identification required or permitted by this section shall be placed on or adjacent to the display that it identifies. The identification of any display shall, under the conditions of S6, be visible to the driver and appear to the driver perceptually upright.

5. Table 1(a) is amended by adding the words "or washer-wiper" after "wash-wipe" as identifying words for combined windshield washing and wiping systems in column 2, and by amending the identifying words for rear window defrosting and defogging systems in column 2 to read: "Rear Defrost, Rear Defog, Rear Def, or R-Def."

6. Section S5.3.2 is revised to read as follows:

S5.3.2. Each telltale shall be of the color shown in column 2 of Table 2. The identification of each telltale shall be in a color that contrasts with the background.

7. Table 2 is amended by deleting the colors designated under Column 2 for all telltales other than those for "Turn Signal," "High Beam," and "Malfunction in Anti-Lock or Brake System."

8. Section S5.3.3 is revised to read:

5.3.3(a) Means shall be provided for making controls, gauges, and the identification of those items visible to the driver under all driving conditions.

(b) The means for providing the required visibility—

(1) Shall be adjustable, except as provided in S5.3.3(d), to provide at least two levels of brightness, one of which is barely discernible to a driver who has adapted to dark ambient roadway conditions.

(2) May be operable manually or automatically, and

(3) May have levels of brightness at which those items and their identification are not visible.

(c) Effective September 1, 1989, if the level of brightness is adjusted by automatic means to a point where those items or their identification are not visible to the driver, a means shall be provided to enable the driver to restore visibility.

(d) For a vehicle manufactured before September 1, 1989, the requirements of S5.3.3(b)(1) shall not apply to any gauge during the actuation of a telltale which shares a common light source with the gauge.

9. A new section S5.3.4 is added to read:

5.3.4(a) Means shall be provided that are capable of making telltales and their identification visible to the driver under all driving conditions.

(b) The means for providing the required visibility may be adjustable manually or automatically, except that the telltales and identification for brakes, high beams, turn signals, and safety belts may not be adjustable under any driving condition to a level that is invisible.

10. A new section S5.3.5 is added to read:

S5.3.5 Any source of illumination within the driver's forward field of view which is not used for the controls and displays regulated by this standard, and which is capable of being illuminated while the vehicle is in motion, most have either a variable intensity, a single intensity that is barely discernible to a driver who has adapted to dark ambient roadway conditions, or a means of being turned off. This requirement shall not apply to buses that are normally operated with the passenger compartment illuminated.

11. A new section S5.4 is added to read:

S5.4 A common space may be used to display messages from any sources, subject to the following requirements:

(a) The telltales for the brake, high beam, and turn signal, and the safety belt telltale required by S4 5.3.3 of Standard No. 208 may not be shown on the common space.

(b) Except as provided in S5.4(e), the telltales listed in Table 2 shall be displayed at the initiation of any underlying condition.

(c) When the underlying condition exists for actuation of two or more messages, the messages shall be either—

(1) repeated automatically in sequence, or

(2) indicated by visible means and capable of being selected by the driver for viewing.

(d) Messages may be cancellable automatically or by the driver.

(e) The safety belt telltale must be displayed and visible during the time specified in S7.3 of Standard No. 208.

12. Table 2 is amended by placing "7" as an additional superscript for the color of the safety belt telltale and by adding the following as footnote 7:

The color of the telltale required by S4.5.3.3 of Standard No. 208 is red; the color of the telltale required by S7.3 of Standard No. 208 is not specified.

Issued on Jan. 29, 1987

Diane K. Steed
Administrator

52 F.R. 3244
February 3, 1987

PREAMBLE TO AN AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 101

Hydraulic Brake Systems; Controls and Displays
[Dockets No. 1-18, Notice, 32; No. 70-27, Notice 31]

ACTION: Final rule.

SUMMARY: Federal Motor Vehicle Safety Standards No. 105, *Hydraulic Brake Systems*, and No. 101, *Controls and Displays*, have required telltales whose single function is indicating failure in the antilock portion of a brake system to read "ANTILOCK." This notice amends those standards to permit "ABS," an abbreviation for "Antilock Brake System," as an alternative.

DATES: The amendments made by this rule are effective June 29, 1987.

SUPPLEMENTARY INFORMATION: Federal Motor Vehicle Safety Standard No. 105, *Hydraulic Brake Systems*, requires an indicator lamp, i.e., a telltale on the dashboard, to be activated whenever there is a total functional electrical failure in an antilock brake system. The manufacturer may meet this requirement by using a common indicator displaying the word "BRAKE," which also warns the driver about other types of brake failure. Alternatively, the manufacturer may provide a separate indicator for antilock failure.

If the manufacturer uses a separate indicator for antilock failure, Standard No. 105 and Standard No. 101, *Controls and Displays*, have specified that the indicator must read either "ANTILOCK" or "ANTI-LOCK." On April 16, 1986, NHTSA published a notice of proposed rulemaking (NPRM) in the *Federal Register* (51 FR 12900) to permit "ABS," an abbreviation for "Antilock Brake System," as an alternative.

As discussed in the NPRM, this rulemaking action resulted from a petition for rulemaking submitted by Mercedes-Benz. That company stated that the letters "ABS" have been used in automotive press articles and in manufacturers' print advertising, with few exceptions, for identifying brake systems with antilock capabilities. Copies of such publications were submitted with the petition. The petitioner contended that as antilock brake systems increase in availability, the abbreviation will be increasingly used by the media, in technical publications, and in owners' manuals, and is expected to remain synonymous with this type of brake system.

Mercedes also argued that if a manufacturer offers a system or feature not required by regulation, but provides a corresponding telltale required by regulation, that telltale message should be permitted to correspond with the campaigns developed to promote such safety systems. That company compared the use of "ABS" in its marketing of antilock braking systems to the use of "SRS" in marketing its Supplementary Restraint System.

In the NPRM, NHTSA stated that it believed that the primary issue it must consider in responding to Mercedes' petition is the recognizability and understanding of "ABS" as compared to "ANTILOCK," both by new car buyers and other drivers. For example, in deciding not to adopt the International Standards Organization (ISO) brake symbol as an alternative to the word "BRAKE" in common indicators, the agency noted a Society of Automotive Engineers (SAE) study indicating extremely low percentage recognition for the ISO brake symbol compared to the word "BRAKE," and the importance for safety of drivers understanding the meaning of the brake indicator lamp. See 50 FR 23430 (June 4, 1985).

NHTSA indicated in the NPRM that it was unaware of data concerning the recognizability and understanding of "ANTILOCK" or "ABS." The agency recognized that, unlike some identifying words and abbreviations, the abbreviation ABS appears to require learning by the driver in order to understand its meaning. However, given the use of ABS by the media and in marketing campaigns, the agency agreed with the petitioner that such learning is likely to be taking place and to continue to do so. The agency also noted that the word "ANTILOCK" requires learning by the driver in order to understand its meaning, since antilock technology is relatively new and unfamiliar to most drivers. NHTSA specifically requested comments and data on the recognizability and understanding of "ANTILOCK" and "ABS."

NHTSA received nine comments on the NPRM, some of which favored the proposal and some of which opposed it. Commenters supporting the proposal include Chrysler, Ford, Volkswagen, BMW, American Motors (AMC) and Volvo. Chrysler stated that with the expected increase in usage of antilock brake systems and accompanying owner information and advertising campaigns, both "ANTILOCK" and "ABS" should be recognizable and understandable to drivers of those cars. Ford stated that it supports the proposal since (1) it represents more efficient use of space in labeling a small telltale, (2) that company has used the term "ABS" to designate its antilock brake systems, (3) the "ABS" designation has been recognized by the International Standards Organization (ISO) as part of one of its proposals for an antilock brake symbol, and (4) that company probably would employ the "ABS" identification in its products worldwide if it is permitted by NHTSA for use in the United States. That company cited data suggesting that "ABS" currently has lower recognition than "ANTILOCK," but pointed out that an abstract symbol, such as "ABS," can be learned just like a word in another language or a new slang word. BMW asserted that since both antilock braking systems and separate telltales for them are voluntarily provided, manufacturers should be provided maximum flexibility in telltale identification. That company stated that both messages are equally unknown to the driving public and that neither is self-explanatory. BMW also noted that, unlike the other required brake telltales, complete loss of this function does not interfere with normal braking. That commenter stated that this is reflected by Standard No. 101's traditional designation of the color yellow for this telltale, in contrast to red for the others, indicating less urgency. AMC acknowledged that the introduction of "ABS" would necessitate some education of drivers, but asserted that it is opportune that this be done now, as the new antilock technology is gradually being integrated into vehicle designs. Volkswagen noted that while the provision of multiple brake indicator lights can add significantly to the amount of information provided to the driver, the amount of information which can be printed on a telltale is usually quite limited. That company supported use of "ABS," arguing that inflexibility with regard to the abbreviated message to be displayed is not reasonable.

Commenters opposing the proposal include Honda, Renault, and a private individual, Mr. Robert F. Schlegel, Jr. Honda stated that other abbreviations for Antilock Brake System are in use by other manufacturers, including "ALB" (Anti-Lock Brake), "ASBS" (Anti-skid Brake System), "ESC" (Electronic Skid Control), and "SCS" (Stop Control System). That commenter stated that these various abbreviations, including "ABS," are trademarks, and expressed concern that the wide use of "ABS" with the Bosch antilock brake system may lead consumers to believe that any vehicle with a telltale showing the letters "ABS" is equipped with a Bosch system. Based on this concern, Honda argued that it is neither wise nor lawful for NHTSA to permit such use. Renault similarly commented that the abbreviation "ABS" is commonly associated with a particular anti-skid device, or with a particular manufacturer. That company stated that there is no reason to assign a greater value to this abbreviation than to other ones which may appear. Renault stated that the French manufacturers have proposed a pictorial symbol for antilock failure to the ISO, which is also currently considering two other symbols. Since the ISO has not yet ruled on an international symbol for antilock failure, that commenter requested that Standards No. 101 and No. 105 not be amended at this time. Renault also argued that if "ABS" is permitted, other symbols, particularly those before the ISO, should also be permitted. Mr. Schlegel argued that the word "ANTILOCK" conveys more information than "ABS" to the vast majority of drivers, contending that symbols must provide a pictorial or verbal clue. According to that commenter, there are too many acronyms arriving lately that are not understood by the general public.

After careful consideration of the comments, NHTSA has decided to permit the use of "ABS" as an alternative to "ANTILOCK." The use of multiple brake indicators can provide additional safety information to the driver, and the agency believes that greater flexibility is appropriate. The message "ABS" is considerably shorter than "ANTILOCK" and is therefore more easily incorporated into a small telltale.

NHTSA recognizes that "ABS" will require learning on the part of drivers. For example, in an informal survey of 40 Ford engineering employees, 15 percent associated "ABS" with antilock brakes, while 72 percent recognized the word "ANTILOCK." As indicated in information provided by Mercedes-Benz and BMW, however, the term "ABS" is being used in both press articles and advertising. NHTSA believes that drivers are learning the meaning of "ABS," and that such learning will continue. NHTSA notes that there are differences between this situation and that involved in the agency's decision not to permit use of the ISO brake symbol. First, the telltale for antilock failure is not as urgent or critical a warning as that for other types of brake failure. Second, there is extensive use of the term "ABS" in press articles and advertising, which is not the case for the ISO brake symbol. Third, as antilock technology is still in the early stages of being introduced to drivers, there is a unique opportunity for learning the term "ABS." By contrast, drivers have come to expect use of the word "BRAKE" for other types of brake failure.

While NHTSA believes that greater flexibility is appropriate, it does not believe it would be in the interest of safety to permit multiple acronyms or symbols. While permitting the use of "ABS" will facilitate the learning of that acronym by drivers, drivers cannot be expected to learn the meaning of multiple acronyms or symbols for the same message. NHTSA notes that this action may help facilitate international harmonization, since one of the symbols being considered by the ISO for antilock failure incorporates "ABS."

Since NHTSA considers it appropriate to permit only one alternative to "ANTILOCK," it is necessary that use of that alternative be available to all manufacturers. Accordingly, the agency contacted Mercedes-Benz concerning whether its parent company, Daimler-Benz, was willing to waive protection of its trademark and grant a general approval to use "ABS" for all types of antilock braking systems. Daimler-Benz executed a declaration, which included the following statement:

> If the term "ABS" is permitted under 49 CFR Part 571, *Federal Motor Vehicle Safety Standards*, by the National Highway Traffic Safety Administration, United States Department of Transportation, as an alternative to "ANTI-LOCK" for identifying telltales for malfunctions in antilock brake systems, Daimler-Benz Aktiengesellschaft hereby declares that it waives the protection of its trademark and grants a general approval to use the term "ABS" as a symbol for all types of anti-lock brake systems.

The declaration executed by Daimler-Benz has been placed in the docket. NHTSA believes that the waiver resolves the trademark concerns raised by commenters. Since it is clear that all manufacturers can now use "ABS," the agency does not believe consumers will associate the term with any particular company.

Since this amendment imposes no new requirements but instead increases manufacturer flexibility by relieving a restriction, NHTSA has determined that an effective date of 30 days after publication in the *Federal Register* is in the public interest.

Part 571–[AMENDED]

In consideration of the foregoing, 49 CFR Part 571 is amended as follows:

In Table 2 of 571.101, the identifying words or abbreviation for malfunction in anti-lock (row 9, column 3, above the dotted line) is revised to read:

Antilock, Anti-lock, or ABS. Also see FMVSS 105.

S5.3.5(a) of 571.105 is revised to read:

S5.3.5(a) Each indicator lamp shall display word, words or abbreviation, in accordance with the requirements of Standard No. 101 (49 CFR 571.101) and/or this section, which shall have letters not less than 1/8-inch high and be legible to the driver in daylight when lighted. Words in addition to those required by Standard No. 101 and/or this section and symbols may be provided for purposes of clarity.

S5.3.5(c)(1)(C) of 571.105 is revised to read:

(C) If a separate indicator lamp is provided for an anti-lock system, the single word "Antilock" or Anti-lock," or the abbreviation "ABS," may be used for S5.3.1(c).

Issued on May 21, 1987

Diane K. Steed
Administrator

52 F.R. 19872
May 28, 1987

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 101

Controls and Displays
(Docket No. 1-18; Notice 33)

ACTION: Final rule; response to petitions for reconsideration.

SUMMARY: In a final rule published in the *Federal Register* on February 3, 1987, NHTSA amended a number of the requirements of Standard No. 101, *Controls and Displays.* The agency received a number of petitions for reconsideration. Some of the issues raised by the petitioners were responded to in a notice published in the *Federal Register* on March 9, 1987. This notice responds to the rest of the issues and makes several changes in the standard for purposes of clarification or correction.

EFFECTIVE DATE: The amendments made by this rule are effective September 3, 1987.

SUPPLEMENTARY INFORMATION: In a final rule published in the *Federal Register* (52 FR 3244) on February 3, 1987, NHTSA amended a number of the requirements of Standard No. 101, Controls and Displays. While the primary purpose of the amendments was to permit greater flexibility in the illumination and identification of controls and displays, the agency recognized that some of the amendments could result in the need for manufacturers to modify existing designs. The agency adopted an effective date of September 1, 1989, for these amendments in order to provide adequate leadtime for such modifications. Other amendments relieved restrictions and were not believed to result in the need for design modifications. The agency concluded that an effective date of 30 days after publication in the *Federal Register*, i.e., March 5, 1987, was in the public interest for these amendments.

NHTSA received petitions for reconsideration from the Automobile Importers of America, Inc. (AIA), Volkswagen (VW), Volvo, Ford, Chrysler, the Motor Vehicle Manufacturers Association (MVMA), Nissan, Austin Rover, Mazda and Toyota. Many of the petitioners indicated that some of the amendments effective on March 5, 1987 would result in the need for design modifications and requested that the effective date for these amendments be extended to September 1, 1989.

After reviewing the petitions, NHTSA concluded that some of the amendments would require design changes and, accordingly, decided to permit compliance with either the earlier version of the standard or the amended standard until September 1, 1987. In a final rule published in the *Federal Register* (45 FR 7151) on March 9, 1987, the agency reissued the earlier version of Standard No. 101, redesignated as Standard No. 100, to apply to vehicles manufactured before September 1, 1989. The application section of the standard made it clear that manufacturers have the option of meeting the requirements of Standard No. 101 for any control or display as an alternative to Standard No. 100's requirements. Conforming amendments were made to the application section of Standard No. 101.

NHTSA noted in its March 1987 notice that while the petitioners were particularly concerned about the March 5, 1987 effective date, they also raised other issues, which would be addressed in a separate notice. This notice addresses those issues.

Several petitioners raised issues concerning the requirements of section S5.3.5. That section states:

> "Any source of illumination within the driver's forward field of view which is not used for the controls and displays regulated by this standard, and which is capable of being illuminated while the vehicle is in motion, must have either a variable intensity, a single intensity that is barely discernible to a driver who has adapted to dark ambient roadway conditions, or a means of being turned off. This requirement shall not apply to buses that are normally operated with the passenger compartment illuminated."

AIA stated that clarification is needed in section S5.3.5 to ensure that the term "variable intensity" means manually or automatically adjustable intensity to provide at least two levels of brightness, and not continuously variable intensity. Similarly, Toyota stated that it assumes that "variable intensity" means manually or automatically adjustable intensity to provide at least two levels of brightness, neither of which need be barely discernible to a driver who has adapted to dark ambient roadway conditions, and not continuously variable. In order to provide greater clarity, the agency is amending section S5.3.5 along the lines requested by AIA. With respect to Toyota's understanding that neither of the two levels of brightness need be "barely discernible" to a driver who has adapted to dark ambient roadway conditions, the agency notes that the purpose of section S5.3.5 is to limit glare. Thus, while NHTSA is not setting specific requirements for the two levels of brightness, it expects that manufacturers will consider problems of glare as they select levels of brightness.

AIA and Toyota also requested clarification concerning section S5.3.5's use of the term "driver's forward field of view." AIA asked whether the term is intended to apply to controls beneath the dash, on the floor console or on the driver's door. Toyota requested that NHTSA provide a definition of "driver's forward field of view," stating that items that should be subject to this section cannot be determined because the term is unclear. The agency interprets that term to refer to anything forward of the driver and within his or her view, including peripheral view. In order to clarify the meaning of this requirement, NHTSA is replacing the phrase which includes "driver's forward field of view" with the following phrase: sources of illumination within a vehicle's passenger compartment which are forward of a transverse vertical plane 4.35 inches (110.6 mm) rearward of the manikin "H" point with the driver's seat in its rearmost driving position. The 4.35 inches dimension represents the distance between the Z-Z datum line and the rearmost point of the 99th percentile eye ellipse (reference SAE JG41 Oct. 1985). This may include illumination sources beneath the dash, on the floor console, and on the driver's door.

Chrysler expressed concern about section S5.3.5's requirements as they apply to telltales not otherwise regulated by Standard No. 101. That petitioner noted that while section S5.3.4 permits the light intensity of telltales listed in the standard to be either variable or non-variable, so long as they can be made visible under all driving conditions, section S5.3.5 requires telltales not listed in the standard to have a variable intensity, a single intensity barely discernible to the driver under nighttime conditions, or a means of being turned off. Chrysler objected that these requirements preclude use of non-variable telltales which are bright enough to be seen under all driving conditions. That company noted that it and other manufacturers provide a number of telltales not listed in Standard No. 101 that provide important and useful information, such as door-liftgate ajar, exterior lamp outage, low windshield washer fluid, transmission oil temperature, and engine condition. NHTSA agrees with the petitioner that manufacturers should be permitted to provide these types of telltales with non-variable intensity. As suggested by Chrysler, the agency is excepting telltales from the requirements of section S5.3.5.

Austin Rover argued that section S5.3.5 should be amended to clarify the requirements for what it termed supplemental information displays. Noting that the February 1987 final rule deleted the definition of "informational readout display" from Standard No. 101, that petitioner stated that some supplemental information displayed in an informational readout display could now be misinterpreted to be covered by section S5.3.3's requirements for "controls, gauges and the identification of those items." Austin Rover stated that "(a)s this element is more stringent than the previous requirements for informational readout displays, it is in clear contradiction to the intent of the amendment as stated in the preamble, that being, to provide greater flexibility in the illumination and identification of controls and displays." The petitioner did not describe what it meant by "supplemental information" or provide any examples.

NHTSA notes that the illumination requirements of section S5.3.3 apply only to the controls and gauges listed in Standard No. 101 (see section S5), while section S5.3.5 covers illuminations for controls and displays not otherwise regulated by the standard. Thus, if the "supplemental information" referred to by the petitioner is a gauge listed in the standard, it is covered by section S5.3.3. On the other hand, if the "supplemental information" is a gauge not listed by the standard, it is covered by section S5.3.5. NHTSA believes that Austin Rover's arguments fail to indicate any need for further clarification. With respect to the petitioner's argument that section S5.3.3's requirements are more stringent than the earlier requirements for informational readout displays, the agency notes that it recognized in both the February 1987 and the March 1987 final rule that some of the amendments would require design changes.

Ford noted that while the definition of informational readout display was removed from the standard, the term still appears in the second sentence of section S5.1. The retention of the term was inadvertent, and it is therefore being deleted.

Ford, VW, Toyota and MVMA noted that amendments to Table 1(a), permitting greater flexibility in identifying certain controls, should have been made to Table 1. While manufacturers currently have the option of complying with the requirements specified in either Table 1 or Table 1(a), they must comply with the requirements of Table 1, effective September 1, 1987. This notice accordingly amends Table 1.

Toyota stated that it assumes that manufacturers may comply with either Standard No. 100 or No. 101 on a control by control (or display or identification) basis and suggested that, in order to minimize confusion in this area, Tables 1 and 1(a) should be revised in both standards. However, NHTSA believes that amendments to Standard No. 100 could cause confusion. Standard No. 101 is the agency's primary standard for controls and displays, and the amendments are being made to that standard. Standard No. 100 is simply the earlier version of the standard, which was reissued for purposes of optional compliance until September 1, 1989. Amending both standards would cloud the distinction between the two standards. NHTSA notes that the application section of Standard No. 101 states that at the option of the manufacturer, motor vehicles manufactured before September 1, 1989, may comply with the requirements of Standard No. 100, instead of the requirements of Standard No. 101, for *any* control, display, or illumination. The agency also notes that there is no need to rescind the amendment to Table 1(a) in Standard No. 101.

Ford pointed out a typographical error in the February 1987 notice. On p. 3246, in the last paragraph of the first column, the notice stated that "(t)he amended provision, now designated as S5.3.3, applies only to those sources of illumination which are capable of being illuminated while the vehicle is in motion . . . ." This sentence should have referred to S5.3.5.

NHTSA has determined that an immediate effective date is in the public interest. The amendments made by this notice impose no new requirements but instead either increase manufacturer flexibility or are for purposes of clarification or correction. As discussed above, manufacturers must comply with the requirements of Table 1 rather than Table 1(a), effective September 1, 1987. Since the amendments permitting greater flexibility in identifying certain controls were made to Table 1(a) rather than to Table 1, manufacturers availing themselves of this flexibility may as of that date be unable to certify that some of their vehicles comply with Standard No. 101, absent these amendments.

In consideration of the foregoing, 49 CFR Part 571 is amended as follows:

The introductory text of S5.1 is revised to read as follows:

S5.1 *Location.* Under the conditions of S6, each of the following controls that is furnished shall be operable by the driver and each of the following displays that is furnished shall be visible to the driver. Under the conditions of S6, telltales are considered visible when activated.*****

S5.3.5 is revised to read as follows:

S5.3.5 Any source of illumination within the passenger compartment which is forward of a transverse vertical plane 4.35 inches (110.6 mm) rearward of the manikin "H" point with the driver's seat in its rearmost driving position, which is not used for the controls and displays regulated by this standard, which is not a telltale, and which is capable of being illuminated while the vehicle is in motion, shall have either (1) light intensity which is manually or automatically adjustable to provide at least two levels of brightness, (2) a single intensity that is barely discernible to a driver who has adapted t dark ambient roadway conditions, or (3) a means of being turned off. This requirement does not apply to buses that are normally operated with the passenger compartment illuminated.

Table 1 is amended by adding the word "Lights" to column 2 as identifying words or abbreviation for Master Lighting Switch control, by adding the word "Horn" to column 2 as identifying words or abbreviation for Horn control, by adding the word "Hazard" to column 2 as identifying words or abbreviation for Hazard Warning Signal control, by adding the words "Wiper or Wipe" to column 2 as identifying words or abbreviation for Windshield Wiping System control, by adding the words "Washer or Wash" to column 2 as identifying words or abbreviation for Windshield Washing System control, by adding the words "Wash-Wipe or Washer-Wiper" to column 2 as identifying words or abbreviation for Windshield Washing and Wiping Combined control, by adding the word "Fan" to column 2 as identifying words or abbreviation for Heating and/or Air Conditioning Fan control, by adding the words "Defrost, Defog or Def" to column 2 as identifying words or abbreviation for Windshield Defrosting and Defogging System control, by adding the words "Rear Defrost, Rear Defog, Rear Def, or R-Def" to column

2 as identifying words or abbreviation for Rear Window Defrosting and Defogging System control, and by adding the words "Marker Lamps or MK Lps" to column 2 as identifying words or abbreviation for Identification, Side Marker and/or Clearance Lamps control.

Issued on August 31, 1987

Diane K. Steed
Administrator

52 F.R. 33416
September 3, 1987

FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 101

Controls and Displays

(Docket No. 1-18; Notice 13)

S1. Scope. This standard specifies requirements for the location, identification, and illumination of motor vehicle controls and displays.

S2. Purpose. The purpose of this standard is to ensure the accessibility and visibility of motor vehicle controls and displays and to facilitate their selection under daylight and nighttime conditions, in order to reduce the safety hazards caused by the diversion of the driver's attention from the driving task, and by mistakes in selecting controls.

S3. Application. This standard applies to passenger cars, multipurpose passenger vehicles, trucks, and buses.

S4. Definitions.

"Telltale" means a display that indicates, the actuation of a device, a correct or defective functioning or condition, or a failure to function.

"Gauge" means a display that is listed in S5.1 or in Table 2 and is not a telltale.

S5. Requirements. (a) Except as provided in paragraph (b) of this section, each passenger car, multipurpose passenger vehicle, truck, and bus manufactured with any control listed in S5.1 or in column 1 of Table 1, and each passenger car, multipurpose passenger vehicle and truck or bus less than 10,000 pounds GVWR with any display listed in S5.1 or in column 1 of Table 2, shall meet the requirements of this standard for the location, identification, and illumination of such control or display.

(b) For vehicles manufactured before September 1, 1987, a manufacturer may, at its option—

(1) Meet the requirements in this standard to use identifying words or abbreviation or identifying symbol for a control by using those specified in Table 1(a) instead of Table 1. If none are specified in Table 1(a), none need be used for the control.

(2) Meet the requirements in this standard to use identifying words or abbreviation or identifying symbol for a display by using those specified in Table 2(a) instead of Table 2. If none are specified in Table 2(a), none need by used for the display.

S5.1 Location. [Under the conditions of S6, each of the following controls that is furnished shall be operable by the driver and each of the following displays that is furnished shall be visible to the driver. Under conditions of S6, telltales are considered visible when activated. **52 F.R. 33416—September 3, 1987—Effective: September 3, 1987)**]

HAND-OPERATED CONTROLS

(a) Steering wheel.

(b) Horn.

(c) Ignition.

(d) Headlamp.

(e) Tail lamp.

(f) Turn signal.

(g) Illumination intensity.

(h) Windshield wiper.

(i) Windshield washer.

(j) Manual transmission shift lever, except transfer case.

(k) Windshield defrosting, and defogging system.

(l) Rear window defrosting and defogging system.

(m) Manual choke.

(n) Driver's sun visor.

(o) Automatic vehicle speed system.
(p) Highbeam.
(q) Hazard warning signal.
(r) Clearance lamps.
(s) Hand throttle.
(t) Identification lamps.

FOOT-OPERATED CONTROLS

(a) Service brake.
(b) Accelerator.
(c) Clutch.
(d) Highbeam.
(e) Windshield washer.
(f) Windshield wiper.

DISPLAYS

(a) Speedometer.
(b) Turn signal.
(c) Gear position.
(d) Brake failure warning.
(e) Fuel.
(f) Engine coolant temperature.
(g) Oil.
(h) Highbeam.
(i) Electrical Charge.

S5.2 Identification.

S5.2.1 Vehicle controls shall be identified as follows:

(a) **[**Except as specified in S5.2.1(b), any hand-operated control listed in column 1 of Table 1 that has a symbol designated for it in column 3 of that table shall be identified by either the symbol designated in column 3 (or symbol substantially similar in form to that shown in column 3) or the word or abbreviation shown in column 2 of that table. Any such control for which no symbol is shown in Table 1 shall be identified by the word or abbreviation shown in column 2. **(52 F.R. 3244—February 3, 1987. Effective: March 5, 1987)]** Words or symbols in addition to the required symbol, word or abbreviation may be used at the manufacturer's discretion for the purpose of clarity. Any such control for which column 2 of Table 1 and/or column 3 of Table 1 specifies "Mfr. Option" shall be identified by the manufacturer's choice of a symbol, word or abbreviation, as indicated by that specification in column 2 and/or column 3. The identification shall be placed on or adjacent to the control. The identification shall, under the conditions of S6, be visible to the driver and, except as provided in S5.2.1.1 and S5.2.1.2, appear to the driver perceptually upright.

(b) S5.2.1(a) does not apply to a turn signal control which is operated in a plane essentially parallel to the face plane of the steering wheel in its normal driving position and which is located on the left side of the steering column so that it is the control on that side of the column nearest to the steering wheel face plane.

S5.2.1.1 The identification of the following need not appear to the driver perceptually upright:

(a) A master lighting switch or headlamp and tail lamp control that adjusts control and display illumination by means of rotation, or of any other rotating control that does not have an off position.

(b) A horn control.

S5.2.1.2 The identification of a rotating control other than one described by S5.2.1.1 shall appear to the driver perceptually upright when the control is in the off position.

S.5.2.2 Identification shall be provided for each function of any automatic vehicle speed system control and any heating and air conditioning system control, and for the extreme positions of any such control that regulates a function over a quantitative range. If this identification is not specified in Tables 1 or 2, it shall be in word or symbol form unless color coding is used. If color coding is used to identify the extreme positions of a temperature control, the hot extreme shall be identified by the color red and the cold extreme by the color blue.

> ***Example 1*** A slide lever controls the temperature of the air in the vehicle heating system over a continuous range, from no heat to maximum heat. Since the control regulates a single function over a quantitative range, only the extreme positions require identification.
>
> ***Example 2*** A switch has three positions, for heat, defrost, and air conditioning. Since each position regulates a different function, each position must be identified.

S5.2.3 **[**Any display located within the passenger compartment and listed in column 1 of Table 2 that has a symbol designated in column 4 of that table shall be identified by either the symbol designated in column 4 (or symbol substantially similar in form to that shown in column 4) or the word or abbreviation shown in column 3. Additional words or symbols may be used at the manufacturer's discretion for the purpose of clarity. Any telltales used in conjunction with a gauge need not be identified. The identification required or permitted by this section shall be placed on or adjacent to the display that it identifies. The identification of any display shall, under the conditions of S6, be visible to the driver and appear to the driver perceptually upright.

S5.3 Illumination.

S5.3.1 Except for foot-operated controls or hand-operated controls mounted upon the floor, floor console, or steering column, or in the windshield header area, the identification required by § 5.2.1 or § 5.2.2 of any control listed in column 1 of Table 1 and accompanied by the word "yes" in the corresponding space in column 4 shall be capable of being illuminated whenever the headlights are activated. However, control identification for a heating and air-conditioning system need not be illuminated if the system does not direct air directly upon windshield. If a gauge is listed in column 1 of Table 2 and accompanied by the word "yes" in column 5, then the gauge and its identification required by § 5.2.3 shall be illuminated whenever the ignition switch and/or the headlamps are activated. Controls, gauges, and their identifications need not be illuminated when the headlamps are being flashed. A telltale shall not emit light except when identifying the malfunction or vehicle condition for whose indication it is designed or during a bulb check upon vehicle starting.

S5.3.2 Each telltale shall be of the color shown in column 2 of Table 2. The identification of each telltale shall be in a color that contrasts with the background.

S5.3.3 (a) Means shall be provided for making controls, gauges, and the identification of those items visible to the driver under all driving conditions.

(b) The means for providing the required visibility—

(1) Shall be adjustable, except as provided in S5.3.3(d), to provide at least two levels of brightness, one of which is barely discernable to a driver who has adapted to dark ambient roadway conditions.

(2) May be operable manually or automatically, and

(3) May have levels of brightness at which those items and their identification are not visible.

(c) Effective September 1, 1989, if the level of brightness is adjusted by automatic means to a point where items or their identification are not visible to the driver, a means shall be provided to enable the driver to restore visibility.

(d) For a vehicle manufactured before September 1, 1989, the requirements of S5.3.3(b)(1) shall not apply to any gauge during the actuation of a telltale which shares a common light source with the gauge.

5.3.4 (a) Means shall be provided that are capable of making telltales and their identification visible to the driver under all driving conditions.

(b) The means for providing the required visibility may be adjustable manually or automatically, except that the telltales and identification for brakes, highbeams, turn signals, and safety belts may not be adjustable under any driving condition to a level that is invisible.

S5.3.5 [Any source of illumination within the passenger compartment which is forward of a transverse vertical plane 4.35 inch (110.6 mm) rearward of the mainkin "H" point with the driver's seat in its rearmost driving position, which is not used for the controls and displays regulated by this standard, which is not a telltale, and which is capable of being illuminated while the vehicle is in motion, shall have either (1) light intensity which is manually or automatically adjustable to provide at least two levels of brightness, (2) a single intensity that is barely discernible to a driver who has adapted to dark ambient roadway conditions, or (3) a means of being turned off. This requirement does not apply to buses that are normally operated with the passenger compartment illuminated.

Table 1 is amended by adding the word "Lights" to column 2 as identifying words or abbreviation for Master Lighting Switch control, by adding the word "Horn" to column 2 as identifying words or abbreviation for Horn control, by adding the word "Hazard" to column 2 as identifying words or abbreviation for Hazard Warning Signal control, by adding the words "Wiper or Wipe" to column 2 as identifying words or abbreviation for Windshield Wiping System control, by adding the words "Washer or Wash" to column 2 as identifying words or abbreviation for Windshield Washing System control, by adding the words "Wash-Wipe or Washer-Wiper" to column 2 as identifying words or abbreviation for Windshield Washing and Wiping Combined control, by adding the word "Fan" to column 2 as identifying words or abbreviation for Heating and/or Air Conditioning Fan control, by adding the words "Defrost, Defog or Def" to column 2 as identifying words or abbreviation for Windshield Defrosting and Defogging System control, by adding the words "Rear Defrost, Rear Defog, Rear Def, or R-Def" to column 2 as identifying words or abbreviation for Rear Window Defrosting and Defogging System control, and by adding the words "Marker Lamps or MK Lps" to column 2 as identifying words or abbreviation for identification, Side Marker and or Clearance Lamps control. **(52 F.R. 33416 September 3, 1987—Effective: September 3, 1987)]**

(b) Except as provided in S5.4(e), the telltales listed in Table 2 shall be displayed at the initiation of any underlying condition.

(c) When the underlying condition exists for actuation of two or more messages, the messages shall be either—

(1) repeated automatically in sequence, or

(2) indicated by visible means and capable of being selected by the driver for viewing.

(d) Messages may be cancellable automatically or by the driver.

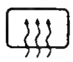
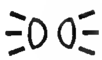
(e) The safety belt telltale must be displayed and visible during the time specified in S7.3 of Standard No. 208.

S6. Conditions. The driver is restrained by the crash protection equipment installed in accordance with the requirements of § 571.208 of this part (Standard No. 208), adjusted in accordance with the manufacturer's instructions.

Joan Claybrook
Administrator

43 F.R. 27541
June 26, 1978

TABLE 1
Identification and Illumination of Controls

Column 1	Column 2	Column 3	Column 4
Hand Operated Controls	Identifying Words or Abbreviation	Identifying Symbol	Illumination
Master Lighting Switch	——	 [5]	——
Headlamps and Tail lamps	(Mfr Option)[2]	(Mfr. Option)[2]	——
Horn	——	 [4]	——
Turn Signal	——	 [3] [5]	——
Hazard Warning Signal	——	 [5]	Yes
Windshield Wiping System	——		Yes
Windshield Washing System	——		Yes
Windshield Washing and Wiping Combined	——		Yes
Heating and/or Air Conditioning Fan	——	 or 	Yes
Windshield Defrosting and Defogging System	——		Yes
Rear Window Defrosting and Defogging System	——		Yes
Identification, Side Marker and/or Clearance Lamps	——	 [2] [5]	Yes
Manual Choke	Choke	——	——
Engine Start	Engine Start[1]	——	——
Engine Stop	Engine Stop[1]	——	Yes
Hand Throttle	Throttle	——	——
Automatic Vehicle Speed	(Mfr. Option)	——	Yes
Heating and Air Conditioning System	(Mfr. Option)	(Mfr Option)	Yes

[1] Use when engine control is separate from the key locking system.
[2] Separate identification not required if controlled by master lighting switch
[3] The pair of arrows is a single symbol. When the controls for left and right turn operate independently, however, the two arrows may be considered separate symbols and be spaced accordingly
[4] Identification not required for vehicles with a GVWR greater the 10,000 lbs., or for narrow ring-type controls.
[5] Framed areas may be filled.

TABLE 1A
Identification and Illumination of Controls

Column 1 Hand Operated Controls	Column 2 Identifying Words or Abbreviation	Column 3 Identifying Symbol	Column 4 Illumination
Headlamps and Tail Lamps	Lights	 [2,4]	—
Turn Signal	—		—
Hazard Warning Signal	Hazard	 [4]	Yes
Clearance Lamps System	Clearance Lamps or Cl Lps	 [3,4]	Yes
Windshield Wiping System	Wiper or Wipe		Yes
Windshield Washing System	Washer or Wash [or Washer-Wiper]		Yes
Windshield Washing and Wiping Combined	Wash-Wipe		Yes
Heating and/or Air Conditioning Fan	Fan		Yes
Windshield Defrosting & Defogging System	Defrost, Defog or Def		Yes
Rear Window Defrosting and Defogging System	Rear Defrost, Rear Defog Rear Def [or R-Def]		Yes
Engine Start	Engine Start[1]	—	—
Engine Stop	Engine Stop[1]	—	Yes
Manual Choke	Choke	—	—
Hand Throttle	Throttle	—	—
Automatic Vehicle Speed	(Mfg Option)	—	Yes
Identification Lamps	Identification Lamps or Lps	—	Yes
Heating and Air Conditioning System	(Mfg Option)	—	Yes

1. Use when engine control is separate from the key locking system.
2. Use also when clearance, identification, parking and/or side marker lamps are controlled with the headlamp switch.
3. Use also when clearance lamps, identification lamps and/or side marker are controlled with one switch other than the headlamp switch.
4. Framed areas may be filled.

TABLE 2
Identification and Illumination of Displays

Column 1	Column 2	Column 3	Column 4	Column 5
Display	Telltale Color	Identifying Words or Abbreviation	Identifying Symbol	Illumination
Turn Signal Telltale	Green	Fasten Seat Belts Also see FMVSS 208	 [1] [6]	—
Hazard Warning Telltale		Also see FMVSS 108	 [2] [6]	—
Seat Belt Telltale		Also see FMVSS 208 [7]	 or 	—
Fuel Level Telltale		Fuel	 or 	—
Gauge	—			Yes
Oil Pressure Telltale		Oil		—
Gauge	—			Yes
Coolant Temperature Telltale		Temp		—
Gauge	—			Yes
Electrical Charge Telltale		Volts, Charge or Amp		—
Gauge	—			Yes
Highbeam Telltale	Blue or Green[4]	Also see FMVSS 108	 [6]	—
Malfunction in Anti-Lock or	Yellow	Antilock, Anti-lock, [or ABS] Also see FMVSS 105	—	—
Brake System		Brake. Also see FMVSS 105	—	—
Brake Air Pressure Position Telltale		Brake Air Also see FMVSS 121	—	—
Speedometer	—	MPH[5]		Yes
Odometer	—	—[3]	—	—
Automatic Gear Position	—	Also see FMVSS 102	—	Yes

[1] The pair of arrows is a single symbol. When the indicator for left and right turn operate independently, however, the two arrows will be considered separate symbols and may be spaced accordingly

[2] Not required when arrows of turn signal tell-tales that otherwise operate independently flash simultaneously as hazard warning tell-tale

[3] If the odometer indicates kilometers, then "KILOMETERS" or "km" shall appear, otherwise, no identification is required

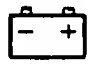
[4] Red can be red-orange. Blue can be blue-green.

[5] If the speedometer is graduated in miles per hour and in kilometers per hour, the identifying words or abbreviations shall be "MPH and km h" in any combination of upper or lower case letters

[6] Framed areas may be filled

[7] The color of the telltale required by S4 5 3 3 of Standard No 208 is red, the color of the telltale required by S7 3 of Standard No 208 is not specified

TABLE 2A
Identification and Illumination of Internal Displays

Column 1	Column 2	Column 3	Column 4	Column 5
Display	Tell-Tale Color	Identifying Words or Abbreviation	Identifying Symbol	Illuminate
Turn Signal Tell-Tale	Green	Fasten Seat Belts Also see FMVSS 208	 [1] [5]	—
Hazard Warning Tell-Tale	Red[4]	Also see FMVSS 108	 [2] [5]	—
Seat Belt Tell-Tale	Red[4]	Also see FMVSS 208		—
Fuel Level, Tell-Tale	Yellow	Fuel		—
Gauge	—	Fuel		Yes
Oil Pressure Tell-Tale	Red[4]	Oil		—
Gauge	—	Oil		Yes
Coolant Temperature Tell-Tale	Red[4]	Temp		—
Gauge	—	Temp		Yes
Electrical Charge Tell-Tale	Red[4]	Volts, Charge or Amp		—
Gauge	—	Volts, Charge or Amp		Yes
Speedometer	—	MPH[6]	—	Yes
Odometer	—	— [3]	—	—
Automatic Gear Position	—	Also see FMVSS 102	—	Yes
High Beam Tell-Tale	Blue or Green[4]	Also see FMVSS 108	 [5]	—
Brake Air Pressure Position, Tell-Tale	Red[4]	Brake Air Also see FMVSS 121	—	—
Malfunction in Anti-Lock or	Yellow	Anti-Lock Also see FMVSS 105-75	—	—
Brake System	Red[4]	Brake Also see FMVSS 105-75	—	—

1. The pair of arrows is a single symbol. When the indicator for left and right turn operate independently, however, the two arrows will be considered separate symbols and may be spaced accordingly.

2. Not required when arrows of turn signal tell-tales that otherwise operate independently flash simultaneously as hazard warning tell-tale.

3. If the odometer indicates kilometers, then "KILOMETERS" or "km" shall appear otherwise, no identification is required.

4. Red can be red-orange. Blue can be blue-green.

5. Framed areas may be filled.

6. If the speedometer is graduated in miles per hour and in kilometers per hour, the identifying words or abbreviations shall be "MPH and km/h" in any combination of upper or lower case letters.

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 102

Transmission Shift Lever Sequence, Starter Interlock, and Transmission Braking Effect
(Docket No. 88–16; Notice 2)
RIN: 2127-AC-54

ACTION: Final rule.

SUMMARY: Standard No. 102 has long required the "identification of shift lever positions of automatic transmissions" to be "permanently displayed in view of the driver." This notice amends the standard for automatic transmission vehicles which have a shift lever position which puts the transmission in park. For these vehicles, the requirement for "permanent display" is replaced with a requirement that identification of automatic transmission shift lever positions be displayed in view of the driver whenever any of the following conditions exist: (a) the ignition is in a position where the transmission can be shifted; (b) the transmission is not in park. The new requirements will facilitate the use of electronic displays, while ensuring that the information in question is displayed at all times when it may be needed for safety.

DATES: The amendments made by this rule are effective August 10, 1989.

SUPPLEMENTARY INFORMATION: One of the stated purposes of Standard No. 102, *Transmission Shift Lever Sequence, Starter Interlock, and Transmission Braking Effect,* is to reduce the likelihood of shifting errors. Since 1967, section S3.2 of the standard has required "identification of shift lever positions of automatic transmissions" to be "permanently displayed in view of the driver." NHTSA has interpreted the term "positions" to include both the position of the gears in relation to each other and the gear position actually selected. NHTSA has interpreted the requirement that identification be "permanently displayed in view of the driver" to require a display whenever there is a driver in the driver's seating position, even if the ignition is not turned on.

On August 25, 1988, NHTSA published in the *Federal Register* (53 FR 32409) a notice of proposed rulemaking (NPRM) to amend Standard No. 1902. As discussed in the NPRM, Chrysler and GM had submitted petitions for rulemaking requesting that section S3.2 of the standard be amended to "permit" or "more clearly allow" the use of electronic displays of automatic transmission shift lever positions. (These displays are often called PRNDL displays, the acronym PRNDL referring to the following gear positions: *p*ark, *r*everse, *n*eutral, *d*rive, and *l*ow.) Chrysler argued that the requirement for permanent display of the PRNDL was design restrictive and prevented the use of electronics. That company stated that since an electronic display requires electrical current for activation, a permanent and constantly activated display would drain the vehicle's battery in a short period of time. Chrysler stated that fifteen minutes is the maximum amount of time that it can allow an electronic display to draw energy from the battery of a parked vehicle.

Both Chrysler and GM argued that the use of electronic PRNDL displays can offer several benefits, as compared to conventional mechanical displays. These include more precise indication of the selected gear, visibility which does not depend on ambient light and/or headlamp activation, designs with improved human factors characteristics, and improved customer satisfaction through product distinction and innovation.

In light of Chrysler's and GM's petitions for rulemaking and changed technology since the requirement for "permanent display" was promulgated, NHTSA reexamined the issue of whether permanent display of PRNDL information is necessary for safety. The agency explained in the NPRM that it had tentatively determined that a less stringent requirement could maintain the safety aspects of section S3.2 while facilitating the use of electronic technology.

As indicated above, the stated purpose of the requirement for permanent display of PRNDL information is to reduce the likelihood of shifting errors. NHTSA stated in the NPRM that, with respect to a driver making a mistake in shifting gears, it believed that this purpose could be accomplished by requiring PRNDL information to be displayed whenever the ignition is in a position where it is possible for the driver to shift the transmission. Another safety concern about shifting errors is the possibility that a driver will leave a vehicle believing that it is in park when it is not. The agency stated in the NPRM that, with respect to the contribution that a PRNDL display can make to reducing the likelihood of such an occurrence, it believed that purpose could be accomplished by requiring PRNDL information to be displayed whenever the transmission is not in park.

NHTSA therefore proposed to amend Standard No. 102 by replacing section S3.2's requirement for "permanent display" with a requirement that identification of shift lever positions of automatic transmissions, including both the position of the gears in relation to each other and the position selected, be displayed in view of the driver when either of the following conditions exists: (A) the ignition is in a position where the transmission can be shifted, or (B) the transmission is not in park. Under the proposal, however, such display would not be required when the ignition is in a position that is used only to start the vehicle. The only time the ignition is in that position is momentarily during the starting of the vehicle, and full battery power may be needed at that time to start the vehicle. NHTSA noted that the proposed requirements focused on the vehicle conditions where the agency believed there is a safety need for PRNDL information to be displayed to the driver.

NHTSA explained that, as a practical matter, manufacturers choosing to avail themselves of the increased flexibility offered by the proposed requirements would likely use an electronic PRNDL display coupled with a transmission shift interlock system. The interlock system could be designed to prevent the transmission from being shifted when the vehicle is parked, i.e., when the transmission is in park and the ignition is in the lock position. The PRNDL information would not be required to be displayed in this situation, since the transmission would be in park and the ignition would be in a position where the transmission could not be shifted. There would thus not be a problem of the vehicle's battery being drained as a result of a driver's leaving the vehicle with the PRNDL display illuminated.

NHTSA also noted that the use of transmission shift interlock systems could result in safety benefits unrelated to the display of PRNDL information. In a separate rulemaking concerning Standard No. 114, the agency has proposed requirements that would have the effect of requiring transmission shift interlock systems for automatic transmission vehicles (i.e., the ignition key-locking system shall not permit removal of the key except when the transmission lever is in the park position). See 53 FR 11105, April 5, 1988. That proposal was issued in light of a safety concern about the rolling away of some automatic transmission vehicles when they are parked on slanted surfaces with the ignition key removed and the parking brake not applied. The rollaway accidents occur because the ignition key can be removed, but the gear shift lever can be left in neutral or in gear, or it can be inappropriately or inadvertently shifted out of park by another occupant, typically an unattended child.

NHTSA received seven comments on the NPRM concerning Standard No. 102. Both of the petitioners supported the proposal, although GM's support was limited to vehicles other than heavy duty vehicles. GM stated that it supports the agency's view that the proposed requirements would preserve the safety benefits of section S3.2 while facilitating the use of electronic technology. That company expressed concern, however, that the proposed amendments would not provide the same flexibility for heavy duty trucks. GM stated that the increased flexibility is only available when the electronic PRNDL is used in conjunction with a transmission interlock system which precludes shifting the transmission whenever it is in the park position and the ignition is in the lock or accessory position. According to GM, however, its heavy duty trucks with GVWR in excess of 10,000 pounds do not have a park position or transmission interlock system. That company recommended a different amendment for heavy duty vehicles. Chrysler stated that while the proposed requirements were somewhat different than it had recommended in its petition, the proposal would achieve the desired objective.

Like GM, Ford expressed support for the proposal, while recommending different requirements for medium and heavy duty trucks. Ford stated that automatic transmission-equipped medium and heavy duty trucks do not have a shift lever park position and urged that a provision be made for these vehicles to provide the same flexibility for use of electronic display of shift lever positions as in vehicles with a shift lever park position. The Motor Vehicle Manufacturers Association (MVMA) and Navistar International also recommended that different requirements be established for medium and heavy duty vehicles.

Two manufacturers, Volkswagen and Austin Rover, supported the intent of the proposal to permit additional design flexibility but argued that the proposal did not go far enough. Volkswagen expressed concern that the proposed requirements could increase the potential for unwanted battery drain. That company noted that the NPRM had cited the possibility of battery drain occurring if the key remains in the ignition and the vehicle is not in park. Volkswagen argued that existing NHTSA requirements along with a shift interlock would adequately protect against this type of problem without increasing the potential for unwanted battery drain and urged the agency to modify its proposal to accommodate such systems. That company explained its position as follows:

"If a driver leaves a vehicle without removing the key from the ignition, FMVSS 114 S4.5 requires that a warning be provided to the driver. This warning is intended to attract the driver's attention to the fact that the key is left in the ignition. A driver who responds to this warning, who has not placed the transmission in park, will not be able to remove the key if the vehicle is equipped with a shift interlock. Hence, the driver's attention will be attracted to the factor prohibiting removal of the key and the transmission will be placed in park in order to remove the key. In addition, FMVSS 102 S3.1.3 requires that the engine starter be inoperative when the transmission shift lever is in a forward or reverse drive position. Therefore a driver who ignores the signal and returns later to start the vehicle will not be able to do so unless the transmission is in park or neutral. A driver who left the vehicle in park or neutral, will see the electronic PRNDL display just before and immediately after safely starting the vehicle. A driver who left the vehicle in drive or reverse will see the display when an attempt is made to start the vehicle and it will not respond."

Volkswagen also stated that all of its currently produced Audi vehicles, with automatic transmissions, are equipped with an audible warning to the driver if the transmission is left in a position other than park. That company requested that the agency allow this design alternative. Austin Rover argued that there are alternative systems to the "General Motors system" described in the NPRM which could be used without any reduction in the level of safety offered by the present standard and recommended requirements that would permit such systems. That company suggested that complete PRNDL information is needed only when the vehicle is capable of powered motion, and that in situations where the vehicle is not capable of powered motion, the driver only needs to be able to determine whether the park position has been selected.

After carefully considering the comments, NHTSA has decided to issue a final rule along the lines of the proposal for automatic transmission vehicles which have a shift lever park position. The agency has concluded that the amended requirements will maintain the safety aspects of section S3.2 while facilitating the use of electronic technology for passenger cars and other light vehicles.

NHTSA recognizes the concerns expressed by several commenters that the amended requirements may not facilitate the use of electronic technology in medium and heavy duty vehicles, since those vehicles do not have a shift lever park position. However, the requirements recommended by those commenters are significantly different than those proposed in the NPRM. The agency therefore plans to address that issue in a separate rulemaking. NHTSA notes that Volkswagen suggested in its comment that Standard No. 102 be amended to provide greater flexibility for manual transmission pattern displays as well as for automatic transmission shift lever position displays. The agency plans to address that issue in the separate rulemaking. For now, NHTSA is maintaining the existing requirements both for automatic transmission vehicles which do not have a park position and for manual transmission vehicles. However, the agency is amending the language requiring that information be "permanently displayed in view of the driver" to reflect its past interpretations that display is required whenever there is a driver in the driver's seating position.

As discussed above, in developing its August 1988 proposal, NHTSA focused on the vehicle conditions where it believes there is a safety need for PRNDL information, i.e., whenever it is possible for the driver to shift the transmission and whenever the transmission is not in park. The agency does not believe that Volkswagen or Austin Rover demonstrated either a need for further flexibility for purposes of facilitating electronic technology or that their suggested alternative amendments would ensure that PRNDL information is always available when needed.

With respect to Volkswagen's comment concerning possible battery drain, NHTSA notes that the NPRM specifically requested comment on this issue. Only two commenters directly addressed the issue, Volkswagen and Chrysler. While Volkswagen expressed concern that the proposed requirements could increase the potential for unwanted battery drain, Chrysler stated the following:

"We do not believe that a problem will be created for motorists if the PRNDL display is activated when the ignition switch is in the 'off' position. In fact, it should encourage drivers to place the transmission in 'park' and turn the ignition switch to the lock position in order to avoid battery rundown. Since the agency's proposal allows the PRNDL display to be off when the transmission is in 'park' and the ignition switch is in the 'lock' position, leaving the key in the ignition switch for an extended period, as often happens in parking lots and garages. poses no problem. . . ."

While GM and Ford did not directly address the issue of possible battery drain, NHTSA believes that their general support of the proposal and statements that the proposal will facilitate the use of electronic technology indicate that they do not consider the issue to present a significant problem for their customers.

In the NPRM, NHTSA noted that the possibility of battery drain occurring when the key remains in the ignition and the vehicle is not in park is not unlike other situations, such as leaving headlamps or a radio on for extended periods. The agency also noted that manufacturers could provide warnings to the driver before the battery is drained to the point that it could no longer start the vehicle. In the absence of evidence indicating that battery drain would be a significant actual problem for drivers, as opposed to a theoretical possibility, NHTSA does not believe that further flexibility should be provided at the expense of ensuring that PRNDL information is available when needed. The agency also believes that the chances of this problem occurring would be much lower than for a driver leaving lights on. That problem typically occurs when a driver forgets to turn off lights when parking during daylight or under brightly lit conditions. However, while a driver typically needs to turn off a vehicle's lights separately, that would not be true for PRNDL displays. The potential problem of battery drain occurring from the PRNDL display would be limited to the rare situation where the driver parks the vehicle not only leaving the key in the ignition but also with the vehicle not in park.

Volkswagen suggested that a driver who responds to an audible warning that the key is left in the ignition would not be able to remove the key if the vehicle is equipped with a shift interlock, and thereby would have his or her attention attracted to the factor prohibiting removal of the key. That company stated that the transmission would be placed in park in order to remove the key. NHTSA believes, however, that some drivers who choose to ignore the audible warning about the key might wish to check the PRNDL display as to whether the vehicle is in park, as part of ensuring that the vehicle is securely parked, or simply notice the PRNDL display. Also, in the situation posited by Volkswagen, the PRNDL display might assist the driver in comprehending what factor was preventing removal of the key, thereby making it more likely that the driver would place the vehicle in park.

Volkswagen also suggested that manufacturers should be permitted the alternative of providing an audible warning to the driver if the transmission is left in a position other than park. While manufacturers are free to provide such warnings, NHTSA does not believe that the warning should be a substitute for a PRNDL display that advises the driver that the vehicle is not in park. Drivers may not understand the meaning of the audible warning and are likely to check the PRNDL display if they are in doubt as to whether the vehicle is in park.

As indicated above, Austin Rover suggested that complete PRNDL information is needed only when the vehicle is capable of powered motion, and that in situations where the vehicle is not capable of powered motion, the driver only needs to be able to determine whether the park position has been selected. NHTSA disagrees. First, whenever a vehicle is not already in park, the agency believes that a driver needs complete PRNDL information in order to be able to easily shift the vehicle to park. The issue of whether the vehicle is then capable of powered motion or not is irrelevant to that point. Second, a driver might choose to shift gears and move a vehicle for short distances without the engine on. In this situation, where the vehicle is not capable of powered motion, the agency believes that the driver needs full PRNDL information in order to safely move the vehicle.

Volkswagen stated that the proposal presented one aspect of ambiguity, whether the functions of two PRNDL displays can be used together to demonstrate compliance with the standard. That company asked whether an electronic display on the instrument panel could be used to show the gear position selected and an embossed display on the floor console be used to show the position of the gears in relation to each other.

Section S3.2's current requirement that "(i)dentification of shift lever positions of automatic transmissions. . . be permanently displayed in view of the driver" does not expressly require the specified information to be provided in a single display. However, NHTSA believes that requirement was written with the assumption that the specified information would be provided in a single display, and that current vehicle designs reflect that assumption. The agency is concerned that if the information is not provided in a single display, the standard may be less effective in achieving its purpose of reducing the likelihood of shifting errors. NHTSA plans to address this issue in the separate rulemaking cited above.

Since the amendments adopted today impose no new requirements but instead increase manufacturer flexibility, NHTSA has determined that an effective date of 30 days after publication in the *Federal Register* is in the public interest.

In consideration of the foregoing, 49 CFR Part 571 is amended as follows: S3.1.4 is added to § 571.102 to read as follows:

S3.1.4 *Identification of shift lever positions.*

S3.1.4.1 Except as specified in S3.1.4.3, if the transmission shift lever sequence includes a park position, identification of shift lever positions, including the positions in relation to each other and the position selected, shall be displayed in view of the driver whenever any of the following conditions exist:

(a) The ignition is in a position where the transmission can be shifted.

(b) The transmission is not in park.

S3.1.4.2 Except as specified in S3.1.4.3, if the transmission shift lever sequence does not include a park position, identification of shift lever positions, including the positions in relation to each other and the position selected, shall be displayed in view of the driver at all times when a driver is present in the driver's seating position.

S3.1.4.3 Such information need not be displayed when the ignition is in a position that is used only to start the vehicle.

3. S3.2 is revised to read as follows:

S3.2 *Manual transmissions.* Identification of the shift lever pattern of manual transmissions, except three forward speed manual transmissions having the standard "H" pattern, shall be displayed in view of the driver at all times when a driver is present in the driver's seating position.

Issued on July 5, 1989.

Jeffrey R. Miller
Acting Administrator

54 F.R. 29041
July 11, 1989

MOTOR VEHICLE SAFETY STANDARD NO. 102

Transmission Shift Lever Sequence, Starter Interlock, and Transmission Braking Effect—Passenger Cars, Multipurpose Passenger Vehicles, Trucks, and Buses

S1. Purpose and scope. This standard specifies the requirements for the transmission shift lever sequence, a starter interlock, and for a braking effect of automatic transmissions, to reduce the likelihood of shifting errors, starter engagement with vehicle in drive position, and to provide supplemental braking at speeds below 25 miles per hour.

S2. Application. This standard applies to passenger cars, multipurpose passenger vehicles, trucks, and buses.

S3. Requirements.

S3.1 Automatic transmissions.

S3.1.1 Location of transmission shift lever positions on passenger cars. A neutral position shall be located between forward drive and reverse drive positions. If a steering-column-mounted transmission shift lever is used, movement from neutral position to forward drive position shall be clockwise. If the transmission shift lever sequence includes a park position, it shall be located at the end, adjacent to the reverse drive position.

S3.1.2 Transmission braking effect. In vehicles having more than one forward transmission gear ratio, one forward drive position shall provide a greater degree of engine braking than the highest speed transmission ratio at vehicle speeds below 25 miles per hour.

S3.1.3 Starter interlock. The engine starter shall be inoperative when the transmission shift lever is in a forward or reverse drive position.

[S3.1.4.1 Except as specified in S3.1.4.3, if the transmission shift lever sequence includes a park position, identification of shift lever positions, including the positions in relation to each other and the position selected, shall be displayed in view of the driver whenever any of the following conditions exist:

(a) The ignition is in a position where the transmission can be shifted.

(b) The transmission is not in park.

S3.1.4.2 Except as specified in S3.1.4.3, if the transmission shift lever sequence does not include a park position, identification of shift lever positions, including the positions in relation to each other and the position selected, shall be displayed in view of the driver at all times when a driver is present in the driver's seating position.

S3.1.4.3 Such information need not be displayed when the ignition is in a position that is used only to start the vehicle. **(54 F.R. 29041—July 11, 1989. Effective: August 10, 1989).]**

S3.2 [Manual transmissions.

Indentification of the shift lever pattern of manual transmissions, except three forward speed manual transmissions having the standard "H" pattern, shall be displayed in view of the driver at all times when a driver is present in the driver's seating position. **(54 F.R. 29041—July 11, 1989. Effective: August 10, 1989)]**

32 F.R. 2410
February 3, 1967

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 103

Windshield Defrosting and Defogging Systems—Passenger Cars, Multipurpose Passenger Vehicles, Trucks and Buses

(Docket Nos. 9, 1–12)

Motor Vehicle Safety Standard No. 103 (32 F.R. 2410) requires that each passenger car and multipurpose passenger vehicle manufactured for sale in the Continental United States be provided with a windshield defrosting and defogging system. A proposal to amend section 371.21 of Part 371, Federal Motor Vehicle Safety Standards, by amending Standard No. 103, was published in the *Federal Register* on December 28, 1967 (32 F.R. 20867).

Interested persons have been afforded an opportunity to participate in the making of the amendment. Their comments, as well as other available information, have been carefully considered.

The purpose of the amendment is to increase driver visibility, and thereby enhance safe vehicle performance, by (1) adding test conditions and performance requirements for passenger car defrosting and defogging systems; and (2) broadening the standard's application to cover trucks and buses, which were not subject to the initial standard. In addition, the standard was modified to improve its clarity.

Paragraph S4.3 in the notice of proposed rulemaking required testing of passenger car windshield defrosting and defogging systems in accordance with the test conditions specified in paragraph 4 of SAE Recommended Practice J902, August 1964. Several comments asked that this requirement be modified to permit optional use of the test conditions set out in paragraph 4 of SAE Recommended Practice J902a, March 1967, a revised version of the Recommended Practice. The Administrator has determined that there are only minor differences between the test equipment, instrumentation, conditions and procedures in paragraphs 4.1 through 4.4.7 of these two versions, and that these minor differences do not affect the level of safety attained with the use of either one. Accordingly, S4.3 of the notice has been changed to permit the use of the demonstration procedures described in paragraphs 4.1 through 4.4.7 of either SAE Recommended Practice J902 or SAE Recommended Practice J902a.

Another feature of paragraph S4.3 which evoked comments was its provision for use of the test procedures in section 4 of Recommended Practice J902 to the extent they are "applicable to" the particular system being tested. Any possible ambiguity that might appear upon superficial examination of the quoted words disappears when this requirement is read in conjunction with the operative provisions of section 4 of the SAE Recommended Practices. Section 4 makes reference to certain components that are not incorporated in every passenger car (e.g. defroster blowers). The use of the section 4 test procedures is restricted to those procedures "applicable to" the particular passenger car system being tested to make it clear that procedures which, by their terms, apply to components that are not a part of the car being tested need not be complied with.

Three comments asked that paragraph S4.2 of the standard be changed to permit optional use of the defrosted area and defrosting time requirements prescribed in section 3 of SAE Recommended Practice J902a in lieu of those set forth in section 3 of Recommended Practice J902. In the notice of proposed rulemaking, paragraph S4.2 incorporated, with minor modifications, the defrosted area and defrosting time requirements of Recommended Practice J902. Comparison of the two versions of the SAE Recommended Practice reveals that there are great differences between the areas and times prescribed by J902 and those prescribed by J902a. The requests for a change in paragraph S4.2 acknowledged that compliance with one procedure is not necessarily more difficult than compliance with the other. The submissions did not indicate that adherence to the J902 requirements would impose any significant burden or would be impracticable in any sense. In view of the absence of sufficient substantiation to justify changing the standard, paragraph S4.2 has not been modified to allow alternative defrosted area and defrosting time requirements.

One comment requested that the standard be changed to allow 5 minutes more to meet the defrosted area requirements of the critical or "C" area. It was said that reasonable performance tolerances should be taken into account, and that, therefore, the requirement of paragraph 3.1 of SAE Recommended Practice J902, as adopted in modified form in paragraph S4.2 of the standard, that the "C" area must be 80 percent defrosted after 20 minutes of operation should be changed to allow manufacturers 25 minutes to attain the 80 percent defrosted goal. Such a modification would permit a significant reduction of the defrosting performance of defrosting and defogging systems and this, in turn, would be contrary to the interest of safety. While it is true that variations in such things as the performance of the thermostat and the outlet nozzle will affect the system's capability to defrost a given windshield area within a stated time, there is no apparent reason why it is impracticable to design and construct the system so that, at a minimum performance level, it will comply with the requirements of paragraph S4.2. For these reasons, the Administrator has rejected this request for modification of the standard.

Many comments submitted suggestions that went beyond the scope of the notice. For example, submissions that discussed the problems of establishing performance requirements for defrosting and defogging systems on multipurpose passenger vehicles, trucks, and buses were received. These, and other comments of this nature, will be considered in connection with future rulemaking action.

In consideration of the foregoing, § 371.21 of Part 371, Federal Motor Vehicle Safety Standards, is amended, effective January 1, 1969, by amending Motor Vehicle Safety Standard No. 103 . . . .

This amendment is made under the authority of sections 103 and 119 of the National Traffic and Motor Vehicle Safety Act of 1966 (15 U.S.C. 1392, 1407) and the delegation of authority of April 24, 1968.

Issued in Washington, D. C. on April 24, 1968.

Lowell K. Bridwell,
Federal Highway Administrator.

33 F.R. 6468
April 27, 1968

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 103
Windshield Defrosting and Defogging Systems
(Docket No. 73-6; Notice 2)

The purpose of this notice is to amend Motor Vehicle Safety Standard No. 103, *Windshield Defrosting and Defogging Systems*, to revise the wind test condition.

On March 20, 1973, the National Highway Traffic Safety Administration published a notice (38 F.R. 7339) proposing a change in the standard's wind velocity test condition which would clarify the NHTSA's intent that the performance requirements be met at all levels within the specified wind speed range. The present provision specifying that "the wind velocity may not exceed 5 mph" may be interpreted by manufacturers as requiring compliance at only one point within the range. Such an interpretation could result in enforcement problems if the NHTSA discovered a failure to comply when testing a vehicle at one point within the range while the manufacturer had attained compliance during testing at another point within the specified wind speed range. Perpetuation of this type of enforcement situation might retard the development of complying vehicle systems and undermine the level of performance the NHTSA intends to accomplish. Therefore, the NHTSA proposed in its March 20, 1973, notice that the standard specify that the wind velocity test condition be at any level from 0 to 2 mph. Reading this requirement together with the interpretive provisions of § 571.4, the vehicle would be required to be capable of complying with the standard when the wind velocity is at any speed within that range. This would prevent any discrepancy between the manufacturers' and the NHTSA's conception of what the standard actually requires.

Several comments submitted in response to the proposal to revise the wind speed test condition asserted that wind speeds cannot be accurately measured below 2 mph, and therefore the requirement should remain unchanged. This objection lacks merit, since the standard only requires that a vehicle be *capable* of complying with the standard at wind speeds from 0 to 2 mph. A manufacturer may generally conduct his testing at higher wind speeds to determine compliance, since the greater the wind speed, the more difficult it is to defrost the windshield within the specified time span.

The March 20, 1973, notice also proposed that the test chamber temperature sensor be located in a position not substantially affected by the heat from the engine. Comments from Ford and General Motors, submitted in response to this aspect of the proposal, objected to the proposed temperature location as unobjective and ambiguous and suggested establishment of a more specific location. The NHTSA is in tentative agreement with commenters' suggestion and is proposing in a separate notice issued today an exact location for the temperature sensor.

In consideration of the foregoing, in S4.3 of 49 CFR § 571.103, Motor Vehicle Safety Standard No. 103, paragraph (g) is amended. . . .

Effective date: September 1, 1975.

(Secs. 103, 119, Pub. L. 89-563, 80 Stat. 718, 15 U.S.C. 1392, 1407; delegation of authority at 49 CFR 1.51.)

Issued on March 17, 1975.

James B. Gregory
Administrator

40 F.R. 12991
March 24, 1975

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 103

Windshield Defrosting and Defogging Systems

(Docket No. 73–6; Notice 4)

The purpose of this notice is to amend Motor Vehicle Safety Standard No. 103, *Windshield Defrosting and Defogging Systems*, 49 CFR 571.103, to specify a relocation of the test chamber temperature and wind velocity sensors.

On March 24, 1975, the National Highway Traffic Safety Administration published a notice (40 F.R. 13002) proposing a change in the location of the test chamber temperature and wind velocity sensors to a position where they would not be affected by air released from vehicle engines during testing. A petition from Jaguar Cars Division of British Leyland UK Limited, describing compliance problems for vehicles that direct engine heat at the windshield as part of the defrosting process, prompted the rulemaking action.

It was proposed that the temperature and wind sensors be positioned at the forwardmost point of the vehicle or 36 inches from the base of the windshield, whichever is farther forward, at a level halfway between top and bottom of the windshield. At this location, the NHTSA concluded that the temperature measurement would not be affected by expelled engine heat and the wind measurement would not be affected by air released from hood ducts.

Comments to the proposal were received from Chrysler, Jaguar, and General Motors. Both Chrysler and General Motors supported adoption of the amendment.

Jaguar took issue with the proposed thermocouple location and asked that the sensors be placed 3 feet forward of the vehicle. The NHTSA denies this request, having found that the proposed thermocouple position provides for reliable and objective temperature and wind velocity measurements. Location of the sensors at the position suggested by Jaguar is therefore unnecessary and would tend to penalize those manufacturers using short cold chambers for compliance testing. The purpose of the amendment is to relocate the temperature and wind sensors to locations where they will not be affected by air released from vehicle engines. The agency concludes that the proposed location accomplishes this goal and should therefore be adopted.

In consideration of the foregoing, Standard No. 103 (49 CFR 571.103) is amended by adding in S4.3 a new paragraph (h)....

Effective date: September 1, 1975.

(Secs. 103, 119, Pub. L. 89-563, 80 Stat. 718, 15 U.S.C. 1392, 1407; delegation of authority at 49 CFR 1.51.)

Issued on July 28, 1975.

James B. Gregory
Administrator

40 F.R. 32336
August 1, 1975

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 103

Windshield Defoggers
[Docket No. 83-10; Notice 2]

ACTION: Final Rule

SUMMARY: This notice amends Standard No. 103, *Windshield Defrosting and Defogging Systems,* to require that passenger cars, multipurpose passenger vehicles, trucks, and buses manufactured for sale in the noncontinental United States be equipped with defogging systems. The noncontinental United States includes such areas as Hawaii, Puerto Rico, the Virgin Islands, Guam, and American Samoa. The agency believes that adoption of this amendment will eliminate the safety hazard caused by fogging of vehicle windshields in vehicles without defogging systems in the damp weather prevalent in these geographic areas and having to manually wipe those windshields in order to see properly.

EFFECTIVE DATE: September 1, 1987.

SUPPLEMENTARY INFORMATION: Standard No. 103, *Windshield Defrosting and Defogging Systems,* currently applies to passenger cars, multipurpose passenger vehicles, trucks, and buses which are manufactured for sale in the continental United States (including Alaska). The standard requires manufacturers to install systems which perform both windshield defrosting and defogging functions in those vehicles.

When the original rule was issued, the agency believed there was no justification for requiring defrosting equipment on vehicles manufactured for sale in the warm, humid regions of the noncontinental United States. Therefore, these vehicles are not required to be equipped with the combined windshield defrosting and defogging systems required under Standard No. 103. The noncontinental United States includes such areas as Hawaii, Puerto Rico, the Virgin Islands, Guam and American Samoa. Standard No. 103 is the only Federal motor vehicle safety standard which exempts vehicles manufactured for sale in the noncontinental United States.

Domestic manufacturers install combined defrosting and defogging systems on all passenger cars, regardless of where they are sold. However, several foreign manufacturers do not include any type of defrosting or defogging equipment on many of their vehicles sold in the noncontinental United States. For the reasons set forth below, this rule amends the standard to require all manufacturers to install, at their option, either a defrosting and defogging system or a defogging system, in all vehicles manufactured for sale in the noncontinental United States.

Safety Problem

On July 14, 1983, (48 FR 32200), NHTSA issued a notice of proposed rulemaking which responded to a petition for rulemaking filed by Sunrise Motors, Inc. The petitioner claimed that windshields in the Virgin Islands fog up very badly in damp weather, creating a serious safety hazard in vehicles which do not have defogging systems. The petitioner therefore requested that manufacturers be required to install defogging systems in passenger cars sold in the Virgin Islands.

The agency reviewed the climatic conditions of the Virgin Islands as well as in the rest of the noncontinental United States and determined that the petitioner's claim that these conditions are conducive to the occurrence of windshield fogging on a regular basis is accurate. The fogging occurs when a cool windshield comes into contact with warm, moist air and the water vapor in the air condenses in the form of a liquid on the windshield. All the geographic areas in question are characterized by high temperatures and high humidity. Windshield fogging is especially likely to occur in the morning hours.

Under these conditions windshield fogging reduces visibility, substantially. Thus, driving a vehicle without defogging equipment that clears the windshield automatically, poses a safety hazard. In addition, in the absence of defogging equipment, drivers try to manually wipe the windshield clean while driving—a process which itself is distracting and creates a safety hazard. The agency therefore believes that a vehicle without defogging equipment creates an unreasonable safety risk. This is true not only for passenger cars, the specific subject of the petition for rulemaking, but also for multipurpose passenger vehicles, trucks, and buses. Thus, the notice proposed to require windshield defogging systems in passenger cars, multipurpose passenger vehicles, trucks, and buses.

Automobile Importers of America, Inc., supplied information concerning the sales of passenger cars by four foreign manufacturers in the noncontinental United States with and without defrost and defogging equipment. According to these data, more than 76,000 automobiles were shipped to the noncontinental United States in 1980 by these companies. Approximately 40,000 of these cars, representing 52 percent of the total, were not equipped with defrosting and defogging equipment. The total vehicle population without defogging equipment is likely to be larger when other passenger car imports, multipurpose passenger vehicles, trucks, and buses are included; however, the agency does not have specific data on the total vehicle population. Therefore, a significant number of foreign-manufactured vehicles in these areas are being operated without a defogging system to improve visibility. This situation obviously increases the risk of motor vehicle accidents, injuries, or deaths.

Alternative Requirements

Three comments were received on the notice, two from vehicle manufacturers. None of the commenters on the notice of proposed rulemaking opposed this amendment to Standard No. 103.

Amending the standard to require vehicles manufactured for sale in the noncontinental United States to have defogging systems is not simply a matter of extending the applicability of the standard to the additional geographic areas. Standard No. 103 requires vehicles built for sale in the continental United States to have a system which defrosts as well as defogs. The standard does not currently specify separate performance requirements for defogging. Instead, for passenger cars, the defrosting requirements of the standard serve the double purpose of ensuring adequate defrosting and defogging performance. This is possible because the amount of heat necessary for adequate defrosting, i.e., for melting ice that forms on a windshield, also provides adequate defogging performance. For multipurpose passenger vehicles, trucks, and buses, the standard simply requires a windshield defrosting and defogging system and does not specify any performance requirements.

The agency does not consider it appropriate to extend the defrosting requirements of Standard No. 103 to vehicles manufactured for sale in Hawaii, Puerto Rico, the Virgin Islands, Guam, and American Samoa. Since those areas have warm climates, there is no safety need for vehicles to have a defrosting (as opposed to defogging) system.

This rule gives manufacturers the option of complying with the defogging requirement in alternative ways. Combination defrosting and defogging equipment can be installed in the vehicles. As noted earlier, domestic manufacturers currently do so in passenger cars. The agency's rule also permits manufacturers to design a system with only defogging capability for installation in vehicles for sale in the noncontinental United States.

There are two major ways to provide windshield defogging capability, by applying heat to the windshield or by dehumidifying the air inside a vehicle. The first method is the same as that used for defrosting, although less heat may be necessary for defogging. Therefore, a manufacturer may be able to design a defog-only system using heat application which is less expensive than a standard defrosting and defogging system. The second method, dehumidifying the air inside a vehicle, is considerably more expensive than the first method and therefore unlikely to be used for defogging only purposes. Since air conditioners dehumidify the air inside a vehicle in addition to cooling it, all vehicles equipped with air conditioners have defogging capability, whether or not they have a combined defrosting and defogging system. Thus, vehicles with air conditioners would not need an additional defogging system to meet this rule's amendments.

The agency is not requiring a defogging system for side or rear windows of passenger cars, as requested by the petitioner. The primary problem created by fogging involves the windshield. For this reason, there is currently no requirement for side or rear window defogging equipment in vehicles manufactured for sale in the continental United States.

Toyota Motor Corporation suggested that an alternative defogging method be allowed which applies outside ambient air directly to the windshield using a boost ventilator system. The agency believes that the Toyota system would not be able to defog a windshield as quickly as the other alternatives, particularly when very high humidity conditions exist. Moreover, the agency has no data which show that a boost ventilator defogger system would provide equivalent defogging capability in multipurpose passenger vehicles, trucks, or buses. For these reasons, the agency will not permit the use of a boost ventilator defogger system for defog-only purposes under this amendment. As stated earlier, the vehicle manufacturer will have the option of installing a windshield defog-only system which operates either by applying heat to the windshield or by dehumidifying the air inside the passenger compartment of the vehicles. Of course, a combined windshield defrosting and defogging system could be installed instead of a defog-only system.

Defogging Performance Requirements

Transportation Safety Consultants (TSC) stated that the *defrosting* performance requirements of the standard should be amended to include other vehicles as well as passenger cars. In addition, TSC urged the agency to set specific defogging performance requirements for all vehicles. The changes sought by TSC are beyond the scope of this petition. First, the agency did not propose to amend the *defrosting* requirements of Standard 103. Therefore, extending the current requirements for defrosters to other passenger vehicles is inappropriate as part of this rulemaking. In addition, the agency disagrees with TSC that a vehicle equipped with a combined defrosting and defogging system or an air-conditioning unit may not have adequate defogging capability. The agency also believes it is reasonable to require the installation of defogging equipment only, on vehicles manufactured for sale in the noncontinental United States without specific defogging performance requirements, primarily because defogging equipment provides obvious and important safety benefits by improving visibility in these geographic regions.

Potential Benefits, Costs and Other Effects

The agency has evaluated the economic and other effects of this final rule and determined that they are neither major as defined by Executive Order 12291 nor significant as defined by the Department's Regulatory Policies and Procedures.

The safety benefits of this rule are difficult to quantify, as they usually are for crash avoidance safety standards. However, the agency believes there is no rationale for exempting vehicles manufactured for sale in the noncontinental United States from the requirement to install defogging equipment. As discussed earlier, there are adverse safety consequences that result from not having a defogger. Vehicles manufactured for sale in those locations were only exempted from the defogging requirements because of an oversight. When Standard 103 was first proposed its provisions would have applied to the noncontinental United States. However, since the Standard also included defrosting (i.e., deicing) requirements, it was recognized that these would be inappropriate for the noncontinental United States. Because of statutory deadlines for issuance of initial safety standards, the agency did not have time to re-propose only the defogging requirements and thus exempted the noncontinental United States from all the requirements of Standard 103. This rule corrects the oversight.

Although the agency cannot quantify the possible reduction in accidents, deaths, and injuries, requiring a defogger will improve safety by providing increased visibility through a vehicle's windshield and by eliminating the need to manually wipe the windshield while driving. The agency's final regulatory evaluation analyzes the potential effects on safety of this action.

The final regulatory evaluation also contains cost information prepared by the agency. NHTSA conducted an independent analysis of a complete Standard No. 103 *defrosting and defogging* system based on tear-down analyses of a Chevrolet Citation and a Plymouth Reliant. These costs are in the $60 to $68 per vehicle range which equates with the lower end of cost figures supplied by foreign manufacturers. As noted above, defog-only systems would cost less, if manufacturers choose to design that type of system, although the exact lower amount is not known. Since domestically produced vehicles already come equipped with defoggers, this rulemaking does not add any cost to manufacturers of those vehicles. The estimated cost of this rule would be $2.4 million to $2.7 million for passenger cars sold by foreign manufacturers in these locales.

The agency believes that the effective date of this rule, September 1, 1987, is reasonable, because this leadtime may be necessary for manufacturers to design defog-only systems if they choose this option for vehicles manufactured for sale in the noncontinental United States.

In consideration of the foregoing, §571.103, *Windshield Defrosting and Defogging Systems,* is amended as follows:

1. The authority citation for Part 571 continues to read as follows:

15 U.S.C. 1392, 1401, 1403, 1407, delegations of authority at 49 CFR 1.50.

2. Paragraph S2 is revised to read as follows:

S2. *Application.* This standard applies to passenger cars, multipurpose passenger vehicles, trucks, and buses.

3. Paragraph S4 is revised to read as follows:

S4. *Requirements.* (a) Except as provided in paragraph (b) of this section, each passenger car shall meet the requirements specified in S4.1, S4.2, and S4.3, and each multipurpose passenger vehicle, truck, and bus shall meet the requirements specified in S4.1.

(b) Each passenger car, multipurpose passenger vehicle, truck, and bus manufactured for sale in the noncontinental United States may, at the option of the manufacturer, have a windshield defogging system which operates either by applying heat to the windshield or by dehumidifying the air inside the passenger compartment of the vehicle, in lieu of meeting the requirements specified by paragraph (a) of this section.

Issued on November 21, 1985

Diane K. Steed
Administrator

50 FR 48772
November 27, 1985

MOTOR VEHICLE SAFETY STANDARD NO. 103

Windshield Defrosting and Defogging Systems—Passenger Cars, Multipurpose Passenger Vehicles, Trucks, and Buses

S1. Scope. This standard specifies requirements for windshield defrosting and defogging systems.

S2. Application. [This standard applies to passenger cars, multipurpose passenger vehicles, trucks, and buses. (50 F. R. 48772—November 27, 1985. Effective: September 1, 1987)]

S3. Definitions. "Road load" means the power output required to move a given motor vehicle at curb weight plus 400 pounds on level, clean, dry, smooth Portland cement concrete pavement (or other surface with equivalent coefficient of surface friction) at a specified speed through still air at 68°F and standard barometric pressure (29.92″ of Hg.) and includes driveline friction, rolling friction, and air resistance.

S4. Requirements.

[(a) Except as provided in paragraph (b) of this section, each passenger car shall meet the requirements specified in S4.1, S4.2, and S4.3, and each multipurpose passenger vehicle, truck, and bus shall meet the requirements specified in S4.1.

(b) Each passenger car, multipurpose passenger vehicle, truck, and bus manufactured for sale in the noncontinental United States may, at the option of the manufacturer, have a windshield defogging system which operates either by applying heat to the windshield or by dehumidifying the air inside the passenger compartment of the vehicle, in lieu of meeting the requirements specified by paragraph (a) of this section. (50 F. R. 48772—November 27, 1985. Effective: September 1, 1987)]

S4.1 Each vehicle shall have a windshield defrosting and defogging system.

S4.2 Each passenger car windshield defrosting and defogging system shall meet the requirements of section 3 of SAE Recommended Practice J902, "Passenger Car Windshield Defrosting Systems," August 1964, when tested in accordance with S4.3, except that "the critical area" specified in paragraph 3.1 of SAE Recommended Practice J902 shall be that established as Area C in accordance with Motor Vehicle Safety Standard No. 104, "Windshield Wiping and Washing Systems," and "the entire windshield" specified in paragraph 3.3 of SAE Recommended Practice J902 shall be that established as Area A in accordance with Motor Vehicle Safety Standard No. 104.

S4.3 Demonstration procedure. The passenger car windshield defrosting and defogging system shall be tested in accordance with the portions of paragraphs 4.1 through 4.4.7 of SAE Recommended Practice J902, August 1964, or SAE Recommended Practice J902a, March 1967, applicable to that system, except that—

(a) During the first five minutes of the test, the engine speed or speeds may be those which the manufacturer recommends as the warm-up procedure for cold weather starting;

(b) During the last 35 minutes of the test period (or the entire test period if the five-minute warm-up procedure is not used), either—

(i) The engine speed shall not exceed 1500 rpm in neutral gear; or

(ii) The engine speed and load shall not exceed the speed and load at 25 mph in the manufacturer's recommended gear with road load;

(c) A room air change of 90 times per hour is not required;

(d) The windshield wipers may be used during the test if they are operated without manual assist;

(e) One or two windows may be open a total of one inch;

(f) The defroster blower may be turned on at any time; and

(g) The wind velocity is at any level from 0 to 2 mph.

(h) The test chamber temperature and the wind velocity shall be measured, after the engine has been started, at the forwardmost point of the vehicle or a point 36 inches from the base of the windshield, whichever is farther forward, at a level halfway between the top and bottom of the windshield on the vehicle centerline.

33 F.R. 6469
April 27,1968

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 104

Windshield Wiping and Washing Systems—Passenger Cars, Multipurpose Passenger Vehicles, Trucks, and Buses

(Docket No. 7)

Motor Vehicle Safety Standard No. 104 (32 F.R. 2410) specifies requirements for windshield wiping and washing systems for passenger cars 68 or more inches in overall width. A proposal to amend section 371.21 of Part 371, Federal Motor Vehicle Safety Standards, by amending Standard No. 104 was published in the *Federal Register* on December 28, 1967 (32 F.R. 20867).

Interested persons have been afforded an opportunity to participate in the making of the amendment. Their comments, as well as other available information, have been carefully considered.

The primary purpose of the amendment is to broaden the application of the Initial Standard to cover smaller passenger cars, multipurpose passenger vehicles, trucks, and buses. The wiped-area performance requirements have been extended to cars smaller than 68 inches wide, and tables which prescribe the minimum size of wiped areas have been added for such cars. The overall effect is that the wiper systems of various passenger cars must wipe areas to provide approximately equivalent driver vision. The wiper frequency requirement, modified to prescribe that the highest and lowest frequencies must differ by at least 15 cycles per minute, has been extended to multipurpose passenger vehicles, trucks, and buses. A requirement for a windshield washing system has also been extended to smaller cars, multipurpose passenger vehicles, trucks, and buses. Other modifications to the standard were made in order to improve its clarity.

The material received in response to the notice of proposed rulemaking evinced almost universal acknowledgement that broadening of the coverage of the standard would improve overall driver visibility and thus contribute to safety on the highways. With a few minor exceptions, discussed below, there was no suggestion that manufacturers would have any difficulty in complying with the revised requirements by the January 1, 1969, effective date.

Some of the comments indicated some misunderstanding of the reference to SAE Recommended Practice J903a, "Passenger Car Windshield Wiper Systems," May 1966, in paragraph S4.1.2 of the standard. Paragraph S4.1.2 is part of the wiped area requirement and it provides, among other things, for testing "in accordance with" SAE Recommended Practice J903a. This does not mean that all of section 4, "Test Methods," of SAE Recommended Practice J903a is incorporated by reference into the wiped area requirements of the standard. The reference to the SAE Recommended Practice relates only to its procedure for testing wiper systems for compliance with wiped area requirements. Therefore, the ozone test, wiper system stall test, 1,500,000-cycle durability test, and other details of section 4 of SAE Recommended Practice J903a are not included in the scope of Standard No. 104.

Several comments asked that the standard contain a demonstration procedure for testing windshield wiper systems for compliance with the 45-cycle-per-minute frequency requirement and the 15-cycle-per-minute frequency differential requirement. Apparently, these persons were concerned that the ability of systems to meet both requirements might be judged under abnormal conditions rather than under those encountered in normal driving. Considering these requests reasonable, the Administrator has provided that windshield wiper systems will be deemed to have met the frequency differential requirements of the standard (sections S4.1.2 and S4.1.1.3) if they meet those requirements when tested in accordance with sections 4.1.1 and 4.1.2 of SAE Recommended Practice J903a.

One comment requested clarification of the location of the plan view reference line in the "eyellipse." The "eyellipse" is the "95 percent eye range contour" specified in SAE Recommended Practice J941, "Passenger Car Driver's Eye Range," November 1965. The author of this comment pointed out that Figure 2 in Recommended Practice J903a incorrectly shows the plan view reference line as located through the geometric center of the 95 percent eye range contour. The drawings referred to in Recommended Practice J941 show the "eyellipse" centerline as disecting the left ellipse of the two intersecting ellipses in the plan view. In paragraph S3 of the standard, the definition of the "95 percent eye range contour" makes reference to SAE Recommended Practice J941, which correctly positions the plan view reference line in the left-hand ellipse of the "eyellipse." Accordingly, the Administrator has determined that subparagraph (a) of the definition of "plan view reference line" in paragraph S3 of the standard correctly reflects this position as defined, but subparagraph (b) of the same definition has been modified to clarify the location of the "eyellipse." Subparagraph (b), as revised by this amendment, places the plan view reference line outboard of the longitudinal centerline of the driver's designated seating position, thus locating the "eyellipse" itself geometrically in the center of the seat.

In the notice of proposed rulemaking, paragraph S4.2 required a windshield washing system meeting the requirements of SAE Recommended Practice J942, "Passenger Car Windshield Washer Systems," November 1965. Section 3.1 of that Recommended Practice sets washer system capability requirements by reference to the passenger car wiped area requirements of SAE Recommended Practice J903. Several comments pointed this out and requested modification of the standard in view of the fact that the wiped area requirements of the standard are different from those of Recommended Practice J903. In addition, some comments sought revision of this particular provision on the ground that the wiped areas of Recommended Practice J903 were created for passenger cars, while the washer provisions of the standard apply to multipurpose passenger vehicles, trucks, and buses as well. In view of these comments, the Administrator has deleted the cross-reference, and S4.2 of the standard has been modified. The passenger car wiped-area requirement is now defined as that established under paragraph S4.1.2.1 of the standard; the wiped area for multipurpose passenger vehicles, trucks, and buses is now defined as the wiped area pattern designed by the manufacturer for the windshield wiping system on the exterior of the windshield glazing.

One comment sought a change in the wiper frequency differential requirement from 15 cycles per minute to 10 cycles per minute, claiming that production tolerances did not permit exact compliance with the 15–cycle-per-minute differential requirement. The comment did not indicate why, assuming a 5–cycle-per-minute tolerance is needed, the system could not be constructed to operate in the frequency differential range of between 15 and 20 cycles per minute rather than a 10–15 cycle range. The standard, like all standards, is a minimum one, and nothing in it prohibits a higher standard of performance than the one specified as minimal. For these reasons, and because the deviation requested would, if granted, lower the safety performance of this segment of the standard, the request has been denied.

Similarly, the Administrator has denied a request for deletion of the requirement that windshield washing systems must, when tested, deliver approximately 15 cc. of fluid to the windshield glazing surface. The requirement is embodied in section 2.11 of SAE Recommended Practice J942, which is incorporated by reference in paragraph 4.2 of the standard. The amount of fluid placed on the windshield's exterior is a central performance characteristic of a washing system, and a decrease in the required amount would clearly diminish the capability of the system to promote safety. Neither the comments in general nor any other known data indicate that the requirement incorporated in the standard is unfeasible. The one comment that sought a change in this aspect of the standard contained no detail demonstrating that systems in current production would be unable to meet the requirement by the effective date of the amendment. Consequently, the Administrator has decided not to deviate from the adoption of section 2.11 of Recommended Practice J942, as announced in the notice of proposed rulemaking.

Several comments pointed out the difficulties involved in prescribing wiped-area requirements for multipurpose passenger vehicles, trucks, and buses. The Administrator is cognizant of the problems that arise because of the wide variety of windshield sizes and configurations as well as the differing relationships between the drivers' positions and the windshields in these vehicles. Owing to these factors, he has concluded that it is not possible to prescribe uniform wiped areas for the wiper systems of these vehicles generally or for vehicles within any generic type at this time. Hence, the standard's minimum wiped-area requirements apply only to passenger cars. The possibility of prescribing such requirements for other vehicular types will continue to be studied.

In addition, the Administration will also study the question of whether there should be standards applicable to so-called "hidden" windshield wipers to insure their operability under snow and ice conditions. Although a number of comments sought the inclusion of such a provision in this standard, it was deemed inadvisable to do so in view of the absence of any such provision from the notice of proposed rulemaking.

In consideration of the foregoing, § 371.21 of Part 371, Federal Motor Vehicle Safety Standards, is amended effective January 1, 1969, by amending Motor Vehicle Safety Standard No. 104 . . . .

This amendment is made under the authority of sections 103 and 119 of the National Traffic and Motor Vehicle Safety Act of 1966 (15 U.S.C. 1392, 1407) and the delegation of authority of April 24, 1968.

Issued in Washington, D.C., on April 24, 1968.

Lowell K. Bridwell
Federal Highway Administrator.

33 F.R. 6466
April 27, 1968

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 104

Windshield Wiping and Washing Systems—Passenger Cars, Multipurpose Passenger Vehicles, Trucks, and Buses

(Docket No. 7)

An amendment to Motor Vehicle Standard No. 104, which specifies requirements for windshield wiping and washing systems in passenger cars, multipurpose passenger vehicles, trucks, and buses, was issued on April 24, 1968 (33 F.R. 6466). The amendment is effective January 1, 1969.

Paragraph S3 of the amended standard, entitled "Definitions," contains a definition of the "plan view reference line" which, as it applies to vehicles with individual-type seats, locates the line parallel to the vehicle's longitudinal centerline so that the 95 percent eye range contour, or eyellipse, is geometrically positioned around the longitudinal centerline of the driver's designated seating position.

The purpose of the definition, as stated in the preamble to the standard, was to position the eyellipse geometrically in the center of the seat. The Administrator has determined that the definition may be construed to permit a different location of the eyellipse, since it provides that the 95 percent eye range contour must be geometrically positioned "around" the longitudinal centerline of the driver's seat. Therefore, the definition is being amended to clarify the location of the eyellipse by requiring its geometric center to be positioned on the longitudinal centerline of the driver's designated seating position.

Several petitions for reconsideration of the amendment have raised the possibility that the definition of plan view reference line may impose an unintended hardship on manufacturers of smaller cars. The effect of the definition is to relocate the eyellipse slightly outboard of the location prescribed in the standard prior to the amendment. This change may make it impracticable for manufacturers of smaller cars to comply with the wiped-area requirements of the standard. Therefore, the definition is being further amended to permit optional positioning of the eyellipse on the plan view reference line in the manner prescribed in the standard prior to the previous amendment.

Neither of these revisions appreciably alters the amount of the windshield surface which wiping systems must wipe under the standard. Hence the amendments will have no adverse effect on motor vehicle safety.

Paragraph S4.1.1.3 of the amendment provides, in part, that the lowest frequency or speed of windshield wiping systems must be at least 20 cycles per minute regardless of engine speed and engine load. The Administrator has received petitions asking that a frequency or speed lower than 20 cycles per minute be allowed. The petitioners state that such a lower frequency or speed will be useful under conditions of very light precipitation or wheel spray, and that retention of the 20-cycle-per-minute minimum will preclude the use of so-called "intermittent" windshield wiping systems. The Administrator has concluded that the standard should be amended to allow manufacturers to use systems which can operate at a frequency or speed of less than 20 cycles per minute so long as the driver of the vehicle has available a system capable of operating at at least two other frequencies or speeds, differing by at least 15 cycles per minute, the lower of which is at least 20 cycles per minute. The net effect of this change is to allow as many different frequencies or speeds as the manufacturer desires as long as at least two of these speeds or frequencies meet the specified requirements.

Since these amendments provide clarification, relieve a hardship and impose no additional burden on any person, notice and public procedure thereon are unnecessary.

In consideration of the foregoing, § 371.21 of Part 371, Federal Motor Vehicle Safety Standards, Motor Vehicle Safety Standard No. 104 (32 F.R. 2410), as amended (33 F.R. 6466), is amended, effective July 31, 1968. . . .

It is found, for good cause shown, that an effective date sooner than 180 days after the issuance of these amendments is in the public interest.

(Secs. 103, 119, National Traffic and Motor Vehicle Safety Act of 1966 (15 U.S.C. 1392, 1470); delegation of authority of April 24, 1968 (33 F.R. 6538)).

Issued in Washington, D.C., on July 31, 1968.

Lowell K. Bridwell,
Federal Highway Administrator.

33 F.R. 11117
August 6, 1968

MOTOR VEHICLE SAFETY STANDARD NO. 104

Windshield Wiping and Washing Systems—Passenger Cars, Multipurpose Passenger Vehicles, Trucks, and Buses

S1. Scope. This standard specifies requirements for windshield wiping and washing systems.

S2. Application. This standard applies to passenger cars, multipurpose passenger vehicles, trucks, and buses.

S3. Definitions. The term "seating reference point" is substituted for the terms "manikin H point" and "H point" wherever either of those terms appears in any SAE Standard or SAE Recommended Practice referred to in this standard.

"Daylight opening" means the maximum unobstructed opening through the glazing surface, as defined in paragraph 2.3.12 of section E, Ground Vehicle Practice, SAE Aerospace-Automotive Drawing Standards, September 1963.

"Glazing surface reference line" means the line resulting from the intersection of the glazing surface and a horizontal plane 25 inches above the seating reference point, as shown in Figure 1 of SAE Recommended Practice J903a, "Passenger Car Windshield Wiper Systems," May 1966.

"Overall width" means the maximum overall body width dimension "W116," as defined in section E, Ground Vehicle Practice, SAE Aerospace-Automotive Drawing Standards, September 1963.

"Plan view reference line" means—

(a) For vehicles with bench-type seats, a line parallel to the vehicle longitudinal centerline outboard of the steering wheel centerline 0.15 times the difference between one-half of the shoulder room dimension and the steering wheel centerline-to-car-centerline dimension as shown in Figure 2 of SAE Recommended Practice J903a, May 1966; or

(b) For vehicles with individual-type seats, either—

(i) A line parallel to the vehicle longitudinal centerline which passes through the center of the driver's designated seating position; or

(ii) A line parallel to the vehicle longitudinal centerline located so that the geometric center of the 95 percent eye range contour is positioned on the longitudinal centerline of the driver's designated seating position.

"Shoulder room dimension" means the front shoulder room dimension "W3" as defined in section E, Ground Vehicle Practice, SAE Aerospace-Automotive Drawing Standards, September 1963.

"95% eye range contour" means th 95th percentile tangential cutoff specified in SAE Recommended Practice J941, "Passenger Car Driver's Eye Range," November 1965.

S4. Requirements.

S.41 Windshield wiping system. Each vehicle shall have a power-driven windshield wiping system that meets the requirements of S4.1.1.

S4.1.1 Frequency.

S4.1.1.1 Each windshield wiping system shall have at least two frequencies or speeds.

S4.1.1.2 One frequency or speed shall be at least 45 cycles per minute regardless of engine load and engine speed.

S4.1.1.3 Regardless of engine speed and engine load, the highest and one lower frequency or speed shall differ by at least 15 cycles per minute. Such lower frequency or speed shall be at least 20 cycles per minute regardless of engine speed and engine load.

TABLE I. Passenger cars of less than 60 inches in overall width.

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6
AREA	MINIMUM PERCENT TO BE WIPED	ANGLES IN DEGREES			
		LEFT	RIGHT	UP	DOWN
A	80	16	49	7	5
B	94	13	46	4	3
C	99	7	15	3	1

TABLE II. Passenger cars of 60 or more but less than 64 inches in overall width.

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6
AREA	MINIMUM PERCENT TO BE WIPED	ANGLES IN DEGREES			
		LEFT	RIGHT	UP	DOWN
A	80	17	51	8	5
B	94	13	49	4	3
C	99	7	15	3	1

TABLE III. Passenger cars of 64 or more but less than 68 inches in overall width.

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6
AREA	MINIMUM PERCENT TO BE WIPED	ANGLES IN DEGREES			
		LEFT	RIGHT	UP	DOWN
A	80	17	53	9	5
B	94	14	51	5	3
C	99	8	15	4	1

TABLE IV. Passenger cars of 68 or more inches in overall width.

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6
AREA	MINIMUM PERCENT TO BE WIPED	ANGLES IN DEGREES			
		LEFT	RIGHT	UP	DOWN
A	80	18	56	10	5
B	94	14	53	5	3
C	99	10	15	5	1

S4.1.1.4 Compliance with subparagraphs S4.1.1.2 and S4.1.1.3 may be demonstrated by testing under the conditions specified in sections 4.1.1 and 4.1.2 of SAE Recommended Practice J903a, May 1966.

S4.1.2 Wiped area. When tested wet in accordance with SAE Recommended Practice J903a, May 1966, each passenger car windshield wiping system shall wipe the percentage of Areas A, B, and C of the windshield (established in accordance with S4.1.2.1) that (1) is specified in column 2 of the applicable table following subparagraph S4.1.2.1; and (2) is within the area bounded by a perimeter line on the glazing surface one inch from the edge of the daylight opening.

S4.1.2.1 Areas A, B, and C shall be established as shown in Figures 1 and 2 of SAE Recommended Practice J903a, May 1966, using the angles specified in Columns 3 through 6 of Table I, II, III or IV, as applicable.

S4.2 Windshield washing system.

S4.2.1 Each passenger car shall have a windshield washing system that meets the requirements of SAE Recommended Practice J942, "Passenger Car Windshield Washer Systems" November 1965, except that the reference to "the effective wipe pattern defined in SAE J903, paragraph 3.1.2" in paragraph 3.1 of SAE Recommended Practice J942 shall be deleted and "the areas established in accordance with subparagraph S4.1.2.1 of Motor Vehicle Safety Standard No. 104" shall be inserted in lieu thereof.

S4.2.2 Each multipurpose passenger vehicle, truck and bus shall have a windshield washing system that meets the requirements of SAE Recommended Practice J942, November 1965, except that the reference to "the effective wipe pattern defined in SAE J903, paragraph 3.1.2" in paragraph 3.1 of SAE Recommended Practice J942 shall be deleted and "the pattern design by the manufacturer for the windshield wiping system on the exterior surface of the windshield glazing" shall be inserted in lieu thereof.

33 F.R. 6467
April 27, 1968

PREAMBLE TO MOTOR VEHICLE SAFETY STANDARD NO. 105a

Hydraulic Brake Systems

(Docket No. 70–27; Notice 5)

This notice amends Part 571 of Title 49, Code of Federal Regulations, to add a new Motor Vehicle Safety Standard No. 105a (49 CFR § 571.105a) that establishes requirements for motor vehicle hydraulic brake systems and parking brake systems. A notice of proposed rulemaking on this subject was published on November 11, 1970 (35 F.R. 17345).

Federal Standard No. 105, in effect since January 1, 1968, represents the initial Federal effort to specify braking requirements for motor vehicles. The standard requires that passenger cars be equipped with a split service brake system, and have stopping ability based upon deceleration rates specified in an SAE Recommended Practice. Requirements for fade and recovery, water recovery, and stability while braking are also included in the standard. These requirements do not, however, represent the full capabilities of modern braking technology. Braking continues to be the most important single element of accident avoidance from the standpoint of vehicle performance. The full utilization of the industry's technological capability in this area, within the limits of reasonable cost, is therefore of highest importance to the safety effort.

The requirements of this standard are specified in terms of performance on a surface of relatively high skid number. The NHTSA recognizes the importance to safety of good braking performance on surfaces such as wet or icy roads. It is monitoring closely the development work in progress on methods, such as antilock systems, designed to enhance vehicle performance over a wide variety of surfaces, in preparation for future rulemaking action adding performance requirements in this area. Until such requirements are made effective, this agency assumes that manufacturers will design their vehicles for safe braking performance on all types of road surfaces, while continuing to work on, and make provision for, more advanced braking systems.

The notice issued in November 1970 proposed extension of applicability of Standard No. 105 to other vehicle types and covered the same factors deemed important in the earlier standard. These include stopping distance, linear stability while stopping, fade resistance, and fade recovery. The notice also proposed features in hydraulic braking systems that could warn against malfunction, and stop the vehicle should a malfunction appear in the normal service system. The amended standard covers each of these aspects as discussed below.

1. *Applicability.* Standard No. 105 applies to passenger cars, and has been extended to specify requirements for the first time for multipurpose passenger vehicles, trucks, and buses equipped with hydraulic brake systems. A definition of brake power unit has been adopted and appropriate modifications made in the text to clarify that vehicles with central hydraulic power systems were included in the Notice. Standard No. 105a does not apply to vehicles equipped with "air over hydraulic" systems, which remain within the purview of Standard No. 121, *Air Brake Systems.*

2. *Effective date:* to meet the proposed effective date of October 1, 1972, equipment and performance requirements would have been substantially weaker than those that have been adopted and the NHTSA has determined that a later effective date is, overall, in the public interest. It is therefore set at September 1, 1974.

3. *Service brake system.* All vehicles with hydraulic brake systems are reauired to have a

split service brake system, with partial failure or "emergency" braking features. Effectiveness of the system is demonstrated by a series of road tests covering stopping distance, stability, and fade and recovery, water recovery, and spike stops.

A. *Stopping distance.* As the proposal noted, "perhaps the most important indication of brake performance is the distance in which a brake system can stop a vehicle from a given speed." Stopping distances were proposed from 30 mph, 60 mph, and 80 mph and maximum attainable vehicle speed, under various load and system conditions, based upon vehicle category or weight. These tests included stops with the vehicle at a lightly loaded weight, and stops under partial failure conditions. The following illustrate examples of the proposal and amendment. In addition to the stopping distances discussed below. stopping distances from 30 mph, 80 mph, and maximum attainable vehicle speed are also specified.

Passenger cars. It was proposed that passenger cars demonstrate the ability to stop in 185 feet from 60 mph under adverse loading conditions. The stopping distance adopted, 194 feet, is only slightly longer. According to Consumer Information data submitted by manufacturers of 1972 passenger cars, contemporary vehicles ranked 26th to 61st would be unable to meet this stopping distance requirement. This new requirement will result in a substantial upgrading of passenger car stopping ability. Currently under Standard No. 105, passenger cars must demonstrate the ability to stop in 646 feet from 60 mph under partial failure conditions. The new standard lowers this distance to 431 feet, an increase from the proposed 388 feet. The same stopping distance requirement must be met with an inoperative brake power assist or brake power unit.

Vehicles with GVWR of 10,000 pounds or less. Vehicles other than passenger cars with a gross vehicle weight rating of 10,000 pounds or less, must demonstrate the ability to stop from 60 mph in 216 feet under adverse loading conditions, and in 484 feet under partial failure conditions.

Vehicles with GVWR greater than 10,000 pounds. Vehicles in this category must demonstrate an ability to stop from 60 mph in 245 feet under adverse loading conditions, and in 553 feet under partial failure conditions.

B. *Stability of vehicle while stopping.* As proposed, a vehicle will be required to stop (other than in spike stops) without any part of it leaving a 12-foot-wide lane. Wheel lockup is permitted at a speed below 10 mph and lockup of only one wheel not controlled by an antilock system is permissible at speeds in excess of 10 mph.

C. *Fade and recovery.* Brake fade characteristics are critical from the standpoint of retaining adequate stopping power despite the high temperatures created by prolonged or severe use. A vehicle will demonstrate fade and recovery capability in two tests, by making a number of fade stops from 60 mph if it is a vehicle with a GVWR of 10,000 pounds or less, or fade snubs from 40 mph to 20 mph, if it is a heavier vehicle. The latter represents a modification of the proposed snub speed range of 50 mph to 15 mph. The proposed maximum speed fade recovery test has not been adopted; the effectiveness test at maximum attainable vehicle speed should indicate whether a brake system will experience problems with fade.

D. *Water recovery.* Service brake systems must also demonstrate an acceptable recovery after exposure to water. The method of immersion has been modified on the basis of comments that the method proposed would necessitate use of a trough 880 feet long. Instead, the amendment specifies that the vehicle shall be driven for not less than 2 minutes at a speed of 5 mph, in any combination of forward and reverse directions, through a trough having a water depth of 6 inches. This change should clarify the test requirement as well as simplifying enforcement procedures.

E. *Spike stops.* The spike stop proposal has been adopted, with a revision to allow 6 check stops (instead of one), at least one of which meets the requirements of the specified distance and pedal force. This allowance recognizes variability of test drivers and vehicles.

4. *Parking brake system.* The parking brake system proposal has also been adopted. When the parking brakes are applied, with a force not exceeding 90 pounds for a hand-operated system

or 125 pounds for a foot-operated system, the parking brake system shall be capable of holding the vehicle stationary for 5 minutes on a 30 per-cent grade (20 per cent for vehicles of more than 10,000 pounds GVWR) in both forward and reverse directions. Optional requirements have been adopted for vehicles with a GVWR of 10,000 pounds or less, equipped with a transmission utilizing a parking pawl or detent mechanism within the transmission assembly. Vehicles so equipped may demonstrate compliance by (1) parking with both the parking brake and pawl engaged on a 30 per cent grade, (2) parking on a 20 per cent grade with only the parking brake engaged, and (3) being impacted front and rear, on a level surface, by a 4,000 pound moving barrier without disengagement or fracture of the pawl or detent mechanism.

5. *Reservoirs.* The master cylinder reservoir proposal has been adopted with modifications that allow balance ports and compartmentalized reservoirs in a single integrated master cylinder body and reservoir assembly, and that reduce fluid reservoir capacity requirements from 150 per cent to 100 per cent. The proposed cover, seal, and retention devices have not been adopted since pressure differential warning and low fluid level warning should provide a sufficient safety factor. The proposal was intended also to cover reservoir requirements in systems not using master cylinders and the revised wording of the section clarifies this point.

6. *Brake system indicator lamp.* The proposal would have required separate lamps to indicate when the parking brake is applied, and when a failure has occurred in the service brake system. Standard No. 105a requires only one lamp to serve these functions, to be labeled "Brake". Either the wording or the lens may be the color red. The lamp must light in the event of pressure failure in any part of the service brake system, other than a structural failure of a housing that is common to two or more subsystems, before or upon application of 50 pounds of pedal force upon a manually-operated service brake, or 25 pounds upon a service brake with a brake power assist unit, or when the supply pressure in a brake power unit drops to not less than one-half of the normal system pressure. The lamp must also light, without the application of pedal force, when the level of brake fluid in the master cylinder reservoir drops to less than the recommended safe level specified by the manufacturer, or to not less than one-fourth the fluid reservoir capacity in any reservoir compartment, whichever is greater. This does not preclude the use of translucent covers or sight gauges in addition to the required lamp. Additionally, the lamp must illuminate when there is a total electrical failure in an antilock or brake proportioning system. All indicator lamps shall be activated when the ignition switch is turned from the "on" to the "start" position, which includes the air start condition on diesel-engine vehicles. The lamps will be deactivated upon return of the switch to the "on" position. No time interval is specified for deactivation, as the NHTSA recognizes that instant deactivation is impracticable for continuous sensing units.

7. *Miscellaneous.* The NHTSA proposed that service brakes be installed so that the lining thickness of drum brake shoes and disc brake pads might be visually inspected without removing the drums or pads. The possibility that contaminants may enter the system if plugs are removed, the differences between riveted and bonded lining thickness, and the location of inspection ports, were some of the technical and safety factors weighing in the conclusion to abandon this proposal.

The agency decided against the proposal that would have established suspension system durability requirements to be met following completion of tests. Since the vehicle must remain within a 12-foot-wide lane as a condition of the stopping distance tests, this will be a satisfactory demonstration of suspension system integrity.

Effective date: September 1, 1974. Because of the necessity to allow manufacturers sufficient production leadtime, it is found for good cause shown that an effective date later than one year after issuance of this rule is in the public interest.

In consideration of the foregoing, Title 49, Code of Federal Regulations, is amended by adding § 571.105a, Motor Vehicle Safety Standard No. 105a, *Hydraulic Brake Systems*, as set forth below.

This notice is issued under the authority of sections 103 and 119 of the National Traffic and

Motor Vehicle Safety Act of 1966 (15 U.S.C. 1392, 1407) and the delegation of authority from the Secretary of Transportation to the National Highway Traffic Safety Administrator, 49 CFR 1.51.

Issued on: August 23, 1972.

Douglas W. Toms
Administrator

37 F.R. 17970
September 2, 1972

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 105a

Hydraulic Brake Systems

(Docket No. 70-27; Notice 7)

The purpose of this notice is to announce that the effective date of Motor Vehicle Safety Standard No. 105a will be September 1, 1975. Full response to petitions for reconsideration is scheduled for May 1, 1973.

Standard No. 105a, *Hydraulic Brake Systems*, was published on September 2, 1972 (37 F.R. 17970 with corrections at 37 F.R. 19138) with an effective date of September 1, 1974. On December 19, 1972, the NHTSA advised (37 F.R. 27629) that it intended to issue a notice by February 1, 1973, in response to petitions for reconsideration of the standard. The volume of the petitions received and the complexity of the issues involved are such that the agency has not found it possible to publish a full response to the petitions by the date indicated.

The NHTSA has, however, decided to grant petitions requesting a delay in the effective date, to the extent of a one-year postponement. Petitioners have demonstrated to the satisfaction of the agency that because of critical lead-time problems the original effective date is impracticable. The NHTSA believes that in the additional year provided the industry will have sufficient time to increase the reliability of the systems that otherwise would have been incorporated beginning September 1, 1974, with the result that consumers will be provided with braking systems that have been optimized with respect to safety, performance, and cost.

The full response and discussion of issues raised by the petitioners is planned for issuance by May 1, 1973.

(Sec. 103, 119 P.L. 89-563, 80 Stat. 718, 15 USC 1392, 1407; delegation of authority at 49 CFR 1.51).

Issued on January 30, 1973.

Douglas W. Toms
Administrator

38 F.R. 3047
February 1, 1973

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 105a

Hydraulic Brake Systems

(Docket No. 70–27; Notice 8)

This notice responds to petitions for reconsideration of Motor Vehicle Safety Standard No. 105a and amends the standard in certain respects, effective September 1, 1975.

Federal Motor Vehicle Safety Standard No. 105a, 49 CFR § 571.105a, was published on September 2, 1972 (37 F.R. 17970). Thereafter, pursuant to 49 CFR § 553.35 petitions for reconsideration of the rule were received from many interested corporations. A discussion of the major issues raised by the petitions and their resolution follows.

1. *Policy.* Several petitioners questioned the need for stringent braking requirements. The claim was made that NHTSA has shown neither a need based on accident data relating brake performance to deaths, injuries, or property damage, nor the benefits to be obtained from changed braking systems. Additionally, comments were received that most consumers could not utilize enhanced braking capabilities under most circumstances. Some also questioned the cost to implement the standard (allegedly $40 an average per vehicle as a minimum, and up to $75 in some instances for passenger cars).

The NHTSA does not agree with its critics on these policy issues. Braking system performance has consistently rated high on the safety criticality list. The dominance of the role of braking systems in accident avoidance maneuvers has long been recognized and undisputed. The importance of braking in motor vehicle safety is evidenced by the fact that of all vehicle defects which cause or contribute to accidents, brake failures lead the list. In the Consumer Information data on braking stopping distances provided by the automobile manufacturers, the better performing vehicles are reported to stop from 60 mph in slightly more than one half the distance of the poorer performing vehicles. Large stopping distance differentials among vehicles operating in a common traffic stream are recognized as creating serious hazards to the motorist.

Data have shown that in many accidents a more effective service brake system would have lessened the severity of the collision or possibly averted it. Existing vehicles in many instances do have good braking capabilities but require excessive control forces to utilize these capabilities. Many drivers are not able to exert these forces and hence do not utilize existing systems to the fullest. With reduced stopping distances within the specified pedal forces required by Standard No. 105a, it is the opinion of NHTSA that deaths, injuries, and property damage will be reduced.

Since the requirements also specify that the stopping distances shall be achieved with the vehicle under control, stopping without locked wheels in a 12-foot-wide roadway lane, motorists will be afforded a greater opportunity to operate their brakes effectively in accident avoidance maneuvers.

Cost estimates submitted by petitioners are in agreement with those of the NHTSA. Based upon the information received from petitioners and the changes made as a consequence thereof, however, it is the opinion of this agency that the cost of implementation will be reduced to a figure commensurate with the safety benefits expected to be derived.

With respect to the performance levels specified, the NHTSA has determined that the values are reasonable and do not exceed the inherent capabilities of any of the various vehicle classes.

The values specified for vehicles other than passenger cars will considerably reduce the existing stopping distance differentials among vehicle classes.

Several petitioners commented on what they considered to be a lack of consistency in performance levels between vehicle types. For example, in the second effectiveness test, passenger cars, light trucks and heavy trucks have different performance requirements based upon weight and speed. Standard No. 105a was criticized also because the required stopping distances for heavy trucks with hydraulic brakes were more stringent than requirements for heavy trucks with air brakes (Standard No. 121, *Air Brake Systems*). It was argued that requirements should be the same for similar vehicles regardless of the type of brake system. Petitioners requested that partial failure system requirements, and requirements for failed power units, be identical to those for air-braked vehicles.

Other petitioners requested that emergency-type tests should allow locked wheels as in Standard No. 121. Petitioners, in several instances, requested changes in light load test requirements for the various vehicles. These requests were based on differences in load conditions, inertia load differences in stopping, center of gravity locations, and braking balance differences.

The standard has been amended to recognize the changes in performance due to vehicle weight differences, considering the effects of center of gravity location and weight shifts occurring during decelerations. Also, speed sensitivity effects have been recognized as occurring in all vehicles and appropriate modifications in requirements at the various test speeds have been made. Heavy vehicle requirements have been adjusted where appropriate to make them identical to those existing in Standard No. 121. Some differences have been retained, however. For example, fade tests in Standard No. 105a are run on the vehicle in a road test as compared with a dynamometer test in Standard No. 121. Dynamometer tests were selected in Standard No. 121 since vehicles used primarily in combinations are included in that standard. Compatibility between vehicles (tractor and trailer) was considered to be an important factor in the brake system evaluation and could most easily be determined on the dynamometer.

Revisions to Standard 105a also have been made to allow wheel lockup on emergency-type tests such as spike stops, tests with failed power units, and partial system tests. Also, in the parking brake test, the limit of traction of the braked wheels is used in specifying parking brake system performance on a 30 per cent grade. There are no changes in parking braking system requirements because of weight differences. The NHTSA is of the opinion that all vehicles, regardless of weight class, are frequently parked in a lightly loaded condition and hence should be tested under this condition.

2. *Effective date.* The NHTSA has previously announced an overall delay of one year in the effective date of Standard No. 105a (38 F.R. 3097).

Petitioners generally considered the original effective date of September 1, 1974, to be unreasonable and impracticable. The earlier effective date as it applied to trucks, buses and multipurpose passenger vehicles coincided with the same effective date for Standard No. 121, issued some time before Standard No. 105a. The air brake systems will generally have new and larger foundation brakes, new suspensions and other related components, antilock or brake proportioning systems and new split systems as well as controls. Hydraulic-braked vehicles require in most instances similar changes to meet 105a requirements. However, manufacturers and suppliers had prior commitments to concentrate much of their available manpower, equipment and facilities to the development of conforming air brake systems. These manpower, equipment, and facilities are generally the same required for the development of conforming hydraulic-braked vehicles, and thus the changes to hydraulic-braked vehicles cannot be made simultaneously with air brake system changes. In addition, sufficient recognition must be given to the lead-time necessary for application studies, production standardization in areas where this is possible, drawing and specification preparation, tooling design time and procurement, and establishing manufacturing facilities. In some instances, plant facilities must be built along with construction of development and test facilities. Petitioners also mentioned the significance of reduced product reliability if it is necessary to completely redesign entire vehicle lines simultaneously. Additional problems that can arise are related to the capability of the manufacturers to train adequately technical personnel to assemble, service, and maintain the new vehicles.

Several petitioners requested an extension of the effective date for vehicles other than passenger cars beyond September 1, 1975. International Harvester requested a date of September 1, 1976 for these vehicles. Others would not predict a date on which they could meet the requirements.

Several commenters stressed the fact that metallic, semi-metallic, or ceramic linings, considered exotic materials presently, would probably be required to meet Standard No. 105a as of September 1, 1974. Resulting penalties would occur in cost (high wear, scoring, etc.) and poor or erratic performance under normal conditions.

Comments were also received concerning four-wheel drive vehicles. Low volume and consequent high costs for necessary changes are problems in this segment of the industry. Suppliers of components for these vehicles are allegedly reluctant to design and tool parts. In addition, manpower and facilities are not available for these jobs since most time and efforts must be utilized for the higher volume vehicles. An indefinite delay in an effective date for these vehicles has been requested.

After careful evaluation of all the petitions, the NHTSA considered that good cause had been shown for a delay of one year in the effective date of the standard. But it has been determined that a further delay, either for the standard or for separate vehicle categories is not in the interest of motor vehicle safety, and those petitions for a further extension of time are denied.

3. *Definitions.* Numerous comments were received on the definitions. In some instances amendments are made, in others, none. Clarifications have been provided where they were requested.

Questions relating to brake power assist units and brake power units have been raised. The distinction between the two is that a brake power assist unit has a push-through capability, i.e., the operator can apply additional muscular effort and obtain braking action. A brake power unit does not have this capability. If power is lost, a driver cannot increase braking force by additional muscular effort on the control.

Some petitioners mentioned units which function in both modes, i.e., as a brake power unit in one condition, and as a brake power assist unit in a second condition. For example, a unit may function as a brake power unit under normal operating conditions, but when a power failure occurs, it operates as a brake power assist unit. For purposes of compliance, the failed mode of operation would be the critical mode. Therefore, with inoperative power units, the test requirements should be met depending on how the system operates in the failed mode. The example discussed above would be tested as a brake power assist unit.

The definition of "brake proportioning system" raised the question whether a fixed or variable system was intended. The term has been redesignated "variable brake proportioning system" to clarify the agency's intent.

The definition of "lightly loaded vehicle" does not specify an additional weight allowance for a load platform or body to be added to an incomplete vehicle, but in the opinion of some petitioners it should. Since the standard applies to complete vehicles, a manufacturer must use his discretion in applying additional weight to incomplete vehicles, taking into account the resulting changes in weight and center of gravity, when providing information on Standard No. 105a to subsequent multistage vehicle manufacturers.

Some manufacturers questioned the adequacy of the test surface specification: the "skid number" produced by American Society for Testing and Materials Method E-274, using a test trailer to measure the coefficient of friction. The complaint was made that the measurement results vary from one trailer to another, and vehicle performance results vary from one surface to another with supposedly the same skid number, on the order of 20 percent. It was also argued that the ASTM test was qualitatively inadequate, in that it measured sliding friction rather than peak or incipient friction.

The NHTSA does not accept these arguments. In the first place, it should be noted that thrust of the manufacturers' arguments is not only to abort this rulemaking, but to cast doubt on the validity of the existing braking standard. Whatever its shortcomings, the ASTM test is the only one to the knowledge of this agency that provides an objective and quantitative measure of the frictional characteristics of a road surface, and no other was suggested by petitioners. The present passenger car braking standard incorporates an SAE Recommended Practice (J843d) that specifies only a "dry, smooth, hard-surfaced roadway of Portland cement concrete (or other surface with equivalent coefficient of surface friction) that is free from loose materials," a far vaguer description.

Furthermore, the NHTSA does not find the argument based on variations in test results to be persuasive. The variations of 15 and 20 percent cited are extreme figures. With carefully calibrated and controlled test instruments and conditions, as specified in the standard, evidence before this agency indicates that the normally experienced variations are much smaller. Manufacturers have attempted to impose a criterion of perfect repeatability on the safety standards. Perfect repeatability, however, is an illusion. In the "real world" of materials testing, particularly of gross characteristics such as vehicle braking capability or crashworthiness, variation in results is inevitable; the question is not whether, but how much, variation is acceptable. Obviously, the standard should be designed to reasonably minimize the variability of test results, from the standpoint both of manufacturing costs and of effective regulation.

In this case, the ASTM method chosen was developed in 1965, and has been widely used since then for the purpose of vehicle performance testing. Moreover, it has been in force since 1970 in a closely similar NHTSA regulation: the Consumer Information regulation on Vehicle Stopping Distance (49 CFR 575.101), under which manufacturers have been required to test their vehicles' stopping-distance capabilities, and report them to consumers and to the NHTSA. The same statutory penalties have applied to a failure to meet these reported stopping distances when tested by the government as would apply to a failure to meet the stopping distance required by a standard. In light of these factors, the arguments that the method for specifying the test surface is inadequate are found to be without merit.

The NHTSA also rejects the suggestion by the Recreational Vehicle Institute that this agency should supply or measure the test surface, because of the limited capabilities of motor home manufacturers. The clearly intended result of the National Traffic and Motor Vehicle Safety Act is that the private sector should bear the cost of regular conformity and certification testing. There is no requirement that each vehicle manufacturer have his own measured test track. Small manufacturers can have their vehicles tested by contract with testing companies; they can use their trade associations to arrange for use of measured test tracks in convenient regional locations; or they can work with the chassis manufacturer and use his test results.

The sudden application of force in a "spike stop" is 200 pounds applied in 0.08 second. Chrysler Corporation suggested a "band" of 0.05–0.20 seconds as permitted in SAE Recommended Practice J229 *Service Brake Structural Integrity Test Procedure*, March 1971. The purpose and legal significance of a test condition in a Federal motor vehicle safety standard are different from those of an industry test practice, and a band or tolerance as requested by Chrysler is inappropriate and unnecessary in the former. Assuming that a faster application is more demanding of vehicle performance, Chrysler in effect has a band from 0 to 0.08 second for its tests, which should be designed to show that the vehicle is capable of meeting the requirements with spike stops of 0.08 second.

The definition of "stopping distance" varied from the notice of proposed rulemaking in that the phrase "start of the brake application" was changed to "point of application of force to the brake control." Wagner Electric Co. considers the modified definition as more stringent since, in its view, the notice allowed both "force" and "movement" while the amendment allows only the former. The NHTSA disagrees with Wagner. Both versions refer purely to the brake pedal, and not to more remote parts of the brake system. This agency is unaware of any measurable difference in time between the introduction of force to the pedal and the initiation of pedal movement, and Wagner has supplied no evidence to the contrary. The modified wording has been adopted for purposes of clarity.

General Motors objected to stopping distances as performance requirements, and expressed its views that deceleration rates provide more objective performance criteria. This represented a departure from GM's previous views that buildup and maintenance of a fixed deceleration depended upon varying driver skills, affecting reproducibility. The variety in driver skills is one reason the NHTSA considers measurement of a specified distance more desirable than maintenance of a fixed deceleration rate. Insertion of a fixed build-up time would introduce a complication. The stopping distances specified do not include a fixed build-up time but instead allow use of various characteristics, including greater or lesser build-up times, as long as the vehicle does not exceed the stopping distance specified. A specified maximum (but not fixed) build-up time is used in fade tests where decelerations are specified. Further, the distances expressed in Standard No. 105a are maximum distances, and manufacturers will necessarily design their vehicles to perform with a margin within those limits, thus reducing problems of objective measurement.

4. *Required stopping distances and pedal control forces.* The stopping distance values, in most instances, were considered by petitioners to require redesigned braking systems. In some cases, larger brake systems would be required, incorporating front disc brakes with power assist and larger rear drum brakes. Other vehicles, particularly trucks, buses, and multipurpose passenger vehicles, would require the addition of antilock systems or brake proportioning systems, along with new types of split systems (or completely redundant systems). These systems, it is alleged, would be required to meet the full system effectiveness and the partial system effectiveness requirements.

The 30 mph and maximum speed stopping distances were considered too stringent by most petitioners. The very short stops involved, along with the buildup or actuation time necessary, were the main problems in the 30-mph tests. The problem of the speed sensitivity of lining materials was the main factor noted in comments relating to the high speed and maximum speed tests.

For first effectiveness test, recommended changes in stopping distances ranged at 30 mph from no increase to an increase of 9 feet for passenger cars, 7 feet for light trucks, and 20 feet for heavy trucks. At 60 mph, requests for increases of up to 17 feet for passenger cars, 7 feet for light trucks, and 75 feet for heavy trucks were received. Two petitioners suggested deleting heavy truck requirements, either to be consistent with Standard No. 121 or until "more realistic data" was available.

The second through fourth effectiveness tests were more severely criticized by petitioners. Several suggested that fourth effectiveness test values be increased to at least those used in the first effectiveness tests (involving increases of 5, 7 and 10 feet at 30 mph, and changes of 20, 26, and 32 feet at 60 mph, for passenger cars, light trucks and heavy trucks, respectively). Several commenters recommended deletion of tests at speeds greater than 80 mph. For light and heavy trucks, maximum speeds of 60 mph to 80 mph were recommended.

Certain modifications in stopping distances and test speeds have been made in response to these comments. The maximum test speed for a vehicle with a GVWR that exceeds 10,000 pounds has been reduced from 80 mph to 60 mph. The maximum test speed will be 100 mph, specified only for those passenger cars which attain a speed of 104 mph or greater in 2 miles. If the speed that a passenger car is capable of attaining in 2 miles is from 99 to 104 mph, its maximum test speed will be 95 mph. Intermediate test speeds between 80 and 95 mph, and 60 and 80 mph have also been eliminated for all vehicles; thus if a vehicle's top speed is from 84 to 99 mph, its top test speed is 80 mph; if the top speed is from 64 to 84 mph, its top test speed is 60 mph. Stopping distances have been increased slightly in most instances from those previously required; an example is the second effectiveness test where the 60-mph stopping distance for passenger cars at GVWR will be 204 feet rather than 194. Under partial failure conditions at the same speed, the stopping distance for passenger cars has been increased from 431 to 456 feet.

Standard No. 105a required stops to be made at pedal forces that varied from 15 to 100 pounds at stops from 30 mph, to 20 to 150 pounds at stops from 65 mph or higher. Pedal control force values were objected to and requests for changes were made, ranging from an increase at 30 mph to 120 pounds to an across the board increase to 150 pounds maximum for all tests. Petitions were based generally on the need either to allow higher pedal forces to reduce brake sensitivity or to provide a simple single value for all tests. A change to allow 200 pounds of maximum pedal force on parking brake tests for light trucks was also requested. Several petitioners also requested modifications in fade recovery test pedal force values.

The NHTSA considers that most of these requests are meritorious. The standard is being amended to specify a uniform force range of 15 to 150 pounds for all stops that must be made within required stopping distances, and this will be expressed as a test condition in paragraph S6. However, the parking brake test pedal forces must, in the opinion of the NHTSA remain uniform at 125 and 90 pounds (foot and hand) and the petition on this point is denied. General Motors requested a force for the 5th (final) fade recovery stop that is within plus 50 pounds and minus 5 pounds or minus 40 percent (whichever is greater) of the average control force for the baseline check. These values are considered too broad. Some relief is deemed warranted, however, and Japan Automobile Manufacturers Association's suggested value of minus 10 pounds has been adopted.

5. *Inoperative power units.* In addition to the requests for clarification between brake power assist units and brake power units petitioners requested changes in requirements that would recognize the reserve capabilities that have been designed into the inoperative mode of some power systems. These petitions have been granted, and tests with an inoperative brake power unit or power assist unit have been modified to allow optional utilization of reserve capabilities in stopping. Under the optional procedure a vehicle makes a series of stops from 60 mph at specified decelerations when the inoperative unit is not initially depleted of all reserve capability and in a final stop within 554 feet when the unit has been depleted of its reserve.

6. *Fade and recovery requirements.* Standard No. 105a required that vehicles with a GVWR of 10,000 pounds or less demonstrate fade resistance in two fade and recovery tests of 10 and 15 stops each from 60 mph at 15 fpsps.

Fade and recovery requirements were considered extremely stringent by petitioners. Several petitioners suggested a reversion to the existing requirements with minor modifications. Others suggested changes in test weights. Most were willing to accept the 150-pound pedal force limitation if other modifications proposed were acceptable. GM recommended that two different fade test procedures be adopted, the first simulating a mountain type fade test at GVWR with increased distance intervals, and the second being similar to that adopted except at a reduced test load.

These petitions have been deemed in large part to have merit, and the two fade tests will be revised to consist of 5 and 10 fade stops at 15 fpsps, each followed by an additional 5 stops at the maximum deceleration attainable between 5 and 15 fpsps. The fade test requirements for vehicles with a GVWR in excess of 10,000 pounds remains unchanged. However, no procedure simulating mountain descents has been developed, and GM's request is denied. International Harvester, in the fade test procedure, requested that the time to attain the required deceleration presently 1 second, be increased to 5 seconds. This request is denied, since an increase has been found unnecessary.

7. *Water recovery.* GM petitioned for substantial changes in the water recovery test, asking relocation within the test sequence, modified control forces, and increassed number of recovery stops for heavy trucks. None of these requests has been found to have merit. A change in sequence would necessitate reevaluation of the effect of the standard with a possible consequent further delay in the effective date.

8. *Spike stops.* With regard to the spike stop requirements, Bendix requested that the stopping distance for the effectiveness (check) stops be the equivalent of the first effectiveness test rather than that of the other effectiveness tests. The request has merit, and the stopping distance requirements of the first effectiveness test have been adopted.

GM requested that for the spike stop test manufacturers be allowed to use separate vehicles not used in the other tests, while Harvester requested a reduction in stopping speed from 60 mph to 30 mph. Because of the changes in stopping distance that have been adopted, no further relief is deemed necessary and the petitions are denied.

9. *Parking brake systems.* The parking brake system requirements, particularly in the lightly loaded vehicle condition, were objected to as violating the laws of physics. As mentioned earlier, petitioners generally requested inclusion of a "limit of traction" condition. Vehicles with a great range of loading conditions are allegedly incapable of holding on grades specified in the requirements (20 percent or 30 percent). Particular stress was placed on brake holding capability on a 75 skid number surface. One commenter requested that the same requirements apply to all vehicles, claiming it unrealistic for light vehicles to meet the 30 percent grade requirement while heavy vehicles only had to meet a 20 percent requirement, and suggested use of a Swedish standard (16 percent grade, 110 pounds of foot brake force, 88 pounds of hand brake force). Ford requested allowance for use of a multistroke parking brake application. American Motors Corporation requested reinstatement of existing Standard No. 105 requirements. GM and Chrysler objected to the requirement that the parking brake be of a "friction type" which they considered design restrictive, prohibiting other acceptable parking brake systems.

The parking brake system test remains substantially as adopted. The performance requirements have been found feasible with present technology. A multistroke application is permissible, and limit of traction language has been added to the 30 percent grade requirement, to eliminate the irrelevant problem of tire slippage. The requirement for a friction-type parking brake is also retained. In a case of complete loss of service brake capability, a friction-type parking brake furnishes a residual stopping capability for a moving vehicle that is absent in a pawl-type system (such as the "park" position transmission stop). If the phrase "friction type" appears design restrictive of other types of parking brake systems that would provide equivalent capability, this agency will be receptive to suggestions for substitute language, with adequate supporting information.

Wagner petitioned for deletion of the parking brake test with the vehicle at lightly loaded weight. This request is denied as the NHTSA believes that vehicles are frequently parked in a lightly loaded condition, and that a test should therefore be run at this vehicle weight.

10. *Indicator lamps.* The standard has been amended so that indicator lamps may now be activated as a check of lamp function when the ignition is in the on position and the engine is not running, or in any position between on and start that is designated by the manufacturer as a check position. Ford petitioned that the brake fluid level indicator be deleted, but its request is denied as the NHTSA has determined that a warning should be provided in the event of slow leaks. Conversely, Mercedes-Benz of North America petitioned for deletion of the pressure differential warning, alleging that the fluid level indicator is sufficient. This, too, is denied, as the fluid level indicator will not indicate pressure failure until the fluid is at the level specified for a warning, an entirely different function. Several petitions asked that the 200-psi brake fluid pressure level be adopted (this had been proposed in Notice 1 for measurement at master or slave cylinder outlets), and these petitions have been granted. In response to several petitions, the illumination provided when an indicator lamp is activated may be flashing as well as steady-burning.

11. *Reservoirs.* In the requirements for the master cylinder reservoir, clarifications have been provided in the determination of a fully worn, fully applied lining position. Reservoir labeling has been modified to require color contrasts of printed labels only, the contrast in lettering and

background on stamped or embossed labels deemed a sufficient contrast in those instances. GM asserted that the reservoir capacity requirements were unnecessary in light of the requirement for a fluid level indicator, and petitioned that the requirements be deleted. The petition is denied; the volume requirements are necessary to provide sufficient fluid for a full range of brake travel.

12. *Test conditions.* The specified test load of 50 to 725 pounds per cubic foot has been refined by assigning density distribution to various vehicle areas, for example 50 to 125 pounds per cubic foot in the seating area of all vehicles. Several manufacturers requested that the transmission selector control be in gear during all test decelerations, alleging that the neutral position is not representative of consumer usage. These requests are denied. Deceleration in gear by adding driveline drag masks the true effectiveness of the brake system. Comments were also directed to the prohibition against lockups, generally alleging inconsistency with Standard No. 121. These comments had merit, and the test condition has been amended to allow lockups during spike stops, partial failure stops and inoperative brake power or power assist unit stops. On the other hand, a request to allow more than one locked wheel is denied. Provision has been made for installation of a second thermocouple at the beginning of the test sequence if the lining wear is expected to reach a point causing the first thermocouple to contact the metal rubbing surface of a drum or rotor. Since the brake control forces have been modified to a uniform range of 15 to 150 pounds, except as otherwise specified, control forces have been added to the list of test conditions.

13. *Test procedures and sequence.* Most American manufacturers and suppliers commented on the severity of the sequential procedure, with arguments of the following nature: The high speed effectiveness tests early in the sequence result in changes in lining characteristics which, in turn, affect the capability of the vehicles to comply with parking brake and partial systems requirements. Since no reburnish is allowed until after the first fade test, additional lining deterioration occurs as light load tests and fade tests are run. When final effectiveness tests are run, organic linings (normally used in today's vehicles) have deteriorated appreciably. This sequential testing, without reconditioning at intervals, results in brake torque balance changes as the test sequence progresses. To offset these changes and to enable a vehicle to go through compliance tests satisfactorily, many vehicles would have to be designed with an initial high gear brake capacity. This results in an unsafe early rear brake lockup, particularly at the initial light load test. As the sequence progresses, brake balance shifts toward a more reasonable balance, where all wheels approach lockup at or near same point. A brake balance which is designed initially for GVWR test conditions to meet Standard 105a requirements, would be dangerous to consumers for normal usage at 2 to 3 passenger loads due to rear wheel lockup and resultant uncontrollable skids. Recommendations by petitioners generally favored less testing at GVWR, reduced maximum test speeds, lessened fade requirements, and lessened final effectiveness requirements. The various changes would allow design of a brake system more suitable to normal consumer usage rather than the usage encountered in 105a tests. Ford recommended some changes in sequence but submitted a procedure incorporating the 105a sequence with modified performance requirements. GM suggested a drastically revised sequence along with reduced performance requirements. Several petitioners recommended additional burnish stops and adjustments at several points, generally after each effectiveness series. Ford proposed a 200 stop additional burnish after the second fade test.

In responding to petitions for reconsideration, the NHTSA has not modified the sequence of the test procedure. Recognizing the validity of many of the comments, the NHTSA instead has adjusted all vehicle performance values to more closely correlate sequential testing with normal everyday driving performance. This has been accomplished by (1) reducing the high speed performance requirements, (2) eliminating high speed performance requirements at early sequence test points and retaining them only in the last effectiveness test, (3) allowing extra burnish stops for reconditioning of the lining materials, (4) modifying fade performance requirements,

(5) allowing a broader range of control force requirements while maintaining a maximum force limit of 150 pounds, (6) allowing extra adjustments of the brake system during the test sequence to provide more optimum brake performance, (7) modifying fade and wet-brake control force requirements to allow a broader range of forces without allowing a range that might produce severe over- or under-recovery. These modifications are intended to allow manufacturers to design braking systems with a balance that will provide satisfactory overall performance.

At Ford's request, the general test procedure instructions have been modified to require lockout of automatic adjusters prior to burnish and for the remainder of the test sequence.

For the pretest instrumentation check, requests were received to specify a minimum number of instrumentation check stops or snubs, as well as the presently specified maximum. Such a specification would, however, be meaningless. With the maximum number specified, each manufacturer knows precisely the "worst case" that his vehicles must be designed for, and should test his vehicles at or above that level.

In consideration of the foregoing, 49 CFR § 571.105a, Motor Vehicle Safety Standard No. 105a, is revised to read as set forth below.

Effective date: September 1, 1975. Because these amendments relate to a standard that is effective September 1, 1975, it has been determined for good cause shown that an effective date later than 180 days after issuance is in the public interest.

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718, 15 USC 1392, 1407; delegation of authority at 38 F.R. 12147).

Issued on: May 11, 1973.

James E. Wilson
Associate Administrator
Traffic Safety Programs

38 F.R. 13017
May 18, 1973

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 105–75

Hydraulic Brake Systems

(Docket No. 70–27; Notice 10)

This notice responds to further petitions for reconsideration of Motor Vehicle Safety Standard No. 105a and amends the standard in certain minor respects effective September 1, 1975.

Federal Motor Vehicle Safety Standard No. 105a, 49 CFR 571.105a, *Hydraulic brake systems*, was published on September 2, 1972 (37 F.R. 17970). Thereafter, pursuant to 49 CFR 553.35, petitions for reconsideration of the rule were received and, in response, a revised Standard No. 105a was published on May 18, 1973 (38 F.R. 13017). Timely petitions for reconsideration of the revised rule were received from American Motors Corporation (AMC), Wagner Electric Corporation (Wagner), General Motors Corporation (GM), International Harvester Company (Harvester), Japan Automobile Manufacturers Association (JAMA), Ford Motor Company (Ford), Recreational Vehicle Institute (RVI), and Toyota Motor Sales, USA, Inc. (Toyota). This notice discusses the major issues raised and their resolution. The Administrator does not consider repetitious petitions and to the extent that these further petitions were repetitious of the initial ones (*e.g.* deletion of tests above 80 mi/h for heavy vehicles, modification of pedal forces, running tests in gear rather than in neutral), they have not been considered, pursuant to NHTSA regulations (49 CFR 553.35 (c)).

GM petitioned for rulemaking that would rescind Standard No. 105a on the grounds that the brake systems it has designed for the 1976 model year would have to undergo substantial changes in subsequent model years when it plans to introduce lighter vehicles with improved fuel consumption. This agency considers energy needs along with other factors relevant to its rulemaking actions. The information available to the NHTSA does not indicate, however, that Standard No. 105a is incompatible with increased fuel mileage, or would add substantially to the weight of the vehicles covered. The NHTSA does not consider a change in a manufacturer's own design plans to be a justification for discarding an important new set of requirements for which the world industry has been preparing for several years. The petition by GM to rescind the standard is therefore denied.

Effective date: Harvester and RVI petitioned for a delayed effective date for certain categories of vehicles. Harvester requested a one-year delay in the effective date for vehicles whose GVWR exceeds 10,000 pounds, stating its doubt that acceptable antilock systems will be available to it by September 1, 1975, and that the advance hardware proposals from its brake system suppliers indicate that considerable design and development time is still needed. RVI wished an extension of 2 years for recreational vehicles built upon truck and multipurpose passenger vehicle chassis, alleging that time will be needed for testing and retooling after receipt of the first chassis or vehicle certified as conforming to the new braking standard.

The NHTSA does not consider further extension of the effective date to be in the public interest, and the petitions are denied. The broad outlines of the performance requirements have been known to industry since publication of the initial proposal in November, 1970, with its proposed effective date of September 1, 1972. Since publication of the new standard in September, 1972, the effective date has been delayed one year to September 1, 1975. and considerable relief provided for vehicles whose GVWR exceeds 10,000 pounds.

Definitions. In response to a petition by JAMA, a definition of "backup system" is adopted. Such a system is "a portion of a service brake system, such as a pump, that supplies energy in the event of a primary brake power source failure".

Effective requirements. Clarifying words are added throughout in response to various requests. For example, the fourth effectiveness test now makes it clear that if the speed attainable in 2 miles is 99 mi/h or greater, stops must be made from both 80 mi/h and a specified higher speed, and not from the higher speed alone. In response to GM's comments on inoperative brake power and power assist units (S5.1.3), a new S5.1.3.4 has been adopted that allows brake power assist units to be tested under the optional procedure if the unit utilizes a backup system.

The word "average" has been deleted from S5.1.4.2 (fade and recovery) which specified fade stops in excess of "an average deceleration" floor, at the request of Wagner, as the inclusion of the word was erroneous and does not reflect the test procedures of S7.11.2.1.

The brake system indicator lamp requirements (S5.3.1) were the subject of numerous petitions, most of which have been granted. The NHTSA reiterates that the methods of pressure failure indication in S5.3.1(a) are alternative rather than inclusive. Harvester asked that S5.3.1(a) be amended to delete the qualification of pressure measurement at a slave cylinder outlet "if the master cylinder controls slave cylinders at a booster unit". It argues that with this design configuration it should be allowed to measure pressure at the master cylinder outlet. The NHTSA agrees that the original wording of S5.3.1(a) is design restrictive and that measurement at either the master or slave cylinder outlet is satisfactory for monitoring pressure, and the qualifying phrase is removed. S5.3.1(a)(1) requires activation of the indicator upon activation of "a line pressure of not more than 200 psi". Ford requested an amendment to clarify that the intent is to specify a differential pressure between the operational and failed brake systems. The clarifying amendment has been made and the pressure differential increased to 225 psi to compensate for certain power-assisted units. As a failure indicator GM prefers a switch that would activate the warning lamp when the brake pedal has been depressed past a certain point, rather than a lamp activated by fluid pressure failure.

The petition is denied, as the NHTSA has determined that the brake pedal travel involved to activate the lamp would not provide an adequate warning.

JAMA and Toyota asked for an amendment or interpretation of S5.3.2 that would allow the indicator lamp to remain activated when the ignition is returned to "on", after the engine is started. To allow the lamp to remain on after the engine is started might degrade the importance of the check that the system is intended to indicate, and that the request is denied. JAMA also requested that if there is a separate parking brake indicator that it be labelled "Park", and this petition has been granted.

GM requested that the volume requirements of master cylinder reservoirs on large trucks be reduced to one-third that required by the new standard. Since NHTSA has reduced the requirement in response to previous petitions, from 150 per cent to 100 per cent of fluid displacement, it does not deem it in the interest of safety to reduce it further. GM's petition is denied. The agency wishes to clarify, however, that the volume concerned is only that within the storage compartment, and does not include that fluid which may remain in pipes, hoses, and fittings. At Harvester's request, S5.4.2 is amended slightly to clarify that the minimum reservoir capacity is that of the total reservoir system rather than each reservoir compartment.

S5.6, *Brake system integrity*, had been amended in May 1973 to specify that friction facing tearout of the lining must "not exceed 10 percent of the lining on any frictional element" rather than "10 percent of the lining surface areas". GM requested reinstatement of the original requirement. The request is denied. The language that was adopted in May 1973 clarified a previously existing ambiguity while providing a measure of relief that had been previously requested.

Conditions. Ford interpreted the words "test load" in S6.1.1 as the load required to be added to bring a vehicle to its GVWR. In some instances, if this added weight were distributed proportionally to GAWR the front GAWR would be exceeded. NHTSA intended that a vehicle be loaded at GVWR so that its gross vehicle weight is distributed proportionally to its GAWR, and S6.1 is amended appropriately. Ford, JAMA, Toyota, and RVI petitioned for a change in the load material density specification of S6.2 to allow use of iron shot or bars in the passenger seating area, or in cargo areas of light and heavy trucks. The RVI request would allow use of lead shot in drawers, cupboards, and cabinets of recreational vehicles. In large part, these requests have been granted; maximum material densities have been increased from 125 to 450 pounds per cubic foot in seating areas of passenger cars, and in cargo areas of vehicles with a GVWR of 10,000 pounds or less. To allow the use of cast iron in the cargo areas of heavy trucks the minimum density has been lowered slightly from 450 to 400 pounds per cubic foot. The RVI request, however, is not adopted as this would permit too broad a range for testing and consequent difficulty of reproducing test results. It was to alleviate this problem that the original Standard No. 105a was amended on this point in May 1973. AMC and GM asked that the tire inflation pressure be that specified for the test weight, rather than for the GVWR of the vehicle. In NHTSA's view, the time to reset tire pressures after allowing tires to cool would complicate and lengthen test procedures. There are only three tests run at the lightly loaded weight, and no data have been submitted to show that the tire pressure required causes a substantial increase in stopping distances.

S6.10 allows only one uncontrolled wheel to lock at braking speeds above 10 mph on any given stop. GM suggested that this section allowed one wheel per axle to lock. GM's interpretation is incorrect, however; "one wheel" means one wheel on the vehicle. Ford wanted to reset thermocouples during brake inspections. This requested amendment is denied. Except for normal adjustment, inspections for thermocouple depths are not allowed once a test series has begun, in order that brake systems not be disturbed. The NHTSA may consider different depths for thermocouples in the future if data are obtained showing a need.

Test procedures. GM, JAMA, Toyota, and RVI petitioned that lockout of automatic brake adjusters be optional rather than required. On review the NHTSA has decided that there is no reason not to allow use of adjusters during testing. However, if a manufacturer locks out brake adjusters, this will now occur when linings are installed after the thermocouple installation; *i.e.* before the test series rather than before burnish. This is intended to save time in the test procedures.

The service brake burnish procedure for heavy vehicles is being amended pursuant to a petition by GM, to be in accord with the procedure recently proposed for such vehicles in Standard No. 121. Minor clarifying amendments have been made at various places in the test procedures. Toyota asked whether S7.9.4 applied only to mechanical proportioning systems. This paragraph applies to any variable proportioning system whether mechanical, electrical, hydraulic or otherwise. It does not apply to a fixed mechanical proportioning system.

Figures and tables. Pursuant to a request from Ford, the dimensional specification of "1½ inches" has been added to Lever A on Figure II. JAMA and Toyota want to consider a modified T lever as a "T" rather than as an "L" type. The NHTSA will consider this design a "T" type if the short side is no less than one-third the long side. JAMA and Toyota requested that the load point on the "L" type handle be revised to 1½ inches from the handle end instead of from the center line. This request is denied, as the original requested dimension (30 mm) has been previously increased to 1½ inches (approximately 37 mm) and no further change is deemed necessary.

Harvester was the sole petitioner to request an increase in the stopping distances of Table II, asking that vehicles with a GVWR of 10,000 pounds or less in the lightly loaded condition be afforded the same maximum stopping distance from 60 mph as required of similarly loaded vehicles under the same conditions in Standard No. 121. It also requested an increase in the fourth effectiveness stopping distance to give the same difference in deceleration at 80 mi/h as allowed by Standard No. 105 at 60 mi/h. Both petitions are denied. Air-braked vehicles covered by Standard No. 121 include truck-tractors with a high center of gravity and usually a higher front-to-rear weight distribution than light trucks, so that the lesser stopping distance in Standard No. 105 is justified. The test value of the fourth effectiveness test reflects previous modifications for requirements at 60 mi/h. The industry in general has not disclosed any problem in complying with the deceleration values from 80 mi/h. The correct stopping distance for heavy vehicles from 50 mi/h in the first, fourth, and spike effectiveness tests is 193 feet, not 183 feet as previously published.

GM, Toyota, and JAMA requested an increase in the deceleration values of Table III as an allowance for larger vehicles tested to optional brake power and assist unit procedures. This request is denied. These vehicles are presently required to meet only a 6.3 ft/s/s deceleration which is considered the minimum value acceptable.

Finally, Harvester wanted an inclusive pedal force range of 15 to 150 pounds for all phases of compliance activity including baseline checks. The NHTSA considers a 150-pound pedal force too high for baseline tests at low speeds and relatively low decelerations, and the petition is denied.

Although the NHTSA has on occasion used the subletter "a" to denote comprehensive revision of existing standards effective at a future date, such standards will henceforth be identified in terms of their effective dates. Thus "Standard No. 105a" becomes "Standard No. 105–75 (effective September 1, 1975)".

In consideration of the foregoing 49 CFR 571.105a, Motor Vehicle Safety Standard 105a, hydraulic brake systems, is amended as follows:

Effective date: September 1, 1975. Because these amendments relate to a standard that is effective September 1, 1975, it has been determined for good cause shown that an effective date late than 1 year after issuance is in the public interest.

(Sec. 103, 119, Pub. L. 89–563, 80 Stat. 718, 15 U.S.C. 1392, 1407; delegation of authority at 49 CFR 1.51.)

Issued on February 14, 1974.

James B. Gregory
Administrator
39 F.R. 6708
February 22, 1974

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 105–75

Hydraulic Brake Systems

(Docket No. 70–27; Notice 11)

This notice responds to petitions for reconsideration of the amendments to 49 CFR 571.105–75, Motor Vehicle Safety Standard No. 105–75, published in the *Federal Register* on February 22, 1974 (39 F.R. 6708). The standard is amended to defer for one year the requirements for a brake fluid level sensor for vehicles with a GVWR over 10,000 pounds, and for two years, a 60-pound maximum baseline pedal effort on vehicles with a GVWR over 15,000 pounds. Slightly increased stopping distances in the third effectiveness test are adopted for one year for certain heavy vehicles at lightly loaded vehicle weight.

Timely petitions for reconsideration of the amendments were received from Girling, Ltd., Wagner Electric Corporation (Wagner), Ford Motor Company (Ford), General Motors Corporation (GM), and Recreational Vehicle Institute, Inc. (RVI). International Harvester Company (Harvester), subsequent to the time allowed for filing petitions for reconsideration, raised certain issues in writing to the Administrator, and its presentation, in accordance with NHTSA regulations, has been considered as a petition for rulemaking. This notice discusses the major issues raised and their resolution.

Effective date: RVI again petitioned for a delayed effective date for recreational vehicles built upon truck and multipurpose passenger vehicles chassis, alleging that time will be needed by final-stage manufacturers for testing and retooling after receipt of the first chassis or vehicle manufactured after the effective date of Standard No. 105–75.

RVI's petition is found to be repetitious of arguments raised previously, and accordingly, pursuant to NHTSA regulations (49 CFR 553.35(c)), has not been granted. The denial of Notice 10 therefore stands, on the grounds set forth in Notice 10 of this docket. In brief, the NHTSA expects a manufacturer of incomplete vehicles to provide final-stage manufacturers, pursuant to 49 CFR 568, with information sufficient to indicate how the final-stage manufacturer may achieve compliance with Standard No. 105–75. Since the effective date of the standard is over a year away, there remains sufficient time for final-stage manufacturers to discuss with manufacturers of incomplete vehicles the kind of information that is to be provided, and to resolve such problems as may appear.

Harvester and Wagner have apprised the NHTSA of unexpected leadtime problems associated with the incorporation of brake fluid indicators into master cylinders of heavy vehicles. The agency has confirmed the seriousness of these problems, and has determined that they derive from factors substantially beyond the control of the affected vehicle manufacturers. It has accordingly concluded that a 1-year delay in the required date for introduction of fluid level sensors for vehicles whose GVWR exceeds 10,000 pounds would be in the public interest.

Harvester also requested a year's delay of the third effectiveness test requirements (S5.1.1.3). It stated that vehicles with 151 inches or less wheelbase and 8,000 pounds or greater GVWR will require anti-lock systems to meet the stopping distance requirements for lightly loaded vehicles, and that suitable anti-lock systems cannot be developed for 1976 model year production. The NHTSA does not consider that a year's delay of the third effectiveness test requirements is in the public interest. It finds, however, on the basis of the information before it that the incorporation of anti-lock systems into this class of vehicles by the September 1, 1975, effective date is probably impracticable. The standard accordingly is being amended to permit, for a period of 1 year, somewhat longer stopping distance requirements for lightly loaded vehicles of 8,000 pounds or more GVWR. The NHTSA finds these distances to be achievable without anti-lock systems, and that the change for the interim period is justifiable in terms of the costs and the safety benefits involved. As an example, the maximum stopping distance permissible from 60 mph at lightly loaded vehicle weight is changed from 216 feet to 242 feet for vehicles with a GVWR between 8,000 and 10,000 pounds.

Effectiveness requirements. Clarifying words are again added to the effectiveness requirements and test procedures in response to various requests. Heretofore the performance requirements for vehicles with inoperative brake power assist units and brake power units specified four stops at a deceleration figure, with the fifth and final stop specified in feet. This has apparently proved confusing, and the final stop will now be expressed in a manner consistent with the remainder of the performance requirements, as "an average deceleration of not lower than 7 fpsps". This value, however, applies only to passenger cars. Ford argued that the heavy truck stopping distance values are unrealistic, in the optional procedures provided by S5.1.3.2 and S5.1.3.3 for inoperative brake power assist units and brake power units. It petitioned for less stringent values. The agency has considered that Ford's views have merit, and is amending the standard to require a final stop at an average deceleration of not lower than 6 fpsps. Table III has been amended to reflect this change.

Two petitioners contested the pedal force baseline value range of 15 to 60 pounds for the fade and recovery and water recovery demonstrations. GM asked that the minimum be reduced to 10 pounds, while Harvester requested an increase in the maximum to 88 pounds. GM submitted new test data to substantiate its request and its petition is granted; but a floor of 5 pounds is placed on the recovery minimum value. Harvester's petition is predicated on the results of "extensive tests" that show "that no vehicle over 15,000 lbs. GVWR can be brought into compliance with this requirement for model year 1976." In recognition that even exerting its best efforts Harvester cannot comply by September 1, 1975, the NHTSA has determined that a relaxation of this requirement for two years would be in the public interest. Therefore, Harvester's petition is granted, and between September 1, 1975, and September 1, 1977, the maximum baseline pedal effort will be 90 pounds with a restriction on fade recovery of 100 pounds maximum, and of 110 pounds on water recovery.

With respect to the brake failure indicator lamp, Ford and Wagner requested clarification that the pressure failure condition is a rupture type, rather than one resulting from slow leaks. This request is granted, and S5.3.1(a) is amended to specify that the failure causing the lamp to operate is "A gross loss of pressure (such as caused by a rupture of a brake line) . . . ." Wagner also asked whether an automatic reset pressure failure valve would violate the standard. When there is a slow leak in the service brake system, the warning valve will shuttle, activating the indicator lamp, but the lamp will not remain activated when the pedal is released and then reapplied. The NHTSA intends the fluid level indicator to warn of fluid loss due to slow leaks, and the pressure differential indicator to warn of gross pressure loss. The failure of the lamps to remain activated by the valve does not violate Standard No. 105-75.

Some petitioners cited an apparent conflict in the previous denial of Toyota's petition to allow an indicator lamp to remain activated when the ignition is returned to "on" after the engine is started, and the fact that some systems do not instantly deactivate. NHTSA has previously noted in the notice of September 2, 1972 (37 F.R. 17970), that no time interval is specified, and that instantaneous deactivation could not be required of continuous sensing units. The indicators considered acceptable to NHTSA are those that may remain activated for a limited time (such as 1 to 10 seconds) after the ignition is returned to "on".

Finally, Wagner petitioned for reinstatement of the limiting phrase "in any reservoir compartment" in the requirement that an indicator lamp be activated whenever there is a drop in the level of brake fluid in a master cylinder reservoir to less than one-fourth of fluid reservoir capacity. The phrase was deleted in the notice of February 22, 1974, but it should have been retained to clarify that a low level in any reservoir compartment must be indicated. Wagner's petition is granted.

Test conditions. Ford requested an amendment of the test weight condition of S6.1 to clarify how, in the GVWR test condition, added weight is to be distributed, since even at lightly loaded weight on some vehicles the front axle load exceeds its proportional share of the GVWR. The clarification is now provided by adding to S6.1.1 "However, if the weight on any axle at lightly loaded vehicle weight exceeds the axle's proportional share of the gross vehicle weight rating, the load required to reach GVWR is placed so that the weight on that axle remains the same as at lightly loaded vehicle weight."

Ford also asked that S6.2 *Test loads* be revised so that the manufacturer could designate the density of the test load selected, rather than to anticipate values that may be selected from within the prescribed range in the agency's compliance testing program. This petition is denied. Ford's suggestion would result in each manufacturer setting its own unique performance requirements, and would not be appropriate for standards required by law to be uniform for the types of vehicles to which they apply. Each vehicle must comply with the requirements of the standard when loaded with materials of any density within the applicable ranges. This is made clear by the second sentence of S6., *Test conditions:* "Where a range of conditions is specified, the vehicle shall be capable of meeting the requirements at all points within the range."

GM once again petitioned for an amendment of S6.4, *Transmission selector control*, to allow stopping of the test vehicle in gear rather than neutral. Since the agency, pursuant to 49 CFR § 553.35, does not consider repetitious petitions, no action has been taken.

Test procedures and sequence. S7. allows automatic adjusters to be locked out prior to burnish and for the remainder of the test sequence. Girling has petitioned that lockout should only be in accordance with manufacturer's recommendations. NHTSA agrees and is amending S7. accordingly. At the request of GM the agency has also amended S7. to outline a test procedure for conducting stops when the gear selector is required to be in the neutral position.

Girling also asked that the postburnish brake adjustment test procedure (S7.4.1.2 and S7.4.2.2) be amended to make clear that these sections do not prohibit postburnish adjustment of manually adjustable brakes. Girling is correct, and appropriate amendments are made to reflect the agency's intent.

Ford and Wagner both asked that the burnish procedure of S7.4.2.1.2 be amended in a manner consistent with Motor Vehicle Safety Standard No. 121, to allow brake applications at a point 1.5 miles from the previous brake application for vehicles unable to attain any required speed in 1 mile. The petition is granted, and the standard is amended accordingly.

Finally, Ford suggested that the test procedure for first reburnish, S7.6, be changed to reflect the optional procedure of S7.4.2.1.2, and this request has also been granted.

Other minor amendments have been made to correct printing errors and for internal consistency.

In consideration of the foregoing, 49 CFR 571.105–75, Motor Vehicle Safety Standard No. 105–75, is amended . . . .

Effective date: September 1, 1975. Because these amendments relate to a standard that is effective September 1, 1975, it has been determined for good cause shown that an effective date later than 1 year after issuance is in the public interest.

(Secs. 103, 119, Pub. L. 89–563, 80 Stat. 718, 15 U.S.C. 1392, 1407; delegation of authority at 49 CFR 1.51.)

Issued on July 9, 1974.

James B. Gregory
Administrator

39 F.R. 25943
July 15, 1974

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 105–75

Hydraulic Brake Systems

(Docket No. 70–27; Notice 13)

This notice amends Standard No. 105–75, *Hydraulic brake systems*, 40 CFR 571.105–75, as it applies to passenger cars, in response to petitions for reconsideration of amendments published July 15, 1974 (39 F.R. 25943) (Notice 11). The amendments defer for one year the requirement for a brake fluid level indicator and modify the permissible pedal force values used in recovery stops.

Manufacturers of hydraulic-braked motor vehicles responded to the Notice 11 amendments of the standard with petitions for reconsideration of specific technical changes in some performance requirements, and also with far-ranging requests for substantial modification, delay, or revocation of the standard. These broad requests are answered in a separate proposal to delay the effective date of the standard for four months in the case of passenger cars, and indefinitely in the case of multipurpose passenger vehicles (MPV's), trucks, and buses. For this reason, only the specific technical elements that necessarily affect passenger cars are addressed in this notice.

Brake fluid level indicator. Chrysler Corporation, Ford Motor Company, General Motors, and Wagner Electric Corporation responded to the 1-year delay in fluid level indicator requirements for heavy vehicles by asserting that procurement and reliability problems also exist for lighter vehicle categories. The NHTSA contacted several manufacturers of brake fluid level indicators and discussed the availability and reliability of their products. It appeared that further field evaluation of available indicators could improve their reliability and that some delay should solve the availability problems which existed. At the February 11 public meeting, American Motors Corporation confirmed that availability problems still exist for brake fluid level indicators. Consequently, the NHTSA amends the standard to defer requirements for brake fluid level indicators until September 1, 1976.

International Harvester requested clarification in the wording of S5.3.1(b), which appears to require a signal if the amount of brake fluid in a small, nearly full compartment of a split system reservoir does not equal one-quarter of the volume of the larger compartment. The NHTSA agrees that confusion may arise from the present wording, and, without changing the intended meaning of the requirement in any way, amends the wording as requested by Harvester.

Ford requested a clarification of wording in S5.3.1(a), which presently calls for a signal when "any" one of several pressure losses is experienced. Ford correctly notes that the NHTSA use of "any" means that the vehicle or system must be capable of meeting the specified requirement upon the occurrence of every condition listed, and that, in this case, such was not intended. The NHTSA has corrected the wording to make clear that only one of the conditions (at the option of the manufacturer) must be indicated by the brake system indicator lamp.

Maximum and minimum brake pedal force—recovery stops. Chrysler and the Japan Automobile Manufacturers Association (JAMA) supported the Notice 11 reduction of baseline pedal force limits to permit optimization of braking characteristics over the whole range of system operating conditions. Their petitions argued for an additional change to the minimum pedal effort in the first through fourth recovery stops to encourage optimal recovery characteristics. Specifically, Chrysler recommended that the present 15-pound limit (S6.1.13) on minimum pedal force in the early recovery stops be replaced by a formula tied to the average control force for the baseline check. To avoid oversensitive brakes, a minimum pedal force of five pounds would be required.

The NHTSA concludes that such a requirement would allow greater design freedom in optimizing brake recovery without sacrificing limits on brake sensitivity. Accordingly, the NHTSA reconsiders its action on minimum brake control force requirements, and amends the standard in response to JAMA and Chrysler.

Chrysler also raised the issue of maximum allowable pedal force in the fifth stop of the water recovery requirements. Presently this pedal force can be a maximum of 90 pounds (60 pounds for average control force in the baseline check plus 30 pounds), but this formula requires lower pedal force on a vehicle with lower average baseline pedal force. Chrysler has considered changes in brake lining to lower the wet recovery stop values, but the modifications include major disadvantages such as increased brake imbalance, larger boosters, noise, and wear. The NHTSA finds that the formula can be revised to avoid penalizing good baseline performance, while maintaining a 90-pound maximum effort. Accordingly, S5.1.2.5 is amended to permit a 45-pound increase of pedal effort, as long as the maximum effort does not exceed 90 pounds.

Other requirements of the standard. Wagner requested that the Notice 11 revisions of "in neutral" procedures be made consistent with other provisions of the standard, or that they be replaced with other procedures. The NHTSA finds the present procedure more reproducible than that suggested by Wagner and therefore denies this petition. Wagner correctly pointed out that the procedure to "exceed the test speed by approximately seven mph" may contradict the requirement of testing at speeds only four mph lower than maximum attainable speeds (S5.1). Accordingly, "four to eight mph" is substituted for "approximately seven mph" in S7.

In a related area, JAMA requested that the test procedure for wet brake recovery stops be modified (S7.16.2). The NHTSA did not address these procedures in Notice 11, and does not find that this new subject matter is appropriate for consideration at this time. The JAMA petition will be considered as a petition for rulemaking which will be addressed in the near future.

Bendix requested clarification of the Notice 8 preamble discussion of "power assist" and "power" units. Bendix's question arose with regard to its "hydro-boost" unit, which is described as designed with a "push through" capability in both the "normal" and "failed power" operating conditions, and with an accumulator that permits low pedal effort for a limited number of brake applications after a power failure has occurred. The NHTSA concludes that, because the Bendix "hydro-boost" does not prevent the operator from braking the vehicle by an application of muscular force in the "failed power" condition, it qualifies as a brake power assist unit under the definitions of Standard No. 105-75.

Several minor amendments have been made to correct a printing error in Table I as it appeared in Notice 8 (38 F.R. 13017, May 18, 1973) and for consistency in the use of abbreviations and terminology.

In consideration of the foregoing, Standard No. 105-75 (49 CFR 571.105-75) is amended. . . .

Effective date: September 1, 1975: Because the amendments relax a requirement and because the present effective date of the standard is September 1, 1975, it is found for good cause shown that an effective date sooner than 180 days following publication of the amendments in the *Federal Register* is in the public interest.

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.51)

Issued on March 6, 1975.

Noel C. Bufe
Acting Administrator

40 F.R. 11584
March 12, 1975

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 105-75

Hydraulic Brake Systems

(Docket No. 70-27; Notice 14)

This notice amends Standard No. 105-75, *Hydraulic brake systems*, 49 CFR 571.105-75, to make it applicable only to passenger cars equipped with hydraulic brake systems. This amendment has the effect of withdrawing the standard's applicability to multipurpose passenger vehicles (MPV's), trucks, and buses equipped with hydraulic brake systems.

The National Highway Traffic Safety Administration (NHTSA) proposed a 4-month delay of the standard as it applies to passenger cars and indefinite delay as it applies to other hydraulic-braked vehicles (40 FR 10483, March 6, 1975). Manufacturers responded to the proposed 4-month delay for passenger cars with objections to technical features of the standard, the costs of mid-year changes, and the NHTSA's estimate of the standard's safety benefits. While consideration of these issues continues, a decision has been made to withdraw the standard's applicability to trucks, buses, and MPV's.

The NHTSA proposed withdrawal of the standard because of uncertainty that the particular performance levels established for trucks, MPV's, and buses by Standard No. 105-75 were justified in view of their costs. It is clear that truck braking is in many cases substantially poorer than passenger car braking, and that the generally longer stopping distances and the greater severity of truck accidents justify a safety standard for these vehicles. At the same time, the costs of meeting Standard No. 105-75 in all truck, bus, and MPV model lines are substantial and the NHTSA is not prepared to conclude that they are justified in view of achievable safety benefits.

The Center for Auto Safety (CFAS) questioned the NHTSA's right to propose withdrawal of a promulgated rule in response to manufacturer cost objections without publication of the agency's evaluation of the submitted cost data. As authority, CFAS cites the newly-enacted cost information provisions of the National Traffic and Motor Vehicle Safety Act (15 U.S.C. § 1402).

In this case manufacturers submitted costs for light- to medium-duty trucks that ranged from \$54 to \$775 per unit (depending on model configuration) to attain compliance with the standard. The NHTSA compared these figures with independently-gathered detailed cost and mark-up information and substantiated that the manufacturer's estimates were accurate. This material has been formally compiled as required by the Act and has been made public in the docket (70-27; Notice 12).

CFAS, the Consumers Union, Ms. Susan P. Baker of Johns Hopkins University, the Insurance Institute for Highway Safety, and the Permanente Medical Group stressed the importance of a brake standard for these vehicles. The NHTSA agrees and intends to issue interim requirements for MPV's, trucks, and buses equipped with hydraulic brake systems. However, the NHTSA concludes that the Standard 105-75 requirements in their present form cannot be justified for trucks, buses, and MPV's on the basis of the data available at this time.

In consideration of the foregoing, Standard No. 105-75 (49 CFR 571.105-75) is amended ....

Effective date: September 1, 1975. Because the effective date of the standard for trucks, buses, and MPV's was less than 180 days after the date of publication of this amendment in the

Federal Register, it is found for good cause shown that an effective date less than 180 days from the date of publication is in the public interest.

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.51).

Issued on April 25, 1975.

James B. Gregory
Administrator

40 F.R. 18411
April 28, 1975

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 105–75

Hydraulic Brake Systems

(Docket No. 70–27; Notice 15)

This notice amends Standard No. 105–75, *Hydraulic brake systems*, 49 CFR 571.105–75, to delay its effective date four months from September 1, 1975, to January 1, 1976, and to establish interim control force values for water recovery testing. This notice also amends the present hydraulic brake system standard for passenger cars (Standard No. 105, *Hydraulic brake systems*, (49 CFR 571.105)) to permit compliance with that standard or the new standard at the option of the manufacturer until January 1, 1976.

As issued, Standard No. 105–75 applied to passenger cars, trucks, buses, and multipurpose passenger vehicles (MPV's) equipped with hydraulic brake systems. Its scheduled effective date was September 1, 1975. Thirteen petitions for rulemaking to postpone or revoke the standard were filed with the NHTSA earlier this year. Following a comprehensive evaluation of the petitions, the NHTSA proposed and made final an indefinite delay of the standard as it applied to trucks, buses, and MPV's (40 F.R. 10483, March 6, 1975; 40 F.R. 18411, April 28, 1975).

At the same time, the agency denied petitions for substantial postponement or revocation of the standard as it applies to passenger cars, having considered the cost of compliance for those vehicles, and having determined that significant safety benefit will derive from better stopping performance, stability, and pedal force levels (40 F.R. 10483, March 6, 1975). A discussion of the potential benefits accompanied that decision. An economic evaluation of the impact of the standard will be available in the public docket. The only revisions of the standard proposed by the NHTSA were an interim pedal force value and a 4-month delay of effective date, to permit some flexibility in new model introduction dates where technical changes or isolated compliance problems had not been resolved.

Manufacturer comments on the proposal were generally unresponsive to the proposed delay of four months and the interim pedal force value of 110 pounds in wet recovery stops. The Vehicle Equipment Safety Commission considered the proposed pedal force values to be overgenerous. Chrysler Corporation indicated its support for the 4-month delay and interim value but emphasized other arguments in its submission. General Motors requested that the pedal force value be made permanent. It appears that manufacturers support the short delay and pedal force modification to simplify introduction of the 1976 models. Accordingly, the standard is modified as proposed, to establish an amended effective date of January 1, 1976, and a pedal force increase of 60 pounds up to a total of 110 pounds (in S5.1.5.2) until September 1, 1976.

The majority of comments restated manufacturer positions on the issue of substantial delay or revocation of the standard for passenger cars. The NHTSA has already considered this issue and, as noted above, concluded that the benefits of improved stopping performance, stability, and pedal force values outweigh the costs of implementation. Manufacturers submitted no new data that would justify a reversal of NHTSA's earlier decision.

Although the NHTSA limited its proposal to a choice between the effective dates of September 1, 1975, and January 1, 1976, several manufacturers compared the cost savings of a short delay to January 1, 1976, with a substantially longer delay to September 1, 1976. Actually, the January 1 date was proposed in order to ease the introduction of new models after September 1, 1975, and was not proposed as a means of reducing costs. The proposal was largely in response to manufacturers' comments that some 1976 models would be introduced substantially later than normal so that 1975 model production might be extended beyond September 1, 1975. The NHTSA believes that the three years of lead-time since promulgation of Standard No. 105–75 have been sufficient to permit the design and testing of complying brake systems in nearly all cases. With the 4-month transitional period, a manufacturer will be free to introduce the new brake systems along with its new model introduction, as dictated by the economic situation of the automotive industry.

Ford and Chrysler suggested that the standard could be improved by reduced loading during brake fade testing. These companies argue that present-day brake balance must be modified to meet the brake-fade and fourth effectiveness test of Standard No. 105–75 and that the new balance is not optimum. Agency testing demonstrates that many present-day vehicles can in fact meet the requirements as their brakes are balanced and suggests that major departures from current brake balance design will generally not be required to comply with fade requirements under the present test conditions. The NHTSA accordingly concludes that the presently-specified loading does not result in characteristics which would justify delay of the standard and the consequent loss of benefits during the period of delay.

In consideration of the foregoing, Standard No. 105–75 (49 CFR 571.105–75) is amended. . . .

Effective date: The date on which Standard No. 105–75 becomes mandatory for all passenger cars is January 1, 1976. However, the effective date of the amendments to both Standard No. 105–75 and Standard No. 105 is June 9, 1975, and passenger cars manufactured between that date and January 1, 1976, may conform to either standard at the discretion of the manufacturer.

(Sec. 103, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.51.)

Issued on June 5, 1975.

James B. Gregory
Administrator

40 F.R. 24525
June 9, 1975

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 105–75

Hydraulic Brake Systems

(Docket No. 70–27; Notice 16)

This notice responds to three petitions for reconsideration of recent amendments of Standard No. 105–75, *Hydraulic brake systems*, 49 CFR 571.105–75 (40 F.R. 11584, March 12, 1975) (Notice 13). The petitions requested clarification of new language that specifies minimum control force application values (S5.1.4.3(a)(2) and S5.1.5.2(a)(2)) and objected to the NHTSA decision to defer for 1 year the requirement for a brake fluid level indicator in passenger cars.

Wagner Electric Corporation requested clarification of the description of minimum permissible control force application value, which reads, "A minimum of 10 pounds or 40 percent (whichever is greater) less than the average control force for the baseline check (but in no case less than 5 pounds)." Starting with a baseline value, the manufacturer must utilize the lower of two values which result when different amounts are subtracted from the baseline value. Because there is some ambiguity in the language used to describe these calculations, the NHTSA hereby revises the language to improve its clarity. The new wording in no way modifies the meaning of S5.1.4.3(a)(2) and S5.1.5.2(a)(2).

Ford Motor Company, Wagner, and Mercedes-Benz requested reconsideration of the decision to defer for 1 year the requirement of S5.3.1(b) that specifies a brake fluid level indicator. Ford and Wagner requested that the indicator be permanently deleted from the requirements in view of expense and reliability problems, claiming that its function is adequately served by the pressure differential warning that is also required by the standard.

The fluid level indicator detects and signals a loss of fluid from the system, whether the loss is swift or gradual. In the event of such a dangerous condition, the vehicle operator is warned early that braking function will be lost in the future. Unlike the pressure differential indicator, the fluid level indicator warns the operator before one subsystem is effectively depleted of all fluid, and permits a repair to be undertaken before braking is lost. The indicator would also signal leakage at a wheel cylinder which could contaminate brake linings and create a side-to-side imbalance in braking.

At the same time, the petitions raise questions about the reliability, availability, and cost of these devices that cannot be answered without further data. The NHTSA is in the process of gathering these data, and for this reason is unable to respond to these two petitions within the 120-day period established for actions on petitions for reconsideration. The NHTSA anticipates publication of its response no later than October 31, 1975.

Mercedes-Benz argued that the 1-year deferral of the brake fluid level indicator discriminated against those manufacturers who presently provide such a device to meet the present Standard No. 105 (49 CFR 571.105). As interpreted, Standard No. 105 specifies a pressure differential indicator (used by most manufacturers) or a fluid level indicator (used by Mercedes) to signal a complete hydraulic-type failure of a partial system. Mercedes asked that the new standard be modified to continue this manufacturer option until both systems are required, reasoning that either system provides an equal safety benefit.

As noted in the earlier discussion, a review of the benefits found in one warning indicator that are not found in the other demonstrates that there are separate and significant benefits in each warning. The new hydraulic brake standard specifies both warnings for this reason. The fluid level indicator was deferred only because of unresolved reliability and availability issues. The pressure differential indicator is a proven and available device which can be incorporated in vehicles at reasonable cost. While the NHTSA does not wish to encourage removal of Mercedes' fluid level indicator, it has decided that all passenger cars should be equipped with the pressure differential indicator. For these reasons, Mercedes' petition is denied.

In an area unrelated to the rulemaking which underlies this response to petitions for reconsideration, Toyota Motor Sales, Inc., has requested confirmation that S5.3.2 of the standard requires a check of the brake system indicator lamp function only when the transmission shift lever is in the "P" (park) or "N" (neutral) position (in the case of vehicles with automatic transmission). The literal wording of S5.3.2 requires a check of lamp function without regard to the position of the transmission shift lever, whenever the ignition switch is turned to the "on" position when the engine is not running, or when the ignition switch is in a position between "on" and "start" that is designated by the manufacturer as a check position. In the case of vehicles with an automatic transmission, however, this wording does not reflect the NHTSA's intent with respect to the check function. To properly reflect this intent, the language of S5.3.2 is hereby modified in accordance with Toyota's request. This is an interpretative ruling, adding no additional burden on any person, concerning which the NHTSA finds that notice and opportunity for comment are unnecessary, under provisions of the Administrative Procedures Act (5 U.S.C. § 553(b)(3)(A)).

In a separate area, the date of September 1, 1975, appearing in S7.4.2.1 of the standard is changed to January 1, 1976, to conform to the standard's new effective date.

In consideration of the foregoing, Standard No. 105-75 (49 CFR 571.105-75) is amended....

Effective date: September 17, 1975. Because this amendment relieves a restriction and imposes no additional burden on any person, it is found for good cause shown that an immediate effective date is in the public interest.

(Sec. 103, 119 Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.51.)

Issued on September 11, 1975.

James B. Gregory
Administrator

40 F.R. 42872
September 17, 1975

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 105–75

Hydraulic Brake Systems

(Docket No. 75–11; Notice 2)

This notice amends Standard No. 105–75, *Hydraulic Brake Systems*, 49 CFR 571.105–75, to permit the manufacture of hydraulic-braked vehicles without split service brake systems as long as they are capable of meeting additional stopping requirements in the event of failure in the service brake system. A proposal of this modification was published May 12, 1975, (40 FR 20641), in response to petitions from Citroen Automobile Company, Maserati, S.P.A., and Volkswagen of America, Inc.

The three vehicle manufacturers requested modifications of Standard No. 105–75 (effective January 1, 1976) because its present requirement for a split service brake system (S5.1) would prevent the development and sale of vehicles utilizing a central hydraulic system with a single pump. The split system has two or more separate subsystems, each operating indefinitely in the event of a failure in another subsystem, and is required as a safety measure to ensure that at least one-half of the braking system will remain operational if any single failure occurs. The central hydraulic system used by Citroen employs a single pump to supply power to both front brakes and rear brakes. The petitions suggested and the NHTSA tentatively agreed that this type of central hydraulic system, which offers a limited number of stops upon a single failure, provides warning and reserve braking capabilities equivalent in safety to a split system. The petitioners asserted that the danger of operating indefinitely on one-half of a split system is as great as that of operating a central hydraulic system beyond its reserve capability.

The responses to the proposal (including approximately 30 endorsements from owners of Citroen vehicles which employ the central hydraulic system) generally supported the amendment to provide additional design flexibility in meeting Standard No. 105–75. Citroen, which intends to import passenger cars with central hydraulic systems, supported the proposal with one exception. The company pointed out that the special warning system specified in the proposal to accompany the central hydraulic system was technically unfeasible and conflicted with the existing requirements for warning systems in vehicles equipped with brake power units (S5.3.1). The same problem was raised by Clayton Dewandre Company Limited, a manufacturer of brake systems for trucks, and Volkswagen of America. Essentially, central hydraulic systems are designed to operate within a pressure range, with intermittent pump operation to restore the system accumulators to the higher pressure of the ranges as energy is used in braking or other hydraulic systems. A pressure sensor would be unable to distinguish the type of pressure drop experienced in this normal operation from that resulting from a rupture or leakage-type failure. Only after the pressure dropped below the pump "cut-in" pressure could the sensor experience an abnormal pressure level signifying system failure.

The proposal, in contrast, would have required a warning as soon as any leakage or rupture occurs, before the abnormal pressure drop would be sensed. To revise the requirement in practical terms, the NHTSA amends the standard to eliminate the conflict between the proposed requirement and the existing requirement of S5.3.1(a)(4) for a warning when the supply pressure in a brake power unit drops to some level not less than one-half of the normal system pressure.

The amendment is placed in the same section of the standard as other requirements for warning systems (S5.3) to improve the coherence of the entire standard and to clarify that the pressure warning required on central hydraulic systems is not redundant or in conflict with the warnings called for in S5.3.1(a).

For the same reason, the proposed requirement for additional stopping capability in central hydraulic systems is placed in the same section as the requirement for partial failure system performance of split service brake systems (S5.1.2). Also, the partial failure test procedures for central hydraulic systems have been consolidated into the test procedures for split service brake systems in S7.9.1.

Citroen, Volkswagen, and Clayton Dewandre stressed that the delay of warning signal necessitates a more fundamental modification of the proposed requirement for additional stopping capabilities. The proposal would have specified that the warning signal be activated as soon as the failure occurred, followed by a back-up capability of 10 stops from 60 mph. Now that the signal has been specified as occurring somewhat after the failure (when abnormal pressure loss can be sensed), the 10-stop capability must be required subsequent to activation of the signal so that braking capability is available to the driver for a reasonable time after he has been warned that a malfunction has occurred. Citroen, the only manufacturer that expects to manufacture vehicles subject to these requirements at this time, states that its system is entirely capable of providing 10-stops from 60 mph after the warning system activates. For this reason, the NHTSA considers it appropriate to amend the warning system requirement so that the 10-stop capability is available following activation of the signal.

The NHTSA also proposed a clarification of the test procedures for brake power unit failure (S7.10.2(b)). No comments addressed this matter, and the proposed change expanded slightly, is made final by this notice.

Citroen suggested that a brake fluid level indicator be specified as an additional safety system on central hydraulic systems, noting that such an indicator will become a requirement for vehicles with master cylinder reservoirs (as of September 1, 1976). Wagner Electric Corporation recommended that a "system energy monitoring device" be specified so that volume as well as pressure would be monitored, arguing that a pressure indicator alone will not indicate a failure of the charging device in an accumulator. Clayton Dewandre suggested that if a split service brake system is no longer required, then the brake system should be better protected against failures of non-brake systems (suspension, power steering) that are connected to the brake system.

The NHTSA considers each of these suggestions to have possible merit and contemplates a new proposal to treat these issues and provide for full opportunity for comment by interested persons. At this time, however, it is considered necessary to implement the amendments that will permit production of vehicles without split service brake systems under Standard No. 105-75.

Both Wagner Electric and General Motors questioned the part of the preamble to the proposal that stated, "The [Citroen] response indicates that the Citroen system is not responsible for a greater percentage of accidents than a conventional system." Both companies felt that the submitted information did not form a statistically adequate basis for that conclusion. The NHTSA agrees. The statement in question was only intended to report Citroen's evaluation of the material it submitted in support of its petition, and not to present a conclusion of the NHTSA.

In consideration of the foregoing, Standard No. 105-75 (49 CFR 571.105-75) is amended. . . .

Effective date: October 10, 1975. Because these amendments have the effect of permitting actions that previously were prohibited, it is found for good cause shown that an effective date sooner than 30 days following publication in the *Federal Register* is in the public interest.

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegations of authority at 49 CFR 1.51).

Issued on Oct. 3, 1975.

Gene G. Mannella
Acting Administrator

40 F.R. 47789
October 10, 1975

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 105–75

Hydraulic Brake Systems

(Docket No. 75–27; Notice 2)

This notice amends Standard No. 105–75, *Hydraulic Brake Systems*, 49 CFR 571.105–75, to revise the parking brake test procedure (S7.7). In addition, this notice amends Subpart B of Part 575, *Consumer Information*, 49 CFR § 575.101, by replacing the present test procedures in that section for passenger car testing with equivalent procedures from Standard No. 105–75.

The NHTSA proposed a modification of the parking brake test procedures in Standard No. 105–75 to permit a reapplication of the parking brake if the first application of the brake failed to hold the vehicle stationary on the test incline. Toyo Kogyo requested the modification as representative of normal driver action (in cases where the application appears to be insufficient to hold the vehicle), justifying the change as necessary to permit new vehicle components to stretch or "set" during the initial application as occurs in any vehicle delivered to a purchaser. The NHTSA agreed that reapplication would be a reasonable test procedure and proposed a revision of S7.7.

Comments were received from Toyo Kogyo, General Motors, American Motors Corporation, and Chrysler Corporation in support of the change. No comments were received that objected to the proposal. The standard is amended accordingly.

The NHTSA also proposed that the consumer information item requiring publication of the stopping ability of passenger cars and motorcycles (49 CFR § 757.101) be modified for passenger cars so that test data developed under Standard No. 105–75 could be the basis for the required consumer information. The existing test procedures of the consumer information item would be replaced by Standard No. 105–75 test procedures, and a transition period until January 1, 1977, would be provided to allow manufacturers latitude in adopting the new procedures.

The Motor Vehicle Manufacturers Association (MVMA), Chrysler Corporation, American Motors Corporation, Ford Motor Company, and General Motors Corporation supported the modifications. The MVMA and Ford pointed out an inadvertent omission in the proposal of a required change in the present loading specification (maximum loaded vehicle weight) to the Standard No. 105–75 loading specification (gross vehicle weight rating (GVWR)). No comments opposed the modification, and the consumer information item is therefore amended as proposed, with the additional modification noted by the MVMA and Ford. The transition period for use of either loading specification conforms to the transition period for use of either test procedure (until January 1, 1977). The MVMA asked for a June 1, 1977, date for transition to the new loading specification but did not explain the need for more time. The NHTSA will consider any data on this subject submitted by the MVMA.

With regard to test loading, Chrysler Corporation repeated a request for revision of the loading conditions of Standard No. 105–75. The request was earlier submitted improperly as a petition for reconsideration of an NHTSA action which did not deal with test loading (40 FR 24525, June 9, 1975). Section 553.35 of NHTSA regulations (49 CFR 553.35) allows petitions for reconsideration of rules issued by the NHTSA, but in this case no rule was issued on test loading that could form the basis for reconsideration. The NHTSA discussed Chrysler's request at a meeting with Chrysler officials on August 21, 1975. Based on the limited information presented by Chrysler at that meeting, the NHTSA has concluded that a reduction in test weight would not be justified. At the meeting it was agreed that Chrysler would submit any additional data it had in support of the request. To date no data have been received, and the NHTSA cannot meaningfully reconsider Chrysler's request without further data.

The NHTSA also proposed modification of the means for establishing the skid number of the surface on which stopping distance tests are conducted in Standard No. 105-75, Standard No. 121, *Air Brake Systems*, Standard No. 122, *Motorcycle Brake System*, and the Consumer Information Item on brake performance. Comments received were not in agreement on how to accomplish the transition from the former ASTM method to the new one. The skid number proposal will therefore be treated separately at a later date so that its resolution will not delay this amendment of the parking brake and consumer information item test procedures.

In consideration of the foregoing, amendments are made in Chapter V of Title 49, Code of Federal Regulations. . . .

Effective date: January 6, 1976. Because these amendments, to the extent that they impose new substantive requirements, are made optional for an interim period, and because manufacturers must plan future testing based on the test procedures as they exist in the present standard, it is found for good cause shown that an immediate effective date is in the public interest.

(Sec. 103, 119 Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.51).

Issued on December 31, 1975.

James B. Gregory
Administrator

41 F.R. 1066
January 6, 1976

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 105–75

Hydraulic Brake Systems

(Docket No. 75–7; Notice 2)

This notice amends Standard No. 105–75, *Hydraulic Brake Systems*, 49 CFR 571.105–75, to extend its applicability to school buses and to establish performance levels for this vehicle category.

The NHTSA proposed applicability of the hydraulic brake standard to school buses (40 FR 18469, April 28, 1975) in satisfaction of the mandate of the Motor Vehicle and Schoolbus Safety Amendments of 1974 (Pub. L. 93–492) to issue safety standards for school bus operating systems (15 U.S.C. § 1392(i)(1)(A)). The Act established a strict schedule for promulgation of the standards, requiring their effectiveness 9 months following promulgation. With a view to this limited leadtime, the NHTSA proposed performance levels based on Society of Automotive Engineers (SAE) recommended practices that reflect the better existing school bus designs. Permissible pedal force values and fade and recovery performance were proposed at somewhat more stringent levels than the SAE practice, in view of the "stop-and-go" duty cycle of school buses, and the high incidence of women as school bus operators.

Commenters generally supported extension of the hydraulic brake standard to school buses. The American Mutual Insurance Alliance supported the standard as proposed. The California Highway Safety Foundation and Action for Child Transportation Safety (ACTS) advocated early implementation of requirements for all hydraulic-braked trucks, buses and multipurpose passenger vehicles to improve their braking compatibility with school buses and passenger cars. The California Department of Highway Patrol (CHP) expressed concern that any bus could be converted into a school bus after sale, and that all buses should therefore be required to meet minimum braking requirements. The NHTSA is presently preparing rulemaking for hydraulic-braked trucks, buses, and MPV's, and these comments are being taken into consideration. In view of the Congressional mandate for swift implementation of school bus standards, however, this rulemaking is being made final largely as it was proposed.

The NHTSA proposed a level of service brake system performance generally based on SAE values, both for school buses of 10,000 pounds gross vehicle weight rating (GVWR) or less, and for school buses with a GVWR or more than 10,000 pounds. Wagner Electric Corporation, Chrysler Corporation, International Harvester Co., and Ford Motor Company asked for relaxation of the requirements, while the Vehicle Equipment Safety Commission (VESC) and ACTS requested more stringent requirements. General Motors supported the requirements for buses with a GVWR of 10,000 pounds or less.

The first effectiveness test (S5.1.1.1) measures the stopping ability of the service brake system as it is delivered to the user before it has been burnished (broken in) through use. Wagner argued that this test is unnecessary and therefore wasteful because the stringency of later tests assures the adequacy of the "green" braking components to stop the vehicle. The company cited variables in the unconditioned components that make it ". . . unrealistic to assume that exact brake performance can be predicted or that test results can be repeated without the thermal and mechanical conditioning of these surfaces."

It is the NHTSA's intent in the first effectiveness test to assure a safe vehicle in the hands of the user from the moment of delivery. The same variables cited by Wagner that make prediction of test results difficult could also make performance in the hands of the user unpredictable, unless the design is carefully controlled. The NHTSA concludes that the first effectiveness requirement is a reasonable method of ensuring adequate new-vehicle performance, and denies Wagner's request to delete this requirement.

Chrysler and Ford recommended increasing the first effectiveness stopping distances at 30 mph for school buses with a GVWR of 10,000 pounds or less. Both argued that vehicles take significantly longer to stop in an unburnished condition and therefore the required stopping distance for first effectiveness should be longer than the second effectiveness requirement. The NHTSA established the unburnished stopping distance requirements based on tests of vehicles by NHTSA contractors and its Safety Research Laboratory. The NHTSA has reexamined its test results in view of manufacturer comments, and has determined that the complying distances recorded were not generated in all cases at the "worst case" weight at which a vehicle could be tested. For this reason, and because of the variability noted above, the NHTSA has increased the first effectiveness stopping distances for school buses of 10,000 pounds GVWR or less to 69 feet. This change represents a 1 fpsps decrease in average deceleration rate from the second effectiveness value, as is the case for passenger cars.

In the case of vehicles with a GVWR of more than 10,000 pounds, Wagner, Chrysler, and International Harvester requested longer stopping distances at 30 mph. The VESC and ACTS requested the same stopping distances for heavy school buses as for lighter ones. The NHTSA proposed more stringent low-speed stopping requirements than the SAE values to remain consistent with existing requirements of the National Conference on School Transportation, the State of California, and the Bureau of Motor Carrier Safety. International Harvester pointed out that, while the distances are comparable, the requirements are in fact more stringent because of the "no lockup" requirement and the limits on pedal control force in Standard No. 105–75. In view of these variations from existing 30-mph stopping distance requirements, and the less effective braking encountered prior to burnish, the first effectiveness stopping distance at 30 mph is increased from 81 feet to 88 feet. In terms of deceleration rate, this 7-foot increase is comparable to the 4-foot increase for light school buses. Stopping distance requirements other than 30-mph first effectiveness values are adopted as proposed.

The second effectiveness test (S5.1.1.2) is of the service brake system following burnish of the brakes and with the vehicles loaded to its GVWR. Comments were received from Wagner and International Harvester on the distance established for 30-mph stops, and from the VESC and ACTS on the full range of stopping distance requirements, for both light and heavy school buses. International made the same point that it made for other stopping distance tests: that the low-speed distances chosen as comparable to existing requirements are somewhat more difficult due to Standard No. 105–75's specification of "no lockup" and pedal control force limits. In this case, however, the value chosen is far less demanding than that for the unburnished brakes, and the factors cited by International are not as crucial.

Wagner assumed that the NHTSA, in adopting existing school bus "equivalent distance" performance requirements for actual road tests, had not compensated for the fact that existing standards refer to deceleration rates measured by inertial decelerometers. Actually, the NHTSA did apply correction factors to compensate for this fact. Wagner's request for longer distances is denied for this reason.

ACTS asked that the NHTSA set performance requirements equal to those for other vehicles that share the highway with school buses. The VESC recommended decreased stopping distances roughly comparable to values for trucks and buses in Standard No. 105–75 before the standard was indefinitely delayed (40 FR 18411, April 28, 1975). For reasons established in the preamble to that decision, the NHTSA is considering appropriate interim performance levels for hydraulic-braked vehicles other than passenger cars, but is not prepared to specify performance levels at this time. The ACTS and VESC requests will be considered as they apply to those interim requirements, but cannot be considered in this rulemaking because they would necessitate hardware changes that cannot be effectuated prior to the October 27, 1976, statutory deadline for effectiveness of this standard.

The NHTSA proposed that second effectiveness performance requirements at speeds in excess of 60 mph not be specified for school buses. The VESC has argued that such requirements should apply to school buses if they have such high speed capability. While the NHTSA cannot promulgate requirements in this area in the short period that remains prior to the standard's mandated effectiveness, the VESC position will be considered in developing future standards for all vehicles other than passenger cars, including school buses. In view of the above, the second effectiveness distances are adopted as proposed.

No comment was received on the requirements for lightly-loaded stopping distances (S5.1.1.3) other than those already discussed with regard to the second effectiveness test, and the proposed values are therefore also adopted. The second sentence of S5.1.1.3 (referring to vehicles to which the standard is no longer applicable) is also deleted as proposed.

The fourth effectiveness test (S5.1.1.4) is of the abilities of the brake system after it has been subjected to fade and recovery testing under S5.1.4. Manufacturer comments indicated that, in the case of school buses with a GVWR greater than 10,000 pounds, use of a "hot" burnish procedure (S7.4.2.1.2) in combination with the standard's fade and recovery testing makes the fourth effectiveness test redundant. NHTSA analysis agrees with these arguments, and in view of the fact that the hot burnish option will become the only permissible method of conditioning the brakes after September 1, 1976, the proposed fourth effectiveness test for heavier school buses is not adopted.

Since use of the hot burnish procedure was an important factor in the decision to drop the fourth effectiveness requirement for vehicles over 10,000 pounds GVWR, the NHTSA denies the Wagner petition to extend the alternative burnish procedures under S7.4.2.1 after the scheduled deletion of that option on September 1, 1976. Because this option ends before the standard's effectiveness for school buses, S7.4.2.1 has been simplified by eliminating the cold burnish procedure, (S7.4.2.1.1) that will not be used.

The NHTSA also notes General Motors' argument that the fourth effectiveness test should be eliminated for vehicle classes offered with either hydraulic or air brakes simply because there is no comparable requirement in Standard No. 121, *Air Brake Systems*. While the NHTSA agrees that vehicle classes ideally might be subjected to identical requirements whatever the method of brake actuation, formulation of any desired compatibility between hydraulic and air-braked vehicles of the same weight class must be accomplished separately from this rulemaking on school buses, which is subject to a statutory deadline. General Motors' view will be considered in future rulemaking.

The April 28 notice proposed deletion, for school buses, of the option methods for testing the service brake system in the event the brake power assist or brake power unit failed (S5.1.3). The only comment received was from the VESC, which misunderstood the proposal as deleting all tests of a failed power assist or power unit. In fact, school buses will be required to meet S5.1.3.1 as hereby amended. The VESC misunderstanding may have arisen because of unclear language used in proposing an amendment of the test procedure of S7.10 that underlies the requirement. Section S7.10 is appropriately revised in this amendment of the standard.

The NHTSA proposed more stringent fade and recovery performance for school buses than the SAE's recommended levels for other truck-type vehicles, because of the distinctive school bus duty cycle. School buses make a high number of stops compared to the truck-type vehicles which may share common components. These stops are usually made on secondary roads that often have steeper grades than the primary road system. The National School Transportation Association (NSTA) confirmed in statements before an NHTSA public meeting on hydraulic brakes that the association's experience indicated inadequate fade resistance in some of today's school buses. While NHTSA testing indicates that some buses already conform to this requirement, other buses will be required to upgrade their brake systems to conform to this minimum performance level.

Three manufacturers objected to this performance level and each suggested a different modification of the proposed requirement to reduce its stringency. Ford requested a 200-pound allowable pedal force for the first five stops, stating that "The 60 mph fade sequence represents, in Ford's opinion, an extreme condition that would rarely, if ever, be duplicated in normal customer operation of school buses." Wagner stated "It is inconsistent to require one degree of vehicle braking for the Effectiveness Test and another (in this case, more powerful) for the Fade and Recovery. . . . We agree in the need for some measure of fade and recovery but the redundancy of two such requirements in a *minimum* standard has not been addressed. . . ." General Motors cited the good safety record of school buses, questioned the adequacy of NHTSA testing, and stated, with regard to school buses with a GVWR of more than 10,000 pounds, ". . . . the NHTSA has proposed stringent fade and recovery requirements which far exceed minimum performance requirements."

"Minimum" performance standards do not equate with "minimal" performance standards, as implied by General Motors and Wagner. The word "minimum" in the statutory definition of motor vehicle safety standards (15 U.S.C. § 1391-(2)), does not refer to the substantive content of the standards but rather to their legal status—that the products covered must not fall short of them.

Wagner considered it inconsistent to specify a performance level for the fade characteristics of a braking system that would have the effect of improving another characteristic of the braking system (stopping distance performance) beyond the minimum level specified in the standard. The NHTSA disagrees, and considers it appropriate to specify the minimum fade performance necessary to assure adequate performance of brakes in stop-and-go operation, whether or not satisfaction of this minimum level results in a brake system with better stopping distance performance than required by the standard.

While Ford is correct that the test sequence typically will not be experienced in day-to-day operations, that does not rule out the need for the improved fade characteristics suggested by the NSTA. Each of the commenters claims that the fade and recovery characteristics do exceed the poorest performance of some existing vehicles, but none presented convincing justification for their positions that the proposed levels are inappropriate for school bus braking systems. It is also noted that school buses with a GVWR of more than 10,000 pounds no longer have to meet the high-speed or fourth effectiveness requirements. With regard to Ford's suggestion of permitting a 200-pound pedal control force, the NHTSA continues to consider a 150-pound maximum necessary in view of the large percentage of school bus operators that are women (see HSRI Report No. HuF–6, NBS Technical Note 557, October 1970, "The Brake Pedal Force Capability of Adult Females"). Accordingly, the fade and recovery performance values are promulgated as proposed. The proposed wording of S5.1.4.3(b)(2) is modified for clarity in response to Wagner's request.

The proposal included a minimum performance level for the ability of school bus brakes to perform after they are soaked with water. Three comments were received that objected to the proposed performance levels. Wagner also objected that the test conditions were stated with insufficient specificity. The width of the water trough used to wet the brakes is not specified and the width may affect the degree of wetting achieved in large truck tire sizes. The NHTSA intends to address this issue in its upcoming proposal on test intervals in the water recovery test.

For the present NHTSA will resolve differences in this test condition in the manufacturer's favor if they affect the outcome of testing.

General Motors' only objection to inclusion of a water recovery test in this standard for school buses over 10,000 pounds GVWR was that a comparable test in Standard No. 121 has not been developed. The NHTSA is not, of course, limited in the breadth of one standard by the breadth of another, whether or not they measure the same aspect of performance of a vehicle.

International was the only manufacturer to provide data indicating that its vehicles are not capable of meeting the water recovery test in all cases. The NHTSA concludes that other manufacturers' products are capable of meeting the levels established in the standard. The NHTSA denies International's request to permit a 1.5-mile "drying-off" period between wet stops, because it would negate for the most part the effect of soaking.

Therefore, the only modification of water recovery testing from that proposed is to clarify the wording of the minimum permissible control force (S5.1.5.2(b)(2)) as requested by Wagner.

The spike stop and parking brake requirements are amended as proposed.

The test procedures contained in S6.1, S6.2, S7.5, S7.7.1, and S7.10 are revised as appropriate to reflect the amended requirements.

Wagner, Ford, General Motors, and International requested that the brake fluid level indicator not be required for school buses. The NHTSA will make its decision in this area shortly and will publish its response to the issues raised in this rulemaking.

Ford also asked that the parking brake warning indicator be deleted from school bus requirements as a luxury. The NHTSA has never considered this signal to be a luxury, and considers it important to prevent a partially-applied brake from overheating, reducing its efficiency. Ford's request is therefore denied.

Wagner proposed that the present speed range for brake warming in S7.1 and S7.2 (40-to-10-mph snubs) be increased to a range of 50-to-20-mph snubs. The agency has seen no evidence in its test program of the inadequacy of present values, and therefore denies the Wagner request, which was not supported by any data.

The California Department of Highway Patrol (CHP) raised the issue of the adequacy of the standard from the enforcement perspective, particularly the complexity of the stopping distance requirements for use in vehicle-in-use inspection. As noted in a recent notice on air brakes (40 FR 56920, December 5, 1975), new vehicle braking standards may be inappropriate for a State inspection program, because they are not designed to measure degradation of equipment and performance over a period of time. Since degradation of the brake system is not addressed by Standard No. 105-75, the CHP is not prevented by the National Traffic and Motor Vehicle Safety Act (15 U.S.C. 1392(d)) from enforcing requirements that measure the condition of the vehicle, as long as they do not dictate the design or performance of new vehicles.

The CHP recommendations for vacuum gauge and vacuum failure requirements on school buses equipped with vacuum-boosted brakes are being taken under consideration in regard to future rulemaking for truck, bus, and multi-purpose passenger vehicle hydraulic braking standards.

SWS Silicon Corporation's comments on DOT 5 brake fluid are noted, and comments of any interested person on the subject of appropriate brake fluids for school buses are solicited.

In an area unrelated to the applicability of the standard to school buses, persons have requested clarification of an amendment of the standard published September 17, 1975 (40 FR 42872). Section S5.1.5.2(a) consists of an opening paragraph, two numbered subparagraphs, and a concluding paragraph. Subparagraph "(2)" was set forth in its entirety in a revised form in that September action, and it was not clear whether the concluding paragraph that follows it remained unchanged or was eliminated in the revision. For clarification, it is noted that only the subparagraph "(2)" was revised and that the concluding paragraph remains in the standard unchanged.

In consideration of the foregoing, Standard No. 105-75 (49 CFR 571.105-75) is. . . .

Effective date: Oct. 12, 1976. The effective date of this amendment is established as 9 months after the date of its issuance, as required by the Motor Vehicle and Schoolbus Safety Amendments of 1974, Pub. L. 93-492, section 202 (15 U.S.C. 1397(i)(1)(A)).

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); § 202, Pub. L. 93-492, 88 Stat. 1470 (15 U.S.C. 1392); delegation of authority at 49 CFR 1.50)

Issued on January 12, 1976.

James B. Gregory
Administrator

41 F.R. 2391
January 16, 1976

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 105–75

Hydraulic Brake Systems

(Docket No. 70–27; Notice 18)

This notice amends Standard No. 105–75, *Hydraulic Brake Systems*, to permit a manufacturer to provide either a gross loss of pressure indicator (GLPI) or a low brake fluid level indicator (BFLI) in satisfaction of the hydraulic failure indicator requirements of S5.3.1.

This amendment of Standard No. 105–75 (49 CFR 571.105–75) was proposed in response to petitions from Ford Motor Company, Wagner Electric Corporation, and Mercedes-Benz of North America, Inc., as well as the comments of other manufacturers of hydraulic-braked motor vehicles (41 FR 2828, January 20, 1976).

Comments were received from General Motors Corporation, Bob Ingham, Jr., Chrysler Corporation, Wagner Electric Corporation, the California Department of Highway Patrol (CHP), Professor P. N. Joubert, Bendix Corporation, British Leyland UK Limited, the Vehicle Equipment Safety Commission, Ford Motor Company, Bayerische Motoren Werke, and the Department of Transport of Australia. The National Motor Vehicle Safety Advisory Council made no comment on the proposal.

All commenters except the CHP, VESC, Department of Transport of Australia, and Professor Joubert endorsed the amendment as proposed and urged its swift implementation.

The CHP recommended that the proposed option be allowed only until the availability and reliability problems associated with the BFLI are resolved, at which time the BFLI would be required on all vehicles. The VESC also recommended a requirement for both of the devices or the BFLI alone. It is the opinion of the CHP that the apparent benefit of a GLPI is not real, because the GLPI warning activates only after failure has occurred, when increased pedal travel and decreased stopping performance have already warned of the faulty condition. However, the failure of one subsystem in split system vehicles, particularly that to the rear wheels, easily may go unnoticed during the low rate-of-deceleration stops encountered in normal driving. In this vast majority of cases, the driver will be warned of the failure by the GLPI before the brake failure is apparent, a substantial benefit in averting accidents.

Each of the four commenters who did not support the proposal found fault with the NHTSA's use of the extremely limited accident data from the Indiana University Institute for Research in Public Safety study (*Tri-Level Study of the Causes of Traffic Accidents*, DOT–HS–801–335, January, 1975). The four commenters apparently interpreted Notice 17 to mean that the NHTSA had concluded, based on this small amount of data, that the BFLI was not cost-effective. Such is not the case. The NHTSA's evaluation of the Indiana study only concluded that its earlier judgement that both warnings were justified was cast in some doubt by the limited data generated since that initial decision was made. The NHTSA believes that the doubt is sufficient to justify dropping the simultaneous requirement for both devices.

As noted by the CHP, the accident data are not yet available to quantitatively prove the comparative benefits of one warning system over the other. Although the four dissenting commenters expressed a preference for the BFLI, the NHTSA feels that there is insufficient evidence of its superiority to mandate its use in place of the GLPI. The NHTSA believes that a continuation of the option previously available under Standard No. 105 is in the public interest.

Ford Motor Company pointed out that the proposed wording of S7.9.1, which refers to a "brake system failure indicator," was inconsistent with other references in the standard, and suggested that the word "failure" be removed. The reference has been changed to read "brake system indicator lamp" to be consistent with S5.3. Section S7.9.4 also is reworded for the same reason.

In a matter unrelated to the BFLI proposal, the agency hereby corrects an inadvertent omission of a conforming amendment that should have accompanied the major amendment making the standard applicable to school buses (41 FR 2391, January 16, 1976). The reference to "S7.4.2.1.2" in S6 is changed to "S7.4.2.1."

In consideration of the foregoing, Standard No. 105-75 (49 CFR 571.105-75) is amended....

Effective date: April 22, 1976. Because this amendment creates no additional requirements for any person and because of the manufacturers' need to know as soon as possible the vehicle requirements for the upcoming model year for planning purposes, it is found that an immediate effective date is in the public interest.

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegations of authority at 49 CFR 1.50 and 49 CFR 501.8.)

Issued on April 14, 1976.

James B. Gregory
Administrator

41 F.R. 16803
April 22, 1976

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 105–75

Hydraulic Brake Systems

(Docket No. 75–27; Notice 4)

This notice amends Standard No. 105–75, *Hydraulic Brake Systems*, and Standard No. 122, *Motorcycle Brake Systems*, to modify the means for establishing the frictional resistance of the surface on which stopping distance tests are conducted. A similar amendment is made to Part 575, *Consumer Information*, of Title 49 of the Code of Federal Regulations.

The National Highway Traffic Safety Administration (NHTSA) proposed the change in Standard No. 105–75 (49 CFR 571.105–75), Standard No. 121, *Air Brake Systems* (49 CFR 571.121), Standard No. 122 (49 CFR 571.122), and the Consumer Information Regulations (49 CFR 575.101) in response to a petition from British-Leyland Motors Limited (40 FR 45200, October 1, 1975). The existing test procedure in these regulations has specified use of the American Society for Testing and Materials (ASTM) E–274–65T procedure, using an ASTM E249 tire that is no longer manufactured.

Responses were received on the proposed ASTM change from White Motor Corporation (White), Mack Trucks, Inc. (Mack), Freightliner Corporation (Freightliner), Ford Motor Company (Ford), General Motors Corporation (GM), Chrysler Corporation (Chrysler), American Motors Corporation (AMC), and International Harvester (IH). The National Motor Vehicle Safety Advisory Council made no comment on the proposal.

Most commenters supported use of the new test procedure and tire, although they differed in recommendations for correlating the reading produced under the new procedure with that produced under the old procedure. Manufacturers are presently certifying compliance to brake standards on test surfaces with a satisfactory reading under the old procedure, and they should be able to continue testing and certifying compliance on the same surface without any increase in the severity of the tests. To accomplish this transition, the correlation in readings between the procedures has been determined, and the difference is reflected in a change of the dry surface value from "skid number" 75 to "skid number" 81.

Freightliner urged postponement of any action until it could be supported by "adequate and statistically reliable test data." AMS also reommended that the NHTSA do nothing "until the industry has had sufficient time to evaluate and verify the performance of the ASTM E501 test tire on all types of surfaces."

The change in procedure is prompted by the ASTM decision to utilize a new tire in ascertaining the frictional coefficient of test surfaces. As a result the old tire is no longer manufactured and only the new tire is available for skid number measurement. Manufacturers have conducted comparative tests with the new tire to determine the correlation between the readings given by the two tires. Neither Freightliner nor AMC submitted data showing that the agency's proposal to adjust the dry surface skid number upwards is unjustified. Only Mack submitted data and it supported the NHTSA and Federal Highway Administration test data that have been placed in the docket. General Motors considered the agency's proposed upward adjustment to be the maximum desirable based on its data. International Harvester, Chrysler, and Ford supported the change in dry surface skid number without qualification, and White suggested that a skid number of 85 be utilized. The agency finds that the AMC and Freightliner requests for further delay are unjustified.

Ford and Freightliner asked that the skid number for the lower coefficient (wet) surface also be adjusted. The agency's purpose in proposing the adjustment is limited to changes necessary to avoid a modification of the test surfaces or an increase in the severity of performance levels specified under the safety standards. The NHTSA earlier concluded that change of the wet surface specification was unnecessary, and no evidence has been supplied that would modify the earlier determination.

General Motors noted that an editorial change to the newer ASTM procedure does not appear in early publications of that procedure. To put all interested persons on notice of the editorial change, the NHTSA has included the change in its references to the ASTM E274-70 procedure.

Freightliner asserted that the newer procedure included modification of a formula that justified a larger upwards adjustment than that proposed by the agency. Actually, the modifications only corrected an error in the earlier formula which had no effect on the determination of frictional coefficient. Manufacturers either utilized a test trailer that obviated the need for calculations using the formula, or were aware of the error and corrected for it in their calculations. Thus the adjustment requested by Freightliner is not warranted.

In accordance with recently-enunciated Department of Transportation policy encouraging adequate analysis of the consequences of regulatory action (41 FR 16201, April 16, 1976), the agency herewith summarizes its evaluation of the economic and other consequences of this amendment on the public and private sectors, including possible loss of safety benefit. Because the new references to procedures and a test tire are expected to accord with existing practices, the amendment is judged not to have any significant impact on costs or benefits of the standards and consumer information item that are modified by the change.

Standard No. 121, *Air Brake Systems*, is presently subject to judicial review under § 105(a) of the National Traffic and Motor Vehicle Safety Act (15 U.S.C. § 1394(a)). The U.S. Court of Appeals hearing the petition for review has indicated that it prefers to review the standard as it presently exists, without unnecessary amendment. To the degree possible, the agency is complying with that request and therefore, in the case of Standard No. 121, will delay the update of ASTM procedure until review is completed.

It is noted that this change in procedure for ascertaining the frictional resistance of the test surface does not invalidate data collected using the older procedure, and manufacturers can presumably certify on the basis of stopping distance tests conducted on sufaces measured by the old tire.

In consideration of the foregoing, amendments are made in Chapter V of Title 49, Code of Federal Regulations.

Effective date: June 14, 1976. Because the older test tire is no longer manufactured, and because the amendment of procedure and test tire is intended only to duplicate the existing procedure and tire, this amendment creates no additional requirements for any person, and an immediate effective date is found to be in the public interest.

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.50.)

Issued on June 8, 1976.

James B. Gregory
Administrator

41 F.R. 24592
June 17, 1976

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 105–75

Hydraulic Brake Systems

(Docket Nos. 75–7; 75–16; Notices 3, 9)

This notice republishes in their entirely Standard No. 105–75, *Hydraulic Brake Systems*, and Standard No. 121, *Air Brake Systems*, because the number and complexity of recent amendments to these standards may have created confusion for some interested persons.

Standard No. 105–75 (49 CFR 571.105–75) was issued September 1972 (37 FR 17970, September 2, 1972) and has been amended numerous times since issuance. Although an up-to-date and complete text of the standard appears each year in the republished Code of Federal Regulations, several complex amendments have been made to the standard in the past year that are not reflected in the most recent up-to-date text. To assist interested persons who must be certain of the text's provisions, the agency herewith publishes the standard in its entirety. Interested persons are advised that amendments of Standard No. 105–75 may occur in the future, although no proposals are outstanding at this time.

In a related matter, General Motors Corporation has brought to the agency's attention an inadvertent deletion of one sentence from one section of Standard No. 105–75. A statement was added to the text of S5.1.5.2(a)(2) to permit an interim increase in permissible control force for the fifth wet recovery stop (40 FR 24525, June 9, 1975). Inadvertently, this sentence was deleted from S5.1.5.2(a)(2) in a subsequent rulemaking action (40 FR 42872, September 17, 1975), although the preamble to the notice made clear that "The new wording in no way modifies the meaning of S5.1.4(a)(2) and S5.1.5.2(a)(2)." To correct this omission, the sentence appears in this publication. It has been moved to S5.1.5.2(a)(1) because it concerns the maximum pedal force limit in that section, rather than the minimum pedal force limit in S5.1.5.2(a)(2) where it appeared in the past.

Standard No. 121 (49 CFR 571.121) was issued in February 1971 (36 FR 3817, February 27, 1971) and has also been amended numerous times since issuance. Several amendments have occurred since the most recent publication of the standard in its entirety. For the reasons cited with regard to Standard No. 105–75, the agency herewith publishes the standard in its entirety. Interested persons are advised that three proposals to amend the standard are outstanding (40 FR 45200, October 1, 1975) (40 FR 56920, December 5, 1975) (41 FR 20706, May 20, 1976) and that amendments to the text of the standard may be made in the future.

It has also been noted that a clarification could be made to the language of S3 of the standard that excludes until September 1, 1977, vehicles that combine with other vehicles to form auto transporters. The temporary exclusion was added to the standard in January 1975 (40 FR 1246, January 7, 1975). To make the effect of that action more clear, the language in the second sentence of the text "or to any vehicle which" is changed in this republication to read "or that." This modification of the language has no effect on the requirements of this standard and notice and opportunity to comment are therefore found to be unnecessary.

In consideration of the foregoing, Standard No. 105–75 (49 CFR 571.105–75) and Standard No. 121 (49 CFR 571.121) are republished to read as set forth below.

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegations of authority at 49 CFR 1.50 and 49 CFR 501.8.)

Issued on June 30, 1976.

Robert L. Carter
Associate Administrator
Motor Vehicle Programs

41 F.R. 29696
July 19, 1976

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 105–75

Hydraulic Brake Systems

(Docket No. 73–03; Notice 7); (Docket No. 73–20; Notice 10); (Docket No. 73–34; Notice 4); (Docket No. 75–02; Notice 3); (Docket No. 75–03; Notice 5); (Docket No. 75–07; Notice 3); (Docket No. 75–24; Notice 3)

This notice announces that the effective dates of the redefinition of "school bus" and of six Federal motor vehicle safety standards as they apply to school buses are changed to April 1, 1977, from the previously established effective dates. This notice also makes a minor amendment to Standard No. 220, *School Bus Rollover Protection*, and adds a figure to Standard No. 221, *School Bus Body Joint Strength.*

The Motor Vehicle and Schoolbus Safety Amendments of 1974 (the Act) mandated the issuance of Federal motor vehicle safety standards for several aspects of school bus performance, Pub. L. 93–492, § 202 (15 U.S.C. § 1392 (i) (1) (A)). These amendments included a definition of school bus that necessitated a revision of the existing definition used by the NHTSA in establishing safety requirements. The Act also specified that the new requirements "apply to each schoolbus and item of schoolbus equipment which is manufactured . . . on or after the expiration of the 9-month period which begins on the date of promulgation of such safety standards." (15 U.S.C. § 1392(i) (1) (B)).

Pursuant to the Act, amendments were made to the following standards: Standard No. 301–75, *Fuel System Integrity* (49 CFR 571.301–75), effective July 15, 1976, for school buses not already covered by the standard (40 FR 483521, October 15, 1975); Standard No. 105–75, *Hydraulic Brake Systems* (49 CFR 571.105–75), effective October 12, 1976 (41 FR 2391, January 16, 1976); and Standard No. 217, *Bus Window Retention and Release* (49 CFR 571.217), effective for school buses on October 26, 1976 (41 FR 3871, January 27, 1976).

In addition, the following new standards were added to Part 571 of Title 49 of the Code of Federal Regulations, effective October 26, 1976: Standard No. 220, *School Bus Rollover Protection* (41 FR 3874, January 27, 1976); Standard No. 221, *School Bus Body Joint Strength* (41 FR 3872, January 26, 1976); and Standard No. 222, *School Bus Passenger Seating and Crash Protection* (41 FR 4016, January 28, 1976). Also, the existing definition of "school bus" was amended, effective October 27, 1976, in line with the date set by the Act for issuance of the standards.

The Act was recently amended by Public Law 94–346 (July 8, 1976) to change the effective dates of the school bus standards to April 1, 1977 (15 U.S.C. § 1392(i) (1) (B)). This notice is intended to advise interested persons of these changes of effective dates. In the case of Standard No. 301–75, the change of effective date is reflected in a conforming amendment to S5.4 of that standard. A similar amendment is made in S3 of Standard No. 105–75.

The agency concludes that the October 27, 1976, effective date for the redefinition of "school bus" should be postponed to April 1, 1977, to conform to the new effective dates for the upcoming requirements. If this were not done, the new classes of school buses would be required to meet existing standards that apply to school buses (e.g., Standard No. 108 (49 CFR 571.108)) before being required to meet the new standards. This would result in two stages of compliance, and would complicate the redesign efforts that Congress sought to relieve.

This notice also amends Standard No. 220 in response to an interpretation request by Blue Bird Body Company, and Sheller-Globe Corporation's petition for reconsideration of the standard. Both companies request confirmation that the standard's requirement to operate emergency exits during the application of force to the vehicle roof (S4(b)) does not apply to roof exits which are covered by the force application plate. The agency did not intend to require the operation of roof exits while the force application plate is in place on the vehicle. Accordingly, an appropriate amendment has been made to S4(b) of the standard.

With regard to Standard No. 220, Sheller-Globe also requested confirmation that, in testing its school buses that have a gross vehicle weight rating (GVWR) of 10,000 pounds or less, it may test with a force application plate with dimensions other than those specified in the standard. The standard does not prohibit a manufacturer from using a different dimension from that specified, in view of the NHTSA's expressed position on the legal effect of its regulations. To certify compliance, a manufacturer is free to choose any means, in the exercise of due care, to show that a vehicle (or item of motor vehicle equipment) would comply if tested by the NHTSA as specified in the standard. Thus the force application plate used by the NHTSA need not be duplicated by each manufacturer or compliance test facility. Sheller-Globe, for example, is free to use a force application plate of any width as long as it can certify its vehicle would comply if tested by the NHTSA according to the standard.

In a separate area, the agency corrects the inadvertent omission of an illustration from Standard No. 221 as it was issued January 26, 1976 (41 FR 3872). The figure does not differ from that proposed and, in that form, it received no adverse comment.

In accordance with recently-enunciated Department of Transportation policy encouraging adequate analysis of the consequences of regulatory action (41 FR 16200, April 16, 1976), the agency herewith summarizes its evaluation of the economic and other consequences of this action on the public and private sectors, including possible loss of safety benefits. The changes in effective dates for the school bus standards are not evaluated because they were accomplished by law and not by regulatory action.

The change of effective date for the redefinition of "school bus" will result in savings to manufacturers who will not be required to meet existing school bus standards between October 27, 1976, and April 1, 1977. The agency calculates that the only standard that would not be met would be the requirement in Standard No. 108 for school bus marker lamps. In view of the agency's existing provision for the markings of eight school buses in Pupil Transportation Standard No. 17 (23 CFR 1204), it is concluded that the absence of this equipment until April 1, 1977, will not have a significant adverse impact on safety.

The interpretative amendment of Standard No. 220 and the addition of a figure to Standard No. 221 are not expected to affect the manufacture or operation of school buses.

In consideration of the foregoing, Part 571 of Title 49 of the Code of Federal Regulations is amended. . . .

Effective dates:

1. Because the listed amendments do not impose additional requirements of any person, the National Highway Traffic Safety Administration finds that an immediate effective date of August 20, 1976 is in the public interest.

2. The effective date of the redefinition of "school bus" in 49 CFR Part 571.3 that was published in the issue of December 31, 1976 (40 FR 60033) is changed to April 1, 1977.

3. The effective dates of Standard Nos. 105-75, 217, 301-75, 220, 221, and 222 (as they apply to school buses) are April 1, 1977, in accordance with Public Law 94-346.

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); Pub. L. 94-346, Stat.

(15 U.S.C. § 1392(i)(1)(B)); delegation of authority at 49 CFR 1.50.)

Issued on August 17, 1976.

John W. Snow
Administrator

41 F.R. 36026
August 26, 1976

PREAMBLE TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 105-83

Hydraulic Brake Systems
(Docket No. 70-27; Notice 20)

ACTION: Final rule.

SUMMARY: This notice amends Standard 105, Hydraulic Brake Systems. The standard currently applies to passenger cars and school buses. Its applicability is extended on a general basis (with some modifications) to trucks, all types of buses, and multipurpose passenger vehicles (MPV's) with a gross vehicle weight rating (GVWR) of 10,000 lbs. or less. Several requirements are also extended to trucks, buses and MPV's with a GVWR greater than 10,000 lbs. In addition, the standard's requirements for school buses are upgraded.

DATES: The effective date of this amendment is September 1, 1983.

ADDRESSES: Petitions for reconsideration should refer to the docket number and be submitted to: Docket Section, Room 5108, 400 Seventh Street, S.W., Washington, D.C. 20590.

FOR FURTHER INFORMATION CONTACT:

Mr. George L. Parker, Office of Vehicle Safety Standards, National Highway Traffic Safety Administration, 400 Seventh Street S.W., Washington D.C. 20590
(202-426-2720)

SUPPLEMENTARY INFORMATION: Standard 105, Hydraulic Brake Systems, currently applies to passenger cars and school buses. This notice extends its applicability on a general basis (with some modifications) to trucks, all types of buses, and multipurpose passenger vehicles (MPV's) with a gross vehicle weight rating (GVWR) of 10,000 lbs. or less. Several requirements are also extended to trucks, buses and MPV's with a GVWR greater than 10,000 lbs. In addition, the standard's requirements for school buses are upgraded.

This final rule was preceded by a notice proposing the extension of Standard 105 in October 1979 (44 FR 60113). Private citizens, safety organizations, manufacturers, and manufacturer trade associations have submitted comments on the proposal. The NHTSA has considered all of those comments and the most significant ones are discussed below.

The agency made two significant modifications in the proposed standard's requirements as a result of the comments. As will be explained below, the agency determined that third effectiveness requirements should not be applicable to vehicles, other than school buses, with a GVWR of 8,000 to 10,000 lbs. Also, the agency determined that fourth effectiveness stopping distance requirements for vehicles with a GVWR of 8,000 to 10,000 lbs., as well as spike stop check stopping distance requirements for those vehicles, should be slightly relaxed.

The changes in the standard's requirements were made to give manufacturers additional leeway in balancing the performance of their vehicles' braking systems for both fully loaded and lightly loaded conditions and to ensure that the requirements would not result in unduly burdensome certification responsibilities being imposed on final stage manufacturers.

A slight change was also made in the standard's definition of "lightly loaded vehicle weight" to permit the use of additional instrumentation.

Also in response to the comments, the agency determined that a longer period of leadtime should be provided. The effective date of the requirements is September 1, 1983, which gives a leadtime of more than two years.

Many comments were received in support of extending Standard 105 to to apply to trucks, all types of buses, and MPV's. General Motors, Chrysler and American Motors/Jeep all stated that they support the adoption of requirements for hydraulic braked trucks, buses and MPV's, though all three companies requested some modifications in the standard as proposed. Wagner Electric stated that it is commendable that efforts are being made to improve the safety of the highways and that it can see the benefits that may accrue when more varieties of highway vehicles have been brought under the control of the appropriate minimum braking standard.

Both Ford and the Japan Automobile Manufacturers Association stated that they are not opposed to the application of braking performance requirements to vehicles in addition to passenger cars and school buses. The Japan Automobile Manufacturers Association added that, from the viewpoint of safety, it thought this application should be promoted.

The National Transportation Safety Board stated that it supported the action, noting that by reducing the current disparity between the braking capability of passenger cars and many trucks and vans, motor vehicle accidents should be reduced. The Board also stated its support for the requirements upgrading the performance requirements for school buses.

While the General Accounting Office of the United States did not specifically comment on this rulemaking, a report to the United States Congress by the Comptroller General issued in 1978 called for, among other things, expeditious rulemaking on light truck braking performance. See Report to Congress by the Comptroller General of the United States, Unwarranted Delays by the Department of Transportation to Improve Light Truck Safety, July 6, 1978.

The Center for Auto Safety stated that extension of the standard is long overdue and is fully supported by the large number of consumer complaints that the Center received each year on inadequate brakes on light trucks, vans and MPV's.

Effectiveness Requirements

Comments received on the proposal's effectiveness requirements for service brake systems primarily dealt with the third and fourth effectiveness test stopping distances for vehicles with a GVWR of 8,000 to 10,000 lbs. Several comments stated that the stopping distance requirements that were proposed were too stringent.

The fourth effectiveness test is an effectiveness test of the braking system which is conducted after the fade tests and while the vehicle is fully loaded. Because it comes after the fade tests, during which some deterioration of the brakes may occur, the fourth effectiveness test was considered by several commenters to be the most stringent of the fully loaded effectiveness tests. Generally discussed along with the fourth effectiveness test were the spike stop check stopping distance requirements. These requirements represent an abbreviated effectiveness test with the same stopping distance requirements as the fourth effectiveness test, which is conducted after the spike stops (which follow the fourth effectiveness test). Because the commenters addressed these tests together and because the stopping distance requirements are the same for the two tests, the discussion of these requirements will subsume the spike stop check stopping distance requirements into consideration of the fourth effectiveness stopping distance requirements.

According to the commenters, brakes which are powerful enough to meet the fourth effectiveness (fully loaded) stopping distance requirements for vehicles in that weight class would be prone to lockup in the lightly loaded condition. If lockup occurred in the lightly loaded condition, the vehicles would be unable to meet the third effectiveness (lightly loaded) stopping distance requirements. Several comments stated that manufacturers would find it necessary to develop anti-lock or similar devices in order to meet the requirements as proposed.

Other comments on the third and fourth effectiveness requirements for this class of vehicles focused on possible deleterious effects that the requirements might have on final stage manufacturers and the market which they serve. (A "final stage manufacturer" is a manufacturer which typically purchases an incomplete vehicle which usually consists only of a chassis, suspension, power train, brakes and perhaps an occupant compartment from an incomplete vehicle manufacturer such as Ford, General Motors or Chrysler and completes the vehicle by adding a body or work-performing equipment).

Any final stage manufacturer that does not complete a vehicle in accordance with conditions established by the incomplete vehicle manufacturer must recertify that the completed vehicle complies with applicable safety standards based upon its own information, analysis, or tests. Several commenters were concerned that final stage manufacturers would not be able to meet those conditions and thus would be required to engage in extensive testing of their vehicles. According to those commenters, extensive testing is not feasible for final stage manufacturers as they are often small manufacturers that produce only limited numbers of a variety of specialty vehicles.

Changes suggested by the commenters varied, depending upon whether they were addressing the requirements from the point of view of the large manufacturers (i.e., the incomplete vehicle manufacturers) or the final stage manufacturers. General Motors, for example, stated that it could meet the longest of a range of stopping distances proposed for the third effectiveness test if fourth effectiveness test stopping distances were extended by 10 percent. Comments received from Ford and Chrysler were similar, with Ford asking for a relatively minor increase in third effectiveness stopping distances and a 10 percent increase in fourth effectiveness stopping distances, while Chrysler requested a 16 percent increase in stopping distances for fourth effectiveness tests.

Those commenters primarily concerned with final stage manufacturer certification difficulties suggested various approaches, including not extending Standard 105 at this time or only extending it to vehicles with a GVWR under 8,000 lbs. Other approaches suggested by those commenters include applying different test requirements to final stage manufacturers, so long as the braking systems on their vehicles are used on similar vehicles, requiring incomplete vehicle manufacturers to give additional information to final stage manufacturers to help them make engineering judgments about the effect changes in the center of gravity will have on a vehicle's braking ability, and providing a longer period of leadtime to final stage manufacturers than other manufacturers.

The latter approach was suggested because some final stage manufacturers were concerned that incomplete vehicle manufacturers would not provide information about new conditions established as a result of the proposed requirements until just before the time of model introduction. According to those comments, final stage manufacturers need to receive such information well in advance of the time of model introduction in order that they can design their vehicles in accordance with the conditions.

The agency was aware of the braking design problems associated with trucks, buses and MPV's, including those particularly affecting vehicles over 8,000 lbs. GVWR, when it issued the proposal. The proposal explained that while trucks, buses and MPV's should ideally stop in as short a distance as passenger cars, since they share the same roads and traffic flow, there are certain differences between those vehicles which make accomplishing that goal more difficult for trucks, buses and MPV's. The primary differences are the greater loaded to empty-weight ratio of trucks, MPV's and buses, the higher center of gravity found in those vehicles (which results in greater dynamic weight transfer during braking), the greater variations in loaded and unloaded weight distribution that occur in those vehicles and the lower traction capabilities of truck tires. Because these factors make it difficult to design braking systems which provide the appropriate brake torque for each axle under all braking and load conditions, the agency proposed stopping distances that were slightly longer than those in effect for passenger cars.

The notice also discussed the design problems particularly affecting trucks, buses and MPV's with a GVWR over 8,000 lbs. In order to stop in as short a distance as lighter vehicles, vehicles with GVWR of 8,000 lbs. or more require powerful rear brakes to meet fully loaded stopping distance requirements. When the vehicles are stopped in a lightly loaded condition, however, the powerful rear brakes can cause wheel-lockup and resulting vehicle instability. Because of these design problems, the agency proposed ranges of slightly longer third effectiveness test stopping distances for vehicles with a GVWR of 8,000 to 10,000 lbs than for vehicles with lower GVWR. In proposing the requirements, the agency stated that it was its intention to avoid requiring manufacturers to develop anti-lock or similar devices for their vehicles. While such systems may be able to overcome these problems, there is no field-tested anti-lock system for hydraulic-braked vehicles that is commercially available at this time.

The stopping distances proposed for the third and fourth effectiveness tests were based upon tests conducted by the agency on existing production vehicles and upon confidential brake development test data submitted by General Motors, Ford and Chrysler. Based upon its analysis of these data, the agency concluded that the proposed stopping distances for both the third and fourth effectiveness tests for vehicles with a GVWR of 8,000 to 10,000 lbs., including vehicles with unusually high centers of gravity and with both short and long wheelbases (which typically are more difficult to design brakes for than other vehicles), could be met without anti-lock or similar devices. Instead, the requirements could be met by modifications to such vehicle components as brake linings, wheel cylinders, master cylinders, and combination valves.

This conclusion does not, however, fully resolve the concerns raised about the requirements as they relate to final stage manufacturers. As noted above, final stage manufacturers, typically purchase incomplete vehicles from large manufacturers and complete the vehicles, often for specialized needs. Since only a limited number of incomplete vehicle designs are available for purchase, a final stage manufacturer must use the same incomplete vehicle design for widely varying applications. A given incomplete vehicle design may be completed as a pickup, a recreational vehicle, or a high cube van. Diverse equipment may be added such as service cranes, lift gates, ladders, aerial devices, and snow plows. Assuming that a final stage manufacturer does not redesign the braking system for each different use, the braking system sold with the incomplete vehicle by its manufacturer must serve applications with widely varying centers of gravity (i.e., varying both vertically and horizontally).

The agency estimates that a 10 percent rise in center of gravity location will lengthen the stopping distance of a typical vehicle by three percent if it is operating at the limit of tire traction for its rear wheels. Changes in horizontal center of gravity will also lengthen stopping distances in some instances. It follows that a vehicle which would barely meet the requirements of the proposed standard at the specific center of gravity for which it is designed, which would be the case for some vehicles with a GVWR of 8,000 to 10,000 lbs., would not be able to meet the requirements at centers of gravity widely varying from the design one.

The agency agrees, after analysis of the comments received from final stage manufacturers, their trade associations, and incomplete vehicle manufacturers, that the increased center of gravity limitations which might be established for some vehicles of 8,000 to 10,000 lbs. GVWR if the proposal were adopted would pose significant difficulties for final stage manufacturers. (Some limitations are currently established by incomplete vehicle manufacturers in connection with their certification of Standards 212, 219, and 301.) In some instances, a final stage manufacturer would be unable to simply complete vehicles on the same incomplete vehicle that it is accustomed to using, as the center of gravity of the completed vehicles would not be within the center of gravity envelope specified by the incomplete vehicle manufacturer.

The final stage manufacturer would be faced with buying the same incomplete vehicles as before and recertifying them and possibly redesigning their braking systems. Since the sales of incomplete vehicles to final stage manufacturers are a very small percentage of the light truck sales of the incomplete vehicle manufacturers, the incomplete vehicle manufacturers are not likely to be willing to accommodate the final stage manufacturers by making major modifications to the line of incomplete vehicles they offer for sale, such as providing incomplete vehicles which are designed for a broader range of centers of gravity. The incomplete vehicle manufacturers have themselves indicated this reluctance in a number of rulemakings.

The agency has dealt with the certification problems of final stage manufacturers during other rulemaking proceedings. Since final stage manufacturers are often very small companies, which produce limited numbers of speciality vehicles, they often have limited resources for redesigning their vehicles, testing their vehicles for compliance with applicable safety standards, or making engineering judgments about the effect changes in a vehicle's center of gravity will have on the vehicle's performance. Therefore, the agency has sought to limit, consistent with the needs of safety, the compliance burdens on final stage manufacturers.

For example, the agency established special provisions affording relief to final stage manufacturers in Standards 212, Windshield Mounting, and 219, Windshield Zone Intrusion. See notice of Final Rule, published in the *Federal Register* (45 FR 22044) on April 3, 1980. One of the final stage manufacturer problems that was addressed in that rulemaking proceeding was center of gravity limitations established by incomplete vehicle manufacturers. The agency added the special provisions to Standards 212 and 219 for the purpose of inducing the reduction of center of gravity restrictions placed on final stage manufacturers by incomplete vehicle manufacturers.

In order to ease the certification problems of final stage manufacturers that are related to Standard 105, while providing the maximum safety benefits that are consistent with that objective, the agency determined that third effectiveness requirements should not apply to vehicles, other than school buses, with a GVWR of 8,000 to 10,000 lbs. The problem of center of gravity limitations as it relates to the proposed test requirements is primarily limited to the third effectiveness (lightly loaded) test. Since the test is conducted while the vehicle is in an unloaded condition, the manufacturer is constrained to test at the vehicle's center of gravity of the vehicle as configured. Center of gravity is not a serious problem for the other effectiveness tests, which are conducted at GVWR. For those tests, the manufacturer may load the vehicle in a way so as to lower the center of gravity and make compliance easier.

In order to provide manufacturers with some additional leeway in balancing the performance of their braking systems for both fully loaded and lightly loaded conditions, the agency also decided that the fourth effectiveness (fully loaded) stopping distances should be extended by approximately 10 percent for the 8,000 to 10,000 lb. GVWR vehicles. As noted above, if fourth effectiveness requirements are too stringent, vehicles would need overly powerful rear brakes that are prone to lock-up in the lightly loaded condition. The agency recognizes that it is more difficult to meet the proposed fourth effectiveness requirements for this class of vehicles without producing vehicles that are prone to lock-up, though, as indicated above, test data indicate that it can be accomplished. The relaxation of the fourth effectiveness requirements will assure that the manufacturers can use braking systems that perform well in the lightly loaded condition.

In making these modifications to the proposed requirements for vehicles with a GVWR of 8,000 to 10,000 lbs., the agency decided that school buses within that weight class should be treated separately. School buses are already required to meet Standard 105's requirements, though the October 1979 notice proposed making the requirements more stringent. As will be explained below, the agency decided that the proposal's fourth effectiveness requirements for school buses with a GVWR of 8,000 to 10,000 lbs. should be extended by 10 percent (the same as other vehicles within that weight class), with the exception of the 30 mph test. The agency also decided that third effectiveness stopping distance requirements, at the longest distances proposed, should be applicable to school buses.

Since school buses are already covered by Standard 105, the agency has a great deal of test data indicating their braking capability. Because school buses with a GVWR of 8,000 to 10,000 lbs. share most of the same characteristics as other vehicles with the same weight, the agency decided that fully loaded effectiveness requirements should be the same for school buses as for other vehicles, with the one exception referred to above. School buses are already required to meet slightly more stringent requirements for fully loaded tests at 30 mph. Therefore, the agency will not relax those requirements. For fully loaded tests at other speeds, the requirements are more stringent than those currently in effect.

As noted above, both agency test data and several comments indicate that the proposed third effectiveness test requirements (at the longest stopping distances proposed) can be met by vehicles with a GVWR of 8,000 to 10,000 lbs., particularly when the proposed fourth effectiveness stopping distances are slightly relaxed. The agency's decision that third effectiveness test requirements should not be applicable to vehicles with a GVWR of 8,000 to 10,000 lbs. resulted from possible center of gravity conditions that incomplete vehicle manufacturers might establish for the use of their vehicles. Since school buses do not have high centers of gravity or widely varying horizontal centers of gravity, they do not pose the same problems for final stage manufacturers as other vehicles. Moreover, since completing a vehicle as a school bus adds weight to the rear axle, the lightly loaded effectiveness test is more easily met by school buses than many other vehicles. The comments received that related to third effectiveness tests and final stage manufacturer difficulties did not identify the requirements for school buses as creating difficulties. Therefore, based upon a detailed analysis of test data, manufacturer-supplied information, and the comments, as well as on the safety need associated with school buses, the agency decided that third effectiveness test requirements should apply to school buses with a GVWR of 8,000 to 10,000 lbs.

The agency believes that the modifications in the standard that were discussed above will eliminate any possibility that incomplete vehicle manufacturers will find it necessary either to establish more stringent center of gravity limitations on the use of their incomplete vehicles or to develop anti-lock or similar devices in order to be able to continue to produce incomplete vehicles that comply with the standard for the range of applications needed by final stage manufacturers. Final stage manufacturers, therefore, will ordinarily be able to rely on the incomplete vehicle manufacturer's certification of the braking system.

In some rare cases, such as when a final stage manufacturer adds an axle or redesigns the braking system of an incomplete vehicle, the final stage manufacturer will be required to recertify that the completed vehicle complies with the brake requirements. Depending upon the changes made, the final stage manufacturer may be able to certify based upon engineering judgments. If testing is required, the agency estimates that the costs of a full test sequence would be approximately $2,500, assuming that the manufacturer has no facilities, instrumentation or test personnel of its own. Testing would not have to be conducted for each vehicle, but only for each vehicle type or, in some cases, the most problem prone configuration of several vehicle types. There are several test facilities and testing organizations distributed throughout the United States.

Such major changes are rarely made by final stage manufacturers, and, if they are, they tend to be made by the larger of these manufacturers. When such changes are made, the agency believes it appropriate to require that the manufacturer making those changes ensure that the vehicle still complies with applicable Federal motor vehicle safety standards.

In adopting these changes, the agency followed, in part, the suggestions of several of the commenters. The National Truck Equipment Association (NTEA), for example, suggested that if the agency extends the standard at this time, it should select 8,000 lbs. GVWR as the cutoff weight for Standard 105. That cutoff was said to address the brake proportioning difficulties inherent in vehicles with a wide weight differential in their laden and unladen conditions. The agency declined to completely exempt vehicles of 8,000 lbs. or greater GVWR from Standard 105's coverage, since the standard offers many benefits in addition to those resulting from the requirements that would cause difficulties for final stage manufacturers. However, the agency did use 8,000 lbs. GVWR as the cutoff weight for the standard's third effectiveness requirements, the requirements which most directly relate to the brake proportioning difficulties referred to by NTEA.

The agency followed the suggestions of several incomplete vehicle manufacturers and other commenters also in deciding to relax fourth effectiveness stopping distance requirements for 8,000 to 10,000 lb. GVWR vehicles. Since the agency concluded that the requirements could be met as proposed without anti-lock or similar devices, albeit with some difficulty, the agency declined to adopt Chrysler's suggestion of a 16 percent extension and instead chose the 10 percent extension suggested by other comments. The agency decided, based on test data, that a 10 percent extension would be sufficient to make it easier for manufacturers to assure that their vehicles' braking systems perform well in both fully loaded and lightly loaded conditions.

The agency considered and rejected the alternative of adopting different test requirements for final stage manufacturers or providing final stage manufacturers with a longer period of leadtime than other manufacturers. Either approach would result in a safety standard that was applied on the basis of the particular manufacturer of a vehicle rather than the safety needs of a particular vehicle type. The National Traffic and Motor Vehicle Safety Act contemplates the application of standards based on vehicle type rather than by manufacturer. Further, the agency determined that the requirements as adopted, including leadtime, are appropriate for all manufacturers. Since incomplete vehicle manufacturers should not find it necessary to place significant new restrictions on the use of their chassis as a result of Standard 105, final stage manufacturers should not require any redesign of their vehicles.

While the standard's requirements have been relaxed to reduce certification burdens on final stage manufacturers and to make it easier for manufacturers to assure that their vehicles' braking systems are balanced for both lightly loaded and fully loaded conditions, the agency encourages manufacturers to recognize the safety advantages offered by better braking systems and, where possible, to produce vehicles which meet or exceed the more stringent requirements that were proposed.

A number of more general comments were received on the appropriateness of the 8,000 lb. GVWR boundary. American Motors/Jeep stated that it supported adoption of the 8,000 lb. GVWR cutoff as a reasonable first step in addressing the brake proportioning difficulties inherent in vehicles with a wide weight differential between their loaded and unloaded conditions. However, the commenter suggested that the agency investigate the feasibility of developing new criteria that respond directly to the laden to unladen ratio regardless of the vehicle's GVWR. Other comments, including those of General Motors, the Motor Vehicle Manufacturer's Association, Wagner Electric and NTEA also suggested that the agency consider an approach using a laden/unladen weight distribution ratio criterion. Several of those commenters emphasized that as vehicle downsizing continues, vehicles with a GVWR of under 8,000 lbs. will have the same balance problems as vehicles of 8,000 to 10,000 lbs. GVWR.

The agency recognizes that this may become a problem in the future, but only if manufacturers seek to hold GVWR constant as they downsize their fleets rather than keeping payload constant. Since the agency believes payload to be a better measure of a vehicle's utility than GVWR, the agency encourages manufacturers to keep a constant payload instead of a constant GVWR as they downsize their vehicles. The agency will monitor developments in this area.

A comment submitted by Daimler-Benz stated that it saw no justification for an additional weight class of 8,000 to 10,000 lbs. GVWR and suggested that those vehicles be included with vehicles over 10,000 lbs. GVWR. According to that commenter, the brake regulations of some countries have a 3,500 kilogram (7716 lb.) weight limit, and some design characteristics of vehicles over 10,000 lbs. GVWR can also be found on vehicles with a GVWR of 8,000 lbs. As noted in the October 1979 notice, the agency is considering establishing more complete brake requirements for vehicles with a GVWR of over 10,000 lbs. but has not yet done so. This final rule brings the more complete requirements of Standard 105 to vehicles with a GVWR of 8,000 to 10,000 lbs. and includes requirements that are appropriate for all vehicles in that class, whatever their design characteristics.

As noted above, the comments concerning effectiveness requirements were largely directed at the requirements for vehicles with a GVWR of 8,000 to 10,000 lbs. However, some of the comments, including those of Chrysler and Wagner Electric, were also directed toward the fourth effectiveness requirements in general. Both the agency's own tests and confidential data submitted by the manufacturers indicate that recent models of almost all vehicles under 8,000 lbs. GVWR pass the effectiveness requirements. For any vehicles that do not, only minor changes would be required. As discussed above, it is easier to design braking systems for these vehicles than larger vehicles since they do not have as wide a weight differential between their loaded and unloaded conditions. Moreover, the type of work-performing equipment that can create center of gravity problems for final stage manufacturers is generally installed on vehicles with a GVWR of 8,000 lbs. or more. Therefore, no changes were made in the requirements as proposed for vehicles with a GVWR of under 8,000 lbs.

Comments submitted by Ford and Chrysler requested that both second and fourth effectiveness tests at 80 mph be eliminated in light of the 55 mph national speed limit. Ford also noted that actions required for fuel economy decrease the maximum speed capability of vehicles. The standard is written to require that the 80 mph test be met only if vehicles are capable of attaining a speed of 84 mph. Therefore, vehicles which cannot attain that speed need not comply with the 80 mph requirements. Since many vehicles can attain speeds well in excess of 80 mph and some vehicles are at times driven at those high speeds, despite the 55 mph national speed limit, the agency believes that 80 mph requirements are appropriate and in the interest of safety.

Fade Recovery; Water Recovery

The October 1979 notice explained that the fade and recovery requirements were included to assure that a vehicle's braking performance is satisfactory when exposed to the high brake temperatures caused by prolonged or severe use, such as is found in long, downhill driving. The proposal requires that vehicles be capable of passing two successive fade and recovery tests. The water recovery requirements assure that a vehicle's braking system performs adequately after immersion in water.

The comments on these tests were limited to the fade and recovery requirements. Chrysler stated that the fade tests simulate abuse that is rarely, if ever, encountered in actual customer service. That commenter stated that the fade tests, coupled with the fourth effectiveness requirements which follow the fade tests, would result in braking systems that are biased toward the rear brakes. According to Chrysler, rear biased brakes would be prone to lock-up in the lightly loaded condition. Wagner Electric submitted a similar comment and suggested that the second fade and recovery test and the fourth effectiveness test were redundant. That commenter suggested that those two tests be eliminated to simplify the test procedures of Standard 105.

The concern that the test requirements would result in braking systems biased toward the rear brakes was largely discussed in the preceding section of this notice. The proposed requirements of Standard 105 included both fully loaded and lightly loaded tests. The agency concluded, based upon its own vehicle tests and on information submitted by manufacturers, that the proposed test requirements could be met by changes in various braking system components. So long as both fully loaded and lightly loaded requirements were met, the braking system would be properly balanced for both fully loaded and lightly loaded conditions. By extending the fourth effectiveness requirements by 10 percent for vehicles with a GVWR of 8,000 to 10,000 lbs., additional leeway was provided to manufacturers in designing their braking systems to be properly balanced. As noted above, no changes were made in the requirements applicable to vehicles with a GVWR of under 8,000 lbs., since recent models of most of those vehicles already pass the effectiveness requirements. Only minor changes are required for those vehicles that do not.

The two fade tests were designed to produce first a mild to moderate fade condition and then a more severe fade condition. Light fade occurs in vehicles even in low speed applications such as in heavy traffic. Moderate to severe fade is a condition that may occur when vehicles are used on hilly or mountainous roads, especially when heavy loads are carried. Far from being redundant, the second fade test simulates the type of fade experienced during long mountain descents. The agency has verified that the temperatures produced by the test sequence are the same temperatures as sometimes experienced during long mountain descents. The fade and recovery test requirements assure that brakes do not perform abnormally while subject to the heat caused by severe use or during the time that the brakes are cooling off after severe use.

The fourth effectiveness test is a complete effectiveness test that is conducted after most of the other tests, including the fade tests, have been completed. This test is included to give an overall system evaluation to assure that a braking system retains satisfactory characteristics related to effectiveness, pedal force, and sensitivity after exposure to the types of conditions simulated during the test sequence.

A comment submitted by the American Trucking Associations (ATA) suggested that the proposed fade requirements are severe enough to adversely affect user acceptance in normal service. According to ATA, compromises in such things as loss of feel and hard pedal in order to achieve greater fade resistance may be necessary. The comment also suggested that fade resistance tests developed in the past may be outdated as vehicles are becoming less powerful.

The agency tested a number of production vehicles before proposing the fade requirements and found that almost all of them met the requirements. The only vehicles tested by the agency which appeared to present problems were some small imported pickup trucks. Since many other vehicles passed the requirements, without having problems such as loss of feel or hard pedal, it is clear that braking systems can be designed to meet the fade requirements without having the problems suggested by ATA. Since fade tests primarily apply to a vehicle's downhill performance, the requirements are appropriate for vehicles even if they are less powerful than in the past.

Partial System Failure; Failed Power-Assist/Power Units

Partial system failure requirements were included to ensure that a vehicle's brakes are capable of bringing the vehicle to a controlled stop in a reasonable distance if a part of the service brake system should fail. Stopping distance requirements were also proposed for vehicles with failed power-assist or brake power units.

The October 1979 notice explained that many manufacturers currently provide what are called split brake systems to provide braking capacity in the event of a partial failure. The split system consists of two or more brake subsystems, each of which is not affected by leakage or failure in the other subsystem. Split systems are typically used on passenger cars, school buses, light trucks and vans. Under the proposed requirements, all hydraulic braked vehicles are required to utilize a split or redundant brake system.

Several commenters stated that the stopping distances for partial failure and for inoperative brake power and power assist units for vehicles with a GVWR over 10,000 lbs. are too stringent. Daimler-Benz stated that the requirements could only be met if the operative braking system has an increased capacity.

In a late submission to the docket, Wagner Electric asserted that agency tests substantiating the capability to meet the partial system requirements for vehicles over 10,000 lbs. were based on the two most effective of the possible partial systems. The commenter stated that no data was provided on vertical split systems and suggested that the requirements as proposed would encourage forms of split systems, such as vertical split systems, that would inordinately increase the level of front brake torque (i.e., make the front brakes overly powerful) and contribute toward lock-up on icy or wet roads. (A vertical split system essentially consists of one subsystem that supplies braking power to the front brakes and another subsystem that provides power to the back brakes. This contrasts with a variety of other types of split systems. Some horizontal split systems, for example, consist of two subsystems that each provide some braking power to each wheel. The two types of split systems which Wagner Electric's comment suggested are the most effective are a horizontal split and a 1- ½ x ½ split, a system with some of the attributes of a horizontal split system.) A comment submitted by ATA also suggested that the requirements would mandate overly powerful, aggressive front brakes.

Several commenters suggested that the stopping distance requirements for vehicles over 10,000 lbs. GVWR be relaxed. Wagner Electric suggested that the requirements currently in effect for school buses be adopted.

The partial system failure and failed power assist or brake power unit requirements were proposed by the agency after careful analysis of its own vehicle test results and of confidential data submitted by manufacturers. These data indicate that many production vehicles already meet the proposed requirements. The current school bus requirements were issued in 1975 under a short-term statutory deadline. Analysis of current school bus data indicates that many school buses already meet the more stringent requirements proposed by the October 1979 notice. As with other stopping distance requirements, there is some increment of safety benefit for each reduction of stopping distance. When partial failure of the service brake system occurs or brake power or power assist units become inoperative, it is important that a vehicle be able to stop in a reasonable distance, especially when that vehicle has the aggressivity associated with a GVWR of over 10,000 lbs.

In regard to Wagner Electric's comment concerning vertical split systems, it is true that if the subsystem providing power to the rear brakes in a vertical split system fails, the subsystem providing power to the front brakes would be required to meet the stopping distance requirements under the standard. Therefore, in order to meet this requirement with a vertical split system, a vehicle would need relatively powerful front brakes. Similar requirements have been in effect for vehicles with air brakes under Standard 121, and European regulations necessitate even more powerful front axle brakes without safety problems.

Moreover, in keeping with the National Traffic and Motor Vehicle Safety Act, the requirements are written as performance requirements and not design requirements. Manufacturers may meet the requirements in many different ways and are not required to use vertical split systems. Indeed, the selection of a means of compliance that poses significant safety risks could raise a safety defect issue. If Wagner Electric is concerned that vertical split systems may contribute to lock-up when used on some vehicle configurations, the manufacturer has the option to use other types of split systems, such as horizontal splits, or a redundant split system. When one of the subsystems of a horizontal split system fails, some braking power is still provided to each wheel by the operative subsystem, so the stopping distances do not have to be met solely by the power provided to the front wheels. Therefore, the braking system does not have to have relatively powerful front brakes in order to meet the requirements. This would also be true for some other types of split systems and for redundant systems.

Wagner Electric also stated that the 150 lb. maximum pedal force specified for the requirements is too low and might result in overly sensitive brakes. That company suggested that a 200 lb. pedal force be adopted.

An analysis of the data referred to above indicates that many vehicles on the road already meet this requirement, without experiencing problems of oversensitivity. While Wagner Electric suggests in its comment that even a small person can reach a 200 lb. pedal effort, the agency has found that small females have difficulty even applying forces of less than 150 lbs.

Moreover, when a driver is used to applying very little force to bring a vehicle to a stop, the driver is likely to believe that the braking system has failed entirely, rather than only partially, if the driver applies maximum force and cannot feel the vehicle braking. Reports of "no brakes" are sometimes given in accident reports where only a partial failure has occurred. Therefore, it is important that a vehicle's braking system respond noticeably when a driver is applying significant force in a partial failure or failed power assist or brake power unit situation.

A comment submitted by the Metropolitan Transit Agency of Dade County, Florida, called for lower pedal force requirements. That commenter cited the difficulty smaller drivers have in bringing a large bus to a stop after loss of vacuum. In establishing the 150 lb. pedal force, the agency took account of both the need to establish a level of pedal force appropriate for smaller drivers and to keep it high enough that brakes will not be oversensitive in ordinary use. That commenter also suggested that the agency establish requirements for vacuum reserve. The agency included optional procedures in Standard 105 that encourage manufacturers to include vacuum reserves by permitting slightly longer stopping distances in the no power tests if the vehicle has the capability of making several stops in consecutive order with gradually decreasing capabilities. The agency recognizes the safety advantages offered by vacuum reserves, but has not, as of yet, proposed that they be required.

A comment submitted by the Recreation Vehicle Industry Association (RVIA) requested that the test procedures for vehicles with a GVWR of over 10,000 lbs. be changed to require less stops and snubs to condition the brakes. The agency declines to make this change since a significant number of stops and snubs is required in order that a braking system's capability be tested in a "worn-in" condition.

Equipment Integrity

Comments on the requirements concerning equipment integrity were primarily limited to the spile stop requirements. RVIA suggested that the spike stop test requirements are inappropriate for motor homes. According to RVIA, it is unaware of a single case where a weakness that the spike stop test would uncover has ever been found in a motor home.

The spike stop test requirements were developed to determine the structural integrity of a vehicle's braking system. Vehicles must be capable of making several very sudden stops without loss of brake system structural integrity. Virtually all types of vehicles, including motor homes, are at times subjected to the abuse caused by very sudden stops. If the vehicle's braking system loses its structural integrity during such stops, serious accidents could result.

Parking Brakes

The October 1979 notice proposed parking brake performance requirements designed to ensure that vehicles have adequate grade holding performance. Under the proposal, vehicles with a GVWR of 10,000 lbs. or less are to meet these requirements on a grade of 30 percent, when a maximum force of 90 lbs. is applied to hand-operated parking brake systems and 125 lbs. is applied to foot-operated parking brake systems. While no comments were received that were specifically opposed to the establishment of parking brake requirements for light trucks, several submissions did comment on the appropriateness of the 30 percent gradient and the maximum force requirements.

The Japan Automobile Manufacturers Association and Toyo Kogyo stated that a 30 percent gradient is too stringent. According to those comments, some vehicles have difficulty climbing a 30 percent grade when fully loaded. They requested that a gradient of 18 percent be adopted, stating that European and Australian safety standards incorporate that requirement.

The 30 percent gradient requirement, which is the same as that in effect for passenger cars and school buses with a GVWR of 10,000 lbs. or less, represents a degree of steepness that is found on roads in some parts of the United States. While the agency is unaware of any light trucks that cannot climb a 30 percent grade, even a vehicle that has difficulty climbing a 30 percent grade may on occasion be parked on such a steep hill. Moreover, recognizing the dangers inherent if a vehicle's grade holding performance is inadequate, the agency established the requirements with a view toward providing a margin of safety for parking brake systems. The safety margin will prevent accidents from occurring when vehicles are parked on more commonly found grades, in some instances, where parking brake systems have deteriorated over time or are improperly adjusted. It is also noted that although European regulations have only an 18 percent grade-holding requirement, those regulations also require a dynamic stopping performance test using the parking brake.

Several commenters stated that the maximum force requirements proposed by the standard for vehicles with a GVWR of 10,000 lbs. or less are too stringent. Those commenters suggesting changes requested either that European requirements be followed (said to be 132 lbs. for hand-operated systems) or that current requirements for school buses be followed (125 lbs. for hand-operated systems and 150 lbs. for foot-operated systems).

The 90 lb. and 125 lb. requirements proposed by the notice are the same as those in effect for passenger cars. They were chosen by the agency as the maximum force requirements that are appropriate for small females. Since small females may be expected to drive light trucks, it is appropriate to require that parking brake systems be designed with their needs in mind. Moreover, the agency established the 90 lb. and 125 lb. requirements with a recognition that some parking brake systems are located in positions within the vehicle which are awkward for drivers to reach. The 90 lb. and 125 lb. requirements therefore provide a margin of safety for instances where drivers have difficulty applying adequate force to parking brake systems because of their location.

As with the other requirements of the proposal, the agency established the parking brake requirements after conducting tests on production vehicles. Neither the agency's test results or any comments submitted indicate that manufacturers will have difficulty meeting the parking brake requirements.

Costs and Benefits

The agency has considered the economic and other impacts of this final rule and determined that this rule is not significant within the meaning of Executive Order 12221 and the Department of Transportation's policies and procedures implementing that order. The agency's assessment of the benefits and economic consequences of this final rule are contained in a regulatory evaluation that has been placed in the docket for this rulemaking. Copies of that regulatory evaluation can be obtained by writing NHTSA's docket section, at the address given in the beginning of this notice.

The October 1979 notice explained that a regulatory evaluation had been prepared before issuing the notice and had been included in the docket. A number of comments were received on the costs and benefits of the proposed requirements.

Ford stated that although its cost analyses were not complete, it had sufficient information to indicate that the proposed requirements would affect a greater number of Ford products and cost considerably more than the agency had estimated. Chrysler stated that the requirements would necessitate the redesign of the parking brake systems on all of its light trucks and require some degree of revision to master cylinders, brake boosters, and/or foundation brakes on 80 to 90 percent of its light trucks. That company also indicated that it would find it necessary to engage in considerably more testing than estimated by the agency in order to meet the proposed requirements.

Both Ford and Chrysler suggested that several requirements be relaxed in order to reduce the costs of the proposed standard. Ford requested that first, second and fourth effectiveness test stopping distances be relaxed for all vehicles and that third effectivenss test stopping distances be relaxed for vehicles with a GVWR of 8,000 to 10,000 lbs. Ford also requested that the stopping distance requirements for the failed system and spike stop check tests be relaxed and that the maximum parking brake force requirements be changed from 125 lbs. to 150 lbs. Chrysler asked that fourth effectiveness test stopping distances be extended by 16 percent and that the maximum parking brake force requirements be changed from 125 lbs. to 150 lbs.

General Motors stated that while it supported NHTSA action to require split service brake systems on vehicles over 10,000 lbs. GVWR, a considerably larger number of those vehicles would require changes than estimated by the agency. According to GM, optional split service brake systems were purchased on only two percent of its hydraulic braked heavy-duty vehicles in model year 1979.

In order to aid in developing its cost estimates, the agency enlisted an outside contractor before issuing the October 1979 notice to conduct an independent assessment of the costs that would be involved. A report prepared by the IIT Research Institute (IITRI), which was included in the docket, substantially verified the cost estimates made by NHTSA, with one exception.

As the regulatory evaluation explained, estimates on the light truck brake system costs differed, reflecting the different methodologies used by IITRI and NHTSA. Since NHTSA's estimates were based on actual test results and confidential data submitted by the manufacturers, which were unavailable to IITRI, the regulatory evaluation used NHTSA figures for light truck brake system costs. IITRI figures were used for development/compliance test costs and cost estimates for medium and heavy duty trucks.

A revised regulatory evaluation, which has been placed in the docket, was prepared by the agency to accompany the issuance of this final rule. Revisions were made in the regulatory evaluation to reflect the latest information available to the agency.

The comments by Ford and Chrysler were difficult to evaluate since they gave only generalized bases for their assertions that a greater number of vehicles would be affected by the standard than estimated by the agency. While those commenters cited some additional braking system components that might require changes, they did not specify which vehicles would require the changes or indicate what the costs of those changes would be.

For example, while Chrysler asserted that the requirements would necessitate the redesign of the parking brake systems on all of its light trucks, it did not indicate its basis for believing that substantially more of its light trucks would require upgrading of their parking brake systems than estimated by the agency. Nor did it indicate what changes would be required or the costs of those changes. Ford stated that preliminary test results indicate that the proposal would necessitate for some models, in addition to those changes assumed by the agency to be required, the addition of hydraulic boosters or larger hydraulic boosters and revisions to brake pedals, power steering pumps, hoses and tires. Ford did not indicate the nature of the preliminary test data it was relying upon. Nor did that commenter specify what models would require additional changes or indicate the costs of those changes. Also, while Ford requested numerous changes in the proposed requirements, it did not attempt to support the specific changes it requested.

In light of the agency's own detailed evaluation of the changes made necessary by the requirements and of the costs of those changes, which was based upon test data and manufacturer-supplied information, as well as the independent assessment made by IITRI, the agency continues to believe that its cost estimates are correct, with one exception noted below.

The agency did change the regulatory evaluation's estimate of the number of vehicles with a GVWR over 10,000 lbs. requiring split brake systems. The agency had anticipated that a greater percentage of those vehicles would be purchased with optional split brake systems. While the number of vehicles affected by that requirement is greater than originally estimated by the agency, the cost per vehicle remains the same, and the agency believes the requirements to be fully justified by the benefits that will accrue.

Other comments that were received concerning costs related to costs of developing anti-lock or similar devices, such as brake system pressure modifiers, and cost that would be borne by final stage manufacturers. As explained fully above in the portion of this notice entitled "Effectiveness Requirements," manufacturers will not find it necessary to develop anti-lock or similar devices, nor will final stage manufacturers in most cases have any costs as a result of the standard. Instead, final stage manufacturers will ordinarily be able to rely on the incomplete vehicle manufacturer's certification of the braking system.

The October 1979 notice explained that the proposal was a continuation of prior NHTSA rulemaking on Standard 105. While the extension of Standard 105 to trucks, buses and MPV's had proceeded to the adoption of a final rule, that extension was indefinitely delayed in April 1975 because the agency had determined that although the benefits of the rule would be substantial, the costs of the standard, particularly for heavy trucks, warranted delaying the standard. See 40 FR 18411, April 28, 1975.

Manufacturers have made a number of significant improvements in their braking systems since that time on a voluntary basis, largely following the requirements and test procedures of the delayed final rule. Because of those improvements, as well as some changes made in the requirements by the agency, the costs of the standard today are only a small fraction of what they would have been in 1975.

The April 1975 notice stated that manufacturers had submitted costs for light to medium duty trucks that ranged from $54 to $775 per unit (depending on model configuration) to attain compliance with the standard. The agency compared those figures with independently gathered detailed cost information and substantiated that the manufacturers' estimates were accurate. In contrast to those figures, the agency today estimates that the average cost per domestic light truck, bus, or MPV with a GVWR of 10,000 lbs. or less is only $2.71, or about $21.24 for each vehicle that needs to be upgraded in braking system performance. The costs for meeting the partial failure and warning indicator requirements for medium and heavy trucks (over 10,000 lbs. GVWR) are estimated to be about $54 per vehicle. The total costs of meeting the standard's requirements for all trucks, buses and MPV's are estimated to be under $18 million.

As explained elsewhere in this notice, the regulatory evaluation, and the October 1979 notice, the agency carefully evaluated the costs and benefits of the proposed requirements. In analyzing costs, the agency estimated how the requirements would affect each manufacturer on a model-by-model basis. In light of this detailed analyis and evaluation, the agency declined to relax particular requirements on the sole ground that they would result in some costs to manufacturers.

A number of comments were also received that related to the benefits of the standard. Ford stated that the proposed requirements have not been justified as being the minimum necessary to provide safe operation of the affected vehicles. That commenter stated that the agency had not provided evidence that the levels of braking performance of today's vehicles are causative factors in the accidents involving those vehicles.

Ford also stated that the estimate of benefits presented in the agency's regulatory evaluation is based on inappropriate data and incomplete analysis. In particular, that commenter stated that a study by the Institute for Research in Public Safety (IRPS) that was cited by the regulatory evaluation does not support the conclusion that a 5 to 10 percent reduction in accidents could be obtained by a 5 percent shortening of stopping distances. That study was based on a sample of skidding accidents, and the finding was related to the benefits that would accrue if vehicles were equipped with anti-lock braking systems. According to Ford, that finding does not relate to the effect on accidents that would be attributable to the implementation of the proposed requirements, since the requirements do not anticipate the introduction of anti-lock braking systems. That company also asserted that the relationship between measured vehicle parameters such as specific stopping distances derived under specified test conditions and the safety effectiveness of the same vehicle in customer service has yet to be established.

A similar comment was submitted by NTEA. That commenter stated that by failing to demonstrate why an increase in light truck accident fatalities has occurred or that the proposed standard will in any way reduce those fatalities, the NHTSA data are seriously deficient. NTEA also stated that since the requirements will affect only 17 percent of the vehicles subject to the standard, NHTSA is obligated to identify that 17 percent segment as the cause of the safety problem. (As a result of the agency revising its estimate of the number of vehicles with a GVWR over 10,000 lbs. requiring the addition of split service brake systems, discussed above, the percentage of vehicles requiring changes as a result of the standard is now estimated to be about 20 percent.)

The October 1979 notice explained that in carrying out the mandate of the National Traffic and Motor Vehicle Safety Act to issue vehicle safety standards to protect the public against unreasonable risk of vehicle accidents and of death or injury occurring as a result of such accidents, the agency is confronted with inherent problems that limit the degree of certainty and precision achievable in estimating the effectiveness and therefore benefits of proposed standards. While engineering and accident analyses can clearly demonstrate that certain vehicle improvements will facilitate the performance of the driver's task and thereby improve safety, it is virtually impossible to isolate individual factors to arrive at precise and certain conclusions about the quantified benefits that will accrue.

Given the duty to act in the area of accident avoidance notwithstanding an inherent measure of imprecision and uncertainty, the agency has developed and issued accident avoidance standards while attempting within its capabilities to quantify the benefits of the standards and limit the uncertainty. The extension of Standard 105 is no different, and, given the inevitable residual uncertainty, the decisionmaking regarding the precise requirements rests in part on policy judgment.

The braking system of a vehicle clearly provides its most important accident avoidance capability. Common sense, as well as basic traffic theory, indicate that a vehicle with a shorter stopping distance capability will be safer than the same vehicle with a longer stopping distance capability, assuming that other parameters such as vehicle stability are held constant. Also, as noted above, since light trucks, buses, and MPV's share the same traffic flow as passenger cars, they should ideally have the same stopping distance capability.

As fully explained above, the agency carefully evaluated the costs of improving braking systems for light trucks, buses and MPV's and proposed requirements that, in its judgment, were economical. In recognition of the costs and problems associated with anti-lock or similar devices, the agency proposed requirements that could be met, where upgrading was required, by simple, state-of-the-art changes to the types of braking systems in use. Since braking ability is an extremely important safety factor and stopping distances can economically be made significantly shorter for light trucks, buses, and MPV's, the agency believes that the braking ability of those vehicles creates an unnecessary risk.

Because available accident data and studies are limited, it is very difficult to make estimates as to the precise benefits that will result from improving a vehicle's accident avoidance capability. The best information available to the agency in estimating the benefits resulting from improved stopping distances was the IRPS study, which was based on a survey of skidding accidents. Skidding accidents are useful for analysis because they leave physical evidence indicating the braking distance of a vehicle prior to impact. Based upon that study, the agency concluded that a 5 to 10 percent reduction of accidents could be obtained by a 5 percent shortening of stopping distances.

The proposed requirements would result in a reduction of skidding accidents, despite the fact that anti-lock or similar devices are not contemplated, since some vehicles would have their braking balance improved. Also, with better braking capability, drivers might be less prone to applying their brakes in a manner that would result in skids. While the IRPS data may not be ideal, since it looked at some types of skidding accidents that would not be prevented by the requirements and did not look at some accidents that would be prevented (i.e., those that do not leave skid marks), the agency believes that it does provide evidence that is useful in analyzing all accidents where braking is attempted.

The 105 test sequence was designed to simulate real world conditions. A vehicle's braking system is tested, for example, in new and broken-in conditions, at various speeds, while the vehicle is fully and lightly loaded, under varying conditions of fade, and under partial failure and failed power. Thus, the test does relate to performance in customer service.

In deciding to propose the extension of Standard 105 to light trucks, buses and MPV's, the agency was very concerned about the recent increase in light truck fatalities. However, the extension is directed at all accidents and not merely at the increase in accidents as suggested by NTEA.

As noted above, manufacturers have largely improved the braking performance of many of the vehicles subject to this standard since the final rule was delayed in 1975. Because of these improvements, changes will be required in only about 20 percent of the vehicles subject to the standard. The only effect on the other 80 percent of vehicles is that manufacturers will not be able to reduce the performance of those vehicles' existing braking systems.

The agency believes it appropriate to require that manufacturers maintain the current level of braking performance for that 80 percent segment of vehicles. In the 1960's, for example, stopping distances of passenger cars lengthened as a result of increased weight. Today, the agency is concerned that manufacturers might reduce the braking ability of their vehicles as part of an effort to improve fuel economy. Since some braking system components are relatively heavy, the braking system is a prime target for weight reduction. The agency believes braking ability to be such an important safety factor that it should not be compromised by efforts to improve fuel economy.

Because of the limitations of available accident data, it is difficult and sometimes impossible to use available accident data to determine the accident rates of particular vehicle types. As noted above, the agency believes the braking ability of those vehicles requiring upgrading of their braking systems to create an unreasonable risk, since that ability can economically be significantly improved.

Miscellaneous Comments

The Japan Automobile Manufacturers Association stated that separate requirements should be applicable to vehicles used for passengers and those used for cargo. That request is similar to ones received during other rulemaking proceedings to establish separate requirements for commercial applications.

The National Traffic and Motor Vehicle Safety Act contemplates the application of standards based on vehicle type instead of vehicle use. Basing a standard on vehicle use would present difficult enforcement problems. It would also place a manufacturer in the difficult position of having to assess in advance the potential future use of the vehicle. Further, basing standards on vehicle use does not recognize that a vehicle may have two or more uses during its lifetime. Therefore, the agency has declined to establish separate requirements based upon vehicle use.

The Japan Automobile Manufacturers Association also requested that all vehicles with a GVWR over 10,000 lbs., other than school buses, be included in Standard 130 under contemplation. Daimler-Benz also requested that vehicles over 10,000 lbs. be included in one standard, whether they have air brakes or hydraulic brakes. Based upon the differences between air brake systems and hydraulic brake systems, the agency has issued separate standards for the two types of braking systems. Standard 121 currently applies to air braked vehicles and Standard 105 to hydraulic braked vehicles.

The agency has issued an advance notice of proposed rulemaking for a new standard to apply to heavy duty brake systems, Standard 130, which addressed issues for which rulemaking is at least several years away. See 45 FR 13155, February 28, 1980. A notice of proposed rulemaking, with opportunity to comment, would be issued if the agency decides to proceed with that standard.

General Motors stated that the proposed requirements of Standard 105 may not be appropriate for electric vehicles which are under development. Since these vehicles are still in the development stage, the agency is unable to establish at this time what types of changes, if any, would be appropriate for electric vehicles. The agency will consider the need for different requirements for electric vehicles when more information is available as to what characteristics those vehicles will have.

Wagner Electric requested that the weight permitted for driver and instrumentation on vehicles with a GVWR of 10,000 lbs. or less for the lightly loaded tests be increased from 300 lbs. to 400 lbs. to permit the use of more recording equipment. Since the lightly loaded tests measure the braking ability of a vehicle while unloaded, it is desirable to keep the weight as low as possible. However, after evaluating the types of instrumentation that are used to certify compliance with Standard 105, the agency agrees that increasing the weight allowance for driver and instrumentation from 300 lbs. to 400 lbs. for vehicles with a GVWR of 10,000 lbs. or less will allow the use of additional types of instrumentation that will be useful in evaluating the performance of a vehicle's braking system. Moreover, the agency has determined that the slight increase in weight will not adversely affect the results of the lightly loaded tests.

One commenter suggested that the standard's requirements might have an adverse effect on tire manufacturers, since tires are an important parameter in complying with the standard and manufacturers would not have the time, funds or facilities to test every kind of tire. Manufacturers will not be required to test all kinds of tires, since they purchase tires according to specifications. Normal production tires were used in all tests relied on by the agency in establising the standard's requirements. The standard has been in effect for several years for passenger cars and school buses without adverse effects on tire manufacturers.

Leadtime

Numerous comments were received on the proposed effective date of the requirements. The agency evaluated those comments and agrees with a number of them that a minimum of 2 years leadtime is appropriate. The effective date of the standard was changed to September 1, 1983, which gives a leadtime well in excess of 2 years and corresponds with the start of a new model year.

Chrysler stated that it required a leadtime of 30 months if its recommendations were adopted and 42 months if its recommendations were not adopted. The extra 12 months beyond 30 months were said to be needed to develop load-sensing or deceleration-sensing proportioning valves. As explained fully in this notice, no manufacturer will be required to develop anti-lock or similar devices in order to be able to comply with the standard's requirements. The effective date of this final rule gives a leadtime of approximately 30 months.

The principal authors of this notice are George L. Parker, Office of Vehicle Safety Standards, and J. Edward Glancy, Office of Chief Counsel.

In consideration of the foregoing, §571.105, Chapter V of Title 49, Code of Federal Regulations, is amended accordingly.

Issued on December 22, 1980.

Joan Claybrook
Administrator

46 FR 55
January 2, 1981

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 105

Hydraulic Brake Systems

(Docket No. 70-27; Notice 23)

ACTION: Final rule; response to petitions for reconsideration.

SUMMARY: This notice responds to three petitions for reconsideration concerning the amendment extending Standard No. 105, *Hydraulic Brake Systems*, to trucks, buses, and multipurpose passenger vehicles (MPV's). The amendment also upgraded the standard's requirements for school buses. In response to one of the petitions, the agency has changed the parking brake gradient requirement from 30 percent to 20 percent for trucks, buses (other than school buses) and MPV's with a GVWR of 10,000 pounds or less. The agency will shortly propose a conforming amendment to make the same change for school buses with a GVWR of 10,000 pounds or less.

DATES: This amendment is effective September 1, 1983. That is the same effective date as for the January 1981 final rule extending Standard No. 105 to trucks, buses and MPV's.

ADDRESS: Petitions for reconsideration should refer to the docket number and be submitted to: Docket Section, Room 5109, 400 Seventh Street, S.W., Washington, D.C. 20590.

SUPPLEMENTARY INFORMATION: On January 2, 1981, the NHTSA published in the *Federal Register* (46 F.R. 55) a final rule amending Standard No. 105, *Hydraulic Brake Systems*. Prior to that time, the standard applied to passenger cars and school buses only. The amendment extended the standard's applicability on a general basis (with some modifications) to trucks, all types of buses, and multipurpose passenger vehicles (MPV's) with a gross vehicle weight rating (GVWR) of 10,000 pounds or less. (These vehicles are collectively referred to as LTM's.) Several requirements were also extended to trucks, buses and MPV's with a GVWR greater than 10,000 pounds. In addition, the standard's requirements for school buses were upgraded.

Petitions for reconsideration were filed with the agency by Chrysler, Ford and the Brake System Parts Manufacturers Council, all of which dealt almost entirely with the requirements applicable to vehicles with a GVWR of 10,000 pounds or less. Of the three petitions, Chrysler's was the only one that raised any technical issues associated with compliance with the amendment. All three petitions challenged the amendment on the bases of safety need and/or costs and benefits. After carefully evaluating those petitions, the agency decided to modify the parking brake requirements in response to Chrysler's petition. To the extent set forth below, Chrysler's petition is granted. Otherwise, Chrysler's petition and the other two petitions are denied.

Parking Brake Requirements

Standard No. 105 includes requirements for both a vehicle's service brake system and its parking brake. These two systems are related in that the parking brake uses major components of the service brake system, including the brake shoes and brake drums. The final rule's parking brake requirements specified that various performance tests be met when a vehicle is parked on a 30 percent grade and a maximum force of 90 pounds is applied to hand-operated parking brake systems and 125 pounds is applied to foot-operated parking brake systems.

Chrysler's petition for reconsideration stated that the parking brake effort limits would cause a major redesign of most of its brake systems. According to that company, such redesign would waste scarce resources and be inflationary in the absence of demonstrated benefits.

The agency contacted Chrysler to obtain clarification of that company's assertions. The agency requested information about the nature of the changes needed to meet the parking brake requirements and the costs of those changes, as well as data substantiating those needs. Chrysler indicated that all of its parking brake systems would require changes in order to meet the parking brake requirements. Many vehicles were said to require a major redesign, including new actuating pedals and supporting structures, low friction cables with new guides, new parking brake lever arms within the rear brake drums, and new shoes and linings.

Chrysler's assertions were substantiated by test data. Chrysler ran a series of parking brake tests on a cross-section of its light trucks on both a 32 percent grade and a 20 percent grade. (The 32 percent grade was used because it was the grade closest to 30 percent that Chrysler had available.) Of nine vehicles tested on the 32 percent grade, only one passed the parking brake tests. That vehicle passed by a margin generally considered to be insufficient to assure that other vehicles of the same type would pass the tests.

In addition to the information received from Chrysler, the agency received new data from agency-sponsored tests that were conducted for purposes unrelated to this rulemaking. Three Chrysler LTM's were among the vehicles tested. While the tests were limited in number, their results confirmed the information supplied by Chrysler. Both the data submitted by Chrysler and the test results received from the agency-sponsored tests have been placed in the docket.

The agency evaluated Chrysler's assertions in light of the test data received. Based upon that data, the agency has concluded that its Regulatory Evaluation underestimated the costs of the parking brake requirements for Chrysler. Because this conclusion is based on actual test results, it is more reliable than the original conclusions made in the Regulatory Evaluation. Those earlier conclusions were largely based on engineering analysis, which is generally less reliable than actual testing. While they were also based on confidential information received from manufacturers, the agency had received less information from Chrysler than from other companies.

The Regulatory Evaluation estimated that 10 percent of Chrysler's LTM's would require changes in order to meet the parking brake requirements, at an average cost of $10.00 per vehicle needing changes. The agency now estimates that virtually all of Chrysler's LTM's would require changes in order to meet the parking brake requirements as issued. Many of Chrysler's LTM's would require a minor redesign with the types of changes indicated by Chrysler and listed above. Other vehicles would require a minor redesign, with such changes as longer actuating pedals, rerouted cables, and new parking brake lever arms within the rear brake drums.

Chrysler did not provide information about the costs of the changes needed to meet the parking brake requirements. The agency estimates that the cost per vehicle requiring a major redesign would be $17.50, while the cost per vehicle requiring a minor redesign would be $6.00. These estimates are based on the types of changes needed for a major redesign and a minor redesign, discussed above. The agency used brake system component costs contained in a report prepared by the IIT Research Institute under contract to the agency, for guidance in preparing its estimates. That report, which was issued in 1979, was included in the docket at the time the notice of proposed rulemaking was issued.

In response to Chrysler's petition for reconsideration, the agency reevaluated Standard No. 105's parking brake requirements in light of the higher costs that it recognizes would result from those requirements. In reevaluating the requirements the agency analyzed two issues: the appropriateness of the parking brake effort limits and the 30 percent gradient. Concerns about both of these issues were raised by several commenters in response to the notice of proposed rulemaking.

While the parking brake effort limit and gradient requirements address different issues from the point of view of motor vehicle safety, in practice the two requirements are closely related. Over a certain range of both force and gradient, a given parking brake will hold a vehicle on increasingly steep gradients as increasingly greater force is applied to the brake. Thus, a given parking brake design may be able to meet either a more stringent parking brake effort limit (i.e., a limit requiring that less force be used) or a steeper gradient, but not both.

The agency has concluded, in light of the lack of significant safety need for a gradient requirement as stringent as 30 degrees and the increased costs that would result from the parking brake requirements, that the parking brake gradient requirement should be changed from 30 percent down to 20 percent with retention of the parking brake effort limits. As explained below, this change will substantially reduce the costs of the parking brake requirements with only a minimal impact on benefits. Also, the change may promote international harmonization of safety standards. Consideration is currently being given in Europe to changing its standard to incorporate a 20 percent gradient requirement instead of an 18 percent gradient.

The preamble to the final rule explained that two commenters had indicated that they believed the 30 percent gradient to be too stringent. Those commenters requested that an 18 percent gradient be adopted, noting that European and Australian safety standards incorporate that gradient. The agency declined to adopt a less stringent gradient at that time, noting that 30 percent gradients do exist in some parts of the United States and that the requirement provided a margin of safety where parking brake systems have deteriorated over time or are improperly adjusted. Even at that time, the agency recognized that any benefits of that particular requirement would be relatively small. Roads with a gradient as steep as 30 percent exist in only a few parts of the country. Therefore, only a small number of vehicles affected by this standard would ever encounter such roads.

The agency does not believe that the large numbers of vehicles affected by the standard should be required to meet this particular requirement which would only be of any possible benefit for a very small number of vehicles.

The agency declined to change the parking brake effort requirements because they were chosen as the maximum force requirements that are appropriate for small females. Those requirements, a maximum force of 90 pounds for hand-operated parking brake systems and 125 pounds for foot-operated parking brake systems, are the same as those in effect for passenger cars. Chrysler's comment on the notice of proposed rulemaking had asked that they be changed to 125 pounds and 150 pounds, respectively. Those limits represent the parking brake effort requirements that have been in effect for school buses for several years. Research studies indicate, however, that between 20 and 50 percent of the female driving population do not have enough strength to exert the maximum pedal efforts that have been permitted for school buses. It is appropriate to require that parking brake systems be designed with the needs of the driving population in mind. The 90 pound and 125 pound limits will cut the above percentages in half, i.e., only 10 percent to 25 percent of the females may lack sufficient strength.

The new parking brake effort limits apply to all LTM's, including school buses (with a GVWR of 10,000 pounds or less). As noted above, school buses were subject to Standard

No. 105 before the January 1981 final rule was issued. The parking brake requirements for school buses with a GVWR over 10,000 pounds, which specify both a 20 percent gradient and the less stringent effort limit, were not changed by either the January 1981 final rule or this amendment. However, the January 1981 final rule did change the standard's parking brake requirements for school buses with a GVWR of 10,000 pounds or less to include the new more stringent effort limit. The agency had not proposed changing the gradient requirement, which remained at 30 percent.

As a conforming amendment, the agency will shortly propose to change the gradient requirement for school buses with a GVWR of 10,000 pounds or less from 30 percent to 20 percent. The purpose of that change would be to make the parking brake requirements for those school buses the same as for other LTM's. The agency believes that change should be made primarily because school buses are constructed on the same chassis, including parking brakes, as other LTM's. Different parking brake requirements for school buses could either limit which chassis could be used for school buses or require that new parking brake systems be specifically designed and installed on some of those chassis used for school buses. In light of the more stringent parking brake effort limits and the relationship between force and the steepness of gradient on which a parking brake will hold a vehicle, the agency does not believe that current school bus parking brakes will be significantly altered as a result of the less stringent gradient requirement.

The agency has determined that significant cost savings will result from changing the gradient requirement for all LTM's. With a 30 percent gradient requirement, Chrysler would be required to complete major redesigns of the braking systems of many of its vehicles and minor redesigns of the rest. With the 20 percent gradient requirement, Chrysler will not have to complete any major redesigns. The agency estimates that Chrysler will have to complete minor redesigns on approximately 48 percent of its vehicles.

A Supplement to the Final Regulatory Evaluation has been prepared to reflect these new conclusions and has been placed in the docket. The figures contained in that document assume that the conforming amendment for school buses, discussed above, will be made. If it is not made, substantially higher costs for school buses could be involved. Because of the larger number of vehicles that are now estimated to be affected, the new projected cost for parking brake requirements for Chryser is higher than previously estimated, despite the relaxation of the gradient requirement. The Supplement to the Final Regulatory Evaluation estimates that the parking brake requirements will result in a total cost to Chrysler of $1,271,400. The previous estimate was $442,000. The agency now estimates that the total costs of the parking brake requirements for Chrysler would have been in excess of $3,000,000 if the gradient requirement was left at 30 percent.

While the agency now estimates that the 20 percent grade will result in greater costs for Chrysler (though not for manufacturers as a whole) than originally estimated, the agency believes that those costs are justified. The parking brake of a vehicle performs an important safety function. It is vital that a vehicle's parking brake be able to hold the vehicle on the types of grades on which it is parked. Twenty percent grades are not uncommon in urban and residential areas, both on streets and driveways, where these vehicles are likely to be parked. In light of the relatively modest cost required to meet the 20 percent grade requirement, the agency has determined that vehicles not meeting that requirement pose an unreasonable safety risk. As noted above, Standard No. 105 has required even large school buses, i.e., those with a GVWR greater than 10,000 pounds, to be tested on a 20 percent grade for several years. Also, Standard No. 121, *Air Brake Systems*, uses a 20 percent grade for large air-braked trucks.

The change in gradient will result in cost savings to other manufacturers. The agency's new cost estimates for those manufacturers are set forth in the Supplement to the Final

Regulatory Evaluation. The agency estimates that while the number of vehicles requiring upgrading as a result of the parking brake requirements will not change for those manufacturers, less significant design changes will be needed to meet the new gradient requirement. The costs for those manufacturers will therefore be less than previously estimated.

Service Brake Requirements: Technical Issues

Chrysler's petition discussed several issues in addition to the parking brake requirements and requested withdrawal of the entire amendment pending further studies. That company stated, as it did in its comment on the notice of proposed rulemaking, that the test requirements are overly stringent and unreasonable because the test procedures are abusive to the brake system. According to that commenter, the test procedure is unrepresentative of real-world driving conditions and goes beyond the need for motor vehicle safety. Moreover, that commenter suggested that the requirements might cause manufacturers to bias the design of brake systems toward complying with the standard rather than providing brake systems that are balanced under all vehicle loading and driving conditions.

The agency carefully considered and addressed those concerns in the preamble to the January 1981 final rule. Chrysler's petition neither addressed the statements made by the agency in response to those concerns nor indicated any consideration of changes made in the standard's requirements to assure that manufacturers have adequate leeway to produce well-balanced brake systems. The petition also did not cite any new issues or data related to those concerns. Moreover, as explained in the preamble to the final rule, the vast majority of light trucks sold today already meet all of the standard's performance requirements without experiencing any problems relating to the balancing of brake performance.

Standard No. 105's test procedures were developed by the agency to assure that a vehicle's braking system meets minimum performance requirements under the varying types of conditions experienced in actual service. A vehicle's braking system is tested, for example, in new and broken-in conditions, at various speeds, while the vehicle is fully and lightly loaded, under varying conditions of fade, and under partial failure and failed power.

Contrary to the assertions made by Chrysler's petition and as explained in the preamble to the final rule, the tests do represent the types of conditions experienced in actual service. For example, the standard's second fade test, which Chrysler has alleged in the past to be abusive, simulates the type of fade experienced during long mountain descents. The agency has verified that the temperatures produced by the test sequence are the same temperatures as sometimes experienced during long mountain descents.

Chrysler's comment on the proposed rule requested only one change in the standard's requirements based upon the above-stated concerns, an increase of 16 percent in fourth effectiveness (fully loaded) stopping distances. Chrysler stated that change was necessary to provide consumers with better balanced brake systems and to avoid the use of unproven load or deceleration sensing proportioning devices. As the preamble to the final rule explained, the proposed stopping distances were based on vehicle tests conducted by the agency using production vehicles with unaltered brakes and on confidential information provided by General Motors, Ford and Chrysler. These data indicated that recent models of almost all vehicles under 8,000 pounds GVWR passed the proposed requirements. Moreover, the agency determined that all vehicles subject to the standard could meet the proposed requirements without using unproven load or deceleration sensing proportioning devices by instead making modifications to such vehicle components as brake linings, wheel cylinders, master cylinders, and combination valves.

A vehicle's braking system which met the proposed requirements for Standard No. 105 would be adequately balanced in that it would meet performance requirements under the varying conditions described above, most significantly when the vehicle was both loaded and unloaded. Based upon a number of comments received from manufacturers, however, as well as on a further evaluation of available data, the agency determined for the January 1981 final rule that the stopping distances for the fourth effectiveness test for vehicles with a GVWR of 8,000 to 10,000 pounds should be extended by 10 percent. This change gave manufacturers additional leeway in balancing their braking systems, thus making it easier to design systems that are balanced for both fully loaded and lightly loaded conditions.

The preamble to the final rule explained that since the agency had concluded that the requirements could be met as proposed for all vehicles (for both loaded and unloaded tests) without anti-lock or similar devices, the agency declined to adopt Chrysler's suggestion of a 16 percent extension of fourth effectiveness stopping distances. Instead, NHTSA chose the 10 percent extension suggested by a number of other manufacturers. The agency further determined, based on test data, that a 10 percent extension would be sufficient to make it easier for manufacturers to assure that their vehicle's braking systems perform well in both loaded and unloaded conditions.

Neither Chrysler's comment on the notice of proposed rulemaking or its petition for reconsideration explained the derivation of its 16 percent figure. Moreover, Chrysler's petition for reconsideration did not indicate why the 10 percent extension was insufficient to meet the problem identified by Chrysler and did not either renew that company's request for a 16 percent extension, or raise any other issues concerning the matter.

Safety Need, Costs and Benefits

All three petitions for reconsideration challenged the extension of the standard on the bases of safety need and/or costs and benefits. Chrysler stated that the January 1981 final rule would require it and probably other manufacturers to redesign service and parking brake systems of light duty trucks, buses and MPV's. According to that commenter, such changes would waste scarce resources in the absence of any demonstrated safety need. As explained above, the agency changed the parking brake requirements in response to Chrysler's concerns. Ford's petition requested withdrawal of the entire final rule because it believes there has been a complete lack of any valid demonstration by NHTSA that the implementation of the requirements may reasonably be expected to produce the safety benefits that have been projected for it and because it believes that the expenditures required to demonstrate conformity with the standard are excessive and inflationary. Ford's petition also stated that NHTSA has failed, based on data presented, to establish a safety need for the extension of the standard. The Brake System Parts Manufacturers Council stated in its petition that it did not believe that careful analysis has been conducted relating to the costs and benefits of the standard and that it does not believe that regulations should be adopted unless the benefits exceed the costs of the regulation.

The issues of safety need and costs and benefits were discussed at considerable length in the preambles of the notice of proposed rulemaking and the final rule and in the Regulatory Evaluation which was prepared by the agency and made available to the public. As those documents indicate, the agency did carefully consider those issues.

The safety need for the extension of the standard arises from the vital safety role played by a vehicle's braking system and the fact that many vehicles are produced with braking systems which can be significantly improved at an economical cost. In evaluating safety need, the agency carefully considered studies indicating the number and seriousness of accidents involving these vehicles, the overinvolvement of LTM's in fatal accidents as compared with passenger cars, the reduction in accidents that would result from improved braking systems, and the costs and feasibility of making such improvements.

One of the agency's primary concerns about LTM braking is the differential in stopping distances between passenger cars and LTM's. Since light trucks, buses and MPV's share the same roads and traffic flow with passenger cars, they should ideally stop in the same distances. The preamble to the final rule explained, however, that there are differences between passenger cars and LTM's which make accomplishing that goal more difficult for LTM's. Therefore, taking those differences into account, the agency established stopping distances for light trucks, buses and MPV's which are slightly longer than those in effect for passenger cars. In light of the greater aggressiveness associated with LTM's as a result of their size, weight, and design, the agency determined that there is a safety need for LTM braking to be as optimal as is economically feasible, thereby reducing the differential in stopping distances between passenger cars and LTM's and reducing accidents involving those vehicles.

Based on those considerations, the agency believes there is a safety need to assure that the braking performance of all vehicles subject to the standard is at the optimal level which can economically be achieved. Approximately 25 percent of the vehicles subject to the amendment will require improved braking systems. Moreover, the rulemaking action has had and will continue to have an effect on the other 75 percent of vehicles. As is explained below, manufacturers have already improved the braking systems of many of their vehicles, largely as a result of this rulemaking.

The agency believes there is a safety need to assure that those vehicles' braking performance is not downgraded. Increases in stopping distance are not without precedent. Stopping distances for passenger cars actually lengthened during the 1960's as a result of increased weight. Today, the agency is concerned that manufacturers might be tempted, in the absence of a standard, to reduce the braking performance of their vehicles as part of an effort to reduce weight and thereby improve fuel economy. Since some braking system components are relatively heavy, the braking system is a prime target for weight-reduction. The agency believes braking ability to be such an important safety factor that it should not be compromised by efforts to improve fuel economy.

Contrary to assumptions made by Ford's petition for reconsideration, the agency did not issue the amendment to Standard No. 105 solely because of the overinvolvement of LTM's in fatal accidents, as compared to passenger cars, and the rise in the trend of those accidents. Ford attempted to demonstrate in its petition that the overinvolvement of LTM's in fatal accidents is the result of a greater number of young males driving those vehicles rather than a problem with LTM braking ability. Ford also argued that there is no evidence that improved braking ability for LTM's will reverse the rise in the trend of fatal accidents involving those vehicles.

The agency included in its Regulatory Evaluation an analysis of accident data involving LTM's. The agency stated that the overinvolvement of LTM's in fatal accidents suggests a probability that LTM's are deficient in accident preventative systems and/or that their weight and aggressiveness make them dangerous to pedestrians, bicyclists, and occupants of lower weight cars. The Regulatory Evaluation noted that in either case improvement of the braking systems of LTM's for greater accident prevention would serve to help fulfill the need for safety.

Ford may be correct that the demographic profile of LTM drivers is another factor accounting for the overinvolvement of LTM's in fatal accidents. That would not change the fact that improved braking ability will reduce accidents. Similarly, the fact that the rise in the trend of fatal accidents involving LTM's has occurred during a period when braking performance has either improved or been held constant does not alter the fact that further improvements in braking performance will produce additional safety benefits. There is a safety need for vehicles' braking systems to perform as optimally as is economically feasible. The agency has not claimed that improved braking performance will by itself reverse the rise in the trend of fatal accidents involving LTM's. The agency has determined that improved braking performance as a result of the amendment will reduce accidents that would occur in the absence of the standard and thereby save lives.

The amendment to Standard No. 105 was issued by the agency in light of the total number of accidents involving LTM's and not just the increase in those accidents. As noted above, the agency evaluated the number and seriousness of accidents involving LTM's, the overinvolvement of LTM's in fatal accidents as compared with passenger cars, the reduction in accidents that would result from improved braking systems, and the costs and feasibility of making such improvements. Before issuing the notice of proposed rulemaking, the agency estimated both the costs and the benefits of the requirements and concluded that the costs of the amendment were justified by the benefits. Based upon all of these factors, the agency concluded that improving braking systems is a reasonable way of reducing some of the LTM accident problem.

The rulemaking process for this amendment has been going on for a period of over 10 years. During the early 1970's, a final rule was issued establishing braking requirements for these vehicles. However, that rule was indefinitely delayed in 1975 based upon economic considerations. Since that time, manufacturers have voluntarily made a number of improvements in their braking systems, largely following the requirements and test procedures of the delayed final rule.

Because of the voluntary changes made by manufacturers in many of their vehicles since the previous final rule was delayed, as well as changes made by the agency in the new standard, the costs of the amendment are estimated to be only a small fraction of those of the delayed 1975 final rule. Manufacturers had submitted costs for the 1975 final rule for light to medium duty trucks that ranged from $54 to $775 per unit (depending on model configuration) to attain compliance with the standard. The agency compared those figures with independently gathered detailed cost information and determined that those estimates were accurate.

Those figures have no relevance to the January 1981 final rule. Today, as a result of the voluntary changes made by manufacturers in many of their vehicles and changes made in the standard's requirements by the agency, it is estimated that the average cost of the new final rule will be only $2.53 per domestic LTM, or about $13.74 for each vehicle that needs to be upgraded. The costs for meeting the requirements for medium and heavy trucks (over 10,000 lbs GVWR) are estimated to be about $54 per vehicle. The total costs of meeting the standard's requirements for all trucks, buses and MPV's are estimated to be under $18,000,000.

The agency made its estimates of costs on a company-by-company basis. In order to assure that its estimates were correct, the agency enlisted an outside contractor to independently assess the costs that would be involved. As the preamble to the January 1981 final rule explained more fully, the report substantially verified the cost estimates of the agency. Both the contractor's report and the agency's Regulatory Evaluation, which were available to the public in the docket, indicated the models which would require upgrading and the nature of the changes needed.

Comments received from Ford and Chrysler on the notice of proposed rulemaking suggested that a greater number of vehicles would be affected by the standard than estimated by the agency. However, those comments gave only generalized bases for that assertion. While those commenters cited some additional braking system components that might require changes, they did not specify which vehicles would require changes or indicate what the nature or costs of those changes would be. Neither Chrysler's petition for reconsideration or that of Ford provided such information.

The agency contacted Chrysler to obtain clarification of that company's assertions about the costs of the standard. As explained above, Chrysler provided information concerning changes that would be required as a result of the parking brake requirements. That company also provided test data to substantiate that information. Largely on the basis of that information, the agency changed the parking brake requirements and amended its cost estimates concerning those requirements. Chrysler did not provide information concerning the costs of the other requirements of the standard. In the absence of information contradicting the detailed studies on costs made by both the agency and an outside contractor for those other requirements, the agency continues to believe that its cost estimates are correct.

The agency also contacted Ford to obtain clarification of its assertions about costs. Ford's petition stated that the amendment would result in $10,000,000 of certification related costs for that company and cause it to raise the suggested retail prices of its LTM's by an average of $11 per vehicle. By contrast, the agency's estimate of certification costs for Ford is only $130,000. Ford did not discuss the $130,000 figure, which was included in the Regulatory Evaluation, in its comment on the notice of proposed rulemaking.

In response to the agency's request for clarification, Ford indicated that of the $11 increase in costs that it projects, $8 is related to increased quality control by parts suppliers and $3 represents amortization of a $10 million initial investment. Of the $10 million, $7.5 million was said to be for the purchase of nine chassis dynamometers and the upgrading of nine other dynamometers to be used to check brake performance at their nine truck plants. The remaining $2.5 million was attributed to engineering costs associated with compliance certification and quality control.

In setting the requirements for the amendment, the agency specifically took into account production variability. All manufacturers balance their level of quality control with the margin of compliance that they believe is necessary to be confident of 100 percent compliance. By designing braking systems for a level of performance which provides a sufficient margin of compliance to account for production variability, the substantial quality control costs cited by Ford should be made unnecessary. The agency took those factors into account when making its cost estimates and assumed that manufacturers would upgrade their vehicles' braking systems, where necessary, to provide a margin of compliance so as to make substantial quality control costs unnecessary. Further, the test requirements of Standard No. 105 do not specify the use of chassis dynamometers. While such devices may be useful for the purposes of quality control in checking such vehicle components as braking systems, speedometers, and emissions systems, their use is neither necessary nor sufficient to assure compliance with Standard No. 105.

On the issue of benefits, the Brake System Parts Manufacturers Council (BSPMC) cited in its petition a statement made in *The Automobile Calendar* by the United States Regulatory Council that NHTSA cannot predict the precise level of safety improvement resulting from the January 1981 final rule because of the isolated effect of a number of interrelated accident factors, such as driver performance, vehicle responsiveness, and the variable characteristics of the highway and environment. That statement was cited by BSPMC as evidence that the agency does not know the benefits that the final rule will entail.

Both the notice of proposed rulemaking and the preamble to the final rule explained that in carrying out the mandate of the National Traffic and Motor Vehicle Safety Act to issue vehicle safety standards to protect the public against unreasonable risk of vehicle accidents and of death and injury occurring as a result of such accidents, the agency is confronted with inherent problems that limit the degree of precision achievable in estimating the benefits of proposed standards. Engineering and accident analyses can clearly demonstrate that certain vehicle improvements will facilitate the performance of the driver's task and thereby improve safety. In this case, there is also a study showing that reducing stopping distances will reduce accidents. However, it is virtually impossible to isolate individual factors to arrive at precise and certain conclusions about the quantified benefits that will accrue.

The notices explained that given the duty to act under this precautionary statute in the area of accident avoidance notwithstanding an inherent measure of imprecision and uncertainty, the agency has developed and issued accident avoidance standards while attempting within its capabilities to quantify the benefits of the standards and limit the uncertainty. Before issuing the proposal to amend Standard No. 105, the agency carefully evaluated and estimated the benefits that will accrue from the amendment. Those estimates were included in the Regulatory Evaluation prepared by the agency and made available to the public.

Ford's petition challenged the statement in the Regulatory Evaluation that an average 4 percent reduction in stopping distance capability will produce a 5 to 9 percent reduction in accidents where brakes are used. That statement, which was based on a study by the Institute for Research in Public Safety (IRPS), was used by the agency in projecting a reduction of 1,700 to 3,500 LTM-related accidents in the first year after the requirements became effective. The preamble to the final rule discussed the IRPS study at some length in response to a comment by Ford.

Ford's petition did not discuss the agency's response to its comment regarding the IRPS study. Instead, Ford stated that it is "obvious" that a minor improvement (such as 4 percent) in the maximum stopping distance capability of a vehicle can be utilized only in a very small proportion of accidents (well under 5 percent). That commenter concluded that reductions in LTM accidents would be limited to only the 5 percent of accidents in which this maximum capability was utilized. According to Ford, that would make the projected benefits virtually disappear.

Ford's petition gave no basis for its assertion that it is "obvious" that a 4 percent improvement in the maximum stopping distance capability of a vehicle can be utilized only in a very small proportion of accidents. Nor did Ford cite any source for its 5 percent figure. As noted above, the agency factored into its estimates of benefits the fact that brakes are used in about 50 percent of accidents. The 50 percent figure is derived from the IRPS study.

Moreover, in addition to the projected reduction of 1,700 to 3,500 LTM-related accidents in the first year after the requirements become effective, the improvement in stopping distance capability will provide benefits in accident situations where brakes are used but the accident is not prevented. Those benefits will result from the fact that the vehicles will be traveling at a slower rate of speed when the accident occurs, thereby reducing the severity of the accident. For example, assuming a vehicle's maximum stopping distance capability is utilized from a speed of 60 mph, at the point where the improved vehicle is going less than 2 mph, the unimproved vehicle would have been going about 13 mph. At the point where the improved vehicle is going 10 mph, the unimproved vehicle would have been going about 16 mph. In the absence of information contradicting the agency's estimates of benefits or the studies on which they are based, the agency continues to believe that its estimates of benefits are correct.

NHTSA has considered the economic and other impacts of the January 1981 final rule and this amendment and has determined that they are not major within the meaning of Executive Order No. 12291. The agency has further determined that they are not significant within the meaning of the Department of Transportation regulatory procedures. Copies of the agency's Supplement to the Final Regulatory Evaluation may be obtained by writing NHTSA's Docket Section at the address given at the beginning of this notice.

Although NHTSA has considered the effects of these amendments on small businesses, the agency has not prepared a regulatory flexibility analysis. Such an analysis is not necessary in this case, since the Regulatory Flexibility Act applies only to rules for which an NPRM was issued on or after January 1, 1981. The NPRM for the extension of Standard No. 105 to trucks, buses and MPV's was published in October 1979.

The agency has also analyzed these amendments for purposes of the National Environmental Policy Act and has determined that they will not have a significant effect on the human environment.

Issued on December 15, 1981.

Raymond A. Peck, Jr.
Administrator

46 F.R. 61887
December 21, 1981

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 105

Hydraulic Brake Systems

[Docket No. 70-27; Notice 28]

ACTION: Final rule.

SUMMARY: This notice amends Standard No. 105, Hydraulic Brake Systems, to provide an optional test procedure for trucks, buses other than school buses, and multipurpose passenger vehicles (MPV's) with a gross vehicle weight rating (GVWR) of greater than 10,000 pounds. The standard becomes applicable to these vehicles on September 1, 1983. The amendment permits manufacturers to meet the partial failure requirements after conducting the standard's full test sequence preceding the partial failure test instead of the abbreviated test sequence generally specified for these vehicles. Under this option, manufacturers continue to be required to meet only the requirements of those tests in the abbreviated test sequence.

EFFECTIVE DATE: September 1, 1983.

SUPPLEMENTARY INFORMATION: Standard No. 105, Hydraulic Brake Systems, provides that vehicles must meet a variety of performance requirements when tested according to a lengthy list of test procedures and in the sequence in which the procedures are listed by the standard. Currently, the standard is only applicable to passenger cars and school buses. However, effective September 1, 1983, the standard becomes applicable, in whole or in part, to trucks, all types of buses, and multipurpose passenger vehicles. (Final rule published in the Federal Register (46 FR 55) on January 2, 1981; response to petitions for reconsideration published December 21, 1981 (46 FR 61887).)

While Standard No. 105 was extended on a general basis (with some modifications) to vehicles with a gross vehicle weight rating (GVWR) of 10,000 pounds or less, only limited requirements were made applicable to vehicles with a GVWR greater than 10,000 pounds. (The standard's full requirements already applied to all school buses, including those with a GVWR greater than 10,000 pounds.) The abbreviated test sequence applicable to heavy vehicles other than school buses is similar to the full test sequence, except that many of the tests are eliminated.

On July 14, 1983, in response to concerns raised by General Motors (GM) about an apparent anomaly in the test procedure, NHTSA published a notice of proposed rulemaking (NPRM) in the Federal Register (48 FR 32202) to provide an optional test procedure for heavy vehicles other than school buses. As explained in that notice, the agency was informed by GM that some of its heavy vehicles were having difficulties in meeting Standard No. 105's partial failure requirements under the limited test sequence. (The partial failure test ensures that a vehicle's brakes are capable of bringing the vehicle to a controlled stop in a reasonable distance if a part of the service brake system should fail.) Under the full test sequence, the partial failure test is conducted well into the test sequence, following three effectiveness tests, burnish and reburnish (i.e., break-in or conditioning) procedures, and the parking brake test. Of these various steps, only one, the burnish procedure, is included in the limited test sequence.

GM informed NHTSA that it discovered, late in its compliance testing, that certain of its heavy vehicles, as designed, were unable to meet the partial failure requirements under the limited test sequence. However, the same vehicles would meet the partial failure requirements if tested under the full test sequence.

According to GM, redesign of some of its heavy vehicle braking systems would be required to meet the partial failure requirements under the limited test sequence. That company stated that in the short run the minimum cost resulting from such redesign would be in excess of $100 per vehicle, without improving user safety. Annual production of approximately 20,000 vehicles would be affected. Given the economic consequences of this apparent anomaly related to the test procedure, GM requested that the standard be amended to correct it.

After analyzing the issues raised by GM, NHTSA agreed that the standard should be amended. The NPRM explained that the elimination of the other procedures from the limited test sequence could have the effect of increasing the stringency of the later partial failure test. The reason for this is that some brakes tend to become more effective as they are tested, because temperature conditioning improves the friction of the brake pads.

The NPRM also explained that the increased stringency of the partial failure test under the limited test sequence was neither intended nor foreseen by the agency. Indeed, the stopping distances for the partial failure test were based on the assumption that the full test sequence would be conducted. The same stopping distances are applicable to heavy school buses, but they are tested under the full test sequence.

NHTSA proposed that manufacturers be given the option of subjecting their heavy vehicles to the full test sequence preceding the partial failure test instead of the limited test sequence. The NPRM explained that manufacturers would not be required to meet performance requirements associated with the additional tests under this proposed option. However, manufacturers would be required to conduct the additional tests in accordance with the standard's specified test procedures.

Three comments were received by the agency, all of which supported adoption of the proposed amendment. GM commented that the NPRM properly described the situation as an unexpected and unintended increase in test stringency arising solely from the elimination of several test sequence steps in the interest of test efficiency and that the difficulty is only one of procedure and not one that in any way affects motor vehicle safety. That company emphasized that the brake system in question is very similar to that on its school buses of equivalent GVWR and when tested to the full sequence schedule, as is the school bus system, meets all applicable requirements.

GM also stated that the proposed solution is the most logical approach to elimination of this unintended increase in stringency. That company noted that giving the manufacturer the option to choose whether its vehicles are tested to the full or abbreviated test sequence enables systems which have been developed to meet the full school bus requirements to also comply when used on trucks, without additional complication, while also allowing a manufacturer which has developed a system to comply with the abbreviated test sequence to use that system without additional testing.

Ford commented that it agrees with the agency's analysis that the elimination of certain procedures from the test sequence applicable to vehicles other than the subject heavy vehicles could have the effect of increasing the stringency of the partial failure test in the abbreviated test sequence, and that it supports the proposed amendment. Chrysler submitted a comment which stated that it concurs with the proposed amendment.

After reviewing the comments, NHTSA has determined that the amendment should be adopted as proposed. An effective date of September 1, 1983, is provided. The agency has determined that an effective date of such short notice is in the public interest given the imminence of the September 1, 1983, effective date for Standard No. 105's applicability to these vehicles, and the optional nature of the amendment.

The agency has considered the costs and other impacts of this amendment and has determined that it is not major within the meaning of Executive Order 12291 or significant within the meaning of Department of Transportation's regulatory procedures. Further, the agency concludes that the economic and other consequences of the amendment are so minimal as not to require preparation of a full regulatory evaluation. Due to the optional nature of the amendment, no new costs are imposed on manufacturers or consumers. The amendment will result in some cost savings to manufacturers and consumers since it eliminates the need for redesign of some brake systems. In the short run, these savings could be relatively high on a per vehicle basis. As noted above, GM indicated that short-run redesign costs would have been in excess of $100 per vehicle, had the standard remained unchanged. In the longer run, however, NHTSA believes that these savings would probably be low, since, with a long leadtime, manufacturers could likely redesign their brakes at a much lower cost to comply with the requirements under the abbreviated test sequence.

The agency has considered the effects of this proposal in relation to the Regulatory Flexibility Act. I certify that this amendment will not have a significant economic impact on a substantial number of small entities. Small businesses will be affected by the amendment only to the extent that they are sellers or purchasers of affected vehicles. Small organizations and small government jurisdictions will only be affected to the extent that they are purchasers of affected vehicles. The amendment will result in some lower vehicle prices, thereby benefitting both sellers and purchasers. However, such savings are sufficiently small relative to the purchase price of heavy vehicles, even in the short run when they are expected to be at their highest, that they are unlikely to significantly affect purchasing decisions.

Finally, the agency has analyzed this amendment for §571.105 [Amended].

Section S7 is amended by revising the parenthetical after the first sentence of the paragraph to read as follows:

(For vehicles only having to meet the requirements of S5.1.2 and S5.1.3 in section S5.1, the applicable test procedures and sequence are S7.1, S7.2, S7.4, S7.9, S7.10 and S7.18. However, at the option of the manufacturer, the following test procedures and sequence may be conducted: S7.1, S7.2, S7.3, S7.4, S7.5, S7.6, S7.7, S7.8, S7.9, S7.10 and S7.18. The choice of this option shall not be construed as adding to the requirements specified in S5.1.2 and S5.1.3.)

Issued on August 30, 1983

Diane K. Steed,
Deputy Administrator

48 F.R. 39939
September 2, 1983

PREAMBLE TO AN AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 105

Hydraulic Brake Systems; Controls and Displays
[Dockets No. 1-18, Notice, 32; No. 70-27, Notice 31]

ACTION: Final rule.

SUMMARY: Federal Motor Vehicle Safety Standards No. 105, *Hydraulic Brake Systems,* and No. 101, *Controls and Displays,* have required telltales whose single function is indicating failure in the antilock portion of a brake system to read "ANTILOCK." This notice amends those standards to permit "ABS," an abbreviation for "Antilock Brake System," as an alternative.

DATES: The amendments made by this rule are effective June 29, 1987.

SUPPLEMENTARY INFORMATION: Federal Motor Vehicle Safety Standard No. 105, *Hydraulic Brake Systems,* requires an indicator lamp, i.e., a telltale on the dashboard, to be activated whenever there is a total functional electrical failure in an antilock brake system. The manufacturer may meet this requirement by using a common indicator displaying the word "BRAKE," which also warns the driver about other types of brake failure. Alternatively, the manufacturer may provide a separate indicator for antilock failure.

If the manufacturer uses a separate indicator for antilock failure, Standard No. 105 and Standard No. 101, *Controls and Displays,* have specified that the indicator must read either "ANTILOCK" or "ANTI-LOCK." On April 16, 1986, NHTSA published a notice of proposed rulemaking (NPRM) in the *Federal Register* (51 FR 12900) to permit "ABS," an abbreviation for "Antilock Brake System," as an alternative.

As discussed in the NPRM, this rulemaking action resulted from a petition for rulemaking submitted by Mercedes-Benz. That company stated that the letters "ABS" have been used in automotive press articles and in manufacturers' print advertising, with few exceptions; for identifying brake systems with antilock capabilities. Copies of such publications were submitted with the petition. The petitioner contended that as antilock brake systems increase in availability, the abbreviation will be increasingly used by the media, in technical publications, and in owners' manuals, and is expected to remain synonymous with this type of brake system.

Mercedes also argued that if a manufacturer offers a system or feature not required by regulation, but provides a corresponding telltale required by regulation, that telltale message should be permitted to correspond with the campaigns developed to promote such safety systems. That company compared the use of "ABS" in its marketing of antilock braking systems to the use of "SRS" in marketing its Supplementary Restraint System.

In the NPRM, NHTSA stated that it believed that the primary issue it must consider in responding to Mercedes' petition is the recognizability and understanding of "ABS" as compared to "ANTILOCK," both by new car buyers and other drivers. For example, in deciding not to adopt the International Standards Organization (ISO) brake symbol as an alternative to the word "BRAKE" in common indicators, the agency noted a Society of Automotive Engineers (SAE) study indicating extremely low percentage recognition for the ISO brake symbol compared to the word "BRAKE," and the importance for safety of drivers understanding the meaning of the brake indicator lamp. See 50 FR 23430 (June 4, 1985).

NHTSA indicated in the NPRM that it was unaware of data concerning the recognizability and understanding of "ANTILOCK" or "ABS." The agency recognized that, unlike some identifying words and abbreviations, the abbreviation ABS appears to require learning by the driver in order to understand its meaning. However, given the use of ABS by the media and in marketing campaigns, the agency agreed with the petitioner that such learning is likely to be taking place and to continue to do so. The agency also noted that the word "ANTILOCK" requires learning by the driver in order to understand its meaning, since antilock technology is relatively new and unfamiliar to most drivers. NHTSA specifically requested comments and data on the recognizability and understanding of "ANTILOCK" and "ABS."

NHTSA received nine comments on the NPRM, some of which favored the proposal and some of which opposed it. Commenters supporting the proposal include Chrysler, Ford, Volkswagen, BMW, American Motors (AMC) and Volvo. Chrysler stated that with the expected increase in usage of antilock brake systems and accompanying owner information and advertising campaigns, both "ANTILOCK" and "ABS" should be recognizable and understandable to drivers of those cars. Ford stated that it supports the proposal since (1) it represents more efficient use of space in labeling a small telltale, (2) that company has used the term "ABS" to designate its antilock brake systems, (3) the "ABS" designation has been recognized by the International Standards Organization (ISO) as part of one of its proposals for an antilock brake symbol, and (4) that company probably would employ the "ABS" identification in its products worldwide if it is permitted by NHTSA for use in the United States. That company cited data suggesting that "ABS" currently has lower recognition than "ANTILOCK," but pointed out that an abstract symbol, such as "ABS," can be learned just like a word in another language or a new slang word. BMW asserted that since both antilock braking systems and separate telltales for them are voluntarily provided, manufacturers should be provided maximum flexibility in telltale identification. That company stated that both messages are equally unknown to the driving public and that neither is self-explanatory. BMW also noted that, unlike the other required brake telltales, complete loss of this function does not interfere with normal braking. That commenter stated that this is reflected by Standard No. 101's traditional designation of the color yellow for this telltale, in contrast to red for the others, indicating less urgency. AMC acknowledged that the introduction of "ABS" would necessitate some education of drivers, but asserted that it is opportune that this be done now, as the new antilock technology is gradually being integrated into vehicle designs. Volkswagen noted that while the provision of multiple brake indicator lights can add significantly to the amount of information provided to the driver, the amount of information which can be printed on a telltale is usually quite limited. That company supported use of "ABS," arguing that inflexibility with regard to the abbreviated message to be displayed is not reasonable.

Commenters opposing the proposal include Honda, Renault, and a private individual, Mr. Robert F. Schlegel, Jr. Honda stated that other abbreviations for Antilock Brake System are in use by other manufacturers, including "ALB" (Anti-Lock Brake), "ASBS" (Anti-skid Brake System), "ESC" (Electronic Skid Control), and "SCS" (Stop Control System). That commenter stated that these various abbreviations, including "ABS," are trademarks, and expressed concern that the wide use of "ABS" with the Bosch antilock brake system may lead consumers to believe that any vehicle with a telltale showing the letters "ABS" is equipped with a Bosch system. Based on this concern, Honda argued that it is neither wise nor lawful for NHTSA to permit such use. Renault similarly commented that the abbreviation "ABS" is commonly associated with a particular anti-skid device, or with a particular manufacturer. That company stated that there is no reason to assign a greater value to this abbreviation than to other ones which may appear. Renault stated that the French manufacturers have proposed a pictorial symbol for antilock failure to the ISO, which is also currently considering two other symbols. Since the ISO has not yet ruled on an international symbol for antilock failure, that commenter requested that Standards No. 101 and No. 105 not be amended at this time. Renault also argued that if "ABS" is permitted, other symbols, particularly those before the ISO, should also be permitted. Mr. Schlegel argued that the word "ANTILOCK" conveys more information than "ABS" to the vast majority of drivers, contending that symbols must provide a pictorial or verbal clue. According to that commenter, there are too many acronyms arriving lately that are not understood by the general public.

After careful consideration of the comments, NHTSA has decided to permit the use of "ABS" as an alternative to "ANTILOCK." The use of multiple brake indicators can provide additional safety information to the driver, and the agency believes that greater flexibility is appropriate. The message "ABS" is considerably shorter than "ANTILOCK" and is therefore more easily incorporated into a small telltale.

NHTSA recognizes that "ABS" will require learning on the part of drivers. For example, in an informal survey of 40 Ford engineering employees, 15 percent associated "ABS" with antilock brakes, while 72 percent recognized the word "ANTILOCK." As indicated in information provided by Mercedes-Benz and BMW, however, the term "ABS" is being used in both press articles and advertising. NHTSA believes that drivers are learning the meaning of "ABS," and that such learning will continue. NHTSA notes that there are differences between this situation and that involved in the agency's decision not to permit use of the ISO brake symbol. First, the telltale for antilock failure is not as urgent or critical a warning as that for other types of brake failure. Second, there is extensive use of the term "ABS" in press articles and advertising, which is not the case for the ISO brake symbol. Third, as antilock technology is still in the early stages of being introduced to drivers, there is a unique opportunity for learning the term "ABS." By contrast, drivers have come to expect use of the word "BRAKE" for other types of brake failure.

While NHTSA believes that greater flexibility is appropriate, it does not believe it would be in the interest of safety to permit multiple acronyms or symbols. While permitting the use of "ABS" will facilitate the learning of that acronym by drivers, drivers cannot be expected to learn the meaning of multiple acronyms or symbols for the same message. NHTSA notes that this action may help facilitate international harmonization, since one of the symbols being considered by the ISO for antilock failure incorporates "ABS."

Since NHTSA considers it appropriate to permit only one alternative to "ANTILOCK," it is necessary that use of that alternative be available to all manufacturers. Accordingly, the agency contacted Mercedes-Benz concerning whether its parent company, Daimler-Benz, was willing to waive protection of its trademark and grant a general approval to use "ABS" for all types of antilock braking systems. Daimler-Benz executed a declaration, which included the following statement:

> If the term "ABS" is permitted under 49 CFR Part 571, *Federal Motor Vehicle Safety Standards,* by the National Highway Traffic Safety Administration, United States Department of Transportation, as an alternative to "ANTI-LOCK" for identifying telltales for malfunctions in antilock brake systems, Daimler-Benz Aktiengesellschaft hereby declares that it waives the protection of its trademark and grants a general approval to use the term "ABS" as a symbol for all types of anti-lock brake systems.

The declaration executed by Daimler-Benz has been placed in the docket. NHTSA believes that the waiver resolves the trademark concerns raised by commenters. Since it is clear that all manufacturers can now use "ABS," the agency does not believe consumers will associate the term with any particular company.

Since this amendment imposes no new requirements but instead increases manufacturer flexibility by relieving a restriction, NHTSA has determined that an effective date of 30 days after publication in the *Federal Register* is in the public interest.

Part 571--[AMENDED]

In consideration of the foregoing, 49 CFR Part 571 is amended as follows:

In Table 2 of 571.101, the identifying words or abbreviation for malfunction in anti-lock (row 9, column 3, above the dotted line) is revised to read:

Antilock, Anti-lock, or ABS. Also see FMVSS 105.

S5.3.5(a) of 571.105 is revised to read:

S5.3.5(a) Each indicator lamp shall display word, words or abbreviation, in accordance with the requirements of Standard No. 101 (49 CFR 571.101) and/or this section, which shall have letters not less than 1/8-inch high and be legible to the driver in daylight when lighted. Words in addition to those required by Standard No. 101 and/or this section and symbols may be provided for purposes of clarity.

S5.3.5(c)(1)(C) of 571.105 is revised to read:

(C) If a separate indicator lamp is provided for an anti-lock system, the single word "Antilock" or Anti-lock," or the abbreviation "ABS," may be used for S5.3.1(c).

Issued on May 21, 1987

Diane K. Steed
Administrator

52 F.R. 19872
May 28, 1987

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 105

Burnish Procedures for Heavy Duty Vehicles

[Docket Nos. 70-27; Notice 29 and 83-07; Notice 4]

ACTION: Final rule.

SUMMARY: Before a vehicle is tested for compliance with most of the requirements of this agency's braking standards, the vehicle's brakes are broken-in by a series of brake applications. This break-in is called a burnish, and is intended to simulate the break-in that a vehicle's brakes would get when they are initially used on the public roads. With respect to heavy vehicles (those with a gross vehicle weight rating greater than 10,000 pounds), the burnish procedure now requires that the brakes be heated to not more than a specified maximum temperature by means of a series of brake applications.

The agency initiated rulemaking regarding this temperature limit because the limit is more favorable to drum brake designs than to disc brake designs. This situation arises because the limit was based on drum brake systems whose normal safe operating temperatures are significantly lower than those of disc brake systems. As a result, disc brake systems may not be adequately broken-in under the current burnish procedure.

To address this problem, this rule establishes a new burnish procedure for vehicles with a gross vehicle weight rating (GVNR) greater than 10,000 pounds. Under this new procedure, the vehicle will make 500 brake applications to slow the vehicle from 40 to 20 miles per hour (mph), without regard to the resulting temperature. This procedure will break-in brakes in a manner that is more realistic and representative of the break-in the vehicle brakes actually get when in service on the roads, without favoring any particular braking system design.

Since this new burnish procedure may affect the design and certification of new and existing braking systems, the agency believes it is appropriate to allow a transition period for implementing this new burnish procedure. Therefore, this rule allows manufacturers to base the certification of their heavy vehicle brakes on either the new or the old burnish procedures until September 1, 1993. In testing a vehicle for compliance, the agency will use the same procedures on which the manufacturer's certification of compliance was premised. All vehicles manufactured on or after September 1, 1993, will be burnished under the new burnish procedures set forth in this rule.

DATE: This rule is effective September 12, 1988.

SUPPLEMENTARY INFORMATION:

Background and Notice of Proposed Rulemaking

NHTSA has established two standards applicable to the braking systems on vehicles with a gross vehicle weight rating greater than 10,000 pounds. These two standards are Standard No. 105, *Hydraulic Brake Systems* (49 CFR §571.105) and Standard No. 121, *Air Brake Systems* (49 CFR §571.121). Standards No. 105 and 121 both specify road tests to measure the brake systems' compliance with the performance requirements. Both standards specify also that the brake systems on these heavy vehicles shall be "burnished" before undergoing road testing to determine if the brake systems satisfy the performance requirements of the applicable standard. The burnish is a series of brake applications that serve to "break-in" the brakes on a new vehicle.

Before the initiation of this rulemaking, the burnish procedure was as follows. The burnish consisted of a series of 500 brake applications at specified speeds. During the burnish procedure, the maximum temperature of the hottest brake on the vehicle was not permitted to exceed 550° F. The first 175 brake applications (hereinafter referred to as "snubs") were made so as to slow the vehicle from 40 miles per hour (mph) to 20 mph. Subsequent snubs were conducted at initial speeds that increase in increments of 5 mph until the final series of snubs brake the vehicle from 60 mph to 20 mph. However, if the maximum allowable brake temperature were reached at some speed less than 60 mph, the speed was not increased for the following snubs. The snub speed could even be reduced if such a reduction were needed to maintain the brake temperature below the specified maximum level.

Standard No. 121 also specifies a dynamometer test. The burnish for brake systems to be tested on the dynamometer specifies a series of 400 brake applications from 40 mph, at a specified rate of deceleration. For these brake applications, Standard No. 121 specifies that the initial brake temperature shall be within a stated range. The initial brake temperature is defined in section S4 of Standard No. 121 as "the average temperature of the service brakes on the hottest axle of the vehicle 0.2 miles before any brake application."

The maximum brake temperatures during the road test burnish, which apply to both disc and drum brake systems, were based on SAE Recommended Practice J880, "Brake System Rating Test Code — Commercial Vehicles." This recommended practice was established in 1963, based solely on test data for drum brakes. One problem that became apparent with respect to the maximum burnish temperatures specified in the standards was that the specified maximum temperature may not have been appropriate for disc brake systems. Disc brake systems are generally designed to operate at appreciably higher temperatures than are drum brake systems. It has been difficult to avoid exceeding the specified 550° F maximum temperature during the burnish of vehicles with disc brake systems, even at the lowest of the burnish speeds set forth in the standards, i.e., 40 mph.

In response to this situation, International Harvester (IH) filed a petition for rulemaking with NHTSA. In its petition, IH asked the agency to amend the burnish procedures to take account of the differing characteristics of disc and drum brake systems. International Harvester has subsequently changed its corporate name to Navistar. However, all of the material in the public docket for this rulemaking action identify the company as International Harvester. To avoid potential confusion, this preamble refers to the company as International Harvester.

Notice of Proposed Rulemaking

After granting this petition, the agency published a notice of proposed rulemaking (NPRM) at 48 FR 29560; June 27, 1983. The NPRM proposed to amend the sections of Standards No. 105 and 121 applicable to burnish before road testing as follows. If the temperature of the hottest brake exceeded 550° F at a snub condition of 40 to 20 mph, the remaining snubs would be run from 40 to 20 mph without regard to the brake temperature. NHTSA anticipated that this proposed change would not create any compliance problems for existing drum brake systems, which do not typically exceed the specified temperature during burnish, while resolving the burnish problems that could occur for disc brake systems.

No change was proposed for the dynamometer burnish temperature in Standard No. 121 because the temperature problems which had arisen during the road test burnish had not occurred with respect to the dynamometer burnish. Accordingly, NHTSA saw no reason to propose changing that burnish procedure.

The NPRM also proposed some more minor revisions to the standards. One proposed change was intended to clarify the procedure for loading tractors and trailers during burnish testing. Another proposed change would have specified brake adjustments at equal intervals during the burnish. This change was proposed to ensure uniformity and repeatability of test results. The final proposed change involved automatic slack adjusters and automatic brake adjusters. Under the NPRM, both standards would have been amended to specify that brake systems equipped with such devices could not deactivate the devices during the testing for compliance with Standards No. 105 and 121.

The agency received seven comments on the NPRM. Motion Control Industries (Motion Control) suggested in its comments that NHTSA delete entirely the temperature restrictions during the burnish. In support of this position, Motion Control asserted that the existing burnish procedures do not sufficiently condition rear drum brakes on vehicles equipped with disc brakes on the front axle. This assertion was based on the fact that the temperature of the front disc brakes will exceed 550° F during the 40 to 20 mph snubs, and so the vehicle would not run any snubs at speeds in excess of 40 mph. The failure to condition the rear drum brakes at the higher snub speeds meant, according to Motion Control, that those drum brakes would not perform as well as they are designed to do during the compliance testing. Motion Control contended that if the friction materials in the brake systems are designed to stop vehicles from 60 mph while in service and are subjected to 60 mph stops during testing, it is desirable for the friction materials to experience whatever temperatures result from 60 mph stops during the burnish.

In a related vein, Ford Motor Company (Ford) stated that the amendment set forth in the NPRM would relieve the problems encountered by vehicles with disc brakes on all axles, but would not achieve its purpose for vehicles equipped with a combination of disc and drum brakes. According to Ford's comment, "the procedure which would burnish the brakes most effectively on a vehicle equipped with a combination of disc and drum brake systems would be one which maintained the drum brake temperatures within the window of 450°-550° F, while allowing the disc brake temperatures to find their own level, unrestricted." This suggestion was similar to Motion Control's, in that no temperature restrictions would apply to disc brake systems. If the Ford suggestion were adopted, vehicles with disc brake systems on all axles would not be subject to any temperature limitations during the burnish procedure. However, the Ford suggestion would have retained the temperature limitations for drum brake systems.

After publication of the NPRM, NHTSA had conducted some testing to determine what burnish procedures would expose heavy duty vehicle brakes to sufficiently high temperatures to simulate a break-in of the brakes under normal driving conditions without favoring any particular design. That testing indicated that heavy duty vehicle brakes should be burnished by 500 snubs slowing the vehicle from 40 to 20 mph, without regard to the brake temperatures generated during the burnish. Such a burnish procedure exposes all types of brake systems to the temperatures they are likely to experience in city driving, without penalizing or favoring any particular type of brake design. Such a procedure would also be consistent with the burnish procedures specified by the Society of Automotive Engineers (SAE) for heavy duty vehicle brake performance testing; see SAE Recommended Practice J786a. (The burnish procedure in SAE Recommended Practice J880a, allowing snubs from 60 to 20 mph, is for a brake *energy absorption* test, not a brake *performance* test).

Supplementary Notice of Proposed Rulemaking

The agency wanted to give the public an opportunity to comment on the approaches suggested by Ford and Motion Control and the agency research, before proceeding to establish a final rule. Accordingly, NHTSA published a supplementary notice of proposed rulemaking (SNPRM) at 50 FR 21313; May 23, 1985. The SNPRM proposed four alternative methods for amending the burnish procedures. These were the Ford approach, the Motion Control approach, the approach suggested by the agency research, and the approach originally proposed in the NPRM with some minor changes.

Further, the SNPRM asked for additional comments on the minor amendments proposed in the NPRM. First, the NPRM had erroneously proposed the following conditions for burnishing the brakes of a truck tractor. As proposed, the truck tractor would be loaded to its gross vehicle weight rating and a trailer attached to the tractor would be loaded to its gross axle weight rating. However, the NPRM would have required that the control trailer be *unbraked*. Such loading would overtax the tractor's brakes during the burnish, since those brakes would be stopping far more weight than they were designed to stop. To correct this error, the SNPRM proposed to require that the combination of the tractor and the unbraked trailer be loaded only to the gross vehicle weight rating of the tractor.

Second, the NPRM had proposed that brake adjustments be made at specified intervals during the burnish procedure. Past interpretations and preambles had repeatedly stated that brake adjustments were permitted during burnish. To establish uniformity for both manufacturer and agency testing as to when such adjustments would be made, the NPRM proposed that the brakes be manually adjusted at specified intervals. In the case of the road test burnishes, the adjustments would be made manually after 125, 250, and 375 snubs, in accordance with the manufacturer's recommendations. For the dynamometer test burnishes specified in Standard No. 121, the brakes would be adjusted manually after 100, 200, and 300 snubs.

General Motors (GM) objected to the proposed brake adjustment procedures in its comments on the NPRM. While acknowledging that manual adjustment might provide the most accurate adjustment, GM did not believe that manual adjustments would always be necessary. GM stated that, in most instances, use of the automatic brake adjustment feature in accordance with the manufacturer's recommendations would provide adequate adjustment.

NHTSA was persuaded by this comment. Accordingly, the SNPRM proposed that brakes shall be adjusted in accordance with the manufacturer's recommendations. If a vehicle manufacturer recommended manual adjustment for its brakes, the brakes would be so adjusted. Alternatively, if the manufacturer recommended that the brakes be inspected and adjusted only if necessary, that recommendation would be followed. If the inspection showed that no adjustment to the brakes was necessary, none would be performed.

Third, several commenters to the NPRM objected to the proposed requirement to prohibit deactivation of automatic brake adjusters during testing for heavy vehicle's brake performance. These commenters argued that there was no valid reason to treat these heavy duty vehicles any differently than vehicles with GVWR's of 10,000 pounds or less. Since the lighter vehicles are allowed to deactivate automatic brake adjusters during testing, heavier vehicles should be offered the same option, according to these commenters.

NHTSA agreed with the implicit point of these comments that the reasons for and against permitting deactivation of automatic brake adjusters apply equally to all vehicles equipped with such devices, regardless of vehicle weight, size, or type. Since this rulemaking addresses only the question or heavy duty vehicles and the agency did not think it appropriate to address the deactivation of automatic brake adjusters in a piecemeal fashion, the SNPRM announced that the issue would be addressed in a separate rulemaking. Hence, this rulemaking no longer addresses the issue of deactivation of automatic brake adjusters.

In response to the SNPRM, 16 comments were submitted by 13 different commenters. All these comments were considered in connection with this final rule, and the most significant are discussed below.

Final Rule

Burnish Procedures

The SNPRM asked for comments on four alternative burnish procedures. In the SNPRM, the agency explained that its desired goal was to establish burnish procedures which represent driving conditions that would be encountered in normal use and which are fair for both types of brake systems (i.e., disc and drum brakes) while favoring neither. 50 FR 21315. Each of the four alternative procedures set forth in the SNPRM was evaluated to see how well it achieved this goal.

The approach suggested by Motion Control in its comments on the NPRM was to eliminate the maximum temperature requirements during burnish and simply run the snubs as specified in Table IV of Standards No. 105 and 121. None of the commenters to the SNPRM supported this approach. Lucas Industries Inc. (Lucas) stated that this approach would cause drum brakes to exceed 550° F in some circumstances during the burnish. Such temperatures would, according to Lucas, degrade the brakes' performance in subsequent tests. Chrysler agreed with Lucas, stating that an overly severe burnish can create excessive brake temperatures that substantially degrade or destroy the friction characteristics of the brake lining material. Accordingly, Chrysler urged that this approach not be adopted. The Bendix Division of Allied Automotive (Bendix) comment was substantially similar to Chrysler's on this alternative. Ford, IH, and General Motors commented that this alternative should not be adopted because it would not be representative of normal conditioning.

Motion Control itself stated that its suggested alternative would not be representative of normal brake conditioning and should not be adopted. However, Motion Control commented that the alternative would be acceptable if modified to require four 40-20 mph snubs followed by one 60-20 mph snub, repeated one hundred times for a total of 500 snubs. In support of this position, Motion Control tested a vehicle with front disc brakes and rear drum brakes according to this proposed modification. The testing showed that the front disc brakes would experience temperatures of 820° F during such burnish, while the rear drum brakes would be heated to 560° F at the end of this testing.

The agency agrees with the commenters that stated that the Motion Control approach as set forth in the SNPRM could potentially damage the brakes. Accordingly, such an approach would not satisfy the goal of establishing burnish procedures that are fair for both disc and drum brakes, nor would it be representative of the conditions encountered in normal driving. Therefore, this approach was not adopted in this final rule.

The Ford approach received some support in the comments. As noted above, the Ford approach set forth in the SNPRM would retain the 550° F temperature limitation for drum brakes during the burnish, but would eliminate temperature restrictions for disc brakes. Lucas supported this alternative, contending that it would burnish drum brakes on disc-drum combination vehicles under the same conditions as drum brakes would be burnished on vehicles using only drum brakes. Motion Control also stated that this alternative was the best for vehicles that used disc and drum brakes. Abex Corporation (Abex) stated that they supported the Ford approach, if the agency were going to amend the burnish procedures. Flxible

Corporation (Flxible) stated that brake temperatures in excess of 500° F cook the lining resin in drum brakes and reduce their performance. Because of this, Flxible stated that any alternative that retained such a limit for drum brake burnish was acceptable, including the Ford approach.

On the other hand, Chrysler, IH, Bendix, GM, and the Motor Vehicle Manufacturers Association (MVMA) opposed the Ford approach. These commenters believed that no temperature limits during the burnish of vehicles using only disc brake systems would potentially damage the disc brakes. Additionally, these commenters did not believe that this burnish procedure would be representative of normal driving. Ford itself agreed that some temperature limits should be added for disc brakes during the burnish, and suggested that its approach be adopted with an upper limit of 800° F for disc brakes. Both Bendix and MVMA commented that they would support the Ford approach, if a temperature limitation for disc brakes were added.

The approach suggested in the NPRM also received some support in the comments. Under this approach, vehicles would be burnished according to the schedule specified in Table IV, with a temperature limitation of 550° F for the hottest brake. However, if this temperature limitation were exceeded during the 40 to 20 mph snubs, all the remaining snubs would be run from 40 to 20 mph without regard to temperature. Chrysler stated that there was no need to change the burnish procedures, but if they were to be changed, the approach suggested in the NPRM was the best of the four alternatives listed in the SNPRM. IH commented that the NPRM's approach was the only acceptable alternative offered in the SNPRM. This belief was based on that approach giving the higher temperatures necessary to properly condition truck brakes and preserving the data history from compliance testing for the past 12 years.

However, Lucas opposed this approach, because rear drum brakes on a disc/drum vehicle would not be sufficiently conditioned when the front disc brakes reached a temperature of 550° F. Motion Control raised the same objection, and also stated that this approach would not be representative of normal conditioning, since it would not allow 60-20 mph snubs on disc/drum vehicles. Bendix opposed this approach, arguing that it would not adequately condition the front disc brakes on a vehicle using only disc brakes.

This final rule does not adopt either the Ford approach (limiting drum brake temperatures to 550° F) or the NPRM approach (limiting the hottest brake temperature to 550° F), because the agency has concluded that the brake temperatures that would be generated under either of these approaches would not be representative of the brake temperatures generated during normal driving conditions in the case of drum brake systems.

NHTSA has conducted a series of brake temperature tests for both hydraulically braked vehicles (DOT HS 806 860) and air braked vehicles (DOT HS 806 738) with gross vehicle weight ratings in excess of 10,000 pounds. These vehicles were driven in downtown traffic through Columbus, Ohio, and on the highways around that city. During this testing, the maximum temperatures measured for drum brakes were 410° F for one hydraulically braked vehicle and 350° F for the other hydraulically braked vehicle. The maximum temperature measured for drum brakes on air braked vehicles was 418° F. It should be noted that these maxima were measured for the rear axle of the tractor, and that the maximum temperatures measured for the other axles were significantly lower. Additionally, all of these maxima were recorded during the urban driving part of the testing. The brake temperatures measured on the highways were generally about 100° F less than the brake temperatures measured on the streets and roads of Columbus. These findings indicate that a burnish procedure that allows drum brakes to be heated to 550° F cannot be said to be representative of normal driving conditions.

Moreover, the findings in the NHTSA testing confirmed past research about brake temperatures. The University of Michigan Transportation Research Institute prepared a 1982 report entitled "Retarders for Heavy Vehicles: Phase II Field Evaluations." This report measured the average brake temperature for the drive axle of the tractor on five axle tractor-semitrailer combinations. This axle experienced the highest brake temperatures in the aforementioned NHTSA testing in Columbus, Ohio. These brake temperatures were measured after the vehicles had made a descent of the fairly long grades on US 40 and US 48 in the western part of Maryland. Under these demanding conditions, the average brake temperature on the tractor drive axles was less than 350° F.

Another 1982 report was prepared by Systems Technology Incorporated, entitled "The Development and Evaluation of a Prototype Grade Severity Rating System" (Report No. FHWA/RD-81/185).

This report also measured brake temperatures for five axle tractor-semitrailer combinations descending a grade. In this case, the grade was "the Grapevine" south of Bakersfield, California, on US 5. This is a well-known grade that features an average grade of 5.35 percent for 5.1 miles and presents heavy vehicle brakes with extremely demanding conditions. The brake temperatures of 25 vehicles were measured at the bottom of this grade. Even including the one vehicle that was a "runaway" because its brakes overheated, the average brake temperature for these vehicles was about 400° F.

Given these consistent research findings about the temperatures to which drum brakes are subjected during normal driving, the agency concludes that a burnish that subjects drum brakes to significantly higher temperatures cannot be said to be representative of normal driving conditions. By allowing the drum brakes to be heated to temperatures well in excess of those encountered during normal driving, the burnish procedures would ideally condition the drum brakes. However, the agency is more interested in the braking capability of vehicles when the brakes are in the condition they are most likely to be when used on the roads than in the maximum braking capability of a braking system if the brakes are ideally conditioned. Since neither the Ford approach nor the approach set forth in the NPRM would be representative of normal brake conditioning, neither approach has been adopted in this rule.

In the comments, only Ford submitted data to support its contention that drum brakes would experience temperatures near 550° F under normal driving conditions. Ford tested a fully loaded vehicle through the traffic of downtown Detroit, Michigan. This vehicle was hydraulically braked with a disc system on the front axle and drum brakes on the rear. Ford stated that the maximum temperature measured for the drum brakes was 459° F. Ford also submitted data measuring the brake temperatures for air braked vehicles driving through the mountainous part of Arizona. The maximum temperature measured for the drum brakes over this road was 507° F. However, Ford did not provide measurements of the initial brake temperatures or average brake temperatures or any other information that would allow the agency to further analyze the Arizona test data.

After considering the data submitted by Ford, NHTSA concludes that those data support the agency's conclusion that burnish procedures that allow drum brakes to be heated to 550° F do *not* represent conditions that will normally be encountered by vehicles in use. The Detroit testing showed what the prior research and the agency research had shown; i.e., drum brakes do not experience temperatures of 550° F under normal driving. With respect to the temperatures measured in the Arizona mountains, NHTSA does not doubt that it is possible to find grades long enough and severe enough to heat drum brakes to 500° F. However, the point of the burnish procedure is not to simulate every conceivable condition that the vehicle might experience while in use. Instead, the burnish procedure is intended to simulate a normal break-in for the vehicle's brakes. While such conditioning would improve the performance of the vehicle's brakes, the agency has no evidence that most, or even a significant number of, new vehicles are broken in by driving through rugged mountainous terrain. Accordingly, a burnish procedure that is intended to be representative of normal driving conditions should not be based on these abnormally high temperatures.

The approach suggested by the NHTSA research, i.e., making 500 snubs from 40-20 mph, is the final approach about which the SNPRM sought comments. After considering the intended function of the burnish procedures and all the comments received during this rulemaking action, NHTSA has selected this approach as the burnish procedure to be used for vehicles with a GVWR greater than 10,000 pounds. By making a series of braking applications from speeds encountered by every vehicle, this procedure will be most representative of normal driving conditions. Further, this procedure allows the brakes to reach whatever temperatures they are designed to reach when driven in typical stop-and-go driving. Thus, any braking system design will be conditioned fairly under this approach.

Among the commenters to the SNPRM, only Rockwell International (Rockwell) completely endorsed this approach. Rockwell cited three factors that favored this approach. These were:

1. It would give a constant rate of energy input to the brakes throughout the burnish, thus reducing variability associated with the original burnish procedure;

2. The schedule of energy input to the brakes would be in the center of most vehicle application duty cycles, as desired, thus producing a typical, real-world vehicle brake burnish and a cor-

respondingly realistic brake performance test; and

3. It would give all brakes the same burnish schedule, regardless of brake design or type, and should give an adequate burnish to each type of brake. Thus, all brakes would be on equal footing before starting the performance testing.

Renault USA Inc. (Renault) stated that it was "not sure" if this approach would give a sufficient burnish to brakes, especially when considering all of the vehicles to which this burnish procedure would apply. However, Renault asserted that the available data were not exhaustive, and recommended that the final rule give manufacturers the option of burnishing their brakes either under this approach or the approach set forth in the NPRM.

Bendix stated that its air braked disc systems reach the 550° F temperature limitations under the current procedures, so all 500 snubs are run from 40 to 20 mph for these vehicles. Flxible made a similar comment for its air braked drum brake systems on buses. These comments suggest that, at least for these manufacturers' braking systems, the new burnish procedures would not change the burnish from that which is specified under the current procedures.

NHTSA believes that another advantage of this approach is that it would not favor or disfavor any type of brake design. Whenever the burnish procedures include a maximum temperature limitation, brakes that are designed to operate nearest that temperature get a more extensive burnish than do brakes that are designed to operate at either a higher or lower temperature. For example, this rulemaking proceeding was initiated because the 550° F temperature limitation results in an unrealistic burnish for vehicles with disc brakes or both disc and drum brakes. That is because disc brakes are designed to operate safely at significantly higher temperatures than are drum brakes. Thus, it is necessary to amend this temperature limitation to account for the higher temperatures generated by disc brakes.

Additionally, Eaton Corporation (Eaton) noted in its comments that the air brake industry is in the process of converting from asbestos-based brake linings to non-asbestos brake linings on drum brake systems. These non-asbestos linings will generate different normal and safe maximum temperatures during brake applications than the asbestos-based linings currently offered. If a temperature limitation for the burnish procedure were specified in this rule, that limitation might need to be adjusted for various new brake linings and new brake systems, to account for changing characteristics.

Such repetitive rulemaking should be avoided. It continually diverts agency time and resources from more productive use. More importantly, it denies the public the early introduction of new technology, not because of any safety-related issues, but because it takes significant periods of time to amend the Federal motor vehicle safety standards.

For example, it is possible that a new design for braking systems would not be adequately or representatively conditioned by burnish at some specified maximum temperature, as a result of which the braking system would not satisfy the performance requirements of Standard Nos. 105 or 121. However, such a braking system would fully comply with those requirements if it were burnished in a manner that represented the break-in it would get during normal driving. Until the burnish procedures were amended, this braking system could not be installed on these heavy vehicles. Its introduction would be delayed solely because the temperature-restricted burnish procedures did not allow for the development of newer designs. NHTSA wants to avoid imposing such unnecessary impediments to the introduction of innovative systems.

A burnish procedure that requires 500 snubs from 40-20 mph avoids this pitfall. Under such a procedure, any new design will be burnished to whatever temperatures it is designed to experience during normal city driving. No additional rulemaking is required to ensure that the new design receives as effective and representative a burnish as do existing designs. Such a burnish procedure allows manufacturers to test and introduce innovative technologies without unnecessary and unintended delays.

However, the vast majority of commenters to the SNPRM objected to this approach. NHTSA stated in the SNPRM that preliminary examination of the results of 500 snubs from 40 to 20 mph indicated that such a burnish would expose all types of brake designs to the temperatures they would encounter in normal service without favoring any type of brake design. A number of commenters at least indirectly questioned this statement.

Lucas commented that this burnish procedure would not adequately burnish drum brakes on some vehicles with low gross axle weight ratings. However, Lucas did not submit any data to substantiate this claim. Motion Control stated that when it burnished a vehicle with disc/drum brakes under this approach, the rear drum brake temperature was only 400° F. Motion Control asserted that this did not approach the necessary 500°-550° F for adequate burnish of these brakes. GM likewise stated that a vehicle with disc/drum brakes would not experience sufficiently high temperatures to adequately burnish either the front disc brakes or the rear drum brakes. GM also commented that this procedure would not adequately burnish certain all drum brake systems. Ford stated that its testing showed that burnish under this approach does not expose the brake linings of vehicles with disc/drum brakes to temperatures they would encounter in normal service.

NHTSA is not persuaded by these comments. Contrary to the implicit assertions of these comments, the purpose of the burnish procedure is not to guarantee that the vehicle's brakes will be exposed to a certain temperature. The agency concedes that this new burnish procedure may not expose current designs of drum brakes to temperatures of 500° F. The fact that drum brakes will not be exposed to temperatures as high as they were under the old burnish procedure does not, however, show that this burnish procedure is not an adequate burnish. As noted above, the burnish procedure is only intended to simulate the break-in of the brakes under normal driving conditions. The burnish is *not* intended to ensure that brakes will be ideally conditioned as a result of being exposed to unusually high temperatures they will rarely encounter while in service on the roads. The agency's testing indicated that a burnish consisting of 500 snubs from 40 to 20 mph will in fact expose the vehicle brakes to the temperatures those brakes would experience during stop-and-go urban driving. This finding leads the agency to conclude that such a burnish procedure would fairly represent the condition of brakes on vehicles that are in use on the nation's roads.

Only Ford submitted data to substantiate its assertion that this burnish procedure would not expose the brakes on vehicles with front disc brake systems and rear drum brake systems to the temperatures such brakes would experience in normal driving. These data were obtained from the aforementioned driving around the Detroit area. However, the agency does not agree with Ford's comment that its Detroit test shows that brakes would not be exposed to normal driving temperatures, and therefore would not be properly conditioned, during this burnish procedure. For the single vehicle that was used in the Detroit test, the rear drum brakes experienced average temperatures while driving around Detroit that were slightly less than the average temperatures measured during the burnish procedure. This fact supports the agency's conclusion that the burnish procedures set forth in this rule will expose the vehicle brakes to temperatures that are representative of the temperatures those brakes will experience in normal driving.

The front disc brakes on this vehicle did experience somewhat higher temperatures in the test than during the burnish procedure. However, disc brakes are often not as sensitive to burnish temperature as drum brakes. This is because the burnish temperature for disc brakes appears to have little effect on the torque output of the brakes after burnish, provided that the burnish temperature reaches at least 500° F. In Appendices B, C, and F to NHTSA's research on hydraulically braked vehicles (DOT HS 806 8602-864), disc brakes on three different vehicles reached temperatures of 500°, 600°, and 700° F during burnish, but all showed comparable performance improvements after the burnish. Hence, even if the front disc brakes did not experience quite as high an average temperature during burnish as they did during urban driving, they did experience sufficiently high temperatures during burnish to simulate the "break-in" process.

Other commenters asserted a position which was somewhat contradictory to the above comments. Chrysler and Bendix were opposed to this burnish procedure, because it did not specify any maximum temperature to which the brakes could be exposed during burnish. These commenters stated that the burnish procedure had to specify some reasonable maximum temperature requirement to avoid damaging the brakes. The agency would like to note that any brakes that are designed so that they will be damaged while making 40 to 20 mph snubs probably should not be installed on new vehicles regardless of any applicable regulatory provisions. Regardless of the brake type, this burnish procedure will ensure that all brakes are exposed to whatever temperatures they will be exposed to during normal break-in when operated on the public roads.

Ford, IH, and MVMA all stated in their comments that NHTSA's testing of a limited sample of vehicles over a single route does not adequately duplicate the range of brake lining temperatures experienced by the large variety of vehicles with GVWR's over 10,000 pounds operating over all possible driving cycles. The agency disagrees with the suggestion that the sample of vehicles for the Columbus, Ohio, tests was not representative. This sample included vehicles with widely varying GVWR's and with all current combinations of brake systems. None of these commenters pointed to a particular vehicle weight class or braking system that was not included in this sample, and the agency believes that its sample was broad enough to adequately represent these vehicles.

NHTSA agrees that there are driving cycles such as frequent driving on grades that would generate higher brake temperatures than city driving. However, the agency was not seeking to establish a burnish procedure to simulate the most demanding conditions these vehicles would face in the real world or a burnish procedure that ideally conditions all brake designs. Instead, the agency wants to establish a burnish procedure that simulates normal "break-in" for vehicle brakes. Stop-and-go city driving generates significantly higher brake temperatures than highway driving, primarily because of more frequent brake applications. This type of driving was chosen as the one the burnish should simulate, because it is a demanding type of driving for all braking systems, and it is likely to be generally and frequently experienced by the braking systems on heavy vehicles. NHTSA concluded that a burnish procedure based on city driving would expose vehicle brakes to temperatures they will encounter in the real world and represent the break-in for those brakes in the real world. A more demanding driving cycle would not be representative of normal break-in for the vast majority of vehicles on the road. A less demanding driving cycle would not expose the vehicle brakes to the conditions those brakes will encounter when in service. Therefore, the urban driving cycle was selected as the one the burnish should represent.

Abex commented that this burnish procedure would pose an additional problem. According to this commenter, without brake temperature data, it will be difficult to ensure any consistency of burnish conditioning from one test to another. First, nothing about the new burnish procedure prevents manufacturers from recording brake temperature data if they wish to do so. Second, this procedure will yield a constant rate of energy input to the brakes throughout the test, because all of the braking applications will be from 40 to 20 mph. That will ensure greater consistency of burnish conditioning from one test to another than the old burnish procedure. This is because the old burnish procedure was based on brake temperature. As noted in the comments of GM, IH, MVMA, and others, the brake temperature fluctuates greatly during the burnish, rising as much as 300° F during a brake application. These sharp temperature rises make it very difficult to ensure consistent conditioning from one burnish to another, if maximum temperature is the controlling factor.

Abex also commented that Standard No. 105 includes 60 mph stopping distance requirements. Since the brakes will be tested for performance from 60 mph, Abex urged that the brakes should also be burnished from this speed. Motion Control made a similar comment. These comments are not persuasive. In both the preburnish and postburnish tests, Standard No. 105 specifies that vehicles with a GVWR greater than 10,000 pounds must stop from 60 mph in 388 feet. NHTSA notes that the service brake stopping distance requirements of Standard No. 105, to which both these commenters referred, are not currently in effect for vehicles with a GVWR greater than 10,000 pounds. Even if the service brake stopping distance requirements were in effect for these vehicles, the braking performance is *not* required to improve after burnish. Since Standard No. 105 only requires that the brakes on these vehicles retain the effectiveness they had before burnish, there is no reason to subject the vehicles to repeated 60 mph snubs during the burnish. Given the current requirements of the standard, the result of permitting 60 mph snubs would appear to be to raise the brake temperatures to unrealistically high levels.

Ford, GM, MVMA, and IH all commented to the effect that this new burnish procedure would lower the brake temperatures experienced by drum brakes during the burnish. According to these commenters, the lower temperatures would affect the static and dynamic performance of the brakes on the vehicles, which, in turn, would require a redesign of the brake systems on certain vehicles.

Since this new burnish procedure more effectively simulates normal break-in of these vehicles' brakes while in service on the roads, the braking performance measured for those vehicles in the performance tests for Standards No. 105 and 121 should now more accurately reflect the vehicles' braking performance while in service. The agency has no reason to believe that any vehicles currently being produced will not comply with Standards No. 105 or 121 after being burnished in accordance with these new procedures. Moreover, none of these commenters submitted data that supports their assertions.

MVMA simply stated that certain vehicles' braking systems would have to be redesigned as a result of this new burnish procedure. Without some data and examples of specific vehicles, NHTSA was unable to analyze this comment further. GM stated that its analysis of Standard No. 121 compliance data for some of its air braked transit buses with drum brake systems would be insufficiently burnished under this new procedure. As a result, GM stated that the buses' postburnish stopping distance would be increased to a level unacceptable to GM. It should first be noted that the stopping distance requirements of Standard No. 121 applicable to air braked buses have been suspended. Hence, there are *no* stopping distance requirements currently in effect for air braked buses. Even if there were stopping distance requirements in effect for air braked buses, GM did not assert that its transit buses would not comply with those requirements of Standard No. 121. Presumably GM meant to say that the performance of its buses would exceed the minimum performance requirements by a margin that was too small to be acceptable to GM. If a more representative burnish procedure results in GM's products not meeting GM's own product standards for the amount by which the product's performance should exceed the requirements of Standard No. 121, any redesign of the buses' braking system would be a result of the GM product standards, not Standard No. 121. To the extent that this new burnish procedure more accurately represents the break-in those buses' brakes actually receive while in service, it would also give GM a more accurate representation of how well those brakes will perform while in service. If vehicle manufacturers are not getting an accurate representation of how their vehicle braking systems perform when used by the public from the current burnish procedure, that is yet another reason to adopt the new burnish procedure.

Ford submitted data purporting to show that one of its vehicles with hydraulic disc and drum brakes would no longer comply with the requirements of section S7.9 of Standard No. 105, if it were burnished according to this new procedure. That section of Standard No. 105 requires the vehicle to stop from 60 mph in a specified distance even if the vehicle experiences a partial service brake failure. With respect to vehicles with a GVWR greater than 10,000 pounds, Table II of Standard No. 105 specifies that such vehicles must stop in 613 feet from 60 mph with a partial service brake failure. Ford submitted data showing that the longest stopping distance for its vehicle was 737.5 feet and the average stopping distance was 626.3 feet.

However, Ford did not note that S7.9 requires only that the vehicle stop in 613 feet in *one* of the four required stops with a partial service brake failure. Since Ford's longest stopping distance for this condition was 737.5 feet and the average stopping distance for the four stops was 626.3 feet, the average of the other three stopping distances was 589.23 feet. This average is well within the required 613 feet maximum distance. Therefore, NHTSA does not believe that Ford's data support its asserted compliance problems.

To the extent that Ford's data were intended to show a reduction in the after burnish performance capabilities of the truck to a level unacceptable to Ford, the agency responds in the same way as it did to GM's comment on this point. That is, the data show that the vehicle complies with Standard No. 105. If the amount by which the vehicle exceeds that minimum performance requirement is unacceptable to Ford, any redesign of the braking system is a result of Ford's product standards, not Standard 105. Further, if the new burnish procedure gives Ford a more accurate representation of how well its braking system performs when in service on the public roads, that fact supports the agency's decision to implement the new burnish procedures.

IH commented that the changed burnish procedure would cause it to have compliance problems with section S5.6.1 of Standard No. 121. That section requires that the static retardation force produced by the parking brakes alone shall be such that the quotient of the static retardation force/GVWR is not less than 0.14. According to IH, under the current burnish procedure, this requirement means that it can use parking brakes on just one axle of a truck tractor unless the GVWR of the tractor is greater than 56,000 pounds. For tractors with a GVWR over 56,000 pounds, International Harvester must use parking brakes on two axles. However, International Harvester stated that under the new burnish procedure, it would have to install parking brakes on two axles of tractors with a GVWR over 46,000 pounds. According to the commenter, this will add costs and system complexity to tractors with GVWR's between 46,000 and 56,000 pounds.

International Harvester did not provide enough information for the agency to fully evaluate this comment. Most notably, the comment does not indicate whether the entire Standard No. 121 test sequence was run prior to the parking brake force measurements. Agency compliance testing of the parking brakes is conducted only after conducting service brake testing. If the 60 mph loaded vehicle service brake tests, which help condition the brakes, were not run prior to the parking brake force measurements, the parking brake force measurements are probably lower than they would have been had the complete Standard No. 121 compliance testing been conducted.

Assuming that International Harvester did conduct the full Standard No. 121 testing for this vehicle, the agency has no reason to believe that parking brakes should not be required on two axles of tractors with a GVWR of more than 46,000 pounds. If the International Harvester data are correct, the parking brakes on one axle of such tractors cannot provide a retarding force of 0.14 even when properly adjusted, if the brake linings are conditioned as they most likely would be when in service. A retarding force of 0.14 is roughly the equivalent of a 14 percent grade. If NHTSA accepts the commenter's conclusion that the new burnish procedure results in a 17 percent reduction in parking brake force, and the new burnish procedure more accurately represents the normal condition of brake linings in use on the roads, the parking brakes of some tractors with a GVWR of 55,000 pounds now being used on the public roads are only capable of holding on an 11.7 percent grade. If true, this comment raises concerns as to how well the parking brakes perform for vehicles currently in service. It also lends support to the agency's decision to implement burnish procedures that are more representative of the conditioning brakes get while in service.

Eaton, IH, and MVMA commented that a change to the burnish procedures should not be adopted, because any change would make obsolete 12 years of accumulated test data. These comments do not directly challenge the agency's conclusion that the new burnish procedures will be far more representative of the break-in that most brakes get while in service on the highways. Neither does this reasoning challenge the agency's conclusion that this new burnish procedure will not favor any new or future brake system designs. Instead, these comments urge the agency to retain a temperature-restricted burnish procedure because that is what the agency has used in the past. NHTSA does not agree that it should continue to require a burnish procedure that favors older brake designs and is not representative of real-world conditioning of brakes, simply because it has done so in the past. Indeed, it appears to be a far more responsible course of action to acknowledge the problems of the old burnish procedure and try to correct those problems in a new burnish procedure at a time when there are *no* service brake stopping distance requirements in effect for hydraulically braked heavy trucks subject to Standard No. 105, and when there are *no* service or emergency brake stopping distance requirements in effect for air braked vehicles subject to Standard No. 121.

Notwithstanding the agency's disagreement with the direct point of these comments, NHTSA believes that the implicit point of these comments is convincing. The agency reads these comments to imply that NHTSA ought to allow the manufacturers sufficient time to develop a new data bank using the new burnish procedures before mandating that vehicles be certified as complying with braking standards that incorporate these new burnish procedures. NHTSA believes that this is a legitimate concern that must be addressed in this rulemaking. The same point was indirectly raised in the International Harvester and MVMA comments that these new burnish procedures will require retesting of some vehicle's braking capabilities to ensure continuing compliance with the applicable standard.

The agency agrees that it must fully consider the economic impacts of a new burnish procedure, and should minimize those impacts when that is possible. This is particularly true in this rulemaking. This new burnish procedure is not intended to impose additional performance requirements for heavy vehicles in response to a demonstrated safety problem. Rather, the new burnish procedure is intended to ensure that vehicles are tested for compliance with the existing performance requirements when the brakes are conditioned to the same extent that brakes are typically conditioned when used by the public on our nation's roads, and to eliminate the current disfavoring of new brake designs from the burnish procedures. Given these purposes, the agency can and should minimize the economic impacts associated with the transition to a new burnish procedure.

Accordingly, this rule includes a transition period until September 1, 1993. During this period, heavy vehicles may be burnished under the old or new burnish procedures, at the manufacturer's option, before compliance testing. For this transition period, the old burnish procedures have been modified in accordance with the approach taken in the NPRM for this rulemaking. That is, vehicles will be subjected to 500 snubs for the burnish according to the schedule set forth in Table IV. However, if the temperature of the hottest brake exceeds 550° F, the snubs shall be adjusted to a lower speed as necessary to maintain a hottest brake temperature of 550° F. If the hottest brake temperature exceeds 550° F at the lowest snub condition set forth in Table IV (40 to 20 mph), the remainder of the snubs shall be run from 40 to 20 mph without regard to brake temperature. This change has been made to accommodate disc brake systems, which are designed to operate safely at temperatures in excess of 550° F. Since this problem was the issue this rulemaking was initiated to address, it is appropriate for the agency to address this problem now instead of waiting for the end of the transition period.

The agency believes that this transition period will effectively minimize any adverse economic impacts associated with the change to a new burnish procedure. It will allow manufacturers to specifically identify any vehicles whose braking system would not comply with the performance requirements of Standard Nos. 105 and 121 using the new burnish procedures. If only a few isolated vehicles are affected, the transition period will give the manufacturers sufficient time to make appropriate design changes to those vehicles. If, on the other hand, the new burnish procedures will necessitate major design changes to almost all vehicles now in production, or result in some other adverse economic consequences of which the agency is now unaware, the transition period would allow the agency time to make appropriate regulatory changes to avert such unintended economic impacts. Further, this transition period would enable the manufacturers to gather a data bank of testing under the new burnish procedures before those procedures are mandated, as urged in the Eaton, IH, and MVMA comments.

Tractor-Trailer Loading During Burnish

As noted above, the SNPRM proposed that the unbraked trailer used to test the braking performance of truck tractors would be loaded so that the combined weight of the tractor-trailer combination is equal to the GVWR of the tractor. Abex supported this proposal.

However, Ford, IH, Bendix, and MVMA opposed this proposal in their comments. They explained that their objection was based on the fact that the proposed change appears to *require* the use of a trailer during the testing of a truck tractor's brakes. These commenters stated that most tractor manufacturers use load racks, instead of trailers, during such testing. These load racks simulate the weight that a trailer would place on the tractor. The commenters stated that a new requirement that tractor manufacturers use actual trailers during testing was unnecessary. Since the commenters believed that the agency's intent was to prevent overloading of trailers *if* trailers were used for testing, they suggested that the language of the rule be amended to more accurately reflect such intent.

NHTSA believes that these comments reflect a misunderstanding of the compliance test procedures set forth in the Federal motor vehicle safety standards. The use of the word "shall" in the compliance test procedures means that the agency, *and no other party*, is required to use an unbraked flatbed semitrailer during its compliance testing for truck tractors. When specifying its compliance testing procedures in any of the safety standards, the agency is required by the National Traffic and Motor Vehicle Safety Act ["the Safety Act"; 15 U.S.C. 1381 *et seq.*] to specify those procedures in "objective terms." 15 U.S.C. 1392(a). One aspect of the requirement that a compliance test procedure be stated in objective terms is that the procedures must, to the maximum extent possible, eliminate potential sources of variability in test results.

In this particular case, the agency has no reason to believe that load racks do not provide an accurate simulation of the loading imposed on a truck tractor by a trailer during the burnish procedures, because it is the total load that effects the burnish and not the load distribution (provided that each axle is loaded sufficiently to protect against wheel lock and the vehicle is not equipped with a load proportioning valve). However, the agency also has no data to support its belief that load racks would yield burnish results identical to those that are obtained with an unloaded trailer. Hence, a provision that the agency could use load racks in its compliance testing *might* introduce variability into these standards. The only way to learn whether the use of load racks during the burnish procedures *would* introduce variability into the standards would be for the agency to spend a substantial amount of its research time and dollars investigating this subject. NHTSA believes that such an expenditure of its research efforts for a project that would have no obvious safety benefits would be unjustified. Therefore, the agency has chosen to draft this final rule so that it does not introduce any potential source of variability, by simply specifying that an unbraked flatbed semitrailer will be used by NHTSA in its compliance testing.

This decision need *not* increase testing costs for the manufacturers. It is worth noting that manufacturers are not even required to conduct testing before certifying that these vehicles comply with these standards, provided that they exercise "due care" in making such certifications, as provided in section 108(a)(1)(C) of the National Traffic and Motor Vehicle Safety Act [15 U.S.C. 1397(a)(1)(C)]. If manufacturers choose to conduct testing in accordance with the compliance test procedures, they are free to simulate any or all parts of the test procedures. If the agency tests reveal a noncompliance, the agency's consideration of the appropriateness of a civil penalty will necessarily include the issue of whether such simulations are reasonable enough to satisfy the "due care" standard.

In this particular case, let us assume that a truck tractor manufacturer has chosen to conduct testing prior to certifying compliance and has employed a load rack during the burnish procedure. Let us also assume that the manufacturer's testing showed that the tractor complied with the standard and the manufacturer so certified. If NHTSA should subsequently conduct compliance testing for the tractor, the agency would burnish the tractor using a trailer. Finally, let us assume that the testing showed that the individual tractor being tested did *not* comply with the braking standards.

In these circumstances, NHTSA would follow its longstanding and well-known enforcement policy of notifying the manufacturer of the agency's test results and asking the manufacturer for further information. In response, the manufacturer would provide the results of its compliance testing to the agency, together with its reasons for concluding that a load rack is a reasonable simulation for a trailer during burnish. To support an argument that its own tests actually demonstrate compliance or to show that it exercised due care in its substitution of a load rack for a trailer during burnish, the manufacturer would also submit the bases for its conclusion that a load rack is a reasonable simulation of a trailer for the purposes of the burnish.

At this point, the agency would carefully analyze the manufacturer's response. If the agency concludes that the difference in test results can be explained to the agency's satisfaction, that the agency's results do not indicate an unreasonable risk to safety, and that the manufacturer's tests were reasonably conducted and were in general conformity with the standard, the agency would consider whether its own test results would support a determination of noncompliance. These enforcement practices have long been a matter of public record.

Of course, a manufacturer that could show that it exercised due care in making its certification would still be subject to the statutory obligation to recall and remedy its vehicles that do not conform to the requirements of Standard Nos. 105 or 121, assuming that the agency or the manufacturer makes a determination that the vehicles did not comply with the applicable standard. However, this same obligation would apply even if the manufacturer had conducted full compliance testing and used a flatbed semitrailer to burnish its tractors.

Thus, the agency does not believe that the amendment requiring NHTSA to burnish tractors using flatbed semitrailers necessarily puts manufacturers at risk of a civil penalty solely because they chose to use load racks during tractor burnish, *unless* the manufacturer had no reason to believe that a load rack was an adequate simulation of a trailer. If this were the case, the manufacturers' comments that they should be allowed to continue using load racks during burnish would have no merit. However, NHTSA does not understand the commenters to be making such an assertion, and has no reason to question the representativeness of load racks during the burnish procedures. Therefore, this rule adopts the tractor loading requirements during burnish that were proposed in the SNPRM.

In this same vein, the agency would like to point out that this final rule does not adopt a proposed change to section S6 of Standard No. 121. That proposed change would have allowed final stage manufacturers to "demonstrate compliance" with Standard No. 121, if the final stage manufacturer adhered to the instructions provided with the vehicle by the incomplete vehicle manufacturer and any intermediate stage manufacturer of the vehicle. The proposed language erroneously conveys the impression that the statutory and regulatory requirements for notification and remedy of noncomplying vehicles would not be applicable if a final stage manufacturer could show that it had adhered to the instructions provided with the incomplete vehicle by the incomplete vehicle manufacturer and any intermediate stage manufacturers.

What the proposed language was intended to do was to make clear that a final stage manufacturer can demonstrate compliance with the statutory requirement that it exercise due care in making certifications of compliance with Standard No. 121, if the final stage manufacturer can show that it adhered to the instructions provided with the incomplete vehicle by the incomplete vehicle manufacturer and any intermediate stage manufacturers. However, such a provision is redundant. 49 CFR §567.5 and 49 CFR §568.6 already permit the final stage manufacturer that has adhered to the instructions provided with the incomplete vehicle to so state, and rely on its adherence to the instructions provided with the incomplete vehicle as the basis for its certification of the vehicle. Since these regulatory requirements make clear that any final stage manufacturers satisfy "due care" responsibilities for certification when they adhere to the instructions furnished with the incomplete vehicle, it is unnecessary to add a similar requirement to Standard No. 121. Therefore, this proposed change is not incorporated in this final rule.

Brake Adjustments During Burnish

The SNPRM proposed that the brakes shall be adjusted in accordance with the manufacturer's recommendations at specified intervals during the burnish procedure. As explained in the SNPRM, if a manufacturer recommends that brakes be inspected first and adjusted only if necessary, that recommendation would be followed. If the inspection were to show that no adjustment was necessary, none would be performed.

This change was proposed because past interpretations and preambles have repeatedly stated that brake adjustments are permitted during burnish. Since these adjustments are permitted, it is necessary that the compliance test procedures specify how often and when the adjustments will be made. Otherwise, the standards would incorporate a potential source of variability, and would give rise to the problems described above in the *Tractor-Trailer Loading During Burnish* section.

Ford commented that it had no objections to the brake adjustment provisions proposed in the SNPRM. MVMA commented that it agreed with the proposed brake adjustment provisions.

However, Lucas disagreed with the proposal. It commented that brake adjustments should only be required during burnish if such adjustments are necessary to obtain the specified rate of deceleration during the burnish. The agency did not propose or intend to *require* brake adjustments unless the manufacturer recommends them at that time. If the vehicle manufacturer recommends that the brakes be inspected and adjusted only if certain conditions exist, the brakes will *not* be adjusted unless those conditions exist. Therefore, if Lucas desires that its brakes not be adjusted unless certain conditions exist, it should recommend that the brakes be inspected and adjusted only if those conditions exist. Such a recommendation would accomplish Lucas's goal without making any change to the proposed requirement. Hence, no change to the proposed language has been made in response to this comment.

Abex also objected to this proposed requirement in its comments. Abex stated that regulating adjustments during burnish was, in its opinion, "unwarranted." The comment went on to state that, "We are not aware of any problems that have been encountered with the current procedure which does not control either the number of adjustments that can be made or the specific points during burnish where they can be made." As explained above and in the SNPRM, the reason for proposing this requirement was to establish uniformity and specificity for the agency's compliance test procedures. The need for uniformity and specificity are sufficiently compelling in the agency's judgment to warrant these provisions.

Abex continued by stating that many dynamometers have automatic controls, which means the manufacturers can conduct the burnish procedures "essentially unattended." The commenter stated that this feature allows manufacturers to frequently conduct the dynamometer burnish through the night or during weekends. According to Abex, if the agency requires manufacturers to make adjustments at specified times and intervals, the requirement will slow up the burnish, increase labor costs, or both.

As discussed above in the section on tractor-trailer loading during burnish, NHTSA is *not* requiring the manufactures to follow these procedures for any testing they choose to conduct. These are the procedures the agency will follow during its compliance testing. As long as the manufacturer exercises due care in connection with the testing it conducts, it would satisfy its statutory obligations in connection with certifications. Abex apparently has reason to believe that brake adjustments are not necessary during dynamometer burnish, since it does not make such adjustments at present. Assuming that Abex's reasons are sufficient to establish that it exercised due care before certifying that its brakes complied with this requirement, *or* if Abex recommends no brake adjustments during burnish, Abex will not have to change its current testing practices under this new regulatory provision. If, on the other hand, Abex has insufficient reason for concluding that no brake adjustment is necessary during dynamometer testing, Abex should change its practice irrespective of any changes to the compliance test procedures. Therefore, the agency has concluded that the establishment of timing and frequency requirements for brake adjustment during burnish in the agency's compliance tests need not increase the costs or time required for any testing manufacturers choose to conduct. These requirements are adopted as proposed.

Regulatory Impacts

A. Costs and Benefits to Manufacturers and Consumers.

NHTSA has analyzed this rule and determined that it is neither "major" within the meaning of Executive Order 12291 nor "significant" within the meaning of the Department of Transportation regulatory policies and procedures. The main impact of this rule will be to provide burnish procedures that are more representative of the actual "break-in" that vehicles' brakes typically receive while in use on the nation's roads, without favoring any particular braking system design. As noted above, there are no stopping distance requirements currently in effect for service brakes on hydraulically braked vehicles, and no stopping distance requirements in effect for either service brakes or emergency brakes on air braked vehicles. Hence, these new burnish procedures will not affect certifications of compliance by manufacturers of those braked systems.

It is possible that the new burnish procedures could affect certifications of compliance with applicable stopping distance requirements for parking brake systems. The extent to which the changed burnish procedures will affect those certifications is uncertain. No commenter submitted evidence that any complying parking brake systems will no longer comply as a result of the change in burnish procedures. To address this possibility, however, this rule provides for a five year transition period to the new burnish procedures, so that manufacturers may continue to certify vehicles using the old burnish procedures. At the same time, the manufacturers can can experience with the effects of the new burnish procedure's effect on the performance of their braking systems. The transition period will allow time for the manufacturers to make appropriate changes to their braking systems in an orderly fashion, and at minimal cost. Because the agency anticipates that this rule will have only minimal economic impacts, it has not prepared a full regulatory evaluation.

B. Small Business Impacts.

The agency has also considered the impacts of this rule as required by the Regulatory Flexibility Act. I hereby certify that this rule will not have a significant economic impact on a substantial number of small entities. Few of the truck tractor manufacturers affected by this burnish procedure are small entities. Many of the trailer manufacturers may qualify as small entities. However, this rule will not significantly increase the production or certification costs for those manufacturers that do not qualify as small entities. There are currently no stopping distance requirements applicable to trailers. Thus, these new burnish procedures will not make it more difficult for small manufacturers of trailers to certify compliance with service brake stopping distance requirements. Standard 121 specifies parking brake requirement for air braked trailers, but trailer manufacturers, except possibly the largest trailer manufacturer who also makes brakes, usually depend on their brake manufacturer to provide the information necessary for certification to the parking brake requirements. Accordingly, any inceased certification burden for parking brake systems that might be associated with this new burnish procedure would be borne by brake manufacturers (which generally do not qualify as small entities) and the large trailer manufacturers. Small organizations and governmental jurisdictions will be affected as purchasers of these vehicles. However, the cost impacts of this rule will be minimal, as described above. Accordingly, a regulatory flexibility analysis has not been performed.

C. Environmental Impacts

NHTSA has considered the environmental implications of this rule, in accordance with the

National Environmental Policy Act, and determined that it will not significantly affect the human environment. Accordingly an environmental impact statement has not been prepared.

List of Subjects in 49 CFR Part 571

Imports, Motor vehicle safety, Motor vehicles, Rubber and rubber products, Tires.

In consideration of the foregoing, 49 CFR 571.105, *Hydraulic Brake Systems*, and 49 CFR 571.12, *Air Brake Systems*, are amended as follows:

PART 571 - *FEDERAL MOTOR VEHICLE SAFETY STANDARDS*

The authority citation for Part 571 continues to read as follows:

Authority: 15 U.S.C. 1392, 1401, 1403, 1407; delegation of authority at 49 CFR 1.50.

§571.105 *Standard No. 105: Hydraulic brake systems.*

1. S7.4.2 of §571.105 is amended by revising S7.4.2.1 and S7.4.2.2 to read as follows:

S7.4.2 *Vehicles with GVWR greater than 10,000 pounds.*

S7.4.2.1 *Burnish.* Vehicles manufactured before September 1, 1993, may be burnished according to the procedures set forth in S7.4.2.1(a) or S7.4.2.1(b) of this section, at the manufacturer's option. Vehicles manufactured on or after September 1, 1993, shall be burnished according to the procedures set forth in S7.4.2.1(b) of this section.

(a) Burnish the brakes by making 500 snubs at 10 fsps in the sequence specified in Table IV and within the speed ranges indicted. Except where an adjustment is specified, after each brake application accelerate to the next sped specified and maintain that speed until making the next brake application at a point 12 mile from the initial point of the previous brake application. If a vehicle cannot attain any speed specified in 1 mile, continue to accelerate until the specified speed is reached or until the vehicle has traveled 1.5 miles from the initial point of the previous brake application, whichever occurs first. If during any of the brake applications specified in Table IV the hottest brake reaches 550° D, make the remainder of the 500 brake applications from that snub condition, except that a higher or lower snub condition shall be followed (up to the 60 mph initial speed) as necessary to maintain a hottest brake temperature of 500° F ± 50° F. However, if at a snub condition of 40 to 40 mph, the temperature of the hottest brake exceeds 550° F, make the remainder of the 500 brake applications from that snub condition, without regard to brake temperature. The brakes shall be adjusted three times during the burnish procedure, in accordance with the manufacturer's recommendations after 125, 250, and 375 snubs.

TABLE IV

Series	Snubs	Snub conditions (highest speed indicated, miles per hour)
1	175	40-20
2	25	45-20
3	25	50-20
4	25	55-20
5	250	60-20

(b) Burnish the brakes by making 500 snubs between 40 mph and 20 mph at a deceleration rate of 10pfps. Except where an adjustment is specified, after each brake application accelerate to 40 mph and maintain that speed until making the next brake application at a point 1 mile from the initial point of the previous brake application. If the vehicle cannot attain a speed of 40 mph in 1 mile, continue to accelerate until the vehicle reaches 40 mph or until the vehicle has traveled 1.5 miles from the initial point of the previous brake application, whichever occurs first. The brakes shall be adjusted three times during the burnish procedure, in accordance with the manufacturer's recommendations after 125, 250, and 375 snubs.

S7.4.2.2 *Brake adjustment - post burnish.* After burnishing, adjust the brakes in accordance with the manufacturer's recommendations. *****

2. S7.6 of §571.105 is revised to read as follows:

S7.6 *First reburnish* Repeat S7.4, except make 35 burnish stops or snubs In the case of vehicles burnished in accordance with S7.4.2.1(a) of this section, reburnish the vehicle by making 35 snubs from 60 to 20 mph, but if the hottest brake temperature reaches 500° F ± 50° F, make the remainder of the brake applications from the highest snub condition listed in Table IV that will maintain the hottest brake temperature at 50° F ± to° F. If at a snub condition of 40 to 20 mph, the temperature of the hottest brake exceeds 550° F, make the remainder of the 35 brake applications from that snub condition without regard to brake temperature.

§571.121 *Standard No. 121: Air brake systems.*

3. S6 of §571.121 is revised to read as follows:

S6 *Conditions*. The requirements of S5 shall be met by a vehicle when it is tested according to the conditions set forth below, without replacing any brake system part or making any adjustments to the brake system except as specified. Except as otherwise specified, where a range of conditions is specified, the vehicle must be capable of meeting the requirements at all points within the range.

4. S6.1 of §571.121 is amended by revising S6.1.1 and S6.1.8.1 to read as follows:

S6.1 *Road test conditions*.

S6.1.1. Except as otherwise specified, the vehicle is loaded to its gross vehicle weight rating, distributed proportionally to its gross axle weight ratings. During the burnish procedure specified in S6.1.8, truck tractors shall be loaded to their GVWR by coupling them to an unbraked flatbed semitrailer, which semitrailer shall be loaded so that the weight of the tractor-trailer combination equals the GVWR of the truck tractor. The load on the unbraked flatbed semitrailer shall be located so that the truck tractor's wheels do not lock during burnish. * * * * *

S6.1.8 * * *

S6.1.8.1. Vehicles manufactured before September 1, 1993 may be burnished according to the procedures set forth in S6.1.8.1(a) or S6.1.8.1(b) of this section, at the manufacturers option. Vehicles manufactured on or after September 1, 1993 shall be burnished according to the procedures set forth in S6.1.8.1(b) of this section.

(a) With the transmission in the highest gear appropriate for the series given in Table IV, make 500 brake applications at a deceleration rate of 10fsps, or at the vehicles maximum deceleration rate if less than 10 fsps, in the sequence specified. Except where an adjustment is specified, after each brake application accelerate to the next speed specified and maintain that speed until making the next brake application at a point 1 mile from the initial point of the previous brake application. If a vehicle cannot attain any speed specified in 1 mile, continue to accelerate until the specified speed is reached or until the vehicle has traveled 1.5 miles from the initial point of the previous brake application, whichever occurs first. If during any of the brake applications specified in Table IV the hottest brake reaches 550° F, make the remainder of the 500 brake applications from that snub condition, except that a higher or lower snub condition shall be used as necessary to maintain an after-stop temperatire of the hottest brake exceeds 550° F, make the remainder of the 500 brake applications from that snub condition, without regard to brake temperature. The brakes shall be adjusted three times during the burnish, with each adjustment made in accordance with the manufacturer's recommendations. Any automatic pressure limiting valve is in use to limit pressure as designed, except that any automatic front axle pressure limiting valve is bypassed if the temperature of the hottest brake on a rear axle exceeds the temperature of the hottest brake on a front axle by more than 125° F. A bypassed valve is reconnected if the temperature of the hottest brake on a front axle exceeds the temperature of the hottest brake on a rear axle by 100° F or more.

TABLE IV

Series	Snubs	Snub conditions (highest speed indicated, miles per hour)
1	175	40-20
2	25	45-20
3	25	50-20
4	25	55-20
5	250	60-20

(b) With the transmission in the highest gear approprrate for a speed of 40 mph, 500 snubs between 40 mph and 20 mph at a deceleration rate of 10 fsps, or at the vehicle's maximum deceleration rate if less than 10 fsps. Except where an adjustment is specified, after each brake application accelerate to 40 mph and maintain that speed until making the next brake application at a point 1 mile from the initial point of the previous brake application. If the vehicle cannot attain a speed of 40 mph in 1 mile, continue to accelerate until the vehicle reaches 40 mph or until the vehicle has traveled 1.5 miles from the initial point of the previous brake application, whichever occurs first. Any automatic pressure limiting valve is in use to limit pressure as designed. The brakes shall be adjusted three times during the burnish procedure, in accordance with the manufacturer's recommendations, after 125, 250, and 375 snubs, and shall be adjusted after burnish in accordance with the manufacturer's recommendations. * * * * *

5. S6.2.6 of §571.121 is revised to read as follows:

S6.2 *Dynamometer test conditions*. * * * * *

S6.2.6. Brakes are burnished before testing as follows: Place the brake assembly on an inertia dynamometer and adjust the brake as recommended by the brake manufacturer. Make 200 stops from 40 m.p.h. at a deceleration of 10 fsps, with an initial brake temperature on each stop of not less than 315° F and not more than 385° F. Make 200 additional stops from 40 m.p.h. at a deceleration of 10 f.s.p.s. with an initial brake temperature on each stop of not less than 450° F and not more than 550° F. The brakes shall be adjusted three times during the burnish procedure, after 100, 100, and 300 stops, and at the conclusion of the burnishing, in accordance with the manufacturer's recommendations. * * * * *

Issued on March 9, 1988

Diane K. Steed
Administrator

53 F.R. 8190
March 14, 1988

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 105

Hydraulic Brake Systems
(Docket No. 88-12; Notice 2)
RIN: 2127-AC50

ACTION: Final rule.

SUMMARY: Standard No. 105, *Hydraulic Brake Systems,* requires a vehicle to have one or more brake system indicator lamps, to warn its driver about certain types of brake failure and to indicate application of the parking brake. Section S5.3.2 of the standard requires that the brake system indicator lamps be activated automatically either when the ignition switch is turned to the "on" position or to a position between "on" and "start," to check whether the lamp bulbs are burned out. This notice amends the standard to provide that the activation as a check of lamp function is not required when a starter interlock is in operation.

DATES: The amendments made by this rule are effective June 29, 1989.

SUPPLEMENTARY INFORMATION: Standard No. 105, *Hydraulic Brake Systems,* requires vehicles to have one or more brake system indicator lamps, to provide a warning to drivers about certain types of brake failure and to indicate application of the parking brake. Section S5.3.2 of the standard requires that the brake system indicator lamps be activated automatically either when the ignition switch is turned to the "on" position or to a position between "on" and "start," to check whether the lamp bulbs are burned out.

On August 18, 1988, NHTSA published in the *Federal Register* (53 FR 31379) a notice of proposed rulemaking (NPRM) to amend Standard No. 105 to provide that activation as a check of lamp function not be provided under any condition in which a vehicle cannot be started due to operation of an interlock switch. The proposal represented an extension of an existing provision. For many years, section S5.3.2 has provided that activation as a check of lamp function is not required for automatic transmission vehicles when the transmission shift lever is in a forward or reverse drive position. In the NPRM, the agency explained the rationale for the existing provision as follows:

> . . . (S)ince the purpose of section S5.3.2 of Standard No. 105 was to provide an automatic check of lamp function each time the vehicle was started, it was unnecessary to require the check function in situations where the vehicle could not be started. Standard No. 102, *Transmission Shift Lever Sequence, Starter Interlock, and Transmission Braking Effect,* requires for vehicles equipped with automatic transmissions that the engine starter be inoperative when the transmission shift lever is in a forward or reverse drive position. Since vehicles equipped with automatic transmissions could not be started when the transmission shift lever is in a forward or reverse drive position, it was unnecessary to require the check function when the transmission shift lever is in either of those positions. 53 FR 31380.

As discussed in the NPRM, Mazda submitted a petition for rulemaking requesting an amendment of section S5.3.2's provision limiting the conditions under which the lamp check function must be provided. That company stated that the provision, which applied only to automatic transmission vehicles, should also apply to manual transmission vehicles which are equipped with a clutch pedal interlock switch. Mazda stated that this type of interlock switch prevents the engine from starting unless the clutch pedal is fully depressed, and is analogous to the starter interlock required by Standard No. 102 for automatic transmission vehicles.

Mazda also asserted that overall cost effectiveness, and to a lesser degree, safety, would be enhanced by its requested amendment. According to the petitioner, the amendment would enable manufacturers to employ a single wiring harness for the brake system indicator lamp circuit for vehicles equipped with both manual and automatic transmissions. That company stated that it currently designs, produces and installs two separate brake system indicator lamp wiring harnesses, one for manual transmission vehicles and the other for automatic transmission vehicles, which results in unnecessary additional costs. Mazda also stated that its requested amendment would provide an incentive for manufacturers to provide clutch pedal starter interlock switches for vehicles not so currently equipped. That company stated that unexpected motion of the vehicle during engine activation would be reduced as the clutch pedal would be depressed more often in a wider variety of vehicles prior to engine activation.

In the NPRM, NHTSA stated that it agreed with the petitioner that, for purposes of section S5.3.2's provision limiting the conditions under which the lamp check function must be provided, a clutch pedal interlock switch for manual transmission vehicles is analogous to the starter interlock required by Standard No. 102 for automatic transmission vehicles. Since the purpose of section S5.3.2 of Standard No. 105 is to provide an automatic check of lamp function each time the vehicle is started, the agency tentatively concluded that it was unnecessary to require the check function under any condition where a vehicle cannot be started due to operation of an interlock switch. The agency therefore granted Mazda's petition and proposed to amend Standard No. 105 accordingly. NHTSA stated that it believed that the proposed amendment would increase manufacturer flexibility without any adverse impact on safety.

NHTSA received comments on the NPRM from Generals Motors, Ford, Chrysler, Volkswagen and the Motor Vehicle Manufacturers Association. All of them supported the proposal.

Volkswagen also suggested that Standard No. 105 be amended so that the activation of the brake indicator lamp when the parking brake is applied satisfies the check of lamp requirement. NHTSA notes that the amendment suggested by that commenter is not within the scope of this particular rulemaking. However, the agency has proposed a requirement along those lines in its rulemaking to establish an internationally harmonized passenger car brake standard. See 52 FR 1474, 1483, January 14, 1987. NHTSA will continue to handle the issue raised by Volkswagen in the context of that rulemaking.

Based on the reasons discussed above and in the NPRM, and on its consideration of the comments, NHTSA is adopting the proposed amendment as a final rule. Since the amendment imposes no new requirements but instead increases manufacturer flexibility by relieving a restriction, NHTSA has determined that an effective date of 30 days after publication in the *Federal Register* is in the public interest.

In consideration of the foregoing, 49 CFR Part 571 is amended as follows:

S5.3.2 of § 571.105 is revised to read as follows:

S5.3.2 (a) Except as provided in paragraph (b) of this section, all indicator lamps shall be activated as a check of lamp function either when the ignition (start) switch is turned to the "on" (run) position when the engine is not running, or when the ignition (start) switch is in a position between "on" (run) and "start" that is designated by the manufacturer as a check position.

(b) The indicator lamps need not be activated when a starter interlock is in operation.

Issued on May 24, 1989

Jeffrey R. Miller
Acting Administrator

54 F.R. 22904
May 30, 1989

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 105

Hydraulic Brake Systems; Air Brakes
(Docket No. 88-03; Notice 2)
RIN: 2127-AD76

ACTION: Final rule.

SUMMARY: Standards No. 105, *Hydraulic Brake Systems*, and No. 121, *Air Brake Systems*, specify procedures for the burnishing or "breaking-in" of a vehicle's brakes. Under the two standards' test procedures, a vehicle's brakes are burnished prior to conducting some of the performance tests for vehicle braking. Today's notice amends these standards to specify, for all types of vehicles, that automatic brake adjusters on vehicles so equipped must remain operational during the burnish procedures and subsequent brake tests.

EFFECTIVE DATE: This rule will become effective September 1,1991. Optional compliance is permitted October 30, 1989

SUPPLEMENTARY INFORMATION: Standards No. 105, *Hydraulic Brake Systems*, and No. 121, *Air Brake Systems*, specify procedures for the burnishing or "breaking-in" of a vehicle's brakes. Under the two standards' test procedures, a vehicle's brakes are burnished prior to conducting some of the performance tests for vehicle braking.

On July 27, 1983, NHTSA published in the *Federal Register* (48 FR 29560) a notice of proposed rulemaking (NPRM) to amend the burnish procedures of Standards No. 105 and No. 121, as they apply to heavy vehicles. One of the proposed changes concerned automatic adjusters. The agency noted that Standard No. 105 specifies for hydraulic-braked vehicles that automatic adjusters can be disconnected prior to the burnish procedure, but if disconnected, they must remain disconnected throughout the brake tests. If the devices are not disconnected, a brake adjustment is permitted at the end of the burnish and all remaining tests are performed with the adjusters connected. On the other hand, NHTSA has interpreted Standard No. 121 to require for air-braked vehicles that automatic adjusters not be disconnected. Today's final rule affirms that interpretation. The July 1983 NPRM proposed to specify in both standards, for heavy vehicles, that automatic adjusters remain operational during brake tests. Under that proposal, vehicles with gross vehicle weight ratings (GVWR's) of 10,000 pounds or less would continue to have been permitted to be tested with automatic adjusters deactivated.

Some of the commenters on the June 1983 NPRM argued that there is no reason to treat vehicles with a GVWR in excess of 10,000 pounds differently from vehicles with a GVWR of 10,000 pounds or less. These commenters stated that if deactivation of automatic adjusters is permitted for light vehicles, heavier vehicles should be offered the same option.

On May 23, 1985, NHTSA published in the *Federal Register* (50 FR 21313) a supplemental NPRM (SNPRM) concerning a number of the issues raised by commenters in response to the June 1983 notice. With respect to automatic adjusters, the agency stated that it agreed with the implicit point that the reasons for and against permitting the deactivation of automatic adjusters apply equally to all vehicles with those adjusters, regardless of size. NHTSA announced in that notice that rather than address the question of the deactivation of automatic brake adjusters in a piecemeal fashion, it would instead issue a notice addressing that issue for all vehicles.

On January 14, 1988, NHTSA published in the *Federal Register* (53 FR 934) an NPRM proposing to amend Standards No. 105 and No. 121 to specify, for all types of vehicles, that automatic brake adjusters remain operational during the burnish procedures and subsequent brake tests. The proposal allowed for a post-burnish brake adjustment in accordance with the manufacturer's recommendations as furnished to the purchaser (i.e., in the owner's manual). Nine comments were received. Of these, seven commenters expressed general concurrence with the proposed approach, and two objected to it.

Austin Rover, Volkswagen of America, the Heavy Duty Manufacturers Association, and Bendix Heavy Vehicle Systems, (commenting on Standard No. 121 only) expressed support for the proposal.

General Motors and Chrysler supported the proposal, but felt it was inappropriate to require the specific brake adjustment information in the owner's manual. NHTSA agrees that requiring this technical information in the owner's manual serves little or no useful purpose to the consumer. The final rule has been revised to specify that after burnishing, the brakes are to be adjusted in accordance with the manufacturer's recommendation. This will provide manufacturers with flexibility to specify recommended adjustments in service literature, rather than being required to provide that information in the owner's manual

General Motors, in a comment that is beyond the scope of today's rulemaking, also suggested that NHTSA issue an SNPRM to clarify the provisions of Standards No. 105 and No. 121 that are applicable to various types of vehicles. Chrysler recommended that the wording of S7.4.1.2 and S7.4.2.2 in Standard No. 105 be revised to eliminate language addressing the lock out of automatic adjusters. NHTSA eliminated the language in S7.4.2.2 in a March 14, 1988, final rule, Burnish Procedures for Heavy Duty Vehicles, (53 FR 8190). Today's final rule eliminates the language referring to adjuster lock out contained in S7.4.1.2.

Rockwell International and Bendix Heavy Vehicle Systems both recommended that NHTSA allow manual adjustment of automatic adjusters during burnish procedures under Standard No. 121. Although these comments are outside the scope of today's rulemaking, NHTSA notes that such adjustments are not precluded by the existing regulatory language. The March 1988 rule provides, with regard to heavy vehicles, that the brakes be adjusted in accordance with the manufacturer's recommendations at specified intervals during the burnish procedure, as well as at the end of the procedure. Under that rule, automatic adjusters are permitted to be manually adjusted at the same times as other types of brake adjustments during burnish. *See*, 53 FR 8201-2. That requirement is not being changed by today's rule.

Rockwell also suggested that S5.3 of Standard No. 121 be revised to allow the readjustment of brakes prior to each test sequence. This comment is beyond the scope of today's rulemaking.

Freightliner Corp. indicated that permitting different standards for vehicles with automatic, as opposed to manual, brake adjusters unfairly penalizes manufacturers using automatic adjusters. Freightliner also provided a comment outside the scope of today's rulemaking, relating to brake adjustment intervals during brake burnishing. This issue was addressed in the March 1988 final rule.

Ford and Bendix Chassis and Brake Division (a supplier of passenger car brake components to Ford) submitted comments opposing the proposal to prohibit the deactivation of automatic adjusters during burnishing and testing under Standard No. 105. Ford believed that the proposed revisions had no relation to improved safety, would provide no benefit to Ford's customers, and would require the redesign of brakes on various Ford vehicles, resulting in additional costs. Bendix pointed out that its brakes are subject to over-adjustment when the automatic adjusters are activated during the burnishing and testing, although it is not aware of any over-adjustment problems occurring during actual use by customers. Bendix also explained that redesign of its brakes to include an automatic adjuster that would be insensitive to the type of stops required by Standard 105 would require a major retooling effort and a substantial test and development program. Finally, Bendix stated that the increased costs of such an effort were not justified, and that the proposal should be adopted because it results in no benefit to the public, or improvement in safety.

Since the close of the public comment period on the NPRM, NHTSA has been advised by Ford that it is changing the designs of its brake systems so that they will no longer require deactivation of the automatic adjusters during burnishing and testing. As a result, Ford has indicated that it no longer objects to the revised standard as proposed as long as adequate lead time is provided. The final rule provides a lead time which NHTSA believes should be adequate for all manufacturers, including Ford.

In the past, problems were sometimes experienced with automatic brake adjusters during burnish procedures. For some vehicles, the swelling of linings at high temperatures made it difficult to complete the burnish procedures, an occurence which led the agency to permit automatic adjusters to be disconnected during testing under Standard No. 105. However, newer designs for linings and automatic adjusters have essentially eliminated these problems, particularly for lighter vehicles. NHTSA is aware of only one manufacturer, Ford, which currently specifies that the automatic adjusters on any of its vehicles with a GVWR of 10,000 pounds or less be deactivated for purposes of brake testing. However, as noted above, Ford has notified NHTSA of its intention to modify the brakes on these models to eliminate the need for deactivation.

One of the purposes behind the various test conditions and procedures specified in Standards No. 105 and No. 121 is to test vehicles as they will perform when used on the road. Since automatic brake adjusters are operational during normal use, specifying that they be operational during brake testing helps approximate real-world conditions and provides a better test of real-world performance.

While it may not be considered normal or typical, the potential exists for motorists to drive their vehicles in a manner that could result in the automatic adjusters over-adjusting, an occurence which could lead to unexpected brake overheating and thus fade. NHTSA believes it is important to amend the rule to reduce the possibility of over-adjusting.

As indicated above, the March 1988 final rule did not cover burnish procedures for vehicles with a GVWR of 10,000 pounds or less. Under today's rule, manual adjustment for vehicles with a GVWR of 10,000 pounds or less is permitted only at the end of the burnish procedure. This is consistent with Standard No. 105's current requirement for vehicles whose automatic adjusters are not deactivated. It is also consistent with the agency's proposal for an internationally harmonized passenger car brake standard. See 52 FR 1474, January 14, 1987.

NHTSA believes that compliance with today's rule will not impose an unreasonable burden upon Ford or any other manufacturer. The necessary designs and technology needed to overcome any tendency toward over-adjusting are available inexpensively and are in use by virtually all other manufacturers. NHTSA has estimated that the cost of adding the improved adjuster design to be no more than $.60 per vehicle. In addition, neither Ford nor Bendix submitted any data showing that over-adjustment problems during burnish and testing still exist with the Ford brake system. NHTSA believes that requiring adjusters to be activated during testing and burnishing procedures is appropriate and promotes the agency's goal of improved motor vehicle safety. Finally, as discussed above, Ford has indicated its intention to change its existing brake designs voluntarily so as to eliminate the need for deactivation of the adjusters. Since Ford has been the last manufacturer to avail itself of the provisions allowing lockout of adjusters, there appears to be no reason to retain these provisions.

Today's rule will become effective on September 1, 1991. Optional compliance will be permitted effective 30 days after publication in the *Federal Register*. The time period will enable manufacturers to conduct compliance testing, as well as make any minor changes to their vehicles that might be necessary in order to ensure compliance.

PART 571—[AMENDED]

In consideration of the foregoing, 49 CFR Part 571-105 is amended as follows:

S7 is revised to read as follows:

S7. *Test procedures and sequence.* Each vehicle shall be capable of meeting all the applicable requirements of S5. when tested according to the procedures and in the sequence set forth below, without replacing any brake system part or making any adjustments to the brake system other than as permitted in burnish and reburnish procedures and in S7.9 and S7.10. (For vehicles only having to meet the requirements of S5.1.2 and S5.1.3 in section S5.1, the applicable test procedures and sequence are S7.1, S7.2, S7.4, S7.9, S7.10 and S7.18. However, at the option of the manufacturer, the following test procedures and sequence may be conducted: S7.1, S7.2, S7.3, S7.4, S7.5, S7.6, S7.7, S7.8, S7.9, S7.10 and S7.18. The choice of this option shall not be construed as adding to the requirements specified in S5.1.2 and S5.1.3.) For vehicles manufactured before September 1, 1991, automatic adjusters may be locked out, at the option of the manufacturer, when the vehicle is prepared for testing. If this option is selected, adjusters must remain locked out for the entire sequence of tests. For vehicles manufactured on or after September 1, 1991, automatic adjusters must remain activated at all times. A vehicle shall be deemed to comply with the stopping distance requirements of S5.1 if at least one of the stops at each speed and load specified in each of S7.3, S7.5, S7.8, S7.9, S7.10, S7.15, or S7.17 (check stops) is made within a stopping distance that does not exceed the corresponding distance specified in Table II. When the transmission selector control is required to be in neutral for a deceleration, a stop or snub shall be obtained by the following procedures: (1) Exceed the test speed by 4 to 8 mph; (2) close the throttle and coast in gear to approximately 2 mph above the test speed; (3) shift to neutral; and (4) when the test speed is reached, apply the service brakes.

*   *   *   *   *

3. S7.4.1.2 is revised to read as follows:

S7.4.1.2 *Brake adjustment—post burnish.* After burnishing, adjust the brakes in accordance with the manufacturer's published recommendations.

4. S7.4.2.2 is revised to read as follows:

S7.4.2.2 *Brake adjustment—post burnish.* After burnishing, adjust the brakes in accordance with the manufacturer's published recommendations.

Section 571.121 [Amended]

5. S6 is revised to read as follows:

S6. *Conditions.* The requirements of S5 shall be met by a vehicle when it is tested according to the conditions set forth below, without replacing any brake system part or making any adjustments to the brake system except as specified. Unless otherwise specified, where a range of conditions is specified, the vehicle must be capable of meeting the requirements at all points within the range. On vehicles equipped with automatic brake adjusters, the automatic brake adjusters must remain activated at all times.

Issued on September 26, 1989.

Jeffrey R. Miller
Acting Administrator

54 F.R. 40080
September 29, 1989

MOTOR VEHICLE SAFETY STANDARD NO. 105

Hydraulic Brake Systems

S1. Scope. This standard specifies requirements for hydraulic service brake and associated parking brake systems.

S2. Purpose. The purpose of this standard is to insure safe braking performance under normal and emergency conditions.

[**S3. Application.** This standard applies to passenger cars, multipurpose passenger vehicles, trucks, and buses with hydraulic service brake systems. (46 F.R. 55—January 2, 1981. Effective: 9/1/83)]

S4. Definitions. "Antilock system" means a portion of a service brake system that automatically controls the degree of rotational wheel slip at one or more road wheels of the vehicle during braking.

"Backup system" means a portion of a service brake system, such as a pump, that supplies energy in the event of a primary brake power source failure.

"Brake power assist unit" means a device installed in a hydraulic brake system that reduces the operator effort required to actuate the system, and that if inoperative does not prevent the operator from braking the vehicle by a continued application of muscular force on the service brake control.

"Brake power unit" means a device installed in a brake system that provides the energy required to actuate the brakes, either directly or indirectly through an auxiliary device, with the operator action consisting only of modulating the energy application level.

"Hydraulic brake system" means a system that uses hydraulic fluid as a medium for transmitting force from a service brake control to the service brake, and that may incorporate a brake power assist unit, or a brake power unit.

"Initial brake temperature" means the average temperature of the service brakes on the hottest axle of the vehicle 0.2 miles before any brake application.

["Lightly loaded vehicle weight" means:

(a) for vehicles with a GVWR of 10,000 pounds or less, unloaded vehicle weight plus 400 pounds (including driver and instrumentation);

(b) for vehicles with a GVWR greater than 10,000 pounds, unloaded vehicle weight plus 500 pounds (including driver and instrumentation). (46 F.R. 55—January 2, 1981. Effective: 9/1/83)]

"Parking mechanism" means a component or subsystem of the drive train that locks the drive train when the transmission control is placed in a parking or other gear position and the ignition key is removed.

"Pressure component" means a brake system component that contains the brake system fluid and controls or senses the fluid pressure.

"Skid number" means the frictional resistance of a pavement measured in accordance with American Society for Testing and Materials (ASTM) Method E-274-70 (as revised July, 1974) at 40 mph, omitting water delivery as specified in paragraphs 7.1 and 7.2 of that method.

"Snub" means the braking deceleration of a vehicle from a higher reference speed to a lower reference speed that is greater than zero.

"Spike stop" means a stop resulting from the application of 200 pounds of force on the service brake control in 0.08 second.

"Split service brake system" means a brake system consisting of two or more subsystems actuated by a single control designed so that a leakage-type failure of a pressure component in a single subsystem (except structural failure of a housing that is common to two or more subsystems) shall not impair the operation of any other subsystem.

"Stopping distance" means the distance traveled by a vehicle from the point of application of force to the brake control to the point at which the vehicle reaches a full stop.

"Variable proportioning brake system" means a system that automatically adjusts the braking force at the axles to compensate for vehicle static axle loading and/or dynamic weight transfer between axles during deceleration.

S5. Requirements.

[**S5.1 Service brake systems.** Each passenger car and each multipurpose passenger vehicle, truck, and bus with a GVWR of 10,000 lbs. or less, and each school bus with a GVWR of greater than 10,000 lbs. shall be capable of meeting the requirements of S5.1.1 through S5.1.6 under the conditions prescribed in S6, when tested according to the procedures and in the sequence set forth in S7. Each multipurpose passenger vehicle, truck, and bus (other than a school bus) with a GVWR greater than 10,000 lbs. shall meet the requirements of S5.1.2 and S5.1.3 under the conditions specified in S6 when tested according to the procedures and in the sequence set forth in S7. Except as noted in S5.1.1.2 and S5.1.1.4, if a vehicle is incapable of attaining a speed specified in S5.1.1, S5.1.2, S5.1.3, or S5.1.6, its service brakes shall be capable of stopping the vehicle from the multiple of 5 mph that is 4 to 8 mph less than the speed attainable in 2 miles, within distances that do not exceed the corresponding distances specified in Table II. If a vehicle is incapable of attaining a speed specified in S5.1.4 in the time or distance interval set forth, it shall be tested at the highest speed attainable in the time or distance interval specified. (46 F.R. 55—January 2, 1981. Effective: 9/1/83)]

[**S5.1.1 Stopping distance.** The service brakes shall be capable of stopping each vehicle, other than a vehicle which both has a GVWR of not less than 8,000 pounds and not greater than 10,000 pounds and is not a school bus, in four effectiveness tests within the distances and from the speeds specified in S5.1.1.1, S5.1.1.2, S5.1.1.3, and S5.1.1.4. The service brakes shall be capable of stopping each vehicle which both has a GVWR of not less than 8,000 pounds and not greater than 10,000 pounds and is not a school bus, in three effectiveness tests within the distances and from the speeds specified in S5.1.1.1, S5.1.1.2, and S5.1.1.4. (46 F.R. 55—January 2, 1981. Effective: 9/1/83)]

S5.1.1.1 In the first (preburnished) effectiveness test, the vehicle shall be capable of stopping from 30 mph and 60 mph within the corresponding distances specified in Column I of Table II.

[**S5.1.1.2** In the second effectiveness test, the vehicle shall be capable of stopping from 30 and 60 mph within the corresponding distances specified in Column II of Table II. If the speed attainable in 2 miles is not less than 84 mph, a passenger car or other vehicle with a GVWR of 10,000 pounds or less shall also be capable of stopping from 80 mph within the corresponding distances specified in Column II of Table II. (46 F.R. 55—January 2, 1981. Effective: 9/1/83)]

S5.1.1.3 In the third effectiveness test the vehicle shall be capable of stopping at lightly loaded vehicle weight from 60 mph within the corresponding distance specified in Column III of Table II.

S5.1.1.4 In the fourth effectiveness test, a vehicle with a GVWR of 10,000 pounds or less shall be capable of stopping from 30 and 60 mph within the corresponding distances specified in Column I of Table II. If the speed attainable in 2 miles is not less than 84 mph, a passenger car [or other vehicle with a GVWR of 10,000 lbs. or less] shall also be capable of stopping from 80 mph within the corresponding distance specified in Column I of Table II. (46 F.R. 55—January 2, 1981. Effective: 9/1/83)

If the speed attainable in 2 miles is not less than 99 mph, a passenger car shall, in addition, be capable of stopping from the applicable speed indicated below, within the corresponding distance specified in Column I of Table II.

Speed attainable in 2 miles (mph)	*Required to stop from (mph)*
not less than 99 but less than 104	95
104 or more	100

Table I—BRAKE TEST PROCEDURE SEQUENCE AND REQUIREMENTS

No.	Sequence	Test Load		Test Procedure	Requirements
		Light	GVWR		
1.	Instrumentation check	-	-	S7.2	-
2.	First (preburnish) effectiveness test	-	x	S7.3	S5.1.1.1
3.	Burnish procedure	-	x	S7.4	-
4.	Second effectiveness	-	x	S7.5	S5.1.1.2
5.	First reburnish	-	x	S7.6	-
6.	Parking brake	x	x	S7.7	S5.2
7.	Third effectiveness (lightly loaded vehicle)	x	-	S7.8	S5.1.1.3
8.	Partial failure	x	x	S7.9	S5.1.2
9.	Inoperative brake power and power assist units	-	x	S7.10	S5.1.3
10.	First fade and recovery	-	x	S7.11	S5.1.4
11.	Second reburnish	-	x	S7.12	-
12.	Second fade and recovery	-	x	S7.13	S5.1.4
13.	Third reburnish	-	x	S7.14	-
14.	Fourth effectiveness	-	x	S7.15	S5.1.1.4
15.	Water recovery	-	x	S7.16	S5.1.5
16.	Spike stops	-	x	S7.17	S5.1.6
17.	Final inspection	-	-	S7.18	S5.6
18.	Moving barrier test	-	x	S7.19	S5.2.2.3

S5.1.2 Partial failure.

S5.1.2.1 In vehicles manufactured with a split service brake system, in the event of a rupture or leakage type of failure in a single subsystem, other than a structural failure of a housing that is common to two or more subsystems, the remaining portion(s) of the service brake system shall continue to operate and shall be capable of stopping a vehicle from 60 mph within the corresponding distance specified in Column IV of Table II.

S5.1.2.2 In vehicles not manufactured with a split service brake system, in the event of any one rupture or leakage type of failure in any component of the service brake system the vehicle shall, by operation of the service brake control, be capable of stopping 10 times consecutively from 60 mph within the corresponding distance specified in Column IV of Table II.

[**S5.1.3 Inoperative brake power assist unit or brake power unit.** A vehicle equipped with one or more brake power assist units shall meet the requirements of either S5.1.3.1, S5.1.3.2, or S5.1.3.4 (chosen at the option of the manufacturer), and a vehicle equipped with one or more brake power units shall meet the requirements of either S5.1.3.1, S5.1.3.3, or S5.1.3.4 (chosen at the option of the manufacturer). (46 F.R. 55—January 2, 1981. Effective: 9/1/83)]

S5.1.3.1 The service brakes on a vehicle equipped with one or more brake power assist units or brake power units, with one such unit inoperative and depleted of all reserve capability, shall be capable of stopping a vehicle from 60 mph within the corresponding distance specified in Column IV of Table II.

S5.1.3.2 Brake power assist units. The service brakes on a vehicle equipped with one or more brake power assist units, with one such unit inoperative, shall be capable of stopping a vehicle from 60 mph—

(a) In six consecutive stops at an average deceleration for each stop that is not lower than that specified in Column I of Table III, when the inoperative unit is not initially depleted of all reserve capability; and

[(b) In a final stop, at an average deceleration that is not lower than 7 fpsps for passenger cars (equivalent stopping distance 554 feet) or 6 fpsps for vehicles other than passenger cars (equivalent stopping distance 646 feet), as applicable, when the inoperative unit is depleted of all reserve capac-

[TABLE II—STOPPING DISTANCES

Vehicle test speed (miles per hour)	STOPPING DISTANCE IN FEET FOR TESTS INDICATED													
	I				II			III				IV		
	1st (preburnish) and 4th effectiveness: spike effectiveness check				2d effectiveness			3d (lightly loaded vehicle) effectiveness				Inoperative brake power and power assist unit; partial failure		
	(a)	(b)	(c)	(d)	(a)	(b) and (c)	(d)	(a)	(b)	(c)	(d)	(a)	(b) and (c)	(d)
30	[1] 57	[1] 65	[1,2] 69(1st) [1,2] 65(4th and spike) [1] 72	[1] 88	[1] 54	[1] 57	[1] 81	51	57	65	81	114	130	170
35	74	83	91	132	70	74	132	67	74	83	132	155	176	225
40	96	108	119	173	91	96	173	87	96	108	173	202	229	288
45	121	137	150	218	115	121	218	110	121	137	218	257	291	358
50	150	169	185	264	142	150	264	135	150	169	264	317	359	435
55	181	204	224	326	172	181	326	163	181	204	326	383	433	530
60	[1] 216	[1] 242	[1] 267	[1] 388	[1] 204	[1] 216	[1] 388	[1] 194	[1] 216	[1] 242	[1] 388	[1] 456	[1] 517	[1] 613
80	[1] 405	[1] 459	[1] 510	NA	[1] 383	NA	NA	NA	NA	NA	NA	NA	NA	NA
95	[1] 607	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
100	[1] 673	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

[1] Distances for specified tests. [2] Applicable to school buses only. NA = Not applicable.

NOTE—(a) passenger cars; (b) vehicles other than passenger cars with GVWR of less than 8,000 lbs; (c) vehicles with GVWR of not less than 8,000 lbs. and not more than 10,000 lbs.; (d) vehicles with GVWR greater than 10,000 lbs. (46 F.R. 55—January 2, 1981. Effective: 9/1/83)]

[TABLE III—INOPERATIVE BRAKE POWER ASSIST AND BRAKE POWER UNITS

Stop. No.	Average Deceleration, FPSPS				Equivalent Stopping Distance, Feet			
	Column 1—brake power assist		Column 2—brake power unit		Column 3—brake power assist		Column 4—brake power unit	
	(a)	(b) and (c)	(a)	(b) and (c)	(a)	(b) and (c)	(a)	(b) and (c)
1	16.0	14.0	16.0	13.0	242	277	242	298
2	12.0	12.0	13.0	11.0	323	323	298	352
3	10.0	10.0	12.0	10.0	388	388	323	388
4	9.0	8.5	11.0	9.5	431	456	352	409
5	8.0	7.5	10.0	9.0	484	517	388	431
6	7.5	6.7	9.5	8.5	517	580	409	456
7	[1] 7.0	[1] 6.0	9.0	8.0	554	646	431	484
8	NA	NA	8.5	7.5	NA	NA	456	517
9	NA	NA	8.0	7.0	NA	NA	484	554
10	NA	NA	7.5	6.5	NA	NA	517	596
11	NA	NA	[1] 7.0	[1] 6.0	NA	NA	554	646

[1] Depleted. (a) passenger cars; (b) vehicles other than passenger cars with GVWR of 10,000 lbs. or less; (c) vehicles with GVWR greater than 10,000 lbs.; NA = Not Applicable. (46 F.R. 55—January 29, 1981. Effective: 9/1/83)]

ity. (46 F.R. 55—January 2, 1981. Effective: 9/1/83)]

S5.1.3.3 Brake power units. The service brakes of a vehicle equipped with one or more brake power units with an accumulator-type reserve system, with any one failure in any one unit, shall be capable of stopping the vehicle from 60 mph:

(a) In 10 consecutive stops at an average deceleration for each stop that is not lower than that specified in Column II of Table III, when the unit is not initially depleted of all reserve capability; and

[(b) In a final stop, at an average deceleration that is not lower than 7 fpsps for passenger cars (equivalent stopping distance 554 feet) or 6 fpsps for vehicles other than passenger cars (equivalent stopping distance 646 feet), as applicable, when the inoperative unit is depleted of all reserve capacity. (46 F.R. 55—January 2, 1981. Effective: 9/1/83)]

S5.1.3.4 Brake power assist and brake power units. The service brake of a vehicle equipped with one or more brake power assist units or brake power units with a backup system, with one brake power assist unit or brake power unit inoperative and depleted of all reserve capability and with only the backup system operating in the failed subsystem, shall be capable of stopping the vehicle from 60 mph in 15 consecutive stops at an average deceleration for each stop that is not lower than 12 fpsps (equivalent stopping distance 323 feet).

S5.1.4 Fade and recovery. The service brakes shall be capable of stopping each vehicle in two fade and recovery tests as specified below.

S5.1.4.1 The control force used for the base line check stops or snubs shall be not less than 10 pounds, nor more than 60 pounds, except that the control force for a vehicle with a GVWR of 10,000 pounds or more may be between 10 pounds and 90 pounds.

S5.1.4.2 (a) Each vehicle with GVWR of 10,000 pounds or less shall be capable of making five fade stops (10 fade stops on the second test) from 60 mph at a deceleration not lower than 15 fpsps for each stop, followed by five fade stops at the maximum decleration attainable from 5 to 15 fpsps.

(b) Each vehicle with a GVWR greater than 10,000 pounds shall be capable of making 10 fade snubs (20 fade snubs on the second test) from 40 mph to 20 mph at 10 fpsps for each snub.

S5.1.4.3 (a) Each vehicle with a GVWR of 10,000 pounds or less shall be capable of making five recovery stops from 30 mph at ten fpsps for each stop, with a control force application that falls within the following maximum and minimum limits:

(1) A maximum for the first four recovery stops of 150 pounds, and for the fifth stop, of 20 pounds more than the average control force for the baseline check; and

(2) A minimum of—

(A) The average control force for the baseline check minus 10 pounds, or

(B) The average control force for the baseline check times 0.60,

whichever result is lower (but in no case lower than 5 pounds).

(b) Each vehicle with a GVWR of more than 10,000 pounds shall be capable of making five recovery snubs from 40 mph to 20 mph at 10 fpsps of each snub, with a control force application that falls within the following maximum and minimum limits:

(1) A maximum for the first four recovery snubs of 150 pounds, and for the fifth snub, of 20 pounds more than the average control force for the baseline check (but in no case more than 100 pounds); and

(2) A minimum of—

(A) The average control force for the baseline check minus 10 pounds, or

(B) The average control force for the baseline check times 0.60, whichever is lower (but in no case lower than 5 pounds).

S5.1.5 Water recovery. The service brakes shall be capable of stopping each vehicle in a water recovery test, as specified below.

S5.1.5.1 The control force used for the baseline check stops or snubs shall be not less than 10 pounds, nor more than 60 pounds, except that the control force for a vehicle with a GVWR of 10,000 pounds or more may be between 10 and 90 pounds.

S5.1.5.2 (a) After being driven for 2 minutes at a speed of 5 mph in any combination of forward and reverse directions through a trough having a water depth of 6 inches, each vehicle with a GVWR of 10,000 pounds or less shall be capable of making five recovery stops from 30 mph at 10 fpsps for each stop with a control force application that falls within the following maximum and minimum limits:

(1) A maximum for the first four recovery stops of 150 pounds, and for the fifth stop, of 45 pounds more than the average control force for the baseline check (but in no case more than 90 pounds, except that the maximum control force for the fifth stop in the case of a vehicle manufactured before September 1, 1976, shall be not more than plus 60 pounds of the average control force for the baseline check) (but in no case more than 110 pounds).

(2) A minimum of—

(A) The average control force for the baseline check minus 10 pounds, or

(B) The average control force for the baseline check times 0.60,

whichever result is lower (but in no case lower than 5 pounds).

However, the maximum control force for the fifth stop in the case of a vehicle manufactured before September 1, 1976, shall be not more than plus 60 pounds of the average control force for the baseline check (but in no case more than 110 pounds).

(b) After being driven for 2 minutes at a speed of 5 mph in any combination of forward and reverse directions through a trough having a water depth of 6 inches, each vehicle with a GVWR of more than 10,000 pounds shall be capable of making five recovery stops from 30 mph at 10 fpsps for each stop with a control force application that falls within the following maximum and minimum limits:

(1) A maximum for the first four recovery stops of 150 pounds, and for the fifth stop, of 60 pounds more than the average control force for the baseline check (but in no case more than 110 pounds); and

(2) A minimum of—

(A) The average control force for the baseline check minus 10 pounds, or

(B) The average control force for the baseline check times 0.60, whichever is lower (but in no case lower than 5 pounds).

[**S5.1.6 Spike stops.** Each vehicle with a GVWR of 10,000 lbs. or less shall be capable of making 10 spike stops from 30 mph, followed by 6 effectiveness (check) stops from 60 mph, at least one of which shall be within a corresponding stopping distance specified in Column I of Table II. (46 F.R. 55—January 2, 1981. Effective: 9/1/83)]

S5.2 Parking brake system. Each vehicle [with a GVWR of 10,000 lbs. or less and each school bus with a GVWR greater than 10,000 lbs.] shall be manufactured with a parking brake system of a friction type with a solely mechanical means to retain engagement, which shall under the conditions of S6, when tested according to the procedures specified in S7, meet the requirements specified in S5.2.1, S5.2.2, or S5.2.3 as appropriate, with the system engaged—

(a) In the case of a [vehicle with a GVWR of 10,000 lbs. or less] with a force applied to the control not to exceed 125 pounds for a foot-operated system and 90 pounds for a hand-operated system; and

(b) In the case of a school bus [with a GVWR greater than 10,000 lbs.] with a force applied to the control not to exceed 150 pounds for a foot-operated system and 125 pounds for a hand-operated system. (46 F.R. 55—January 2, 1981. Effective: 9/1/83)

S5.2.1 Except as provided in S5.2.2, the parking brake system on a [passenger car and on a school bus] with a GVWR of 10,000 pounds or less shall be capable of holding the vehicle stationary (to the limit of traction on the braked wheels) for 5 minutes in both a forward and reverse direction on a 30 percent grade. (46 F.R. 61887—December 21, 1981. Effective: 9/1/83)

S5.2.2 A vehicle of a type described in S5.2.1 at the option of the manufacturer may meet the requirements of S5.2.2.1, S5.2.2.2, and S5.2.2.3 instead of the requirements of S5.2.1 if:

(a) The vehicle has a transmission or transmission control which incorporates a parking mechanism, and

(b) The parking mechanism must be engaged before the ignition key can be removed.

S5.2.2.1 The vehicle's parking brake and parking mechanism, when both are engaged, shall be capable of holding the vehicle stationary (to the limit of traction of the braked wheels) for 5 minutes, in both forward and reverse directions, on a 30 percent grade.

S5.2.2.2 The vehicle's parking brake, with the parking mechanism not engaged, shall be capable of holding the vehicle stationary for 5 minutes, in both forward and reverse directions, on a 20 percent grade.

S5.2.2.3 With the parking mechanism engaged and the parking brake not engaged, the parking mechanism shall not disengage or fracture in a manner permitting vehicle movement, when the vehicle is impacted at each end, on a level surface, by a barrier moving at 2½ mph.

S5.2.3 The parking brake system on a multipurpose passenger vehicle, truck, and bus (other than a school bus) with a GVWR greater than 10,000 pounds shall be capable of holding the vehicle stationary for 5 minutes, in both forward and reverse directions, on a 20 percent grade.

S5.3 Brake system indicator lamp. Each vehicle shall have one or more brake system indicator lamps, mounted in front of and in clear view of the driver, which meet the requirements of S5.3.1 through S5.3.5. However, the options provided in S5.3.1(a) shall not apply to a vehicle manufactured without a split service brake system; such a vehicle shall, to meet the requirements of S5.3.1(a), be equipped with a warning indicator that activates under the conditions specified in S5.3.1(a) (4). This warning indicator shall, instead of meeting the requirements of S5.3.2 through S5.3.5, activate (while the vehicle remains capable of meeting the requirements of S5.1.2.2 and the ignition switch is in the "on" position) a continuous or intermittent audible signal and a flashing warning light, displaying the words "STOP—BRAKE FAILURE" in block capital letters not less than one-quarter of an inch in height.

S5.3.1 An indicator lamp shall be activated when the ignition (start) switch is in the "on" ("run") position and whenever any of conditions (a), (c), or (d) occur, or, at the option of the manufacturer, whenever any of conditions (b), (c), or (d) occur:

(a) A gross loss of pressure (such as caused by rupture of a brake line but not by a structural failure of a housing that is common to two or more subsystems) due to one of the following conditions (chosen at the option of the manufacturer):

(1) Before or upon application of a differential pressure of not more than 225 lb/in^2 between the active and failed brake system measured at a master cylinder outlet or a slave cylinder outlet.

(2) Before or upon application of 50 pounds of control force upon a fully manual service brake.

(3) Before or upon application of 25 pounds of control force upon a service brake with a brake power assist unit.

(4) When the supply pressure in a brake power unit drops to a level not less than one-half of the normal system pressure.

(b) A drop in the level of brake fluid in any master cylinder reservoir compartment to less than the recommended safe level specified by the manufacturer or to one-fourth of the fluid capacity of the reservoir compartment, whichever is greater.

(c) A total functional electrical failure in an antilock or variable proportioning brake system.

(d) Application of the parking brake.

S5.3.2 [(a) Except as provided in paragraph (b) of this section, all indicator lamps shall be activated as a check of lamp function either when the ignition (start) switch is turned to the "on" (run) position when the engine is not running, or when the ignition (start) switch is in a position between "on" (run) and "start" that is designated by the manufacturer as a check position.

(b) The indicator lamps need not be activated when a starter interlock is in operation. **(54 F.R. 22904—May 30, 1989. Effective: June 29, 1989)]**

S5.3.3 Each indicator lamp activated due to a condition specified in S5.3.1 shall remain activated as long as the condition exists, whenever the ignition (start) switch is in the "on" ("run") position, whether or not the engine is running.

S5.3.4 When an indicator lamp is activated it may be steady burning or flashing.

S5.3.5(a) (a) Each indicator lamp shall display word, words, or abbreviation, in accordance with the requirements of Standard No. 101 (49 CFR 571.101) and/or this section, which shall have letters not less than ⅛-inch high and be legible to the driver in daylight when lighted.

(b) If a single common indicator is used, the lamp shall display the word "Brake". The letters and background of a single common indicator shall be of contrasting colors, one of which is red.

(c) (1) [If a separate indicator lamp is provided for an anti-lock system, the single word "Antilock" or "Anti-lock", or the abbreviation "ABS", May be used for S5.3.1(c). **(52 F.R. 19872—May 27, 1987. Effective: June 29, 1987)]**

(A) If a separate indicator lamp is provided for gross loss of pressure, the words "Brake Pressure" shall be used for S5.3.1(a).

(B) If a separate indicator lamp is provided for low brake fluid, the words "Brake Fluid" shall be used for S5.3.1(b), except for vehicles using hydraulic system mineral oil.

(C) If a separate indicator lamp is provided for an anti-lock system, the single word "Antilock" or "Anti-lock" may be used for S5.3.1(c).

(D) If a separate indicator lamp is provided for application of the parking brake, the single word "Park" may be used for S5.3.1(d).

(2) Except for a separate indicator lamp for an anti-lock system, the letters and background of each separate indicator lamp shall be of contrasting colors, one of which is red. The letters and background of a separate indicator lamp for an anti-lock system shall be of contrasting colors, one of which is yellow.

S5.4 Reservoirs.

S5.4.1 Master cylinder reservoirs. A master cylinder shall have a reservoir compartment for each service brake subsystem serviced by the master cylinder. Loss of fluid from one compartment shall not result in a complete loss of brake fluid from another compartment.

S5.4.2 Reservoir capacity. Reservoirs, whether for master cylinders or other type systems, shall have a total minimum capacity equivalent to the fluid displacement resulting when all the wheel cylinders or caliper pistons serviced by the reservoirs move from a new lining, fully retracted position (as adjusted initially to the manufacturer's recommended setting) to a fully worn, fully applied position, as determined in accordance with S7.18(c) of this standard. Reservoirs shall have completely separate compartments for each subsystem except that in reservoir systems utilizing a portion of the reservoir for a common supply to two or more subsystems, individual partial compartments shall each have a minimum volume of fluid equal to at least the volume displaced by the master cylinder piston servicing the subsystem, during a full stroke of the piston. Each brake power unit reservoir servicing only the brake system shall have a minimum capacity equivalent to the fluid displacement required to charge the system piston(s) or accumulator(s) to normal operating pressure plus the displacement resulting when all the wheel cylinders or caliper pistons serviced by the reservoir or accumulator(s) move from a new lining fully retracted position (as adjusted initially to the manufacturer's recommended setting) to a fully worn, fully applied position.

S5.4.3 Reservoir labeling. Each vehicle shall have a brake fluid warning statement that reads as follows, in letters at least ⅛ of an inch high: "WARNING, Clean filler cap before removing. Use only ____________________ fluid from a sealed container." (Inserting the recommended type of brake fluid as specified in 49 CFR § 571.116, e.g., "DOT 3".) The lettering shall be—

(a) Permanently affixed, engraved, or embossed;

(b) Located so as to be visible by direct view, either on or within 4 inches of the brake fluid reservoir filler plug or cap; and

(c) Of a color that contrasts with its background, if it is not engraved or embossed.

S5.5 Antilock and variable proportioning brake systems. In the event of failure (structural or functional) in an antilock or variable proportioning brake system the vehicle shall be capable of meeting the stopping distance requirements specified in S5.1.2 for service brake system partial failure.

S5.6 Brake system integrity. Each vehicle shall be capable of completing all performance requirements of S5 without—

(a) Detachment or fracture of any component of the braking system, such as brake springs and brake shoe or disc pad facing, other than minor cracks that do not impair attachment of the friction facing. All mechanical components of the braking system shall be intact and functional. Friction facing tearout (complete detachment of lining) shall not exceed 10 percent of the lining on any single frictional element.

(b) Any visible brake fluid or lubricant on the friction surface of the brake, or leakage at the master cylinder or brake power unit reservoir cover, seal, and filler openings.

S6. Test conditions. The performance requirements of S5 shall be met under the following conditions. Where a range of conditions is specified, the vehicle shall be capable of meeting the requirements at all points within the range.

S6.1 Vehicle weight.

S6.1.1 Other than tests specified at lightly loaded vehicle weight in S7.7, S7.8, and S7.9, the vehicle is loaded to its GVWR such that the weight on each axle as measured at the tireground interface is in proportion to its GAWR, except that [each] fuel tank is filled to any level from 100 percent of capacity (corresponding to full GVWR loading) to 75 percent. (46 F.R. 55—January 2, 1981. Effective: 9/1/83)

However, if the weight on any axle of a vehicle at lightly loaded vehicle weight exceeds the axle's proportional share of the gross vehicle weight rating, the load required to reach GVWR is placed so that the weight on that axle remains the same as at lightly loaded vehicle weight.

S6.1.2 For the applicable tests specified in S7.7, S7.8, and S7.9, vehicle weight is lightly loaded vehicle weight, with the added weight distributed in the front passenger seat area in passenger cars [multipurpose vehicles and trucks] and in the area adjacent to the driver's seat in buses. (46 F.R. 55—January 2, 1981. Effective: 9/1/83)

S6.2 Test loads. Reserved.

S6.3 Tire inflation pressure. Tire inflation pressure is the pressure recommended by the vehicle manufacturer for the GVWR of the vehicle.

S6.4 Transmission selector control. For S7.3, S7.5, S7.8, S7.15, S7.17, S7.11.1.2, S7.11.2.2, S7.11.3.2, and as required for S7.13, the transmission selector control is in neutral for all decelerations. For all other tests during all decelerations, the transmission selector is in the control position, other than overdrive, recommended by the manufacturer for driving on a level surface at the applicable test speed. To avoid engine stall during tests required to be run in gear a manual transmission may be shifted to neutral (or the clutch disengaged) when the vehicle speed decreases to 20 mph.

S6.5 Engine. Engine idle speed and ignition timing settings are according to the manufacturer's recommendations. If the vehicle is equipped with an adjustable engine speed governor, it is adjusted according to the manufacturer's recommendation.

S6.6 Vehicle openings. All vehicle openings (doors, windows, hood, trunk, convertible top, cargo doors, etc.) are closed except as required for instrumentation purposes.

S6.7 Ambient temperature. The ambient temperature is any temperature between 32° F. and 100° F.

S6.8 Wind velocity. The wind velocity is zero.

S6.9 Road surface. Road tests are conducted on a 12-foot-wide, level roadway having a skid number of 81. Burnish stops are conducted on any surface. The parking brake test surface is clean, dry smooth Portland cement concrete.

S6.10 Vehicle position. The vehicle is aligned in the center of the roadway at the start of each brake application. Stops, other than spike stops, are made without any part of the vehicle leaving the roadway. Except as noted below, stops are made without lockup of any wheel at speeds greater than 10 mph. There may be controlled lockup on an antilock-equipped axle, and lockup of not more than one wheel per vehicle, uncontrolled by an antilock system. [Dual wheels on one side of an axle are considered a single wheel.] Locked wheels at speeds greater than 10 mph are allowed during spike stops (but not spike check stops), partial failure stops, and inoperative brake power or power assist unit stops. (46 F.R. 55—January 2, 1981. Effective: 9/1/83)

S6.11 Thermocouples. The brake temperature is measured by plug-type thermocouples installed in the approximate center of the facing length and width of the most heavily loaded shoe or disc pad, one per brake, as shown in Figure 1. A second thermocouple may be installed at the beginning of the test sequence if the lining wear is expected to reach a point causing the first thermocouple to contact the metal rubbing surface of a drum or rotor. For center-grooved shoes or pads, thermocouples are installed within one-eighth of an inch to one-quarter inch of the groove and as close to the center as possible.

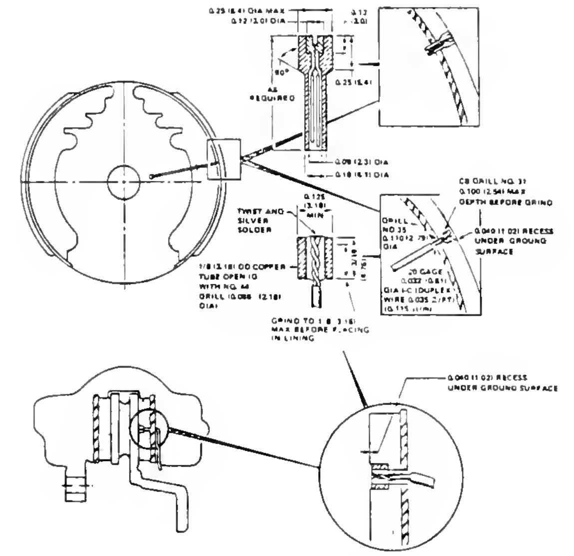


FIGURE 1 - TYPICAL PLUG THERMOCOUPLE INSTALLATIONS

Note: The second thermocouple shall be installed at .080 inch depth within 1 inch circumferentially of the thermocouple installed at .040 inch depth.

S6.12 Initial brake temperature. Unless otherwise specified, the brake temperature is 150° F to 200° F.

S6.13 Control forces. Unless otherwise specified, the force applied to a brake control is not less than 15 pounds and not more than 150 pounds.

S7. Test procedures and sequence. [Each vehicle shall be capable of meeting all the applicable requirements of S5 when testing according to the procedures and in the sequence set forth below, without replacing any brake system part or making any adjustments to the brake system other than as permitted in burnish and reburnish procedures and in S7.9 and S7.10. (For vehicles only having to meet the requirements of S5.1.2 and S5.1.3 in section S5.1, the applicable test procedures and sequence are S7.1, S7.2, S7.4, S7.9, S7.10, and S7.18. However, at the option of the manufacturer, the following test procedures and sequence may be conducted: S7.1, S7.2, S7.3, S7.4, S7.5, S7.6, S7.7, S7.8, S7.9, S7.10 and S7.18. The choice of this option shall not be construed as adding to the requirements specified in S5.1.2 and S5.1.3.) For vehicles manufactured before September 1, 1991, automatic adjusters may be locked out, at the option of the manufacturer, when the vehicle is prepared for testing. If this option is selected, adjusters must remain locked out for the entire sequence of tests. For vehicles manufactured on or after September 1, 1991, automatic adjusters must remain activated at all times. A vehicle shall be deemed to comply with the stopping distance requirements of S5.1 if all least one of the stops at each speed and load specified in each of S7.3, S7.5, S7.8, S7.9, S7.10, S7.15, or S7.17 (check stops) is made within a stopping distance that does not exceed the corresponding distance specified in Table II. When the transmission selector control is required to be in neutral for a deceleration, a stop or snub shall be obtained by the following procedures: (1) Exceed the test speed by 4 to 8 mph; (2) close the throttle and coast in gear to approximately 2 mph above the test speed; (3) Shift to neutral; and (4) when the test speed is reached apply the service brakes. **(54 F.R. 40080—September 29, 1989. Effective: September 1, 1991)]**

S7.1 Brake warming. If the initial brake temperature for the first stop in a test procedure (other than S7.7 and S7.16) has not been reached, heat the brakes to the initial brake temperature by making not more than 10 snubs from not more than 40 mph to 10 mph, at a deceleration not greater than 10 fpsps.

S7.2 Pretest instrumentation check. Conduct a general check of instrumentation by making not more than 10 stops from a speed of not more than 30 mph, or 10 snubs from a speed of not more than 40 mph to 10 mph, at a deceleration of not more than 10 fpsps. If instrument repair, replacement, or adjustment is necessary, make not more than 10 additional stops or snubs after such repair, replacement, or adjustment.

S7.3 Service brake system—first (reburnish) effectiveness test. Make six stops from 30 mph. Then make six stops from 60 mph.

S7.4 Service brake system—burnish procedure.

S7.4.1 Vehicles with GVWR of 10,000 pounds or less.

S7.4.1.1 Burnish. Burnish the brakes by making 200 stops from 40 mph at 12 fpsps (the 150 pound control force limit does not apply here). The interval from the start of one service brake application to the start of the next shall be either the time necessary to reduce the initial brake temperature to between 230° F and 270° F, or the distance of 1 mile, whichever occurs first. Accelerate to 40 mph after each stop and maintain that speed until making the next stop.

S7.4.1.2 Brake adjustment—post burnish. [After burnishing, adjust the brakes in accordance with the manufacturer's published recommendations. **54 F.R. 40080—September 29, 1989. Effective: September 1, 1991.)**]

S7.4.2 Vehicles with GVWR greater than 10,000 pounds.

S7.4.2.1 Burnish. Vehicles manufactured before September 1, 1993 may be burnished according to the procedures set forth in S 7.4.2.1(a) or S 7.4.2.1(b) of this section, at the manufactures option. Vehicles manufactured on or after September 1, 1993 shall be burnished according to the procedures set forth in S 7.4.2.1(b) of this section.

(a) Burnish the brakes by making 500 snubs at 10 fsps in the sequence specified in Table IV and within the speed ranges indicated. Except where an adjustment is specified, after each brake application accelerate to the next speed specified and maintain that speed until making the next brake application at a point 1 mile from the initial point of the previous brake application. If a vehicle cannot attain any speed specified in 1 mile, continue to accelerate until the speed specified is reached or until the vehicle has traveled 1.5 miles from the initial point of the previous brake application, whichever occurs first. If during any of the brake applications specified in Table IV the hottest brake reaches 500° F, make the remainder of the 500 applications from that snub condition, except that a higher or lower snub condition shall be followed (up to the 60 mph initial speed) as necesary to maintain a hottest brake temperature of 500° F ± 50° F. However, if at a snub condition of 40 to 20 mph, the temperature of the hottest brake exceeds 550° F, make the remainder of the 500 brake applications from that snub condition, without regard to the brake temperature. The brakes shall be adjusted three times during the burnish procedure, in accordance with the manufacturer's recommendations, after 125, 250, and 375 snubs.

TABLE IV

Series	Snubs	Snub conditions (highest speed indicated)
1	175	40 to 20 mph
2	25	45 to 20 mph
3	25	50 to 20 mph
4	25	55 to 20 mph
5	250	60 to 20 mph

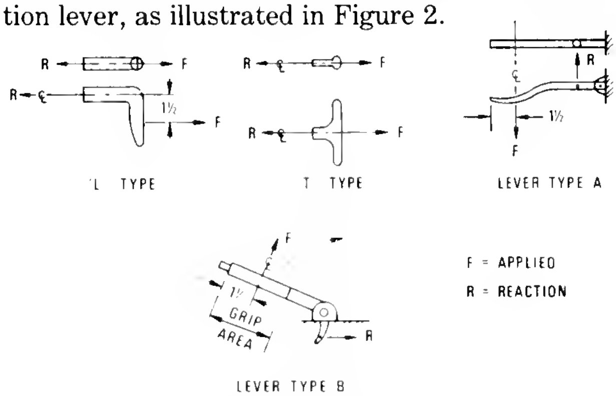
(b) Burnish the brakes by making 500 snubs between 40 mph and 20 mph at a deceleration rate of 10 fsps. Except where an adjustment is specified, after each brake application accelerate to 40 mph and maintain that speed until making the next brake application at a point 1 mile from the initial point of the previous brake application. If the vehicle cannot attain a speed of 40 mph in 1 mile, continue to accelerate until the vehicle reaches 40 mph or until the vehicle has traveled 1.5 miles from the initial point of the previous brake application, whichever occurs first. The brakes shall be adjusted three times during the burnish procedure, the accordance with the manufacturer's recommendations, after 125, 250, and 375 snubs.

S7.4.2.2 [Brake adjustment—post burnish. After burnishing, adjust the brakes in accordance with the manufacturer's published recommendations. **(54 F.R. 40080—September 29, 1989. Effective: September 1, 1991)**]

S7.5 Service brake system—second effectiveness test. Repeat S7.3. Then (for passenger cars) and other vehicles with a GVWR of 10,000 lbs. or less make four stops from 80 mph if the speed attainable in 2 miles is not less than 84 mph.

S7.6 First reburnish. Repeat S7.4, except make 35 burnish stops or snubs. In the case of vehicles burnished in accordance with S 7.4.2.1(a) of this section, reburnish the vehicle by making 35 snubs from 60 mph to 20 mph, but if the hottest brake reaches 500° F ± 50° F make the remainder of the brake applications from the highest snub condition list d in Table IV that will maintain the hottest brake temperature a 500° F ± 50° F. If at a snub condition of 40 to 20 mph, the temperature of the hottest brake exceeds 550° F, make the remainder of the 35 brake applications from the snub condition without regard to brake temperature.

S7.7 Parking brake test. The parking brake tests for any vehicle on different grades, in different directions, and for different loads may be conducted in any order. The force required for actuation of a hand-operated brake system shall be measured at the center of the hand grip area or at a distance of 1½ inches from the end of the actuation lever, as illustrated in Figure 2.



LOCATION FOR MEASURING BRAKE APPLICATION FORCE (HAND BRAKE)

FIGURE II

S7.7 Test procedure for requirements of S5.2.1.

S7.7.1.1 Condition the parking brake friction elements so that the temperature at the beginning of the test is at any level not more than 150° F (when the temperature of components on both ends of an axle are averaged).

S7.7.1.2 Drive the vehicle, loaded to GVWR, onto the specified grade with the longitudinal axis of the vehicle in the direction of the slope of the grade, stop the vehicle and hold it stationary by application of the service brake control, and place the transmission in neutral.

S7.7.1.3 With the vehicle held stationary by means of the service brake control, apply the parking brake by a single application of the force specified in (a) or (b), except that a series of applications to achieve the specified force may be made in the case of a parking brake system design that does not allow the application of the specified force in a single application:

[(a) In the case of a passenger car or other vehicle with a GVWR of 10,000 lbs. or less, not more than 125 pounds for a foot-operated system, and not more than 90 pounds for a hand-operated system; and

(b) In the case of a school bus with a GVWR greater than 10,000 lbs. not more than 150 pounds for a foot-operated system, and not more than 125 pounds for a hand-operated system. **(46 F.R. 55—January 2, 1981. Effective: 9/1/83)]**

S7.7.1.4 Following the application of the parking brake in accordance with S7.7.1.3, release all force on the service brake control and commence the measurement of time if the vehicle remains stationary. If the vehicle does not remain stationary, reapplication of the service brake to hold the vehicle stationary, with reapplication of a force to the parking brake control at the level specified in S7.6.1.3(a) or (b) as appropriate for the vehicle being tested (without release of the ratcheting or other holding mechanism of the parking brake) may be used twice to attain a stationary position.

S7.7.1.5 Following observation of the vehicle in a stationary condition for the specified time in one direction, repeat the same test procedure with the vehicle orientation in the opposite direction on the specified grade.

S7.7.1.6 Check the operation of the parking brake application indicator required by S5.3.1(d).

S7.7.2 Test procedures for requirements of S5.2.2. (a) Check that transmission must be placed in park position to release key;

(b) Test as in S7.7.1, except in addition place the transmission control to engage the parking mechanism; and

(c) Test as in S7.7.1 except on a 20 percent grade, with the parking mechanism not engaged.

S7.7.3 Lightly loaded vehicle. Repeat S7.7.1 or S7.7.2 as applicable except with the vehicle at lightly loaded vehicle weight.

S7.7.4 Non-service brake type parking brake systems. For vehicles with parking brake systems not utilizing the service brake friction elements, burnish the friction elements of such systems prior to parking brake tests according to the manufacturer's published recommendations as furnished to the purchaser. If no recommendations are furnished, run the vehicle in an unburnished condition.

S7.8 Service brake system—lightly loaded vehicle (third effectiveness) test. Make six stops from 60 mph with vehicle at lightly loaded vehicle weight. [This test is not applicable to a vehicle which both has a GVWR of not less than 8,000 pounds and not greater than 10,000 pounds and is not a school bus. **(46 F.R. 55—January 2, 1981. Effective: 9/1/83)]**

S7.9 Service brake system test—partial failure.

S7.9.1 With the vehicle at lightly loaded vehicle weight, alter the service brake system to produce any one rupture or leakage type of failure, other than a structural failure of a housing that is common to two or more subsystems. Determine the control force, pressure level, or fluid level (as appropriate for the indicator being tested) necessary to activate the brake system indicator lamp. Make 4 stops if the vehicle is equipped with a split service brake system, or 10 stops if the vehicle is not so equipped, each from 60 mph, by a continuous application of the service brake control. Restore the service brake system to normal at completion of this test.

S7.9.2 Repeat S7.9.1 for each of the other subsystems.

S7.9.3 Repeat S7.9.1 and S7.9.2 with vehicle at GVWR. Restore the service brake system to normal at completion of this test.

S7.9.4 (For vehicles with antilock and/or variable proportioning brake systems.) With vehicle at GVWR, disconnect functional power source, or otherwise render antilock system inoperative. Disconnect variable proportioning brake system. Make four stops, each from 60 mph. If more than one antilock or variable proportioning brake subsystem is provided, disconnect or render one subsystem inoperative and run as above. Restore system to normal at completion of this test. Repeat for each subsystem provided. Determine whether the brake system indicator lamp is activated when the electrical power source to the antilock or variable proportioning unit is disconnected.

S7.10 Service brake system—inoperative brake power unit or brake power assist unit test. (For vehicles equipped with brake power unit or brake power assist unit.)

S7.10.1 Regular procedure. (This test need not be run if the option in S7.10.2 is selected.) On vehicles with brake power assist units, render the brake power assist unit inoperative, or one of the brake power assist unit subsystems if two or more subsystems are provided by disconnecting the relevant power supply. Exhaust any residual brake power reserve capability of the disconnected system. On vehicles with brake power units, disconnect the primary source of power. Make four stops, each from 60 mph, by a continuous application of the service brake control. Restore the system to normal at completion of this test. For vehicles equipped with more than one brake power unit or brake power assist unit, conduct tests for each in turn.

S7.10.2 Optional procedures—passenger cars only. On vehicles with brake power assist units, the unit is charged to maximum prior to start of test. (Engine may be run up in speed, then throttle closed quickly to attain maximum charge on vacuum assist units.) Brake power units shall also be charged to maximum accumulator pressure prior to start of test. No recharging is allowed after start of test.

(a) (For vehicles with brake power assist units.)

Disconnect the primary source of power. Make six stops each from 60 mph, to achieve the average deceleration for each stop as specified in Table III. Apply the brake control as quickly as possible. Maintain control force until vehicle has stopped.

At the completion of the stops specified above, deplete the system of any residual brake power reserve capability. Make one stop from 60 mph at an average deceleration of not lower than 7 fpsps for passenger cars (equivalent stopping distance 554 feet), or 6 fpsps for vehicles other than passenger cars (equivalent stoppng distance 646 feet) and determine whether the control force exceeds 150 pounds.

(b) (For vehicles with brake power units with accumulator type systems.) Test as in S7.10.2(a), except make 10 stops instead of 6 and, at the completion of the 10 stops, deplete the failed element of the brake power unit of any residual brake power reserve capability before making the final stop.

(c) (For vehicles with brake power assist or brake power units with backup systems.) If the brake power or brake power assist unit operates in conjunction with a backup system and the backup system is activated automatically in the event of a primary power failure, the backup system is operative during this test. Disconnect the primary source of power of one subsystem. Make 15 stops, each from 60 mph, with the backup system activated for the failed subsystem, to achieve an average deceleration of 12 fpsps for each stop.

(d) Restore systems to normal at completion of these tests. For vehicles equipped with more than one brake power assist or brake power unit, conduct tests of each in turn.

S7.11 Service brake system—first fade and recovery test.

S7.11.1 Baseline check stops or snubs.

S7.11.1.1 Vehicles with GVWR of 10,000 pounds or less. Make three stops from 30 mph at 10 fpsps for each stop. Control force readings may be terminated when vehicle speed falls to 5 mph. Average the maximum brake control force required for the three stops.

S7.11.1.2 Vehicles with GVWR greater than 10,000 pounds. With transmission in neutral (or declutched), make three snubs from 40 to 20 mph at 10 fpsps for each snub. Average the maximum brake control force required for the three snubs.

S7.11.2 Fade stops or snubs.

S7.11.2.1 Vehicles with GVWR of 10,000 pounds or less. Make 5 stops from 60 mph at 15 fpsps followed by 5 stops at the maximum attainable deceleration between 5 and 15 fpsps for each stop. Establish an initial brake temperature before the first brake application of 130° F to 150° F. Initial brake temperatures before brake applications for subsequent stops are those occurring at the distance intervals. Attain the required deceleration within 1 second and, as a minimum, maintain it for the remainder of the stopping time. Control force readings may be terminated when vehicle speed falls to 5 mph. Leave an interval of 0.4 mile between the start of brake applications. Accelerate immediately to the initial test speed after each stop. Drive 1 mile at 30 mph after the last fade stop, and immediately follow the recovery procedure specified in S7.11.3.1.

S7.11.2.2 Vehicles with GVWR greater than 10,000 pounds. With transmission in neutral (or declutched), make 10 snubs from 40 to 20 mph at 10 fpsps for each snub. Establish an initial brake temperature before the first brake application of 130° F to 150° F. Initial brake temperatures before brake application for subsequent snubs are those occurring in the time intervals specified below. Attain the required deceleration within 1 second and maintain it for the remainder of the snubbing time. Leave an interval of 30 seconds between snubs (start of brake application to start of brake application). Accelerate immediately to the initial test speed after each snub. Drive for 1.5 miles at 40 mph after the last snub and immediately follow the recovery procedure specified in S7.11.3.2.

S7.11.3 Recovery stops or snubs.

S7.11.3.1 Vehicles with GVWR of 10,000 pounds or less. Make five stops from 30 mph at 10 fpsps for each stop. Control force readings may be terminated when vehicle speed falls to 5 mph. Allow a braking distance interval of 1 mile. Immediately after each stop accelerate at maximum rate to 30 mph and maintain that speed until making the next stop. Record the maximum control force for each stop.

S7.11.3.2 Vehicles with GVWR greater than 10,000 pounds. With transmission in neutral (or declutched), make five snubs from 40 to 20 mph at 10 fpsps, for each snub. After each snub, accelerate at maximum rate to 40 mph and maintain that speed until making the next brake application at a point 1.5 miles from the point of the previous brake application. Record the maximum control force for each snub.

S7.12 Service brake system—second reburnish. Repeat S7.6.

S7.13 Service brake system-second fade and recovery test. Repeat S7.11 except in S7.11.2 run 15 fade stops or 20 snubs instead of 10.

S7.14 Third reburnish. Repeat S7.6.

S7.15 Service brake system—fourth effectiveness test. Repeat S7.5. Then (for passenger cars) make four stops from either 95 mph if the speed attainable in 2 miles is 99 to (but not including) 104 mph, or 100 mph if the speed attainable in 2 miles is 104 mph or greater.

S7.16 Service brake system—water recovery test.

S7.16.1 Baseline check stop. Make three stops from 30 mph at 10 fpsps for each stop. Control force readings may be terminated when vehicle speed falls to 5 mph. Average the maximum brake control force required for the three stops.

S7.16.2 Wet brake recovery stops. With the brakes fully released at all times, drive the vehicle for 2 minutes at a speed of 5 mph, in any combination of forward and reverse directions, through a trough having a water depth of 6 inches. After leaving the trough, immediately accelerate at maximum rate to 30 mph without a brake application. Immediately upon reaching that speed make five stops, each from 30 mph at 10 fpsps for each stop. After each stop (except the last), accelerate the vehicle immediately at a maximum rate to a speed of 30 mph and begin the next stop.

S7.17 Spike stops. Make 10 successive spike stops from 30 mph with the transmission in neutral, with no reverse stops. Make spike stops by applying a control force of 200 pounds while recording control force versus time. Maintain control force until vehicle has stopped. At completion of 10 spike stops, make 6 effectiveness stops from 60 mph.

S7.18 Final inspection. Inspect—

(a) The service brake system for detachment or fracture of any components, such as brake springs and brake shoes or disc pad facing.

(b) The friction surface of the brake, the master cylinder or brake power unit reservoir cover, and seal and filler openings, for leakage of brake fluid or lubricant.

(c) The master cylinder or brake power unit reservoir for compliance with the volume and labeling requirements of S5.4.2 and S5.4.3. In determining the fully applied worn condition assume that the lining is worn to (1) rivet or bolt heads on riveted or bolted linings or (2) within $\frac{1}{32}$ inch of shoe or pad mounting surface or bonded linings, or (3) the limit recommended by the manufacturer, whichever is larger relative to the total possible shoe or pad movement. Drums or rotors are assumed to be at nominal design drum diameter or rotor thickness. Linings are assumed adjusted for normal operating clearance in the released position.

(d) The brake system indicator light(s), for compliance with operation in various key positions, lens color, labeling, and location, in accordance with S5.3.

S7.19 Moving barrier test. (Only for vehicles that have been tested according to S7.7.2.) Load the vehicle to GVWR, release parking brake and place the transmission selector control to engage the parking mechanism. With a moving barrier as described in paragraph 3.3 of SAE Recommended Practice J972 "Moving Barrier Collision Tests," November 1966, impact the vehicle from the front at 2½ mph. Keep the longitudinal axis of the barrier parallel with the longitudinal axis of the vehicle. Repeat the test, impacting the vehicle from the rear. Note: The vehicle used for this test need not be the same vehicle that has been used for the braking tests.

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 106

Brake Hoses

(Docket No. 1–5; Notice 8)

This notice amends 49 CFR 571.106, Motor Vehicle Safety Standard 106, *Hydraulic Brake Hoses*, by (1) extending its requirements to all motor vehicles and hydraulic, air, and vacuum brake hose, brake hose assemblies, and brake hose end fittings for use in those vehicles, (2) replacing some design-oriented requirements with performance requirements for brake hose, brake hose assemblies, and brake hose end fittings, and (3) establishing comprehensive labeling requirements for brake hose, brake hose assemblies, and brake hose end fittings.

A notice of proposed rulemaking on this subject was published on March 30, 1971 (36 F.R. 5855). It revised and corrected earlier proposed amendments and proposed the elimination of many design specifications in favor of broad performance requirements. This reorientation generated little comment, but extensive comments were received on the details of the proposed requirements.

Tests conducted by the NHTSA Safety Systems Laboratory and comments to the docket both indicated that the extensive sequential testing proposed in the NPRM could be an unpredictable measure of brake hose performance and much sequential testing was eliminated. One of the remaining sequential tests requires that all hose assemblies meet the constriction test as well as any other single test.

Several comments indicated confusion concerning the rule's applicability to components of the brake system. The definition of brake hose now limits the standard to flexible conduits that transmit or contain the fluid pressure or vacuum used to apply force to a vehicle's brakes. This excludes such hose as that from the brake fluid reservoir to the master cylinder, and that from the air compressor discharge to its reservoir. Chassis plumbing which is flexible falls within the definition of brake hose, as does hose from the engine to the vacuum booster.

In response to continued requests for physical tolerances and related accommodations for testing, it is reiterated that the safety standards should in all cases be considered as performance levels that each vehicle or item of equipment must meet, and not as instructions for manufacturer testing. Thus, a 35-hour continuous flex test procedure sets the minimum performance level that the hose must meet when the NHTSA tests for compliance. The manufacturer may certify this performance level on the basis of interrupted tests as long as, in the exercise of due care, these tests provide assurance that his hose complies and will withstand 35 hours of continuous flexing. In response to another question, the manufacturer must determine for himself how frequently he should test his products to ensure that they comply.

The standard does not establish varying burst strength requirements for different size hose, because all sizes may be subject to extreme pressure conditions. Neither does the standard remove wire-braided air brake hose from the adhesion requirements as requested, because the NHTSA has concluded that properly embedded wire-braided hose will sustain an 8-pound pull, and that no sufficient data exists to exempt wire-braided hose at this time.

Labeling requirements have been modified in response to comments to permit (1) lettering to fit smaller size hoses, (2) antitorque stripes that are "clearly identifiable" in order to accommodate a molding process as well as color-striping, (3) use of fractions to express the hose inside diameter, and (4) interruption of the second stripe with optional additional information not permitted in the legend that interrupts the first stripe. In this way, the labeling provision requires certain safety-related information expressed in a specified format, and it also permits labeling with additional information by the manufacturer at his option. For example, several comments suggested the use of "air-brake" in lieu of "A" and inclusion of SAE air brake-hose type designations as a part of labeling air brake components. Another comment requested metric labeling. As modified, the standard now permits all this information to be placed on the hose as additional information.

Labeling requirements for brake hose end fitting manufacturers no longer include the assembly completion date. Instead, the assembler is required to place a band on each hose assembly which indicates the assembly completion date. "Brake hose assembly" has been redefined to exclude assemblies containing used components, and this effectively excludes repair operations from the requirements of the standard.

The amendment has been reorganized to clearly indicate that it applies to three types of hose, hose assemblies, and end fittings. The requirements and test procedures for each type of hose have been grouped together for clarity, in response to docket comments.

Changes to the hydraulic brake hose requirements include revision of many sequential tests. The 1,500 psi air pressure resistance test was eliminated as an inappropriate measure of hydraulic brake hose performance. The water absorption test proposed in the NPRM was divided into three distinct tests. The test temperature in the brake fluid compatibility test has been lowered to more accurately reflect vehicle operating conditions and to approach a more suitable test temperature for the specified procedure.

Few changes were made to the vacuum brake hose section. In response to the request of its manufacturers, $\frac{9}{32}$-inch hose has been added to the performance requirements data. Distinctions between light and heavy duty hose were largely eliminated.

All sequential testing except for the constriction test and one water absorption-tensile strength test has been eliminated from the air brake hose requirements. Comments indicated that the extensive combination of tests was inappropriate to measure the adequacy of traditionally constructed air brake hose. The ultraviolet test has been eliminated until sufficient data is generated to support a minimum performance requirement. The standard has also been modified to allow use of permanent as well as reusable end fittings. As anticipated in the NPRM, outside and inside diameter specifications have been added to the requirements for two types of air brake hose, although these specifications do not require the use of Standard SAE 100R5 fittings as proposed in the NPRM.

The suggested standardization on 100R5 fittings generated the greatest number of comments on the rulemaking. Comments generally agreed that thread engagement and component attachment should be standardized. However, disagreement exists on which fitting is most suitable for standardization. Many comments indicated that type E fittings are predominant in the industry and will be more so in the future and that their non-proprietary design permits manufacture by anyone. The NHTSA has decided, on the basis of the comments received, not to standardize on any type of fitting at this time. This amendment only establishes hose diameters and tolerances intended for use in reusable air brake hose assemblies as a first step toward standardization of the air brake hose assembly. Notice and further opportunity to comment will precede any rulemaking on the standardization of air brake hose assemblies.

In consideration of the foregoing, Standard No. 106, *Brake Hoses*, 49 CFR Part 571.106, is amended to read as set forth below.

Effective date: September 1, 1974.

(Sec. 103, 119, Pub. L. 89–563, 80 Stat. 718, 15 U.S.C. 1392, 1407; delegation of authority at 49 CFR 1.51.)

Issued on November 5, 1973.

James B. Gregory
Administrator

38 F.R. 31302
November 13, 1973

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 106

Brake Hoses

(Docket No. 1–5; Notice 9)

This notice amends Standard No. 106, *Brake hoses*, 49 CFR 571.106, to require a manufacturer designation in place of the manufacturer identification code assigned by the National Highway Traffic Safety Administration (NHTSA) which is presently required by the labeling provision.

The NHTSA has not completed consideration of comments to its manufacturer's identification code proposal published June 7, 1973 (38 F.R. 14968). General Motors has stated that production of 1975 model vehicles that conform to Standard 106 will require the immediate manufacture of brake hose that conforms to Standard 106. This amendment modifies the identification requirements to permit the use of manufacturer designations, such as those presently in use, until the NHTSA issues a final rule on the manufacturer's identification code proposal. At that time the standard would be amended again to require whatever code might be assigned by the NHTSA.

Other matters raised by petitions for reconsideration are presently under consideration and will be answered in accordance with the procedures of 49 CFR 553.35, *Petitions for reconsideration.*

In consideration of the foregoing, Standard 106 (49 CFR 571.106) is amended . . . .

Effective date: January 29, 1974. Because this amendment creates no additional burden, and because of the immediate need for an effective requirement applicable to equipment to be produced for the 1975 model year, it is found for good cause shown that notice and public procedure thereon are impracticable, and that an immediate effective date is in the public interest.

(Secs. 103, 119, Pub. L. 89-563, 80 Stat. 718, 15 U.S.C. 1392, 1407; delegation of authority at 49 CFR 1.51.)

Issued on January 23, 1974.

James B. Gregory
Administrator

39 F.R. 3680
January 29, 1974

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 106–74

Brake Hoses

(Docket No. 1–5; Notice 10)

This notice responds to petitions for reconsideration of amended Standard 106, *Brake hoses*, 49 CFR 571.106, published November 13, 1973 (38 F.R. 31302). In response to comments by 36 manufacturers and users of brake hoses, the National Highway Traffic Safety Administration (NHTSA) amends the definitions, labeling, and performance provisions of the standard in several respects.

The Motor Vehicle Manufacturers Association, the American Trucking Association, and three manufacturers questioned the applicability of the standard to nylon and thermoplastic tubing used in the chassis plumbing of air brake systems. They asserted that Notice 7 offered no opportunity for comment on the properties and use of this material and that no safety need could justify its inclusion in the standard. The comments point to a distinction in industry terminology between "tubing" and "hose" to argue that NHTSA use of the term "hose" limited the proposal to traditional applications of six SAE hose types at articulating points in the air brake system.

The NHTSA considers that the broad definition of "Airbrake hose" provided an opportunity to comment on the issue of tubing. Notice 7 defined "Airbrake hose" as "a flexible hose for use in an airbrake system . . ." and it clarified this definition in the preamble to the notice.

Major revisions have been made in the airbrake hose portion of the proposal by eliminating the six types previously specified. Thus an airbrake hose under the proposal may be manufactured from any material as long as the hose can meet the performance requirements of the standard.

The NHTSA included "flexible" in its definition of hose, despite the common meaning of hose as flexible pipe or tubing, to emphasize the exclusion of relatively inflexible elements of an airbrake system such as copper tubing commonly found in chassis tubing. Finally, the broad term "air brake system" adequately gives notice of the standard's applicability to the chassis plumbing portion of that system. The NHTSA determined that a safety need exists to include flexible chassis plumbing in this standard because it is used in the same environment as hose located at articulating points and is subject to many of the same types of stress, including heat, cold, and pressure. A failure of either flexible conduit creates as great a safety hazard. For these reasons, the petitions that tubing be excluded from the standard are denied.

Manufacturers who commented on the use of nylon and thermoplastic in air brake systems expressed confidence that their products, which are in widespread use as chassis plumbing, will meet the requirements of the standard. They requested testing to exclude inadequate materials which might also meet the present requirements. The NHTSA expects to propose additional requirements after review and testing demonstrate that traditional hose materials presently in use will not be excluded arbitrarily. In the interim, the NHTSA's safety defect authority can prevent the use of inadequate materials.

To accommodate the inclusion of nylon and thermoplastic, the comments also requested a revision of the tensile strength value for the smaller nylon and thermoplastic hose. This change has been made. It should be stressed that the applicability of this standard to nylon and thermoplastic tubing does not affect tubing construction or characteristics.

"Brake hose" is defined in the final rule as "a flexible conduit that transmits or contains the fluid pressure or vacuum used to apply force to a vehicle's brakes." Wagner Electric and several other manufacturers argued that a definition like this which differs from accepted industry terminology should include a list of the parts of the brake system it covers. Actually, the use of general language different from industry terminology is specifically intended to avoid identification with specific designs and thereby permit the definition to accommodate future designs as they develop. The preamble refers to specific lines only in response to manufacturer requests for interpretations, and the NHTSA will continue to provide interpretations to interested persons upon request. The NHTSA interprets the term "flexible" to exclude copper or steel tubing. In response to Chrysler, General Motors, Ford, and Mercedes-Benz, the NHTSA reiterates that the vacuum and hydraulic booster lines that service power brake systems transmit or contain pressure used to apply force to a vehicle's brakes within the meaning of the definition. Accessory air lines such as those to the power air horn and windshield wipers are, of course, excluded.

The definition of "brake hose assembly" in the rule covered both combinations of clamps and hose and combinations of end fittings and hose. The NHTSA has deleted reference to clamps, in agreement with manufacturers who pointed out that the mounting of a slip-on clamp and hose is an essentially different manufacturing operation that, if regulated, should be subject to different performance requirements from brake hose assemblies. The clamp assemblies are subject to NHTSA safety defect authority. Comments disagreed for various reasons on the exclusion of hose assemblies containing used components from the standard. The NHTSA concludes that the exclusion is realistic and justified.

The standard now defines "permanently attached end fittings" to make clear that 3-piece hose fittings which utilize sacrificial sleeves or ferrules are permanently attached end fittings and that the hose used with them is not prohibited by S7.1. In addition to the action taken with respect to the definition, $\frac{3}{8}$-in and $\frac{1}{2}$-in hose sizes have been added to Table III under both Type I and Type II hose in order that their use may be continued.

The definition of "rupture" has been modified slightly to make clear that the two types of failure included in the definition are "separation of the hose from its end fitting" and "leakage". Both a small leak and a hose burst constitute "leakage" under this definition.

Manufacturers of brake hose assemblies and vehicles petitioned for numerous variations in the labeling provisions. The many proposed changes in brake hose assembly labeling illustrate the importance of uniform labeling in a field where differing combinations of responsibility exist between manufacturers and installers of hose assembly components.

The NHTSA has determined that the basic assembly banding technique set forth in Notice 8 remains the clearest uniform identification method for assembly manufacturers. The band may be freely attached at any point on the assembly to minimize binding and wear as long as it is retained by the end fittings. An exception to the banding requirement has been made for the vehicle manufacturer who assembles and installs his own brake hose assemblies, because his assemblies are integrally related to the vehicle, and the vehicle certification and identification information serves to identify and certify the hose assembly. The manufacturer may choose to band those hose assemblies subject to being rebuilt, to delimit his responsibiilty in the event a rebuilt assembly fails.

Manufacturers will be permitted to mark the date of manufacture by day or month on the assembly and hose. The identification code required on each component is not yet available for issuance and therefore an amendment of the standard has already been issued to permit use of a manufacturer designation in place of the code (39 F.R. 3680, January 29, 1974). That language has been revised to allow the use of a manufacturer designation that does not consist of the block capital letters otherwise required by S5.2.2, S5.2.3, and S5.2.4.

The labeling requirements now reflect the use of nominal inside and outside diameter designations. The hose labeling has been modified from "not less than 6 inches" to "not more than

6 inches" in response to many requests. Toyota's request for one-stripe labeling of required and optional information has been denied, to ensure that the required information appears at least once on hose as short as 4 inches. The NHTSA has denied requests for rearrangements of the required information, concluding that they would not make it clearer to the user. In response to Midland-Ross' request for clarification, it is reiterated that, while the NHTSA requires certain safety-related information expressed in a certain format, it does not prohibit the addition of other information elsewhere on hydraulic, air, or vacuum hose.

Several manufacturers of hydraulic brake hose assemblies argued that end-fitting labeling information becomes meaningless once a fitting is permanently attached to a hose. They reasoned that the crimping process deforms the fitting, its coating, and possibly the lettering, so that no fitting manufacturer would certify his product to the assembler, and that the responsibility for the fitting's conformity would in any case fall on the assembler.

While the NHTSA expects the labeling information to serve a useful purpose on reusable and 3-piece permanently attached end fittings, the limited benefit of markings on a crimped fitting justifies their elimination. In fact the one performance requirement that applies to fittings has been modified to reflect the crimping process and it effectively becomes the assembler's responsibility to meet this corrosion resistance provision.

There were several general comments on the performance requirements and the test procedures. There were requests for physical tolerances, especially for the expansion test apparatus, and related accommodations for test purposes. These arise from misunderstanding of the legal nature of the safety standards, which are performance levels that each vehicle or item of motor vehicle equipment must meet, and not instructions for manufacturer testing. In the case of a calibration factor, for example, the NHTSA set an exact performance level by stating its requirement without a tolerance. Then, in compliance testing, it determines the calibration factor of its equipment and gives the benefit of that factor to the manufacturer in assessing the test results. Correspondingly, the manufacturer should deal with an exact performance level by determining the calibration factor of his equipment and penalizing his test results by that amount. Manufacturer testing should be directed at proving the equipment's capability in the exercise of due care, by testing under conditions at least as adverse as any that could be established in accordance with the procedures. For example, to accept Goodyear's suggested room temperature range of 65° to 90°F. would permit the NHTSA to test at any temperature within the range, and a manufacturer would correspondingly have to test to assure himself that his product would conform at every point within the range.

Toyota expressed some confusion about sequential testing. As stated in S5.3, S7.3, and S9.2, a particular hose, end fitting, or hose assembly need not meet further requirements after having met the constriction requirements and any one other requirement listed. A particular hose assembly, therefore, would have to meet the constriction requirement in each case and then one other selected requirement, of which S5.3.6, *Water absorption and tensile strength*, is one example.

The constriction requirement requires that any cross section which the NHTSA chooses to examine will be a certain percentage of the nominal diameter. Again the manufacturer may utilize whatever test method convinces him in the exercise of due care that his product conforms to the constriction requirement. Chrysler objected to the application of the constriction test to hose assemblies, citing situations where restrictions are designed into brake systems for pressure control. The NHTSA has determined that the established percentages limit constrictions to a safe level.

With regard to the requirements as a group, it is noted that, while a hose must conform to any of the requirements, it need not be tested to requirements that are obviously inapplicable. For instance, thermoplastic tubing need not be subjected to the adhesion test because it is obvious that there are no layers in this construction which could fail to adhere.

Numerous comments were addressed to specific hydraulic performance requirements. The expansion and burst-strength requirements included a

30-minute waiting period, which has been eliminated as unnecessary. The procedure is modified to better describe the test sequence, and two values in Table I are corrected.

With regard to mounting hose assemblies having L-shaped end fittings in a flexing machine, the test procedures have been modified to permit the use of adapters to secure the assembly to the machine with the same orientation as a straight assembly.

The low-temperature resistance test for hydraulic hose has been modified from −65°F. to −40°F. in line with air and vacuum hose test values.

A hydraulic hose assembler objected that use of SAE RM–1 compatibility fluid had not been proposed in Notice 7 and therefore could not be specified in the final rule. Notice 7 proposed use of "brake fluid conforming to Standard No. 116." This means that the NHTSA could have chosen any such fluid for use in its tests, and that the manufacturer would have to test with each fluid or otherwise assure himself in the exercise of due care that his hose assembly could meet the requirements using each fluid conforming to Standard No. 116. Specification of a single fluid is therefore a relaxation of the proposed requirement. The Society of Automotive Engineers Referee Materials Subcommittee, which contracts for production of RM–1 fluid, has assured the NHTSA of its continued availability for at least the next 3 years. A modification of the requirements has been made for mineral-type systems.

The NHTSA agrees with Wagner Electric that the end fitting corrosion requirement must accommodate the crimping and labeling process, and the requirement is amended to permit displacement of the protective coating necessary to mark the fittings and attach it to a hose.

Several comments were addressed to the air brake hose requirements. Clarifying language has been added to make clear that air brake hose assemblies may be constructed with permanent or reusable end fittings. Table III now includes A- and B-type hose in ⅜- and ½-in special diameters to assure its continued availability, particularly for replacement purposes. The constriction test value of 66 percent remains unchanged because the calculation method is already consistent with hydraulic value of 64 percent.

Table IV is revised to include outside dimensions. New, smaller radii for tubing tests cannot be adopted, however, until there has been notice and opportunity to comment. In answer to Toyota's request for interpretation, it is correct that the test cylinder radii are directly proportional to the diameter of the hose being tested. Suggestions to examine the inner as well as outer layers of hose subjected to the low-temperature resistance test will be considered in future rulemaking, since interested persons should be given notice and opportunity to comment. The same considerations apply to Samuel Moore Company's suggested higher test temperature in the oil-resistance requirement, more demanding percentages in the length change requirement and the high-temperature burst strength test. The oil resistance test specimen has been modified to one-third of an inch in width because ½-in specimens can not be cut from the smaller hose sizes. The burst strength value is reduced to 800 psi to accommodate nylon and thermoplastic tubing while retaining a safety performance level five times that of normal operating conditions.

The application of air pressure has been retained in the length change test and the air pressure test, despite requests for "optional" pressure sources. Hidden options of this type are generally undesirable in the safety standards, since they make uncertain the level of required performance, and complicate the comparison of manufacturer and NHTSA test results. The manufacturer is free to use pressure sources other than air as long as his results assure him that the hose would meet the requirement if air were used.

Manufacturers proposed alternative means of testing the adhesion of hose layers because of the difficulty associated with testing wire-braided and small diameter hose. As pointed out in the petitions, sufficient care in conducting the present test will prevent these difficulties. Any manufacturer who believes that the alternative procedure has significant advantages should submit a petition for rulemaking with supporting data.

Some comments on the adhesion test argued for the averaging of test results without specifying any objection to the present procedure. At this time, it does not appear that averaging would be desirable for purposes of this standard. In another area, some tensile strength test values have been reduced in recognition of the use of tubing in nonarticulating applications. The distinction between permanent and reusable fittings is eliminated, consistent with the rationale that the components may operate under the same conditions.

The NHTSA denies Wagner Electric's requested re-establishment of the air pressure test procedures which appeared in Notice 7. These procedures were modified because comments objected to the measuring technique. As noted previously, the manufacturer may use any test method which assures him the equipment meets the requirement as stated.

One significant question was raised with regard to the vacuum hose requirements. Table V inadvertently listed the same hose lengths and cylinder radii for the low and high temperature resistance tests. A new column of values is added to that table.

Because of the additional leadtime required to purchase conforming brake hose and assemblies for use in vehicles which must conform to the standard, the effective date of the standard as it applies to vehicles is delayed 4 months to January 1, 1975. An amendment to the presently effective Standard 106 permits compliance either with that standard or with this standard, as it is effective September 1, 1974.

Interested persons are reminded that, in addition to the amendments set forth below, an amendment of Standard 106 has already been issued which permits the use of a manufacturer designation in place of the identification code called for in the rule as first issued. (39 F.R. 3680, January 29, 1974.)

In consideration of the foregoing, both Standard No. 106, 49 CFR 571.106, in its presently effective form and Standard No. 106 as it is effective September 1, 1974, and January 1, 1975, are amended.

The present Standard No. 106 is amended by the addition of a new paragraph . . . .

Effective dates: September 1, 1974, for equipment covered by the standard; January 1, 1975, for vehicles to which the standard applies.

(Secs. 103, 119, Pub. L. 89–563, 80 Stat. 718, 15 U.S.C. 1392, 1407; delegation of authority at 49 CFR 1.51.)

Issued on February 20, 1974.

James B. Gregory
Administrator

39 F.R. 7425
February 26, 1974

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 106–74

Brake Hoses

(Docket No. 1–5; Notice 11)

This notice amends Standard No. 106, *Brake hoses*, 49 CFR 571.106, by modifying the definition of "permanently attached end fitting", the effective date for brake hose assemblies and vehicles, several labeling requirements, and certain tensile strength, constriction, and corrosion resistance requirements, in response to petitions for reconsideration of amendments published January 29, 1974 (39 FR. 3680) (Notice 9) and February 26, 1974 (39 FR 7425) (Notice 10). In addition, Toyo Kogyo Company, in a letter request for interpretation, pointed out an inadvertent change of language in Notice 8 (38 FR 31302, November 13, 1973) which is corrected in this notice.

Notice 9

Notice 9 amended the standard to permit the use of "a designation that identifies the manufacturer" of an end fitting, hose or hose assembly in place of a manufacturer identification code which the NHTSA is not yet prepared to issue. Any designation which is filed with the NHTSA may be used until the permanent code is implemented. The only comment on Notice 9 was made by Weatherhead Company, which objected to any interim marking on grounds of expense and advocated elimination of all label identification from the hose. The NHTSA considers identification other than a colored thread to be reasonable and necessary for rapid recognition, and Weatherhead's first petition is denied.

Although not raised by Weatherhead in its petition, several assemblers have objected that the manufacturer designation requirement conflicts with the general industry practice of marking hose with the distributor's designation. The NHTSA requirement that the manufacturer designation appear on one side of the hose in the required format does not in any way prevent labeling of hose with the distributor's designation on the opposite side of the hose along with other optional information.

Weatherhead petitioned for revision of the identification requirements to permit designations other than block capital letters and numerals. The necessary language has already been added to the standard in Notice 10.

Weatherhead also requested a modification of the definition of "end fitting" that would exclude end fitting components from the labeling requirements in order to accommodate the practice of assembler intermixing of components made by different manufacturers. Such an exclusion of components, combined with the present exclusion of labeling crimped-on fittings, would eliminate all identification requirements for all fittings. While unlabeled crimped fittings may be traced through the hose assembler's band, "renewable" or reuseable fittings must be labeled at least once to permit location of any defective fitting which was attached to new hose and then reused after it passed out of the control of the assembler and the NHTSA. Although the NHTSA does not find labeling of each part of a fitting to be feasible, it does not consider it unduly burdensome for an assembler to ensure that the newly assembled fitting is composed entirely of parts made by the manufacturer whose designation appears on one part. This also responds to International Harvester's request for interpretation on labeling multi-piece fittings.

Notice 10

Notice 10 amended the standard in response to petitions for reconsideration of the regulation as it had been issued in final form November 13, 1973 (38 FR 31302). The twelve petitions for reconsideration of this notice emphasized confusion over the status of hose, fittings, and assemblies manufactured before the effective date, and disagreement with certain labeling requirements and the applicability of the standard to particular hose types and applications.

The use of hose and fittings manufactured before the September 1, 1974, effective data raises two problems. The most difficult of these problems is that the components may not conform to any or all of the performance requirements of Standard 106, and therefore could not be made into assemblies or vehicles after the appropriate effective date. To alleviate this "existing stock" problem, Notice 10 delayed the effective date of the standard for vehicles 4 months to permit the utilization of non-106 components. This did not solve the problem, however, as pointed out by Ford and by White Motor Corporation, because the hose and fittings made immediately before the effective date must be made into assemblies after the effective date before they can be used in vehicles. This notice therefore delays the effective date of the standard for six months as it applies to assemblies. The March 1, 1975, date is set with reference to materials submitted by vehicle and hose and fitting manufacturers that support a delay somewhat longer than 4 months to absorb existing stocks. Because it will take some months to stock inventories with conforming assemblies after March 1, 1975, the effective date of the standard for vehicles is delayed until September 1, 1975.

The delay in effective date for assemblies and vehicles will minimize difficulties in the transition to hose marked with the DOT symbol. This transition problem arises because of the requirement that the DOT appear on conforming hose, fittings, and assemblies, but that it not appear on hose to which no safety standard applies, that is, hose manufactured before the standard's effective date. This principle has been consistently followed in the labeling of tires and other items of motor vehicle equipment to avoid confusion in the meaning of the symbol and the concept of compliance. The problem does not arise in the labeling of hydraulic hose for use in passenger cars because a standard already applies and the DOT symbol can be used to indicate compliance with it.

The difficulty in labeling brake hose with the DOT symbol is not that of a September 1, 1974, "midnight changeover". The problem is that any hose assemblies used in new vehicles must conform to the standard as of the effective date for vehicles. With the present change, the hose and fittings used as original equipment must bear the DOT symbol as of September 1, 1975. The new effective dates provide six months to absorb prestandard stock in assemblies and then six more months to prepare conforming assemblies for use in 1976 model vehicles. What stock remains can, of course, be sold in the replacement market.

The greatest number of petitions concerned the applicability of the standard to specific hose types and applications in the vehicle. Three petitions again sought the exclusion of plastic tubing from the standard, stating reasons which have already been responded to in detail in the preamble to Notice 10. The major concern in this area appears to be whether specific tubing assemblies are subject to the high tensile strength tests for "relative motion". This term has raised numerous requests for interpretation, and to make clearer the tensile strength distinction, "relative motion" has been replaced with more specific wording. The new language specifies that hose assemblies (other than coiled nylon tube assemblies which meet the requirements of BMCS Regulations (49 CFR § 393.45)) used between chassis and axles or between towing and towed vehicles must meet the higher tensile strength requirements.

The American Trucking Association (ATA) mistakenly concluded that the signal line between tractor and trailer was totally excluded from the standard, and also the line to any reservoir and to the spring brakes. All these lines fall within the definition of brake hose because the signal pressure, the pressure to the reservoir, and the pressure to the spring brake chamber in each case is "used to apply force to the brakes". This wording should not be misread as restricted to pressure directly used to *apply* the brakes.

The definition of brake hose has been reworded to avoid a problem in another area. As presently worded only hose actually used in the brake system would qualify as brake hose and be entitled to be labeled with the DOT symbol. The rewording permits hose "manufactured for use in a brake system" to be labeled with the DOT symbol even if it is used, for example, as a supply line to the windshield wiper system.

Weatherhead requested further definition of the term "flexible" as it is used in the definition of brake hose. The NHTSA continues to believe that this concept can best be treated on a case-by-case request for interpretation and, as noted in Notice 10, will continue to make interpretations upon request.

Chrysler petitioned for a change in the wording of the definition of "brake hose", apparently directed toward the exclusion of the hydraulic brake booster assembly from the standard. Ford, General Motors, and the Motor Vehicle Manufacturers Association (MVMA) also petitioned to exclude the hydraulic booster lines on the grounds that they are subject to a different working environment than brake hose. The most important difference is the constant flow of fluid through them, requiring a long, complicated, tuned, and expandable hose. The NHTSA has concluded that the difference in requirements for the hydraulic booster system justifies special performance requirements for this application. Until these requirements are developed, hydraulic brake booster hose running from pump to accumulator will be considered to be exempt from the requirements of this standard. Hose running from accumulator to booster will also be exempted if redundant booster is provided. This exemption applies to hoses for which Rolls Royce petitioned for exemptions from certain test requirements.

White Motor Corporation petitioned to include "the chassis portion" in the definition of brake hose assembly, incorrectly assuming that the discussion of chassis plumbing in the preamble to Notice 10 limited the definition to brake line mounted to the frame at one point. Chassis plumbing was emphasized in Notice 10 only because inclusion of that part of the brake system in the standard had been questioned by several petitioners. In answer to White, Standard No. 106 is not limited to hose "installed on the chassis to the point of the last mechanical connection", but includes any hose equipped with end fittings for use in a brake system.

The ATA expressed dissatisfaction at the applicability of hose assembly requirements to assemblies made in the field from all-new components. The NHTSA has accommodated emergency repairs by excluding hose assemblies which contain used components, whether renewable or reusable. There is no reason, however, to routinely exempt the smaller assemblers from the requirements of the standard simply because past practices have permitted fabrication of assemblies in the field by anyone who has the necessary equipment. In this regard, the NHTSA believes the practice of refabrication of hose assemblies in the correct length in the field for emergency repairs promotes safety, by not forcing substitution of a permanent assembly which is only a "close fit". For this reason Weatherhead's petition to require permanent fittings on all brake hose is denied.

Several questions were raised with regard to end fittings. Most important to manufacturers is elimination of the reference to two- and three-piece end fittings in the definition of permanently attached end fittings. This definition, as well as the reference in S5.2.3, has been changed to eliminate this design restriction.

The status of intake manifold connectors and booster check valves typically clamped to the ends of vacuum booster hose were also questioned. "Brake hose end fitting" is defined as "a coupler, other than a clamp, designed for attachment to the end of a brake hose." As typically configured, the couplers are the clamps, and the intake manifold connection and brake booster check valve are engine components to which the brake hose has been attached by the clamp couplers. Therefore neither component is subject to Standard 106.

Several petitions addressed the labeling of fittings, as well as hose and assemblies. Two of the major concerns, use of the DOT symbol and the marking of multi-piece end fittings, have been discussed earlier.

Labeling of brake hose "at intervals of no more than six inches, measured from the end of one legend to the beginning of the next" can create several problems; for example, spray painting of a vehicle frame in which hose has been mounted. Mack argued that the legend need appear only once on hose which has been made into an assembly and mounted in a vehicle. The NHTSA has concluded that the value of the continuous line and legend, as a ready source of the hose characteristics on bulk hose and as aid to untwisted installation, is exhausted when an assembly has been mounted. Therefore S5.2.2 has been modified to require only that the legend appear at least once on assemblies mounted in vehicles. It is emphasized that masking material used in painting must be removed so that the labeling does appear on the completed vehicle. Only the required information may appear along one side of the hose.

The labeling distance of a maximum 6 inches between legends is intended to ensure adequate repetition on bulk hose without restricting the size of the legend. A manufacturer is free to make the legend as short or long as he feels is necessary to make the information clear, and on this basis, Midland-Ross' petition to require labeling at 6-inch intervals measured from the beginning of one legend to the beginning of the next is denied. Weatherhead expresses confusion over a Notice 10 preamble reference to the complete legend appearing in 4 inches. This statement was only intended to illustrate a situation where a mixture of optional and required labeling would interfere with the appearance of complete labeling on some hose assemblies, and it did not imply a requirement that the legend must be 4 inches long.

Although no manufacturer specifically requested a change, the NHTSA has concluded that clarity would not be substantially degraded by permitting required label information to appear in any order. The requirement for a specific order of label information has accordingly been deleted in order to reduce waste associated with hose cutting. The lettering height of one-eighth of an inch is considered necessary for clarity and will be retained.

Mack requested confirmation that end fitting labeling may be covered with paint until a person strips off the paint to read the labeling. This interpretation is incorrect. To be useful, label information must be clearly visible for easy reference.

Midland-Ross requested clarification of the use of the letters "SP". These letters distinguish, two types of air brake hose: regular ½-inch hose and hose that requires special reusable fittings. This is the only situation where different hoses share the same size designation. The NHTSA cannot agree with Midland that wider use of the letters would clarify the use of other components.

Weatherhead challenged as discriminatory the required labeling by manufacturers of hose assemblies other than those assembled and installed by a vehicle manufacturer in vehicles manufactured by him. The argument relied in part on a statutory requirement that "every manufacturer . . . shall furnish to the distributor or dealer at the time of delivery of such vehicle or equipment . . . the certification that . . . [it] conforms . . . in the form of a label or tag . . ." (15 U.S.C. § 1403).

This section covers vehicles and equipment only "at that time of delivery" to a distributor or dealer. In contrast, the exception in question applies to hose assemblies mounted in vehicles by their manufacturers which do not fall under the language of § 1403.

Weatherhead also requested an alternative labeling procedure in place of banding which the NHTSA has determined is not desirable because it detracts from the uniformity of the labeling procedure, and accordingly this petition is denied.

Several manufacturers have requested approval of specific banding techniques, including a molded rubber ring, a metal band crimped together, and an adhesive label which adheres to the hose. The NHTSA interprets a band as a label which encircles the hose completely, and attaches to itself. To constitute labeling at all, the band must, of course, be affixed to the hose in such a manner that it can not be easily removed.

Manufacturers raised objections to the specific performance requirements as they apply to hose types. Manufacturers of hydraulic hose assemblies requested exclusion of various types of end fittings from the constriction requirements to permit L-shaped and T-shaped fittings, distribution blocks, and residual valves, which are designed to have small diameters. The NHTSA has concluded that the major constriction problems occur in joining the hose to the fitting, and has amended the constriction requirements so that they apply only to that part of the fitting in which hose is inserted.

Weatherhead requested a calibration factor for the expansion test procedure used with hydraulic hose. The NHTSA explained in its last notice that, although calibration factors exist and must be taken into account in any performance test, it is inappropriate to state a calibration factor as part of the performance requirement. Weatherhead's petition is accordingly denied.

Several manufacturers pointed out the inadvertent substitution of "rupture" as the performance requirement to be met in the tensile strength tests of hydraulic hose and air brake hose. This language has been replaced with a requirement of no separation of the end fittings from the hose. With regard to "rupture", it should be noted that the definition of the term was not substantively changed in Notice 10, but only rearranged for clarity.

Another omission has been corrected by the addition of language to the corrosion resistance requirements of air and vacuum brake hose fittings to allow the same displacement of a protective coating which is permitted for hydraulic hose end fittings. It is noted for the benefit of manufacturers who have requested interpretation that discoloration of a brass end fitting is not of itself considered to be corrosion.

Most manufacturers objected to the restrictive elements of Table III, making various arguments for increasing the number of sizes available for use with reusable fittings. Table III, however, is intended to be a first step toward standardization of reusable fittings and hose, and dislocations of former practices must be expected in restricting the choice of available sizes and types. The petitions to eliminate Table III restrictions, or to add new sizes to it, are denied for these reasons. Weatherhead argued that permanent as well as reusable hose should be subject to size limits, but the NHTSA has found that this would be a design restriction without corresponding safety benefit. The hose used with permanent fittings is generally assembled by high volume manufacturers, not repair operations in the field, and the mismatch problem, to which standardization of reusable hose is addressed, should not occur. The petition is therefore denied.

In response to Parker-Hannifin's inquiry, the NHTSA favors no one fitting type among the choice of reusable air brake fittings.

Stratoflex questioned a leakage requirement in a hydrostatic test of air brake hose when at the same time an air pressure test permits a limited amount of air leakage. The NHTSA makes the distinction on the basis of the rubber composition which permits air but not water to permeate the hose wall.

With regard to vacuum hose requirements, Midland-Ross petitioned for the use of wording in S9.2.9 that appeared in Notice 8, believing it to be more clear than the language substituted for it in Notice 10. On balance, the NHTSA agrees that "adjacent layers" accurately describes heavy as well as light hose construction, and it is reestablished. It should be understood that this wording includes separation of the outer cover from the tube.

Toyo Kogyo, in a letter request for interpretation, questioned a language change between the Notice 7 proposal (36 FR 5855, March 30, 1971) and the Notice 8 rule, in S9.2.8. The swell test of vacuum hose called for "no leakage . . . after which there shall be no separation of the inner tube from the fabric reinforcement of the hose." By error, the Notice 8 requirement instead called for no "collapse," which would require absolutely no deformation of the hose in terms of decreased interior diameter. The NHTSA did not intend to increase the requirement and this notice reestablishes the intended performance level. It should be noted that a "no collapse" requirement would have been inconsistent with the shorter vacuum test requirements of S9.2.7.

One manufacturer asked for an explanation of the use of "[Reserved]". This term is used in the Code of Federal Regulations to indicate an omission or deletion, to avoid having to renumber the following units. It does not indicate reservation for any specific purpose.

Several minor changes are made to the standard to correct typographical errors found in Notice 10. It is also noted that the Notice 10 amendment of S5.2.3 appearing in the *Federal Register* appeared to delete paragraph (e), which in fact remains in the standard.

In consideration of the foregoing, both Standard No. 106 (49 CFR 571.106) in its presently effective form, and Standard No. 106–74 (49 CFR 571.106–74) as it is effective September 1, 1974, are amended.

Effective dates. September 1, 1974, for brake hose and brake hose end fittings; March 1, 1975, for brake hose assemblies; September 1, 1975, for vehicles to which the standard applies.

(Secs. 103, 112, 114, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1392, 1401, 1403, 1407); delegation of authority at 49 CFR 1.51.)

Issued on June 24, 1974.

James B. Gregory
Administrator

39 F.R. 24012
June 28, 1974

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 106–74

Brake Hoses

(Docket No. 1–5; Notice 12)

This notice amends Standard No. 106–74, *Brake hoses*, 49 CFR 571.106–74, to provide that hose assemblies of the same internal diameter are subjected to the same tensile strength requirements. This amendment responds to a petition for reconsideration of the most recent amendments of Standard No. 106–74 (Notice 11) filed by Samuel Moore and Company on July 1, 1974.

The National Highway Traffic Safety Administration (NHTSA) is responding to this petition before considering all other comments on Notice 11 because of the effect of this ruling on Standard No. 121, *Air brake systems*, which becomes effective January 1, 1975, for trailers and March 1, 1975, for trucks and buses. The design and testing of air brake systems for the standard has been based in part on the continued availability and use of 3/8-inch OD plastic tubing, a popular substitute for 1/4-inch ID hose in some tractor-to-trailer applications. Samuel Moore has pointed out that, although 3/8-inch tubing and 1/4-inch hose deliver the same air supply under the same circumstances, Standard No. 106–74 subjects the tubing to greater tensile strength requirements than hose. As a result the tubing may have to be withdrawn from the market because it is unable to meet the higher requirements. Designers of the new air brake systems must know immediately if 3/8-inch tubing can continue to be used.

The NHTSA intends that all brake hose subject to the standard, including traditional rubber hose and the newer plastic tubing, be subject to appropriate tests for the environment and use in which they serve. In this situation 3/8-inch OD tubing has the equivalent bore of 1/4-inch ID hose. The NHTSA hereby amends the standard, by adding "in nominal internal diameter" to S7.3.10 and S7.3.11 following each size designation, to test these products to the same tensile strength requirements.

A typographical error in Notice 11 which changed the meaning of the tensile strength requirements is corrected here by the addition of parentheses around the phrase "other than a coiled nylon tube assembly which meets the requirements of § 393.45 of this title" appearing in S7.3.10 and S7.3.11.

Additionally, Notice 11 attempted to resolve an ambiguity in Notice 10 concerning the deletion of subparagraph (e) of S5.2.2 of the standard. Notice 11 mistakenly referred to S5.2.3, and it should be noted that, in actuality, it was the Notice 10 amendment of S5.2.2 appearing in the *Federal Register* that appeared to delete paragraph (e), which in fact remains in the standard.

In consideration of the foregoing, Standard No. 106–74 (49 CFR 571.106–74) is amended....

Effective date: March 1, 1975.

(Sec. 103, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.51.)

Issued on August 2, 1974.

James B. Gregory
Administrator

39 F.R. 28436
August 7, 1974

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 106–74

Brake Hoses

(Docket No. 1–5; Notice 14)

This notice amends Standard No. 106–74, *Brake hoses*, 49 CFR 571.106–74, to permit, for a limited time, the manufacturing of brake hose assemblies which comply with the standard in all respects except that they are constructed with hose or end fittings which do not meet certain labeling requirements.

A notice of proposed rulemaking was published on October 3, 1974 (39 F.R. 35676) (Notice 13), which proposed amendment of the standard to facilitate the depletion of inventories of brake hose that is not properly labeled. All of the comments supported the proposal. Several of those commenting suggested that the proposed temporary exception to the labeling requirements be extended to cover end fittings as well as hose. These manufacturers pointed to large inventories of end fittings, manufactured before September 1, 1974, which meet all of the performance requirements of the standard, but which could not be used because they are not properly labeled. As with the brake hose discussed in Notice 13, safety of performance is not a major issue. The NHTSA has determined that the use of both non-conforming hose and end fittings in assemblies manufactured before September 1, 1975, while it may make enforcement by this agency temporarily more difficult, is appropriate and in the public interest.

In its petition for reconsideration of Notice 11 (39 F.R. 24012, June 28, 1974), Wagner Electric Corporation requested an amendment to permit the labeling of brake hose assemblies with DOT-marked bands in accordance with S5.2.4 before March 1, 1975, the date assembly labeling becomes effective. The NHTSA takes this opportunity to respond to Wagner's petition ahead of other petitions for reconsideration of Notice 11 in order to clarify the standard's scheme of effective dates.

Even though Standard 106–74 has already been published, there are no requirements in it applicable to air brake hose assemblies or to vacuum brake hose assemblies until March 1, 1975. Consequently, use of the DOT symbol on such assemblies manufactured before that date would be inconsistent with the established meaning of that symbol as a certification of compliance with *applicable* standards. Use of the symbol to indicate "anticipatory compliance", as Wagner has suggested, would foster confusion in both the meaning of the symbol and the concept of the certification required by Section 108(a)(3) of the National Traffic and Motor Vehicle Safety Act of 1966. Accordingly, Wagner's petition is denied.

The problem of excessive inventories of pre-standard hose and end fittings arose from incorrect assumptions about the effective date of the standard as applied to hose assemblies which are not completed until the hose is installed in the vehicle. No parallel misunderstanding can arise with respect to the September 1, 1975 effective date for vehicles, so brake hose assemblers can plan their production schedules accordingly.

In consideration of the foregoing, Standard No. 106–74 (49 CFR 571.106–74) is amended by the addition of a new section . . . .

Effective date: November 11, 1974. Because this amendment relieves a restriction, the National Highway Traffic Safety Administration finds, for good cause shown, that an immediate effective date is in the public interest.

(Secs. 103, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.51.)

Issued on November 6, 1974.

James B. Gregory
Administrator

39 F.R. 39725
November 11, 1974

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 106–74

Brake Hoses

(Docket No. 1–5; Notice 16)

This notice amends 49 CFR 571.106–74, Standard No. 106–74, *Brake hoses*, by modifying several labeling requirements and the deformation test requirement for vacuum brake hose, in response to petitions for reconsideration of amendments which were published June 28, 1974 (39 F.R. 24012) (Notice 11). Several of the petitions are denied; others requested changes which are outside the scope of a petition for reconsideration, and will be considered as petitions for future rulemaking.

Ford Motor Company petitioned for relaxation of the labeling requirements of the standard as they apply to brake hose end fittings. Recognizing that labeling of all components of an end fitting is not feasible, the NHTSA in Notice 11 interpreted S5.2.3 to require that all unlabeled components of an end fitting be made by the manufacturer whose designation appears on one part. Ford pointed out that, because end fitting components made by different manufacturers and purchased according to the assembler's specifications are virtually interchangeable, this interpretation would preclude the cost saving practice of purchasing individual components from the source offering the most favorable price. Because most of the performance requirements of the standard apply to assemblies, responsibility for noncompliance and for safety defects will usually belong to the assembler. Accordingly, the standard is amended to require labeling on at least one component of an end fitting, thus permitting the practice of mixing parts from different sources to continue as requested by Ford.

Several vehicle manufacturers petitioned for changes in the interpretation of the labeling requirements, to allow labels on hose and end fittings to be obscured by paint or by masking materials. New information indicates that spray painting of end fittings leaves their labeling visible in most cases and that, in the occasional instances where labeling is obscured, excess paint may be easily scraped off. In addition, painting protects the labels and fittings against corrosion. Therefore, the NHTSA will not consider the painting of end fittings to be a violation of the standard. Painting of hose labels, however, presents different considerations, because removal of paint from a hose may damage both the label and the hose. Therefore, the label on a hose must remain visible after painting unless it is protected by masking which can be removed manually to permit inspection. Because masking material can protect the label from obscuration by road grime, and because the expense required to remove it after painting does not appear justified, hose labels may remain masked after painting provided that the masking material is affixed in such a way that no adhesive contacts any part of the label.

BMW petitioned for a relaxation of the deformation test requireemnts for wire-reinforced vacuum hose. S9.2.10 in its present form requires a vacuum brake hose to return to 90 percent of its original diameter within 60 seconds after five applications of force as specified in S10.9. The NHTSA has determined that a reduction of the 90 percent figure to 85 percent will facilitate the use of wire-reinforced hose having greater resistance to collapse under vacuum, and is in the public interest. Therefore, BMW's petition is granted.

The Rubber Manufacturers Association (RMA) and Gates Rubber Company requested an exception to the hose labeling requirement for hose lengths shorter than the length of a complete

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legend plus the space between legends. These petitions are denied. The NHTSA has no reason to believe the hose labeling cannot be reduced in length to fit virtually any hose length. The 6-inch distance between legends specified in S5.2.2 is a maximum, and for hose which is to be cut into short lengths, this distance can be reduced or eliminated. Also, lettering width may be reduced because there is no width requirement in S5.2.2 for specified lettering. In addition, Notice 11 modified the standard to permit the required information to appear in any order to facilitate hose cutting.

Kugelfischer Georg Schafer & Co. of Germany expressed dissatisfaction with the banding requirement for brake hose assemblies. Requests to eliminate this requirement were responded to in Notice 10 (39 F.R. 7425, February 26, 1974). Kugelfischer also suggested exemption from the banding requirement of assemblers who manufacture both the hose and end fittings in their assemblies. Such an exemption would make it impossible to identify the assembler of a defective or noncomplying assembly in which hose and end fittings were made by the same manufacturer, and to which no band was attached. Therefore the Kugelfischer petition is denied.

Several manufacturers petitioned for substitution of a ball-vacuum test for the adhesion test described in S8.6 in the case of a hose which is reinforced with wire braid. The RMA petitioned for a change in the method of expressing the results of the adhesion test, to permit averaging of the values recorded on the chart. The NHTSA has tentatively found these petitions to have merit, and is considering the issuance of a notice of proposed rulemaking on these subjects.

Several of the petitions requested changes which are outside the scope of a petition for reconsideration of a rule. A petition for reconsideration is appropriate to assert that the petitioner believes that compliance with the rule as issued is not practicable, is unreasonable, or is not in the public interest, and to suggest changes on that basis (49 CFR 553.35(a)). Requests for new requirements that do not contest the appropriateness of the issued ones are properly submitted as petitions for rulemaking. Gates and the RMA petitioned for an amendment of S7.3.3 to require an internal as well as external inspection of the hose surface after an air brake hose is subjected to the low temperature resistance test of S8.2. Stratoflex petitioned for changes in S7.3.10 and S7.3.11 to require higher tensile strength values for hoses used in certain applications. Stratoflex also petitioned for the addition to S7.3 of a flexion resistance test for air brake hose. The NHTSA considers these requests to merit further consideration and accordingly, the NHTSA will treat these petitions as petitions for rulemaking.

Several inconsistencies resulted from amendments made to the standard in Notice 11. In one case, the modification of the definition of "Permanently attached end fitting" inadvertently changed the requirements for hydraulic brake hose assemblies in S5.1. The modification was not intended to permit use of renewable fittings in hydraulic brake hose assemblies. Accordingly, S5.1 is amended to require that hydraulic brake hose assemblies incorporate only those permanently attached end fittings which are attached by deformation of the fittings about the hose by crimping or swaging. To correct another inadvertent error, S6.7.2(c) is amended to bring the brake fluid compatibility test for hydraulic hose into conformity with the constriction test as changed by Notice 11. In response to an inquiry from BMW, new entries are made in Tables V and VI to cover 7/16-inch diameter vacuum hose. To clarify the meaning of S5.2.2, the words "may appear" in the first paragraph are changed to read "need appear". In addition, several typographical errors have been corrected.

In consideration of the foregoing, Standard No. 106–74 (49 CFR 571.106–74) is amended. . . .

Effective date: March 17, 1975. Because these amendments relieve restrictions and create no additional burdens, the NHTSA finds, for good cause shown, that an immediate effective date is in the public interest.

(Sec. 103, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.51)

Issued on: March 10, 1975.

Noel C. Bufe
Acting Administrator

40 F.R. 12088
March 17, 1975

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 106–74

Brake Hoses

(Docket No. 1–5; Notice 17)

This notice delays for 6 months the effective date of the hose label masking requirements of 49 CFR 571.106–74 (Standard No. 106–74 *Brake Hoses*), in order to allow time for public comment on a proposal to eliminate those requirements.

S5.2.2, S7.2, and S9.1 of the standard require certain information to be labeled at intervals of not more than 6 inches on new hydraulic, air, and vacuum brake hose, respectively. Those requirements were effective September 1, 1974, and are unchanged by this notice. S5.2.2, by itself and as incorporated by reference in S7.2 and S9.1, also requires at least one legend of this information to remain either visible after painting and undercoating, or properly masked, on each brake hose in a completed vehicle. This requirement, which as a practical matter requires masking, would become effective September 1, 1975, because it applies to vehicles. The NHTSA intends to propose, in the near future, an amendment of Standard No. 106–74 that would eliminate the requirement entirely. In order to allow time for public comment on the proposal, and to permit vehicle manufacturers to defer preparation for compliance with a requirement which might never become effective, this notice delays the effective date of the masking requirement. There is no change in the requirement that vehicles manufactured on or after September 1, 1975, be equipped with brake hoses, brake hose end fittings, and brake hose assemblies that comply with the standard.

In consideration of the foregoing, the effective date of the requirement in S5.2.2, S7.2, and S9.1 of 49 CFR 571.106–74 (Standard No. 160–74, *Brake Hoses*), that hose label information remain visible on completed vehicles unless properly masked, is changed to March 1, 1976. Because of the need to allow time for public comment on the prospective proposal to eliminate the requirement. the NHTSA for good cause finds that notice and public procedure on the delay are impracticable and contrary to the public interest.

(Sec. 103, 112, 114, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1392, 1401, 1407); delegation of authority at 49 CFR 1.15.)

Issued on July 29, 1975.

James B. Gregory
Administrator

40 F.R. 32336
August 1, 1975

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 106–74

Brake Hoses

(Docket No. 1–5; Notice 18)

This notice amends 49 CFR 571.106–74 (Standard No. 106–74, *Brake Hoses*) to permit, until August 31, 1976, the manufacturing of motor vehicles with brake hose, brake hose end fittings, and brake hose assemblies which comply with all requirements of the standard except certain labeling requirements.

In a notice published on June 28, 1974 (39 FR 24012, Docket No. 1–5, Notice 11), the following scheme of effective dates was established: September 1, 1974, for brake hose and brake hose end fittings; March 1, 1975, for brake hose assemblies; and September 1, 1975, for vehicles to which the standard applies. This scheme was designed to permit an orderly phase-in of parts meeting the new standard, by allowing six months at each production stage for the depletion of inventories of non-conforming parts.

After the September 1, 1974, effective date for hose and fittings, it became apparent that, due to a misunderstanding within the industry of the standard's requirements, stocks of hose and end fittings manufactured before that date would not be completely converted into assemblies by the March 1, 1975, effective date for assemblies. Because the only difference between those nonconforming components and hose and fittings manufactured after September 1, 1974, appeared to be one of labeling, the NHTSA added S12. to the standard. That section extended until August 31, 1975, the period during which such components could be used in assemblies, provided that they met all of the standard's performance requirements (30 FR 39725, Docket No. 1–5, Notice 14).

Since the publication of Notice 14, there has been an unforeseen sharp decline in the production of new trucks, causing several component manufacturers, distributors, and vehicle manufacturers to have on hand large inventories of hose and end fittings manufactured before September 1, 1974, and of assemblies manufactured from them before March 1, 1975.

A further extension of the time during which these inventories could be exhausted was requested in petitions for rulemaking filed by Parker-Hannifin Corp., Wagner Electric Corp., Aeroquip Corp., Samuel Moore and Co., Freightliner Corp., and PACCAR, Inc. These petitioners indicated that, without such an extension, components valued at several hundred thousand dollars would have to be scrapped, even though they comply fully with all performance requirements of the standard. The petitioners requested extensions ranging from 6 to 18 months.

As with the inventories which were the subject of the Notice 14 amendment, safety of performance is not a major issue. The NHTSA has determined that, while granting these petitions may continue to make enforcement by this agency more difficult until these inventories are depleted, the avoidance of waste in this situation is appropriate and in the public interest. Accordingly, a 1-year extension is granted. It should be noted that this amendment makes no change in the banding requirement for assemblies manufactured on and after March 1, 1975. S13(c) is merely intended to facilitate the exhaustion of stocks of unbanded assemblies which comply with the standard in all other respects.

Because of the imminent effective date of a requirement which would otherwise lead to substantial economic waste, the NHTSA for good cause finds that notice and public procedure on this amendment are impracticable and contrary to the public interest.

In consideration of the foregoing, 49 CFR 571.106–74 (Standard No. 106–74, *Brake hoses*), is amended . . . .

Effective date: August 27, 1975. Because this amendment relieves a restriction, it is found, for good cause shown, that an immediate effective date is in the public interest.

(Secs. 103, 112, 114, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1392, 1401, 1403, 1407); delegation of authority at 49 CFR 1.51.)

Issued on August 22, 1975.

James B. Gregory
Administrator

40 F.R. 38159
August 27, 1975

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 106–74

Brake Hoses

(Docket No. 1–5; Notice 20)

This notice delays until September 1, 1976, the effective date of the hose label masking requirements of 49 CFR 571.106–74 (Standard No. 106–74, *Brake Hoses*), in order to allow further time for evaluation of comments on the proopsed amendment of the standard that would eliminate those requirements.

In its present form, S5.2.2 of the standard (by itself and as incorporated by reference in S7.2 and S9.1) requires at least one legend of labeling information to remain either visible after painting and undercoating, or properly masked, on each brake hose in a completed vehicle. As a practical matter, this provision requires masking. In Notice 17 (40 F.R. 32336, August 1, 1975), the requirement's effective date was set as March 1, 1976. In Notice 19 (40 F.R. 55365, November 28, 1975), elimination of the masking requirement and several other labeling requirements was proposed. The NHTSA has not concluded its evaluation of the comments that have been submitted in response to that proposal. In order to permit vehicle manufacturers to defer preparation for compilance with a requirement which might never become effective, this notice delays the effective date of the masking requirement for 6 months.

In considration of the foregoing, the effective date of the requirement in S5.2.2, S7.2, and S9.1 of 49 CFR 571.106–74 (Standard No. 106–74, *Brake Hoses*), that hose label information remain visible on completed vehicles unless properly masked, is changed to September 1, 1976. Because of the need for further evaluation of comments and the otherwise imminent effective date of this requirement, the NHTSA for good cause finds that notice and public procedure on this delay are impracticable and contrary to the public interest.

(Secs. 103, 112, 114, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1392, 1401, 1403, 1407); delegation of authority at 49 CFR 1.50.)

Issued on February 24, 1976.

James B. Gregory
Administrator

41 F.R. 8783
March 1, 1976

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 106–74

Brake Hoses

(Docket No. 1–5; Notice 21)

This notice amends the definitions and several labeling requirements of Standard No. 106–74, *Brake Hoses.* The definition of "brake hose assembly" is amended to exclude certain assemblies made in the field from all new components for repair service. A definition for "vacuum tubing connector' is added, and the definition of "brake hose" is amended to exclude such connectors. The requirement that certain information remain either visible or properly masked on brake hoses in completed vehicles—the "masking requirement"—is eliminated. In addition, the requirements that hose be labeled "permanently" and that a full legend of information appear on any hose, regardless of its length, are eliminated.

The amendment of the definition in Standard No. 106–74 (49 CFR 571.106–74) of "brake hose assembly" was proposed in Notice 15 (40 F.R. 8962; March 4, 1975). The remaining amendment were proposed in Notice 19 (40 F.R. 55365; November 28, 1975). Seventy-nine comments were received in response to the former proposal and 14 in response to the latter. Any suggestions for changes from the proposals not specifically mentioned herein are denied, on the basis of all the information presently available to this agency.

NOTICE 15

Standard No. 106–74 has required the manufacturer of a brake hose assembly, except a vehicle manufacturer who assembles and installs it in a vehicle manufactured by him, to affix a band to his product. The band must be labeled with the date of assembly, a designation identifying him as the assembler, and the symbol "DOT" as a certification that the assembly meets all applicable safety standards. Assemblies made entirely of new components for installation in used vehciles come from a variety of sources. Among these are repair shops, employees of truck fleet owners, and even truck owners themselves. Under the applicable law, each of these many assemblers is a "manufacturer". The NHTSA has concluded that, as suggested in Notice 15, the burden of affixing a band and certifying compliance with the requirements of the standard is not commensurate with the relatively small number of assemblies prepared by such manufacturers, The exclusion of the asemblies in question from the definition will relieve them of both the banding and performance requirements of the standard. The Weatherhead Company, Wagner Electric Corporation, and the Brake System Parts Manufacturing Council pointed out that the proposed amendment of the definition would permit the preparation of replacement hydraulic assemblies in the field with renewable or useable end fittings, because such assemblies would no longer be subject to S5.1, which requires hydraulic end fittings to be attached by crimping or swaging. The NHTSA did not intend such a result. Accordingly, this notice limits the proposed exclusion from the definition of "brake hose assembly" to air and vacuum assemblies.

Paccar pointed out that the driver of a tractor-trailer combination is often the owner of the tractor but not the trailer, and that the proposed amendment would not exclude assemblies made in the field by such a driver for installation on the trailer that he is towing. For this reason. the amendment adopted today also excludes from the definition those assemblies prepared by the operator of a used vehicle for installation in that vehicle.

Several distributors of brake hose and brake hose assemblies urged that the proposed exclusion be extended to cover assemblies made by them as well. In recognition of the costs of banding, the NHTSA has granted petitions for rulemaking to eliminate the banding requirement for all manufacturers of brake hose assemblies. A notice of proposed rulemaking on this subject can be expected in the near future. Such an amendment of the standard, if adopted, will relieve distributors of the expense of banding while retaining the performance and other requirements applicable to brake hose assemblies.

NOTICE 19

Masking. S5.2.2, S7.2, and S9.1 of the standard require certain information to be labeled on new hydraulic, air and vacuum brake hose, respectively. In addition, S5.2.2 in its present form (by itself and as incorporated by reference in S7.2 and S9.1) requires, effective September 1, 1976, at least one legend of that information to be visible on each brake hose that has been installed in a motor vehicle, unless it is covered by a manually removable masking material in such a way that no adhesive contacts any part of the legend. The practical effect of this section, unless amended, would be to require the addition of an entire new stage in the vehicle manufacturing process.

Elimination of the masking requireemnt was proposed in Notice 19. All comments in response to the notice supported this proposal. The NHTSA has concluded that, in light of the limited usefulness of the information that would be preserved, the masking requirement creates an inappropriate burden and should be eliminated.

Labeling of short hoses. The standard presently requires that, effective September 1, 1976, a complete legend of labeling information appear on every brake hose, regardless of its length. Because this would require manual labeling of hose shorter than the normal label spacing, Notice 19 proposed elimination of the "short hose labeling" requirement. No objections were received, and the requirement is eliminated accordingly. For clarification, the first sentence of S5.2.2 is modified to indicate that, for labeling purposes, hose need merely be cut from bulk hose that is properly labeled.

Permanent labeling. Also proposed in Notice 19 was the elimination of the requirement that hoses be permanently labeled. Volkswagen objected to such elimination, arguing that "if the labeling provision has any meaning at all, the labeling must be permanent." Even without a performance requirement, however, the information specified in S5.2.2 must appear on bulk hose to identify it to distributors, dealers, assemblers, and installers, and to facilitate compliance inspection and testing. Because the agency conducts its compliance tests on new hose and assemblies, these purposes have been fulfilled once the hose is put in service. Accordingly, the permanence requirement is deleted from S5.2.2. If in the future the agency finds a need to ensure preservation of identifying information for the life of the hose, a requirement for permanence can be established through further rulemaking.

Vacuum tubing connectors. Bendix Corporation petitioned for an amendment of the standard that would exclude from its coverage certain short flexible connectors used in vacuum brake booster systems. These connectors, while meeting the existing definition of "brake hose," have special performance requirements that make it inappropriate to subject them to this standard. No comments objected to the proposal in Notice 19 to amend the definition of "brake hose." Wagner Electric, however, suggested that the exclusion of tubing connectors be limited to those used in vacuum systems. Such an approach provides the requested accommodation of an existing practice that has proved acceptable without encouraging the improper design of short air and hydraulic brake hoses. Accordingly, the definition of "brake hose" is amended to exclude vacuum tubing connectors. The latter are defined as proposed, with the modification suggested by Wagner Electric.

The National Motor Vehicle Safety Advisory Council took no position on the proposals of these amendments.

In consideration of the foregoing, 49 CFR 571.106-74 (Standard No. 106-74, *Brake Hoses*) is amended. . . .

Effective date: July 12, 1976. Because these amendments relieve restrictions and create no additional burdens, the NHTSA finds, for good cause shown, that an immediate effective date is in the public interest.

(Secs. 103, 112, 114, 119, Pub. L. 89-563, 80 Stat 718 (15 U.S.C. 1392, 1401, 1403, 1407); delegation of authority at 49 CFR 1.50.)

Issued on July 7, 1976.

James B. Gregory
Administrator

41 F.R. 28505
July 12, 1976

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 106–74

Brake Hoses

(Docket No. 1–5; Notice 22)

This notice amends Standard No. 106–74, *Brake Hoses*, to permit the manufacturing of brake hose assemblies and motor vehicles with brake hose and brake hose end fittings which comply with all requirements of the standard except labeling requirements.

Standard No. 106–74 (49 CFR 571.106–74) was implemented with staggered effective dates for brake hose, assemblies, and motor vehicles. This scheme was designed to permit an orderly phase-in of parts meeting the new standard, by allowing six months at each production stage for the depletion of inventories of non-conforming parts.

Since implementation of the standard, there have been interruptions in the production of new trucks, causing several component manufacturers, distributors, and vehicle manufacturers to have on hand large inventories of hose and end fittings manufactured before September 1, 1974, and of assemblies manufactured from them before March 1, 1975. These components comply with all performance requirements of the standard, but not its labeling requirement.

A 1-year extension of the time during which these inventories could be exhausted by manufacture into assemblies and installations in motor vehicles was therefore granted (40 F.R. 38159, August 27, 1975). The NHTSA determined that, while granting the petitions could make enforcement by this agency more difficult until the inventories were depleted, the avoidance of waste in such a situation was appropriate and in the public interest.

The 1-year extension terminated August 31, 1976, and PACCAR Corporation has petitioned for a further extension of 90 days to permit exhausting inventories that it had planned to utilize earlier but has been unable to do. Freightliner Corporation petitioned for a similar 15-month extension, and Wagner Corporation suggested comparable delay for assemblies and vehicles. While the agency cannot make an extension "retroactive" to September 1, 1976, as PACCAR appeared to request, the NHTSA does conclude that the same balance of interests underlying the 1-year extension continue to be valid and justify use of the remaining unlabeled components. Because the agency has granted petitions to commence rulemaking to delete the assembly-labeling requirements that are mainly at issue here, it is concluded that the relaxation of the labeling requirements for assemblies and vehicles should be indefinite. As a practical matter, brake hose and fittings for use in motor vehicles are now only produced with the correct labeling.

Because of the agency's findings that substantial loss of safety benefit would not occur in this case and that substantial economic waste will occur if the brake hose components in question are not permitted to be used, the NHTSA for good cause finds that notice and public procedure on this amendment is contrary to the public interest.

In consideration of the foregoing, Standard No. 106–74 (49 CFR 571.106–74) is amended. . . .

Effective date: November 26, 1976. Because this amendment relieves a restriction, it is found, for good cause shown, that all immediate effective date is in the public interest.

(Secs. 103, 112, 114, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1392, 1401, 1403, 1407); delegation of authority at 49 CFR 1.50.)

Issued on November 18, 1976.

John W. Snow
Administrator

41 F.R. 52055
November 26, 1976

PREAMBLE TO MOTOR VEHICLE SAFETY STANDARD NO. 106–74

Brake Hoses

(Docket No 1–5; Notice 24)

This notice amends Standard No. 106–74, *Brake Hoses*, to exempt hydraulic brake hose to be used only in assemblies having keyed end fittings from the striping requirement, to exempt air and vacuum brake hose assemblies having renewable or reusable end fittings from the assembly labeling requirement, to exempt certain end fittings that are to be used on plastic vacuum brake hose from the end fitting labeling requirement, to provide for a stamping alternative to banding for the labeling of assemblies having crimped or swaged end fittings, to exempt coiled nylon air brake hose from the length change requirement for air brake hose, and to exempt wire reinforced air brake and vacuum brake hose from the adhesion requirements. This rule responds to industry requests for less expensive labeling alternatives and for relief from several performance requirements in the standard that are not appropriate for certain hose designs.

Dates: Effective date: May 25, 1978.

For further information contact:

Fred Redler, Crash Avoidance Division, National Highway Traffic Safety Administration, Washington, D.C. 20590 (202–426–0853).

Supplementary information: This amendment is based on a notice of proposed rulemaking published December 30, 1976 (41 F.R. 58365). Nineteen comments were received in response to that notice and were given full consideration in the formulation of this final rule. The comments were primarily supportive of the proposed changes.

Based on a petition by one committee of the American Society for Testing and Materials (ASTM), the proposal specified an increase in the "brake fluid compatibility" test temperature from 200° to 212° F. The ASTM Committee petitioned for the increase so that the temperature would be compatible with the equivalent 100° Centigrade (C) value that has been proposed for adoption as a standard test temperature by the International Standards Organization. Several commenters strongly objected to this slight increase in the test temperature. Commenters stated that there is no safety justification for the proposed change and that the increase, over the 70-hour test period, could cause significant changes in test results and lead to the rejection of good hose. Four foreign commenters noted that the inner tubing of much imported brake hose is made from natural rubber rather than the synthetic materials that are generally used in the United States. They argued that this small temperature increase could rule out the use of natural rubber, which has certain desirable properties and which has otherwise proven satisfactory in the past.

General Motors stated that the International Standards Organization has apparently not proposed a temperature of 100° C for this test and that the test temperature for "brake fluid compatibility" should remain at 200°F. The ASTM Committee D–11.31 stated that the ASTM Committee that requested the change (D–11.45) was not authorized to seek the change, and the ruling ASTM Committee does not approve of the temperature increase.

Based on consideration of these comments, the NHTSA has concluded that an increase in temperature for "brake fluid compatibility" testing of brake hose is not justified. Therefore, the proposed change is not adopted.

This amendment exempts air and vacuum brake hose assemblies having renewable or reusable end fittings from the existing labeling requirement (banding) for brake hose assemblies (by specifying assembly labeling requirements only for brake hose assemblies having end fittings attached by crimping or swaging). Further, the new assembly labeling requirement provides for alternative methods of labeling by banding or by stamping (or etching or embossing) of one end fitting on the assembly. The new provisions do not require the date of assembly to be placed on the label, whether banding or stamping is used.

Paccar recommended retention of the existing requirement that the date of assembly be included in assembly labeling. Paccar contended that date of assembly is important for purposes of determining the shelf-life of an assembly. The NHTSA concludes that the assembly date is not necessary for this purpose, because it is the brake hose that generally determines the assembly shelf-life. Since the hose must bear its date of manufacture under existing requirements, this should suffice as an indicator of the entire assembly's shelf life.

Several commenters stated that the assembly labeling requirements should be deleted altogether, arguing that brake hose assembly failures are most likely to result from installation errors and damge in service rather than from improper production of the assembly. Samuel Moore and Company argued that all assembly labeling should be totally optional. While data demonstrate that most assembly failures result from improper installation or later damage, identity of the assembler is still important. If assembly labeling were not required, only reputable assemblers might identify themeselves with their products. The door would be opened to the marketing of substandard hose assemblies, and there would be no way to identify the assembler in the event a safety-related defect or a noncompliance necessitated recall.

Samuel Moore and Company also stated that the proposed assembly labeling requirement would discriminate against manufacturers of crimped and swaged air brake hose assemblies, since the requirements would not be applicable to assemblies having renewable or reusable end fiittings. The agency did not require labeling for assemblies having renewable or reusable end fittings because it has been found that such labeling is impractical. With reusable end fittings the assembler's identity could be lost or misapplied by a person who reassembles the set at a later date, and the chances for confusion concerning who assembled the set would be great.

Paccar commented that the "stamping" option for assemblies having cramped or swaged end fittings could create confusion also, and that all assembly labeling requirements should be deleted. While the NHTSA agrees that some confusion might exist, labeling of assemblies having permanent end fittings is substantially more practicable and offers less possibility for confusion than labeling of assemblies having renewable or reusable end fittings. Most of the hypotheses posed by Paccar involved situations in which permanent end fittings are stamped with the fitting manufacturer's designation (which is not required by the standard). Paccar contends confusion as to who is responsible for the assembly could result when an assembler later applies his band to the assembly or when a repair shop in the field produces an assembly using stamped end fittings.

Since end fittings that are to be attached to hose by crimping or swaging are not required to be labeled, the NHTSA concludes that it is the responsibility of the fitting manufacturer who chooses to stamp his fittings to keep adequate records whether a certain production lot of fittings are sold by themselves or whether they are used in assemblies that are also produced by the fitting manufacturer.

Paccar also argued that large assemblers who also manufacture end fittings would have an economic advantage over assemblers whom they supply with end fittings, since end fittings are usually stamped with the fitting manufacturer's designation. With the stamping labeling alternative, the fitting manufacturer who also makes assemblies would not have to further label his assemblies, whereas an assembler who purchased his end fittings would have to pay either the cost of special labeling of end fittings or that of banding.

The NHTSA recognizes that there are several items of higher cost borne by small assemblers but disagrees that the assembly labeling requirements are discriminatory as suggested by Paccar. As mentioned earlier, manufacturers of permanent end fittings are not required to label their fittings (and if they do so they bear the additional cost by choice). Therefore, under the new assembly labeling requirements, assemblers who are also permanent end fitting manufacturers and small assemblers who do not manufacturer end fittings are on the same footing; both are required to label only once, either by banding or by stamping the end fitting. Of course, independent of any standard, an assembler who produces all components of his product can generally manufacture an assembly at a lower cost than an assembler who purchases components for his product.

Further, from a practical standpoint, the larger assemblers who also supply end fittings to smaller assemblers are not generally in competition with the smaller assemblers. Rather, they deal with large volume users in competition with other large suppliers. The small assemblers are generally only in competition with other small assemblers who are in the same position with respect to cost of assembly labeling. The requirements are, therefore, made final as proposed.

Several commenters pointed out that the notice proposing these amendments deleted an existing exemption from the assembly labeling requirements of the standard. Assemblies that are assembled and installed by a vehicle manufacturer in vehicles manufactured by him are currently excepted from the requirements of paragraph S5.2.4. The deletion in the proposal was inadvertent, and the exception is included in the new paragraph S5.2.4 specified in this amendment.

General Motors noted that the proposed new paragraph S5.2.4.1 (the stamping option for assembly labeling) did not specify any criteria for the manufacturer's designation and asked whether the designation could consist of block capital letters or symbols representative of the assembler. General Motors also requested concurrence in their assumption that, as a manufacturer of both bulk brake hose and hose assemblies, they would be permitted under the stamping option to use one designation for bulk hose and a different designation for hose assemblies. Finally General Motors recommended that the phrase "shall be permanently etched, embossed, or stamped," in proposed paragraph S5.2.4.1 and in existing paragraph S5.2.4 be changed to read, "shall be etched, embossed, or stamped by means of deformation of the material." They argued that the word "permanently" should be deleted, since any marking can eventually be obliterated by corrosion, rust, abuse, or other means.

The NHTSA agrees with the clarification and editorial changes requested by General Motors, and the changes are included in these amendments of the hose assembly and end fitting labeling requirements. The NHTSA concurs with General Motors' assumption that it is permitted to stamp its bulk hose and its assemblies with different designations. The word "permanently" is deleted from paragraphs S5.2.3 and S5.2.4, as it was from paragraph S5.2.2 in a previous notice (41 F.R. 28505, July 12, 1976).

International Harvester objected to the proposal to exempt hydraulic brake hose used in assemblies with keyed end fittings from the striping requirement of paragraph S5.2.1. International Harvester stated that its hose assemblies with keyed end fittings are designed with different orientations for the left and right hand sides of vehicles. Each could be installed with a 20° twist if inadvertently installed on the wrong side of the vehicle. Since the striping requirement is intended to prevent twisted installation, this amendment only exempts hose for use in an assembly whose end fittings prevent its installation in a twisted orientation.

Commenters supported the proposed exemption from labeling of end fittings used in factory-made, non-repairable plastic vacuum brake hose assemblies (such as those used by Mercedes-Benz). The proposal is therefore made final.

Commenters also agreed with the proposed exemption of coiled nylon air brake hose from the "length-change" requirement of paragraph S7.3.6. The requirement is therefore amended as proposed.

Paragraphs S7.3.7 and S9.2.9 are amended to exempt wire-reinforced brake hose from the adhesion requirements of the standard, since the adhesion test does not give sufficiently repeatable results in the case of wire-reinforced brake hose. A substitute test for this type hose is under consideration.

The Dairy Equipment Company stated that all assembly labeling requirements were eliminated by a notice pubished November 26, 1977 (41 F.R. 52055) which revised paragraphs S12 and S13 of the standard. The Company's interpretation of that amendment is incorrect. As explained in the preamble to that notice, the revision of paragraphs S12 and S13 permits the indefinite use in new vehicles of hose assemblies manufactured prior to the effective date of the labeling requirement for assemblies.

This does not mean that new hose end fittings and assemblies produced after specific effective dates do not have to meet the labeling requirements of the standard. For example, a hose assembly manufactured today must bear the required assembly labeling even if it is constructed of hose or end fittings that do not have DOT labeling because they were manufactured prior to September 1, 1974.

Since this amendment relieves restrictions, the agency has determined that it will have negligible economic impact. The environmental effects of the amendments should be positive. Elimination of the banding requirement will save approximately 30,000 pounds of material annually.

The engineer and lawyer primarily responsible for the development of this rulemaking document are Fred Redler and Hugh Oates, respectively.

Because these amendments relieve restrictions and create no addittional burdens, the National Highway Traffic Safety Administration (NHTSA) finds, for good cause shown, that an immediate effective date is in the public interest.

In consideration of the foregoing, Standard No. 106–74 (49 CFR 571.106–74) is amended . . . .

(Secs. 103, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.50.)

Issued on May 17, 1978.

Howard J. Dugoff
Acting Administrator

43 F.R. 22360–22362
May 25, 1978

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 106

Federal Motor Vehicle Safety Standards; Brake Hoses

[Docket No. 81-18; Notice 2]

ACTION: Final rule.

SUMMARY: The purpose of this notice is to amend Safety Standard No. 106, *Brake Hoses*, to make a change in the test procedures relating to the brake hose "whip test." Specifically, the list of items to be removed from the brake hose assembly prior to conducting the "whip test" is expanded to include mounting brackets. The amendment is responsive to a petition for rulemaking submitted by General Motors Corporation, and makes the test procedures specified in the standard consistent with the test procedures used by the agency's Office of Enforcement.

EFFECTIVE DATE: October 22, 1982.

SUPPLEMENTARY INFORMATION: Safety Standard No. 106, *Brake Hoses* (49 CFR 571.106), specifies a "whip test" for hose assemblies to measure fatigue resistance. On March 29, 1982, the agency issued a notice of proposed rulemaking to amend the procedure for that test, in response to a petition for rulemaking submitted by General Motors Corporation (47 F.R. 13176). General Motors asked for certain changes because of possible confusion between the NHTSA's Laboratory Procedures and the procedures stated in the standard with respect to preparing brake hose assemblies for the "whip test."

The Laboratory Procedure for conducting the "whip test" published by the NHTSA Office of Standards Enforcement in 1975 ("Laboratory Procedure for Brake Hose Testing" TP-106-03) specifies the following procedure in preparation of the Whip Fatigue Test: "All external appendages such as chafing collars, mounting brackets, date bands and spring guards shall be removed from the brake hose assembly prior to testing on the whip machine." By contrast, paragraph S6.3.2(a) of Safety Standard No. 106 specifies the following preparation: "Remove hose armor and date band, if any." As noted in the March proposal, General Motors was concerned that this inconsistency might create confusion, and requested that the standard be amended to include all the items that are specified for removal in the Laboratory Procedure. The notice of proposed rulemaking sought to remove the inconsistency.

There were five comments to the proposal from the following vehicle manufacturers: Chrysler, Ford, American Motors, Volkswagen and General Motors. All supported the proposed change and stated that it should have absolutely no adverse effect on the integrity of the whip fatigue test.

The agency has determined that this minor technical change should be adopted as proposed. The agency has always intended for all external appendages to be removed prior to conducting the "whip test." As noted in the proposal, since it is only the brake hose itself that is being tested for fatigue resistance, it is not necessary to have readily removable external components present during the test. Further, these external components could unnecessarily complicate the test procedure or cause problems by becoming caught in the test apparatus. The agency does not believe that removing these components will in any way degrade the safety performance that is garnered from the "whip test." Therefore, the standard is being amended as proposed.

Issued on October 5, 1982.

Raymond A. Peck, Jr.
Administrator
47 F.R. 47838
October 28, 1982

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 106

Federal Motor Vehicle Safety Standards; Brake Hoses

[Docket No. 82-09; Notice 2]

ACTION: Final rule.

SUMMARY: The purpose of this notice is to amend Federal Motor Vehicle Safety Standard (FMVSS) No. 106, *Brake Hoses*, by allowing the use of brake hoses that are labeled in metric sizes. The agency received a petition for rulemaking from Saab-Scania to amend Standard No. 106 to allow the use of millimeter sizes in the labeling of air brake hose. The agency issued a notice of proposed rulemaking which proposed to allow manufacturers to label their brake hoses with metric units, and provided performance requirements in the standard for metric-sized brake hoses which were equivalent to the present requirements for English-sized hoses. This final rule primarily addresses Saab-Scania's petition to allow the use of brake hoses manufactured in metric sizes and is thus more limited than the proposal.

EFFECTIVE DATE: June 3, 1985.

SUPPLEMENTARY INFORMATION: Federal Motor Vehicle Safety Standard (FMVSS) No. 106, *Brake Hoses*, sets performance and labeling requirements for brake hoses used in motor vehicles. Sections 7.2.1(d) and 7.2.2(d) of FMVSS No. 106 require that air brake hoses and end fittings be labeled for size in inches or fractions of inches. The standard currently permits information such as metric labeling to be placed on hoses as additional information.

In June 1981, the agency received a petition for rulemaking from Saab-Scania to amend sections 7.2.1(d) and 7.2.2(d) to permit labeling in metric units as an alternative to inches. On April 12, 1982, the agency published a notice in the Federal Register (47 FR 15612) granting the petition and proposing that various sections of the standard be amended to permit labeling in metric units.

The notice explained that permitting use of metric sizes is consistent with Federal policy concerning metric conversion and that the proposed amendments would aid international harmonization. As the agency has explained in other notices, international harmonization can result in decreased costs, benefiting both consumers and manufacturers, without an adverse effect on safety. In issuing the notice, the agency emphasized that the proposed amendments would not make any change in performance criteria applicable to a particular size of hose. The notice included performance requirements for the new metric sizes of brake hose which were the same as the requirements for brake hoses of comparable English sizes.

Although the language of this amendment uses the terms "hoses" and "tubing," it is emphasized that "brake hose" comprises both terms. Standard No. 106 defines "brake hose" as a flexible conduit, other than a vacuum tubing connector, manufactured for use in a brake system to transmit or contain the fluid pressure or vacuum used to apply force to a vehicle's brakes. As explained in past Federal Register preambles, the term "brake hose" includes traditional rubber hose and plastic tubing. All brake hoses are subject to the standard and to appropriate tests for the environment in which they serve.

The agency received a number of comments on the proposal, all of which have been carefully considered. Most commenters supported the concept of permitting labeling in metric units. Some commenters suggested various ways to rewrite parts of the standard for purposes of clarity or to address safety concerns not directly related to the proposal. The agency may consider these suggestions, as well as other issues, as part of its efforts to modernize Standard No. 106 to address current technological developments in the industry. However, in order to resolve the specific concerns raised by the Saab-Scania petition, the agency has decided to limit its actions at this time to adopting a final rule which directly addresses Saab's petition.

This final rule permits the use of brake hoses and end fittings that are labeled in metric units. In response to concerns raised in the comments that it might be unclear whether a hose or fitting is inch-sized or metric-sized if the unit of measurement is not included in the label, the final rule requires that metric labeling include the abbreviation "mm" to designate that the labeled units are metric. Finally, the final rule does not adopt the proposed Table III(a).

Conversion

Most commenters to the notice of proposed rulemaking (NPRM) supported the concept of permitting labeling of brake hoses and end fittings in metric units. A number of commenters, however, expressed concerns about specific aspects of the proposal.

Several commenters specifically addressed the issue of conversions from metric to English units or English to metric units. General Motors (GM) stated that while the preamble of the NPRM indicated that metric units of any size would be allowed, the actual text proposed for the amended standard used only integer units. GM stated that this approach appeared to discourage soft conversions. (A soft conversion is an exact conversion, which tends to result in noninteger units, e.g., 1/2 inch = 12.7 mm. By contrast, a hard conversion involves rounding off to an integer, e.g., 1/2 inch = 13 mm.) GM stated that soft conversions may be the best interim approach to export products and to increase understanding of metrics in this country. GM suggested that the easiest way to specify the size-related requirements of the standard, without discouraging soft conversions, would be to establish requirements for a continuum of metric sizes. Eaton commented that the proposed amendment should specify that a manufacturer wishing to label a 1/2-inch-outside-diameter (O.D.) tube metrically should label this hose "12.7 mm (1/2 in) O.D." and not "12 mm O.D." Ford interpreted the notice as allowing manufacturers the option of labeling brake hoses in either metric or English unit sizes.

Several commenters emphasized that only soft conversions should be permitted, unless and until industry agrees on hard metric numbers. The Rubber Manufacturers Association (RMA) stated that a 1/4 inch-hose should be marked either 1/4 inch or 6.4 millimeters until such time as a hose in hard metric dimensions is produced. Stratoflex stated that United States manufacturers have made great progress in encouraging the international industrial community to standardize on inch-size hoses and that it should not be assumed that there is any need for the domestic industry to develop a line of hoses with whole metric dimensions.

Other commenters also addressed issues related to conversions. Several commenters emphasized that inch-size fittings must not be used with metric-size hose, since a mismatch could reduce performance and result in accidents. Goodyear objected to hard conversions of hose sizes because this would encourage the use of English-sized fittings with metric-sized hoses (and vice versa) which could lead to coupling-compatibility problems.

In response to the comments on conversions, the agency reiterates that NHTSA did not intend to encourage conversions of either inch-size or metric-size hose or fittings. The agency primarily contemplated that hoses that were manufactured in inch-size units would be labeled in inches, and hoses that were manufactured in integer metric units would be labeled in metric units. The agency intended to allow the use of metric-sized brake hoses in the American market, using the appropriate metric size labeling to denote the "as manufactured" size.

It should be noted, however, that with the exception of air brake hose intended for use with reusable end fittings, Standard No. 106 does not currently limit the sizes or specify the dimensional tolerances of brake hose. While the standard does specify some requirements and test conditions in terms of specific sizes, the standard does not prohibit sizes other than those listed, except for air brake hose intended for use with reusable end fittings. Apart from the above exception, manufacturers are not limited to the hose sizes listed in the standard. They may produce sizes of brake hose other than those listed. The test values for such sizes would be provided by reference to the nearest appropriate size that is listed in the standard.

Industry has voluntarily standardized the sizes and dimensional tolerances of inch size brake hose and fittings, primarily through the auspices of the Society of Automotive Engineers (SAE). It is critical that a hose or fitting marked with an inch size correspond dimensionally to accepted industry practice. A conversion of a metric-size hose to an inch size that resulted in labeling outside the scope of accepted industry dimensional practice, such as by hard conversions (i.e., rounding off) might well constitute a safety defect, since a mismatch could result in serious accidents due to brake hose assembly failure. It is particularly important in the case of air brake tubing and fittings, since these are often assembled in repair shops rather than in factories where there usually exists more control over the matching of hoses and fittings.

Since Standard No. 106 does not limit the sizes of most types of brake hose, manufacturers are not currently prohibited from using standard metric-sized hose if they label the hose sizes in inches. It should be emphasized, however, that in proposing the amendment, the agency did not intend to encourage conversions of any sort.

The same analysis discussed above applies to converting inch sizes to metric sizes. The agency did not intend to encourage these types of conversions when the amendment was proposed. However, if manufacturers choose to make conversions of inch sizes into metric sizes, the conversions should be within the scope of accepted dimensional practice of the international industry.

Mismatch Problems

Stratoflex expressed concern that the existence in the same marketplace of both inch- and metric-size hose and fittings could result in mismatch problems. That comment was specifically directed toward air brake tubing. Stratoflex's concern addressed the definition in Standard No. 106 of "permanently attached end fitting," which includes hose fittings which use sacrificial sleeves. Stratoflex stated that air brake tubing assemblies are often assembled in repair shops by mechanics who insert a fitting into a nylon tube and use an ordinary wrench to deform a sacrificial sleeve about the outside diameter of the tube to make the connection. Stratoflex stated that mechanics cannot be expected to know the difference between inch and metric fittings when neither fitting is marked for "size and type control." That commenter stated that the agency should either require inch-size air brake tubing only, set a date to require metric-size air brake tubing only, or establish additional marking rules for tubing and tube fittings and dimensional control for both inch- and metric-size tubing.

Stratoflex is correct that the standard's definition of "permanently attached end fitting" includes end fittings that are attached by use of a sacrificial sleeve. It is this type of fitting that is typically used for air brake tubing. That commenter is incorrect, however, in stating that these fittings need not be marked for size. Section S7.2.2 of Standard No. 106 requires that end fittings must be labeled as to size except for end fittings attached by deformation of the fitting about a hose by crimping or swaging. Crimping or swaging is a process that is done by the manufacturer of the hose during the assembly of a hose. It does not include using a wrench to deform a sacrificial sleeve around tubing. This latter type of fitting (i.e., utilizing a sacrificial sleeve) would be required to be marked as to size.

Stratoflex stated that the agency should establish additional marking rules for dimensional control for both inch and metric tubing as currently required by Table III of the standard. Table III specifies precise dimensions for two nearly identical reusable air brake hoses and fittings. They are required to be specifically marked as Type AI or AII, in order to differentiate between these air brake assembly components in the field. While type control is relevant for reusable air brake hose, the agency is not aware of the existence of different types or sizes of air brake tubing that would necessitate special marking requirements.

It appears that Stratoflex may be referring to the question of whether a hose is inch or metric size. While the April 1982 NPRM proposed permitting labeling in either metric units or inches, the proposed language said that the hose could be labeled metrically but it did not specifically require that the unit of measurement be identified. In any event, the agency believes that Stratoflex's concerns about labeling are reasonable, and the final rule accordingly requires that metric labeling include the abbreviation "mm" to designate that the labeled units are metric.

The agency does not agree that this amendment permitting the use of metric-sized brake hoses will result in mismatch problems. Section 7.2.2 of Standard No. 106 currently requires at least one component of each air brake hose end fitting (except for end fittings that are attached by crimping or swaging) to be labeled with information which includes the nominal inside diameter of the hose to which the fitting is properly attached, or the outside diameter of the plastic tubing to which the fitting is properly attached. Section 9.1.2 requires at least one component of each vacuum brake hose fitting (except for end fittings that are attached by heat shrinking, interference fit with plastic vacuum hose, or crimping and swaging) to be labeled in a similar manner. These labeling requirements are not specified for hydraulic brake hose assemblies because section 5.1 of the standard requires each hydraulic brake hose assembly to have end fittings which are permanently attached by crimping or swaging. This final rule allows the end fittings to be labeled metrically, and the information provided on the end fittings to be expressed metrically. Since all hoses and end fittings that are assembled by mechanics will be labeled in inch or metric units, assemblers should have no difficulty in correctly matching hoses and end fittings.

Table III(a)

The agency has decided not to adopt the proposed Table III(a) in this final rule. Table III(a) specified physical dimensions for metric sizes of air brake tubing intended for use with reusable end fittings. Since the time of the proposal of Table III(a), however, the industry has moved to standardize on the sizes of air brake tubing labeled in metric units. Dimensional requirements for metric-sized air brake tubing has been specified by the SAE in Standard J1394 (April 1983). These specifications are equivalent to those proposed in Table III(a) by NHTSA. Similarly, the International Standards Organization (ISO) has moved towards the development of specifications for metric-sized air brake tubing in its draft form of TC22-SC2-WG1-173(e). Since the industry has moved to voluntarily standardize on sizes of metrically labeled brake tubing, the agency has decided it is unnecessary to specify dimensional requirements for air brake tubing at this time.

Tables IV, V, VI

Table IV of Standard No. 106 specifies test cylinder radii for air brake hoses of varying diameters. Hoses must not show visible cracks as a result of exposure to various test conditions, such as low temperatures, when bent around the test cylinder. Table V lists test requirements for high and low temperature resistance, bend, and deformation tests for vacuum brake hose, specifying the test values for different sizes of hose. Table VI provides test specimen dimensions and feeler gage dimensions for the deformation test for vacuum brake hoses. Presently the sizes of brake hoses referenced in these tables are in inch-size units. The amendment would provide the test values for specified sizes of metric-sized brake hoses as well as for the inch-size hoses.

Several commenters addressed the changes in Tables IV, V, and VI, proposed in the NPRM. Stratoflex suggested changes in the millimeter sizes referenced in Table IV and requested the table's column heading be changed to read "Nominal inside hose diameter in inches (millimeters)." The requirements of Table IV were previously specified on the basis of the inside diameter of the hose. However, in February 1974 (39 FR 7428), the agency revised the table to read "Hose, nominal diameter in inches." Since nominal diameter of traditional rubber hose refers to internal diameter and nominal diameter of tubing refers to outside diameter, the revision was made to include outside dimensions. In light of this revision, the agency does not find reason to change this column heading as suggested by this commenter.

Stratoflex also suggested deleting references to 5-, 8-, 10-, and 16-millimeter sizes in Tables V and VI, or adding these sizes to Table III(a). This suggestion was made in order to "maintain consistency in the document." In response to this comment, the agency notes that Table III(a) was proposed for sizes of metric air brake tubing, while Tables V and VI reference metric vacuum brake hose sizes. These metric sizes represent the sizes of metric brake hoses "as manufactured," and include all the sizes of metric brake hoses currently in use. Since the metric sizes listed in the tables are not conversions but instead represent actual sizes of metric hose presently manufactured, the various metric sizes proposed in Table III(a) for air brake tubing and in Tables V and VI for vacuum brake tubing would not be identical.

The RMA commented that the metric units referenced in Tables IV and V of the NPRM imply hard conversions of the inch dimensions. The commenter stated that hard conversions have not been adopted by the industry. The agency reiterates that the metric sizes referenced in the tables were not intended to represent conversions of inch-size hose, but were included in the tables for brake hose manufactured in metric sizes. The metric sizes listed in the tables represent all metric-sized brake hose currently being manufactured in the international industry. By referencing these sizes in the tables, the agency intended to provide the test values for these specific sizes of metric-sized brake hoses.

In order to avoid any appearance that metric values inserted in the tables constitute conversions, the agency has revised the proposed tables. Separate columns or rows are provided for inch-size hoses and metric-size hoses.

American Motors Corporation noted a mixture of dimensional systems in Tables I through IV, and suggested referencing the Systeme International d'Unites (SI) system for labeling brake hose at all applicable places in these tables. The agency interprets this comment to suggest using base units of the SI system in the standard. This approach would be impractical as the base unit of SI, for length is the meter. NHTSA believes that the use of the derived SI unit, the millimeter, will result in a comprehensible and uniform system of measurement.

Test Requirements

Eaton commented that a 6-mm O.D. tube it tested that was coupled with a metric fitting did not meet the 50-pound tensile load requirement of S7.3.10. The commenter expressed concern whether the current performance criteria of the standard could be directly applicable to the metric sizes specified in Table III(a). The agency sees no reason why a metric-size hose would not pass the same requirements as for an inch-size hose of similar dimensions, and has concluded that no changes need be made to these requirements for the metric-size hoses referenced in the final rule.

Eaton commented that S7.3.10 should reference "9 mm" instead of "10 mm" in paragraph 7.3.10 for the 150 pounds tensile requirement. Currently the tensile strength requirements of S7.3.10 specify that air brake hose assemblies with nominal internal diameters of 3/8 inch or 1/2 inch must withstand a pull of 150 pounds. The agency decided against requiring a brake hose with nominal internal diameter of 9 mm to withstand a 150-pounds tensile strength requirement because a hose of this size is less than 3/8 inch in nominal internal diameter. As announced in the NPRM, in proposing this amendment allowing the use of metric-sized brake hoses, the agency did not intend to change the performance criteria applicable to a particular size of hose. Therefore, hoses with nominal internal diameters less than 3/8 inch will continue to meet the 50-pounds test of S7.3.10.

Braid Reinforcement

Eaton raised the issue of air brake tubing construction. According to that commenter, nonmetallic air brake tubing manufactured in the United States which complies with Standard No. 106 also complies with the requirements of SAE Standard J844d. SAE J844d requires the use of fiber reinforcement in hose sizes 3/8 inch through 3/4 inch outside diameter. Eaton expressed concern that the ISO's draft proposal for Thermoplastic Tubing for Use in Air Brake Systems does not require the use of fiber reinforcement in the larger sizes of such hose, and suggested that the metric sizes of air brake hose also be required to comply with the SAE construction parameters. This amendment to Standard No. 106 does not require fiber reinforcement for these larger sizes of air brake tubing, since this final rule is limited to the issues raised by Saab-Scandia's petition. However, if in the future it becomes apparent that construction requirements for air brake tubing should be included in Standard No. 106, then the agency will address that issue at the proper time.

In consideration of the foregoing, Standard No. 106, *Brake Hoses*, 49 CFR Part 571.106, is amended to read as set forth below.

1. S5.2.2(d) is revised to read as follows:

(d) The nominal inside diameter of the hose expressed in inches or fractions of inches, or in millimeters followed by the abbreviation "mm."

2. In table 1, the column entitled "Hydraulic brake hose, inside diameter" is amended by revising the phrase "1/8 inch or less" to read "1/8 inch or 3 mm or less"; by adding the phrase "or 4 to 5 mm" after the phrase "3/16 inch"; and by revising the phrase "1/4 inch or more" to read "1/4 inch or 6 mm or more."

3. Table II is amended by revising the headings under the phrase "Slack, inches" to read: "1/8 inch or 3 mm hose or less" and "more than 1/8 inch or 3 mm hose."

4. S6.6.1(b) is revised to read as follows:

(b) Condition a cylinder in air at minus 40 °F for 70 hours, using a cylinder of 2 1/2 inches diameter for test of hose less than 1/8 inch or 3 mm, 3 inches for tests of 1/8 inch or 3 mm hose, 3 1/2 inches for tests of 3/16 and 1/4 inch hose or of 4 to 6 mm hose, and 4 inches for tests of hose greater than 1/4 inch or 6 mm in diameter.

5. S7.2.1(d) is revised to read as follows:

(d) The nominal inside diameter of the hose expressed in inches or fractions of inches or in millimeters, or the nominal outside diameter of plastic tubing expressed in inches or fractions of inches or in millimeters followed by the letters O.D. The abbreviation "mm" shall follow hose sizes that are expressed in millimeters. (Examples of inside diameter: 1/8, 1/2 [1/2SP in the case of 1/2 inch special air brake hose], 4 mm, 6 mm. Examples of outside diameter: 1/4 O.D., 12 mm O.D.)

6. S7.2.2(d) is revised to read as follows:

(d) The nominal inside diameter of the hose to which the fitting is properly attached expressed in inches or fractions of inches or in millimeters, or the outside diameter of the plastic tubing to which the fitting is properly attached expressed in inches or fractions of inches or in millimeters followed by the letters O.D. (See examples in S7.2.1(d).) The abbreviation "mm" shall follow hose sizes that are expressed in millimeters.

7. Table IV is revised to read:

TABLE IV AIR BRAKE HOSE DIAMETERS AND TEST CYLINDER RADII

Nominal hose diameter, in.*	1/8	3/16	1/4	5/16	3/8, 13/32	7/16, 1/2	5/8
mm.*	3	4,5	6	8	10	12	16
Radius of test cylinder in inches	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2

*These sizes are listed to provide test values for brake hoses manufactured in these sizes. They do not represent conversions.

8. S7.3.10 amended by revising the section to read:

S7.3.10 *Tensile strength.* An air brake hose assembly (other than a coiled nylon tube assembly which meets the requirements of §393.45 of this title) designed for use between frame and axle or between a towed and a towing vehicle shall withstand, without separation of the hose from its end fittings, a pull of 250 pounds if it is 1/4 inch or less or 6 mm or less in nominal internal diameter, or a pull of 325 pounds if it is larger than 1/4 inch or 6 mm in nominal internal diameter. An air brake hose assembly designed for use in any other application shall withstand, without separation of the hose from its end fitting, a pull of 50 pounds if it is 1/4 inch or 6 mm or less in nominal internal diameter, 150 pounds if it is 3/8 or 1/2 inch or 10 mm to 12 mm in nominal internal diameter, or 325 pounds if it is larger than 1/2 inch or 12 mm in nominal internal diameter (S8.9).

9. S7.3.11 is amended by revising the section to read:

S.7.3.11 *Water absorption and tensile strength.* After immersion in distilled water for 70 hours (S8.10), an air brake hose assembly (other than a coiled tube assembly which meets the requirements of §393.45 of this title) designed for use between frame and axle or between a towed and a towing vehicle shall withstand without separation of the hose from its end fittings a pull of 250 pounds if it is 1/4 inch or 6 mm or less in nominal internal diameter, or a pull of 325 pounds if it is larger than 1/4 inch or 6 mm in nominal internal diameter. After immersion in distilled water for 70 hours (S8.10), an air brake hose assembly designed for use in any other application shall withstand without separation of the hose from its end fitting a pull of 50 pounds if it is 1/4 inch or 6 mm or less in nominal internal diameter, 150 pounds if it is 3/8 inch or 1/2 inch or 10 to 12 mm in nominal internal diameter, or 325 pounds if it is larger than 1/2 inch or 12 mm in nominal internal diameter (S8.9).

10. S9.1.1(d) is revised to read as follows:

(d) The nominal inside diameter of the hose expressed in inches or fractions of inches or in millimeters, or the nominal outside diameter of plastic tubing expressed in inches or fractions of inches or in millimeters followed by the letters OD. The abbreviation "mm" shall follow hose sizes that are expressed in millimeters. (Example of inside diameter: 7/32, 1/4, 4 mm. Example of outside diameter: 1/4 O.D., 12 mm O.D.)

11. S9.1.2(d) is revised to read as follows:

(d) The nominal inside diameter of the hose to which the fitting is properly attached expressed in inches or fractions of inches or in millimeters, or the outside diameter of the plastic tubing to which the fitting is properly attached expressed in inches or fraction of inches or in millimeters followed by the letters O.D. (See examples in S9.1.1(d).) The abbreviation "mm" shall follow hose sizes that are expressed in millimeters.

12. In tables V and VI, column 1, referring to hose inside diameter is amended by changing it to read (note: columns after column 1 remain unchanged):

Issued on January 22, 1985.

Diane K. Steed
Administrator

50 FR 4688
February 1, 1985

TABLE V — VACUUM BRAKE HOSE TEST REQUIREMENTS

Hose Inside Diameter*		High Temp Resistance		Low Temp. Resistance	
Inches	Millimeters	Hose Length, inches	Radius of Cylinder inches	Hose Length, inches	Radius of Cylinder inches
— 7/32	5 —	8	1 1/2	17 1/2	3
— 1/4	6 —	9	1 1/2	17 1/2	3
9/32	—	9	1 3/4	19	—
— 11/32	8 —	9	1 3/4	19	—
3/8 —	— 10	10	1 3/4	19	—
7/16	—	11	2	—	—
15/32	—	11	2	—	—
— 1/2	12 —	11	—	—	—
5/8 —	— 16	12	—	—	—
3/4	—	14	—	—	—
1	—	16	—	—	—

*These sizes are listed to provide test values for brake hoses manufactured in these sizes. They do not represent conversions

TABLE VI—DIMENSIONS OF TEST SPECIMEN AND FEELER GAGE FOR DEFORMATION TEST

Hose inside diameter*		Specimen dimensions (see fig. 4)		Feeler gage dimensions	
In.	Mm.	Depth (inch)	Length (inch)	Width (inch)	Thickness (inch)
7/32	5	3/64	1	1/8	3/64
1/4	6	1/16	1	1/8	1/16
3/32	—	1/16	1	1/8	1/16
1 1/32	8	5/64	1	3/16	3/64
3/8	10	3/32	1	3/16	3/32
7/16	—	5/64	1	1/4	5/64
15/32	—	3/64	1	1/4	5/64
1/2	12	1/8	1	1/4	1/8
5/8	16	3/32	1	1/4	5/32
3/4	—	3/16	1	1/4	3/16
1	—	1/4	1	1/4	1/4

*These sizes are listed to provide test values for brake hoses manufactured in these sizes. They do not represent conversions.

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 106

Brake Hoses

(Docket No. 82-02; Notice 3)

ACTION: Final rule.

SUMMARY: This notice amends the air brake hose adhesion test of Federal Motor Vehicle Safety Standard No. 106, *Brake Hoses.* The adhesion test is included in FMVSS No. 106 to assure that the various layers of an air brake hose do not separate in service. The test measures the force required to separate adjacent layers of a brake hose. This rule amends the standard to exclude the force levels recorded during the initial and final 20 percent of the testing from the calculation of adhesion value. The agency believes that those data should be excluded because they can be artificially influenced by variables other than the actual adhesion of the brake hose layers. This rule also changes the test apparatus used to measure adhesion value. The new apparatus, a tension-type machine, is more widely used by test laboratories than the pendulum-type apparatus currently referenced in the standard, and provides more valid and consistent data.

This rulemaking action commenced in response to a petition for rulemaking submitted by the B.F. Goodrich Company.

EFFECTIVE DATE: July 6, 1986. In addition, this rule provides for an optional immediate effective date.

SUPPLEMENTARY INFORMATION: On February 18, 1982, the agency published a notice (47 FR 7293) granting a petition for rulemaking submitted by the B.F. Goodrich Company (Goodrich) and requesting comments on the issues raised by the petition. Goodrich's petiton concerned technical changes to the adhesion test for air brake hoses set forth in Federal Motor Vehicle Safety Standard (FMVSS) No. 106, *Brake Hoses.* That company requested the agency to adopt two changes to the adhesion test: (1) that adhesion value, i.e., the force required to separate adjacent layers of a brake hose, be determined by an averaging technique rather than by the current method of using the minimum force recorded during the test; and, (2) that the force levels recorded in separating the layers of the brake hose at the beginning and end of the test be disregarded.

Comments were received on the advantages and disadvantages of specifying an average adhesion value and disregarding portions at the ends of the test chart. After considering those comments, the agency concluded that the current method of determining adhesion value by an absolute minimum value furthers the interests of safety. Accordingly, in a notice of proposed rulemaking (NPRM) issued in May 1985, NHTSA terminated further rulemaking as to that portion of Goodrich's petition requesting that an averaging technique be used. (50 FR 21090; May 22, 1985.) However, that notice also announced that the agency had tentatively determined that a portion of the test chart should be excluded from the calculation of adhesion value, and proposed to revise S8.6.4 to set this excluded portion at the first and last 20 percent of the adhesion test chart.

Testing Brake Hose Adhesion

The adhesion test is included in FMVSS No. 106 to ensure that the various layers of a brake hose do not separate in service. Low adhesion in brake hoses can result in the build-up of air between plies. The trapped air can cause inward ballooning of the hose, resulting in slow reaction of the brakes served, or a complete malfunction due to the hose conduit being blocked altogether.

The first step of the adhesion test procedure is to cut a specimen of brake hose, one inch or more in length. The specimen is then cut longitudinally along its entire length to the level of contact with a lower layer. The layer to be tested is peeled back along the longitudinal cut so as to create a flap large enough to be attached to a test apparatus. The test apparatus applies tension in a direction essentially perpendicular to the axis of the brake hose so as to separate, i.e., unroll, the layer being tested from the rest of the brake hose. A chart is produced which has inches of separation as one coordinate and applied tension as the other. Paragraph S7.3.7 requires that, except for hose reinforced by wire, an air brake hose must withstand a tensile force of eight pounds per inch of length before the adjacent layers separate. Paragraph S8.6.4 of the standard provides that adhesion value—i.e., the force required to separate adjacent layers of a brake hose—is "the minimum force recorded on the portion of the chart corresponding to the actual separation of the part being tested."

Disregarding Force Levels at Beginning and End of Test

Goodrich requested that the force levels recorded on the beginning and end of the test chart be disregarded because adhesion between layers might be disturbed during sample preparation, and because samples can distort near the end of the test, resulting in erratic values. The February 1982 notice requested comments on this issue. Several comments where received, all of which have been discussed in the May 1985 NPRM.

Most of the commenters agreed that an excluded area at each end of the test curve was necessary, but were divided as to how much of the chart should be disregarded. Porter and Aeroquip agreed with Goodrich that the beginning and end of the chart should be excluded because those portions are affected by variables resulting from sample preparation. Goodyear stated that the initial and final 20 or 25 percent of the test chart could be spurious because of distortion or mechanical effects, and believed that amending the standard to exclude those portions would be reasonable and acceptable. Midland Ross and Blue Bird commented that disregarding the beginning and end of the adhesion test chart has merit, but that 20 percent on either side was too much to exclude.

After considering those comments, the agency proposed a change to Standard No. 106 along the lines suggested by Goodrich. (50 FR at 21092.) NHTSA believed that an excluded area at each end of the test curve might be necessary because the end points on the test curve appeared to vary considerably depending on the sensitivity of the recording device and variation of sample preparation. A 20 percent exclusion zone was proposed since the agency believed that this area would not result in any safety problems and would cover the portions of the chart which were artificially influenced by variables other than the actual adhesion of the hose layers. This change was intended to ensure that the remaining portion of the test chart corresponds more accurately to the actual adhesion value of a brake hose specimen.

Goodyear was the only commenter to the NPRM. That company concurred with the proposed changes and reiterated its belief that the initial and final 20 or 25 percent of the adhesion test trace could be spurious because of distortion or mechanical effects, and should therefore be excluded.

This rule amends paragraph S8.6.4(a) of Standard No. 106 to specify that the actual separation of the part of the brake hose being tested shall be determined by excluding the protion of the chart which corresponds to the initial and final 20 percent of the separation distance along the chart's displacement axis. NHTSA has concluded that this excluded area would cover the portions of the chart which are artificially influenced by variables other than the actual adhesion of the hose layers, and that safety would not be negatively affected by this change.

As explained in the NPRM, each air brake hose tested for compliance with Standard No. 106 must meet the adhesion test requirement regardless of the specimen tested. Disregarding 20 percent at the beginning and end of the chart yields test results for 60 percent of the test specimen. This does not mean that 40 percent of the hose is not tested to the adhesion requirements of the standard. Multiple specimens of the brake hose can be oriented on the test apparatus so that test results for the entire circumference of the hose can be obtained. Several one inch long test specimens are usually cut from a single piece of hose. These additional samples are each individually cut axially in preparation for the adhesion test. Another hose specimen, adjacent to the original specimen, can be tested for compliance, with the cut made at a different point from the original. The portion of the air brake hose falling within the 40 percent range that was disregarded in the first test can thus be included in the portion of the hose tested for compliance in a subsequent test.

Test Apparatus

Paragraph S8.6.1 of FMVSS No. 106 currently references a pendulum type test apparatus in the adhesion test procedure. The NPRM proposed to reference a tension-type test apparatus in its place. The tension-type apparatus is commonly available and widely used in brake hose testing laboratories. This type of machine is a constant-speed, pulling device whose rate of pull can be set to the required in the standard. A load cell is utilized to measure the resistive load of the bonded layers of hose as they are separated by the machine.

Goodyear, the only commenter to the NPRM, concurred with this change. Since NHTSA believes that the tension-type apparatus is widely used and provides more valid and consistent data than the pendulum apparatus, this rule amends S8.6.1 as proposed.

Effective Date

These amendments are effective July 6, 1986. In addition, this rule provides for an optional immediate effective date. The agency finds good cause for an optional immediate effective date since the amendments clarify the method of calculating the actual adhesion value of a brake hose. Further, there is good cause for specifying an optional immediate effective date for use of the tension-type test apparatus since most, if not all, compliance testing is presently done on this machine. The alternative effective date of 180 days after publication of this rule in the *Federal Register* would provide adequate leadtime for any users presently testing with a pendulum or inclination balance type apparatus.

In consideration of the foregoing, 49 CFR Part 571 is amended as follows:

S8.6.1 *Apparatus.*

A tension testing machine that is power-driven and that applies a constant rate of extension is used for measuring the force required to separate the layers of the test specimen. The apparatus is constructed so that:

(a) The recording head inlcudes a freely rotating form with an outside diameter substantially the same as the inside diameter of the hose specimen to be placed on it.

(b) The freely rotating form is mounted so that its axis of rotation is in the plane of the ply being separated from the specimen and so that the applied force is perpendicular to the tangent of the specimen circumference at the line of separation.

(c) The rate of travel of the power-actuated grip is a uniform one inch per minute and the capacity of the machine is such that maximum applied tension during the test is not more than 85 percent nor less than 15 percent of the machine's rated capacity.

(d) The machine produces a chart with separation as one coordinate and applied tension as the other.

S8.6.4(a) The adhesion value shall be the minimum force recorded on the chart excluding that portion of the chart which corresponds to the initial and final 20 percent portion along the displacement axis.

Issued on December 31, 1985

Diane K. Steed
Administrator

51 F.R. 603
January 7, 1986

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 106

Brake Hoses
(Docket No. 85-02; Notice 2)

ACTION: Final Rule.

SUMMARY: The purpose of this notice is to amend Federal Motor Vehicle Safety Standard (FMVSS) No. 116, *Motor Vehicle Brake Fluids,* and FMVSS No. 106, *Brake Hoses,* to revise the referee materials and test procedures referenced in portions of those standards. FMVSS No. 116 and FMVSS No. 106 currently reference the referee material (RM) identified as RM-1 fluid by the Society of Automotive Engineers (SAE). However, RM-1 fluid is now commercially unavailable, and is less representative of brake fluids used in vehicles on the road today. The SAE in its January 1980 revision of Standard J1703, "Motor Vehicle Brake Fluid," substituted a new referee material, RM-66-03, in place of RM-1 for use in the J1703 compatibility test. This final rule adopts this revision and references RM-66-03 for use in the compatibility test of Standard No. 106, and the compatibility and fluid chemical stability tests of Standard No. 116. This notice also references a new referee material, TEGME, in the humidification procedure of Standard No. 116, adjusts the water content level and test temperature referenced in the test procedures, and amends the number of sets of stroking test materials in the stroking test procedures. This notice also makes procedural modifications to Standard No. 116's humidification procedure adopted from the SAE, and corrects the description of test procedures used to evaluate brake fluid stroking properties.

EFFECTIVE DATE: Due to the commercial unavailability of RM-1 fluid, this rule is effective May 6, 1986. However, because the agency is concerned that manufacturers who might still be using RM-1 fluid to test their products should be able to use their existing supplies, use of RM-1 fluid may continue until November 3, 1986.

SUPPLEMENTARY INFORMATION: Federal Motor Vehicle Safety Standard (FMVSS) No. 116, *Motor Vehicle Brake Fluids,* and FMVSS No. 106, *Brake Hoses,* specify performance requirements for motor vehicle brake fluids and brake hoses. Included in the performance requirements of Standard No. 106 is a brake fluid compatibility test, and included in Standard No. 116 are compatibility, chemical stability, and humidification tests. Referee materials are used to test specimens of brake hose and brake fluid for compliance with the standards' requirements. These materials provide a basis of comparison between the results of the tests and the specifications of the standards. The procedures for the compatibility, chemical stability, and humidification tests currently reference the referee material brake fluid specified by the Society of Automotive Engineers (SAE) in the April 1968 version of SAE Standard J1703b. Standard J1703b, in turn, references a referee material (RM) identified as RM-1. (Standard No. 116's description of SAE Standard J1703b, "Motor Vehicle Brake Fluid," April 1968, is incorrect in that the correct reference should be to J1703b, July 1970. In 1970, the agency proposed to reference test procedures of J1703a, April 1968, in Standard No. 116. Subsequently, NHTSA changed reference from J1703a to J1703b. The effort to make this change inadvertently resulted in showing April 1968, the date of J1703a, as the date of J1703b. This notice corrects the error by referencing J1703b, July 1970.)

This rule amends FMVSS Nos. 116 and 106 to revise the referee materials and test procedures referenced in portions of those standards. The SAE, in its January 1980 and November 1983 revisions of Standard J1703, "Motor Vehicle Brake Fluid," substituted a new referee material, RM-66-03, in place of RM-1 for use in the J1703 compatibility test. This notice adopts this revision and references RM-66-03 for use in the compatibility test of Standard No. 106, and the compatibility and fluid chemical stability tests of Standard No. 116. This notice also references a new referee material, TEGME, in the humidification procedures of Standard No. 116, adjusts the water content level and test temperature referenced in the test procedures, and amends the number of sets of stroking test materials in the stroking test of Standard No. 116. This notice also adopts SAE revisions to FMVSS No. 116's humidification test which had been inadvertently omitted from the amendatory language of the proposed rule, and corrects the description of test procedures used to evaluate brake fluid stroking properties.

Testing Brake Hose/Fluid Characteristics

Brake fluid compatibility is an important factor in establishing brake hose life and strength characterisitcs. The compatibility test of FMVSS No. 106 measures hydraulic brake hose compatibility with brake fluid. The brake hose test specimen is filled with the SAE Compatibility Fluid for a required number of hours at specified temperatures, and is then subjected to constriction and burst strength tests. Currently, RM-1 fluid is referenced in the test procedures for the standard's brake fluid compatibility test.

Under the compatibility requirements of FMVSS No. 116, the compatibiltiy of a brake fluid with an RM fluid is determined. The compatibility fluid that is used in these tests as a referee material should be representative of the fluids found in a braking system in service. The tests measure the compatibility of fluids of different chemical bases by checking whether there are undesirable chemical interactions resulting from the mixture of fluids. Paragraph S6.10 sets out the procedures for evaluating the compatibility of a brake fluid with other liquids used in a hydraulic brake system (i.e., other brake fluids). This section currently references RM-1 fluid as the referee material used in that test procedure.

The humidification tests of FMVSS No. 116 measure the amount of water absorbed by a brake fluid as compared to a reference fluid. The presence of water in a brake system degrades braking performance and safety by lowering the boiling point of brake fluid, increasing the possibility of vapor lock and the corroding of system components, and the depositing of sediment in wheel cylinders that could cause a system malfunction.

Standard No. 116 establishes minimum wet equilibrium reflux boiling points (ERBP's) for different grades of brake fluid, and the test procedures of S6.2 determine the water content and wet ERBP of brake fluid specimens. The current test procedure specifies that sample fluids of RM-1 and the test specimen are to be humidified simultaneously under controlled conditions. The SAE RM-1 fluid is used as the reference fluid that establishes the "endpoint" for humidification. When the water content of the RM-1 fluid is measured to be 3.50 ± 0.05 percent by weight, the test fluid sample is removed from the humidification apparatus. After humidification, the water and ERBP of the sample are determined.

Section 7.2 of FMVSS No. 116 also refers to RM-1 fluid as a reference for measuring the water content of brake fluids.

RM-66-03 Fluid

A notice of proposed rulemaking (NPRM) on this rulemaking action was published on March 7, 1985 (50 FR 9294). The NPRM explained that FMVSS Nos. 106 and 116 currently reference SAE RM-1 Compatibility Fluid in their test procedures. In that notice, the agency announced its tentative finding that the inclusion of RM-1 fluid is no longer desirable for the following reasons.

The agency stated its belief that reference to RM-1 fluid should be changed because manufacture of the fluid has ceased. A new fluid, identified as RM-66-03 Compatibility Fluid, has replaced the RM-1 fluid in test procedures described in the January 1980 and November 1983 revisions of SAE Standard J1703. This new fluid is described by the SAE as a blend of four proprietary polyglycol brake fluids of fixed composition, in equal parts by volume. The four fluids selected comprise three factory-fill and one after-market fluid as follows: DOW HD50-4, DOW 455, Delco Supreme II, and Olin HDS-79.

While RM-1 fluid is not readily available, RM-66-03 fluid is available from the SAE in the blend and formulation developed by the SAE for J1703. The indiviual manufacturers of the four proprietary fluids have indicated to the SAE Brake

Fluids Subcommittee and Reference Materials Subcommittee that the proprietary formulation might be changed in the commercial market, but that the formulations developed for the RM-66-03 fluid would be guaranteed to be available for a minimum five-year period commencing May 1983, i.e., at least until May 1988.

The updated reference to RM-66-03 fluid by the SAE is a result of the termination of the manufacturing of the RM-1 fluid. Several of the ingredients contained in the RM-1 fluid are not available to fluid manufacturers since the materials are no longer used in today's fluids, or have become prohibitively costly to obtain. As a result, manufacturers are unwilling to produce more RM-1 fluid.

In addition, RM-1 fluid is not representative of fluids in service today. The agency stated its belief that revising the referee material used in the compatibility test is warranted since the purposes of that test would be better served by a referee material more representative of today's fluids. Inclusion of RM-1 fluid in FMVSS Nos. 116 and 106 is also undesirable because RM-1 fluid contains toxic materials which require elaborate protective procedures and special handling and manufacturing processes.

In consideration of the foregoing, NHTSA proposed an amendment to FMVSS Nos. 106 and 116 to substitute new referee materials for the compatibility and humidification tests. For Standard No. 106's compatibility requirement and test procedures (S5.3.9 and S6.7), and Standard No. 116's compatibility (6.10), fluid chemical stability (6.5), and water content (7.2) tests, the new referee material was proposed to be RM-66-03 fluid as described in the January 1980 version of SAE Standard J1703.

Seven commenters responded to the NPRM. Each commenter agreed with the proposal to reference RM-66-03 fluid in FMVSS Nos. 106 and 116. General Motors Corporation (GM) and Chrysler Corporation agreed with the agency's tentative conclusion that the new referee material would be more available and compatible with current brake fluids than RM-1 fluid. Other commenters believed that the change would be practical and reasonable.

NHTSA has considered the comments to the NPRM and has decided to amend FMVSS Nos. 106 and 116 to reference RM-66-03 compatibility fluid. One slight change has been made to the NPRM's proposal. The NPRM proposed to reference the RM-66-03 fluid as described in the January 1980 revision of SAE Standard J1703. This rule will reference RM-66-03 fluid as described in the November 1983 revision of J1703. The two SAE revisions of J1703 are identical in their descriptions of RM-66-03; the agency is making this change in order to keep FMVSS Nos. 106 and 116 current by referencing the more recent SAE standard.

Use of the RM-66-03 fluid in the test procedures of Standards Nos. 116 and 106 should have a beneficial impact on safety. Since the RM-1 compatibility fluid currently referenced in FMVSS Nos. 106 and 116 is not commercially available, ascertaining whether hoses and fluids comply with certain requirements related to compatibility and boiling points is difficult. Amending the standards to allow the use of RM-66-03 fluid in place of RM-1 provides a readily available compatibility fluid for the compliance tests which is more representative of fluids used in today's vehicles.

TEGME, Brake Fluid Grade

In humidification test procedures under FMVSS No. 116, the referee material fluid is used as a reference to determine when to terminate the humidification procedure. Currently, RM-1 fluid is used as this referee material. NHTSA proposed to amend Standard No. 116 to reference a new referee fluid, triethylene glycol monomethyl ether (TEGME), brake fluid grade, as the referee material noted in Standard No. 116's procedures for a brake fluid's wet equilibrium reflux boiling point (S6.2). TEGME has been referenced by the SAE in J1703, January 1980, and J1703, November 1983, as the referee material used in the humidification test procedure.

In addition to referencing the TEGME material, the agency also proposed to amend S6.2 of FMVSS No. 116 to adjust the final water content of the referee material fluid to 3.70% water (instead of the current requirement of 3.5%), change the test temperature to 50°C. (from 23°C.), and add a cooling period for the sealed jar sample. As explained in the NPRM, those changes (use of TEGME fluid, change in water pickup and test temperature, and the cool-down to room temperature) were proposed as part of the overall changes adopted from SAE J1703 procedures.

All but one of the commenters to the notice supported the changes to the TEGME fluid. Commenters believed that the changes would simplify the test procedures and make them more cost effective.

In its comment on the NPRM, Union Carbide questioned whether there are adequate data to show that the new humidification test procedure will produce comparable test results when applied to DOT-4 and DOT-5 brake fluids. That commenter suggested that NHTSA reconsider adopting the SAE J1703, January 1980 humidification test method or adopt it as an alternative to the current method that uses RM-1 fluid until complete comparative testing could be performed.

The agency does not agree with Union Carbide that the humidification test method of SAE J1703, January 1980 should not be adopted as the new Standard No. 116 test procedure. The TEGME fluid is capable of absorbing a measurable amount of water in a given time and is only used as a reference to determine when to terminate the humidification process. Under the humidification test procedure, samples of brake fluid and TEGME are humidified simultaneously until a measured quantity of fluid is picked up in the TEGME. When the water content of the TEGME fluid reaches 3.7 percent, the brake fluid test specimens are removed from the test apparatus and their water contents and ERBP's are measured. TEGME, the referee material used in the humidification procedure, thus serves only to establish the end point of a test procedure.

The 3.7 percent TEGME water pickup (at 50°C) corresponds to the 3.5 percent water pickup (at 23°C) of the referee fluid (RM-1) used previously to determine the end point of the humidification procedure. The agency has determined that DOT-3 fluid picks up the same amount of water when humidified under procedures which use TEGME as the referee material as it does when humidified under procedures using RM-1. Therefore, the agency believes that the water pickup of test fluids, including DOT-4 and DOT-5 fluids, would not be affected by the change to TEGME. Accordingly, NHTSA is amending FMVSS No. 116 to reference the TEGME referee material.

The NPRM proposed to reference the TEGME fluid as described in the January 1980 revision of Standard J1703. This rule will instead reference TEGME as described in the November 1983 revision of J1703. The two SAE revisions of J1703 are identical in their descriptions of TEGME; the agency is making this change in order to keep FMVSS No. 116 current by referencing the more recent SAE standard.

Humidification Test Procedures

All commenters supported the additional changes to the humidification procedure of S6.2 adopted from SAE Standard J1703. This rule adopts the proposed changes to S6.2 and adjusts the final water content of the referee material fluid to 3.70%, changes the test temperature to 50°C, and adds a cooling period for the sealed jar sample.

Other changes to the humidification procedure were suggested in the comments to the NPRM. GM and Union Carbide Corporation pointed out that while NHTSA proposed to adopt the humidification test procedures from SAE J1703, the procedural modifications proposed in the amendatory language differed slightly from the SAE standard. GM suggested changing FMVSS No. 116's humidification procedure to agree with that of SAE J1703, January 1980 in order to facilitate testing. The following changes were suggested: S6.2.1 should be revised to require 150 ml. samples of brake fluid and TEGME instead of the proposed 100 ml. samples; S6.2.3 should be revised to eliminate ammonium sulfate from the list of reagents and materials and to specify distilled water and TEGME; S6.2.4 should be revised to load the dessicators with 450 ml. of distilled water instead of the ammonium sulfate/distilled water slurry; and S6.2.5 should be revised to use 150 ml. samples of the brake fluid and TEGME instead of the proposed 100 ml. samples.

As evidenced by the GM and Union Carbide comments, it was clear that the agency intended to facilitate testing by adopting the overall changes to the humidification test from SAE J1703. Therefore, NHTSA agrees that those additional changes should be incorporated into this final rule. This rule amends S6.2.1, S6.2.3, S6.2.4 and S6.2.5 to correct the minor omissions noted above. Further, S6.2.2 is revised to clarify that distilled water would be substituted for the salt slurry in Figure 3 of FMVSS No. 116, *Humidification Apparatus*, when TEGME is used as the referee material.

Stroking Test

The stroking test in FMVSS No. 116 checks the lubricity effect of a brake fluid on rubber components. The NPRM explained that the SAE had determined, in its revision of J1703, January 1980, that three sets of test material are sufficient to analyze the adequacy of test results. The notice announced that, based on NHTSA's tentative agreement with that SAE conclusion and its belief that compliance testing costs would be reduced by that change without an adverse affect on safety, the agency was proposing to amend the requirements of S5.1.13 and S6.13 to require testing of only three sets of test material (consisting of wheel cylinders, drums, shoe assemblies, etc.) instead of four sets, and eight new brake cups instead of 10. Since NHTSA proposed to reduce the number of cups tested, a reduction in the number of cups checked for unsatisfactory operating condition was also proposed.

All comments supported the agency's proposal to revise the stroking test procedures. The commenters believed that the changes proposed in the NPRM would simplify the test procedures and make them more cost effective. NHTSA agrees, and has revised S5.1.13 and S6.13 as proposed in the NPRM.

In addition, this rule makes several changes to the stroking test procedures in FMVSS No. 116 which directly relate to the agency's adoption of the SAE stroking test revision. Currently, S6.13.2 describes the apparatus and equipment used for the stroking test and refers to figures in SAE Standard J1703b which depict stroking apparatuses. Figure 1 of J1703b depicts four sets of drum and shoe assemblies. Since NHTSA has reduced the number of sets of test materials to three, the agency believes that the description of the test apparatuses and arrangement of test materials should also be revised to reflect this change. The description of the apparatuses used in the stroking test is changed only to clarify that three sets of materials are used, instead of four.

The following related revisions to the stroking test procedure are necessary to facilitate the change to three sets of materials. Paragraph S6.13.4(c) describes the preparation and assembly of test apparatuses. When a shoe and drum type apparatus is used, S6.13.4(c) specifies a 23 mm. stroke length, based on output piston movement of four sets of wheel cylinders. Stroke length refers to the distance traveled by the master cylinder piston to displace a certain volume of fluid in the test system which, in turn, forces the wheel cylinder pistons to travel a specified distance. Since the stroking test is revised to require only three sets of materials, the stroke length of the master cylinder would no longer be 23 mm.

This rule deletes reference in S6.13.4(c) to exact piston displacement measurements and a 23 mm. stroke length. The agency has determined that it is not necessary to specify master cylinder and wheel cylinder piston travel since those values are determined by the characteristics of the system which are specified in the standard (i.e., dimensions of the master cylinder and wheel cylinders, and pressure). The stroking test apparatus is a closed hydraulic system; pressure of 1000 pounds per square inch (psi) is generated at the outlet port of the master cylinder, and all pistons have the same diameters of $1^1/_8$ inch. Given the above, displacement of the wheel cylinders is directly proportional to the displacement of the master cylinder, and in the given test apparatus the stroke length of the master cylinder is dependent on system pressure. Stroke length would therefore be adjusted by the characteristics of the system from the former value of 23 mm. to a value proportioned for three wheel cylinders.

Since the agency is eliminating exact wheel cylinder piston travel measurements and is specifying that only three sets of test materials are required in the stroking test, this rule also deletes reference in S6.13.4(c) to Figure 4 of SAE Standard J1703b. That figure illustrated the approximate pressure buildup versus the master cylinder piston movement, and was based on the use of four sets of materials. S6.13.4(c) would continue, however, to specify that the pressure buildup is relatively low during the first part of the stroke, in order to avoid damage of the master cylinder's primary cup by ensuring that the primary cup passes the compensating port at a relatively low pressure.

Typographical Errors

This notice corrects the typographical errors in S5.1.9(a), S5.1.9(b) and S5.1.12 of Standard No. 116, as proposed in the NPRM.

Effective Date

This rule is effective May 6, 1986. As explained in the NPRM, the agency finds good cause for this expedited effective date because the RM-1 fluid used in the testing procedures of FMVSS Nos. 116 and 106 is commercially unavailable. Use of the RM-66-03 fluid will facilitate compliance testing by utilizing a referee material that is currently available and more representative of fluids in service. However, because the agency is concerned that manufacturers who might still be using RM-1 fluid to test their products should be able to use their existing supplies, use of RM-1 fluid may continue until October 26, 1986, i.e., 180 days after publication of this rule.

In accordance with the above provision permitting the use of RM-1 during the interim period, this rule describes separate test procedures appropriate for use with RM-1 and for the new referee materials (i.e., RM-6603 and TEGME). Test procedures for RM-1 usage are specified for those manufacturers who choose to use that fluid during the 180-day period.

Economic Effects

NHTSA has concluded that this final rule does not qualify as a "major rule" within the meaning of Executive Order 12291, and that it is not "significant" within the meaning of the Department of Transportation's regulatory procedures. Preparation of a regulatory impact analysis is not necessary for this rulemaking. The agency has determined further that the effects of this rulemaking are minor and that a full regulatory evaluation is not warranted. The rule references referee materials in Standards Nos. 116 and 106 that are readily available to manufacturers of brake fluids and brake hoses.

The agency believes that manufacturers will benefit by the change to RM-66-03 fluid and TEGME fluid in FMVSS No. 116 and RM-66-03 fluid in FMVSS No. 106. The fluids are readily available whereas RM-1 is not, and are more representative of fluids in service today. The agency knows of no problems resulting from tests onducted with the RM-66-03 and TEGME fluids.

Some cost savings would be realized with this amendment. The utilization of RM-66-03 fluid will reduce the costs of fluids used in compliance testing without sacrificing adequate test results. For example, as cited in the NPRM, when last available, RM-1 fluid cost approximately $27.00 per quart. The cost of RM-66-03 fluid is approximately $8.00 per quart.

Cost savings will be realized by the use of the TEGME fluid in the humidification tests of FMVSS No. 116. The TEGME fluid costs approximately $3.30 per quart. Further, using the TEGME fluid in compliance testing would conserve the more expensive supply of RM-66-03 brake fluid material.

The change in the stroking test procedures will also result in some cost savings. The costs related to the quantities of materials tested will be reduced about 25 percent.

Any changes to Standard Nos. 106 and 116 referencing the RM-66-03 and TEGME fluids and reducing the number of test materials used in the stroking test will not significantly affect manufacturers of brake hoses and referee materials. These manufacturers may benefit from some cost savings resulting from the changes to the standards, but will not otherwise be significantly affected by this amendment.

In consideration of the foregoing, 49 CFR 571.06, *Brake Hoses*, is amended as follows:

1. S5.3.9 is revised to read as follows:

S5.3.9 *Brake Fluid Compatibility, Construction, and Burst Stength.* Except for brake hose assemblies designed for use with mineral or petroleum-based brake fluids, a hydraulic brake hose assembly shall meet the constriction requirement of S5.3.1 after having been subjected to a temperature of 200°F for 70 hours while filled with SAE RM-66-03 Compatibility Fluid, as described in Appendix A of SAE Standard J1703, November 1983, "Motor Vehicle Brake Fluid," November 1983 (S6.7). It shall then withstand water pressure of 4,000 psi for 2 minutes and thereafter shall not rupture at less than 5,000 psi (S6.2). (SAE RM-1 Compatibility Fluid, as described in Appendix A of SAE Standard J1703b, "Motor Vehicle Brake Fluid," July 1970, may be used in place of SAE RM-66-03 until November 3, 1986.

2. Paragraph S6.7.1(a) is revised to read as follows:

S6.7.1 *Preparation.*

(a) Attach a hose assembly below a 1-pint reservoir filled with 100 ml of SAE RM-66-03 Compatibility Fluid as shown in Figure 2. (SAE RM-1

Compatibility Fluid, as described in Appendix A of SAE Standard J1703b, "Motor Vehicle Brake Fluid," July 1970, may be used in place of SAE RM-66-03 until October 26, 1986.

* * * * * *

§ 571.116 [Amended]

In consideration of the foregoing, 49 CFR 571.116, *Motor Vehicle Brake Fluids,* is amended as follows:

1. S5.1.9 is revised to read as follows:

S5.1.9 *Water Tolerance.*

(a) *At low temperature.* When brake fluid is tested according to S6.9.3(a)—

(1) * * *

(b) At 60°C (140°F). When brake fluid is tested according to S6.9.3(b)—

(1) * * *

2. S5.1.12 is revised to read as follows:

S5.1.12 *Effects on cups.* When brake cups are subjected to brake fluid in accordance with S6.12—

* * * * * *

3. S5.1.13 is revised to read as follows:

S5.1.13 *Stroking properties.* When brake fluid is tested according to S6.13—

* * * * * *

(c) The average decrease in hardness of seven of the eight cups tested (six wheel cylinder and one master cylinder primary) shall not exceed 15 IRHD. Not more than one of the seven cups shall have a decrease in hardness greater than 17 IRHD;

(d) None of the eight cups shall be in an unsatisfactory operating condition as evidenced by stickiness, scuffing, blisters, cracking, chipping, or other change in shape from its original appearance;

(e) None of the eight cups shall show an increase in base diameter greater than 0.90 mm (0.035 inch):

(f) The average lip diameter set of the eight cups shall not be greater than 65 percent:

* * * * * *

4. S6 is revised to read as follows:

S6. *Test procedures.* Until October 26, 1986, SAE RM-1 Compatibility Fluid, as described in Appendix A of SAE Standard J1703b, "Motor Vehicle Brake Fluid," July 1970, may be used in place of TEGME and SAE RM-66-03 in the humidification (S6.2), chemical stability (S6.5.4), and compatibility (S6.10) test procedures, and as a referee material in S7.2.

* * * * * *

5. S6.2.1 is revised to read as follows:

S6.2.1 *Summary of the procedure.*

(a) *With TEGME:* Except as provided in paragraph S6.2.1(b), a 150 ml sample of the brake fluid is humidified under controlled conditions; 150 ml of SAE triethylene glycol monoethyl ether, brake fluid grade, referee material (TEGME) as described in Appendix E of SAE Standard J1703, November 1983, "Motor Vehicle Brake Fluid," November 1983, is used to establish the end point for humidification. After humidification the water content and ERBP of the brake fluid are determined.

(b) *With RM-1:* Until November 3, 1986, SAE RM-1 Compatibility Fluid, as described in Appendix A of SAE Standard J1703b, "Motor Vehicle Brake Fluid," July 1970, may be used with the following procedures. See S6. A 100-ml. sample of the brake fluid is humidified under controlled conditions: 100 ml of SAE RM-1 Compatibility Fluid is used to establish the end point for humidification. After humidification the water content and ERBP of the brake fluid are detemined.

6. S6.2.2 is revised to read as follows:

S6.2.2 *Apparatus for humidification.* (See Figure 3. Until October 26, 1986, a manufacturer may use either TEGME or RM-1 Compatibility Fluid. If TEGME is used, substitute 450 ml. of distilled water in place of the salt slurry and disregard the "45±7mm" dimension.)

Test apparatus shall consist of—

* * * * * *

7. S6.2.3 is revised to read as follows:

S6.2.3 *Reagents and Materials.*

(a) Distilled water, see S7.1.

(b) Except as provided in S6.2.3(c), SAE TEGME referee material.

(c) Until October 26, 1986, a manufacturer may use either TEGME or SAE RM-1 Compatibility Fluid. See S6.

(d) If RM-1 is used, also use ammonium sulfate $(NH_4)_2SO_4$, Reagent or A.C.S. grade.

8. S6.2.4 is revised to read as follows:

S6.2.4 *Preparation of Apparatus.*

(a) *With TEGME:* Except as provided in S6.2.4(b), lubricate the ground-glass joint of the desiccator. Pour 450±10 ml of distilled water into each desiccator and insert perforated porcelain desiccator plates. Place the desiccators in an oven with temperature controlled at 50±1°C (122±1.8°F) throughout the humidification procedure.

(b) *With RM-1:* Until October 26,1986, a manufacturer may use either TEGME or SAE RM-1 Compatibility Fluid. See S6. Lubricate the ground-glass joint of the desiccator. Load each desiccator with 450±25 grams of the ammonium sulfate and add 125±10 ml. of distilled water. The surface of the salt slurry shall lie within 45±7 mm. of the top surface of the desiccator plate. Place the desiccators in an area with temperature controlled at 23±2° C (73.4±3.6°F) throughout the humidification procedure. Condition the loaded desiccator with the covers on and stoppers in place at least 12 hours before use. Use a fresh charge of salt slurry for each test.

9. S6.2.5 is revised to read as follows:

S6.2.5 *Procedure.*

(a) *With TEGME:* Except as provided by S6.2.5(b), pour 150±5 ml of the brake fluid into an open corrosion test jar. Place the jar into a desiccator. Prepare in the same manner a duplicate test fluid sample and two duplicate specimens of the SAE TEGME referee material (150±5 ml of TEGME in each jar). The water content of the SAE TEGME fluid is adjusted to 0.50±0.05 percent by weight at the start of the test in accordance with S7:2. Place these samples in the dessicators in the 50°C (122°F) controlled oven and replace desiccator covers. At intervals, during oven humidification, remove the rubber stopper in the top of each desiccator containing SAE TEGME fluid. Using a long needled hypodermic syringe, take a sample of not more than 2 ml from each jar and determine its water content. Remove no more than 10 ml of fluid from each SAE TEGME sample during the humidification procedure. When the water content of the SAE fluid reaches 3.70± 0.05 percent by weight (average of the duplicates), remove the two test fluid specimens from their desiccators and promptly cap each jar tightly. Allow the sealed jars to cool for 60-90 minutes at 23±5°C (73.4±9°F). Measure the water contents of the test fluid specimens in accordance with S7.2 and determine their ERBP's in accordance with S6.1. If the two ERBP's agree within 4°C (8°F), average them to determine the wet ERBP: otherwise repeat and average the four individual ERBP's as the wet ERBP of the brake fluid.

(b) *With RM-1:* Until October 26, 1986, a manufacturer may use either TEGME or SAE RM-1 Compatibility Fluid. See S6. Pour 100±1 ml of the brake fluid into a corrosion test jar. Promptly place the jar into a desiccator. Prepare duplicate test sample, and two duplicate specimens of the SAE RM-1 Compatibililty Fluid. Adjust water content of the SAE RM-1 fluid to 0.50±0.05 percent by weight at the start of the test in accordance with S7.2. At intervals remove the rubber stopper in the top of each desiccator containing SAE RM-1 fluid. Using a long needled hypodermic syringe, take a sample of not more than, 2 ml from each jar and determine its water content. Remove no more than 10 ml of fluid from each SAE RM-1 sample during the humidification procedure. When the water content of the RM-1 fluid reaches 3.50±0.05 percent by weight (average of the duplicates), remove the two test fluid specimens from their desiccators and promptly cap each jar tightly. Measure the water contents of the test fluid specimens in accordance with S7.2 and determine their ERBP's in accordance with S6.1 through S6.1.5. If the two ERPB's agree within 4°C. (8°F.), average them to determine the wet ERBP; otherwise repeat and average the four individual ERBP's as the wet ERBP of the brake fluid.)

10. S6.5.4.1 is revised to read as follows:

S6.5.4.1 *Materials.*

(a) Except as provided in S6.5.4.1(b), SAE RM-66-03 Compatibility Fluid, as described in Appendix A of SAE Standard J1703, November 1983, "Motor Vehicle Brake Fluid," November 1983.

(b) Until October 26, 1986, a manufacturer may use either SAE RM-66-03, or SAE RM-1 Compatibility Fluid as described in Appendix A of SAE Standard J1703b, "Motor Vehicle Brake Fluid," July 1970. See S6.

11. Paragraph S6.5.4.2 is revised to read as follows:

S6.5.4.2 *Procedure.*

(a) *With RM-66-03:* Except as provided in S6.5.4.2(b), mix 30±1 ml of the brake fluid with 30±1 ml of SAE RM-66-03 Compatibility Fluid in a boiling point flask (S6.1.2(a)). Determine the initial ERBP of the mixture by applying heat to the flask so that the fluid is refluxing in 10±2 minutes at a rate of excess of 1 drop per second, but not more than 5 drops per second. Note the maximum fluid temperature observed during the first minute after the fluid begins refluxing at a rate in excess of 1 drop per second. Over the next 15±1 minutes, adjust and maintain the reflux rate at 1 to 2 drops per second. Maintain this rate for an additional 2 minutes, recording the average value of four temperature readings taken at 30-second intervals as the final ERBP.

(b) *With RM-1:* Until October 26, 1986, a manufacturer may use either RM-66-03, or SAE RM-1 Compatibility Fluid as described in Appendix A of SAE Standard J1703b, "Motor Vehicle Brake Fluid, " July 1970. See S6.

(c) Thermometer and barometic corrections are not required.

12. S6.10.1 is revised to read as follows:

S6.10.1 *Summary of the procedure.*

(a) *With RM-66-03:* Except as provided in S6.10.1(b), brake fluid is mixed with an equal volume of SAE RM-66-03 Compatibility Fluid, then tested in the same way as for water tolerance (S6.9) except that the bubble flow time is not measured. This test is an indication of the compatibility of the test fluid with other motor vehicle brake fluids at both high and low temperatures.

(b) *With RM-1:* Until October 26, 1986, a manufacturer may use either RM-66-03, or SAE RM-1 Compatibility Fluid as described in Appendix A of SAE Standard J1703b,"Motor Vehicle Brake Fluid," July 1970. See S6. This test is an indication of the compatibility of the test fluid with other motor vehicle brake fluids at both high and low temperatures.

13. Paragraph S6.10..2(e) is revised to read as follows:

S6.10.2 *Apparatus and materials.*

* * * * * *

(e) Except as provided in S6.10.2(f), *SAE RM-66-03 Compatibility Fluid.* As described in Appendix A of SAE Standard J1703, November 1983, "Motor Vehicle Brake Fluid," November 1983.

(f) Until October 26, 1986, a manufacturer may use either RM-66-03, or SAE RM-1 Compatibility Fluid as described in Appendix A of SAE Standard J1703b, "Motor Vehicle Brake Fluid," July 1970. See S6.

14. Paragraph S6.10.3(a) is revised to read as follows:

S6.10.3 *Procedure.*

(a) *At low temperature.*

(1) *With RM-66-03:* Except as provided in S6.10.3(a)(2), mix 50 ± 0.5 ml of brake fluid with 50 ± 0.5 ml of SAE RM-66-03 Compatibility Fluid. Pour this mixture into a centrifuge tube and stopper with a clean dry cork. Place tube in the cold chamber maintained at minus 40 ± 2°C (minus $40° \pm 3.6$°F). After 24 ± 2 hours, remove tube, quickly wipe with a clean lint-free cloth saturated with ethanol (isopropanol when testing DOT 5 fluids) or acetone. Examine the test specimen for evidence of sludging, sedimentation, or crystallization. DOT 3 and DOT 4 test fluids shall also be examined for stratification.

(2) *With RM-1.* Until October 26, 1986, a manufacturer may use either RM-66-03, or SAE RM-1 Compatibility Fluid as described in Appendix A of SAE Standard J1703b, "Motor Vehicle Brake Fluid," July 1970. See S6.

* * * * * *

15. S6.13.1 is revised to read as follows:

S6.13.1 *Summary of the procedure.* Brake fluid is stroked under controlled conditions at an elevated temperature in a simulated motor vehicle hydraulic braking system consisting of three slave wheel cylinders and an actuating master cylinder connected by steel tubing. Referee standard parts are used. All parts are carefully cleaned, examined, and certain measurements made immediately prior to assembly for test. During the test, temperature, rate of pressure rise, maximum pressure, and rate of stroking are specified and controlled. The system is examined periodically during stroking to assure that excessive leakage of fluid is not occurring. Afterwards, the system is torn down. Metal parts and SBR cups are examined and remeasured. The brake fluid and any resultant sludge and debris are collected, examined, and tested.

16. S6.13.2 is revised to read as follows:

S6.13.2 *Apparatus and equipment.*

Either the drum and shoe type of stroking apparatus (see Figure 1 of SAE Standard J1703b) except using only three sets of drum and shoe assemblies, or the stroking fixture type apparatus as shown in Figure 2 of SAE J1703, November 1983, with the components arranged as shown in Figure 1 of SAE J1703, November 1983. The following components are required.

(a) *Brake assemblies.* With the drum and shoe apparatus: three drum and shoe assembly units (SAE RM-29a) consisting of three forward brake shoes and three reverse brake shoes with linings and three front wheel brake drum assemblies with assembly component parts. With stroking fixture type apparatus: three fixture units including appropriate adapter mounting plates to hold brake wheel cylinder assemblies.

* * * * * *

(c) *Heated air bath cabinet.* An insulated cabinet or oven having sufficient capacity to house the three mounted brake assemblies or stroking fixture assemblies, master cylinder, and necessary connections. A thermostatically controlled heating system is required to maintain a temperature of 70°±5°C (158°±9°F) or 120°±5°C (248°±9°F). Heaters shall be shielded to prevent direct radiation to wheel or master cylinder.

* * * * * *

(f) *Wheel cylinder (WC) assemblies (SAE RM-14a).* Three unused cast iron housing straight bore hydraulic brake WC assemblies having diameters of approximately 28 mm ($1^1/_8$ inch) for each test. Pistons shall be made from unanodized SAE AA 2024 aluminum alloy.

* * * * * *

17. Paragraph S6.13.3(a) is revised to read as follows:

S6.13.3 *Materials.*

(a) *Standard SBP brake cups.* Six standard SAE SBR wheel cylinder test cups, one primary test cup, and one secondary MC test cup, all as described in S7.6, for each test.

* * * * * *

18. Paragraph S6.13.4(c) is revised to read as follows:

S6.13.4 *Preparation of test apparatus.*

* * * * * *

(c) *Assembly and adjustment of test apparatus.* When using a shoe and drum type apparatus, adjust the brake shoe toe clearances to 1.0 ± 0.1 mm (0.040 ± 0.004 inch). Fill the system with brake fluid, bleeding all wheel cylinders and the pressure gage to remove entrapped air. Operate the actuator manually to apply a pressure greater than the required operating pressure and inspect the system for leaks. Adjust the actuator and/or pressure relief valve to obtain a pressure of 70 ± 3.5 kg./sq. cm. (1,000 ± 50 psi). A smooth pressure-stroke pattern is required when using a shoe and drum type apparatus. The pressure is relatively low during the first part of the stroke and then builds up smoothly to the maximum stroking pressure at the end of the stroke, to permit the primary cup to pass the compensating hole at a relatively low pressure. Using stroking fixtures, adjust the actuator and/or pressure relief valve to obtain a pressure of 70 ± 3.5 kg./sq. cm. (1,000 ±50 psi).

Adjust the stroking rate to 1,000 ±100 strokes per hour. Record the fluid level in the master cylinder standpipe.

19. S6.13.6(b) and S6.13.6(c) are revised to read as follows:

S6.13.6 *Calculation.*

* * * * * *

(b) Calculate the average decrease in hardness of the seven cups tested, as well as the individual values (see S5.1.13(c)).

(c) Calculate the increases in base diameters of the eight cups (see S5.1.13(e)).

20. The first sentence of Paragraph S6.13.6(d) is revised to read as follows:

(d) Calculate the lip diameter interference set for each of the eight cups by the following formula and average the eight values (see S5.1.13(f)).

* * * * * *

21. S7.2 is revised to read as follows:

S7.2 *Water content of motor vehicle brake fluids.* Use analytical methods based on ASTM D1123–59, "Standard Method of Test for Water in Concentrated Engine Antifreezes by the Iodine Reagent Method," for determining the water content of brake fluids, or other methods of analysis yielding comparable results. To be acceptable for use, such other method must measure the weight of water added to samples of the SAE RM-66-03 and TEGME Compatibility Fluids within ±15 percent of the water added for additions up to 0.8 percent by weight, and within ±5 percent of the water added for additions greater than 0.8 percent by weight The SAE RM-66-03 Compatibility Fluid used to prepare the samples must have an original ERBP of not less than 205°C (401°F) when tested in accordance with S6.1. The SAE TEGME fluid used to prepare the samples must have an original ERBP of not less than 240°C (464°F) when tested in accordance with S6.1.

Until October 26, 1986, a manufacturer may use either RM-66-03 and TEGME or SAE RM-1 Compatibility Fluid. See S6. To be acceptable for use, such other method must measure the weight of water added to samples of the SAE RM-1 Compatibility Fluid within ±15 percent of the water added for additions up to 0.8 percent by weight, and within ±5 percent of the water added for additions greater than 0.8 percent by weight. The SAE RM-1 Compatibility Fluid used to prepare the samples must have an original ERBP of not less than 182°C (360°F) when tested in accordance with S6.1.

Issued on April 29, 1986.

Diane K. Steed
Administrator

51 F.R. 16694
May 6, 1986

MOTOR VEHICLE SAFETY STANDARD NO. 106

Brake Hoses

S1. Scope. This standard specifies labeling and performance requirements for motor vehicle brake hose, brake hose assemblies, and brake hose end fittings.

S2. Purpose. The purpose of this standard is to reduce deaths and injuries occurring as a result of brake system failure from pressure or vacuum loss due to hose or hose assembly rupture.

S3. Application. This standard applies to passenger cars, multipurpose passenger vehicles, trucks, buses, trailers, and motorcycles, and to hydraulic, air, and vacuum brake hose, brake hose assemblies, and brake hose end fittings for use in those vehicles.

S4. Definitions.

"Armor" means protective material installed on a brake hose to increase the resistance of the hose or hose assembly to abrasion or impact damage.

"Brake hose" means a flexible conduit, other than a vacuum tubing connector, manufactured for use in a brake system to transmit or contain the fluid pressure or vacuum used to apply force to a vehicle's brakes.

"Brake hose assembly" means a brake hose, with or without armor, equipped with end fittings for use in a brake system, but does not include an air or vacuum assembly prepared by the owner or operator of a used vehicle, by his employee, or by a repair facility, for installation in that used vehicle.

"Brake hose end fitting" means a coupler, other than a clamp, designed for attachment to the end of a brake hose.

"Free length" means the linear measurement of hose exposed between the end fittings of a hose assembly in a straight position.

"Permanently attached end fitting" means an end fitting that is attached by deformation of the fitting about the hose by crimping or swaging, or an end fitting that is attached by use of a sacrificial sleeve or ferrule that requires replacement each time a hose assembly is rebuilt.

"Rupture" means any failure that results in separation of a brake hose from its end fitting or in leakage.

"Vacuum tubing connector" means a flexible conduit of vacuum that (i) connects metal tubing to metal tubing in a brake system, (ii) is attached without end fittings, and (iii) when installed, has an unsupported length less than the total length of those portions that cover the metal tubing.

For hose, a dimensional description such as "¼-inch hose" refers to the nominal inside diameter. For tubing, a dimensional description such as "¼-inch tubing" refers to the nominal outside diameter.

S5. Requirements—Hydraulic brake hose, brake hose assemblies, and brake hose end fittings.

S5.1 Construction. Each hydraulic brake hose assembly shall have permanently attached brake hose end fittings which are attached by deformation of the fitting about the hose by crimping or swaging.

S5.2 Labeling.

S5.2.1 Each hydraulic brake hose shall have at least two clearly identifiable stripes of at least one-sixteenth of an inch in width, placed on opposite sides of the brake hose parallel to its longitudinal axis. One stripe may be interrupted by the information required by S5.2.2, and the other stripe may be interrupted by additional information at the manufacturer's option. However, hydraulic brake hose manufactured for use only in an assembly whose end fittings prevent its installation in a twisted orientation in either side of the vehicle, need not meet the requirements of S5.2.1.

S5.2.2 Each hydraulic brake hose shall be labeled, or cut from bulk hose that is labeled, at intervals of not more than 6 inches, measured from the end of one legend to the beginning of the next, in block capital letters and numerals at least one-eighth of an inch high, with the information listed in paragraphs (a) through (e). the information need not be present on hose after it has become part of a brake hose assembly or after it has been installed in a motor vehicle.

(a) The symbol DOT, constituting a certification by the hose manufacturer that the hose conforms to all applicable motor vehicle safety standards.

(b) A designation that identifies the manufacturer of the hose, which shall be filed in writing with: Office of Crash Avoidance, Handling and Stability Division, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590. The marking may consist of a designation other than block capital letters required by S5.2.2.

(c) The month, day, and year, or the month and year, of manufacture, expressed in numerals. For example, 10/1/74 means October 1, 1974.

(d) [The nominal inside diameter of the hose expressed in inches or fractions of inches, or in millimeters followed by the abbreviation "mm." (50 F.R. 4691—February 1, 1985. Effective: June 3, 1985)]

(e) Either "HR" to indicate that the hose is regular expansion hydraulic hose or "HL" to indicate that the hose is low expansion hydraulic hose.

S5.2.3 "Reserved"

S5.2.4 Each hydraulic brake hose assembly, except those assembled and installed by a vehicle manufacturer in vehicles manufactured by him, shall be labeled by means of a band around the brake hose assembly as specified in this paragraph or, at the option of the manufacturer, by means of labeling as specified in S5.2.4.1. The band may at the manufacturer's option be attached so as to move freely along the length of the assembly, as long as it is retained by the end fittings. The band shall be etched, embossed, or stamped in block capitals letters, numerals, or symbols at least one-eighth of an inch hight with the following information:

(a) The symbol DOT constituting certification by the hose assembler that the hose assembly conforms to all applicable motor vehicle safety standards.

(b) A designation that identifies the manufacturer of the hose assembly, which shall be filed in writing with: Office of Vehicle Safety Standards, Crash Avoidance Division, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590. The designation may consist of block capital letters, numerals, or a symbol.

S5.2.4.1 At least one end fitting of a hydraulic brake hose assembly shall be etched, stamped, or embossed with a designation at least one-sixteenth of an inch high that identifies the manufacturing of the hose assembly and is filed in accordance with S5.2.4(b).

S5.3 Test requirements. A hydraulic brake hose assembly or appropriate part thereof shall be capable of meeting any of the requirements set forth under this heading, when tested under the conditions of S11 and the applicable procedures of S6. However, a particular hose assembly or appropriate part thereof need not meet further requirements after having been subjected to and having met the constriction requirement (S5.3.1) and any one of the requirements specified in S5.3.2 through S5.3.11.

S5.3.1 Constriction. Except for that part of an end fitting which does not contain hose, every inside diameter of any section of a hydraulic brake hose assembly shall be not less than 64 percent of the nominal inside diameter of the brake hose.

S5.3.2 Expansion and burst strength. The maximum expansion of a hydraulic brake hose assembly at 1,000 psi and 1,500 psi shall not exceed the values specified in Table I (S6.1).

The hydraulic brake hose assembly shall then withstand water pressure of 4,000 psi for 2 minutes without rupture, and shall not rupture at less than 5,000 psi (S6.2).

S5.3.3 Whip resistance. A hydraulic brake hose assembly shall not rupture when run continuously on a flexing machine for 35 hours (S6.3).

S5.3.4 Tensile strength. A hydraulic brake hose assembly shall withstand a pull of 325 pounds without separation of the hose from its end fittings (S6.4).

S5.3.5 Water absorption and burst strength. A hydraulic brake hose assembly, after immersion in water for 70 hours (S6.5), shall withstand water pressure of 4,000 psi for 2 minutes, and then shall not rupture at less than 5,000 psi (S6.2).

S5.3.6 Water absorption and tensile strength. A hydraulic brake hose assembly, after immersion in water for 70 hours (S6.5), shall withstand a pull of 325 pounds without separation of the hose from its end fittings (S6.4).

S5.3.7 Water absorption and whip resistance. A hydraulic brake hose assembly, after immersion in water for 70 hours (S6.5), shall not rupture when run continuously on a flexing machine for 35 hours (S6.3).

S5.3.8 Low-temperature resistance. A hydraulic brake hose conditioned at minus 40°F for 70 hours shall not show cracks visible without magnification when bent around a cylinder as specified in S6.6 (S6.6)

S5.3.9 Brake fluid compatibility, constriction, and burst strength. [Except for brake hose assemblies designed for use with mineral or petroleum-based brake fluids, a hydraulic brake hose assembly shall meet the constriction requirement of S5.3.1 after having been subjected to a temperature of 200°F for 70 hours while filled with SAE RM-66-03 *Compatibility Fluid,* as described in Appendix A of SAE Stnadard J1703, November 1983, *Motor Vehicle Brake Fluid,* November 1983 (S6.7). It shall then withstand water pressure of 4,000 psi for 2 minutes and thereafter shall not rupture at less than 5,000 psi (S6.2). (SAE RM-1 *Compatibility Fluid,* as described in Appendix A of SAE Standard J1703b, *Motor Vheicle Brake Fluid,* July 1970, may be used in place of SAE RM-66-03 until November 3, 1986. **(51 F.R. 16694—May 6, 1986. Effective: May 6, 1986)]**

5.3.10 Ozone resistance. A hydraulic brake hose shall not show cracks visible under 7-power magnification after exposure to ozone for 70 hours at 140°F (S6.8).

S5.3.11 End fitting corrosion resistance. After 24 hours of exposure to salt spray, a hydraulic brake hose end fitting shall show no base metal corrosion on the end fitting surface except where crimping or the application of labeling information has caused displacement of the protective coating (S6.9).

TABLE 1—Maximum Expansion of Free Length Brake Hose, cc/ft.

Hydraulic Brake Hose, inside diameter	Test Pressure 1,000 psi Regular Expansion Hose	1,000 psi Low Expansion Hose	1,500 psi Regular Expansion Hose	1,500 psi Low Expansion Hose
⅛ inch or 3 mm or less	0.66	0.33	0.79	0.42
$^3/_{16}$ inch or 4 to 5 mm	0.86	0.55	1.02	0.72
¼ inch or 16 mm more	1.04	0.82	1.30	1.17

S6. Test procedures—Hydraulic brake hose, brake hose assemblies, and brake hose end fittings.

S6.1 Expansion test.

S6.1.1 Apparatus. Utilize a test apparatus (as shown in Figure 1) which consists of:

(a) Source for required fluid pressure;

(b) Test fluid of water without any additives and free of gases.

(c) Reservoir for test fluid;

(d) Pressure gauges;

(e) Brake hose end fittings in which to mount the hose vertically; and

(f) Graduated burette with 0.05 cc increments.

S6.1.2 Preparation.

(a) Measure the free length of the hose assembly.

(b) Mount the hose so that it is in a vertical straight position without tension when pressure is applied.

(c) Fill the hose with test fluid and bleed all gases from the system.

(d) Close the valve to the burette and apply 1,500 psi for 10 seconds; then release pressure.

S6.1.3 Calculation of expansion at 1,000 and 1,500 psi.

(a) Adjust the fluid level in the burette to zero.

(b) Close the valve to the burette, apply pressure at the rate of 15,000 psi per minute, and seal 1,000 psi in the hose (1,500 psi in second series).

(c) After 3 seconds open the valve to the burette for 10 seconds and allow the fluid in the expanded hose to rise into the burette.

(d) Repeat the procedure in steps (b) and (c) twice. Measure the amount of test fluid which has accumulated in the burette as a result of the three applications of pressure.

(e) Calculate the volumetric expansion per foot by dividing the total accumulated test fluid by 3 and further dividing by the free length of the hose in feet.

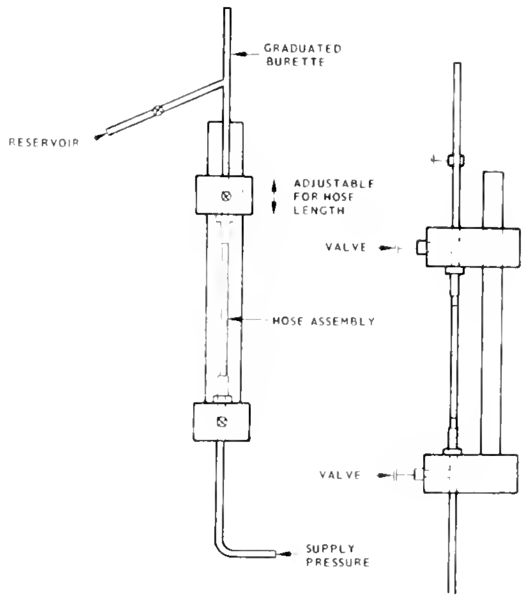

Fig 1-Expansion Test Apparatus

S6.2 Burst strength test.

(a) Connect the brake hose to a pressure system and fill it completely with water, allowing all gases to escape.

(b) Apply water pressure of 4,000 psi at a rate of 15,000 psi per minute.

(c) After 2 minutes at 4,000 psi, increase the pressure at the rate of 15,000 psi per minute until the pressure exceeds 5,000 psi.

S6.3 Whip resistance test.

S6.3.1 Apparatus. Utilize test apparatus that is dynamically balanced and includes:

(a) A movable header consisting of a horizontal bar equipped with capped end fittings and mounted through bearings at each end to points 4 inches from the center of two vertically rotating disks whose edges are in the same vertical plane;

(b) An adjustable stationary header parallel to the movable header in the same horizontal plane as the centers of the disks, and fitted with open end fittings;

(c) An elapsed time indicator; and

(d) A source of water pressure connected to the open end fittings.

S6.3.2 Preparation.

(a) Remove all external appendages including, but not limited to, hose armor, chafing collars, mounting brackets, date bands and spring guards.

(b) Measure the hose free length.

(c) Mount the hose in the whip test machine introducing slack as specified in Table II for the size hose tested, measuring the projected length parallel to the axis of the rotating disks. The manufacturer may, at his option, adapt the fitting attachment points to permit mounting hose assemblies equipped with angled or other special fittings in the same orientation as hose assemblies equipped with straight fittings.

S6.3.3 Operation.

(a) Apply 235 psi water pressure and bleed all gases from the system.

(b) Drive the movable head at 800 rpm.

S6.4 Tensile strength test. Utilize a tension testing machine conforming to the requirements of the methods of Verification of Testing Machines (1964 American Society for Testing and Materials, Designation E4), and provided with a recording device to give the total pull in pounds.

S6.4.1 Preparation. Mount the hose assembly to ensure straight, evenly distributed machine pull.

S6.4.2 Operation. Apply tension at a rate of 1 inch per minute travel of the moving head until separation occurs.

S6.5 Water absorption sequence tests.

S6.5.1 Preparation. Prepare three hose assemblies as follows:

(a) Remove 1⅛ inches of hose cover, if any, from the center of the hose assemblies without injury to any reinforcing material or elongation of the hose assemblies.

(b) Measure the free length of the hose assemblies.

S6.5.2 Immersion and sequence testing.

(a) Immerse the hose assemblies in distilled water for 70 hours.

(b) Thirty minutes after removal from water, conduct tests S6.2, S6.3, and S6.4, using a different hose for each sequence.

S6.6 Low temperature resistance test.

S6.6.1 Preparation.

(a) Remove hose armor, if any, and condition a hose in a straight position in air at minus 40°F for 70 hours.

(b) Condition a cylinder in air at minus 40°F for 70 hours, using a cylinder of 2½ inches in diameter for test of hose less than ⅛-inch or 3 mm 3 inches for tests of ⅛-inch or 3 mm hose, 3½ inches for tests of 3/16-inch and ¼-inch hose or of 4 to 6 mm hose, and 4 inches for tests of hose greater than ¼ inch or 6 mm in diameter.

S6.6.2 Flexibility testing. Bend the conditioned hose 180 degrees around the conditioned cylinder at a steady rate in a period of 3 to 5 seconds. Examine without magnification for cracks.

S6.7 Brake fluid compatibility test.

S6.7.1 Preparation.

[(a) Attach a hose assembly below a 1-pint reservoir filled with 100 ml of SAE RM-66-03 *Compatibility Fluid* as shown in Figure 2. (SAE RM-1 *Compatibility Fluid*, as described in Appendix A of SAE Standard J1703b, *Motor Vehicle Brake Fluid*, July 1970, may be used in place of SAE RM-66-03 until October 26, 1986. **(51 F.R. 16694—May 6, 1986. Effective: May 6, 1986)]**

TABLE II—Hose Lengths

Free length between end fittings, inches	Slack, inches: ⅛-inch or 3 mm hose or less	Slack, inches: more than ⅛-inch or 3 mm hose
8 to 15½, inclusive	1.750	-----
10 to 15½, inclusive	-----	1.000
Over 15½ to 19 inclusive	1.250	-----
Over 19 to 24, inclusive	0.750	-----

(b) Fill the hose assembly with brake fluid, seal the lower end, and place the test assembly in an oven in a vertical position.

6.7.2 Oven treatment.

(a) Condition the hose assembly at 200° F for 70 hours.

(b) Cool the hose assembly at room temperature for 30 minutes.

(c) Drain the brake hose assembly, immediately determine that every inside diameter of any section of the hose assembly, except for that part of an end fitting which does not contain hose, is not less than 64 percent of the nominal inside diameter of the hose, and conduct the test specified in S6.2.

S6.8 Ozone resistance test. Utilize a cylinder with a diameter eight times the nominal outside diameter of the brake hose excluding armor.

S6.8.1 Preparation. After removing any armor, bind a hydraulic brake hose 360° around the cylinder. In the case of hose shorter than the circumference of the cylinder, bend the hose so that as much of its length as possible is in contact.

S6.8.2 Exposure to ozone.

(a) Condition the hose on the cylinder in air at room temperature for 24 hours.

(b) Immediately thereafter, condition the hose on the cylinder for 70 hours in an exposure chamber having an ambient air temperature of 104° F during the test and containing air mixed with ozone in the proportion of 50 parts of ozone per 100 million parts of air by volume.

(c) Examine the hose for cracks under 7-power magnification, ignoring areas immediately adjacent to or within the area covered by binding.

S6.9 End fitting corrosion resistance test. Utilize the apparatus described in ASTM B117-64, "Salt Spray (Fog) Testing."

S6.9.1 Construction. Construct the salt spray chamber so that:

(a) The construction material does not affect the corrosiveness of the fog;

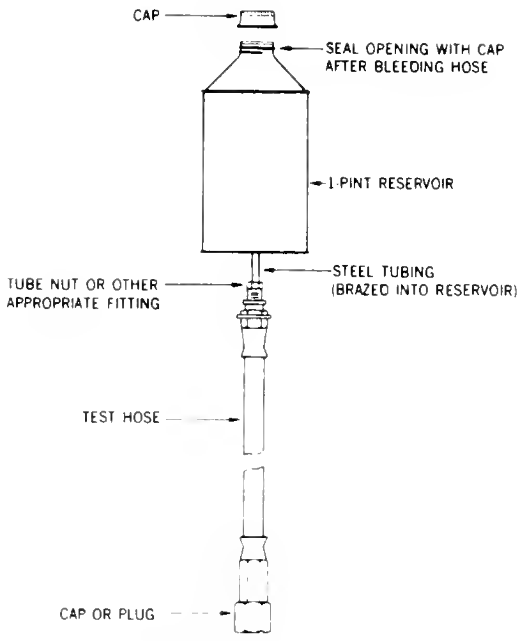

Fig. 2 Brake Fluid Compatability Apparatus

(b) The hose assembly is supported or suspended 30° from the vertical and parallel to the principal direction of the horizontal flow of fog through the chamber;

(c) The hose assembly does not contact any metallic material or any material capable of acting as a wick;

(d) Condensation which falls from the assembly does not return to the solution reservoir for respraying;

(e) Condensation from any source does not fall on the brake hose assemblies or the solution collectors; and

(f) Spray from the nozzles is not directed onto the hose assembly.

S6.9.2 Preparation.

(a) Plug each end of the hose assembly.

(b) Mix a salt solution five parts by weight of sodium chloride to 95 parts of distilled water, using sodium chloride substantially free of nickel and copper, and containing on a dry basis not more than 0.1 percent of sodium iodide and not more than 0.3 percent total impurities. Ensure that the solution is free of suspended solids before the solution is atomized.

(c) After atomization at 95° F ensure that the collected solution is in the pH range of 6.5 to 7.2. Make the pH measurements at 77° F.

(d) Maintain a compressed air supply to the nozzle or nozzles free of oil and dirt and between 10 to 25 psi.

S6.9.3 Operation. Subject the brake hose assembly to the salt spray continuously for 24 hours.

(a) Regulate the mixture so that each collector will collect from 1 to 2 ml of solution per hour for each 80 square centimeters of horizontal collecting area.

(b) Maintain exposure zone temperature at 95° F.

(c) Upon completion, remove the salt deposit from the surface of the hoses by washing gently or dipping in clean running water not warmer than 100° F and then drying immediately.

S7. Requirements—Air brake hose, brake hose assemblies, and brake hose end fittings.

S7.1 Construction. Each air brake hose assembly shall be equipped with permanently attached brake hose end fittings or reusable brake hose end fittings. Each air brake hose intended for use with reusable end fittings shall conform to the dimensional requirements specified in Table III.

7.2.1 Hose. Each air brake hose shall be labeled, or cut from bulk hose that is labeled, at intervals of not more than 6 inches, measured from the end of one legend to the beginning of the next, in block capital letters and numerals at least one-eighth of an inch high, with the information listed in paragraphs (a) through (e). The information need not be present on hose after it has become part of a brake hose assembly or after it has been installed in a motor vehicle.

(a) The symbol DOT, constituting a certification by the hose manufacturer that the hose conforms to all applicable motor vehicle safety standards.

(b) A designation that identifies the manufacturer of the hose, which shall be filed in writing with: Office of Vehicle Safety Standards, Crash Avoidance Division, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590. The designation may consist of block capital letters, numerals, or a symbol.

(c) The month, day, and year, or the month and year, of manufacture, expressed in numerals. For example, 10/1/74 means October 1, 1974.

(d) [The nominal inside diameter of the hose expressed in inches or fractions of inches or in millimeters, or the nominal outside diameter of plastic tubing expressed in inches or fractions of inches or in millimeters followed by the letters OD. The abbreviation "mm" shall follow hose sizes that are expressed in millimeters. (Examples of inside diameter: ⅛, ½ (½ SP in the case of ½ inch special air brake hose), 4 mm, 6 mm. Examples of outside diameter: ¼ OD, 12 mm OD.) (50 F.R. 4691—February 1, 1985. Effective: June 3, 1985)].

TABLE III—Air Brake Hose Dimensions for Reusable Assemblies

Size, inches	Inside Diameter Tolerance, inches	TYPE I O.D., inches Min	TYPE I O.D., inches Max	TYPE II O.D., inches Min	TYPE II O.D., inches Max
3/16	+0.026 −0.000	0.472	0.510	0.500	0.539
¼	+0.031 −0.000	0.535	0.573	0.562	0.602
5/16	+0.031 −0.000	0.598	0.636	0.656	0.695
⅜	±0.023	0.719	0.781	0.719	0.781
13/32	+0.031 −0.000	0.714	0.760	0.742	0.789
½	+0.039 −0.000	0.808	0.854	0.898	0.945
⅝	+0.042 −0.000	0.933	0.979	1.054	1.101
½ special	±0.031	0.844	0.906	0.844	0.906

(e)) The letter "A" shall indicate intended use in air brake systems. In the case of a hose intended for use in a reusable assembly, "AI" or "AII" shall indicate Type I or Type II dimensional characteristics of the hose as described in Table III.

S7.2.2 End fittings. Except for an end fitting that is attached by deformation of the fitting about a hose by crimping or swaging, at least one component of each air brake hose fittings shall be etched, embossed, or stamped in block capital letters and numerals at least one-sixteenth of an inch high with the following information:

(a) The symbol DOT, constituting a certification by the manufacturer of that component that the component conforms to all applicable motor vehicle safety standards.

(b) A designation that identifies the manufacturer of that component of the fitting, which shall be filed in writing with: Office of Vehicle Safety Standards, Crash Avoidance Division, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590. The designation may consist of block capital letters, numerals, or a symbol.

(c) The letter "A" shall indicate intended use in air brake systems. In the case of an end fitting intended for use in a reusable assembly, "AI" or "AII" shall indicate use with Type I or Type II hose, respectively.

(d) [The nominal inside diameter of the hose to which the fitting is properly attached expressed in inches or fractions of inches or in millimeters, or the outside diameter of the plastic tubing to which the fitting is properly attached expressed in inches or fractions of inches or in millimeters followed by the letters OD (See examples in S7.2.1(d)). The abbreviations "mm" shall follow hose sizes that are expressed in millimeters. (50 F.R. 4691—February 1, 1985. Effective: June 3, 1985)].

S7.2.3 Assemblies. Each air brake hose assembly made with end fittings that are attached by crimping or swaging, except those assembled and installed by a vehicle manufacturer in vehicles manufactured by him, shall be labeled by means of a band around the brake hose assembly as specified in this paragraph or, at the option of the manufacturer, by means of labeling as specified in S7.2.3.1. The band may at the manufacturer's option be attached so as to move freely along the length of the assembly, as long as it is retained by the end fittings. The band shall be etched, embossed, or stamped in block capital letters, numerals, or symbols at least one-eighth of an inch high, with the following information:

(a) The symbol DOT, constituting certification by the hose assembler that the hose assembly conforms to all applicable motor vehicle safety standards.

(b) A designation that identifies the manufacturer of the hose assembly, which shall be filed in writing with: Office of Vehicle Safety Standards, Crash Avoidance Division, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590. The designation may consist of block capital letters, numerals, or a symbol.

S7.2.3.1 At least one end fitting of an air brake hose assembly made with end fittings that are attached by crimping or swaging shall be etched, stamped, or embossed with a designation at least one-sixteenth of an inch high that identifies the manufacturer of the hose assembly and is filed in accordance with S7.2.3(b).

S7.3 Test requirements. Each air brake hose assembly or appropriate part thereof shall be capable of meeting any of the requirements set forth under this heading, when tested under the conditions of S11 and the applicable procedures of S8. However, a particular hose assembly or appropriate part thereof need not meet further requirements after having met the constriction requirement (S7.3.1) and then having been subjected to any one of the requirements specified in S7.3.2 through S7.3.13.

S7.3.1 Constriction. Except for that part of an end fitting which does not contain hose, every inside diameter of any section of an air brake hose assembly shall be not less than 66 percent of the nominal inside diameter of the brake hose.

S7.3.2 High temperature resistance. An air brake hose shall not show external or internal cracks, charring, or disintegration visible without magnification when straightened after being bent for 70 hours at 212° F over a cylinder having the radius specified in Table IV for the size of hose tested (S8.1).

S7.3.3 Low temperature resistance. The outer cover of an air brake hose shall not show cracks visible without magnification as a result of conditioning at minus 40° F for 70 hours when bent around a cylinder having the radius specified in Table IV for the size of hose tested (S8.2).

S7.3.4 Oil resistance. After immersion in ASTM No. 3 oil for 70 hours at 212° F the volume of a specimen prepared from the inner tube and cover of an air brake hose shall not increase more than 100 percent (S8.3).

S7.3.5 Ozone resistance. The outer cover of an air brake hose shall not show cracks visible under 7-power magnification after exposure to ozone for 70 hours at 104° F (S8.4).

S7.3.6 Length change. An airbrake hose shall not contract in length more than 7 percent nor elongate more than 5 percent when subjected to air pressure of 200 psi (S8.5). "(other than a coiled nylon tube for use in an assembly that meets the requirements of § 393.45 of this title)" followed the phrase "An air brake hose."

§ 7.3.7 Adhesion. "Except for hose reinforced by wire," an airbrake hose shall withstand a tensile force of 8 pounds per inch of length before separation of adjacent layers (S8.6).

S7.3.8 Air pressure. An air brake hose assembly shall contain air pressure of 200 psi for 5 minutes without loss of more than 5 psi (S8.7).

S7.3.9 Burst strength. An air brake hose assembly shall not rupture when exposed to hydrostatic pressure of 800 psi (S8.8).

S7.3.10 Tensile strength. [An air brake hose assembly (other than a coiled nylon tube assembly which meets the requirements of § 393.45 of this title) designed for use between frame and axle or between a towed and a towing vehicle shall withstand, without separation of the hose from its end fittings, a pull of 250 pounds if it is 1/4 inch or less or 6 mm or less in nominal internal diameter, or a pull of 325 pounds if it is larger than 1/4 inch or 6 mm in nominal internal diameter. An air brake hose assembly designed for use in any other application shall withstand, without separation of the hose from its end fitting, a pull of 50 pounds if it is 1/4 inch or 6 mm or less in nominal internal diameter, 150 pounds if it is 3/8 or 1/2 inch or 10 mm to 12 mm in nominal internal diameter, or 325 pounds if it is larger than 1/2 inch or 12 mm in nominal internal diameter (S8.9). (50 F.R. 4691—February 1, 1985. Effective: June 3, 1985)]

S7.3.11 Water absorption and tensile strength. [After immersion in distilled water for 70 hours (S8.10), an air brake hose assembly (other than a coiled tube assembly which meets the requirements of § 393.45 of this title) designed for use between frame and axle or between a towed and a towing vehicle shall withstand without separation of the hose from its end fittings a pull of 250 pounds if it is 1/4 inch or 6 mm or less in nominal internal diameter, or a pull of 325 pounds if it is larger than 1/4 inch or 6 mm in nominal internal diameter. After immersion in distilled water for 70 hours (S8.10), an air brake hose assembly designed for use in any other application shall withstand without separation of the hose from its end fitting a pull of 50 pounds if it is 1/4 inch or 6 mm or less in nominal internal diameter, 150 pounds if it is 3/8 or 1/2 inch or 10 to 12 mm in nominal internal diameter, or 325 pounds if it is larger than 1/2 inch or 12 mm in nominal internal diameter (S8.9). (50 F.R. 4691—February 1, 1985. Effective: June 3, 1985)]

S7.3.12 Zinc chloride resistance. The outer cover of an air brake hose shall not show cracks visible under 7-power magnification after immersion in a 50-percent zinc chloride aqueous solution for 200 hours (S8.11).

TABLE IV—Air Brake Hose Diameters and Test Cylinder Radii

[Nominal hose diameter in. *	1/8	3/16	1/4	5/16	3/8, 13/32	7/16, 1/2	5/8
mm. *	3	4, 5	6	8	10	12	16
Radius of test cylinder in inches	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2

* These sizes are listed to provide test values for brake hoses manufactured in these sizes. They do not represent conversions. (50 F.R. 4691—February 1, 1985. Effective: June 3, 1985)].

S7.3.13 End fitting corrosion resistance. After 24 hours of exposure to spray, air brake hose end fittings shall show no base metal corrosion on the end fitting surface except where crimping or the application of label information causes a displacement of the protective coating.

S8. Test procedures—Air brake hose, brake hose assemblies, and brake hose end fittings.

S8.1 High temperature resistance test.

(a) Utilize a cylinder having the radius indicated in Table IV for the size of hose tested.

(b) Bind the hose around the cylinder and condition it in an air oven for 70 hours at 212°F.

(c) Cool the hose to room temperature, remove it from the cylinder and straighten it.

(d) Without magnification, examine the hose externally and cut the hose lengthwise and examine the inner tube.

S8.2 Low temperature resistance test.

(a) Utilize a cylinder having the radius indicated in Table IV for the size of hose tested.

(b) Condition the cylinder and the brake hose, in a straight position, in a cold box at minus 40° F for 70 hours.

(c) With the hose and cylinder at minus 40° F, bend the hose 180 degrees around the cylinder at a steady rate in a period of 3 to 5 seconds.

S8.3 Oil resistance test. Utilize three test specimens and average the results.

S8.3.1 Preparation. Fashion a test specimen by cutting a rectangular block 2 inches long and not less than one-third of an inch in width, having a thickness of not more than one-sixteenth inch, from the brake hose and buff the specimen on both faces to ensure smooth surfaces.

S8.3.2 Measurement.

(a) Weigh each specimen to the nearest milligram in air (W1) and in distilled water (W2) at room temperature. If wetting is necessary to remove air bubbles, dip the specimen in acetone and thoroughly rinse it with distilled water.

(b) Immerse each specimen in ASTM No. 3 oil for 70 hours at 212° F and then cool in ASTM No. 3 oil at room temperature for 30 to 60 minutes.

(c) Dip the specimen quickly in acetone and blot it lightly with filter paper.

(d) Weigh each specimen in a tared weighing bottle (W3) and in distilled water (W4) within five minutes of removal from the cooling liquid.

(e) Calculate the percentage increase in volume as follows:

$$\text{Percent of increase} = \frac{(W_3 - W_4) - (W_1 - W_2)}{(W_1 - W_2)} \times 100$$

S8.4 Ozone resistance test. Conduct the test specified in S6.8 using air brake hose.

S8.5 Length change test.

(a) Position a test hose in a straight, horizontal position, and apply air pressure of 10 psi thereto.

(b) Measure the hose to determine original free length.

(c) Without releasing the 10 psi, raise the air pressure to the test hose to 200 psi.

(d) Measure the hose under 200 psi to determine final free length. An elongation or contraction is an increase or decrease respectively, in the final free length from the original free length of the hose.

S8.6 Adhesion test.

S8.6.1 Apparatus. [A tension testing machine that is power-driven and that applies a constant rate of extension is used for measuring the force required to separate the layers of the test specimen. The apparatus is constructed so that:

(a) The recording head includes a freely rotating form with an outside diameter substantially the same as the inside diameter of the hose specimen to be placed on it.

(b) The freely rotating form is mounted so that its axis of rotation is in the plane of the ply being separated from the specimen and so that the applied force is perpendicular to the tangent of the specimen circumference at the line of separation.

(c) The rate of travel of the power-actuated grip is a uniform one inch per minute and the capacity of the machine is such that maximum applied tension during the test is not more than 85 percent nor less than 15 percent of the machine's rated capacity.

(d) The machine produces a chart with separation as one coordinate and applied tension as the other. **(51 F.R. 603—January 7, 1986, Effective: July 6, 1986)]**

S8.6.2 Preparation.

(a) Cut a test specimen of 1 inch or more in length from the hose to be tested and cut the layer to be tested of that test specimen longitudinally along its entire length to the level of contact with the adjacent layer.

(b) Peel the layer to be tested from the adjacent layer to create a flap large enough to permit attachment of the power-actuated clamp of the apparatus.

(c) Mount the test specimen on the freely rotating form with the separated layer attached to the power-actuated clamp.

S8.6.3 Operation. Reserved

S8.6.4 Calculations.

(a) [The adhesion value shall be the minimum force recorded on the chart excluding that portion of the chart which corresponds to the initial and final 20 percent portion along the displacement axis. **(51 F.R. 603—January 7, 1986. Effective: July 6, 1986)]**.

(b) Express the force in pounds per inch of length.

S8.7 Air pressure test.

(a) Connect the air brake hose assembly to a source of air pressure.

(b) Apply 200 psi air pressure to the hose and seal the hose from the source of air pressure.

(c) After 5 minutes, determine the air pressure remaining in the test specimen.

S8.8 Burst strength test.

(a) Utilize an air brake hose assembly.

(b) Fill the hose assembly with water, allowing all gases to escape. Apply water pressure at a uniform rate of increase of approximately 1,000 psi per minute until the hose ruptures.

S8.9 Tensile strength test. Utilize a tension testing machine conforming to the requirements of the Methods of Verification of Testing Machines (1964 American Society for Testing and Materials, Designation E4), and provided with a recording device to register total pull in pounds.

(a) Attach an air brake hose assembly to the testing machine to permit straight, even, machine-pull on the hose.

(b) Apply tension at a rate of 1 inch per minute travel of the moving head until separation occurs.

TABLE V—Vacuum Brake Hose Test Requirements

Hose inside diameter*		High temperature resistance		Low temperature resistance		Bend		Deformation—
Inches	Millimeters	Hose length, inches	Radius of cylinder, inches	Hose length, inches	Radius of cylinder inches	Hose length, inches	Maximum collapse of outside diameter, inches	collapsed inside diameter (dimension D), inches
7/32	5	8	1 1/2	17 1/2	3	7	11/64	3/64
1/4	6	9	1 1/2	17 1/2	3	8	3/32	1/16
9/32		9	1 3/4	19	3 1/2	9	12/64	4/64
11/32	8	9	1 3/4	19	3 1/2	11	13/64	6/64
3/8	10	10	1 3/4	19	3 1/2	12	5/32	3/32
7/16		11	2	20 1/2	4	14	17/64	5/64
15/32		11	2	20 1/2	4	14	17/64	5/64
1/2	12	11	2	20 1/2	4	16	7/32	1/8
5/8	16	12	2 1/4	22	4 1/2	22	7/32	6/32
3/4		14	2 1/2	24	5	28	7/32	3/16
1.0		16	3 1/4	28 1/2	6 1/2	36	9/32	1/4

* These sizes are listed to provide test values for brake hoses in these sizes. They do not represent conversions.

S8.10 Water absorption and tensile strength test. Immerse an air brake hose assembly in distilled water at room temperature for 70 hours. Thirty minutes after removal from the water, conduct the test specified in S8.9.

S8.11 Zinc chloride resistance test. Immerse an air brake hose in a 50-percent zinc chloride aqueous solution at room temperature for 200 hours. Remove it from the solution and examine it under 7-power magnification for cracks.

S8.12 End fitting corrosion resistance test. Conduct the test specified in S6.9 using an air brake hose assembly.

S9. Requirements—vacuum brake hose, brake hose assemblies, and brake hose end fittings.

9.1 Labeling.

S9.1.1 Hose. Each vacuum brake hose shall be labeled, or cut from bulk hose that is labeled, at intervals of not more than 6 inches, measured from the end of one legend to the beginning of the next, in block capital letters and numerals at least one-eighth of an inch high, with the information listed in paragraphs (a) through (e). The information need not be present on hose after it has become part of a brake hose assembly or after it has been installed in a motor vehicle.

(a) The symbol DOT, constituting a certification by the hose manufacturer that the hose conforms to all applicable motor vehicle safety standards.

(b) A designation that identifies the manufacturer of the hose, which shall be filed in writing with: Office of Vehicle Safety Standards, Crash Avoidance Division, National Highway Traffic Safety Administration, 400 Seventh Street S.W., Washington, D.C. 20590. The designation may consist of block capital letters, numerals, or a symbol.

(c) The month, day, and year, or the month and year, of manufacture, expressed in numerals. For example, 10/1/74 means October 1, 1974.

(d) [The nominal inside diameter of the hose expressed in inches or fractions of inches or in millimeters, or the nominal outside diameter of plastic tubing expressed in inches or fractions of inches or in millimeters followed by the letters OD. The abbreviation "mm" shall follow hose sizes that are expressed in millimeters. (Example of inside diameter: 7/32, 1/4, 4 mm. Example of outside diameter: 1/4 OD, 12 mm OD.) (50 F.R. 4691—February 1, 1985. Effective: June 3, 1985)]

(e) The letters "VL" or "VH" shall indicate that the component is a light-duty vacuum brake hose or heavy-duty vacuum brake hose, respectively.

S9.1.2 End Fittings. Except for an end fitting that is attached by heat shrinking or by interference fit with plastic vacuum hose or that is attached by deformation of the fitting about a hose by crimping or swaging, at least one component of each vacuum brake hose fitting shall be etched, embossed, or stamped in block capital letters and numerals at least one-sixteenth of an inch high with the following information:

(a) The symbol DOT, constituting a certification by the manufacturer of that component that the component conforms to all applicable motor vehicle safety standards.

(b) A designation that identifies the manufacturer of that component of the fitting, which shall be filed in writing with: Office of Vehicle Safety Standards, Crash Avoidance Division, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590. The designation may consist of block capital letters, numerals, or a symbol.

(c) The letters "VL" or "VH" shall indicate that the end fitting is intended for use in a light-duty or heavy-duty vacuum brake system, respectively.

(d) [The nominal inside diameter of the hose to which the fitting is properly attached expressed in inches or fractions of inches or in millimeters, or the outside diameter of the plastic tubing to which the fitting is properly attached expressed in inches or fraction of inches or in millimeters followed by the letters OD (See examples in S9.1.1 (d)). The abbreviation "mm" shall follow hose sizes that are expressed in millimeters. (50 F.R. 4691—February 1, 1985. Effective: June 3, 1985)]

S9.1.3 Assemblies. Each vacuum brake hose assembly made with end fittings that are attached by crimping or swaging and each plastic tube assembly made with end fittings that are attached by heat shrinking or dimensional interference fit, except those assembled and installed by a vehicle manufacturer in vehicles manufactured by him, shall be labeled by means of a band around the brake hose assembly as specified in this paragraph or, at the option of the manufacturer, by means of labeling as specified in S9.1.3.1 The band may at the manufacturer's option attached so as to move freely along the length of the assembly, as long as it is retained by the end fittings. The band shall be etched, embossed, or stamped, in block capital letters and numerals at least one-eighth of an inch high, with the following information:

(a) The symbol DOT, constituting certification by the hose assembler that the hose assembly conforms to all applicable motor vehicle safety standards.

(b) A designation that identifies the manufacturer of the hose assembly, which shall be filed in writing with: Office of Vehicle Safety Standards, Crash Avoidance Division, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590. The designation may consist of block capital letters, numerals, or a symbol.

S9.1.3.1 At least one end fitting of a vacuum brake hose assembly made with end fittings that are attached by crimping or swaging, or of a plastic tubing assembly made with end fittings that are attached by heat shrinking or dimensional interference fit shall be etched, stamped, or embossed with a designation at least one-sixteenth of an inch high that identifies the manufacturer of the hose assembly and is filed in accordance with S9.1.3(b).

S9.2 Test requirements. Each vacuum brake hose assembly or appropriate part thereof shall be capable of meeting any of the requirements set forth under this heading, when tested under the conditions of S11 and the applicable procedures of S10. However, a particular hose assembly or appropriate part thereof need not meet further requirements after having met the constriction requirement (S9.2.1) and then having been subjected to any one of the requirements specified in S9.2.2 through S9.2.11.

S9.2.1 Constriction. Except for that part of an end fitting which does not contain hose, every inside diameter of any section of a vacuum brake hose assembly shall be not less than 75 percent of the nominal inside diameter of the hose if for heavy duty, or 70 percent of the nominal inside diameter of the hose if for light duty.

S9.2.2 High temperature resistance. A vacuum brake hose shall not show external or internal cracks, charring, or disintegration visible without magnification when straightened after being bent for 70 hours at 212° F over a cylinder having the radius specified in Table V for the size of hose tested (S10.1).

S9.2.3 Low temperature resistance. A vacuum brake hose shall not show cracks visible without magnification after conditioning at minus 40° F for 70 hours when bent around a cylinder having the radius specified in Table V for the size hose Tested (S10.2).

S9.2.4 Ozone resistance. A vacuum brake hose shall not show cracks visible under 7-power magnification after exposure to ozone for 70 hours (S10.3).

S9.2.5 Burst strength. A vacuum brake hose shall not rupture under hydrostatic pressure of 350 psi (S10.4).

S9.2.6 Vacuum. The collapse of the outside diameter of a vacuum brake hose under internal vacuum of 26 inches of Hg for five minutes shall not exceed one-sixteenth of an inch (S10.5).

S9.2.7 Bend. The collapse of the outside diameter of a vacuum brake hose at the middle point of the test length when bent until the ends touch shall not exceed the values given in Table V for the size of hose tested (S10.6).

S9.2.8 Swell. Following exposure to Reference Fuel A, every inside diameter of any section of a vacuum brake hose shall be not less than 75 percent of the nominal inside of the hose if for heavy duty, or 70 percent of the nominal inside diameter of the hose if for light duty. The vacuum brake hose shall show no leakage and there shall be no separation of the inner tube from the fabric reinforcement of the hose in a vacuum test of 26 inches of Hg for 10 minutes (S10.7).

S9.2.9 Adhesion. "Except for hose reinforced by wire," a vacuum brake hose shall withstand a force of 8 pounds per inch of length before separation of adjacent layers (S10.8).

S9.2.10 Deformation. A vacuum brake hose shall return to 90 percent of its original outside diameter within 60 seconds after five applications of force as specified in S10.9, except that a wire-reinforced hose need only return to 85 percent of its original outside diameter. In the case of heavy-duty hose the first application of force shall not exceed a peak value of 70 pounds, and the fifth application of force shall reach a peak value of at least 40 pounds. In the case of light-duty hose the first application of force shall not exceed a peak value of 50 pounds, and the fifth application of force shall reach a peak value of at least 20 pounds (S10.9).

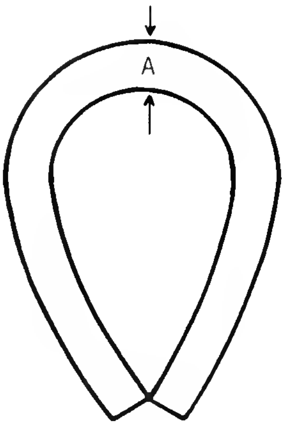

Fig. 3—Bend Test of Vacuum Brake Hose.

S9.2.11 End fitting corrosion resistance. After 24 hours of exposure to salt spray, vacuum brake hose end fittings shall show no base metal corrosion of the end fitting surface except where crimping or the application of labeling information has caused displacement of the protective coating.

S10. Test procedures—Vacuum brake hose, brake hose assemblies, and brake hose and fittings.

S10.1 High temperature resistance test. Conduct the test specified in S8.1 using vacuum brake hose with the cylinder radius specified in Table V for the size of hose tested.

S10.2 Low temperature resistance test. Conduct the test specified in S8.2 using vacuum brake hose with the cylinder radium specified in Table V for the size of hose tested.

S10.3 Ozone resistance test. Conduct the test specified in S6.8 using vacuum brake hose.

S10.4 Burst strength test. Conduct the test specified in S8.8 using vacuum brake hose.

TABLE VI

Dimensions of Test Specimen and Feeler Gage for Deformation Test

*Hose Inside Diameter**		*Specimen Dimensions (see Fig. 4)*		*Feeler Gage Dimensions*	
(inch)	*Mm.*	*D (inch)*	*L (inch)*	*Width (inch)*	*Thickness (inch)*
[7/32	5	3/64	1	1/8	3/64
1/4	6	1/16	1	1/8	1/16
9/32		1/16	1	1/8	1/16
11/32	8	5/64	1	3/16	5/64
3/8	10	3/32	1	3/16	3/32
7/16		5/64	1	1/4	5/64
15/32		5/64	1	1/4	5/64
1/2	12	1/8	1	1/4	1/8
5/8	16	5/32	1	1/4	5/32
3/4		3/16	1	1/4	3/16
1.0		1/4	1	1/4	1/4]

* These sizes are listed to provide test values for brake hoses manufactured in these sizes. They do not represent conversions. (50 F.R. 4691—February 1, 1985. Effective: June 3, 1985)

S10.5 Vacuum test. Utilize a 12-inch vacuum brake hose assembly sealed at one end.

(a) Measure the hose outside diameter.

(b) Attach the hose to a source of vacuum and subject it to a vacuum of 26 inches of Hg for 5 minutes.

(c) Measure the hose to determine the minimum outside diameter while the hose is still subject to vacuum.

§ 10.6 Bend test.

(a) Bend a vacuum brake hose, of the length prescribed in Table V, in the direction of its normal curvature until then ends just touch, as shown in Figure 3.

(b) Measure the outside diameter of the specimen at point A before and after bending.

(c) The difference between the two measurements is the collapse of the hose outside diameter on bending.

S10.7 Swell test.

(a) Fill a specimen of vacuum brake hose 12 inches long with Reference Fuel A as described in the Method of Test for Change in Properties of Elastomeric Vulcanizers Resulting From Immersion in Liquids (1964 American Society for Testing and Materials Designation D471).

(b) Maintain reference fuel in the hose under atmospheric pressure at room temperature for 48 hours.

(c) Remove fuel and determine that every inside diameter of any section of the brake hose is not less than 75 percent of the nominal inside diameter of the hose for heavy-duty hose and 70 percent of the nominal inside diameter of the hose for light-duty hose.

(d) Subject the hose specimen to a vacuum of 26 inches of Hg for 10 minutes.

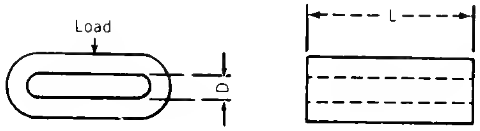

Fig 4 Deformed Specimen of Vacuum Brake Hose

S10.8 Adhesion test. Conduct the test specified in S8.6 using vacuum brake hose.

S10.9 Deformation test. Table VI specifies the test specimen dimensions.

S10.9.1 Apparatus. Utilize a compression device, equipped to measure force of at least 100 pounds, and feeler gauges of sufficient length to be passed completely through the test specimen.

S10.9.2 Operation.

(a) Position the test specimen longitudinally in the compression device with the fabric laps not in the line of the applied pressure.

(b) Apply gradually increasing force to the test specimen to compress its inside diameter to that specified in Table VI (dimension D of Figure 4) for the size of hose tested.

(c) After 5 seconds release the force and record the peak load applied.

(d) Repeat the procedure four times permitting a 10-second recovery period between load applications.

S10.10 End fitting corrosion resistance test.

Conduct the test specified in S6.9 using a vacuum brake hose assembly.

S11. Test conditions. Each hose assembly or appropriate part thereof shall be able to meet the requirements of S5, S7, and S9 under the following conditions.

S11.1 The temperature of the testing room is 75° F.

S11.2 Except for S6.6, S8.2, and S10.2, the test samples are stabilized at test room temperature prior to testing.

S11.3 The brake hoses and brake hose assemblies are at least 24 hours old, and unused.

S12. Notwithstanding any other provision of this standard, a brake hose assembly shall meet each requirement of this standard, except that the assembly may be constructed of brake hose which meets every requirement of the standard for hose other than the hose labeling requirements of S5.2, S7.2, and S9.1, and the assembly may be constructed of end fittings which meet every requirement of the standard for end fittings other than the end fitting labeling requirements of S5.2, S7.2, and S9.1.

S13. Notwithstanding any other provision of this standard, a vehicle to which this standard applies shall be equipped with brake hose, brake hose end fittings, and brake hose assemblies that meet each requirement of this standard, with the following exceptions:

(a) The vehicle may be equipped with brake hose that meets every requirement of the standard for hose other than the hose labeling requirements of S5.2, S7.2, and S9.1;

(b) The vehicle may be equipped with end fittings that meet every requirement of the standard for end fittings other than the end fitting labeling requirements of S5.2, S7.2, and S9.1; and

(c) The vehicle may be equipped with brake hose assemblies that meet every requirement of the standard for assemblies other than the assembly labeling requirements of S5.2, S7.2, and S9.1.

38 F.R. 31302
November 13, 1973

MOTOR VEHICLE SAFETY STANDARD NO. 107

Reflecting Surfaces—Passenger Cars, Multipurpose Passenger Vehicles, Trucks, and Buses

S1. Purpose and scope. This standard specifies reflecting surface requirements for certain vehicle components in the driver's field of view.

S2. Application. This standard applies to passenger cars, multipurpose passenger vehicles trucks, and buses.

S3. Definitions. "Field of view" means the area forward of a lateral vertical plane which is located tangent to the rearmost boundary of the SAE 99th percentile eye range contour of SAE Recommended Practice J941, November 1965. "Specular gloss" means the luminous fractional reflectance of a specimen at the specular direction.

S4. Requirements. The specular gloss of the surface of the materials used for the following bright metal components in the driver's field of view shall not exceed 40 units when measured by the 20° method of ASTM Standard D523-62T, June 1962—

(a) Windshield wiper arms and blades;

(b) Inside windshield mouldings;

(c) Horn ring and hub of steering wheel assembly; and

(d) Inside rearview mirror frame and mounting bracket.

32 F.R. 2411
February 3, 1967

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment—Passenger Cars, Multipurpose Passenger Vehicles, Trucks, Buses, Trailers and Motorcycles

(Docket No. 69–18)

On January 3, 1970, a proposal to amend Federal Motor Vehicle Safety Standard No. 108 (Docket No. 69–18) was published in the *Federal Register* (35 F.R. 106). Comments were requested on 25 proposed amendments.

Interested persons have been afforded an opportunity to participate in the rulemaking process and their comments have been considered in the amendments published today. Except as otherwise noted, the amendments are effective July 1, 1971. The amendments are discussed below in the order in which the proposals were published. Unless otherwise indicated, there were no significant objections to the proposals that are being adopted.

(a) It was proposed that Standard No. 108 be extended to include requirements for replacement lighting equipment on vehicles manufactured to comply with Standard No. 108, and all replacement sealed beam headlamp units, lamp bulbs, and plastic lenses.

The proposal to include replacement equipment on vehicles manufactured on or after the effective date of the standard (July 1, 1971) has been adopted. However, the proposal to include all replacement sealed beam headlamp units, lamp bulbs, and plastic lenses on vehicles manufactured prior to that date has been deferred because of the difficulties involved in retrofitting vehicles that were not originally manufactured to conform to Standard No. 108. Further study is necessary of the problems, leadtime, and costs involved in designing and testing replacement equipment for older vehicles that meets the standards required of motor vehicles manufactured today.

(b) The present intermediate side marker device requirement covering vehicles 30 feet or more in overall length, and 80 inches and more in overall width, has been extended to cover vehicles of lesser width.

Commenters requested that the overall length of a trailer be interpreted to exclude the length of the trailer tongue. However, it has been determined that when the rear of a trailer is 30 feet or more from the towing vehicle, intermediate side marker devices are warranted, regardless of the length of the trailer tongue.

(c) SAE Standard J594d, "Reflex Reflectors", has replaced J594c as the basic reference for this item of lighting equipment. Some commenters felt that Class B reflectors (eliminated in J594d) should still be permitted for motorcycles, but the Bureau believes that a motor vehicle whose conspicuity is already marginal should be required to have Class A reflectors.

(d) Self-canceling turn signal operating units wil be required on all vehices less than 80 inches in overall width. One commenter requested excluding all trucks, truck tractors, and commercial vehicles regardless of vehicle width, and several commenters requested the elimination of the requirement for cancellation by steering wheel rotation.

Since the operation of vehicles less than 80 inches in overall width is similar to that of passenger vehicles and other vehicles of lesser width are operated by drivers other than pro-

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Individual copies of Motor Vehicle Safety Standards may be obtained from the National Highway Safety Bureau's General Services Division, Room 5111C, Nassif Building, 400 Seventh Street SW., Washington, D.C. 20590.

fessionals, their exclusion from this requirement is not warranted.

The Bureau is studying automatic cancellation by time or distance, or both, but current evidence indicates that these methods, given the state of the art, are inferior to cancellation by steering wheel rotation.

(e) As proposed, amber has been eliminated as an optional color of the stop lamp.

(f) The minimum candlepower of any separately mounted stoplamp will equal that of a Class A turn signal lamp.

Many commenters requested a longer leadtime to comply. The requests have been found reasonable, and good cause has been shown for an effective date of January 1, 1973. Other comments suggested consideration of stop lamp candlepower in connection with dual intensity signals, allowance for multiple compartment lamps, and retention of the present Class B intensity for motorcycle stop lamps.

Dual intensity signals have not been proposed, and since time is required for development and implementation of such a proposal, a requirement for increased minimum candlepower in stop lamps cannot be deferred. No justification has been found for not requiring Class A intensity for motorcycle stop lamps. The standard is therefore being amended as proposed, with clarifying provisions for multiple compartment stop lamps.

(g) It was proposed that motorcycles should be equipped with turn-signal lamps, that there be a maximum candlepower limitation on amber rear-mounted lamps, and that minimum photometric output of head and tail lamps at engine idle speeds should be specified.

Several comments objected to the maximum candlepower proposal and the mounting requirements specified in the proposed Table IV. Also, comments indicated potential problems if minimum photometric output were specified, suggesting instead reference to SAE Recommended Practice J392, "Motorcycle and Motor Driven Cycle Electrical System Maintenance of Design Voltage", December 1969.

Glare candlepower tests on signal lamps installed on the rear of motor vehicles have consistently indicated that a specification in excess of 300 candlepower for both red and amber lamps is not desirable. A manufacturer encountering problems of exceeding this maximum with amber lamps has the option of using red lamps, which have a lower minimum required candlepower.

The detection and interpretation of turn signal lamps improves as they are mounted farther away from the centerline of the vehicle and from other lamps. Some motorcycle manufacturers, recognizing this fact, have installed the turn signal lamps in the ends of the handlebars, exceeding the requirements adopted in the amendment. The mounting requirements for these lamps specified in Table IV are considered reasonable and practicable for motorcycles.

The standard is being amended as proposed, except that minimum photometric output of headlamps and taillamps at engine idle speeds is not specified. Minimum photometrics are currently being studied for further rulemaking. Since an incorporation by reference to SAE Recommended Practice J392 was not proposed, it is beyond the scope of this rulemaking to incorporate it in the amendment.

(h) Aging and weathering requirements for plastic materials used for optical parts are specified. Although the comments generally supported this revision, many requested a more realistic test than continuous operation of stop and backup lamps in an oven for 1 hour to determine lens warpage. Accordingly, the amendment requires a cycle of operation of 10 minutes' duration followed by 10 minutes' rest during the 1 hour test. Comments suggesting extending the 2-year outdoor exposure test to 3 years and additional oven test details were beyond the scope of the proposal, and will be considered in future rulemaking actions.

(i) As proposed, the words "it is recommended that," "recommendations," or "should be" appearing in any referenced and subreferenced SAE standard shall be read as setting forth mandatory requirements, with minor exceptions covering certain aspects of school bus warning lamps.

(j) Specific tolerances for mounting lamps and reflectors "as far apart as practicable" were proposed, but have not been adopted.

Several comments recommended adopting the ISO (International Standards Organization) requirements that lamps and reflectors be mounted within 16 inches of the edge of the vehicle. Others stated that the Bureau did not have the authority to establish tolerances.

Vehicles having lamps located in conformance with ISO regulations may create problems of distance judgment resulting in driver error. Lamps could be mounted in a range from a minimum of 25 inches apart on small imported passenger cars to a maximum of 74 inches apart on standard domestic cars.

The location of lamps and reflectors is clearly safety related, as it facilitates clearance and distance estimation, detection of signals, and similar functions. The Bureau therefore has the authority to establish horizontal mounting tolerances, analogous to the vertical tolerances that have already been established.

Major changes in lighting requirements may result in the rulemaking action proceeding under Docket No. 69-19. New requirements such as horizontal mounting tolerances need relatively long leadtimes. Accordingly, this proposal has not been adopted, and the requirement for lamps and reflectors is still that they be located "as far apart as practicable."

(k) Lamps and reflectors must meet specified visibility angles when mounted on the vehicle.

Some comments pointed out that when special equipment such as mirrors and snow plows is mounted on the vehicle visibility and photometric test angles may not be met. The amendment allows compliance with this requirement by means of auxiliary lighting devices.

Items (l) through (o) represents proposals which were adopted:

(l) The axis of side reflex reflectors for the photometric test has been defined.

(m) The minimum mounting height for reflectors mounted on the rear of truck tractor cabs will be 4 inches above the height of the rear tires.

(n) Combination turn signal and hazard warning signal flashers will meet the requirements applicable to each, when tested in sequence. Manufacturers of turn signal and hazard warning signal flashers have commented that economic factors and the current state of the art in manufacturing lamps preclude a quality level that would totally eliminate occasional random failures. This condition is reflected in the language in Standard No. 108 that lighting equipment "shall be designed to conform" to the stated requirements. The SAE recognizes the problem by specifying an allowable percentage of failures in SAE Standards J590b, "Automotive Turn signal Flasher," and J945, "Vehicular Hazard Warning Signal Flasher." Such a provision is inappropriate, however, for regulatory purposes. It is doubtful that specific failure allowance in a standard would correspond with the statutory mandate that "No person shall manufacture for sale * * * any motor vehicle or item of motor vehicle equipment * * * unless it is in conformity with [any applicable] standard". (15 U.S.C. 1397(a)(1)). From a practical standpoint, such a provision would tend to make the requirement unenforceable except in extreme cases, since failures within a single lot are statistically inconclusive in determining the extent of failures in overall production. Therefore the sampling provisions of the two SAE Standards, originally incorporated by reference in Standard No. 108, are expressly omitted from the standard in this issuance. The omission should not cause a hardship, since the "designed to conform" language has been retained.

(o) SAE Recommended Practice J565b, "Semi-Automatic Headlamp Beam Switching Devices", has replaced J565a as the basic reference for this item of lighting equipment.

(p) It was proposed that all vehicles be equipped with a turn signal pilot indicator, and that those vehicles not equipped to tow trailers (i.e. vehicles with a fixed load flasher) be provided with a lamp failure indicator.

If visible to the rider, motorcycle front turn signal lamps can serve as the pilot indicator, as permitted in SAE Standard J588d, "Turn Signal Lamps".

Many comments objected to the proposal for a lamp failure indicator on vehicles 80 inches or more in overall width. Heavy-duty flashers used on these vehicles are not presently available with a failure indicator. However, this type flasher is considerably more durable than the fixed-load type, used on vehicles of lesser width, which indicates a lamp failure, and the continued use of present heavy-duty flashers for wider vehicles is warranted. Also, vehicles of 80 inches or more overall width are generally used commercially, and many of them are subject to the regulations of the Bureau of Motor Carrier Safety of the Federal Highway Administration; such vehicles are more frequently inspected and failed lamps more promptly repaired. For the foregoing reasons, vehicles of 80 or more inches overall width are excluded from the requirement in the amended standard for a turn signal lamp failure indicator.

(q) As proposed, on vehicles less than 80 inches in overall width, license plate lamps and side marker lamps must be on when the headlamps are on, and the taillamps, license plate lamps, and side marker lamps when the parking lamps are on.

(r) No lamps that are normally steady-burning will be allowed to flash automatically for signaling purposes, except headlamps and side marker lamps.

Some commenters requested that additional lamps be permitted to flash, and some requested that flashing headlamps be prohibited.

With the exception of certain signals such as turn signals, hazard warning, and schoolbus warning signals, flashing lamps should be reserved for emergency and road-maintenance-type vehicles. Flashing lamps are otherwise prohibited in the Uniform Vehicle Code. Any lamp may be flashed by the vehicle driver by merely turning the standard lamp switch on and off, and this standard cannot prohibit such operation. However, the definition of "flash" adopted in the amendment makes clear that automatic flashers for use with steady burning lamps other than headlamps and side marker lamps are prohibited.

(s) SAE Standard J593c, "Backup Lamps", has replaced J592b as the basic reference for these lamps. The clarification is made that the center of the backup lamp lens is the optical center. However, because of the leadtime that will be required for manufacturers to alter their designs, good cause is considered shown for an effective date of January 1, 1973.

(t) Headlamp mountings will be required to meet SAE Recommended Practice J566, "Headamp Mountings". Although some comments suggested that this was a redundant requirement, it has been determined that this set of requirements contains important safety elements such as requiring lateral adjustability of motorcycle headlamps, adjustability of all headlamps by one man with ordinary tools, and that the aim will not be disturbed under ordinary conditions of service, matters that are not dealt with elsewhere in Standard No. 108.

(u) Turn signal operating units must be capable of meeting a durability test of 100,000 cycles. Most of the comments stated that the 175,000-cycle durability test proposed for passenger cars would be difficult to meet and recommended that SAE Standard J589a be referenced instead of J589. Since J589a includes other changes that were not proposed (temperature test, durability test cycle rate, and ambient temperature), it is beyond the scope of this rulemaking to incorporate it by reference in the amended standard. However, a 100,000-cycle durability test has been adopted, as specified in J589a.

(v) The mounting requirements for clearance lamps have been amended to indicate that delineating overall vehicle width, rather than vehicle height, is the primary purpose of these lamps, and a clarification has been added that clearance lamps on truck tractors may be mounted so as to indicate the width of the cab.

(w) Identification lamps must be mounted as high as practicable, and the maximum permissible spacing between the lamps has been reduced from 12 inches to 8 inches.

Objections to these requirements were received primarily because the reduced spacing would create mounting problems due to interference with functional hardware, such as air conditioners and door locking mechanisms. The 8-inch maximum spacing has been adopted, but spacing 6 to 12 inches apart is allowed when 8-inch maximum spacing is not practicable.

(x) License plate lamps must illuminate the plate from the top or sides only.

This is a standard practice with domestic vehicle manufacturers, but not with foreign ones. Foreign manufacturers objected because of inadequate leadtime, and the proposal has been adopted with an effective date of January 1, 1973.

(y) A maximum mounting height of 72 inches is specified for turn signal lamps.

Objections were received from manufacturers of cab-over-engine trucks and of snow removal equipment who commented that such a requirement would restrict turn signal placement. However, since no exceptions are specified for headlamp mounting (24–54 inches), none are considered necessary for turn signal lamps (15–72 inches) for these vehicles.

Other comments suggested revisions to the standard that went beyond the scope of the proposal. Those that appear to have merit will be considered in future rulemaking actions.

In consideration of the foregoing, 49 CFR 571.21, Federal Motor Vehicle Safety Standard No. 108, Lamps, Reflective Devices, and Associated Equipment, is amended to read as set forth below.

Effective date: July 1, 1971, except as otherwise noted in the text of the rule.

Issued on October 22, 1970.

Douglas W. Toms,
Director,
National Highway Safety Bureau.

35 F.R. 16840
October 31, 1970

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment—Passenger Cars, Multipurpose Passenger Vehicles, Trucks, Buses, Trailers and Motorcycles

(Docket No. 69-18)

Motor Vehicle Safety Standard No. 108, establishing requirements for lamps, reflective devices, and associated equipment on motor vehicles was amended on October 31, 1970 (35 F.R. 16840). Thereafter, pursuant to 49 CFR 553.35 (35 F.R. 5119) petitions for reconsideration of the amendment were filed by Freightliner Corp., Ford Motor Co., Japan Automobile Manufacturers Association, Inc., Wagner Electric Corp., General Motors Corp., Chrysler Corp., Rohm and Haas Co., Motor Coach Industries, International Harvester Co., and Motorcycle Industry Council, Inc. The petitions of Harley-Davidson Motor Co., Inc., Kawasaki Motors Corp., White Motor Corp., Hackney Bros. Body Co., and a supplement to the Japan AMA petition were not timely filed, and have been treated as petitions for rulemaking pursuant to 49 CFR 553.31. However, some of the issues raised in these petitions are similar to those contained in timely filed petitions.

In response to information contained in several of the petitions the standard is being amended. The Administrator has declined to grant requested relief from other requirements of the standard.

1. *Effective date.* General Motors, Ford, and Chrysler have petitioned for an extension of the effective date, stating that compliance is impracticable for 1971 models which, as of July 1, 1971, have only a short production life before the end of the model run. The Bureau has determined therefore that an effective date later than 1 year from issuance of the original amendment is in the public interest. The effective date of the standard is extended to January 1, 1972.

2. *Paragraph S4.1.1.7.* This paragraph is being amended to clarify that its stop lamp requirement does not apply to passenger cars manufactured before January 1, 1973, and to correctly cite SAE Standard J588d, "Turn Signal Lamps," June 1966, as the standard incorporated by reference.

3. *Paragraph S4.1.1.14.* The amendment inadvertently omitted installation requirements for backup lamps. This paragraph is hereby amended to correct the omission, and to insure that current installation requirements remain in effect until January 1, 1973.

4. *Paragraph S4.1.1.16.* Japan AMA and Motorcycle Industry Council objected to the portion of this paragraph that would require motorcycles, as of January 1, 1973, to be equipped with turn-signal units designed to complete a durability test of 100,000 cycles. In order to allow time for further industry study and comment on this aspect of performance, the requirement is withdrawn from the standard. It is anticipated, however, that an increased durability test cycle for motorcycle turn-signals will be proposed in a future rulemaking action.

5. *Paragraph S4.1.2.* Ford, Chrysler, and Rohm and Haas petitioned for reduction of the heat test cycle of the warpage test from 10 to 5 minutes or, in the alternative for an extension of the effective date of this requirement. The Traffic Safety Administration has determined that the 10-minute cycle is appropriate because of the frequency of usage of stop and backup lamps. The petitions for reduction of the test cycle are therefore denied. However, because of the leadtime for development and tooling of new

lamps which may be required, good cause is considered shown for postponement of the effective date for this requirement until January 1, 1973.

6. *Paragraph S4.3.1.8 and Table II.* General Motors, Motor Coach Industries, and International Harvester objected to the reduction in the maximum allowable spacing of identification lamps (from 6 to 12 inches, to 6 to 8 inches), alleging that there is no safety justification for the requirement, and that compliance by July 1, 1971, is impracticable. It is recognized that other approaches to wide-vehicle identification, such as minimum spacing between identification and clearance lamps, have merit. These approaches are being considered and, as deemed appropriate, will be incorporated into future rulemaking proposals. Accordingly, the petitions are granted; Table II is amended to reinstate the 6 to 12 inch spacing, and S4.3.1.8 is deleted.

7. *Paragraph S4.4.2 and Tables I and III.* Wagner Electric petitioned for reconsideration of the omission of sampling provisions from SAE Standard J590b, "Turn-Signal Units," October 1965, and SAE Standard J945, "Vehicular Hazard Warning Unit," February 1966. Letters have also been received inquiring as to the number of flashers constituting a sample for test and the number of failures allowable for compliance. Standard No. 108 was amended without notice to omit sampling provisions in order to bring the standard into conformity with the National Traffic and Motor Vehicle Safety Act of 1966, which requires that all items conform to applicable standards. Therefore the safety standards should not specify sampling provisions or failure rates. It is the manufacturer's responsibility to institute a test program that is sufficient to legally constitute due care, on a continuing basis, to insure that all products manufactured after the effective date of a standard meet the applicable requirements. However, in response to the procedural objection that the change is important enough to merit notice and opportunity for comment, Wagner's petition is granted and paragraph S4.4.2 and Tables I and III are being amended to strike the language precluding sampling provisions. At the same time, this agency is publishing today a notice (Docket No. 69-18; Notice 3, 36 F.R. 1913) proposing omission of sampling provisions as of January 1, 1972, the date when this omission would otherwise have been effective.

8. *Paragraph S4.5.6.* International Harvester asked that the exemption for lamp outage indication be extended to vehicles equipped with auxiliary lamps or wiring, since these vehicles, like vehicles equipped to tow trailers, use variable load flashers. However, fixed load flashers providing lamp outage indication are available on the market for the increased load of an auxiliary lamp. The manufacturer can provide the appropriate flasher with foreknowledge of the intended end configuration of the vehicle, and International Harvester's petition is therefore denied.

9. *Tables II and IV.* Freightliner, International Harvester, and White Motor requested that the maximum mounting height allowable for turn-signal units, 72 inches, be reconsidered. This agency believes that most turn-signal lamps are presently mounted at or below the height of 72 inches, and that no detriment to motor vehicle safety would occur if the maximum mounting height were increased to 83 inches to allow higher mounting of turn-signals on cab-over-engine trucks, snow removal equipment, and other vehicles where a lower height may be impracticable. Tables II and IV are being revised accordingly. In Table IV the word "rear" was inadvertently omitted in that position of Column 2 establishing location requirements for side reflex reflectors, and has been reinserted.

10. *Table III.* Motorcycle Industry Council recommended that SAE Standard J584a, "Motorcycle and Motor Driven Cycle Headlamps," October 1969, be incorporated by reference rather than SAE Standard J584, April 1964. Such an amendment is beyond the scope of the original rulemaking proposal. Reference of the upgraded SAE Standard is being considered for a future rulemaking action. The petition is denied.

In addition, General Motors, Japan AMA, Motorcycle Industry Council, Harley-Davidson, and Kawasaki objected that the 300 candlepower limitation on motorcycle amber rear turn signals is unduly restrictive. Motorcycle Industry Council, Harley-Davidson, and Kawasaki objected to the spacing requirements for motorcycle turn-signal lamps. Both of these matters are still under reconsideration and will be disposed of at a later date.

In consideration of the foregoing, S4.1.1.7, S4.1.1.14, S4.1.1.16, S4.1.2, S4.3.1.8, S4.4.2, Table I, Table II, Table III and Table IV of Motor Vehicle Safety Standard No. 108 in 49 CFR 571.21 are revised. . . .

Effective date: January 1, 1972, except as otherwise noted in the text of the rule.

Issued on January 28, 1971.

Charles H. Hartman,
Acting Administrator, National Highway Traffic Safety Administration.

36 F.R. 1896
February 3, 1971

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment—Passenger Cars, Multipurpose Passenger Vehicles, Trucks, Buses, Trailers and Motorcycles

(Docket No. 69-18)

This notice amends Motor Vehicle Safety Standard No. 108 to delete the 300-candlepower limitation on motorcycle amber rear turn signals, to adopt an interlamp spacing of 9 inches for motorcycle rear turn signal lamps, and to extend to January 1, 1973, the effective date by which passenger cars and vehicles less than 80 inches in overall width must be manufactured with self-canceling turn-signal units.

In response to petitions for reconsideration of Motor Vehicle Safety Standard No. 108 (35 F.R. 16840), certain amendments to the standard were published on February 3, 1971 (36 F.R. 1896). Action was deferred on other petitions pending further reconsideration. The National Highway Traffic Safety Administration has concluded its review of these petitions and is further amending Standard No. 108. General Motors, Japan Automobile Manufacturers Association, Inc., and Kawasaki Motors Corp. objected that the 300-candlepower limitation on motorcycle amber rear turn signals is unduly restrictive. Since the candlepower limitation would not have become effective until January 1, 1973, and since the Administration has not proposed similar restrictions on amber rear turn signals for other motor vehicles, these petitions are granted, and S4.1.1.11 is deleted. The NHTSA will address the overall problem of candlepower limitations, along with that of rear turn signal color, in a proposal currently under formulation.

Motorcycle Industry Council, Harley-Davidson, and Kawasaki objected to the spacing requirements for motorcycle turn signal lamps and requested that the spacing recommended by the SAE, 9 inches front and rear, be adopted instead. The Administration has decided to grant the petitions insofar as they concern spacing of rear turn signals. Petitioners are concerned about the durability and injury potential of turn signal lamps spaced 12 inches apart at the rear of a motorcycle. While it appears true that wider spacing of turn signals at the rear create a greater likelihood of damage to the units should the motorcycle fall, this is not considered significant justification for spacing less than 12 inches. Rather, the crash injury problem appears of greater importance. While spacing of rear turn signal lamps at 12 inches does not appear to present a significant injury threat to pedestrians, it may present a hazard to operators and passengers when the vehicle is involved in a collision or falls over. This agency intends to evaluate motorcycle rear turn signal lamp spacing for injury potential in its motorcycle crash injury research program for the current fiscal year, and to reinstate the 12-inch requirement if such spacing does not appear to present a significant potential hazard. Table IV is hereby amended to specify 9 inches as the minimum horizontal separation distance for motorcycle turn signal lamps at the rear.

The motorcycle industry has also expressed its concern about the durability and injury potential of front turn signal lamps spaced 16 inches apart, as well as whether the spacing is justified by available data. Tests conducted by the Road Research Laboratory and SAE provide adequate support, not only for the 16-inch spacing at the front but also for the 12-inch spacing at the rear. Since front turn signal lamps are generally protected by handlebars and durability and injury potential do not appear to be significant, the Administration has decided to retain the 16-

inch spacing for motorcycle front turn signal lamps.

In addition, Citroen has brought to the attention of the Administration the fact that its vehicles exported to the United States are not equipped with, and are not currently designed to be equipped with, self-canceling turn signals. Because of the modifications required in the panel control, dashboard, and steering column, it avers that it cannot comply until January 1, 1973, and has petitioned that the effective date of S4.1.1.5 be extended . Since virtually all other motor vehicle manufacturers presently comply with this requirement, the granting of this petition would not cause a significant degradation of motor vehicle safety, and S4.1.1.5 is amended accordingly.

Finally, the word "red" inadvertently was included in the first sentence of S4.1.1.7 and is hereby deleted.

In consideration of the foregoing, § 571.21 is amended as follows:

1. S4.1.1.5 is amended to read:

S4.1.1.5 The turn signal operating unit on each passenger car, and multipurpose passenger vehicle, truck, and bus less than 80 inches in overall width manufactured on or after January 1, 1973, shall be self-canceling by steering wheel rotation and capable of cancellation by a manually operated control.

2. In S4.1.1.7 the word "red" appearing between "Class A" and "turn signal lamps" is deleted.

3. S4.1.1.11 is deleted, in S4.1.1 the reference to "S4.1.1.16" is changed to "S4.1.1.15," and S4.1.1.12, S4.1.1.13, S4.1.1.14, S4.1.1.15, and S4.1.1.16 are renumbered S4.1.1.11, S4.1.1.12, S4.1.1.13, S4.1.1.14, and S4.1.1.15 respectively.

4. In Table IV, under Motorcycles Column 3 for turn signal lamps, the dimension "2 inches" for turn signals at or near the rear is changed to "9 inches."

Effective date: January 1, 1972.

Issued on May 13, 1971.

Douglas W. Toms,
Acting Administrator.

36 F.R. 9069
May 19, 1971

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment—Passenger Cars, Multipurpose Passenger Vehicles, Trucks, Buses, Trailers and Motorcycles

(Docket No. 69–18)

The purpose of this notice is to amend Motor Vehicle Safety Standard No. 108 to delete sampling and failure-rate provisions from the tests of turn signal and hazard warning signal flashers, and to modify performance requirements for these items of motor vehicle equipment.

The notice of proposed rulemaking upon which this amendment is based was published in the *Federal Register* on February 3, 1971 (36 F.R. 1913). Standard No. 108 incorporates by reference SAE Standard J590b, "Automotive Turn Signal Flasher," October 1965, and SAE Recommended Practice J945, "Vehicular Hazard Warning Signal Flasher," February 1966. Both standards specify a test sample size and a permissible failure rate for the items tested, viz., that 50 items shall be "submitted for test," that 20 items shall be chosen from the 50, and that "at least 17 out of 20 samples" shall meet the requirements. These are the provisions whose deletion was proposed.

Careful consideration has been given to the comments received in response to the notice. Many industry comments opposed the proposal, alleging that substantially total compliance would necessitate an increase in unit cost, and arguing that the cost increase is not justified by the safety benefits to be gained. Concern was also expressed as to possible penalties that might arise from the occasional failures that are claimed by the industry to be unavoidable in items of this type.

As stated in the February 3 notice of proposed rulemaking, the NHTSA considers permissible failure rates to be contrary to both the letter and the intent of the National Traffic and Motor Vehicle Safety Act. Manufacturers are required to use due care to ensure that all their products meet the requirements of the standards. The assessment of penalties for test failures is not automatic, however, but is made after a review of all the facts, with a view to determining whether due care was used in accordance with sound engineering and manufacturing principles. The sampling and failure-rate provisions are accordingly hereby deleted from the requirements in Standard No. 108 for turn signal and hazard warning signal flashers.

The NHTSA has determined that the design and production problems associated with the manufacture of thermal flashers are such that total compliance with current performance and durability test requirements is not practicable. Therefore, modifications have been made in starting time, voltage drop, flash rate and percent current "on" time for performance tests, and in the duration and cycle of operation for durability tests. For example, the previously required performance range of 60 to 120 flashes per minute is broadened to 40 to 140 flashes per minute, and the percentage of time during a flash cycle that flasher contacts are required to be engaged, previously a range of 30 percent to 75 percent, is now 25 percent to 80 percent. The durability test for turn signal flashers will be continuous for 25 hours, rather than consisting of an on-off cycle for 200 hours. The durability test for hazard warning signal flashers is reduced to 12 hours from 36 hours. This agency has concluded that the net effect of these modifications is not a lessening of motor vehicle safety, since the minimum performance of flashers is substantially upgraded by requiring compliance of every flasher manufactured, rather than of only 17 of every 20 tested.

To implement the deletion of sampling and failure-rate provisions and the modification of the previous requirements, the NHTSA is amending Standard No. 108 to delete existing references to SAE Standard J590b and SAE Recommended Practice J945, and to adopt a new paragraph S4.6, *Turn signal flashers; hazard warning signal flashers*, that incorporates the new requirements.

In consideration of the foregoing, 49 CFR 571.21, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices and Associated Equipment*, is amended. . . .

Effective date: January 1, 1973. Manufacturers commented that the proposed effective date of January 1, 1972, was impracticable in view the necessity to evaluate and adopt new flasher and switch designs meeting the requirements. In light of the time needed for changes in design and preparation for production, the Administrator has found, for good cause shown, that an effective date later than one year from the date of issuance is in the public interest.

Issued on August 20, 1971.

Charles H. Hartman
Acting Administrator

36 F.R. 17343
August 28, 1971

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices and Associated Equipment

(Docket No. 69-18; Notice 6)

Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, was amended on August 28, 1971 (36 F.R. 17343) to revise performance requirements for turn signal and hazard warning signal flashers. Thereafter petitions for reconsideration of the amendment were filed by Chrysler Corporation, Ideal Corporation, Signal-Stat Corporation, and Stewart-Warner Corporation. This notice responds to these petitions. This notice also amends Standard No. 108 to allow compliance with paragraph S4.6 of Standard No. 108a (§ 571.108a), at the option of the manufacturer, before January 1, 1973.

In its petition for reconsideration, Chrysler noted that "the amendment deletes the sampling provision and imposes new, presumably less stringent, but unique performance requirements" and commented that "while this change was announced in principle in prior rulemaking actions, the details of the new performance requirements were specified for the first time in this amendment." Claiming that its suppliers have not had time to evaluate their ability to comply with the new requirements, Chrysler petitioned that the amendment be withdrawn and reissued as a notice of proposed rulemaking. Sampling and failure-rate provisions were initially deleted in a rule published October 31, 1970 (35 F.R. 16840), which amended Standard No. 108 in various ways. Then, in response to objections that the action had not been previously the subject of a notice of proposed rulemaking, the action was revoked, a new notice of proposed rulemaking to that effect was issued on February 3, 1971 (36 F.R. 1913), and all interested persons were given full opportunity to comment. After careful consideration of the comments received, the agency again published a rule on August 28, 1971 (36 F.R. 17343), which deleted the sampling and failure-rate provisions. The rule also relaxed somewhat some of the quantitative levels of required performance. Thereafter, in accordance with the agency procedural rules, petitions for reconsideration of the rule were received and considered. The NHTSA considers that these actions have considerably exceeded the requirements of the Administrative Procedure Act, 5 U.S.C. 553, that notice and opportunity for comment be provided giving "either the terms or substance of the proposed rule or a description of the subjects and issues involved," and finds that no significant further benefit will be gained by reopening the matter for still another round of comments. Chrysler's petition is therefore denied.

Stewart-Warner submitted a general petition for reconsideration of the amendment, believing that "the amendment can allow unsafe conditions to come into existence." While it is true that the new performance requirements, on a strictly quantitative basis, may be viewed as less stringent than the old, the agency has concluded that the net effect of the amendment, considering the removal of the permissible failure rate, is not a lessening of the safety performance of these items.

Signal-Stat and Ideal petitioned that paragraph S4.1.1 be amended to require that all lighting equipment designed to conform to Standard No. 108 be "manufactured in accordance with sound engineering, manufacturing, and quality control principles." The basis for this request, in Signal-Stat's words, is that "while it is not possible to assure the durability of any single individual flasher, it is possible to reasonably produce requirements on a statistical basis in mass production," and that "the only feasible and practical 'due care' and production means available, dictated by sound quality control principles, is to evaluate devices of volume on a statistical basis." The NHTSA has generally no objection to the above statements, although they are not necessary or appropriate for inclusion in the standard itself. The agency does not have any intent of outlawing designs such as thermal flashers, that have been previously used to satisfy the requirements in question. It also recognizes fully that with high-volume, low-cost items of equipment such as flashers, sample testing by the manufacturer may be the only practicable means of quality control. It can further be stated that in the case of such items, an occasional failure of NHTSA compliance tests, representing a very small percentage of production, will not necessarily result in a determination that there has been a violation of the Act. The question in each case is whether the manufacturer exercised due care; wherever a manufacturer can establish that he has exercised due care, he will not be in violation of the Act. The petitions of Ideal and Signal-Stat are therefore denied.

Ideal has also requested an interpretation that it be allowed to manufacture flashers before January 1, 1973, that conform to the revised requirements. To encourage manufacturers to conform at an early date, the NHTSA is amending Standard No. 108 to allow compliance with paragraph S4.6 of Standard No. 108a (§ 571.108a), at the option of the manufacturer, between January 1, 1972, and January 1, 1973.

This notice also corrects a paragraph numbering error in both standards.

In consideration of the foregoing, 49 CFR § 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, is amended. . . .

Effective date: January 1, 1972. Because the amendments create no additional burden or obligation, and permit an early implementation of revised performance requirements, the Administrator has found for good cause shown that an effective date earlier than one hundred eighty days after issuance of this notice is in the public interest.

This notice is issued under the authority of sections 103 and 119 of the National Traffic and Motor Vehicle Safety Act of 1966 (15 U.S.C. 1392, 1407) and the delegation of authority from the Secretary of Transportation to the National Highway Traffic Safety Administrator, 49 CFR 1.51.

Issued on December 22, 1971.

Douglas W. Toms
Administrator

36 F.R. 25013
December 28, 1971

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 69–18; Notice 7)

The purpose of this notice is to specify a permissible method of certifying replacement lighting equipment for vehicles manufactured on or after January 1, 1972, to conform to Federal Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment.*

Section 114 of the National Traffic and Motor Vehicle Safety Act (15 U.S.C. 1403) requires every manufacturer or distributor of motor vehicle equipment to "furnish to the distributor or dealer at the time of delivery of such . . . equipment by such manufacturer or distributor the certification that each such . . . item of motor vehicle equipment conforms to all applicable Federal motor vehicle safety standards . . . [S]uch certification may be in the form of a label or tag on such item or on the outside of a container in which such item is delivered." Thus, manufacturers of equipment to which a safety standard applies generally certify the equipment by labeling either the equipment or its container. In the case of Standard No. 109, *New Pneumatic Tires*, certification labeling on the items themselves is required by the standard.

Normally, the certification responsibility of a distributor is met by the distributor's delivery of the manufacturer's certification statement to the dealers to whom he sells. Although no separate statement is necessary, the delivery of the manufacturer's certification is considered a legal act by which the distributor makes the certification required by the statute.

With the extension of Standard No. 108 to items of replacement equipment, some difficulties in this scheme may arise where small items are not individually packaged. Automotive parts distributors commonly sell single items of equipment "over the counter" to local garagemen, who are dealers within the meaning of the Act. If these items are not separately packaged and not marked with a certification, the distributor must, under the Act, certify the items to the dealer. Although there is a variety of ways in which the distributor can do this, it is probably unrealistic to expect a separate certification to be properly and consistently made at this level. Manufacturers of lighting equipment have recognized the problem, and have suggested that they be permitted to certify their equipment by affixing the symbol DOT to each item of equipment.

This request has been found to have merit, and S4.7 of Standard No. 108, 49 CFR 571.108, is hereby amended to permit manufacturers to certify lighting equipment items by placing the symbol "DOT" directly on the item, if they choose to do so.

In consideration of the foregoing, S4.7 of 49 CFR § 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, is amended. . . .

Effective date: January 12, 1972. Because the amendment creates no additional burden or obligation and permits an optional method of compliance with an existing requirement, the Administrator has found for good cause shown that an immediate effective date is in the public interest.

This notice is issued under the authority of sections 103, 112, 114 and 119 of the National Traffic and Motor Vehicle Safety Act of 1966 (15 U.S.C. 1392, 1401, 1407) and the delegation of authority from the Secretary of Transportation to the National Highway Traffic Safety Administrator, 49 CFR 1.51.

Issued on January 6, 1972.

Douglas W. Toms
Administrator

37 F.R. 445
January 12, 1972

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 69–18; Notice 8)

This notice amends 49 CFR 571.108 and 571.108a, Motor Vehicle Safety Standard No. 108 and No. 108a, *Lamps, Reflective Devices, and Associated Equipment*, to permit off-center spacing of identification lamps on vehicles 80 inches or more in overall width.

Utility Trailer Manufacturing Co., has petitioned for the reinstatement of former requirements for the location of identification lamps. Before January 1, 1972, the three-lamp cluster was required to be mounted "as close as practicable to the vertical centerline." On vehicles manufactured on or after that date, the three identification lamps must be mounted "one on the vertical centerline, and one on each side of the vertical centerline." A type of trailer manufactured by Utility mounts a lock on the centerline of the trailer with the lock socket at the rear header. Typically the header is shallow and does not allow room to mount the gasket seal, the center lock socket, and an identification lamp all "on the vertical centerline." Extensive retooling is necessary for compliance, and apparently would cause hardship to Utility and other manufacturers of this type of trailer. The Administration believes that permitting the lamp cluster to be mounted slightly off center would not compromise motor vehicle safety, and accordingly is returning to the original mounting requirement for all vehicles required to have identification lamps.

In consideration of the foregoing, the specifications for "Identification Lamps" in Table II, Location of Required Equipment, 49 CFR § 571.108, and 49 CFR § 571.108a, are revised....

Effective date: January 25, 1972. Because the amendments create no additional burden or obligation, the Administrator finds for good cause shown that an immediate effective date is in the public interest.

This notice is issued under the authority of sections 103 and 119 of the National Traffic and Motor Vehicle Safety Act of 1966 (15 U.S.C. 1392, 1407) and the delegation of authority from the Secretary of Transportation to the National Highway Traffic Safety Administrator, 49 CFR 1.51.

Issued on January 19, 1972.

Douglas W. Toms
Administrator

37 F.R. 1107
January 25, 1972

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 72–4; Notice 2)

This notice amends 49 CFR § 571.108 and § 571.108a, Motor Vehicle Safety Standard Nos. 108 and 108a, *Lamps, Reflective Devices, and Associated Equipment*, to revise the test method for reflex reflectors.

On April 8, 1972, the National Highway Traffic Safety Administration proposed (37 F.R. 7107) that the applicable SAE standard for reflex reflectors incorporated by reference in Table I and Table III of Standards No. 108 and 108a be SAE Standard J594e, "Reflex Reflectors," March 1970, to replace J594d, March 1967. All comments received were in favor of the proposal and the standards are being amended accordingly. The effect of the amendment is to permit photometric testing at a range around a test point if speculiar reflection is encountered at the test point itself. The amendment does not impose a new performance requirement but allows a more realistic method of testing than J594d, which prohibited testing at other than the specified test points, and which had the effect of causing a technical noncompliance if there were specular reflection at any test point.

Paragraph S4.3.1.2 has been incorporated into J594e and is being deleted from the text of Standard No. 108a. This paragraph specifies that, for purposes of photometric testing, the axis of the side reflex reflectors shall be perpendicular to a vertical plane through the longitudinal axis of the vehicle.

In consideration of the foregoing, 49 CFR § 571.108 and § 571.108a, Motor Vehicle Safety Standards 108 and 108a, are revised . . . .

Effective date: Standard No. 108: Sep. 1, 1972; Standard No. 108a: January 1, 1973. Because the amendments create no additional burden and modify a test procedure currently in effect, it is found for good cause shown that an effective date earlier than one hundred eighty days after issuance is in the public interest.

This notice is issued under the authority of sections 103 and 119 of the National Traffic and Motor Vehicle Safety Act of 1966 (15 U.S.C. 1392, 1407) and the delegation of authority from the Secretary of Transportation to the National Highway Traffic Safety Administrator, 49 CFR 1.51.

Issued on July 28, 1972.

Douglas W. Toms
Administrator

37 F.R. 15514
August 3, 1972

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 69–18; Notice 11)

This notice amends 49 CFR Part 571, by revoking Section 571.108a, Motor Vehicle Safety Standard No. 108a, *Lamps, Reflective Devices, and Associated Equipment* and deleting a conforming amendment to Standard No. 108, in accordance with a decision of the U.S. Court of Appeals.

Standard No. 108a was established on December 2, 1971 (36 F.R. 22909), to clarify requirements for turn signal and hazard warning signal flashers effective January 1, 1973. These requirements were established by an amendment published on August 28, 1971 (36 F.R. 13743). The amendment deleted sampling and failure rate provisions from the tests for these items of motor vehicle equipment, and modified the performance requirements.

Pursuant to section 105(a)(1), of the National Traffic and Motor Vehicle Safety Act of 1966 (15 USC 1394(a)(1)), Wagner Electric Corporation petitioned for review of the August 28, 1971 order in the United States Court of Appeals for the Third Circuit. On August 29, 1972, the court granted the petition, set aside the order and remanded the matter to the National Highway Safety Administration for new rulemaking proceedings consistent with the court's views. (Wagner Electric Corporation v. Volpe, No. 71–1976 (3d Cir. 1972))

By this notice, the NHTSA deletes from the Code of Federal Regulations the amendment set aside by the Court's order. The deleted provision essentially constituted the version of the standard that was to become effective January 1, 1973, (Standard No. 108a) along with paragraph S4.1.1.16 of Standard No. 108, which allowed manufacturers to conform to the new requirements before that date.

In consideration of the foregoing, 49 CFR Part 571 is amended . . . .

Effective date: This notice reflects the order of the U.S. Court of Appeals for the Third Circuit, whose mandate was issued September 19, 1972, and is effective as of that date.

This notice is issued under the authority of sections 103 and 119 of the National Traffic and Motor Vehicle Safety Act of 1966 (15 U.S.C. 1392, 1407) and the delegation of authority at 49 CFR 1.51.

Issued on September 28, 1972.

Douglas W. Toms
Administrator

37 F.R. 20695
October 3, 1972

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 71–21; Notice 3)

This notice amends 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, to modify the method by which conformity of certain lamps to photometric requirements is determined. A notice of proposed rulemaking on this subject was published on November 30, 1971 (36 F.R. 22763).

Standard No. 108 requires that tail lamps, stop lamps, parking lamps, and turn signal lamps meet minimum photometric candlepower requirements at up to 27 individual test points. If a lamp fails to meet the minimum requirement at any test point, the lamp does not conform to Standard No. 108 even though it may exceed the specified minimum at all other test points.

As noted in the November 30, 1971 proposal, this requirement appeared unnecessarily severe, since deviances at individual test points are generally not great enough to be discernible to the human eye. The method proposed and adopted sets up seven groups of test points, as shown in Figure 1, each group containing from three to five test points. The groups include requirements for devices with one, two, or three separately lighted compartments, and multiple lamps used in an array to perform a function at a single design location. The minimum candlepower requirement for any single group is the sum of the minimum candlepower specified in the applicable SAE standards for individual test points within the group. Therefore, there will be no failure to conform to Standard No. 108 as long as the sum of the candlepower measured at all test points within a group equals or exceeds the required minimum figure for that group. The amendment will not have a significant effect on motor vehicle safety and is designed to set up a more realistic and cost effective method of determining compliance with photometric requirements.

Two aspects of the proposal are not adopted in the amendment. The proposal would have set a floor of 60 per cent on the amount by which the measured candlepower at a single test point could fail to reach the required minimum for that test point. The same rationale governing the overall proposal dictated that the floor not be adopted: as long as the sum of the test points within a group meets the overall minimum for the group, the difference in illumination at any discrete test point is unlikely to be great enough to be discernible.

Secondly, the proposal would have required that clearance, side marker, identification, and parking lamps have minimum candlepower equivalent to tail lamps. This proposal has not been adopted. Comments indicated that the increase in candlepower would be so significantly greater as to cause a glare problem. The group test concept has been adopted for parking lamps, but not for clearance, side marker, identification lamps, which retain minimum candlepower for all test points.

In addition, a deferred effective date has been adopted for increased grouped candlepower requirements applicable to tail, stop and turn signal lamps with two or three lighted compartments, and to lamp arrangements where two or three lamps are used to perform a single function in a single design location. These requirements have been made effective September 1, 1974, in order to provide sufficient leadtime for redesign and retooling. In the interim, beginning January 1, 1973, such lamps or lamp arrangements may meet the grouped requirements applicable to single compartment and single stop and turn signal lamps.

It was also proposed that minimum candlepower requirements be specified for tail lamps, stop lamps and turn signal lamps, measured at a 45-degree angle where any SAE Standard incorporated by reference required visibility of the lamps at a 45-degree angle. Objections were raised that the proposed values were too high and that there was no safety benefit in requiring them. The NHTSA, on the basis of its analysis of cost benefit factors, has not adopted the proposal.

The amendment does not adopt the proposal that both red and yellow rear turn signal lamps have the same maximum candlepower limitation. The subject of the color of rear turn signal lamps will be addressed in a forthcoming notice, in Docket No. 69–19.

The SAE standard applicable to parking lamps in Table III has been changed to SAE Standard J222, "Parking Lamps (Position Lamps)," December 1970. Paragraph S4.1.1.11, which specifies photometric values for parking lamps, is deleted as these values are incorporated in the revised SAE standard.

In consideration of the foregoing, 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, is revised . . . .

Effective date: January 1, 1973. Because the amendment creates no additional burden, it is found for good cause shown that an effective date earlier than one hundred eighty days after issuance is in the public interest.

This notice is issued under the authority of sections 103 and 119 of the National Traffic and Motor Vehicle Safety Act of 1966 (15 U.S.C. 1392 and 1407) and the delegation of authority from the Secretary of Transportation to the National Highway Traffic Safety Administrator, 49 CFR 1.51.

Issued on October 2, 1972.

Douglas W. Toms
Administrator

37 F.R. 21328
October 7, 1972

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 72-5; Notice 2)

This notice amends 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, to specify stop and turn signal lens area requirements that are identical for all motor vehicles less than 80 inches in overall width.

As the NHTSA explained in its proposal published April 8, 1972 (37 F.R. 7107), Standard No. 108 requires (Table III) passenger cars, multipurpose passenger vehicles, trucks, and buses to be equipped with "Class A" turn signal lamps. Class A lamps prior to Standard No. 108 were generally found only on vehicles whose overall width is 80 inches or more. Class A lamps differ from Class B lamps in having a minimum effective projected illuminated area of 12 square inches rather than 3½ square inches. Paragraph S4.1.1.7 of Standard No. 108, however, permits passenger cars to meet Class A photometrics through an effective projected illuminated area not less than that of a Class B lamp (3½ square inches). The NHTSA, in response to a petition from Jeep Corporation, proposed that this exception be provided for all vehicles less than 80 inches in overall width, instead of being limited to passenger cars, and that stop lamps be included as well.

The comments received supported the proposal. Recommendations were also made as to standardization of lens area and identification of lamps providing Class A photometric values. These will be treated as suggestions for future rulemaking since they were beyond the scope of the proposal.

In consideration of the foregoing, the first sentence of paragraph S4.1.1.7 of 49 CFR 571.108, Standard No. 108, is revised ....

Effective date: January 1, 1973. Because the amendment relaxes a requirement and creates no additional burden, it is found for good cause shown that an effective date earlier than one hundred eighty days after issuance is in the public interest.

This notice is issued under the authority of sections 103 and 119 of the National Traffic and Motor Vehicle Safety Act of 1966 (15 U.S.C. 1392, 1407), and the delegation of authority at 49 CFR 1.51.

Issued on: October 26, 1972.

Charles H. Hartman
Acting Administrator

37 F.R. 23272
November 1, 1972

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 71–21; Notice 4)

This notice amends 49 CFR § 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, to specify minimum photometric-candlepower requirements for motorcycle turn signal lamps.

Standard No. 108 was amended on October 7, 1972 (37 F.R. 21328), effective January 1, 1973, to specify, in part, that turn signal lamps are not required to meet the minimum photometric values at each test point specified in Table 2 of SAE Standard J575d, "Tests for Motor Vehicle Lighting Devices and Components," if the sum of the candlepower measured at the test points within the groups listed in Figure 1 is not less than the sum of the candlepower values for such test points specified in J575d. Effective January 1, 1973, Class B turn signal lamps are required on motorcycles, and the minimum photometric candlepower values for such lamps are one-half those required for Class A turn signals. The amendment failed to make this distinction, and this notice corrects the omission.

In consideration of the foregoing, paragraph S4.1.1.12 of 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, is amended . . . .

Effective date: January 1, 1973. Because the amendment creates no additional burden, it is found for good cause shown that an effective date earlier than 180 days after issuance is in the public interest.

This notice is issued under the authority of sections 103 and 119 of the National Traffic and Motor Vehicle Safety Act of 1966 (15 U.S.C. 1392, 1407) and the delegation of authority from the Secretary of Transportation to the National Highway Traffic Safety Administrator, 49 CFR 1.51.

Issued on November 21, 1972.

Douglas W. Toms
Administrator

37 F.R. 25235
November 29, 1972

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices and Associated Equipment

(Docket No. 69–18; Notice 14)

This notice amends 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, to delete the requirements of the warpage tests for plastic lenses used on lamps.

The NHTSA proposed on July 7, 1972 (37 F.R. 13350), that the lens warpage test be deleted from the motor vehicle lighting standard. The test requirement itself, as contained in an SAE Standard incorporated by reference, lacked objectivity, in that it prohibited warpage that would "affect the proper functioning of the device" without further clarification. The lens warpage test did not appear to add significantly to motor vehicle safety.

Comments to the docket were divided, some confirming the NHTSA position on both issues. Others objected, suggesting that the agency seek to establish objective compliance criteria. On review of all data and arguments, the NHTSA finds that a safety problem that would justify the development of such a requirement has not been demonstrated.

In the future, if serious problems of lens warpage arise, they may be dealt with immediately as safety-related defects under section 113 of the National Traffic and Motor Vehicle Safety Act, and steps can be taken to develop and promulgate an objective test.

In consideration of the foregoing, 49 CFR § 571.108 is amended . . . .

Effective date: Jan. 1, 1973. Because this amendment relieves a restriction and creates no additional burden, it is found for good cause shown that an effective date earlier than 180 days after issuance is in the public interest.

This notice is issued under the authority of sections 103 and 119 of the National Traffic and Motor Vehicle Safety Act of 1966 (15 U.S.C. 1392, 1407) and the delegation of authority at 49 CFR 1.51.

Issued on December 29, 1972.

Jack L. Goldberg
Acting Administrator

38 F.R. 743
January 4, 1973

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices and Associated Equipment

(Docket No. 71-21; Notice 6)

This notice denies petitions for reconsideration of an amendment to Federal Motor Vehicle Safety Standard No. 108 published on October 7, 1972, that modified the method by which conformity of certain lamps to photometric requirements is determined.

The National Highway Traffic Safety Administration amended 49 CFR § 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, on October 7, 1972, (37 F.R. 21328) to allow photometric conformance of parking lamps, taillamps, stop lamps, and turn signal lamps to be based upon the sum of values derived from grouping individual test points rather than upon a requirement of conformance at each test point. Thereafter, pursuant to 49 CFR § 553.35, petitions for reconsideration of the amendment were filed by American Motors Corporation, Ford Motor Company, General Motors Corporation, SWF-Spezial fabrik fur Autozubehor Gustav Rau GmbH, and Volkswagen of America, Inc. Petitions raising the same issues but not timely filed were submitted by Automobiles Peugeot on behalf of the Association Peugeot-Renault and Westfalische Metall Industry KG. Chrysler Corporation submitted a request for an interpretation. The Administration has declined to grant requested relief.

1. *Inclusion of SAE Recommended Practice J256.* All petitioners except General Motors asked for adoption in its entirety of SAE Recommended Practice J256, "Service Performance Requirements for Motor Vehicle Lighting Devices," July 1971. Petitioners complain that the NHTSA adopted the grouping concept and photometric values of Table I and Table 3 of the Practice without including a correction adjustment factor or a tolerance for maximum photometric values. SAE J256 permits an adjustment in lamp orientation from design position not to exceed 3 degrees in determining compliance with photometric requirements. SAE J256 also permits a tolerance of 10 per cent in determining whether group photometric requirements are met. It further provides that the candlepower of parking lamps, taillamps, stop lamps, and turn lamps shall not exceed 120 per cent of the maximum values specified in appropriate SAE Standards. In support of their request petitioners argue that a readjustment factor is necessitated by the difficulties that test laboratories experience in insuring that lamps of complex and varied shapes are mounted with accuracy in the design position. Tolerances in candlepower output are requested because of variations in test lamp bulbs, and in manufacture and assembly of the lamps themselves.

When Standard No. 108 required compliance at every test point, the SAE Standards incorporated by reference did not permit the tolerances that petitioners request. Compliance by meeting minimum group totals rather than compliance at each test point is intended to insert a factor to compensate for those variations in test methods and manufacture that apparently concern industry. The tolerances in the SAE Recommended Practice represent a further lowering of the quantitative performance requirements. The NHTSA has determined that no sufficient reasons have been given to lower these requirements further, and that it is not in the interest of motor vehicle safety to do so. The petitions are denied.

2. *Excluded lamps.* General Motors requests the inclusion in the group testing concept of clearance lamps, side marker lamps, and identification lamps, as originally proposed by NHTSA.

GM's petition is denied. Under the proposal, photometric requirements for clearance, side marker, and identification lamps would have been increased, and identical to those for parking lamps and taillamps. But the proposed values were not adopted, and these lamps were not included in the group concept. The NHTSA believes that the group concept is inappropriate for lamps of low candlepower, and that requirements should be met at each test point. The photometric requirements for clearance, side marker, and identification lamps, are minimal in nature and identical at all test points.

3. *Interpretations.* Chrysler Corporation has asked whether "the maximum values provided in Figure 1 may be used in place of the maximum photometric values set out in paragraph S5.2," which states in pertinent part that "the maximum photometric candlepower values for one-compartment and two-compartment stop lamps shall be 300 candlepower." The answer is yes, and paragraph S5.2 is being deleted.

Chrysler has also asked whether "subscripts (f) and (g) of Table 2 of . . . SAE Standard J575d applies to the measurement of the maximum values in . . . Figure 1 . . . ". There is no footnote (g) in J575d, and footnote (f) does apply.

Clarification has also been requested as to whether the maximum tail lamp values in Figure 1 are intended to apply at test points below the horizontal. The answer is no; the limitation, as was true before the amendment, is restricted to the horizontal and above.

In consideration of the foregoing, section S5 of 49 CFR § 571.108, Motor Vehicle Standard No. 108 is amended by removing the designation "S5.1" and deleting paragraph S5.2.

Effective date: February 5, 1973. Because the amendment clarifies an ambiguity and creates no additional burden, good cause has been shown that an effective date earlier than 180 days after issuance is in the public interest.

(Sec. 103, 119, Pub. L. 89–563, 80 Stat. 718, 15 U.S.C. 1392, 1407; delegation of authority at 49 CFR 1.51.)

Issued on January 30, 1973.

Douglas W. Toms
Administrator

38 F.R. 3331
February 5, 1973

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices and Associated Equipment

(Docket No. 71-21; Notice 7)

This notice corrects the amendment to 49 CFR § 571.108 published on February 5, 1973 (38 F.R. 3331) that removed the designation "S5.1" and deleted paragraph S5.2 from Motor Vehicle Safety Standard No. 108.

The amendment inadvertently overlooked the fact that a new paragraph S5.3, concerning lens warpage, had been added to Standard No. 108 on January 4, 1973 (38 F.R. 743). The notice published on February 5, 1973 should have retained the designation of S5.1, deleted S5.2 and renumbered S5.3.

In consideration of the foregoing, section S5 of 49 CFR § 571.108, Motor Vehicle Safety Standard No. 108, is amended by adding the designation "S5.1" to the first paragraph, and changing the designation of paragraph S5.3 to read "S5.2".

Effective date: February 28, 1973. Because the amendment corrects an error and creates no additional burden good cause has been shown that an effective date earlier than 180 days after issuance is in the public interest.

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718, 15 U.S.C. 1392, 1407; delegation of authority at 49 CFR 1.51).

Issued on February 21, 1973.

Douglas W. Toms
Administrator

38 F.R. 5338
February 28, 1973

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 71-21; Notice 6)

This notice amends the test procedures relating to bulbs in Motor Vehicle Safety Standard No. 108, effective January 1, 1974.

The National Highway Traffic Safety Administration proposed on December 1, 1972 (37 F.R. 25535) to amend two test procedures relating to bulbs. As the NHTSA explained:

"At the present time, test bulbs must be 'operated at their rated mean spherical candlepower unless otherwise specified.' Not all bulbs have been assigned a mean spherical candlepower rating. The proposal specifies that when no rating has been assigned by the bulb manufacturer or the SAE or, if the lamp is sealed and the bulb cannot be replaced, the bulb shall be operated at design voltage. Secondly, instances have arisen where noncompliance of lamps could not be proven in marginal cases because of the tolerances permitted in test bulbs. The notice seeks to render test results more reproducible by proposing that the filaments of test bulbs (other than sealed-in bulbs) be positioned within ±.010 inch of the nominal design position specified in SAE Standard J573d, "Lamp Bulbs and Sealed Units," or by the bulb manufacturer. Other requirements of SAE Standard J575d, incorporated by reference into Standard No. 108, remain applicable."

Comments generally supported the notice, and the standard is being amended as proposed. The chief objection voiced was that it is difficult to obtain test bulbs at the proposed filament location tolerances. The NHTSA finds, however, that these difficulties are outweighed by the need for objective and repeatable tests. Moreover, while the NHTSA intends to use a bulb with the filament positioned within ±.010 inch of the design position for its compliance tests, a manufacturer is not required to do so. If the manufacturer has test data to show a correlation between a Standard No. 108 test bulb and one used by him outside the ±.010-inch tolerances, his certification could be based on the test data and the correlation factor, assuming that that factor indicated compliance. Similarly if it can be demonstrated that the lamp complied using test bulbs having filament locations on both the plus and minus sides of the design position, outside the ±.010 tolerance but within the other tolerances of J573, compliance could be certified.

The NHTSA would also like to make clear that only the filament in the test bulb for the function tested need meet the .010-inch tolerance. For example, if a combination tail lamp/stop lamp is being tested for the tail lamp function, the stop lamp filament need not be within the tolerance, and a bulb with a correctly positioned filament may subsequently be substituted for the stop lamp test.

In consideration of the foregoing, 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, is revised by adopting new paragraphs S4.1.1.19 and S4.1.1.20. . . .

Effective date: January 1, 1974.

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718, 15 U.S.C. 1392, 1407; delegation of authority at 38 F.R. 12147)

Issued on June 15, 1973.

James E. Wilson
Associate Administrator
Traffic Safety Programs

38 F.R. 16230
June 21, 1973

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 69–19; Notice 6)

This notice amends the requirements of Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices and Associated Equipment* applicable to trailers that are either less than 6 feet in overall length or 30 inches in overall width.

On October 25, 1972 the National Highway Safety Administration proposed (Docket No. 69–19; Notice 3, 37 F.R. 22801) as part of a comprehensive rule making action that small trailers need not be equipped with the complement of lighting devices required of larger trailers. The agency proposed that a trailer less than 30 inches wide may be equipped with only one of each of the following devices located at or near its vertical centerline: tail lamp, stop lamp, and rear reflex reflector. The NHTSA also proposed that a trailer that is less than 6 feet in overall length, including the trailer tongue, need not be equipped with front side marker lamps and front side reflex reflectors. In the opinion of the NHTSA this equipment is sufficient to meet the needs of motor vehicle safety. Commenters generally agreed, and Standard No. 108 is being amended as proposed. Two suggested that two rear reflectors be required. The amendment, which is phrased as an option, does not preclude a two-reflector configuration if the manufacturer wishes. In accordance with several comments, the amendments, which relieve a restriction, are being made effective 30 days after publication of this notice in the *Federal Register*.

Several amendments of Standard 108 are also being made by this notice to reflect the expiration of the stated period for certain compliance options. Paragraphs S4.1.1.13, S4.1.1.14, and S4.1.1.15 of Standard 108 deferred compliance with amended backup lamp and license plate lamp requirements, and with turn signal requirements for motorcycles, until January 1, 1973, at the manufacturer's option. Since these options are no longer permissible, the paragraphs are being deleted. Rather than redesignating the succeeding subparagraphs of S4.1.1 as has been the practice in the past, the NHTSA, in order to eliminate confusion, intends to maintain the current order and adopt new numbers in successive order for new requirements. A similar policy has been adopted with respect to footnotes in the Tables. Thus, the trailer lighting amendments adopted by this notice are designated S4.1.1.17 and S4.1.1.18. S4.1.1.16 is amended to delete the expired option allowing use of Class B turn signals on vehicles less than 80 inches wide designed to complete a durability test of 100,000 cycles. Appropriate amendments reflecting these deletions are made to the footnotes and references in Tables I, III, and IV of the standard.

In consideration of the foregoing, 49 CFR § 571.108, Motor Vehicle Safety Standard No. 108, is amended. . . .

Effective date: July 23, 1973. Because the amendment in part relieves a restriction and creates no additional burden, and in part is administrative in nature, it is found for good cause shown that an effective date earlier than 180 days after issuance is in the public interest.

(Section 103, 119, Pub. L. 89–563, 80 Stat. 718, 15 USC 1392, 1407; delegation of authority at 38 F.R. 12147.)

Issued on June 15, 1973.

James E. Wilson
Associate Administrator
Traffic Safety Programs

38 F.R. 16875
June 27, 1973

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 69–19; Notice 7)

This notice amends 49 CFR § 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, to specify requirements for rectangular headlamps that may be used as an option in a four-headlamp system until September 1, 1976. The notice also sets forth NHTSA policy concerning rectangular headlamps after such time.

Interested persons have been afforded an opportunity to participate in the making of the amendment by a notice of proposed rulemaking (Docket No. 69–19; Notice 5) published on June 8, 1973 (38 F.R. 15082), and due consideration has been given to all comments received in response to the notice, insofar as they relate to matters within its scope.

The prior notice responded to a petition by General Motors. Under it, a rectangular headlamp approximately 6¾ in. by 4¼ in. would be permissible in five headlamp types (Types 1A through 5A) proposed for the two four-lamp front lighting Systems B and C proposed in Notice 3 to Docket No. 69–19 (37 F.R. 22801). Photometric values based upon Notice 3 were also proposed. As Notice 5 was technically an amendment of Notice 3, other headlighting requirements of the earlier proposal, such as those affecting mounting and aiming, were incorporated by reference.

Based upon comments to the docket and consideration of the issues involved, this amendment allowing an optional rectangular headlamp system differs from the proposal in several respects. The most important of these is its incorporation into Standard No. 108 as it is currently in effect, rather than into the amendment proposed by Notice 3. Thus, only two of the five proposed rectangular headlamp types have been adopted, and the photometric, mounting, and other requirements are with slight exceptions those that are presently required for a four-headlamp system. Dimensions are slightly different from those proposed, at the request of General Motors which has modified its original experimental design.

The comments received expressed a variety of opinions on the rectangular headlamp proposal. The most common point of agreement was that there is no clear safety benefit or detriment in the use of rectangular headlamps. The NHTSA expressed concern in the notice "that there should not be such a proliferation of headlamp shapes and sizes that the motorist who has an immediate need to replace a headlamp has difficulty in finding one," and this concern was shared by several commenters. The points were also made that rectangular headlamps may be more expensive than conventional ones, and that they cannot be mechanically aimed with equipment currently in use. Finally, the question was raised whether rectangular headlamps might encounter more service performance difficulties than round ones.

Commenters generally supported the relief of a design restriction imposed by Standard No. 108, and this has been a prime determinant in the NHTSA's decision to permit certain rectangular headlamps. The NHTSA has determined that, by reducing the proposed number of types of rectangular headlamps from five to two, there will not be an undue proliferation of headlamps on the replacement market. Since these headlamps are optional and not mandatory, their cost is not a major relevant factor to be considered in determining whether they should be permitted. Rectangular headlamps can be optically aimed, the method in predominant use in State motor vehicle inspections, and thus the NHTSA did not find the difficulty of mechanical aiming a persuasive argument. In addition, mechanical aimers capable of aiming rectangular headlamps are under development and should shortly be commercially available. The NHTSA is, of course, concerned as to whether the rectangular headlamps will encounter more service difficulties than conventional ones, but does not believe that the issue can be proven until such units are mass-produced and actually in service.

These amendments to Standard No. 108 represent an interim rather than a final decision on the issues of rectangular headlamps and appropriate dimensions. During 1974 and 1975 NHTSA expects the world motor vehicle industry, through international standards organizations and regular trade and professional associations, to arrive, if possible, at a consensus for one set of requirements, including dimensions for rectangular headlamps. Late in 1975, the NHTSA intends to announce its final decision on the matter: whether to remain with the requirements and dimensions adopted in this notice, to propose and adopt others, or to revoke the option. The agency at this point is not committing itself either to adopt any consensus dimensions or to perpetuate the ones desired by General Motors, though the field experience with such lamps over the next two years may be expected to have some influence in the final decision. Adoption of these optional dimensions by a manufacturer during this interim period is at his own risk, and the cost of changing over from interim to permanent dimensions, if different, in 1977 model year tooling will not be considered a material factor in the decision on permanent dimensions. It is planned that the interim amendment will be in effect through August 31, 1976, and that no petitions will be entertained for variant headlamp dimensions or system configurations before the end of that period, to avoid multiplying stock items and disrupting supply channels.

In consideration of the foregoing, 49 CFR § 571.108, Motor Vehicle Safety Standard No. 108, is amended by adding a new paragraph S4.1.1.21. . . .

Effective date: January 1, 1974. Because the amendment creates an optional system without imposing new mandatory requirements on any person it is found for good cause shown that an effective date earlier than 180 days after the issuance of the amendment is in the public interest.

(Secs. 103, 119 Pub. L. 89-563, 80 Stat. 718, 15 U.S.C. 1392, 1407; delegation of authority at 49 CFR 1.51.)

Issued on November 23, 1973.

James B. Gregory
Administrator

38 F.R. 33084
November 30, 1973

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 72–22; Notice 2)

This notice amends Federal Motor Vehicle Safety Standard No. 108 to modify requirements for lighting equipment on mobile structure trailers.

The National Highway Traffic Safety Administration proposed on September 30, 1972 (37 F.R. 20573) that mobile structure trailers (commonly known as mobile homes) need be equipped only with tail lamps, stop lamps, and turn signal lamps if the manufacturer so chooses. As the agency observed in support of its proposal:

"Since January 1, 1968, mobile homes towed on their own wheels have been categorized as 'trailers' by the Federal motor vehicle safety standards, and required to conform to applicable Federal motor vehicle lighting specifications. Pursuant thereto, mobile homes in transit have been equipped with the full complement of trailer lighting equipment required by Standard No. 108: Tail lamps, stop lamps, license plate lamps, reflex reflectors, side marker lamps and reflectors, identification lamps, clearance lamps, and turn signal lamps.

"Because of the limited time a mobile home is on the public ways, manufacturers have been advised that compliance may be achieved by use of a lighting harness removable upon completion of transit. The Trailer Coach Association alleges that installation and removal expense of the wiring harness adds needless cost to 'the only low cost housing available to the majority of people today.' It has petitioned for an amendment of the lighting requirements such that reflex reflectors, license plate lamps, identification lamps, clearance lamps, and side marker lamps would not be required on mobile structure trailers 'when moved under the authority of State issued permits whose regulations specifically prohibit movement during hours of darkness.' . . .

"Available information indicates that a mobile structure trailer, defined in 49 CFR 571.3 as 'a trailer that has a roof and walls, is at least 10 feet wide, and can be used off road for dwelling or commercial purposes,' cannot move over the public roads of any State without a permit containing the condition that the trailer shall not be moved during hours of darkness. In many jurisdictions, movement is also prohibited during inclement weather or under other conditions of reduced visibility. The safety benefit of requiring the full complement of trailer lighting equipment appears negligible under these circumstances, and unnecessary for the safety of the motoring public."

The proposal was supported by numerous mobile home manufacturers and manufacturers associations, and opposed by a number of manufacturers and suppliers of lighting equipment, by a consumer group, one State, and other interested persons. Those who opposed the proposal argued that the presence of large mobile homes on the public highway is a traffic hazard *per se*, and that a full complement of lights should be required regardless of restrictions on movement. Comments were made that the existence of State laws did not necessarily preclude movement of mobile homes either at night or during periods of inclement weather. Most States, however, require special warning to motorists when mobile structure trailers exceeding a specified width and length are being transported. This warning may be in the form of flagmen, escort vehicles, flags on the towing vehicle, and "wide load" signs.

The NHTSA has concluded that motor vehicle safety does not require a full complement of lighting devices on mobile structure trailers, whose use of the roads, as a class, is infrequent, and confined to daylight hours, when identification lamps, clearance lamps, and side marker lamps are not normally in use. Accordingly, the standard is being amended to specify that the only required lighting equipment for these vehicles is stop lamps, turn signal lamps, tail lamps, and rear reflex reflectors. The NHTSA has decided to include rear reflex reflectors as required equipment to provide some measure of protection when a mobile structure trailer is parked on the road shoulder at night or during periods of reduced visibility. Mobile structure trailers in interstate transit, however, must continue to meet the requirements of the Bureau of Motor Carrier Safety (49 CFR 393.17, 393.25).

In consideration of the foregoing, 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, is revised by adding a new section S4.1.1.25. . . .

Effective Date: May 29, 1974. Because the amendment relieves a restriction, and creates no additional burden, it is found for good cause shown that an effective date earlier than 180 days after issuance is in the public interest.

(Sec. 103, 119, Pub. L. 89–563, 80 Stat. 718, 15 U.S.C. 1392, 1407; delegation of authority at 49 CFR 1.51.)

Issued on April 24, 1974.

James B. Gregory
Administrator

39 F.R. 14946
April 29, 1974

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 73–25; Notice 2)

This notice amends 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, to: (1) update the incorporated SAE standard on clearance lamps, (2) group test points for determining photometric conformance of backup lamps, (3) identify load requirements for testing variable load turn signal flashers, and (4) increase the allowable voltage drop in testing turn signal and hazard warning signal flashers.

These amendments are responsive to petitions by Truck Safety Equipment Institute, Signal Stat Corporation, Sylvania GTE and Hope-Tronics, Ltd., as discussed in the notice proposing the amendments, published on November 2, 1973 (38 F.R. 30280). The comments received in response to the notice were unanimous in supporting the change from SAE J592c to J592e as the referenced standard for clearance lamps, and in adopting the grouping of test points to determine compliance of backup lamps with photometric requirements. Comments also unanimously supported the identification of load requirements for testing variable load turn signal flashers, with one commenter suggesting that this might better be accomplished by referencing SAE J590e. The suggestion was not adopted, as J590e incorporates matter not proposed in Notice 1. The proposal that the maximum voltage drop across flashers be increased from 0.45 volt to 0.8 volt was supported by four vehicle manufacturers with a fifth suggesting an increase to 0.6 volt. It was objected to by six commenters, all of them flasher manufacturers, on the grounds that it would result in a lessening of light output. The NHTSA recognized this possibility in Notice 1, but noted that the diminution would be so slight as to be undetectable by the human eye, while the public would be afforded the choice of a flasher with greater life expectancy. The amendment increasing the minimum voltage drop is adopted as proposed.

In consideration of the foregoing, 49 CFR 571.108 Motor Vehicle Safety Standard No. 108 is amended. . . .

Effective date: May 29, 1974. Because these amendments either relax a requirement or reflect existing widespread industry practice, and create no additional burden, it is found for good cause shown that an effective date earlier than one hundred eighty days after issuance is in the public interest.

(Secs. 103, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.51.)

Issued on April 24, 1974.

James B. Gregory
Administrator

39 F.R. 15130
May 1, 1974

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 73–33; Notice 2)

This notice amends 49 CFR § 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, to allow variable-load turn signal flashers on trucks that are capable of accommodating slide-in campers.

The proposal on which the amendment is based was published on January 3, 1974 (39 F.R. 822), pursuant to a petition by Ford Motor Company. Standard No. 108 presently requires turn signal failure indication in accordance with SAE Standard J588d, except on vehicles whose overall width is 80 inches or more, and on vehicles equipped to tow trailers. This has the effect of mandating use of fixed-load flashers, since special circuitry would be necessary to sense and indicate a failure in a variable-load system.

The NHTSA proposed to include trucks capable of accommodating slide-in campers in the group of vehicles not required to have a failure indicator (and hence allowed to have variable-load flashers). The problem presented by Ford may be summarized as follows: when camper turn signal lamps are added to the turn signal circuit of the vehicle carrying the camper, the flash rate will increase, to a level generally exceeding the maximum specified by Standard No. 108. Allowing a variable-load flasher will insure a uniform flash rate when the camper is installed.

In response to the opportunity afforded for comments, seven submittals were received. Six supported the proposal. The seventh commenter, a foreign equipment manufacturer, opposed the proposal on the grounds that suitable flashers for similar applications are available in Europe.

The NHTSA has determined that the availability of variable-load flashers ensuring flash rate control within the limits of the standard is desirable, and should be permitted on trucks capable of accommodating slide-in campers, despite the lack of lamp failure indication. In order to make clear the intent of the regulation, language is being added to specify that the exception applies only to vehicles with variable-load flashers.

In consideration of the foregoing, paragraph S4.5.6 of 49 CFR 571. 108, Motor Vehicle Safety Standard No. 108 is revised. . . .

Effective date: June 6, 1974. Because the amendment allows an additional option and creates no additional burden, it is found for good cause shown that an immediate effective date is in the public interest.

(Secs. 103, 119, Pub. L. 89-563, 80 Stat. 718, 15 U.S.C. 1392, 1407; delegation of authority at 49 CFR 1.51.)

Issued on May 31, 1974.

James B. Gregory
Administrator

39 F.R. 20063
June 6, 1974

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

(Docket No. 74–16; Notice 2)

This notice amends 49 CFR 571.108, 571.122, and 571.123, Motor Vehicle Safety Standards Nos. 108, 122, and 123, to modify current requirements that apply to motor-driven cycles.

Interested persons have been afforded an opportunity to participate in the making of the amendment by a notice of proposed rulemaking published on April 12, 1974 (39 F.R. 13287) and due consideration has been given to all comments received in response to the notice, insofar as they relate to matters within its scope.

The prior notice responded to petitions by Cycles Peugeot, Ateliers de la Motobecane, and S.I.N.F.A.C., manufacturers, and Bermuda Bikes, Inc., and Robert F. Smith, retail dealers. The notice proposed that a motor-driven cycle whose speed attainable in 1 mile is 30 mph or less need not be equipped with turn signal lamps, and may be equipped with a stop lamp with one-half the photometric output otherwise required. Braking fade and recovery requirements also would not apply to these low-speed vehicles. Maximum stopping distance values for the various tests would be added for test speeds of 25, 20, and 15 mph. Finally, a braking control on the left handlebar would be a permissible alternative to the required right foot braking control.

The comments received addressed both areas of performance covered in the proposal, and areas where no standards currently exist, such as motors, transmissions, pedals, and a request for exemption from Standard No. 119, *Tires for Vehicles Other Than Passenger Cars*. As these latter comments cover matters beyond the scope of the proposal, this notice does not discuss them. The agency, however, has been formally petitioned for rulemaking covering transmissions and Standard No. 119, and will respond to the petitioners in the near future.

The decision by NHTSA not to establish a separate category of vehicle was objected to by some commenters. In support of their request, they argued that the majority of motor-driven cycles have engines producing only 1.5 to 2 horsepower, and consequent low maximum speeds, reducing the need for forward lighting that is currently required of these vehicles. Petitioners submitted no data justifying their request. The NHTSA, however, intends to study the matter of forward lighting for low-powered two-wheeled vehicles through a research contract with the University of Michigan. When the contract is completed the agency will then decide whether further rulemaking is warranted.

The proposal distinguished motor-driven cycles on the basis of maximum speed attainable in 1 mile, rather than on horsepower, and the value selected, 30 mph, fell within the maximum (40 mph) and minimum (20 mph) suggested by commenters. The NHTSA has concluded therefore that the distinction should be adopted as proposed.

Some manufacturers requested restrictive controls on power plant output, apparently in fear that the engine of a vehicle with a top speed of 30 mph or less could be modified to exceed that speed, and therefore cause the vehicle to no longer comply with the Federal standards. This agency has not found that course of action to be practicable. The various ways to modify a vehicle after purchase cannot be anticipated or prevented at the manufacturer level. On the other hand, the great majority of consumers use their vehicles in the form in which they were purchased. The motor-driven cycle category itself contains a limitation of 5 horsepower, which will be applicable to the special lighting modifications. In the NHTSA's judgment, modifications by consumers and the consequent equipment requirements should continue to be regulated at the State level.

The fact that the agency took no action to propose a reduction in existing headlamp requirements for motor-driven cycles was criticized by several manufacturers as unduly restrictive because of the low speed and power output of their vehicles. No justification has been shown for such a change. Motor driven cycles therefore must have sufficient generating and/or battery capacity to meet the headlamp requirements.

There was no substantive objection to the actual proposals for omission of turn signals, reduced stop lamp photometrics, relief from brake fade requirements, inclusion of maximum allowable stopping distances for low speeds, and rear brake control placement. Accordingly, the standards are being amended in the manner proposed.

Standard No. 122 is also being amended to delete the final effectiveness test (S5.5) for those motor-driven cycles excused from the fade and recovery requirements. The purpose of the final effectiveness test is to check the stopping ability of the vehicle after the fade and recovery tests. Since this requirement has been eliminated for motor-driven cycles of low top-speed, the final effectiveness test is redundant, and an unnecessary duplication of the second effectiveness test. No safety purpose is served by its retention. Language is also added to the fade and recovery and final effectiveness test procedures (S7.6, S7.7, and S7.8), making it clear that they do not apply to motor-driven cycles whose speed attainable in 1 mile is 30 mph or less.

In consideration of the foregoing, 49 CFR Part 571 is amended . . . .

Effective date: October 14, 1974. As the amendments allow new options for compliance, relieve restrictions, and impose no additional burdens on regulated persons, it is found for good cause shown that an effective date earlier than 180 days after issuance of the amendments is in the public interest.

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718, 15 U.S.C. 1392, 1407; delegation of authority at 49 CFR 1.51.)

Issued on September 6, 1974.

James B. Gregory
Administrator

39 F.R. 32914
September 12, 1974

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

(Docket No. 69–19; Notice 9)

This notice amends 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, to waive the requirement that there be a 4-inch minimum spacing between a front turn signal and a low-beam headlamp whenever the turn signal lamp's photometric output is at least two and one-half times the minimum required. The amendment is effective October 17, 1974.

Interested persons have been afforded an opportunity to participate in the making of the amendment by a notice of proposed rulemaking (Docket No. 69–19, Notice 3) published on October 25, 1972 (37 F.R. 22801), and due consideration has been given to the comments received in response to the notice.

In order to enhance detectability of front lamp function by oncoming drivers at a distance, Standard No. 108 through its incorporation of SAE Standard J588d, "Turn Signal Lamps," requires at least 4 inches of spacing between a front turn signal lamp and a low beam headlamp. However, as part of Notice 3, the NHTSA proposed in paragraph S8.12 that turn signal lamps and low beam headlamps could be closer if the candlepower output of the turn signal lamp is at least two and one-half times that specified for yellow turn signal lamps in the SAE standard. Mercedes-Benz of North America has asked the NHTSA to make an early decision on the proposal to facilitate its product development plans.

Comments in general supported the proposal. Some requested removal of the 4-inch limitation regardless of turn signal photometric output. Others felt that the photometric values of all front turn signal lamps should be two and one-half times the present minimum. The NHTSA has decided to amend the standard primarily as proposed, but with reference to the grouped test points of Figure 1 of the standard rather than to the individual test points of J588.

In consideration of the foregoing, 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, is amended by adding new paragraph S4.3.1.7 . . . .

Effective date: October 17, 1974. Because the amendment relieves a restriction without imposing new requirements on any person, it is found for good cause shown that an effective date earlier than 180 days after the issuance of the amendment is in the public interest.

(Sec. 103, 119, Pub. L. 89–563, 80 Stat. 718, (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.51.)

Issued on September 12, 1974.

James B. Gregory
Administrator

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices and Associated Equipment

This notice amends 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, to resolve an unintended ambiguity between paragraphs S4.1.1.11 and S4.1.1.12, and paragraph S4.3.1.1.

Paragraphs S4.1.1.11, S4.1.1.12 and S4.1.1.22 allow photometric conformance of parking lamps, stop lamps, taillamps, turn signal lamps, and backup lamps to be determined by measurement of sums of values within specified groups of test points. Paragraph S4.3.1.1 prohibits vehicle equipment obscuring the photometric output "at any test point" specified in SAE materials unless auxiliary lighting equipment is provided that meets all photometric requirements. Standard No. 108 can thus be interpreted as requiring the addition of auxiliary lighting equipment if, for example, a single test point of a taillamp is obscured by part of the vehicle, even though the taillamp might meet the group requirements of Figure 1. NHTSA is therefore amending paragraph S4.3.1.1 to remove the ambiguity.

In consideration of the foregoing the second sentence of paragraph S4.3.1.1 of 49 CFR 571.108 Motor Vehicle Safety Standard No. 108 is revised.

Effective date: April 21, 1975. Because the amendment clarifies an ambiguity and creates no additional burden on any person, it is found for good cause shown that an effective date earlier than 180 days after issuance is in the public interest.

(Secs. 103, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.51.)

Issued on April 15, 1975.

James B. Gregory
Administrator

40 F.R. 17574
April 21, 1975

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 74–34; Notice 2)

This notice amends 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, to define in objective terms an acceptable level of surface gloss and/or haze for plastic materials used for lamp lenses following an outdoor exposure test. The amendment is effective upon publication in the *Federal Register*. It is based upon a notice of proposed rulemaking published on September 30, 1974 (39 F.R. 35179).

Paragraph S4.1.2 of Standard No. 108 incorporates by reference SAE Recommended Practice J576b, *Plastic materials for use in optical parts, such as lenses and reflectors, of motor vehicle lighting devices*. This practice requires in pertinent part (Paragraph 4.2.2) that, following an outdoor exposure test of 2 years' duration, exposed samples, when compared with unexposed control samples, shall not show haze or loss of surface luster. This requirement has been interpreted as forbidding any haze or loss of surface luster, and has prohibited the use of plastics of uncoated polycarbonate resin, as these plastics show a surface change after outdoor weathering. General Electric Company petitioned for rulemaking to amend Standard No. 108 to define in objective terms an acceptable level of surface gloss, so that uncoated polycarbonate plastic may be used for exterior automotive applications. Although a protective coating is available for the plastic, GE stated that vehicle manufacturers are reluctant to use it because of the cost involved, "from 3–40 cents per lens depending upon the size."

In support of its petition GE submitted a large body of technical information showing the effect of surface gloss reduction on the photometric performance and signaling effectiveness of various types of lighting devices used on motor vehicles. These tests showed that at the end of a 3-year period the photometric output through uncoated polycarbonate lenses decreases, on the average, less than 10 percent. In GE's view, deglossing to haze levels of 50 percent does not appear significantly to affect the overall photometric performance and signaling effectiveness of a lamp. The effect of haze is to scatter light from the point of maximum intensity to the wider angle test points, resulting in a diminution of light output at the former, and an increase at the latter. In accordance with GE's test data and suggestion, however, the National Highway Traffic Safety Administration (NHTSA) proposed that haze level should not exceed 30 percent. NHTSA tentatively found that the proposed amendments would enhance traffic safety. Polycarbonate lenses appear to offer some benefits lacking in conventional plastics in terms of heat resistance and higher impact strength.

It was also proposed to update the referenced SAE Recommended Practice J576b, to J576c, effective January 1, 1976. This substitution had been previously proposed (Docket No. 69–19; Notice 3, 37 F.R. 22806) and favorably commented upon. The only difference is that J576c requires a 3-year exposure test while J576b requires only a 2-year one.

Comments submitted in response to the notice generally indicated support by vehicle manufacturers, and opposition by manufacturers of lamps and plastic materials. It was argued that the data in the petition did not support a relaxation, and that further data and study were necessary before a decision could be made. These arguments do not appear to have merit. On the basis of the comments, however, the amendment excludes reflex reflectors. The current higher performance level is justified for reflector materials, which do not have a light source shining through them. In addition, the amendment specifies that the tests are performed on lens materials rather than finished lenses.

The economic effect of the amendment is that by allowing use of uncoated polycarbonate materials, a lens possessing superior heat resistance and impact durability will be made available at a lesser cost.

In consideration of the foregoing, 49 CFR 571.108 is amended. . . .

Effective date: June 18, 1975. Since the amendment does not require compliance before January 1, 1976 and allows optional compliance until then, it is found for good cause shown that an effective date earlier than 180 days after issuance is in the public interest.

(Secs. 103, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.51.)

Issued on June 12, 1975.

James B. Gregory
Administrator

40 F.R. 25677
June 18, 1975

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 75–8; Notice 2)

This notice amends 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, to remove the restriction that would disallow manufacture of vehicles with four-lamp rectangular headlamp systems on and after September 1, 1976.

The NHTSA proposed on April 30, 1975 (40 FR 18795) the termination of the amendment to Standard No. 108 adopted November 30, 1973 (38 FR 33084), that disallowed use of rectangular headlamp systems on motor vehicles manufactured on or after September 1, 1976. In allowing probationary use of the new headlamp system, this agency had concluded that the interests of safety required a period in which the systems could be evaluated as to on-road performance and availability of replacements. A final decision was scheduled for late in 1975 on whether to allow continued use of such systems, and if so, whether to retain the current dimensions or to propose modifications.

The NHTSA has decided to remove the termination date of September 1, 1976, thus allowing indefinite use of four-lamp rectangular headlamp systems, and to retain the current dimensions. In the period that rectangular systems have been in use no service or supply problems have come to this agency's attention. The lamps have been tested and approved by the American Association of Motor Vehicle Administrators. No comments to the notice of April 30, 1975, objected to the removal of the termination date, and all those who commented on the issue supported it. The dimensions specified in Standard No. 108 have been adopted by the Society of Automotive Engineers in SAE Standard J579c, "Sealed Beam Headlamp Units for Motor Vehicles," December 1975, and are now accepted by the motor vehicle and lighting industries. There has been occasional criticism that these systems increase vehicle weight and cost without a corresponding benefit in safety. Any weight increases are very minor, however. The purpose of the amendment was to remove a design restriction and to allow manufacturers and consumers the freedom to choose an alternative but equivalent headlighting system. The cost increase is not, therefore, mandated by the standard.

The Administrator also requested comments in the April 30, 1975, notice as to the advisability of proposing an amendment to Standard No. 108 that would allow a single two-lamp rectangular system. Commenters generally supported the concept of a two-lamp system, advising dimensions based upon SAE recommendations. The subject is now under consideration by the agency.

In consideration of the foregoing, paragraph S4.1.1.21 of 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, is amended by deleting the phrase "manufactured between January 1, 1974 and September 1, 1976" and substituting the phrase "manufactured on or after January 1, 1974".

Effective date: November 24, 1975. Because the amendment relieves a restriction and creates no additional burden on any person it is found for good cause shown that an effective date earlier than 180 days after issuance is in the public interest.

(Sec. 103, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.51)

Issued on November 17, 1975.

James B. Greory
Administrator

40 F.R. 54426
November 24, 1975

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 75–15; Notice 2)

This notice amends 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices and Associated Equipment*, to modify requirements for clearance lamps on vehicles of special configuration.

Notice of the amendment was published on June 5, 1975 (40 FR 24204), and an opportunity afforded for comment. The NHTSA proposed that the inboard visibility angle of 45 degrees for clearance lamps need not be met on a vehicle where it is necessary to mount the lamps on surfaces other than the extreme front or rear to indicate the overall width or for protection from damage during normal operation of the vehicle. Restricted inboard visibility angles of clearance lamps are encountered on many types of vehicles other than boat trailers and horse trailers. Examples are (1) front clearance lamps that are mounted on a truck body behind the cab and below the top of the cab, and (2) front and rear clearance lamps mounted on the fenders of trucks and trailers such as liquid and bulk commodity vehicles and cement mixer carriers.

Eleven comments were submitted by manufacturers, trade associations, and the California Highway Patrol. Ten of these supported the amendment. The sole dissenter felt that there might be traffic situations where visibility at some inboard positions would be important. Trailmobile and Recreational Vehicle Industry Association requested modifications to Standard No. 108 that were beyond the scope of the proposal and thus were not considered.

In consideration of the foregoing, 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, is amended. . . .

Effective date: November 24, 1975. Because the amendment relieves a restriction and creates no additional burden upon any person, it is found for good cause shown that an effective date earlier than 180 days after issuance is in the public interest.

(Secs. 103, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.51)

Issued on November 17, 1975.

James B. Gregory
Administrator

40 F.R. 54427
November 24, 1975

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 69–19; Notice 10)

This notice amends 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, to clarify the electrical terminal specifications for Type 1A rectangular headlamps.

Standard No. 108 was amended on November 30, 1973, (38 FR 33084) to specify requirements for rectangular headlamps that may be used as an option in a four-headlamp system. Figure 2 of the amended standard specifies certain interchangeability features of Type 1A and 2A rectangular headlamps, including location and arrangement of the electrical terminals. The three terminals shown in Figure 2 are designed as "ground," "lower beam," and "Type 2A upper beam." The terminal designated as "lower beam" is used as the terminal for the upper beam on Type IA headlamps. This is implied by the notation, "no connection or terminal for Type 1A headlamp," under the phrase "Type 2A upper beam," since the ground is not a connection, but the figure may not be sufficiently clear on that point. In order to make it clear, this notice amends Figure 2 so that the "lower beam" terminal is redesignated as the "Type 2A lower beam or Type 1A upper beam" terminal.

It has also come to the attention of this agency that certain dimensional tolerances of Figure 2 are unnecessarily restrictive and that other methods of dimensioning are more applicable in certain cases. In addition, an optional terminal configuration permitted for other headlamps is not currently included for the Type 1A and 2A headlamps.

Accordingly, Figure 2 is being revised to provide a tolerance change to the overall lamp width (6.58 inches) and height (4.20 inches). The lamp corner radius of 0.56 inch is changed to 0.54 inch, a terminal spacing of 0.333 inch is changed to 0.335 inch, and an optional terminal configuration is specified. A dimension is included for the seating lugs, and a different method of dimensioning the locating lug is specified.

These changes do not affect interchangeability or performance of the lamps and are specified only to relieve unnecessary restrictions.

Effective date: December 23, 1975. Because the amendment creates no additional burden upon any person it is found for good cause shown that an immediate effective date is in the public interest.

(Sec. 103, 119, Pub L. 89–563, 80 Stat. 718, 15 U.S.C. 1392, 1407; delegation of authority at 49 CFR 1.51)

Issued on December 3, 1975.

James B. Gregory
Administrator

40 F.R. 59349
December 23, 1975

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 69–19; Notice 11)

This notice amends 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, primarily to modify requirements applicable to turn signal lamps. The amendments are effective January 5, 1976.

Triangle Home Products has petitioned for immediate adoption of SAE Standard J588e, *Turn Signal Lamps*, September 1970, as the referenced standard for that item of lighting equipment. This change was originally proposed by NHTSA in Notice 3, Docket No. 69–19 (37 F.R. 22801). SAE J588e differs from J588d in several respects, the principal one being that the minimum effective projected luminous area of all turn signal lamps is 8 square inches. SAE J588d had divided turn signal lamps into two classes, A and B, but this no longer occurs in J588e. Class A turn signal lamps were those with a lens area not less than 12 square inches, while Class B were those whose minimum lens area was not less than 3.5 square inches. The amendment means that the minimum required luminous area of turn signals on passenger cars, and on other vehicles (except motorcycles) less than 80 inches in overall width, is increased to 8 square inches from 3.5 square inches, while that of larger vehicles is reduced to 8 from 12 square inches. The agency expects there to be no effect upon safety from this reduction as the photometric requirements are unchanged.

This proposal was not uniformly supported, several manufacturers objecting that the increase in minimum area from 3.5 square inches to 8 square inches was unnecessary, and suggesting 5 square inches instead. The NHTSA notes, however, that the SAE adopted J588e after many tests that demonstrated that the increase to 8 square inches, by providing more signal area, resulted in better estimation of the position of the signaling vehicle as seen by drivers of oncoming and following vehicles. Because of the increased photometrics for turn signal lamps that became effective January 1, 1970, it is difficult to manufacture lamps smaller than 8 square inches and produce the required light output. Finally, an area smaller than 8 square inches would increase the unit area intensity to a level that is likely to be distressing to many drivers. It is likely, however, in spite of the objections to the proposal that the industry conforms at present. The NHTSA surveyed the turn signal lens of 18 contemporary domestic and foreign passenger cars, finding no lens area less than 8 square inches, with the average at 14. However, the amendments permit continued compliance with J588d, on an optional basis, until September 1, 1978.

Notice 3 also proposed the adoption of updated SAE Standards, J585d and J586c, for tail lamps and stop lamps respectively. There were no objections to these proposals. The principal difference in the updated standards is the inclusion of definitions of and photometering instructions for multiple compartment lamps and multiple lamp arrangements. SAE J586c also establishes a minimum of 8 square inches for the effective projected luminous lens area of stop lamps, and, in a combination stop lamp-turn signal lamp, prohibits operation of the stop lamp while the turn signal is flashing. SAE J585d, in a change from J585c, requires measurement of photometrics not less than 10 feet from the photometer screen, the previous distance being a minimum of 4 feet. Because of these changes, the NHTSA is permitting continued compliance with J585c and J586b until September 1, 1978.

Accordingly, Standard No. 108 is being amended to incorporate the three new SAE Standards. Editorial amendments are also made to S4.1.1.6, S4.1.1.7, S4.1.1.12, S4.5.5 and S5.1 to conform them to the new requirements.

In consideration of the foregoing, 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, is amended. . . .

Effective date: January 5, 1976. Because the effect of the amendments is to allow compliance with either the new or the existing requirements until September 1, 1978, an immediate effective date imposes no additional burden on any person and is found for good cause shown to be in the public interet.

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718, 15 U.S.C. 1392, 1407; delegation of authority at 49 CFR 1.50)

Issued on December 23, 1975.

James B. Gregory
Administrator

41 F.R. 765
January 5, 1976

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 69–19; Notice 12)

This notice amends 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, to allow conformance with SAE Standard J579c, "Sealed Beam Headlamp Units for Motor Vehicles", December 1974 as an option to compliance with the presently referenced SAE Standard J579a.

On October 25, 1972, the National Highway Traffic Safety Administration proposed (37 FR 22801) as part of a comprehensive rulemaking action that SAE Standard J579a, as currently referenced in Standard No. 108, be replaced by SAE Standard J579b. Except for the increased maximum candlepower (75,000 candlepower) specified in SAE Standard J579b, the commenters generally supported this proposal. SAE Standard J579c has added a definition of H–V axis and a description of rectangular sealed beam headlighting systems; otherwise it is identical to J579b.

SAE Standard J579c provides compatibility between headlight beam positions regardless of whether the headlamp is aimed by mechanical, optical, or visual methods, unlike SAE Standard J579a, which results in different beam positions if the lamp is aimed by mechanical methods instead of optical or visual methods. Since the headlamp beam position provided by the optical and visual aim methods is higher and results in greater seeing distance for the driver, the same improvement should be afforded by mechanical aim methods.

SAE Standard J579c contains minor changes in photometrics at certain test points which also provide improved lighting, but are of such a minor technical nature that allowance of these values would be a relief of a restriction. However, this amendment of Standard No. 108 restricts the maximum candlepower output, for the present time, to 37,500. The question of allowing the SAE maximum of 75,000 candlepower was raised in the notice of October 25, 1972, and will be considered in future rulemaking actions.

In consideration of the foregoing, amendments are made to 49 CFR § 571.108, Motor Vehicle Safety Standard No. 108. . . .

Effective date: January 8, 1976. Because the amendment allows an option, relieves restrictions, and creates no additional burden on any person, it is found for good cause shown that an immediate effective date is in the public interest.

(Sec. 103, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.50)

Issued on January 5, 1976.

James B. Gregory
Administrator

41 F.R. 1483
January 8, 1976

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 69–19; Notice 14)

This notice amends 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, to provide identical wattage tolerances for headlamps with rectangular and circular lenses.

Standard No. 108 was amended on January 8, 1976 (41 FR 1483), to add S4.1.1.33 which provided, in subparagraph (c), an allowable tolerance of plus 7.5 percent for the maximum design wattage of headlamps with circular lenses that conform to SAE Standard J579c, *Sealed Beam Headlamp Units for Motor Vehicles*, December 1974. The question has been raised by Stanley Electric Co., Ltd., of Tokyo, Japan, and General Motors Corp. of Warren, Michigan, whether the same tolerance applies for the maximum design wattage of headlamps with rectangular lenses.

The answer is yes, and S4.1.1.21(b) is amended by this notice to provide an allowable tolerance of plus 7.5 percent for Type 1A and Type 2A headlamps. The 7.5 percent tolerance is the average actual maximum wattage (as opposed to design wattage) rating of headlamps listed in Table 2 of SAE Standard J573d, *Lamp Bulbs and Sealed Units*, December 1968, as determined by multiplication of the maximum amperage times the design volts, and applies to all Type 1, Type 1A, Type 2 and Type 2A headlamps.

In consideration of the foregoing, subparagraph (b) of S4.1.1.21 is deleted and a new subparagraph (b) is added. . . .

Effective date: June 21, 1976. Because this amendment clarifies an existing requirement and creates no additional burden upon any person, it is found for good cause shown that an effective date earlier than 180 days after issuance is in the public interest.

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.50.)

Issued on June 14, 1976.

James B. Gregory
Administrator

41 F.R. 24886
June 21, 1976

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 75-8; Notice 5)

This notice amends 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, to allow use of a two-lamp rectangular headlamp system on motor vehicles manufactured on or after November 1, 1976.

On April 15, 1976, the agency proposed (41 FR 15870) that a system of two headlamps conforming to SAE Recommended Practice J1132—"142mm × 200mm Sealed Beam Headlamp Unit," January 1976, be used as an option in a two-headlamp system, and that applicable referenced and subreferenced SAE Standards and Recommended Practices not specifically included in SAE J1132 be those published in the 1976 SAE Handbook. A corrective notice was published on May 6, 1976 (41 FR 18687) clarifying that the headlamps would be "designed to conform" with J1132, consistent with other requirements for compliance of lighting equipment. The comments have received full consideration in adoption of this amendment.

The proposal was generally supported by vehicle and lighting manufacturers. Commenters indicated approval of the relief of a design restriction and the allowance of a greater choice of headlamps. Those who opposed the proposal commented that it might be difficult to obtain a replacement headlamp and that the 2-lamp rectangular system would complicate the supply-distribution network. Others commented that new mechanical aimers would be required for the two-lamp system.

In response to these comments, a study of the introductory period of the 4-lamp rectangular system demonstrated that replacement lamps were generally available, the supply-distribution network functioned as well as with older conventional headlamps, and that rectangular lamps could be inspected and properly aimed as well as, if not better, than those with circular lenses. Although the 4-lamp system required development of a new mechanical aimer, the 2-lamp system will require only a simple adapter for the aimer.

Lamp manufacturers commented that the rectangular lamps may have more service performance difficulties than the circular types. However, unlike the 4-lamp system, the 2-lamp Type 2B system provides improved aim, about 15 percent higher photometrics in low beam performance, and up to 100 percent improvement in high beam performance.

In accordance with recently enunciated Department of Transportation policy encouraging adequate analysis of the consequences of regulatory action (41 FR 16200) the agency has evaluated the economic and other consequences of this action on the public and private sector, including possible loss of safety benefits. Since the system itself is an optional one, in one sense there is neither an adverse or positive economic impact. A Type 2B headlamp is expected to cost 150 percent of a conventional Type 2 headlamp but because of the improved photometrics of the lamp, the amendment should result in an overall benefit to safety.

The National Motor Vehicle Safety Advisory Council has not taken a position on the amendment.

In consideration of the foregoing a new paragraph S4.1.1.34 is added to 49 CFR 571.108, Motor Vehicle Safety Standard No. 108. . . .

Effective date: November 1, 1976. Because the amendment relieves a restriction and allows an optional means of compliance, it creates no additional burden upon any person. Accordingly, it is found for good cause shown that an effective date earlier than 180 days after publication in the *Federal Register* is in the public interest.

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.50.)

Issued on October 13, 1976.

John W. Snow
Administrator

41 F.R. 46437
October 21, 1976

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 69–19; Notice 16)

This notice amends 49 CFR 571.108 Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, in minor respects.

This agency recently reviewed Motor Vehicle Safety Standard No. 108 and discovered five minor errors which this notice corrects. The first is an amendment of S4.1.1.4 to substitute SAE Standard J594e, "Reflex Reflectors," March 1970 as the referenced SAE Standard, a change inadvertently omitted when Table I and Table III were amended to incorporate J594e (37 FR 15514, August 3, 1972). The second corrects typographical errors in S4.1.1.17 that occurred in the republication of the standard on August 23, 1976 (41 FR 35522). The third is a correction of S4.3.1 which currently excludes "S4.3.1.8" from its applicability. There is no S4.3.1.8. The fourth amendment corrects a typographical error in S4.3.1.1.1 that also occurred in the republication of the standard. The final amendment substitutes "J593c, February 1968" in Table III as the referenced standard for backup lamps, in place of "J593e, July 1972". This error initially occurred in "Volume 49 CFR Parts 200 to 999 revised as of October 1, 1975."

In consideration of the foregoing 49 CFR 571.108, Motor Vehicle Safety Standard No. 108 is amended as follows.

Effective date: November 1, 1976. Since the amendments are corrective in nature and impose no additional burden upon any person, it is found for good cause shown that an effective date earlier than 180 days after issuance is in the public interest.

(Sec. 103, 119, Pub. L. 89–563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.50.)

Issued on November 12, 1976.

John W. Snow
Administrator

41 F.R. 50826
November 18, 1976

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 71-19; Notice 06)
(Docket No. 75-32; Notice 02)

This notice responds to petitions for reconsideration of the newly established Standard No. *120, Tire Selection and Rims for Motor Vehicles Other Than Passenger Cars*, by amendments to the standard in the areas of tire and rim selection, rim marking, and tire label information. A minor amendment of Part 567, Certification," is also made. In addition, the decision that the agency no longer regulates mobile structure trailers (mobile homes) is also set forth, along with appropriate conforming amendments of Standard No. 120, Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, and § 71.3, *Definitions*, of Part 571.

Standard No. 120 (49 CFR 571.120) establishes that multipurpose passenger vehicles (MPV's), trucks, buses, motorcycles, and trailers shall be equipped with tires and rims that are adequate to support the fully-loaded vehicle under contemplated operating conditions. The legislative history of the National Traffic and Motor Vehicle Safety Act (the Act) (15 U.S.C. 1381, *et seq.*) and § 202 of that Act establish Congress' concern that motor vehicles could be equipped with inadequate tires and that regulation would be necessary to protect against this problem:

> Sec. 202. In standards established under title I of this Act the Secretary shall require that each motor vehicle be equipped by the manufacturer or by the purchaser thereof at the time of the first purchase thereof in good faith for purposes other than resale with tires which meet the maximum permissible load standards when such vehicle is fully loaded with the maximum number of passengers it is designed to carry and a reasonable amount of luggage.

Standard No. 120 was promulgated January 19, 1976 (41 FR 3478, January 26, 1976), and 17 petitions for reconsideration of particular provisions were filed by vehicle, tire, and rim manufacturers, and by trade associations representing these manufacturers. In view of the length of time that has been taken to respond to these petitions for reconsideration, the effective dates for implementation of several of the standard's provisions were delayed (41 FR 18659, May 6, 1976) (41 FR 36657, August 31, 1976). The standard's basic provision for tire and rim selection (S5.1) was not delayed and became effective September 1, 1976.

Tire and rim selection. The primary effect of Standard No. 120 is fulfillment of § 202 of the Act by specification of the minimum load-carrying characteristics of tires on motor vehicles not already subject to the passenger care tire and rim selection requirements of Standard No. 110, *Tire Selection and Rims*, of Part 571. The rim selection requirements of the standard are limited (use of a rim designated as suitable by the tire manufacturer for use with its product; use of "DOT" labeled rims on and after September 1, 1979) in anticipation of more comprehensive regulation of rims as part of an upcoming wheel standard.

Tire selection consist of two elements: With one exception, each vehicle must be equipped with tires that comply with Standard No. 119, *New Pneumatice Tires for Vehicles Other than Passenger Cars* (or Standard No. 109, *New Pneumatic Tires*), and the load rating of the tires on each axle of the vehicle must together at least equal the gross axle weight rating (GAWR) for that axle. The term GAWR is defined in § 571.3 of Part 571 as ". . . the value specified by the vehicle manufacturer as the load-carrying capacity of single axle system, as measured at the tire-ground interfaces." The GAWR concept formalizes the decision each manufacturer makes about the load-bearing ability of the tires, rims, axle, brakes, and suspension components (at a minimum) chosen to support and control the loaded vehicle.

The Truck Equipment Body Distributors Association (TEBDA) questioned the requirement that, with one exception, each vehicle subject to Standard No. 120 be equipped with tires that conform to Standard No. 119 (or Standard No. 109). TEBDA's March 17, 1976, letter concerned certification of trucks equipped for agricultural service with Goodyear "Terra-Tires." The "Terra-Tire" is one example of tires that are placed on specialized motor vehicles which operate both on and off the highway. The tires are specially designed and are unable to be certified to either of the tire performance standards.

Section S5.1.1 specifies that "each vehicle equipped with pneumatic tires for highway service shall be equipped with tires that meet the requirement of [the tire] standard[s] . . . ." This language is intended to exclude from the requirement for Standard 119 (or 109) tires those vehicles which the manufacturer (or person later in the chain of distribution) decides to equip with tires other than "tires for highway service." The decision is left with the manufacturer at this time in view of the absence of data that demonstrates problems in the use of these tires that would justify their elimination. Any pattern of accident occurrence that points to unsafe utilization of non-highway service tires would presumably constitute a safety-related defect and could lead to revision of Standard No. 120 to regulate them. At this time, the answer to TEBDA is that the tire selection requirements of S5.1.1. ,and S5.1.2 as a logical extension of S5.1.1) would not apply to a vehicle equipped with non-highway service tires. It is emphasized that this exclusion from Standard No. 120 bears no direct relationship to the determination of whether a particular vehicle qualifies as a "motor vehicle" as that term is defined in § 102(3) of the Act.

The second requirement for tire selection (S5.1.2) is that "[t]he sum of the maximum load ratings of the tires fitted to an axle shall be not less than the gross axle weight rating (GAWR) of the axle system. . . ." Comparable further specification exists when multiple ratings appear on the certification label, or the tires used on the vehicle are not listed on the certification label.

Because no petition directly raised objections to the requirements of S5.1.2, the agency first addresses issues raised in a separate and outstanding NHTSA proposal dealing with tire choice and its relationship to GAWR. The action (Definition of "Gross Axle Weight Rating," 40 FR 58152, December 15, 1975) proposed that the GAWR determination be based on, among other things, the vehicle's maximum attainable speed or the maximum load rating of the tire established by the tire manufacturer at 60 mph, whichever is lower. The proposed modification was intended to reflect the industry practice of assigning (in most cases) and labeling (in accordance with Standards 119 and 109) a tire's basic load-carrying capabilities in recognition of the unrestricted highway speeds to which it is normally exposed. This formalization of GAWR determination was intended to prevent manufacturers from assigning higher capabilities to tires than their 60-mph ratings, based on arbitrarily low speeds.

Most comments supported the GAWR proposal, although several truck manufacturers asked that the term "maximum attainable speed" be specifically defined as it is elsewhere in NHTSA regulations. Ford Motor Company opposed the proposed change in the definition of GAWR as an arbitrary selection of only one of the many criteria that enter into the determination of GAWR. The company suggested that other means exist to prevent assignment of arbitrary GAWR's based on tire ratings other than those established at 60 mph and so labeled on the tire sidewall.

The NHTSA agrees with Ford and notes that the "other means" to regulate this practice exist in the tire selection requirements of S5.1.2 of Standard No. 120. At the time of the GAWR proposal, Standard 120 had not been made final. Since its implementation on September 1, 1976, a manufacturer is free to determine GAWR as in the past, but the maximum load ratings (marked on the tire sidewall) of tires on the vehicle must at least equal the GAWR listed. For this reason, the NHTSA's proposal for amendment of the GAWR definition is considered unnecessary and is therefore withdrawn. Further notice and opportunity for comment will precede any further action on the proposal set forth in that notice.

Several issues were raised in regard to the GAWR proposal that should be addressed for purposes of clarification. The Heavy & Specialized Carriers Conference of the American Trucking Associations (HSCC) cautioned the NHTSA against requiring an "unrestricted speed GAWR" on the Part 567 certification label in view of two State laws (or regulations) that no vehicle can operate on the state highways at gross vehicle weights greater than those listed on the vehicle in accordance with Federal regulations. It is common practice to load some "heavy hauler" vehicles to a gross vehicle weight that exceeds the unrestricted speed ratings of the vehicle tires, because the vehicle's tires are capable of carrying greater weight at reduced speeds.

As issued, Standard No. 120 required that the maximum load ratings of the tires at least equal the GAWR. This effectively limits the GVWR to the sum of these GAWR's (except in the case of semi-trailers). In the agency's view, however, the problem cited by HSCC can be avoided by listing additional GAWR's (calculated for reduced speed operation) at the end of the certification plate following the required data on the label. This practice has been followed by members of the Truck Trailer Manufacturers Association (TTMA) and was confirmed as permissible by the NHTSA in a March 5, 1975, letter to the TTMA. In order to aid resolution of issues that may arise between States that wish to refer to the certification label and operators that wish to continue the additional rating system, the agency hereby makes an interpretive amendment to Part 567 to specify where additional ratings may appear.

Based on this understanding of the relationship between choice of tires under S5.1.2 of Standard No. 120 and the determination of GAWR under § 567.4 of Part 567, a modification of the requirements of Standard No. 120 is justified. In the case of a vehicle that is incapable of the 60-mph speed used by tire manufacturers to establish the maximum load rating that is stamped on the tire sidewall (typically a powered vehicle and not a trailer), it would not be reasonable to require the GAWR's to be strictly limited to the sum of the maximum load ratings of the tires on the vehicle. This is because the vehicle will never achieve the speeds for which maximum load ratings were established. In many cases, provision is made to rate tires for a greater load at the lower (but maximum) speed of which a vehicle is capable. In recognition of this extremely limited specialized situation, the agency amends S5.1.2 to permit installation of tires with reduced speed capabilities in the case of vehicles whose maximum attainable speed is not greater than 50 mph. This amendment is considered to be a technical adjustment of language to fully implement the intent of the final rule as that was established. A separate amendment of § 571.3 is made to establish the basis for determination of a vehicle's maximum attainable speeds.

Volkswagen raised a separate issue concerning the requirement that the sum of maximum load ratings at least equal the GAWR of the axle system. This provision, in the case of an MPV, truck, bus, or trailer that is equipped with passenger car tires, requires that the maximum load ratings on the tires be reduced by approximately 10 percent before calculating the sum. The purpose of this 10-percent reduction in tire rating is to account for the generally harsher treatment (impulse and surge loading in the case of MPV's off-road) to which the tires of a vehicle other than a passenger car are exposed that is not accounted for in passenger car tire ratings. Volkswagen requested data showing that MPV's actually experience more abusive treatment in use.

The MPV category is based in part on the existence of characteristics that make these vehicles less amenable to passenger car standards. If Volkswagen has data indicating that the two categories actually experience identical usage, the

NHTSA would prefer to adjust the definition to ensure that these vehicles are subject to all passenger car standards. Until that time, the existing rationale for excusing these vehicles from some passenger car standards dictates the use of higher strength tires.

As earlier noted, the rim selection requirements of Standard No. 120 are not substantial, consisting of a requirement that the rims be listed by the tire manufacturer as suitable for use with its tires, and a requirement that, on and after September 1, 1979, the rims used on a vehicle be labeled as specified in S5.2 of the standard. The September 1, 1979, date for use of labeled rims replaced a March 1, 1977, date that proved impractical in view of large inventories of unlabeled rims that exist and will exist long after rim labeling is begun. In establishing the later effective date, the agency noted that it was considering the possibility of eliminating this requirement entirely, to simplify the phase-in of properly marked rims as they become available. Experience with phase-in of newly regulated equipment in other areas such as tires and brake hoses has demonstrated that the requirement for labeled equipment on and after a particular date can create substantial inventory and potential economic waste problems. In view of experience that the delay of labeling requirements has not substantially impeded certification verification and defect actions, the NHTSA has decided to withdraw the requirement (that appears as the last sentence of S5.1.1). It is noted that withdrawal of this requirement does not affect the requirement of S5.1.2 that rims be listed as suitable by the tire manufacturer for use with the tires that equip the vehicle, or the requirement of S5.2 that rims be labeled with specified information.

Mobile structure trailers. With regard to the applicability of this standard and other standards as a general matter, the NHTSA takes this opportunity to publish in the *Federal Register* its conclusion that enactment of the National Mobile Home Construction and Safety Standards Act of 1974 (42 U.S.C. 5401 et seq.) (the Mobile Home Act) impliedly repealed this agency's authority to regulate mobile homes. This conclusion was announced in a May 5, 1976, letter to the Department of Housing and Urban Development that stated in relevant part:

> The National Mobile Home Construction and Safety Standards Act of 1974 (42 U.S.C. 5401 et seq.) (the "Mobile Home Act") established within the Department of Housing and Urban Development a comprehensive program for the regulation of mobile homes. We have concluded that one result of that statute's enactment was the implied repeal of the NHTSA's authority with respect to mobile homes. Accordingly, we consider that the enactment has the effect of amending the Vehicle Safety Act's definition of "motor vehicle" to exclude "mobile homes" as the latter term is defined in the Mobile Home Act.

The effect of this conclusion is that tire and rim selection for mobile homes (known as "mobile structure trailers" by the NHTSA) is no longer subject to Standard No. 120 or other regulations issued under authority of the Act. For this reason, references to "mobile structure trailer" in Standard No. 120, Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, and the general definitions section of Part 571 (§ 571.3) are deleted.

On the same subject, a May 25, 1976 (and supplementing July 7, 1976), letter from Firestone to the NHTSA asked whether tires manufactured exclusively for mobile homes and tires that are used on mobile homes (although manufactured for other uses) are subject to regulation under the Act. Similar questions were raised as to the status of rims, some of which are designed exclusively for use on mobile homes and some of which are used on mobile homes and other vehicles.

As for tires, Standard No. 109 applied to "tires for use on passenger cars" and Standard No. 119 applies to "tires designed for highway use on [specified motor vehicles]." By these terms, neither standard applies to tires designed exclusively for use on mobile homes. In the case of tires actually used on mobile homes but designed for use also on vehicles subject to the Act, the agency considers such tires to be subject to the standard's requirements because they constitute motor vehicle equipment as that term is defined in § 102(4) of the Act.

As for rims, Standard No. 110 contains specifications only for rims that equip passenger cars and therefore contains no requirements that would directly require performance of a rim that was installed on a mobile home. Standard No. 120 applies to rims "for use on" MPV's, trucks, buses, motorcycles, and trailers (other than mobile structure trailers) and therefore would not apply to rims designed exclusively for use on mobile homes. In the case of rims designed for use on any of the motor vehicle types listed, the NHTSA would consider Standard No. 120's requirements applicable, and labeling in accordance with S5.2 would be required.

Rim marking. The second requirement of Standard No. 120 is an equipment requirement specifying five items of information (six in the case of multipiece wheels) that must appear on any rim for use on MPV's, trucks, buses, trailers, or motorcycles. The requirements for location of the information varies according to the type of information and whether the rim is part of a single or multipiece wheel. In answer to a question raised by Kelsey-Hayes and Motor Wheel, it is confirmed that these marking requirements have no bearing on the use of the rim on passenger cars, except as future labeling requirements in Standard No. 110 might prohibit one or more of the items required by S5.2. This eventually is considered to be extremely unlikely.

Based on a comphensive review of the petitions for reconsideration, the agency has decided that some requested modifications in labeling requirements are justified. The Japanese Automobile Manufacturers Association and Suzuki asked that required labeling be permitted to be embossed as well as impressed on the rim. Volkswagen (and representatives from Motor Wheel and Goodyear in a February 4, 1976, meeting with the NHTSA) asked that rim labeling be permitted on the disc portion of a single-piece wheel. The agency considers these suggestions to constitute justifiable options that would not diminish the level of motor vehicle safety represented by the standard, and the standard is accordingly amended.

Motor Wheel requested amendment of the standard to state that labeling of multipiece rims is permitted in the bolt hole area. The agency does not consider the addition of advisory information to be a desirable drafting practice because the mention of bolt hole locations would imply that some restriction on location exists when in fact it does not. In answer to another question from Motor Wheel, more than one "rim type designation" on rim components of a multipiece wheel is permitted by the standard.

Motor Wheel and Goodyear also asked if numbers that contain decimals or "trailing zeros" (*e.g.*, 7.50) could be shortened by deleting the decimal and "trailing zero." The agency believes that abbreviation by dropping the zero will not be confusing and amends the standard to include an example of such abbreviation. Confusion would result from dropping the decimal.

In response to a request by Motor Wheel and Budd Company for a specific provision in S5.1.2 that the marking requirements only apply to newly manufactured wheels, the agency notes the general applicability statement in § 571.7, governing the applicability of all standards found in Part 571, states that ". . . each standard set forth in subpart B of this part applies according to its terms to all motor vehicles or items of motor vehicle equipment the manufacture of which is complete on or after the effective date of the standard." Thus, the standard only applies to rims manufactured on or after the effective date of S5.2.

Manufacturers asked for several revisions of the marking requirements which the agency has considered and concludes are unjustified. This discussion treats the requests in the order that the markings in question appear in S5.2.

With regard to the requirement for marking with a designation that indicates the source of the rim's published dimensions (S5.2(a)), Daido Corporation asked whether the Japanese Industrial Standards' symbol (a stylized combination of the letters J, I, and S) or the letters "JIS" would meet the requirements of S5.2(a)(3) for use of letter "J." The agency interprets its labeling requirements as strictly as any other portion of its requirements and concludes that neither "JIS" nor the JIS symbol would conform to the requirement of S5.2(a)(3). In response to a similar request by Volkswagen to permit "DIN" in place of "D," the agency has considered the idea of permitting the manufacturer the option of a choice of designations, and concludes they are undesirable in the interest of maintaining uniformity and comprehension.

Grove Manufacturing suggested that the single letter designations of "D" and "E" could be mistaken for the load ranges that appear on tires and on the certification label. The agency concludes that the designations on the rim are sufficiently separated to preclude confusion and therefore the recommendation by Grove is not undertaken.

The "rim size designation" required by S5.2(b) is defined in S4 to mean the rim diameter and width. Daido and Volkswagen asked that a width designation followed by a diameter designation be considered as satisfying the requirement for designation of diameter and width. The agency specified the existing order to distinguish rim designations from tire designations. This order of information is being considered as the uniform practice to be adopted by the International Standards Organization. For reasons of uniformity, the requests are denied.

Volkswagen asked that the "DIN" symbol be permitted to signify compliance of the rim with Standard No. 120 in place of the "DOT" symbol required by S5.2(c) for this purpose. The agency does not find that the requirement of § 114 of the Act for certification is satisfied by use of a designation that has a wholly different meaning. Volkswagen's request is therefore denied.

Certification label. The third requirement of Standard No. 120 is that information about suitable tires and rims for use on the vehicle, along with appropriate inflation pressure and speed restriction information, be placed on a label on the vehicle (S5.3). As amended April 29, 1976 (41 FR 18659, May 6, 1976), the standard requires that the information appear on the certification labels of vehicles manufactured on or after September 1, 1977.

Some manufacturers and the Truck Trailer Manufacturers Association (TTMA) objected to the provision of this information on grounds that valid information already appears on the tires and rims that equip the vehicle, and that the information could mislead a person to think that only the listed tires and rims could be used on the vehicle. With regard to the first objection, the NHTSA disagrees and notes that an improper choice of tires or rims (as could occur by replacing original equipment with "custom" rims or the equivalent in tires) could permanently mislead vehicle owners as to the suitable selection of tires and rims. As for the possibility of misleading, the agency believes that a heading over the tire-rim listings (specifically, "SUITABLE TIRE-RIM CHOICE") can be added to the requirements for optional use by a manufacturer who believes the information would be otherwise misleading. With regard to General Motors' note that an owner should be guided by all available information on tire choice (e.g., information in the owner's manual), the agency notes its longstanding position that manufacturers may add statements referring the reader to other publications for additional information.

It is apparent from the examples cited by manufacturers that the decision to place all required data on the certification label could prove cumbersome in some cases, particularly those involving a heavy truck with several available axle combinations. In view of these problems, the agency has decided to remove the restriction on location and permit the information to appear on the certification label or on a separate label that conforms to the requirements for certification labels. The NHTSA notes that this option to provide information on a separate label responds to concern of the Truck Body and Equipment Association (TBEA) for the responsibilities of its final-stage manufacturing membership. The agency does not believe the tire and rim information would be as useful in a location entirely separate from the certification label, and it therefore declines to adopt General Motors' suggestion to use the Vehicle Identification label.

Motorcycle manufacturers and General Motors pointed out that the requirements for listing tire and rim information after GVWR in the case of vehicles, such as motorcycles, that only utilize one GVWR listing, is redundant and therefore wasteful of space. Other manufacturers suggested that the tire-rim information was redundant in the case of multiple GVWR listings, although this is not the case because of the need to associate the appropriate GVWR with GAWR's that may exceed the GVWR. In any event, these comments suggest that GVWR and GAWR could be better linked by revision of the example format to reduce the amount of information that must be listed. The solution is to permit listing of the GVWR alone, followed immediately by corresponding GAWR's and appropriate tire-rim information. The clearer format would be used for single and multiple listings. This revision is described in the new example that accompanies the rule changes at the end of this notice. In conformity with this simplification, the rule is also amended to delete the requirements for GVWR tire-rim-inflation-listings. Depending on manufacturers' reactions to the simplified format, a similar change could be undertaken for the passenger car example found in Part 567 (§ 567.4(h)(1)).

With regard to the items of information that must be listed in accordance with S5.3, General Motors and the TTMA argued that "tires . . . appropriate *as a minimum* for the GAWR" [emphasis added] could be construed to require tires with load rating less than those that the manufacturer would choose to recommend. To eliminate any ambiguity, the agency replaces "at a minimum" with "as specified by S5.1.2".

Suzuki asked whether "cold inflation pressure" means the maximum inflation pressure specified by the tire manufacturer. The TTMA also asked for clarification on this point. The answer is that the requirement does not call for maximum pressure, but the pressure specified by the tire manufacturer as sufficient to carry the load specified by the vehicle manufacturer as the tire's share of the assigned GAWR.

Michelin Tire Corporation noted that listing inflation pressure could be misleading in the case of tire designations that call for different inflation pressures depending on the tire construction. It is the agency's view that any possibility of confusion can easily be avoided by an indication that the tire designation represents a radial tire, so that a person substituting a non-radial tire size with the same designation is aware that the two tires are not identical.

The TBEA requested clarification of the term "maximum speed" as it appeared in the example that accompanied the final rule. The TBEA appeared to misunderstand the example as a reference to the speed capabilities of the vehicle instead of speed restriction of the tires. The agency has in mind only the rare tire types constructed for transit buses and mining and logging operations and so designated. Goodyear and the TTMA appeared to have the same mistaken impression of the requirement.

Speed-restricted vehicles have now been addressed under S5.1.2. In view of the confusion that arose over the requirement, and the agency's assumption that the users of these tires are knowledgeable in the use of the tires, it has been decided to drop the requirement of S5.3(d) altogether.

The TTMA raised several other questions with regard to the information that appears along with the GAWR. In answer to these questions, the effective dates of the standard are such that the manufacturer will be required to list the information specified by S5.3 on and after September 1, 1977. Also, it is not permissible to "bracket" the GVWR and GAWR values for a particular vehicle by specifying the minimum and maximum values that any tire-rim choice could provide. Section 567.4 of Part 567 requires that the GVWR and GAWR's representing the manufacturer determination of the particular vehicles's characteristics must be listed.

The standard does not require the information specified in S5.3 to be listed alongside the additional GVWR's and GAWR's that a manufacturer might list at the end of its certification label as reduced speed ratings. Lastly, the agency does not agree that the GAWR ratings for a semi-trailer are not related to the trailer's GVWR. While the trailer's axles do not support the entire weight of the vehicle, it is still the case that the various GVWR's that could be assigned to a semi-trailer are affected by the GAWR values that can be assigned, and that the GVWR probably differs depending on the GAWR value assigned. In this sense the GAWR's assigned to a semi-trailer's axles do "correspond" to its GVWR.

In accordance with Department of Transportation policy encouraging adequate analysis of the consequences of regulatory action (41 FR 16200, April 16, 1976), the agency herewith summarizes its evaluation of the economic and other consequences of this action on the public and private sectors, including possible loss of safety benefits. The new options, simplification, and reduction of marking and labeling requirements should make compliance with the standard less costly, while the changes are not expected to significantly reduce the level of motor vehicle safety. The exception for speed-restricted vehicles provided in S5.1.2 represents a correction of the requirements to reflect the agency's intent not to prevent the assignment of greater load-carrying capabilities to vehicles at lower speeds. Permitting this practice to continue will result in the avoidance of new costs in the economy.

In consideration of the postponement of effective dates already granted for rim marking and the tire information labeling, the agency concludes that the present effective date schedule permits adequate time for compliance.

In view of the three notices that have modified the text of Standard No. 120, the entire standard (incorporating the amendments made by this notice) is published for the convenience of persons affected.

In consideration of the foregoing, Chapter V of Title 49, Code of Federal Regulations, is amended . . . .

Effective date: Changes to the text of the Federal Register may be made immediately. The provisions of Standard No. 120 are in effect at this time, except as otherwise provided in the standard.

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.50)

Issued on January 28, 1977.

John W. Snow
Administrator

42 F.R. 7140
February 7, 1977

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Motor Vehicle Lighting

(Docket No. 77-5; Notice 2)

This notice was preceded by a notice of proposed rulemaking issued pursuant to a petition for rulemaking. It amends color specifications for motor vehicle signaling devices. This change is adopted to facilitate manufacturer conformance with OSHA requirements. The change slightly modifies the acceptable color coordinates for yellow (amber).

Effective date: January 1, 1979, with optional compliance permitted as of the date of publication of this amendment in the Federal Register.

For further information contact:

Bill Eason, Office of Vehicle Safety Standards, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590 (202-426-2720).

Supplementary information: On October 25, 1976, the General Electric Company (GE) petitioned for an initiation of rulemaking to amend Federal Motor Vehicle Safety Standard No. 108 to substitute SAE Standard J578b, "Color Specification for Electric Signal Lighting Devices," September 1974, as the color standard for motor vehicle lighting equipment. GE has been confronted with an OSHA proposal to lower the maximum permissible level of arsenic used in glass making, and on that basis intended to eliminate arsenic entirely from its production. Clear glass made with a substitute for arsenic apparently absorbs yellow dye in a manner that differs from glass made with arsenic, with the result that yellow light emitted through it no longer conforms to the color coordinates for yellow (amber) of SAE J578a, but would be within those for J578b. The NHTSA deferred immediate action because of the imminence of SAE J578c which contains color coordinates that are internationally accepted. On February 10, 1977, GE modified its petition, asking only for a definition of the color yellow (amber) identical to that specified in J578c.

Notice of the proposal was published on June 30, 1977, and an opportunity afforded for comment (942 F.R. 33354). Seven comments were received on the proposal, all of which concurred with it. The amendment is therefore adopted.

In consideration of the foregoing paragraph S4.1.5 of 49 CFR 571.108, Motor Vehcile Safety Standard No. 108 is amended. . . .

(Sec. 103, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1302, 1407); delegation of authority at 49 CFR 1.50)

Issued on June 8, 1978.

Joan Claybrook
Administrator

43 F.R. 25822-25823
June 15, 1978

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Motor Vehicle Lighting

(Docket No. 78-5; Notice 3)

Action: Final rule.

Summary: This notice establishes an alternate performance standard for most motor vehicle headlamps which would allow candlepower output on the upper beam to be double the amount currently permitted. It also establishes a marking code for identification and certification of the new headlamps. It also requires that headlamps be adjustable without the necessity of removing trim rings or other ornamental parts. The amendment is issued under the National Traffic and Motor Vehicle Safety Act which requires the issuance of appropriate safety standards. This standard will allow the production of headlamps, both as original and aftermarket equipment, that provide the driver with an increase in seeing distance, and that are marked to insurse compatibility of replacement.

Effective dates: The photometric portion of the amendment is effective upon publication in the Federal Register. Lens marking and certification requirements are effective July 1, 1979. The headlamp adjustability requirement is effective October 1, 1979.

For further information contact:

Bill Eason, Office of Rulemaking, National Highway Traffic Safety Administration, Washington, D.C., 202-426-2720.

Supplementary information: On February 23, 1978, the NHTSA published in 43 FR 7451 a notice of proposal rulemaking (NPRM) that would reduce accidents on the Nation's streets and highways by allowing the production of motor vehicle headlamps with greater light output. The proposal was issued in response to petitions for rulemaking submitted by GTE, Sylvania, General Motors Corp., Koito Manufacturing Co. Ltd. and General Electric Co.

Federal Motor Vehicle Safety Standard No. 108 (49 CFR 571.108), *Lamps, Reflective Devices and Associated Equipment*, requires motor vehicles other than motorcycles to be equipped with a headlighting system that meets, among other specifications, minimum and maximum photometric output values specified by the Society of Automotive Engineers in SAE Standard J579a, Sealed Beam Headlamp Units for Motor Vehicles, August 1965. Under this standard, the maximum candlepower (cp) of headlamps in operation on motor vehicles shall not exceed 75,000. The SAE revised its standard in December 1974 (J579c), one effect of which was to raise the system total output ceiling to 150,000 cp. Shortly thereafter NHTSA added paragraph S4.1.1.33 to Standard No. 108 to allow manufacturers to comply with J579c if they wished, provided that the ceiling imposed by J579a was not exceeded. NHTSA's amendment also imposed maximum design wattage limitations at 12.8 volts. These standards apply to traditional headlamp systems with circular lenses and to a newer system consisting of four lamps with rectangular lenses. When SAE adopted Recommended Practice J1132 "142 mm x 200mm Sealed Beam Headlamp Unit", in January 1976, establishing specifications for a two-lamp rectangular headlamp system, NHTSA added S4.1.1.34, effective November 1, 1976, allowing this system, without imposing additional candlepower output restrictions. The reason for this regulatory anomaly with NHTSA's intent to raise the candlepower ceiling on the three other headlighting systems within the near furture (now accomplished by this amendment) and the desire not to impose a limitation on manufacturers of the newest system which would be in effect for only a relatively short time. NHTSA research has demonstrated that an increase in photometrics to a maximum of 150,000 cp will enhance seeing ability without any significant increase in glare from properly aimed headlights, but that photometric output exceeding 150,000 cp results in only a marginal increase in visibility with an increase in glare.

In addition, NHTSA proposed establishment of a marking code to be embedded in the lens of each headlamp designed to comply with SAE J579c to enable the agency to determine with ease which version of Standard No. 108 applies to the headlamp, as well as enabling a consumer to replace original equipment headlamps with lamps of compatible photometric output. A marking system identifying headlamps as type "1A", etc. currently exists. The new proposed code consists of three characters. The first is a number indicating the number of beams produced by the lamp, i.e., 1 or 2. The second character is a letter indicating whether the headlamp is a large or small rectangular or circular headlamp. The final character indicates the version, or requirement, of Standard No. 108 which apply to the lamp. For the present this will be "1", until requirements change to the extent that a new identification number is required, as it is anticipated that future headlighting systems may have different wattages, beam patterns and other characteristics and could not serve as replacements for J579c headlamps.

The agency proposed that types 1A, 2A, and 2B would retain their present nomenclature (plus the final digit), while 5¾ inch diameter (146 mm diameter) headlamps will be identified by the letter "C", and 7 inch diameter lamps (178 mm diameter) with the letter "D". Thus, a Type 2D1 headlamp would be the new identification for a Type 2 (7 inch) headlamp permitted a maximum candlepower output of 75,000. Also on the lens, at a location of the manufacturer's choosing, would be the letters "DOT" certifying compliance with requirements of Standard No. 108. Manufacturers wishing to manufacture high intensity lamps will probably change lens molds anyway to provide other marking and to secure improved beam pattern control.

Other proposed changes include substituting SAE J571d for J571c and J580b for J580a as two of the referenced standards on headlamps. SAE J571d incorporates Figure 2 of present Standard No. 108 which would be deleted from the body of the standard under the proposal. SAE J580b differd from J580a primarily by the addition of a definition for "aiming screws", changes of the aiming adjustment test procedure, and the requirement of aim retention with specified applied forces.

More than 380 comments on the proposal were received from manufacturers, State motor vehicles officials, and motorists. All comments have been considered. NHTSA has separated the comments into six major areas which will be discussed separately.

I. The Need for High Intensity Headlamps

The major issue which concerned the commenters was whether there is a need for headlighting systems capable of producing 150,000 candlepower, whether the sealed beam headlamp is the lamp best suited to provide high intensity lighting, and whether this high intensity lighting tends to produce an unacceptabily high level of glare.

Motorists who commented to Docket No. 78–5 appear divided on the question of high intensity headlamps. There are those whose driving is largely urban in nature who argue that their present headlamps are adequate for their motoring needs. There are others in rural areas, who appear to use the upper beam more frequently than the average driver, and who want a brighter headlighting system for their vehicles. This division of opinion confirmed NHTSA's belief that allowance of higher intensity headlamps should be made on an optional basis and that the manufacture of present design headlamps should continue.

Statistics indicate that there is a significantly greater number of deaths and injuries that occur at night, and that cannot be totally attributed to alcohol or fatigue. A disproportionate number of these occur in rural areas where use of the upper beam is more likely to be required due to lack of ambient roadway light, and to occur in the absence of other vehicular traffic. While it is not possible to determine how many of those casualties could have been prevented by better lighting, it is likely that the rate would have been reduced if the vehicles had been equipped with high intensity headlamps; NHTSA's research data indicates that the average night seeing distance for speeds of 50 mph and higher is less than the average braking distance and reaction time at that speed. NHTSA's review shows that a headlighting system using 150,000 candlepower increases nighttime seeing distance by over 20 percent where there are no cars approaching. In addition, research indicates that a sizeable number of pedestrian accidents occurring in rural and suburban areas could be reduced by improvements in roadway lighting; it is likely that better headlamps could provide some of these improvements.

Several commenters who are proponents of European unsealed lighting systems questioned whether the sealed beam system is the best medium for a high intensity headlamp, and suggested it would create an unacceptably high level of glare. All of NHTSA's extensive research on vehicle lighting has considered both disability glare, measured in possible loss of seeing distance, and discomfort glare, assessed by test subjects who were scientifically rated for visual acuity and glare tolerance. The subjects undertook on-road driving tests which evaluated their seeing distances while driving cars equipped with different headlighting systems, including the proposed high intensity systems.

The conclusion of the NHTSA research, supported by the findings of other expert researchers, is that the safety of night driving on the upper beam would be improved by the proposed level of intensity, with only minor degradation of seeing distance from misuse of that beam. Glare is a problem even at intensities below 75,000 candlepower. As headlight intensity increases to 150,000 candlepower there is an increase in disability glare, however it is less than proportionate to the increase in tensity. The 20 percent increase in seeing distance when no car is approaching contrasts favorably with the minor degradation in the worst case, when the upper beam is misused. In that case, when two vehicles utilizing 150,000 candlepower headlamps approach each other on the upper beam and both fail to switch to lower beam, seeing distance is reduced only approximately 1.5 percent when compared to a corresponding situation involving vehicles utilizing 75,000 candlepower headlamps. This minor degradation from increased disability glare is transient. Furthermore, high intensity headlights are more readily noticeable and may improve the response of opposing drivers to signals to dim upper beam headlights. NHTSA also recognizes that the level of disability glare experienced when driving is considerably more sensitive to highway environmental factors than to headlight intensity.

In addition to its research, NHTSA has been sensitive to the views of those drivers who report that they are bothered by glare from headlamps of the levels of intensity now permitted. NHTSA has reviewed its own research and has uncovered no data indicating that disability glare (that glare which reduces seeing ability) from current headlamps creates a driving hazard to the average vehicle operator or to older drivers. Discomfort glare varies with drivers, however, and generally the eyes of older drivers are more sensitive to stronger lights whatever their sources.

II. Headlamp Lens Markings

Notice 1 proposed that the lenses of the new high intensity headlamps be marked with an identification code and with the letters "DOT" constituting a certification that the lamps comply with applicable Federal motor vehicle safety standards.

As was to be expected, this aspect of the proposal was of little interest to the general public. Comments were received only from States, manufacturers, and one retailer. Industry did not express strong support for the proposed code, preferring instead to allow each manufacturer to retain its own system of trade numbers as a means of headlamp identification. Most requested that sufficient time be allowed to implement the new code if NHTSA decided to adopt it.

NHTSA has decided to adopt the code as proposed with an effective date of July 1, 1979. The lenses of headlamps have contained a lens code for several decades as a means of identification and the rule extends the practice in a logical fashion. Trade numbers are not only more numerous than the code characters, but they are changed for specific technical design changes not necessarily related to interchangeability or performance of headlamps. Use of the NHTSA code will simplify lamp replacement for the consumer who will be able to identify a lamp by its universally applicable code number rather than by manufacturers' specific trade number. Since then lens code is visible with the lamp installed and the trade number is not, the code will give consumers and inspection stations a ready means of determining whether a balanced lighting system is installed on the vehicle. The proposal did not specify the minimum size of the characters, and the amendment will allow the manufacturer to choose the size and location on the lens most appropriate for his lamp design.

The great majority of comments opposed mandating use of the "DOT" symbol on the lens. Many felt that placing it above the lens marking code would interfer with beam refraction. Others commented on the cost that would be incurred in changing lens molds. Some suggested that the size and placement of the characters be the manufacturer's choice. Two commented that they felt the proposal was illegal under section 114 of the National Traffic and Motor Vehicle Safety Act which allows equipment items to be certified by a label or tag on the shipping containers as an alternate means to certification on the item itself.

The NHTSA has decided to adopt the proposed means of lens certification as mandatory for the new headlamps, effective July 1, 1979, with the size and placement of the "DOT" characters to be decided by the manufacturers. Thus, there need not be a problem of light interference and the lens mold may be changed at the same time for both the marking and certification code changes. The agency rejects the argument that it is illegal under section 114 to require items of equipment to bear certification markings. Such a requirement is well within the discretion accorded the Administrator under the act and general legal principle, and is consistent with the intent of the framers of the act. The NHTSA currently requires equipment items such as tires and brake hoses to bear the DOT symbol as mandatory certification.

III. Headlamp Wattage

Comments were made on the proposed headlamp wattages requesting increases, decreases, and minor changes. In the proposal the 2A1 headlamp was specified as 40 watts for upper beam and all comments on watts indicated that it should be a higher figure, generally 43 watts. The NHTSA agrees and accordingly has revised the 2A1 wattage to 43 watts.

The wattage for a system using 2A1 lamps would then be 6 watts or 3 percent higher than a system using 2C1 headlamps, whereas the two systems should be allowed the same level of performance. Since there should be no vehicle electrical problems associated with a 3-percent change in a headlamp intended for the aftermarket, the 2C1 headlamp is provided the same maximum of 43 watts on upper beam.

The proposed type 2D1 headlamp wattage of 70 watts for upper beam and 65 watts for lower beam exceeds present system wattages by 15 percent. This value would have provided the same wattage (and therefore performance) for all low beams of all systems and would have provided equivalent performance to the 2B1 headlamp system on upper beam. The comments and NHTSA information both indicate that an attempt to equate systems to this degree could possibly cause some electrical problems on older vehicles using the new lamps as replacement headlamps. Because of this concern of the aftermarket the NHTSA is reducing the wattage of the 2D1 headlamp to 65 watts for upper beam and 55 watts for lower beam.

Some comments recommended only a 1-watt change for some lamps. Such a minor change is insignificant to the effect of lighting performance on vehicle electrical systems and therefore the NHTSA has retained the same values as proposed.

IV. Inclusion of SAE J580b

The proposal to substitute SAE Standard J580b, *Sealed Beam Headlamp*, occasioned some comment. Among other things, J580b requires that headlamp aim be adjustable without removal of trim rings or other vehicle parts.

While it is believed that most of the industry currently conforms to this requirement, several manufacturers commented that leadtime will be required to implement this change. The NHTSA has therefore decided to defer mandatory compliance with this portion of J580b until October 1, 1979.

V. Miscellaneous Changes

In the proposed deletion of paragraph S4.1.134, the allowance of two Type 2B1 headlamps on motorcycles was inadvertently deleted and is hereby reinstated. Notice 1 also indavertently omitted allowance of current low intensity headlamps on passenger cars and motor vehicles less than 80 inches in overall width. This was corrected by Notice 2 (43 FR 16783) and is retained in the amendment.

VI. Other Issues

A sizable number of comments from individuals and suppliers felt that there should be no amendment of existing headlamp requirements without consideration being given to unsealed headlighting systems that meet European standards.

In brief, these headlamps, popularly known as "quartz halogen", do not meet Standard No. 108's requirements for sealed beam construction, and mechanical aimability. Many unsealed systems also exceed the newly increased candlepower maximum of 150,000. These commenters frequently attacked the sealed beam concept as "outmoded" and "40 years behind the times", espouse the do-it-yourself philosophy of headlamp aim, and praise the "superior" lighting provided by their imported unsealed headlamps.

These issues are generally not within the scope of the rulemaking proposal under consideration, but have been considered, where appropriate, as supportive of a desire for better headlighting. It is felt that the sealed headlamps that will be shortly available by virtue of this rulemaking action, which NHTSA understands will utilize the halogen cycle, will provide the brighter lighting that many people seek. The NHTSA has always expressed its willingness to consider alternate technologies supportable by objective data upon which safety performance standards can be based. In recognition of the public interest in the issue, NHTSA has placed relevant public correspondence and other materials in a general reading file "Halogen Headlamps" available for inspection in Room 5108 at 400 Seventh Street, SW., Washington, D.C.

In consideration of the foregoing, 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, is hereby amended ....

In evaluating the cost impact of this rulemaking action, the NHTSA has concluded that there will be none with respect to headlamp manufacturers as the amendment provides an optional means of conformance to Standard No. 108. With respect to the requirement of J580b that headlamps be adjustable without removal of trim, it is believed that most manufacturers already comply. Those who do not may find it necessary to modify trim or sheetmetal or grille parts on a one-time basis but it is concluded that these modifications would be minor and that no significant costs would be incurred.

Because the amendment with respect to candlepower relieves a restriction it is made effective July 27, 1978.

The lawyer and program official principally responsible for this rule are Z. Taylor Vinson and Bill Eason, respectively.

(Secs. 103, 112, 114, 119, Pub. L. 89-563, 80 Stat. 718 (15 U.S.C. 1392, 1401, 1403, 1407); delegation of authority at 49 CFR 1.50.)

Issued on July 20, 1978.

Joan Claybrook
Administrator

43 F.R. 32416
July 27, 1978

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Motor Vehicle Lighting

(Docket No. 77–1; Notice 2)

This notice amends Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, to specify that rear side marker lamps on large trailers cannot be located higher than 60 inches above the road surface. This action was taken to achieve regulatory consistency with a parallel action of the Federal Highway Administration's Bureau of Motor Carrier Safety (BMCS) which has acted pursuant to a petition by the International Brotherhood of Teamsters, Chauffers, Warehousemen and Helpers of America ("Teamsters Union"). The effect of the limitation will be to make it more likely that the trailer rear side marker lamp can be viewed in the outside rear view mirror of the tractor pulling it, acting as a reference light by which the tractor driver may check the tracking of the trailer's rear end.

Effective date: March 1, 1979.

For further information contact:

Marx Elliott, Crash Avoidance Division, Office of Vehicle Safety Standards, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590, 202–426–1714.

Supplementary information: On January 17, 1977, NHTSA proposed (42 FR 3187) that rear side marker lamps on trailers with an overall width of 80 inches or more be located "as far to the rear as practicable and as close as practicable to the lower rear corner". The existing requirement is that they be "as far to the rear as practicable" and "not less than 15 inches" above the road surface. This action was taken as a parallel to rulemaking conducted by BMCS which had the following history. BMCS published an advance notice of intent to amend 49 CFR 393.14 to require large semitrailers and full trailers operating in interstate commerce to have the rear side marker lamps at or near the lower rear corner (40 FR 31959). The purpose of the proposal was to enhance traffic safety by providing a driver of a tractor pulling such a trailer with a reference light visible in the outside rearview mirror through which he may check the tracking of the trailer's rear end at night or at such other times as the headlamps are required. The NHTSA tentatively determined that a companion amendment of Standard No. 108 was required to preclude a conflict between the requirements of that standard and the BMCS Regulations.

BMCS, having evaluated the comments to the Advance Notice, proposed (41 FR 47948) that rear side marker lamps be "as near as practicable to the lower rear corner, and visible in the rearview mirror of the truck tractor when the trailer is tracking straight behind the tractor." The NHTSA proposal required only that the lamps be located as close as practicable to the lower rear corner. The difference in requirements was dictated by the different safety missions of the two issuing agencies—that of NHTSA, to insure that motor vehicles are manufactured in accordance with Federal motor vehicle safety standards, and that of BMCS, to insure that commercial vehicles in interstate commerce are operated in accordance with that agency's safety requirements. Federal motor vehicle safety standards do not apply to a combination of vehicles (tractor and trailer) and it would not be possible to determine at time of manufacture whether the rear side marker lamp of the trailer would be visible in the rearview mirror of every possible tractor that could tow it.

Fifteen comments were received on the proposal, 11 supporting the reasoning relative to the relocation of the side marker lamp. Six of these, however, recommended that the agency consider establishing a mounting height range due to peculiarities of certain trailer designs. For example, side marker lamps mounted at the lowest position on trailers designed to carry snowmobiles, motorcycles, or boats would be subject to water, dust, mud and road debris. The R. E. Dietz Company supported the concept of a tracking light but suggested that a special light be provided for that purpose. The proposal was objected to by, among others, the Truck Safety Equipment Institute (TSEI), because it would eliminate the presnt option of allowance of a combination clearance—side marker lamp, mounted higher than 60 inches and because low mounted side marker lamps would not necessarily be visible in tractor rear view mirrors. The Recreational Vehicle Industry Association joined TSEI in objecting on the ground that an option would be eliminated. It also cited potential problems with obscuration by mud or other road matter. Truck Trailer Manufacturers Association was not convinced that the location of the side marker lamp was such an important safety matter that it needed coverage by a Federal regulation. Concern was also expressed that the amendment would not achieve its purpose unless the marker lamps were required to project light toward the towing vehicle, and unless a candlepower output for that light was required.

NHTSA concurs with those commenters who expressed concern about low-mounted side marker lamps, and who suggested that a mounting height range from 15 to 60 inches would be preferable, and has decided to amend Standard No. 108 to reflect this comment. BMCS is joining NHTSA in a companion amendment published today. Such a range will also afford a manufacturer more flexibility with respect to trailers of unique design, and should also come closer to the goal of providing visibility of a reference light in the mirrors of various sized towing vehicles. NHTSA realizes that the clearance—side marker lamp option will no longer be available for those trailers on which the clearance lamp is at a height greater than 60 inches, but has concluded that a height limitation must be adopted to insure a greater likelihood that the purpose of the rulemaking action is achieved. Adequate lead time is being afforded for design modifications. With respect to visibility of the side marker lamp by the driver, it is true that a lamp meeting Standard No. 108's minimum requirement that it be visible at a 45 degree angle from its mounting plane might not provide the reference light desired, but in common practice most of the rear side marker lamps appear to exceed this angle and should be visible in the rear view mirror. Further, NHTSA believes that the light output of current side marker lamps is sufficient to provide the desired cue.

In consideration of the foregoing Table II of 49 CFR 571.108 Motor Vehicle Safety Standard No. 108 is amended. . . .

The program official and lawyer responsible for the development this amendment are Marx Elliot and Taylor Vinson, respectively.

(Secs. 103, 119, Pub. L. 89-563, 80 Stat 718 (15 U.S.C. 1392, 1407); delegation of authority at 49 CFR 1.50).

Issued on August 25, 1978.

Joan Claybrook
Administrator

43 F.R. 38832–38833
August 31, 1978

PREAMBLE TO AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices and Associated Equipment

(Docket No. 78-08; Notice 2)

ACTION: Final rule.

SUMMARY: This notice amends Motor Vehicle Safety Standard No. 108 to increase the maximum permissible candlepower for single compartment tail lamps while extending requirements for contrast between stop (signaling) and tail (marking) functions at test points below the horizontal. This action is taken in response to a petition for rulemaking from industry. The effect of the increase will be to relieve a burden on manufacturers who must monitor production closely to insure continuing compliance of existing lamp designs with the existing limitation.

EFFECTIVE DATE: The amendment is effective immediately but compliance with the contrast requirements is not mandatory until July 1, 1980.

FOR FURTHER INFORMATION CONTACT:

Marx Elliott, Crash Avoidance Division, Office of Vehicle Safety Standards, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590. (202-426-2720).

SUPPLEMENTARY INFORMATION: A limit of 15 candlepower on photometric output at test points on or above the horizontal is imposed on single compartment tail lamps by 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment.* The intent of this limitation is to eliminate the possibility of excessive glare, and to insure that the ratio between stop lamps and tail lamp output offers sufficient contrast that the stop function can be readily identified when it is actuated.

On February 18, 1977, Truck Safety Equipment Institute (TSEI) petitioned for rulemaking to amend Standard No. 108 to increase the permissible maximum output of single compartment tail lamps to 18 candlepower. This figure is derived from SAE Recommended Practice J256a Service Performance Requirements for Motor Vehicle Lighting Devices and Components, June 1972, which permits tail lamp output to be 120 percent of the maximum value specified in SAE Standard J585d, Tail Lamps (Rear Position Light) August 1970. The reason for TSEI's request is that the 15 candlepower limitation has become "an unnecessary burden on manufacturers who must attempt to monitor their productions in an attempt to insure a strict compliance with this maximum output". TSEI argued that an increase would have no detrimental effect upon safety because there has been no limitation on candlepower output below the horizontal and it was reasonable to assume that there must be countless driving situations every day "where the following driver is exposed to lamp candlepower outputs from approximately 15 cp to 22 cp" without any evidence of hazardous driving conditions because of glare. The basis of the petition, therefore, was that a restriction should be relaxed for economic reasons, and that the relaxation will have a neutral effect upon safety. The NHTSA granted TSEI's petition for rulemaking and proposed that the maximum output of single compartment tail lamps be raised to 18 candlepower, and that the current ratio of candlepower output by stop and tail lamps in combination lamps be maintained at test points above the horizontal and extended to test points below the horizontal to minimize problems of glare. NHTSA proposed the extension of the ratio to test points below the horizontal to provide protection equivalent to that at points above the horizontal. Standard No. 108 allows combination stop and tail lamps to be mounted as high as 72 inches above the road surface while in today's passenger cars the driver's eye point is much lower, only 38 inches to 48 inches above the road surface.

A notice of proposed rulemaking was published on this subject on May 4, 1978 (43 FR 19250), and an opportunity afforded for comment.

Twenty-seven comments were submitted on the proposal. There was one objection to the increase in candlepower, and two to extension of contrast ratios. All other comments supported it.

An important suggestion made was that NHTSA adopt SAE Standard J585e, September 1977 as the referenced standard on tail lamps since the SAE revision encompassed both of NHTSA's proposals. NHTSA concurred with this recommendation and is amending the standard in this fashion. J585e is otherwise identical to J585d except for the addition of a final sentence to Note 4 which prescribes an alternative way for computing the candlepower ratio for combination lamps when certain conditions are met.

The Japanese Automotive Manufacturers Ass'n. Inc. (JAMA), objected to the extension of the contrast ratio, principally because of its effect upon the motorcycle industry. In JAMA's opinion there is no need for the requirement to cover motorcycles as lamps are not mounted at a height greater than 38 inches. NHTSA does not concur with this comment. The amendment will insure that there is no confusion when the driver's eye reference point is lower than the average 38 to 48 inches above the road surface. This situation could occur when a motorcycle is on a hill in front of the driver of another vehicle. The mandatory compliance date of the requirement, July 1, 1980, should afford sufficient time for tooling of new lamps if needed.

Chrysler Corporation commented that it saw no need to adopt intensity ratio requirements for the test points below horizontal since photometric requirements for tail and stop lamps are the same, whether above or below horizontal. While the requirements are the same, the values prescribed are minimal and a manufacturer may establish its own values above the minimum level. NHTSA has concluded that the amendment would assure that the ratio now required above the horizontal would also be maintained below. It would also avoid use of the wrong replacement lamps or lens.

California Highway Patrol suggested that test point 5 D–V should be added to those at which not less than a 5 to 1 ratio is required. The NHTSA cannot add it at this time since it was not part of the rulemaking proposal, but consideration will be given to it in future rulemaking.

American Motors Corporation supported the proposal but commented that the 120 percent value specified in J256a should apply to all tail lamps and not just single compartment designs. This suggestion is beyond the scope of the proposal and NHTSA will consider it in future rulemaking.

Dry Launch suggested an increase from 15 to 20 and 25 candela. This suggestion was also considered beyond the scope of the proposal. Those values are permitted for two and three compartment lamps because the light sources are distributed, and NHTSA does not believe that excessive glare should be risked by increasing the maximum from 18 to 20 or 25 candela for single compartment lamps.

The proposal was objected to by G. F. Meese in whose opinion the upper limit should be 10 candela because excessive brightness irritates following drivers. The NHTSA did not agree with this comment. There appear to be instances in which the upper limit of 10 candela, which is being proposed by Mr. Meese, has been exceeded, and there is no indication that this causes any hazardous driving conditions because of glare.

In consideration of the foregoing 49 CFR 571.108, Motor Vehicle Safety Standard No. 108 is amended as follows:

1. Paragraph S4.1.1.28 is revised to read:

S4.1.1.28 Each tail lamp on any motor vehicle manufactured before June 1, 1980 may be designed to conform to SAE Standard J585d, Tail Lamps, August 1970.

2. Table I and Table III are amended so that the applicable SAE Standard for tail lamps in the final column of each Table is "J585e, September 1977."

In accordance with Department of Transportation policy encouraging adequate analysis of the cost and other consequences of regulatory actions (41 FR 16201, April 16, 1976), the NHTSA has evaluated the economic and other consequences of this amendment on the public and private sectors and has concluded that there is no cost increase required by an allowance of an increase in candle power in single compartment tail lamps. While there should be no increase associated with maintenance of contrast ratios at test points below the horizontal in combined lamp configurations, the NHTSA requested comments on this factor and received none.

The program official and lawyer responsible for the development of this proposal are Marx Elliott and Taylor Vinson, respectively.

Issued on December 13, 1979.

Joan Claybrook
Administrator

44 F.R. 75385
December 20, 1979

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices and Associated Equipment

(Docket No. 69-19; Notice 18)

ACTION: Final rule.

SUMMARY: This notice finalizes the interim amendment of Motor Vehicle Safety Standard No. 108 adopted effective September 1, 1978, which retained the requirement that stop lamp lenses on motor driven cycles be a minimum of 3½ square inches.

EFFECTIVE DATE: The amendment is effective immediately.

FOR FURTHER INFORMATION CONTACT:
Marx Elliott, Crash Avoidance Division, Office of Vehicle Safety Standards, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590. (202-426-2720).

SUPPLEMENTARY INFORMATION: On August 31, 1978, the agency published an interim rule and request for comments (43 FR 38831) deleting the requirement that low-speed motor driven cycles (mopeds) have larger stop lamps effective September 1, 1978, and asking whether the amendment should be made permanent. NHTSA noted it did not intend to include these vehicles in earlier amendments increasing the size of stop lamp lenses from a minimum of 3½ square inches to 8 square inches. The agency believed that moped conspicuity and safety would be reduced if lamps on these low-powered vehicles were required to have a larger lens area without being required also to have higher light output. The effect of the interim amendment, therefore, was to retain the existing requirements.

Three comments were received in response to that Notice. Two supported the rule but the California Highway Patrol opposed it on the basis that moped rear lighting needs improvement. As noted above, simply reinstating the requirement for increased lens area would not improve safety. However, the agency intends to ask for comments in the near future on this aspect of moped safety.

In consideration of the foregoing, NHTSA hereby makes final the interim revision of paragraph S4.1.1.27 of 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, adopted on August 31, 1978.

The program official and lawyer responsible for the development of this rule are Marx Elliott and Taylor Vinson respectively.

Issued on February 19, 1980.

Joan Claybrook
Administrator

45 F.R. 13736
March 3, 1980

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices and Associated Equipment

(Docket No. 77-1; Notice 4)

ACTION: Correction.

SUMMARY: This notice corrects a typographical error in the notice of correction published on December 28, 1978 (43 FR 60472). The error appears in the designation of the table, identifying it as "Table III" when the correct designation is "Table II". The effect was to change the heading of the last column in Table III from "Applicable SAE standard or recommended practice" to "Height above road surface measured from center of item on vehicle at curb weight". It is therefore necessary to correct the heading to Table III.

FOR FURTHER INFORMATION CONTACT:

W. Marx Elliott, Office of Rulemaking National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590. (202-426-2720).

Accordingly, Title 49, Code of Federal Regulations, § 571.108 is amended to read:

TABLE III.—*Required Motor Vehicle Lighting Equipment*

Item	Applicable SAE standard or recommended practice
* * *	* *

The lawyer and program offical principally responsible for this correction are Z. Taylor Vinson and W. Marx Elliott, respectively.

Issued on February 28, 1980.

Michael M. Finkelstein
Associate Administrator
for Rulemaking

45 F.R. 14577
March 6, 1980

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment
(Docket No. 78-12; Notice 2)

ACTION: Final rule.

SUMMARY: This notice amends Motor Vehicle Safety Standard No. 108 to allow an optional method of measuring side marker lamp light output for all vehicles less than 30 feet in overall length, regardless of width. This option currently applies to all vehicles less than 80 inches in overall width, regardless of length. This amendment is in response to a petition for rulemaking submitted by Chrysler Corp. The effect of the amendment is to remove a restriction on vehicles which are normally built in versions less than 80 inches in overall width but which have derivatives that exceed this dimension.

EFFECTIVE DATE: Date of publication of final rule. Since the amendment relieves a restriction, it may be made effective immediately, July 3, 1980.

FOR FURTHER INFORMATION CONTACT:

John Simeroth, Crash Avoidance Division,
Office of Vehicle Safety Standards,
National Highway Traffic Safety
Administration, 400 Seventh Street, S.W.,
Washington, D.C. 20590 (202-426-2715)

SUPPLEMENTARY INFORMATION: A Notice of Proposed Rulemaking on this subject was published on September 7, 1978 (43 FR 39839).

Standard No. 108 requires the photometric requirements for side marker lamps to be met at test points 45 degrees outboard and inboard of the lateral center line passing through the lamp. However, if a vehicle is less than 80 inches in overall width, paragraph S4.1.1.8 of Motor Vehicle Safety Standard No. 108 allows photometric measurements of side marker lamps to "be met for all inboard test points at a distance of 15 feet from the vehicle and on a vertical plane that is perpendicular to the longitudinal axis of the vehicle and located midway between the front and rear side marker lamps." This results in a measurement of less than 45 degrees instead of a fixed 45 degrees.

Chrysler Corp. petitioned that the option be available to all vehicles regardless of width. In its opinion, the effect of differing requirements imposes needless restrictions on smaller size vehicles normally built in versions less than 80 inches but which have special derivatives which exceed this width:

"For example, a pick-up truck may be designed with wraparound front or rear lamps [that meet S4.1.1.8]. If dual rear wheels are installed on this same vehicle, its width will exceed 80 inches and different side marker lamp requirements will apply * * * [and] auxiliary lamps may have to be used on these wider vehicles."

The NHTSA agreed with Chrysler's views, but with the reservation that the exception should not apply to vehicles whose overall length is 30 feet or greater. None of these vehicles are currently eligible for this option since all exceed 80 inches in overall width. Those vehicles are required to have an intermediate side marker lamp that is centrally located between the front and rear side marker lamps. All three markers need to be clearly visible to motorists from the side so that the overall vehicle size is evident. Thus, for vehicles 30 feet or longer the 45 degree visibility angles are more appropriate than the provisions of paragraph S4.1.1.8. Accordingly, it was proposed that S4.1.1.8 of 49 CFR 571.108 Motor Vehicle Safety Standard No. 108 be revised by deleting the words "80 inches in overall width" and substituting "30 feet in overall length."

Six comments were received in response to the Notice of Proposed Rulemaking, all of which supported it. Typical was the opinion of American

Motors that it is inappropriate to have differing side marker requirements based on a criterion related to vehicle width when the primary purpose of the lamp is to indicate overall length.

In consideration of the foregoing, paragraph S4.1.1.8 of 49 CFR 571.108, Motor Vehicle Safety Standard No. 108 is revised as follows:

§571.108 Motor Vehicle Safety Standard No. 108

* * * *

S4.1.1.8 For each motor vehicle less than 30 feet in overall length, the photometric-minimum candlepower requirements for side marker lamps specified in SAE Standard J592e "Clearance, Side Marker, and Identification Lamps," July 1972, may be met for all inboard test points at a distance of 15 feet from the vehicle and on a vertical plane that is perpendicular to the longitudinal axis of the vehicle and located midway between the front and rear side marker lamps.

The agency has considered the impacts of this amendment under Executive Order 12044, "Improving Government Regulations," and determined that they are not significant. Further, the impacts are so minor as not to warrant the preparation of a regulatory evaluation. The effect of the amendment is to relieve a minor restriction under which a manufacturer in certain circumstances would have to provide an additional or modified side marker lamp.

The program official and attorney responsible for developing this amendment are John Simeroth and Taylor Vinson respectively.

Issued on June 26, 1980.

Joan Claybrook
Administrator

45 FR 45287
July 3, 1980

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment (Docket No. 69-19; Notice 19)

ACTION: Final rule.

SUMMARY: This notice amends Motor Vehicle Safety Standard No. 108 by supplementing an amendment published on January 5, 1976 (49 FR 765) which adopted SAE Standard J588e, Turn Signal Lamps, September 1970 as the referenced standard for that item of lighting equipment. The effect of the amendment was to increase the minimum effective projected luminous area of all turn signal lamps but a corresponding change was not made in the maximum allowable candlepower for single and triple compartment yellow rear turn signal lamps in Figure 1. This notice effects that change.

EFFECTIVE DATE: Since the amendment imposes no new substantive requirements it is effective upon publication in the *Federal Register*, July 29, 1980.

FOR FURTHER INFORMATION CONTACT:

John Simeroth, Crash Avoidance Division, Office of Vehicle Safety Standards, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590 (202-426-2720)

SUPPLEMENTARY INFORMATION: Standard No. 108 was amended in January 1976 to incorporate SAE J588e as the referenced standard on turn signal lamps. Table 1 of J588e establishes maximum candlepower restrictions for rear lamps, different than those in effect under J588d, its predecessor with respect to single and triple compartment yellow turn signal lamps. When J588e was adopted, a corresponding change was not made to Figure 1 of Standard No. 108 which sets out the photometric minimum candlepower requirements calculated using the "Group" or zonal method. This amendment to Figure 1 corrects that error.

In consideration of the foregoing, Figure 1 of 49 CFR 571.108, Motor Vehicle Safety Standard is amended to read:

GROUP TOTALS, CP

Groups * *	Tail lamps	Red stop and turn signal lamps	Yellow turn signal lamps
	* * *	* * *	one * three
Maximum rear lamps only	* * *	* * *	750 * 1050

The program official and lawyer primarily responsible for the development of this amendment are John Simeroth and Taylor Vinson, respectively.

Issued on July 21, 1980.

Joan Claybrook
Administrator

45 FR 49941
July 28, 1980

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment (Docket No. 81-17; Notice 2)

ACTION: Final rule.

SUMMARY: This notice amends Saety Standard No. 108 to delete the dimensional requirements for all headlamp retaining rings. It implements the grant of a petition for modification of Dimension "K", specified in SAE Standard J571d for retaining rings of headlamps. The primary purpose of this amendment is to remove a design restriction and associated administrative and compliance burdens upon the automotive industry. The amendment was proposed on October 13, 1981 (46 F.R. 50394).

EFFECTIVE DATE: June 10, 1982.

SUPPLEMENTARY INFORMATION: Safety Standard No. 108, *Lamps, Reflective Devices and Associated Equipment* (49 CFR 571.108), incorporates by reference SAE Standard J571d "Dimensional Specifications for Sealed Beam Headlamp Units," June 1976. Toyota Motor Sales, USA, Inc. informed NHTSA that it had developed a new retaining ring for a four lamp rectangular headlamp system which combined the function of the previously separate headlamp door (mounting ring) and the retaining ring. The new ring is lighter in weight by 0.2 kg than the old ring and its use makes it easier to replace a headlamp. But in order to allow it, Toyota argued that Dimension "K" as specified in Figure 8(A) of SAE J571d should not be limited to a maximum of 1.52 mm, and it petitioned the agency for rulemaking to eliminate Dimension K. Having been assured that the new design does not interfere with use of a mechanical aimer, NHTSA granted the petition.

Upon its review of Standard No. 108 the agency concluded that it should go beyond the scope of the petition and that deletion of all retaining ring design requirements would not compromise motor vehicle safety. This appeared to be one of those Federal regulations that can be rescinded, thereby relieving a burden, if only a small one, on vehicle manufacturers. The necessary compliance and associated administrative tasks will be removed and therefore implementation of the proposal should have a positive economic impact. Retaining ring dimensions specified in SAE Recommended Practice J1132, applicable to two-lamp rectangular headlamp systems, are also eliminated.

In response to the notice of proposed rulemaking published on October 13, 1981, the agency received six comments, five of which endorsed the agency's planned action. The sixth comment, from Hopkins Manufacturing Corporation, a producer of mechanical aiming devices for headlamps, expressed concern that without a limitation on Dimension "K", there could be interference between the retaining ring and the aiming head, thus preventing the use of a mechanical aimer. However, the agency has concluded, as did several of the commenters, that certain performance requirements specified in SAE J580b "Sealed Beam Headlamp Assembly," February 1974, adequately guarantee compatibility between the retaining ring and the headlamp. Specifically, paragraph S5.1 requires that "Headlamps shall be designed so that they may be inspected and aimed by mechanical aimers . . . without removal of any ornamental trim rings or other parts." This means simply that the headlamps, when installed on the motor vehicle, must be mechanically aimable.

The agency has considered thus rulemaking action and determined that it is not a major regulation under Executive Order 12291 "Federal Regulation," or a significant regulation under the departmental regulatory policies and procedures, and that neither a regulatory impact analysis nor a full regulatory evaluation is required. Amendment of the standard will impose no additional requirements but will allow manufacturers flexibility to adopt retaining ring designs with dimensional specifications that may now be precluded by strict adherence to the SAE requirements incorporated in Standard No. 108. The cost effects of utilizing the new retaining rings would be minimal.

The agency has also considered the impacts of this rule in relation to the Regulatory Flexibility Act. NHTSA certifies that amending Standard No. 108 to eliminate dimensional requirements for retaining rings will not have a significant economic impact on a substantial number of small entities. Accordingly, no regulatory flexibility analysis has been prepared. Based on available information, the agency believes that few, if any, of the retaining ring manufacturers are small businesses as that term is defined for purposes of the Flexibility Act. Businesses which make or install the new retaining rings and small organizations and government jurisdictions which purchase fleets of motor vehicles will not be significantly affected. Retaining rings will continue to be required and provided, in most instances probably unchanged from current ones. The difference in cost of vehicles equipped with current retaining rings and those of a different design will be insubstantial at most.

Issued on June 4, 1982.

Raymond A. Peck, Jr.
Administrator

47 F.R. 25149
June 10, 1982

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Federal Motor Vehicle Safety Standards; Motor Vehicle Lighting

[Docket No. 81-16; Notice 2]

ACTION: Final rule.

SUMMARY: This notice amends Motor Vehicle Safety Standard No. 108 to substitute SAE Standard J594f for J594e as the referenced standard on reflex reflectors. This amendment is in response to a petition for rulemaking submitted by Motor Vehicle Manufacturers Association (MVMA). A notice of proposed rulemaking was published on October 13, 1981 (46 F.R. 50396). The effect of the amendment is to increase the diameter of the circumscribing circle for the photometric test from 7 to 10 inches.

DATE: Effective date is December 20, 1982.

SUPPLEMENTARY INFORMATION: Standard No. 108 requires that reflex reflectors be designed to conform to SAE Standard J594e *Reflex Reflectors*, March 1970. Section J "Photometry" of the Standard specifies that "reflex reflectors may have any linear or area dimensions, but for the photometric test a maximum of 12 square inches contained within a 7 inch diameter circle shall be exposed." In January 1977 the SAE adopted J594f which increased the diameter of the test circle to 10 inches. MVMA petitioned the agency to substitute J594f as the referenced standard on reflex reflectors aguring that it will relieve a design restriction and permit greater latitude in reflector design with no decrease in safety performance.

Specifically, MVMA noted that the increase in minimum requirements for lens area of rear turn signal lamps from 3.5 to 8 inches adopted by NHTSA in 1976 has resulted in increased use of reflex material in the form of horizontal or vertical strips as well as material incorporated within the lenses. But some types of designs are prohibited by current requirements that would be allowable when 12 square inches of reflex material are circumscribed by a circle with a diameter increased from 7 to 10 inches. The performance requirements of this reflective material itself would remain unchanged.

In the proposal NHTSA pointed out the following additional differences between the two standards. The option of using visual measurements for determining photometric performance will be eliminated. This change will result in a greater comparability of test results between manufacturers and NHTSA, which uses photometric rather than visual measurements, thus reducing the likelihood of disagreements when agency tests indicate photometric performance does not meet the standard. In addition, a new Table I is provided, "Minimum Milli-candelas per Incident Lux for Red Reflex Reflectors," the current table becoming "1A." The new table is the equivalent of the old in metric units. Either table may be used, a fact not made clear by J594f.

Nine comments were received on the proposal, all of whom supported it. The majority approved of the removal of a design restriction. The Traffic Control Materials division of 3M Corporation suggested updating Federal Specification L-S-300 which has been revised three times since September 1965, the version cited in S4.1.1.4. However, because such an amendment was beyond the scope of the original proposal and the public has not had an opportunity to comment upon it, this recommendation was not adopted.

The agency's preliminary examination has shown that this rulemaking action is not a major regulation under Executive Order 12291 "Improving Government Regulations," or a significant regulation under the Department's regulatory policies and procedures, and that a regulatory impact analysis is not required. Further, the costs impacts will be so minimal that preparation of a full regulatory evaluation is not warranted. Amendment of the standard will impose no additional manufacturer requirements but will allow producers flexibility to adopt reflex material designs that are now precluded by the current requirements of Standard No. 108. The cost savings resulting from taking advantage of that flexibility would be insubstantial. Although visual measurements for determining photometric conformance will be eliminated, the cost of substituting photometric measures should be minimal. NHTSA believes that most manufacturers, as the best assurance of compliance, have relied on photometric measurements in the past.

Issued on November 9, 1982.

Raymond A. Peck, Jr.
Administrator
47 F.R. 51883
November 18, 1982

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 82-17; Notice 2)

ACTION: Final rule.

SUMMARY: This notice amends Safety Standard No. 108 to allow motor vehicles to be equipped with a new two-lamp rectangular sealed beam headlamp system. The individual lamps in the system will be smaller than those currently allowed in two-lamp systems. The new headlamps have external dimensions identical to those of headlamps used in four-lamp rectangular headlamp systems. The headlamps are required to be designed to conform to performance levels of the presently existing Federal standards met by other headlamps.

DATE: Effective date of the amendment is 30 days after publication in the *Federal Register*. Because of the necessity of manufacturers to meet tooling deadlines, it is found for good cause shown that an effective date earlier than 180 days after issuance of the rule is in the public interest.

SUPPLEMENTARY INFORMATION: Chrysler Corporation petitioned for rulemaking to amend Standard No. 108 to permit the use of a new, smaller, rectangular dual-beam sealed beam headlamp in a two-lamp system. The lamp, which was developed by Wagner Electric Corporation, has the same external dimensions as the rectangular headlamps used in four-lamp systems, and is designed to meet the same photometric requirements as the larger lamp currently used in rectangular two-lamp systems.

The change was requested by Chrysler in order to allow aerodynamic improvements in vehicle front end designs which will result in increased fuel economy. The current four-lamp system of units of identical size is limited in application because of infringement of the extra pair of headlamps upon the amount of grille area required for engine cooling. This will become increasingly critical as the front edges of cars become more rounded in designs planned by the industry for vehicles to be introduced in the mid-1980's.

The new system will use halogen bulbs from Type 2B headlamps, the reflector from the current Type 2A headlamp, and a modified lens. In addition, the lamp ground terminal will be rotated 45 degrees to ensure that Type 1A or Type 2A lamps cannot be inserted as replacements.

To meet the agency's previously expressed concern over proliferation of headlamp types and the consequent possibility that some of them may not be readily available, Chrysler's suppliers, Wagner, General Electric, and GTE Sylvania, have reported that the lamp will be distributed to the field through their normal distribution centers and marketing channels. Thus, the lamps will be available at "well over ten thousand retail sales outlets." Service Parts Division at all of Chrysler's 20 parts depots would stock the new headlamps to supply dealers nationwide.

Because the new headlamp would be derived basically from components of current headlamps, Chrysler estimated that there will be a "considerable" cost decrease over the current larger halogen dual rectangular lamps.

Chrysler also argued that the environmental effects of the new system are all positive, and include reduction in both fuel consumption and raw materials used in lamp manufacture. It is aware of no alternatives which would produce the same level of public benefits.

NHTSA granted the Chrysler petition on October 8, 1982, and published a notice of proposed rulemaking on October 14, 1982 (47 FR 45890).

The agency, in essence, asked three questions in the proposal—whether the performance of a small two-lamp system can meet the needs of motor vehicle safety, whether it would not be better to require such a system to "conform" to the specified requirements instead of being only "designed to conform" with them, and whether the addition of a new headlamp type to the existing types would over-burden the existing distribution system so that replacement headlamps would be difficult to find.

In response to the proposal, NHTSA received 14 comments, including one from Chrysler. Virtually all supported an amendment which would allow the new system; virtually all opposed the proposal that the new headlamp be required to "conform" to specified requirements.

In response to an earlier notice (Request for comments, August 31, 1981; 46 Fed. Reg. 43,719) on new headlighting systems, several commenters had expressed concern about the implications of the possible changes for the simplicity and ease of manufacturing headlamps. In terms of these considerations, the optimum headlamp appears to be one having a relatively large diameter and a single beam. If a headlamp is smaller, contains more than one beam or has a noncircular shape, its photometrics are more difficult to control. Two of those parties who had previously criticized the concept of a system using smaller headlamps, BMW and Koito, did not comment on the current proposal. Volkswagen of America, a previous critic, voiced no objection to the smaller headlamp *per se*, though indicating its preference lay in other directions. California Highway Patrol concurred with the proposal but asked whether the smaller lamp could produce as good a road-lighting beam as a larger headlamp with the same size filament.

NHTSA has carefully reviewed all comments. The fact that the new smaller headlamp is required to meet the same photometric requirements as those of other sizes should ensure that roadway lighting on either high or low beam is sufficient for motor vehicle safety. NHTSA anticipates that manufacturers of these headlamps will maintain quality controls sufficient to insure that the photometrics of any lamp chosen at random will meet the minimum required for each headlamp, even if these controls are more rigorous than those required for a four-lamp system. Sealed beam lighting technology is well proven in practice, and lamps whose dimensions are identical to those which would be used in the new headlamp system have been produced for almost ten years now. Thus, problems inherent in start-up production should be reduced to a minimum. NHTSA has concluded that, in spite of theoretical objections, the new lamps should provide equivalent performance while allowing manufacturers to improve vehicle aerodynamics by locating them to best advantage.

Commenters expressed almost universal opposition to the agency's proposal to require that the new lamps "conform" instead of being "designed to conform" with the requirements for those lamps. Because minor deviations at individual test points are not discernible to the naked eye, the commenters believed that very little real safety advantage would accrue from an approach requiring strict adherence to the performance specifications. (The agency is not willing to accept this argument without further study.) Further, commenters argue that the cost of lamps would increase. Similarly, the commenters stated that the administrative burden on the agency would increase because manufacturers finding individual test point failures of a marginal nature would petition under Part 556 for determinations that they were inconsequential as they relate to motor vehicle safety and thus exempt from the statutory requirement for recall and remedy of noncomplying vehicles and equipment. These potential problems have been avoided under the "design to conform" requirements applicable to currently permitted headlamp systems since NHTSA has allowed random occasional failures without concluding that a lamp is noncompliant. Noting that the Society of Automotive Engineers is currently developing a headlamp performance standard, General Electric recommended that NHTSA review the SAE work and consider a new Federal standard instead of attempting to require strict compliance with existing performance requirements.

After reviewing these comments, NHTSA has concluded that if a requirement for strict compliance is to be introduced, it should be done simultaneously for all lamps, not just for one size of headlamp. Therefore, the agency has not adopted this portion of the proposal at this time but believes that the issue of "conform" versus "design to conform" should be considered in the future as a separate issue.

Because six types of headlamps in four sizes are currently permitted under Standard No. 108 and being offered in the United States, the agency raised the issue of proliferation, i.e., whether permitting an additional type would lead to replacement difficulties, either as a result of the failure of supply outlets to carry the new size, or as a result of the discontinuation of a currently permitted, less popular size to make way for the new headlamp. Truck Safety Equipment Institute expressed its concern that the new lamp would be available only through Chrysler dealerships and therefore its cost would tend to be high.

NHTSA has reviewed the proliferation issue and has concluded that the addition of a new type of headlamp should not create a problem. Current rectangular headlamps received wide availability soon after introduction in 1974 and 1977. Given the precedent of this tradition of availability, it is assumed that a similar pattern will evolve if the new lamp is allowed since it is made using parts from existing lamps and similar production machinery. It is true that it will take time for a supply of replacement lamps to become as available as current headlamps. However, Chrysler stated that its dealers will have replacement lamps and that its lamp suppliers are prepared to supply sufficient quantities quickly to handle both production and field replacement markets. Changing to a new design headlamp may cause occasional difficulties in the initial period of introduction, but reasonable solutions appear to be available to eliminate any safety related problems.

Under the amendment issued today, the new headlamp is identified as "2E1", in accordance with the lighting code currently used by Standard No. 108. The amendment specifies that 2E1 headlamps meet the dimensional specifications for Type 2A headlamps (SAE Standard J571d) except that the ground terminal is rotated clockwise 45 degrees. The 2E1 headlamp is required also to meet all requirements of SAE Standard J579c and subreferenced standards applicable to Type 2 headlamp units (these are basically the photometric, beam pattern, and beam color requirements, and laboratory test specifications). The maximum design wattage is 12.8 volts, 70 watts for upper beam, and 60 watts for lower beam. The lamp is also allowed for use on motorcycles.

Issued on May 9, 1983.

Raymond A. Peck, Jr.
Administrator

48 F.R. 21955
May 16, 1983

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 81-11; Notice 3)

ACTION: Final rule.

SUMMARY: The purpose of this notice is to amend Federal Motor Vehicle Safety Standard No. 108 to allow an optional headlighting system that could improve the fuel economy performance of automobiles. The amendment follows a notice of proposed rulemaking published on January 17, 1983 (48 FR 1992).

The amendment is based upon a petition from, and is primarily directed toward a type of headlamp system developed by, Ford Motor Company. Ford wishes to offer on certain 1984 model cars a semisealed headlamp with a standardized replaceable bulb, which it states would conform to a proposed set of environmental performance requirements similar to those adopted by this notice.

DATE: The amendments made by this notice are effective on July 1, 1983.

SUPPLEMENTARY INFORMATION: This notice completes rulemaking initiated by the agency's publication of a notice of proposed rulemaking (NPRM) on new headlighting systems on January 17, 1983 (48 FR 1992). That proposal was issued following the grant of a petition for rulemaking submitted on August 28, 1981, by Ford Motor Company.

Ford Petition

The Ford petition sought an amendment to Standard No. 108 to permit the use of a nonfully sealed headlamp. To ensure the proper performance of the new headlamp, Ford requested the application to it of certain sealed beam headlamp performance requirements and of certain environmental tests.

Ford's new headlamp consisted of two discrete components: a plastic lens bonded to a plastic reflector, and a replaceable light source capsule of standardized design that is inserted through an opening in the rear of the reflector, and sealed by an "O-ring" seal on the capsule. Although contoured, the headlamp is mechanically aimable with an adapter to the current aiming equipment. Ford argued that the possibility of reflector contamination is minimized because of the lens/reflector bond and the seal at the base of the light source.

Ford stated that its replaceable bulb lamp was developed to assure a high reliability of positioning of the filament after repeated replacements of the bulb in different lamp bodies, and to ensure tight sealing of the capsule into the reflector. Ford asserted that it had rejected the European H-4 design with its multipiece stamped construction as unacceptably complex.

A single piece plastic molding is the foundation of Ford's new bulb design. Ford claimed that electrical socket molding technology has established that extremely fine dimensional control ($\pm$.004 inch) is consistently achievable even at elevated temperatures.

The Ford-type lamp has a bayonet mounting, selected because it provided positive "one way only" insertion of the bulb into the reflector assembly separate from the locking action of the retaining device. Twist lock designs currently used for signal lamp functions do not provide the precise and consistent filament positioning necessary for a headlamp assembly.

Control surfaces are established between the socket and mounting hole to provide (1) axial location, (2) surface to surface contact for in-out positioning of filament and (3) a controlled pin location for accurate filament position.

The method chosen for positioning and securing the bulb in the plastic molded base utilizes current technology such that either optical or dimensional filament control techniques are applicable. The bulb capsule can be inserted into a "master parabola" and illuminated, and the bulb can then be adjusted in the capsule using photo cells for optimum filament positioning. An alternative procedure would orient the filament relying strictly on dimensional location using an optical comparator.

Ford said in its petition that it believes a sealed, unvented assembly is desirable to avoid the problem of corrosion. The agency's primary concern about the headlamp systems in use in Europe has been corrosion developing on the inside and outside surfaces of lamp reflectors after a relatively short time in service. Painted steel reflectors were most commonly used in Europe, and the lamp assemblies were typically vented to the atmosphere through a controlled path. With the sealed capsule design, replacement of the bulb may be achieved in a manner which Ford thinks protects the optic surfaces within the lamp as would be the case in sealed beam units. Ford intends to fabricate the reflector from corrosion-resistant material.

A single silicone O-ring provides the seal for the bulb. Ford tests have allegedly shown that the pressure build-up inside the sealed headlamp cavity due to the operating temperatures of the lamp is approximately 20 psi. Due to the close tolerances of the mating parts and the use of a low durometer "O" ring seal which permits sealing across surface irregularities, an internal pressure of 100 psi can be contained within the lamp body. The efficacy of "O" ring seals to contain static pressure is well known.

Notice of Proposed Rulemaking

In the NPRM, NHTSA proposed three regulatory options that would allow for the use of new headlighting systems. Each of these systems would have involved the use of two separate components, the lens and reflector unit and a replaceable bulb unit. Options which were presented were—

(1) A Ford-type semisealed contoured lamp that has a standardized replaceable light source and that is designed to meet detailed photometric, dimensional and environmental performance requirements.

(2) A fully sealed lens reflector unit that could be contoured, that has a standardized replaceable light source, and that is required to meet standards similar to those in Option 1.

(3) A mechanically aimable unit that has a standardized replaceable light source and that is designed to meet minimum photometric requirements. The unit was not to be subject to detailed dimensional or environmental requirements as in the other options. The success of this option was to depend primarily on the product liability system and on use of the agency's defects authority to control unsatisfactory lamps.

Summary of Comments and Decision

NHTSA received extensive comments on the proposal from vehicle and lighting manufacturers and the general public. Most commenters favored the concept of new headlighting systems, although some commenters expressed no preference among the options. Those who commented on the options tended to favor Option 1, the subject of the Ford petition. Some commenters thought that option was too design restrictive, permitting a headlamp suitable only for one particular size of a two headlamp system and perhaps for only one manufacturer initially. The second choice was Option 3. However, both these options were also opposed by many commenters. Option 2, the sealed system with the replaceable bulb, occasioned few comments, but most of those were negative.

The agency has decided that Option 1 is the most feasible of the three proposed headlighting concepts and is adopting it with several modifications based on the comments. Since the Ford headlamp represents a new lighting technology, the agency believes that it is particularly appropriate to apply the detailed requirements of Option 1 to promote the lamp's safe performance.

With respect to Option 2, no specific proposals were presented to the agency for production of a contoured, sealed lens-reflector unit with a replaceable bulb. Also, while many of the motor vehicle equipment and vehicle manufacturers commenting on the NPRM favored Option 1, only one favored Option 2. Accordingly, the agency rejected Option 2.

The agency did not adopt Option 3 for several reasons. That option would require photometric conformance at the time the headlamp was manufactured and nothing more. No tests like those in Option 1 would be prescribed to ensure durability of the photometric performance over the life of the lamp. Assurance of continued performance would be provided almost solely by competitive forces of the marketplace, and NHTSA's defects authority. However, that authority is generally exercised only after safety problems have manifested themselves on the road. The agency believes that a higher quality of lamp is more likely to result if equipment is required to be built to certain specified levels of safety rather than left to the manufacturer's estimates of potential product liability and of the likelihood of the agency's discovery of defects and exercising its defects authority.

With the decision to adopt Option 1, the principal issue became the efficacy of the performance tests in ensuring that the headlamps will perform adequately in real world conditions. NHTSA believes that the tests as adopted would accomplish that goal.

Discussion of Comments

Designed to conform. Some commenters understood the proposal as requiring that the new headlamps conform with the applicable requirements instead of simply being designed to conform with those requirements. The commenters who addressed this issue uniformly urged that the latter approach be adopted as it already has been for all other items of lighting equipment under the standard. As the agency indicated in its recent amendment to Standard No. 108 to permit a new size of headlamps requested by Chrysler Corp., the agency will address this issue in a separate rulemaking proceeding.

Sequential testing of single lamp. Under NHTSA's proposal, a single lamp would have been tested sequentially under all of the standard's performance requirements. Most commenters did not favor sequential testing. Opponents objected to it on several grounds. From a practical standpoint, the time required for sequential testing of a single headlamp would be from 6 to 10 weeks. Further, laboratories would find it difficult to make efficient use of equipment since one facility must be held idle awaiting a lamp to finish another stop in the test. The agency notes that nonsequential testing would facilitate the agency's accurately judging a headlamp's level of performance under a particular environmental test. Failures could be more easily isolated and related to a particular test with nonsequential testing. For these reasons, NHTSA has decided to eliminate a requirement for sequential testing and to specify that a separate lamp be used for each test, except that the same lamp must be used for the temperature cycle and internal heat tests, for the reasons discussed below.

In addition to retaining certain sealed beam headlamp performance requirements, the amendment includes a series of environmental tests to assure adequate performance. The tests adopted are:

(1) Photometry.

(2) Abrasion.

(3) Vibration.

(4) Chemical Resistance.

(5) Corrosion.

(6) Dust.

(7) Temperature Cycle and Internal Heat.

(8) Humidity.

(9) Impact.

Photometry. A headlamp that has not been subjected to any of the environmental tests is required to meet certain SAE photometry requirements: S4.6 Photometry of SAE J575 "Test for Motor Vehicle Lighting Devices and Components," June 80; S3.1 Test Voltage and S3.5 Photometric Design Requirements, including Figure 3 and Table 1 of SAE J579c, December 78, SAE J580 "Sealed Beam Headlamp Assembly," August 77.

After a headlamp has been exposed to any of the following environmental hazards, abrasion, chemical resistance, humidity, dust, and temperature cycle/internal heat, it must continue to meet the photometric test prescribed by SAE Standard J579c. That test is currently a requirement of Standard No. 108 for existing headlamp systems.

Abrasion. Based on fleet field test results, the abrasion tests on plastic headlamps appear to be particularly critical. Accordingly, a proposed NHTSA procedure and an alternative Ford procedure were included to generate comment on this critical test phase. NHTSA proposed a test by which abrasion resistance would be judged by the effect of sand falling on a headlamp lens.

The abrasion test was to be required only if a proposed headlamp had a plastic lens. This was consistent with the agency's abrasion concerns, and with the current absence of any abrasion requirements applicable to existing glass surfaced lamp systems. At the end of the abrasion test, photometric output was to be measured to assure continuing compliance with SAE J579c, December 78.

Some commenters stated that the falling sand method of testing represents the manner in which abrasion actually occurs on headlamp lenses in use, and that the test has some "heritage" in an established ASTM procedure. However, opposing comments suggested that the reproducibility of a sand drop test is so poor that the results from different test laboratories could not be compared. NHTSA is concerned that a performance requirement based on that method of testing would not be readily enforceable.

Ford proposed a test in which steel wool would be rubbed against the lens for 11 cycles. It argued that the results of its test correlated more closely to the manner in which abrasion actually occurs than do the results of the falling sand test. Ford's data showed similar linear correlations between vehicle age and on-the-road development of headlamp haze due to abrasion and between the number of steel wool test cycles and the haze on headlamps tested under that test. There was no similarity in the correlation involving real world experience and that between the results of the falling sand test and the haze on headlamps resulting from that test. Most haze resulting from the falling sand test occurred during the first minute of testing.

Accordingly, the agency has adopted Ford's proposed test rubbing steel wool against the lens for 11 cycles, but not Ford's proposed abbreviated photometric checks following this test. Glass lensed units are exempt from the tests for abrasion and impact.

Vibration. At the conclusion of the proposed vibration test, there was not to be any evidence of loose or broken parts in the lamp, and the lamp was to continue to meet the photometric requirements. Since the proposed vibration test differed from the one currently specified in Standard No. 108 for other items of lighting equipment, the agency heeded requests not to have two different vibration tests requiring different test equipment. Therefore, the agency has amended the rule to specify the use of the vibration test specified by SAE J575e, the test currently applied to other items of lighting equipment. Similarly, as that vibration test allows filament fracture, the agency has determined that it is not appropriate to require photometric conformance following the vibration test.

Chemical resistance test. The proposed chemical resistance test involved total immersion of the entire test lamp in fluids for a period of five minutes, storage for 48 hours and then an examination for deterioration both in the lamp assembly and the photometric performance of the lamp. The proposed test fluids were gasoline, tar remover, motor oil, brake fluid, power steering fluid, windshield washer fluid, and antifreeze.

Most of those who commented on the chemical resistance test were opposed to the proposal that headlamps be totally immersed for a period of time in separate fluids. Opposition was based on the argument that this does not reflect actual conditions in service where a headlamp may come in contact with one of the listed fluids while being cleaned with a cloth having a variety of chemicals on it. Commenters also opposed use of gasoline and brake fluid as test fluids, the former primarily on the grounds of the effect likely upon a headlamp whose lens has already been subjected to the abrasion test, and the latter on the grounds that brake fluid, because of its corrosive nature, is not likely to be present on a cloth used in cleaning headlamps.

After due consideration of these comments, the agency has decided that total immersion of the lamp unit is not necessary since the purpose of the chemical resistance test is to ensure that the lens is not susceptible to damage by the listed fluids. Accordingly, the agency has modified the test to require that a headlamp be exposed to the fluids not by immersion, but by the more realistic procedures of being wiped with a cloth that has been immersed in one of the test fluids.

NHTSA has retained gasoline as a test fluid as it is a fluid very likely to be present on a wiping rag. The objection to using gasoline because of the headlamp's previous testing under the abrasion test is moot since the agency has deleted the provision for sequential testing of a single headlamp for compliance with all environmental tests. In view of the known corrosive effect of brake fluid on vehicle finishes, the agency believes that it is less likely that headlamps will be exposed to brake fluids than any of the other listed fluids. That effect and the warnings about brake fluid on containers of that fluid make it likely that mechanics will be particularly careful about not using brake fluid contaminated rags near any external vehicle surface. Therefore, the agency is not including it in the list of test fluids.

In concert with its elimination of sequential testing under the environmental tests, the agency is also eliminating the requirement that a single headlamp be exposed to each of the listed fluids. The agency believes that exposing a particular headlamp to only a single fluid will facilitate determining the performance capabilities of a headlamp when exposed to that fluid.

Corrosion test. The corrosion test that was proposed involved subjecting the test lamp to a salt spray test in accordance with ASTM B117-73 "Method of Salt Spray (Fog) Testing" for a period of 240 hours, consisting of ten successive 24-hour intervals. During each interval, the headlamp was to be exposed for 23 hours to the salt spray and then allowed to dry for an hour. At the end of the test period, compliance with the photometric requirements was to be determined. Further, the proposal provided that there could not be any evidence of internal or external corrosion more than an eighth of an inch from sharp edges, or any corrosion, on the terminals or elsewhere, which would involve loss of function.

Many commenters were concerned with the stringency of the test and the criteria. One commenter noted that the proposed test would not achieve the objective of ensuring reflectors with good corrosion resistance because the test does not take into account a situation in which a bulb may be removed for an extended period of time.

NHTSA is satisfied that the requirements are reasonable but believes that the test should be adjusted to reflect the possibility of bulb removal for an extended period of time or under highly humid conditions. Accordingly, the corrosion test adopted requires removal of the bulb for each one-hour period in which the salt spray is deactivated. This should introduce a salt atmosphere on the inside of the lamp. However, as this may create excessive salt deposits on the lens, not easily removed, there is no requirement to measure photometric requirements after the test period. The strictures against corrosion, of course, remain.

Dust test. There was general agreement on maintaining the dust test as proposed, in which fine powdered dust is diffused through a test box for a period of 5 hours. Accordingly, that test is adopted without change.

Temperature cycle, thermal shock, and internal heat tests. The principal changes made in the test procedures as adopted concern the temperature cycle, thermal shock, and internal heat tests. As proposed, a temperature cycle test was required from −40°F to 176°F for 10 complete cycles. The headlamp was not to show any evidence of specific adverse effects.

In the proposed thermal shock test, the headlamp was to be energized on its highest wattage filament for 45 minutes, then plunged into ice water (32°F) for five minutes. The headlamp was to be required to show no evidence of fractures, delamination or entry of water in liquid form after this test.

As proposed, the internal heat test provided that the lens was to be coated with simulated road dirt consisting of Zaccharini dust and water, to reduce light transmission to 25% of the original. No lens distortion was to be permitted at the end of such test.

The main issue associated with the related tests regarding temperature cycle, thermal shock and internal heat is the relationship between the tests and the expected performance under actual operating conditions. Two basic aspects of performance are addressed by these tests. One is the integrity of the construction of the lamp. This is typically tested by cycling a lamp between a hot and a cold temperature. The second aspect is the permanence of the shape and size of the lens, reflector, and filament under high temperature conditions. Any changes in this geometry should be noticeable from the lens distortion measurements and photometric tests conducted after exposure to such conditions.

As for the first aspect, most commenters who addressed the temperature range in the temperature cycle test indicated that the integrity of lamp construction can be tested adequately with a smaller temperature cycle range than the −40°F to +176°F range that was proposed. Accordingly, the agency adopted a narrower range of −30°F to

+120°F. As for the second aspect, a minimal amount of lens warpage, .118 inch, is allowed in the final rule since it is not practicable to insist that plastic lenses remain absolutely warpage free. That small amount of distortion should not pose any safety problem since the lamp must still meet photometric conformance requirements. Finally, in a change from the proposal, the rule allows any means including Zaccharini dust to reduce light transmittance to 25±2% of the output originally measured.

Headlamps will still be subjected to sufficiently high temperatures to ensure adequate performance. NHTSA understands that plastic materials currently used in headlamps can begin to lose strength in high ambient temperatures when the lens is very dirty. The internal heat test will, it is believed, generate temperatures seen in this condition.

The agency has decided to delete the proposed thermal shock test. That test is redundant, particularly because the agency has decided also that the temperature cycle and internal heat tests should be linked so as to require a single headlamp to demonstrate compliance with both of them. The temperature cycle test will not only test headlamps at extreme temperatures likely to be encountered in the real world, but also to subject them to a substantial change in temperature in a several hour period. Even with the narrower range adopted in this notice, headlamps will be required to maintain their performance when subjected to a much greater temperature change than headlamps will experience in the real world.

Humidity test. For the humidity test, the agency proposed that the headlamp was to be operated in a controlled environment of 100°F and humidity from 80 to 100% and was not to show any evidence of moisture, fogging, or delamination, after a period of 240 hours during which the headlamp is turned on and off. Although some commenters believed that some moisture should be allowed as a result of the test, NHTSA has decided that headlamps should be constructed so that no moisture can collect. However, the agency believes that a lesser period of time is sufficient to demonstrate compliance and the humidity test has been adopted with a period of 120 hours.

Impact test. The agency proposed an impact test which would require a plastic lens to withstand a single impact by a steel ball bearing 1.76 oz. (50 grams) in weight and dropped from a distance of 15.75 inches (40 cm.) above the lens. This test has been adopted as proposed.

Out-of-focus and bulb deflection tests. Two tests, an out-of-focus test and a bulb deflection test, were proposed to ensure the proper placement of the bulb filament. The out-of-focus test, not part of the Ford petition, was similar to that currently required of motorcycle headlamps which incorporate a replaceable bulb. The bulb deflection test was proposed by both NHTSA and Ford to simulate the effect of rough handling which could affect the bulb filament alignment, such as might occur during insertion of a replacement bulb. The agency believes that it is redundant to have two tests to ensure proper filament placement. That placement is a function of bulb fit and filament position. The latter is assured by the narrow tolerances in the required bulb specifications and the former by the bulb deflection test. Accordingly, the agency has decided not to adopt an out-of-focus test.

Provision of bulb with new vehicle. NHTSA also proposed that manufacturers be required to provide a replacement bulb with every vehicle equipped with the new headlighting system. Several commenters opposed this requirement as unnecessary. This proposal is adopted but restricted to those motor vehicles manufactured during the first year in which the new amendments are effective. The establishment of that fixed period is premised on introduction of the new Ford-type headlamps near the beginning of that period. Based on that premise, the agency anticipates that replacement bulbs should be readily available through normal distribution channels at the end of the one year period. If the agency's premise proves false or distribution problems otherwise arise, the agency will consider extending this period.

Testing of replacement headlamps. Each lens-reflector unit manufactured as replacement equipment would also have to meet the performance requirements of replaceable bulb headlamps when a standardized replaceable light source is inserted. This requirement is adopted as proposed.

Adapter for aiming device. Because most existing mechanical aimers are not designed for headlamps with contoured lenses, the agency proposed to require that an adapter to facilitate aiming be furnished with each vehicle manufactured during the first model year in which replaceable bulb headlamps are included as standard equipment. The adapter specified has been designed by Ford for this purpose. After that time, an adjustable adapter, also designed by Ford, should be available for mechanical aimers such that all contoured lenses could be aimed by reference to the pad aiming dimensions. Some commenters argued that the agency should not require mechanical aiming and thus should not adopt the requirement concerning adapters. The agency believes that requiring mechanical aiming is appropriate since most aimers used in this country are mechanical. The adapter requirement has been adopted for motor vehicles manufactured between July 1, 1983, and June 30, 1984, and equipped with the new headlamps. As in the case of the period established for provision of a replacement bulb with new vehicles, the agency will monitor the production of headlamps under the option adopted by this notice and consider making any necessary adjustments in the end date of the period.

Distortion of plastic lenses. Because Ford intends to construct its lamps of plastic, lens distortion appeared to be another important issue. Elevated headlamp operating temperatures caused by dirt on the lens could exceed the thermal limit of some plastics and result in distortion. NHTSA's proposal and amendment distinguish between lamps of plastic and glass, not prohibiting use of the one or requiring the other. However, a headlamp using plastics would have to be certified as meeting the currently required tests for plastics of SAE J576c, including a heat test and the 3-year outdoor exposure test (now most generally conducted as a simulated equivalent).

Other issues. Two additional issues of major concern to a number of commenters were the suggestion that Option 1 was excessively design restrictive and the belief that greater consideration needed to be given to the use of the H4 bulb in the interest of international harmonization.

Standard No. 108 already contains many provisions substantially affecting design because of the necessity to standardize lighting equipment for the purpose of ensuring the ready availability of replacement lights. In recognition of the complexity of the proposed design dimensions of the standardized replacement light source, NHTSA has eliminated some of the proposed specifications. In order to allow manufacturers complete freedom in the exterior design of the lamp, however, the light source must be standardized to avoid proliferation. The H4 bulb was not included in the NPRM because NHTSA concluded that the bulb presented in the Ford petition was superior in design. The close fit of the bulb capsule and reflector socket (to prevent misaim from an out-of-position filament) and the O-ring seal were especially important in the agency's view. While the final rule does not harmonize light source, it will produce cost savings by allowing manufacturers to employ the same front end sheet metal for all markets.

One manufacturer expressed concern that NHTSA's allowance of the Option 1 system would mean that the agency would not consider petitions for the adoption of additional headlighting systems. The agency does not agree that new lighting concepts will be foreclosed from consideration. Each new concept will be judged on its merits.

Impact Analyses

NHTSA has considered this rule and has determined that it is not major within the meaning of Executive Order 12291, "Federal Regulation" or significant under Department of Transportation regulatory policies and procedures, as its adoption does not require any person to change current practices under the standard. A regulatory evaluation has been prepared and placed in the docket. (A free copy of this document can be obtained from the Docket Section.) The rule will not impose any additional requirements but will permit manufacturers greater flexibility in the design of headlighting systems and adjacent exterior vehicle surfaces. Use of this flexibility will allow improvements in safety, aerodynamic efficiency and fuel economy. The extent of such improvement is dependent on the extent to which manufacturers take advantage of the new headlamp designs permitted by the option.

Safety benefits. The agency has determined that use of the replacement bulb headlamp has the potential to provide several safety benefits as well as increase fuel economy through reducing aerodynamic drag and vehicle weight. One such potential benefit is that the aerodynamic shape of the lens may aid in keeping the lens cleaner and thus the light output higher. Further, the easy replacement of the bulb may result in faster replacement of burned out headlamps.

Energy saving benefits. Based on testing by Ford, it appears that use of the replaceable bulb headlamp would make possible a 2 percent reduction in aerodynamic drag. The slight weight reduction that could be achieved through use of plastics and the reduced aerodynamic drag would produce an average savings of 26 gallons over the life of a vehicle. Together, these quantifiable benefits could provide savings of $4.00 per vehicle per year.

Costs. The safety benefits could, of course, be offset if in those instances in which fractures do occur, the economic costs of replacement were prohibitive. Concerns regarding this possibility were raised by some commenters. However, the agency's analysis does not indicate that the replacement costs would be prohibitive. The average installed cost for replacing today's halogen sealed beam unit is approximately $20. The same figure for a replaceable bulb lamp complete with bulb would be about $55 according to information provided by Ford. Corning, however, estimates that the cost could be as high as $80.

The agency estimates that the initial consumer cost is $19 per car or $2 per year. The average annual incremental replacement cost to the vehicle owner is believed to range between $1 and $3 per lamp depending on the amount of stone damage experienced by the lamp. Therefore, the incremental annual consumer cost is believed to range from a cost of $3 to $5 per car per year. Considering the benefit of $4, the net consumer cost is estimated to range from a saving of $1 to a cost of $1 per car per year.

NHTSA has concluded that this rule will not have a significant impact on the human environment. The lamps that will be manufactured pursuant to the rule are expected to be lighter, thus slightly reducing the overall material content of the automobile. This would have a small positive effect on the environment. No adverse impact on safety is anticipated, although as noted above the greater resistance of plastic facing to fracture in on-road use could produce incremental safety benefits by reducing the number of occasions in which fractures result in loss of illumination.

The agency has also considered the impacts of this rule under the Regulatory Flexibility Act. I certify that this rule will not have a significant economic impact on a substantial number of small entities. Accordingly, no regulatory flexibility analysis has been prepared. Manufacturers of motor vehicles and headlamps, those affected by the rule, are generally not small businesses within the meaning of the Regulatory Flexibility Act. Further, these manufacturers would be affected only to the extent that they elected to take advantage of the new headlighting option that is established by the rule. The number of different components in the inventories of headlamp distributors will increase, but not to the extent that any significant problem will be created. Finally, small organizations and governmental jurisdictions would be affected only to the extent that they choose to buy vehicles equipped with the new headlamps. The organizations and jurisdictions making that choice would not be significantly affected by the price of the new headlamps.

Because motor vehicle manufacturers must make timely decisions with respect to product plans for the 1984-model year, it is hereby found that an effective date earlier than 180 days after issuance of the rule is in the public interest. The rule is effective July 1, 1983.

PART 571—[AMENDED]

§ 571.108 [Amended]

In consideration of the foregoing, 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, is amended as follows:

1. Section S3 Definitions is amended by adding the following definitions so that all definitions in that section are in alphabetical order:

"Headlamp test fixture" means a device designed to support a replaceable bulb headlamp in the test position specified in the laboratory tests in S4.1.1.36(d), and whose mounting hardware and components are those necessary to operate the headlamp as installed in a motor vehicle.

"Replaceable bulb headlamp" means a headlamp comprising a bonded lens and reflector assembly, and a standardized replaceable light source.

"Seasoning" means a process of energizing the filament of a headlamp, at design voltage, for a period of time equal to 1 percent of average rated laboratory life.

"Standardized replaceable light source" means an assembly of a headlamp bulb, base, and terminals, as described in Figure 1.

2. New Sections S4.1.1.36, S4.1.1.37, S4.1.1.38, S4.1.1.39 and S4.1.1.40 are added to read as follows:

S4.1.1.36. Instead of being equipped with a headlighting system specified in Table I or Table III, a passenger car, multipurpose passenger vehicle, truck, or bus manufactured on or after July 1, 1983, may be equipped with two replaceable bulb headlamps which are designed to conform to the following requirements:

(a) (1) Each replaceable bulb headlamp shall include components which are designed to conform to the applicable specifications of paragraph S4.1.1.38 and Figure 3—*Specifications For The Standardized Replaceable Light Source,* including filament location, base and socket dimensions, electrical connector dimensions, and maximum design wattage.

(2) The exterior face of each replaceable bulb headlamp lens shall have three pads which meet the requirements of Figure 4, *Dimensional Specifications for Location of Aiming Pads on Replaceable Bulb Headlamp Units,* and which form an aiming plane for mechanically adjusting and inspecting headlamp aim. The exterior lens face shall have molded into it the specific settings applicable to that headlamp as designed to be installed in the vehicle, for each of the two adjustable legs of the aiming device locating plate; e.g., "11H 17V" requires the horizontal aiming pad leg to be set in position 11, and the vertical aiming pad leg to be set in position 17.

(b) Each replaceable bulb headlamp shall meet the following sections of the specified SAE Standards and Recommended Practices:

(1) Section 4.6—Photometry of SAE J575 "Tests for Motor Vehicle Lighting Devices and Components" June 80.

(2) Section 3.1—Test Voltage, and Section 3.5—Photometric Design Requirements including Figure 3 and Table 1 of SAE J579c "Sealed Beam Headlamp Units for Motor Vehicles" December 1978, except that the aiming plane on the lens shall be at horizontal and vertical distances to the photometer axis as inscribed on the lens of a replaceable bulb headlamp.

(3) Section 5—General Requirements, Section 6—Design Requirements and Tests (to the extent listed below), Section 6.1—Aiming Adjustment Test, Section 6.2—Inward Force Test, and Section 6.4—Connector Tests of SAE J580 "Sealed Beam Headlamp Assembly" August 1979.

(c) A headlamp with a glass lens need not meet the abrasion resistance test specified in S6.2, nor the impact test specified in S6.11.

(d) When tested according to any of the procedures indicated in subparagraphs (1) through (8), a replaceable bulb headlamp shall meet the appropriate requirement:

(1) After an abrasion test conducted in accordance with S6.2, the headlamp shall meet the photometric requirements of SAE J579c, "Sealed Beam Headlamp Units for Motor Vehicles" December 1978.

(2) After a vibration test conducted in accordance with S6.3, there shall be no evidence of loose or broken parts visible without magnification, except that the filament need not be unbroken.

(3) After a chemical resistance test involving exposure to any of the fluids listed in S6.4, there shall be no surface deterioration, coating delamination, fractures, deterioration of bonding materials, color bleeding or color pick-up visible without magnification, and the headlamp shall meet the photometric requirements of SAE J579c, "Sealed Beam Headlamp Units for Motor Vehicles" December 1978.

(4) After a corrosion test conducted in accordance with S6.5, there shall be no evidence of external or internal corrosion or rust visible without magnification. Loss of adhesion of any applied coating shall not occur more than .125 inch (3.2 mm) from any sharp edge on the inside or outside. Corrosion may occur on terminals provided there is no voltage drop greater than 3 percent from that measured before the test when measured per paragraph 6.4 of SAE J580 August 1979.

(5) After a dust test conducted in accordance with S6.6, the headlamp shall meet the photometric requirements of SAE J579c, "Sealed Beam Headlamp Units for Motor Vehicles" December 1978.

(6) The headlamp shall first meet the requirements of paragraph (d) (6) (A) and then those of paragraph (d) (6) (B).

(A) After a temperature cycle test conducted in accordance with S6.7.1, the headlamp shall show no evidence of delamination, fractures, entry of moisture or deterioration of bonding material, color bleeding, warpage or deformation visible without magnification, or lens warpage greater than .118 inch (3 mm) when measured perpendicular to the aiming plane at the point of intersection of the mechanical axis with the exterior surface of the lens, and it shall meet the photometric requirements of SAE J579c, "Sealed Beam Headlamp Units for Motor Vehicles" December 1978.

(B) After an internal heat test conducted in accordance with S6.7.2, there shall be no lens warpage greater than .118 inch (3 mm) when measured perpendicular to the aiming plane at the point of intersection of the mechanical axis with the exterior surface of the lens, and it shall meet the photometric requirements of SAE J579c, "Sealed Beam Headlamp Units for Motor Vehicles" December 1978.

(7) After a humidity test conducted in accordance with S6.8, the inside of the headlamp shall show no evidence of delamination or moisture, fogging or condensation visible without magnification, and the headlamp shall meet the photometric requirements of SAE J579c, "Sealed Beam Headlamp Units for Motor Vehicles" December 1978.

(8) After an impact test on a headlamp with a plastic lens conducted in accordance with S6.11, there shall not be any fracture of the adhesion of lens coating or delamination of materials visible without magnification, and the lens shall not be broken, cracked, or chipped.

S4.1.1.37 Each lens-reflector unit manufactured as replacement equipment for a replaceable bulb headlamp system shall conform to the requirements of S4.1.1.36 when a standardized replaceable light source is inserted in it.

S4.1.1.38 Each standardized replaceable light source shall conform to the following requirements:

(a) A silicone O-ring shall be provided.

(b) The bulb portion of the standardized replaceable light source shall meet the requirements in paragraph (b) (1) through (b) (6) of this section.

(1) The general specifications of the bulb shall be:

	Low Beam	*High Beam*
Watts @ 12.8 V	45	65
Lumens (without black cap) @ 12.8 V	1067 ± 7½%	1736 ± 7½%
Average Life @ 14.0 V	320 Hrs.	150 Hrs.

(2) The bulb filaments shall be subject to seasoning prior to wattage and lumens measurement.

(3) Wattage and lumens measurements shall be made with the direct current test voltage regulated within one quarter of one percent.

(4) Except for reference dimensions, and unless otherwise specified, a general tolerance of ±.004 in. (0.10 mm) shall apply to all linear dimensions and ±1°.00′ shall apply to all angular dimensions.

(5) Bulb, lead wires and/or terminals shall be installed in the base so as to provide an airtight seal.

(6) After a bulb deflection test conducted in accordance with S7, the permanent deflection of the glass envelope of each standardized replaceable light source shall not exceed .005 inch (.13 mm) in the direction of the applied force in the base.

S4.1.1.39 Each motor vehicle manufactured on or after July 1, 1983, and before July 1, 1984, which is equipped with a replaceable bulb headlamp system shall also be provided with a spare standardized replaceable light source as original equipment for such vehicle.

S4.1.1.40 The lens of each replaceable bulb headlamp that conforms with this standard, and the side of the base of each standardized replaceable light source shall be marked with the symbol

"DOT" or "D
O
T" which shall constitute a certification that the headlamp or light source conforms to all applicable Federal motor vehicle safety standards.

3. New sections S6, S7, and S8 are added to read:

S6. *Tests and procedures for replaceable bulb headlamps.* When tested according to the procedures below, each replaceable bulb headlamp shall meet the requirements of S4.1.1.36(b) and (d).

S6.1 *Photometry.* A headlamp shall be tested according to Section S3.5, Photometric Design Requirements of SAE Standard J579c, "Sealed Beam Headlamp Units for Motor Vehicles" December 1978, after the tests specified in S6.2, S6.4, S6.6, S6.7(a), S6.7(b) and S6.8.

S6.2 *Abrasion.* (a) A headlamp shall be mounted in the abrasion test fixture in the manner indicated in Figure 5 with the lens facing upward.

(b) An abrading pad meeting the requirements in paragraph (c) (1) through (c) (4) of this section shall be cycled back and forth (1 cycle) for 11 cycles at 4 ±0.8 in. (10 cm ±2 cm) per second over at least 80 percent of the lens surface, including all the area between the upper and lower aiming pads, but not including lens covers and edges.

(c) (1) The abrading pad shall be not less than 1.0 ±.04 in. (2.5 cm ±.1 cm) wide, constructed of 0000 steel wool, and rubber cemented to a rigid base shaped to the same vertical contour of the lens. The "grain" of the pad shall be perpendicular to the direction of motion.

(2) The abrading pad support shall be equal in size to the pad and the center of the support surface shall be within ±.08 in. (±2 mm) of the lens surface.

(3) The density of the abrading pad shall be such that when the pad is mounted to its support and is resting unweighted on the lens, the base of the pad shall be no closer than .125 in. (3.2 mm) to the lens at its closest point.

(4) When mounted on its support and resting on the lens of the test headlamp, the abrading pad shall then be weighted such that a pad pressure of 2.0 ±.15 psi (14 ±1 KPa) exists at the center and perpendicular to the face of the lens.

(d) A pivot shall be used if it is required to follow the contour of the lens.

(e) Unused steel wool shall be used for each test.

S6.3 *Vibration.* A vibration test shall be conducted according to the procedures in SAE Standard J575e, "Tests for Motor Vehicle Lighting Devices and Components" August 1970, and those set forth in paragraphs (a) through (c) of this section.

(a) The table on the adapter plate is of sufficient size to contain completely the test fixture base with no overhang.

(b) The direction of vibration is the vertical axis of the headlamp as mounted on the vehicle.

(c) The filament is cold (not energized).

S6.4 *Chemical resistance.* (a) The entire exterior lens surface of the fixtured headlamp and top surface of the lens-reflector joint shall be wiped once to the left and once to the right with a 6-inch square soft cotton cloth (with pressure equally applied) which has been saturated once in a container with 2 ounces of one of the test fluids listed in paragraph (b) of this section. The lamp shall be wiped within 5 seconds after removal of the cloth from the test fluid.

(b) The test fluids are:

(1) gasoline—unleaded 89 octane $\frac{(R+M)}{2}$ or above used per OSHA Std. 29 CFR 1910-106—Handling Storage and Use of Flammable Combustible Liquids.

(2) tar remover (petroleum base with Xylene).

(3) power steering fluid.

(4) windshield washer fluid consisting of 1.5% monethinalamine with the remainder 50% concentrations of methanol/distilled water by volume.

(5) antifreeze (50% concentration of ethylene glycol/distilled water by volume).

(c) After the headlamp has been wiped with the test fluid, it shall be stored in designed operating attitude for 48-hours at a temperature of 73°F ±7° (23°C ±4°) and a relative humidity of 30 ±10 percent. At the end of the 48-hour period, the headlamp shall be wiped clean with a soft dry cotton cloth and visually inspected.

S6.5 *Corrosion.* The headlamp, unfixtured and in its designed operating attitude with all drain holes, breathing devices or other designed openings in their normal operating positions, shall be subjected to a salt spray (fog) test in accordance with ASTM B117-73, "Method of Salt Spray (FOG) Testing," for a period of 240 hours, consisting of ten successive 24-hour intervals. During each interval, the headlamp shall be exposed for 23 hours to the salt spray, which shall not be activated for the 24th hour. The bulb shall be removed during the one hour of salt spray deactivation and reinserted for the start of the next test cycle.

S6.6 *Dust.* The headlamp, mounted on a test fixture, with all drain holes, breathing devices or other designed openings in their normal operating positions, shall be positioned within a cubical box, with inside measurements of 35.4 in. (900 mm) on each side or larger if required for adequate wall clearance, i.e., a distance of at least 5.9 in. (150 mm) between the headlamp and any wall of the box. The box shall contain 9.9 lb. (4.5 kg) of fine powdered cement which conforms to the ASTM C150–77 specification for Portland Cement. Every 15 minutes, the cement shall be agitated by compressed air or fan blower(s) by projecting blasts of air for a two-second period in a downward direction so that the cement is diffused as uniformly as possible throughout the entire box. This test shall be continued for five hours after which the exterior surfaces of the headlamp shall be wiped clean.

S6.7 *Temperature and internal heat tests.*

S6.7.1 *Temperature cycle.* A headlamp, mounted on a headlamp test fixture, shall be exposed to 10 complete consecutive thermal cycles having the thermal cycle profile shown in Figure 6. During the hot cycle, the highest wattage filament in the headlamp shall be energized at design voltage commencing at point "A" of Figure 6 and de-energized at Point "B." Separate or single test chambers may be used to generate the temperature environment described by the thermal cycle profile. All drain holes, breathing devices or other designed openings of the headlamp shall be in their normal operating positions.

S6.7.2 *Internal heat.*

(a) After its lens surface has been cleaned, the photometric output on upper beam of a headlamp that has been tested according to S6.7.1 is measured.

(b) The lens surface of the headlamp that would normally be exposed to road dirt shall be sprayed uniformly with any appropriate mixture of dust and water or other material to reduce the photometric output at the test point H-V of the lamp to 25% ±2% of the output originally measured in the high beam photometric test under paragraph (b) of S4.1.1.36. Such reduction shall be determined under the same conditions under which the original measurement was made.

(c) After the determination has been made that the photometric output of the lamp has been reduced as specified in S6.7.2, the lamp and its mounting hardware shall be mounted in an environmental test chamber in the manner similar to that indicated in Figure 7 "Dirt-Ambient Test Setup." The headlamp shall be soaked for one hour at a temperature of 95°F (35°C) and then be energized for one hour in a still air condition, allowing the temperature to rise from 95°F (35°C).

(d) The lamp shall be returned to the room ambient temperature, 73 ±7°F (23 ±4°C) and relative humidity of 30 ±10%. The lens shall then be cleaned. Photometric output of the lamp on high beam shall be determined according to S6.1.

S6.8 *Humidity.* (a) The headlamp, mounted on a test fixture, shall be placed in a controlled environment consisting of a temperature of 100°F ±9° (38°C ±5°) with a relative humidity of 90% ±10%. All drain holes, breathing devices, and other designed openings shall be in their normal operating positions. The headlamp shall be subjected to 20 consecutive 6-hour test cycles. In each cycle, it shall be energized at design voltage on the highest wattage filament contained in the device for 1 hour and then de-energized for 5 hours. After completion of the last cycle, the lamp shall be soaked for 1 hour at 73°F (20°C) and a relative humidity of 30% ±10% before it is removed for photometric testing. The headlamp shall be tested for photometrics at 10 ±1 minutes following completion of the humidity test.

S6.9 *Impact.* The headlamp shall be rigidly mounted in a headlamp test fixture on the seating lugs with the mechanical axis (bulb socket axis) vertical, and the lens upward. The seating plane of the test fixture shall consist of oakwood 0.5 inch (13 mm) thick. One impact shall be delivered to the center of the lens on the mechanical axis using a steel ball bearing with a diameter of .9055 in. (23 mm) weighing 1.76 oz. (50 grams), dropped freely from a distance of 15.75 in. (40 cm) from the bottom of the ball to the surface of the lens, at the intersection of the ball trajectory and the mechanical axis of the headlamp.

S7. *Deflection test for replaceable bulb.* Each replaceable bulb shall meet the requirements of S4.1.1.38(b) (6) when tested in the following manner. With the bulb rigidly mounted in a fixture in a manner indicated in Figure 8, apply a force of 4.0±0.1 lb. (17.8±4N) perpendicular to the longitudinal axis of the glass envelope and perpendicular to, and in a line intersecting, the lateral axis of the low beam filament. The force shall be applied to the outside surface of the glass envelope using a rod with a hard rubber tip with a minimum spherical radius of .039 in. (1 mm).

S8. *Aiming device locating plate for replaceable bulb headlamps.* Each motor vehicle manufactured on or after July 1, 1983, and before July 1, 1984, which is equipped with a replaceable bulb headlamp system shall be furnished with a Headlamp Aiming Device Locating Plate, conforming to:

(a) The general requirements of SAE J602, October 1980 "Headlamp Aiming Device for Mechanically Aimable Sealed Beam Headlamp Units," and Figure 9, except that the general and specific references in that standard to sealed beam headlamp units shall be read as applicable to replaceable bulb headlamps, and references in that standard to dimensions for headlamp aiming device locating plates shall be read in reference to the dimensions specified in this section.

(b) (1) If a suction cup is used to retain a mechanical aiming device to the headlamp unit, the overall diameter of the suction cup shall not exceed 2.8 in. (71 mm). The suction cup assembly shall be capable of securing the aiming device to a smooth lens surface angled up to 30 degrees universally from a transverse plane perpendicular to the H-V axis of the lamp.

(2) The aiming pad seating surface on the locating plate shall be free of burrs, projections, holes or impressions.

(3) There shall be no projections, tangs, or lugs on the locating plate that would prevent the seating surfaces locating with the aiming pads on the headlamp lens surface.

(4) Each of the two adjustable legs shall be capable of being extended, and locked in position, in increments of .10 in. (2.54 mm) with each increment measured from the 'O' seating plane (perpendicular to the H-V axis of the lamp) with a maximum tolerance of ±.01 in. (±0.25 mm). The incremental positions extending out from the 'O' seating plane shall be identified by whole numbers, i.e., 'O', '1', '2', '3', through a minimum of '37' for the vertical adjustable leg and a minimum of '20' for the horizontal adjustable leg.

4. New Figures 3 through 9 also are added.

Issued on May 20, 1983.

Raymond A. Peck, Jr.
Administrator

48 F.R. 24690
June 2, 1983

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Federal Motor Vehicle Safety Standards; Lamps, Reflective Devices and Associated Equipment

[Docket No. 81-11; Notice 4]

ACTION: Final rule; response to petitions for reconsideration.

SUMMARY: This notice responds to petitions for reconsideration of the June 2, 1983 notice (48 FR 24690) amending Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, to allow use of a semi-sealed replaceable bulb headlamp system. Corrections are also made to errors appearing in the June notice.

In response to a petition from Ford Motor Company, the requirement that an adjustable aimer adapter be supplied with vehicles equipped with the semi-sealed headlamp system is modified to specify that the aimer adapter be a fixed type. The agency acknowledges that some time is required to modify the suction cup mount on existing mechanical aimers to allow use of the adjustable aimer adapter. The requirement to assure performance on the headlamp connectors after the corrosion test is revised to eliminate an overly stringent requirement, in response to petitions from both Ford and Volkswagen. The requirement reverts to no loss of function as proposed originally. In addition, critical dimensional changes were made to the drawings on the replaceable light source. Also, in response to petitions from Volkswagen and Westfalische Metall Industries, the corrosion test for semi-sealed headlamps is amended to delete the requirement for testing with the bulb removed, and to adopt the test proposed on January 17, 1983 (48 FR 1992). The effect of all these changes is to allow manufacturers to commence manufacturing the new headlamps for their introduction before the end of the year.

Finally, the agency has deleted all dimensions of the standardized replaceable light source that were originally specified only for reference purposes.

EFFECTIVE DATE: September 30, 1983.

SUPPLEMENTARY INFORMATION: On June 2, 1983, NHTSA published a notice amending 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment* (48 FR 24690). The amendment adopted an optional motor vehicle headlighting system consisting of two semi-sealed replaceable bulb headlamps. Each headlamp consists of two discrete components, a lens bonded to a reflector, and a replaceable light source of standardized design. To insure the proper performance of the new headlamp design, certain environmental tests were adopted. Petitions for reconsideration of various aspects of the amendment were filed by Ford Motor Company ("Ford"), General Motors Corporation ("GM"), Sylvania, Volkswagen of America ("VW"), and Westfalische Metall Industries (manufacturer of Hella lighting equipment) ("Hella"). Because the headlamps may incorporate inclined lenses and most existing mechanical aimers are designed for headlamps with vertical lenses, the amendment required that each vehicle manufactured between July 1, 1983, and July 1, 1984, which has the new headlamps system, be furnished with an adjustable adapter to allow use of existing mechanical aiming equipment.

Discussion of Petitions

Corrosion Test (Paragraphs S4.1.1.36(d)(4) and S6.5).

In its notice of proposed rulemaking on January 17, 1983, (48 FR 1992) NHTSA proposed a corrosion test which would involve subjection of a test lamp to a salt spray test in accordance with ASTM B117-73 "Method of Salt Spray (Fog) Testing" for a period of 240 hours, consisting of ten successive 24-hour intervals. During each 24-hour interval, the test chamber salt spray would be activated for 23 hours and deactivated for 1 hour. At the end of the test period, there could not be evidence of internal or external corrosion more than an eighth of an inch from sharp edge or any corrosion on the terminals or elsewhere, which would involve loss of function. Further, the lamp would be required to meet the minimum photometric requirements for headlamps at the end of the test.

As NHTSA stated in its June 2, 1983 notice, "One commenter noted that the proposed test would not achieve the objective of ensuring reflectors with good corrosion resistance because the test does not take into account a situation in which a bulb may be removed for an extended period of time." NHTSA adopted a corrosion test requiring removal of the bulb for the 1 hour of the interval in which the salt spray is deactivated to assure adequate corrosion resistance of reflector surfaces with an accelerated test. In recognition of the fact that the introduction of a salt atmosphere on the inside of the lamp might create a salt deposit on the lens not easily removed, the proposal for photometric performance at the end of the test was not adopted. The strictures against rust or corrosion on the lens and reflector were adopted as proposed. In summary, in adopting the corrosion test NHTSA believed that lens-reflector assemblies needed a corrosion requirement to prevent premature reflector degradation in cheaper parts which might become available.

NHTSA was petitioned by VW and Hella to reconsider the modified corrosion test. VW's objection, and the principal objection by Hella, was the requirement that the bulb be removed during the final hour of each of the ten test cycles. Both petitioners object on the grounds that the test was not discussed in the proposal. In VW's opinion, only an all-plastic lamp could meet the new corrosion requirements and it does not believe that the agency intended to be design restrictive. It therefore petitioned that the standard be amended to adopt the corrosion test as proposed. It was Hella's position that the requirements do not mirror real-world conditions and afford the opportunity of water entry during bulb removal or insertion which could bias the test results.

The agency has considered these comments carefully. Although the test it proposed appeared adequate at the time to judge the performance of a semi-sealed lamp as a whole, the agency adopted a more component-oriented test to ensure adequate reflector performance with an accelerated test. It is evident, however, that at least some commenters believe the subject of corrosion testing should be more fully explored. Because the replacement market for the new headlamps will be minimal during the first year of the lamps' availability, NHTSA is granting the petitions of VW and Hella for reconsideration of the subject, and amending the standard to specify the corrosion test without bulb removal as proposed. NHTSA is preparing a notice of proposed rulemaking which will propose a bulb removal test for lamps. This NPRM will appear in the near future.

In addition, the agency originally proposed a prohibition against "loss of function" on lamp terminals. This was quantified in the final rule to allow corrosion on terminals "provided there is no voltage drop greater than 3 percent from that measured before the test when measured per paragraph 6.4 of SAE J580 August 1979."

Ford raised a question as to the appropriateness of the electrical test. VW also objected to the adoption of the 3 percent voltage drop, on the basis that it had not been described in the proposal, and that it was unreasonable. The reason for the objection is that the terminals are similar to those of sealed beam lamps and renewed at each burnout. In VW's opinion, no significant safety problem has occurred, and if some limit on corrosion of the terminals is necessary, the "loss of function" requirement should be sufficient.

NHTSA agrees that the requirements in the *Federal Register* should be reconsidered and is amending the standard to specify the requirement as proposed. The agency is preparing an NPRM which will propose a new test. This NPRM will appear in the near future.

Accurate Rated Bulb. In its comments on the proposal, GM stated its assumption that NHTSA would use "accurate rated bulbs" in its compliance testing of the new headlamps. In its petition for reconsideration it asked that the photometry specified in paragraph S4.1.1.36(b)(1) be conducted according to paragraph S4.1.1.20 of Standard No. 108 as well as the already-specified paragraph 6.4 of SAE J575 June 80. Paragraph S4.1.1.20 states: "Except for a lamp having a sealed-in bulb, a lamp *** shall meet the applicable requirements of the standard when tested with a bulb whose filament is positioned within ±.010 inch of the nominal design position specified in SAE Standard J573d, "Lamp Bulbs and Sealed Units," December 1968, or specified by the bulb manufacturer." GM argues that use of such bulbs provides a common basis for evaluating other components, and that in this manner compliance testing on lighting devices made by other laboratories can be repeated and compared.

The bulbs specified in J573d and defined as "accurate rated" have the trade numbers 1156, 1157, and 1157A, and are intended for applications other than headlamps. Sealed beam headlamps are tested "as is" without reference to filament tolerance and must meet the minimum photometric requirements regardless of filament placement. NHTSA believes that this concept has met the need for headlamp safety and that there is no need to prescribe a filament tolerance of ±.010 for the standardized replaceable light source. The tolerance specified on low beam is ±.015 inch with the centerline of the high beam to be located within ±.035 inch of the centerline of the low beam. The semi-sealed headlamp with replaceable light source should be tested photometrically in a manner identical to its fully sealed counterparts. GM's petition is denied.

Replaceable Light Source Dimensions. GM commented that the specifications of the filament are not sufficiently rigorous to define the exact placement of the filament within the bulb assembly, which could present a problem because the headlamp manufacturer may have to certify a lamp using aftermarket bulbs. It requested additional specifications on rotation, slant and snake of the filament, and it also stated that the tolerance of Dimension G in Figure 3-5 (sic) was in error.

The agency is amending the dimensions of Figure 3-6. But GM's petition to adopt additional dimensions is denied; in the agency's view, a minimum standard does not require the additional dimensions suggested. Any vehicle manufacturer, however, may specify that its supplier provide bulbs meeting additional specifications if it wishes.

Sylvania and Ford pointed out various errors and minor changes needed in Figure 3 which specifies dimensions for the standardized replaceable light source. (Sylvania stated that a more accurate way to describe the cap was needed.) The petitions are granted on these points and all the requested changes are being made.

Change in Definition. GM petitioned that the word "bonded" be removed from the definition of replaceable bulb headlamp so that a lens alone could be replaced in the event of breakage. In the development of the final rule, NHTSA considered changing the definition in the manner requested but rejected it because removable lenses introduce additional opportunities for aiming problems due to alignment inaccuracy. Also, there is the opportunity for substitution of lenses designed for off-road vehicles and for other than U.S. beam patterns. Accordingly, GM's petition is denied.

Vibration Test. NHTSA proposed a vibration test with many of the characteristics of that contained in SAE J575 June 80. There were very few comments on the proposal, but it was pointed out that the test differed from that of SAE J575e, already incorporated in Standard No. 108 for headlamps and other lighting devices. Accordingly, the final rule adopted the vibration test currently required for other items of lighting equipment, so as not to burden manufacturers with differing vibration tests requiring different test equipment.

Commenting that this is a "substantive and substantial change" GM claims that the J575e test has been "abandoned by the industry" as "obsolete" and "non-repeatable", and asked NHTSA to adopt the vibration test proposed, or the one specified in SAE J575 June 80.

NHTSA disagrees with GM's characterization of J575e. Although the test in the earlier version may use less modern equipment than the later one, NHTSA continues to regard J575e as more closely approaching on-road vibration characteristics. Further in adopting the vibration test of J575e, NHTSA considered it a logical outgrowth of the preceding notice and comment period and not such a deviation from the course of the rulemaking as to warrant, in all fairness to the public, a new notice offering opportunity to comment. To impose the same SAE vibration test upon semi-sealed headlamps as is required for all other types of headlamps and lighting equipment, instead of the proposed test containing certain characteristics of a later version of that SAE standard, cannot be said either to be unfair or outside the penumbra of the proposed rulemaking. GM's petition is denied.

Tolerance on Wattage and Spherical Candlepower. GM asked for an amendment of paragraph S4.1.1.38(b)(1) for a tolerance of ±12 percent of bulb lumens. Sylvania asked for a ±10 percent tolerance on lumens, claiming that this is the current industry standard.

Sylvania's petition is granted, and the standard amended to allow a tolerance of ±10 percent. This should allow industry to comply with reduced costs attributable to lesser bulb rejection. GM also asked for a tolerance of ±7½ percent on upper and lower beam wattages. The values given are maximum and therefore a tolerance is not appropriate. For this reason, the GM petition is denied.

Windshield Washer Fluid. The agency incorrectly spelled the washer fluid component in paragraph S6.4(b)(4) as "monethinalamine". It is corrected to read "monoethanolamine."

The percentage of this test fluid used in the chemical resistance test was given as 1.5. GM, the manufacturer of the fluid, states that this is the correct percentage in bulk form, but that when the fluid is diluted with two parts water for normal recommended usage, the correct percentage is 0.5. GM's petition is granted, and an appropriate change is being made.

S4.1.1.38(b) and S6.7.2(c) Minor Amendments. Sylvania requested a clarification that a headlamp assembly in the life test be in the normal operating attitude. It further requested that the 12.8 and 14 volts noted in this section be specifically identified as design and rated voltage, respectively. The agency agrees and clarifying amendments are made.

The agency is also clarifying the heat test procedure to insure that the headlamp achieves maximum head dissipation by being operated on its highest wattage filament.

Paragraph S7 Bulb Deflection Test. Sylvania commented that to allow a permanent deflection of .005 inch after a 4-pound load is more severe than the bulb will experience in practice, and suggested that the requirement be amended to allow deflection of .010 inch after a 2-pound load, which "is more reasonable and economically practical."

The agency does not agree with this suggestion. The danger of misaim due to bulb deflection requires assurance that the bulb will not move in the base during handling and installation.

Paragraph S8 Aiming Adapters. Ford, the only manufacturer currently known to NHTSA who intends to use the new headlamp system during the 1984 model year, has called to NHTSA's attention that paragraph S8 specifies an adjustable adapter for use during the first year rather than a fixed adapter as discussed in the preamble.

NHTSA's specification of the adjustable adapter for the first year was in error, and Ford's petition for substitution of a fixed adapter is granted. The adapter will allow lamps to be aimed mechanically by a mechanical aimer conforming to SAE J602.

It remains the intention of NHTSA that adjustable adapters be available for use when mechanical aimers are modified to allow their use. Although Standard No. 108 is being amended to no longer require adjustable adapters, NHTSA is retaining the requirements for headlamp markings to assist in aiming with adjustable adapters conforming to the design specified in the June admendment (Figure 9) expected to become available by July 1, 1984. GM requested a change that would allow 45 degrees of adjustment. An extreme angle of a headlamp lens, such as 45 degrees, not only reduces light transmittance but also creates a distortion in the beam pattern more likely to create glare. Therefore GM's petition is denied.

Four-Lamp Headlamp System. VW asked for an admendment of paragraph S4.1.1.36 which would allow use of a four-lamp replaceable bulb headlamp system with only two bulbs illuminated on either high or low beam. GM, in a letter to the agency after the reconsideration period, inquired whether two bulbs could be used in a single headlamp cavity. The original petition from Ford was based on a two-lamp system and the standard as adopted allows only a two-lamp system with a single dual-filament bulb in each headlamp. A number of issues would need to be resolved before allowing use of a dual-filament bulb in a four-lamp configuration, or two dual-filament bulbs in a single cavity. These issues involve, in the case of the VW petition, whether only two lamps should be illuminated on high beam (four are presently required) and if so, whether it is important that the front corner of the vehicle be otherwise indicated. These issues also involve simultaneous actuation of light filaments in a headlamp system which could produce excessive illumination and uncertainties in the ability to insure correct simultaneous high beam or low beam aim if the bulb reflector systems are not separate high and low beam units. VW's petition and GM's request are denied.

Deletion of Certain Tests for Glass-Lensed Headlamps. VW petitioned for deletion of certain environmental tests on the basis that they were inappropriate for headlamps with glass lenses. These tests are those covering chemical resistance, temperature, internal heat, and impact.

NHTSA has decided to grant in part and deny in part this petition. The agency does not agree that temperature tests are unnecessary for glass-lensed metal reflector lamps. This test checks the expansion and contraction of the seal of the lens to the reflector. As metal is a conductor and glass basically an insulator, a large temperature differential will occur on these lamps, and a test to verify the existence of a good seal is required. On the other hand, all glass lenses should easily pass the chemical and internal heat test and these requirements may be deleted for glass-lensed lamps without affecting the overall quality of the lamp. Accordingly, appropriate amendments are made to paragraph S4.1.1.36(c)(1).

Paragraph S6.8, Humidity Test. VW petitioned for deletion of the requirement in the humidity test that the photometric test begin within 10 ± 1 minute after the humidity exposure. Apparently VW's photometric test equipment is not located near the humidity chamber. The purpose of the time restriction is to insure that all photometric testing after a humidity test occur within 2 minutes of each other for repeatability of results. NHTSA is therefore denying VW's petition on this point.

Deletion of Reference Dimensions. Because reference dimensions are advisory and not mandatory, the agency is revising Figures 3-2, 3-6, and 3-8 to delete them, to clarify that manufacturers may choose dimensions that they deem appropriate. These deletions do not affect interchangeability of replacement light sources.

Correction of Errors. Several errors occurred in the rule concernig improper references to Figures and cross-references to test procedures. These are now corrected.

PART 571—[AMENDED]

§ 571.108 [Amended]

In consideration of the foregoing, 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, is amended as follows:

1. The definition of "standardized replaceable light source" contained in Section S3 Definitions is amended by changing "Figure 1" to "Figure 3".

2. In the second sentence of paragraph S4.1.1.36(a)(2), the words "the aiming device locating plate" are amended to read "an aiming device locating plate conforming to Figure 9."

3. Paragraph S4.1.1.36(b) is amended by changing the word "headlight" to "headlamp".

4. Paragraph S4.1.36(c) is revised to read:

(c) A headlamp with a glass lens need not meet the following tests of the sections specified: abrasion resistance (S6.2), chemical resistance (S6.4), and impact (S6.9). If, in addition to a glass lens, the headlamp uses a non-plastic reflector, it need not meet the internal heat test of section S6.7.2.

5. Paragraph S4.1.1.36(d)(4) is amended by revising the final sentence to read: "Corrosion may occur on terminals provided there is no loss of function."

6. Paragraph S4.1.1.36(d)(8) is amended by changing "S6.11" to "S6.9".

7. Paragraph S4.1.1.38(b)(1) is revised as follows:

The general specifications of the bulb shall be:

	Low beam	High beam
Maximum power, watts at 12.8 V (design voltage).	50	70
Lumens (without black cap) at 12.8 V design Voltage.	$1{,}067 \pm 10\%$ . . .	$1{,}738 \pm 10\%$
Average life at 14.0 V rated voltage (life testing is conducted in a finished headlamp assembly placed in the normal operating attitude).	320 hrs.	150 hrs.

8. Paragraph S6.1 is amended by adding "S6.5" between "S6.4" and "S6.6".

9. Paragraph S6.2(c)(2) is revised to read:

(2) The abrading pad support shall be equal in size to the pad and the center of the support surface shall be within ±.08 in. (²2 mm) of parallel to the lens surface.

10. Paragraph S6.4(b)(4) is amended by changing "1.5% monethinalamine" to "0.5% monoethanolamine".

11. Paragraph S6.5 is amended by deleting the last sentence.

12. The second sentence of paragraph S6.7.2(c) is revised to read:

(c) . . .The headlamp shall be soaked for one hour at a temperature of 95°F [35°C] and then its highest wattage filament shall be energized for one hour in a still air condition, allowing the temperature to rise from 95°F [35°C].

13. Paragraph S8 is revised to read:

S8. *Mechanical aiming fixed adapters for replaceable bulb headlamps.* Each motor vehicle manufactured on or after July 1, 1983, and before July 1, 1984, which is originally equipped with a replaceable bulb headlamp system, shall be furnished with a pair of fixed headlight aiming adapters for mechanical aimers. Each fixed adapter shall be provided with a lens to suction cup interface that allows the headlamp to be usable with a mechanical aimer. Each adapter when mounted on the headlamp in contact with the aiming pads prescribed by S4.1.1.36(a)(2), shall provide a surface perpendicular to the longitudinal axis of the vehicle so that the lamp may be mechanically aimed by a mechanical aimer conforming to SAE Standard J602, Oct 80, *"Headlamps Aiming Device for Mechanically Aimable Sealed Beam Headlamp Units."*

14. Figures 3-1 through 3-8, Figure 5, Figure 6, and Figure 9-2 are revised, and new Figures 3-10 and 3-11 are added.

Issued on September 26, 1983.

Diane K. Steed,
Deputy Administrator.

48 FR 44815
September 30, 1983

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Federal Motor Vehicle Safety Standards; Lamps, Reflective Devices, and Associated Equipment [Docket No. 81-02; Notice 2]

ACTION: Final rule.

SUMMARY: This notice amends Safety Standard No. 108 to require installation of a single center, high-mounted stoplamp on passenger cars, in addition to the stoplamps presently required. Since the new stoplamp is a single-function lighting device providing an unambiguous signal, and as it would be closer to the forward line of sight of following drivers, it will reduce rear-end collisions by providing a more effective indication to those drivers that the car ahead is slowing or stopping. The amendment is supported by field test data indicating that the reduction in rear-end collisions would be significant. A proposal on this subject was issued on December 31, 1980, and published on January 8, 1981 (46 FR 2132).

EFFECTIVE DATE: September 1, 1985.

SUPPLEMENTARY INFORMATION: Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment* (49 CFR 571.108) presently requires passenger cars to be equipped with two stoplamps, mounted on the rear, one on each side of the vertical centerline, as far apart as practicable, and at the same height, which is not less than 15 inches, nor more than 72 inches above the road surface. Notwithstanding those stoplamps, the problem of rear-end collisions remains very large.

The Rear-End Collision Problem

Of the 4,200,000 rear-end collisions in 1980 (Accident Facts, 1981 edition, p. 47), NHTSA estimates that approximately 3,500,000 were rear end collisions in which a passenger car was struck from behind by another motor vehicle. Based on agency studies, it is estimated that 2,344,000 of the struck passenger cars had their stoplamps on at the time of the collision. Data from NHTSA's Fatal Accident Reporting System (FARS) for 1980 showed 1,104 fatalities in accidents involving rear-impacted passenger cars and data from NHTSA's National Accident Sampling System (NASS) showed 603,000 injuries in those accidents.

As NHTSA noted in the January 1981 proposal, the rule under discussion is the culmination of many years of NHTSA and industry-funded research on vehicle rear lighting systems. Early research findings advocated the separation of rear lamps and signals to improve recognition and response to the different functions. Research conducted in the private sector had concluded that reaction time, especially at night, was significantly faster when lamps were high-mounted.

Although NHTSA was encouraged by this research, the agency decided that more data were needed since the research was based on limited real-world testing. Thus, in 1977 NHTSA contracted with Essex Corporation to make a study and field test evaluation of rear lighting systems. The results of this study are contained in Report No. DOT-HS-803 467, "Field Test Evaluation of Rear Lighting Systems," 1978.

The purpose of this study was to determine whether equipping cars with one or more of three experimental rear lighting and signaling systems would result in a significant reduction in rear-end collisions compared to cars equipped with the current conventionally configured (low-mounted) rear lamps under actual traffic conditions. The three experimental systems were:

1. A single center, high-mounted stoplamp. This stoplamp was installed at the approximate eye level of a following driver. The stoplamp was positioned on the vehicle's trunk just beneath the centerline of the back window. This stoplamp was supplemental

to the normal low-mounted stop and turn signal lamps of the vehicle.

2. A dual high-mounted stop and turn signal lamp system. Two high-mounted stoplamps, one on each side of the trunk directly below the back window, were installed at the approximate eye level of a following driver. These stoplamps were supplemental to the normal low-mounted stop and turn signal lamps of the vehicle.

3. A functionally-separated system. The tail lamp was separated from the stop and turn functions of existing low-mounted lamps of the vehicle.

Approximately 2,100 taxicabs in the Washington, D.C. area participated in the study. The taxicabs were divided into four equal groups. Three of the groups were equipped with one of the three experimental concepts while the fourth or control group was equipped with conventionally configured rear lamps. During the 12-month study period, the four groups accumulated a combined total of nearly 60 million miles under a broad range of weather and road conditions. Drivers in the four groups had been matched for age, sex, and prior accident record. At the end of the study, the four groups had experienced a total of 1,470 accidents, of which 217 or 15 percent involved taxicabs being struck in the rear while in operation.

The most significant finding of the study was that the rate at which taxicabs equipped with a single center, high-mounted stoplamp were involved in 54 percent fewer relevant rear-end collisions than were experienced by the control group. A relevant rear-end collision is one in which a stoplamp could have affected the outcome. Nonrelevant rear-end collisions, e.g., the striking of the rear of a parked car by a moving car, were excluded. This reduction, which was demonstrated to be statistically significant, was achieved whether measured in terms of absolute number or frequency of accidents or in terms of accident rate per million vehicle miles. In addition, of all the cabs struck in the rear, those with the center, high-mounted stoplamp had the lowest mean cost of repair. This indicated that these accidents were less severe than accidents involving vehicles with other stoplamp systems.

To determine whether the drivers of cabs equipped with experimental lamps drove more carefully than drivers in the control group, a comparison of the groups was made based on non-rear-end accidents. The results of this comparison indicate no statistically significant differences between any of the three experimental groups and the control group. The similarity of experience in those crash modes and the difference in rear-end crashes supports the finding in the Essex study that the supplemental single center high-mounted stop signal has the potential to dramatically reduce the occurrence of rear-end collisions.

The Essex report recommended that another field study be conducted, using a broader sampling of drivers, passenger cars, and traffic conditions in order to validate its findings. The Allen Corporation contracted to make this validation study and the results are given in the May 1980 report "Validation of the Reduction of Rear-End Collisions by a High-Mounted Auxiliary Stoplamp," (DOT-HS-805 360).

Accident and exposure (mileage) data were collected on approximately 5,400 telephone company passenger cars, about 2,500 of which were equipped with the single, high-mounted stoplamp. The remaining cars had only conventionally configured stoplamps and served as the control group. The vehicles were operated by seven companies of the Bell Telephone System from New England to Florida, and also in Illinois and California. Data were collected from January 1, 1979, through December 31, 1979. During that time, the vehicles were driven a total of approximately 55 million miles.

The test group received 53 percent fewer rear-end impacts than did the control group. The difference was statistically significant beyond the 99 percent level of confidence. The result is in agreement with the Essex study which found a 54 percent reduction in rear-end impacts. Therefore, the agency tentatively concluded that the single high-mounted stoplamp would provide significant safety benefits beyond those obtained from the safety lighting required by Standard No. 108, and issued its January 1981 proposal for the installation of such a stoplamp.

As proposed by NHTSA, the high-mounted stoplamp would have been required to have an effective projected luminous lens area not less than 4½ square inches in size. A vibration test was specified, under which the lamp would have been energized during the final ten minutes of the test, and required to be functioning at the end. A turn signal, stop, or tail lamp would not have been permitted to have its edge closer than 10 inches to the edge of the high-mounted lamp. Three slightly different alternative locations for the high-mounted lamp were proposed (discussed in more detail below). A common feature of each was that, if mounted inside the vehicle, the lamp would have been required to be provided with means to prevent glare. The photometric requirements would have been those of SAE Recommended Practice J186a "Supplemental High Mounted Stop and Rear Turn Signal Lamps," September 1977, which specifies a maximum of 60 cp for a red supplemental stop lamp.

Since issuance of the proposal, there has been a further field study which verifies the earlier findings. That study, "A Field Test of Two Single High-Mounted Brake Light Systems," was sponsored by the Insurance Institute for Highway Safety (IIHS), and completed in April 1981. The objective of the study, conducted on a fleet of 900 taxicabs operating in New York City, was to establish the effectiveness of single, high-mounted brake lamp configurations in reducing rear-end collisions between vehicles stopping or slowing down.

The most significant finding of the study was that taxis equipped with a single center high-mounted stop lamp had almost 50 percent fewer rear end collisions than those experienced by a control group of cabs having a conventional rear light configuration. Two versions of the high-mounted stoplamp were evaluated by the study. One employed a single bulb (44 percent reduction) and the other dual bulbs in a single housing (58 percent reduction). The two bulbs were brighter than the single bulb.

Discussion of Comments

Effectiveness on Small Cars

One of the major issues raised was the effectiveness of the center high-mounted stoplamps on subcompact cars. Critics of both the Essex and the Allen studies observe that subcompacts were not included in the Essex study and were included in relatively small numbers in the Allen study. Further, even though 329 or 11.2 percent of the 2,927 control cars used in the Allen study were subcompacts, none of these subcompacts were involved in a "relevant" rear-end collision during the test period. This fact has led to the conjecture by some commenters that subcompacts may actually be involved in relevant rear-end collisions to a significantly lesser extent than large cars and that as large cars are slowly being replaced in the fleet by small cars, there will be fewer vehicles involved in relevant rear-end collisions in the coming years. Thus, the effectiveness of center, high-mounted rear stoplamps on subcompact models was questioned.

In response to this criticism, the agency obtained data on all police-reported accidents involving passenger cars struck in relevant rear-end collisions in North Carolina for each year from 1975 through 1980. These data were obtained by size of car (e.g., large, intermediate, compact, subcompact, and foreign).[1] The results of this study were:

a. For each year, except 1976, and for the average of all years combined there were no statistically significant differences in relevant rear-end accident rates between intermediate, compact, and subcompact domestic cars. However, during 1976, significantly more subcompacts were struck in the rear as compared to compacts and intermediates.

b. For each year, there was a significantly lower relevant rear-end accident rate for large passenger cars compared to smaller ones.

c. In general (average of all years combined), the relevant rear-end accident rate for foreign cars was significantly higher than those of domestic compacts and subcompacts. However, in 1976 and 1977 the accident rate of the foreign and domestic compacts and subcompacts was essentially equivalent.

d. For each size passenger car and for the average of all passenger cars combined, there was no significant change in the rate of occurrence of relevant rear-end accidents from 1975 through 1978. Significantly lower rates were noted in 1979 and 1980, except for foreign cars.

These results are based on North Carolina accidents only, and for the years indicated. However, the North Carolina accident experience is believed to be comparable to that of the Nation taken as a whole for any year. The proportion of municipal and

[1] Foreign cars could not be broken down by size of car. Consequently, the size groups listed are for domestic passenger cars. NHTSA has subsequently learned that in the years 1975-80 about 90 percent of the foreign cars registered in North Carolina were subcompacts and about 9 percent were compacts.

The rear-end accident rate for foreign cars was significantly higher than that for compact and subcompact domestic cars.

rural roadway mileage of North Carolina and the United States is virtually identical; the motor vehicle death rate for 100 million vehicle miles is only .14 percent higher in North Carolna, while the number of registered drivers per 1000 persons is only 25 persons higher than the national average. Therefore, these results are strong evidence to indicate that, in general, the fact that a passenger car is smaller than average does not suggest that the car is more likely or less likely to be a struck vehicle in a relevant rear-end collision.

Further information pertinent to the issue of subcompact cars' effectiveness is provided by past research on braking perception reaction time sponsored by General Motors at the University of Michigan Transportation Research Institute (formerly the Highway Safety Research Institute). One of the vehicles used to test for reaction time was a subcompact. A statistically significant reduction in reaction time occurred in urban areas when the center high-mounted stoplamp was added to that subcompact.

Another theory set forth is that the center high-mounted stoplamp on a subcompact car may not be perceived by following drivers as being higher than the conventionally configured stoplamps. Thus, subcompacts may not experience the same reductions in collisions as larger cars will. To determine the precise effectiveness of the center high-mounted stoplamp on subcompacts would require additional testing. However, the agency examined typical mounting heights (H_2) for the center lamp and compared these to the current brake light mounting heights (H_1) for subcompacts and larger vehicles. The difference in height (H_2-H_1) was on average 2.35 inches less for subcompacts than larger vehicles (10.35 to 12.7 inches) and 3.3 inches less for the diagonal (24.0 to 27.3 inches). Thus, the differences between the center high-mounted stoplamp for subcompacts is 82 percent and 88 percent of the difference for larger cars. Based on this analysis and the previous discussions, the agency concludes that the center high-mounted stoplamp will be as effective for subcompacts as for the larger tested vehicles. Even if subcompacts only achieved 80 percent of the benefit of larger cars, they would be highly cost-effective.

Number of High-Mounted Stoplamps

Many of the automobile manufacturers commented on the issues of whether the final rule should require only one rather than two high-mounted stoplamps, as well as where the lamp or lamps should be located. Manufacturers argued that the agency should not be so design restrictive as to specify installation of only a single high-mounted stoplamp. The automobile industry generally favored the use of two high-mounted stoplamps located closer to the sides of a vehicle, in order to provide more styling flexibility. The agency does not agree with this comment because the data show that the single-lamp design is more effective.

The Essex field test results show that the dual high-mounted lamps are not so effective as the single high-mounted lamp. One of the experimental groups in the field test consisted of vehicles with two high-mounted combined stop and turn signal lamps. This group did not experience a statistically significant reduction in rear-end accidents compared to the control groups.

Location

The 1981 NPRM asked for comments on three alternative locations as follows:

Alternative 1

Each high-mounted stoplamp would have been required to be mounted not less than 34 inches above the road surface:

(a) If practicable, outside the passenger car with the center of the lamp within 3 inches of the outside bottom edge of the rear window daylight opening, or

(b) If compliance with paragraph (a) of this section were not practicable, inside the passenger car with the center of the lamp not more than 3 inches above the inside bottom edge of the rear window daylight opening and with means provided to minimize reflections inside the vehicle from the light upon the rear window glazing, or

(c) If compliance with neither paragraph (a) nor (b) of this section were practicable, outside the passenger car with the center of the lamp within 3 inches of the outside top edge of the rear window daylight opening.

Alternative 2

Each high-mounted stoplamp would have been required to be mounted inside or outside the passenger car with the center of the lamp not less than 34 inches and not more than 50 inches above the road surface, and not more than 3 inches below the bottom or above the top of the rear window daylight opening. If the lamp were mounted inside the vehicle, means would have been required to be provided to minimize reflections inside the vehicle from the light upon the rear window glazing.

Alternative 3

Each high-mounted stoplamp would have been required to be mounted:

(a) If practicable, outside the passenger car with its center not less than 38 inches above the ground surface and within 3 inches of the bottom of the rear window daylight opening, or

(b) If compliance with paragraph (a) of this section were not practicable, inside the passenger car with its center as near as practicable to 38 inches above the road surface, and with means provided to minimize reflections inside the vehicle from the light upon the rear window glazing.

In general, commenters recommended Alternative 2, the least design-restrictive alternative. However, all the commenting automobile manufacturers, both domestic and foreign, recommended changes to the alternatives. Some wanted a minimum mounting height of 30 inches while others wanted the minimum to be 34 inches. Some agreed that the minimum separation distances between the high-mounted stoplamp and other rear lighting devices should be the proposed 10 inches, others wanted 15 inches. A few manufacturers asked deletion of the proposed requirement that the lamp be within 3 inches of the back window daylight opening. Some manufacturers wanted the decision whether to install the lamp inside or outside the car left to their discretion, and some wanted the option to place the lamp off-center to avoid interfering with the operation and location of rear windshield wiper systems. At least seven different locations were suggested by commenters to accommodate problems presented by different vehicle configurations. For sedans, the suggested locations were the trunk lid or the panel between the trunk lid and the rear window; for hatchbacks, the roof or the hatch; for station wagons, the roof or the tailgate. The seventh location suggested was forward of the rear window (i.e., inside the vehicle).

Based on these comments, the agency decided that none of the three alternatives would adequately accommodate the design problems involved in attempting to install center high-mounted stoplamps on all sizes and body types of cars. Accordingly, NHTSA has decided to eliminate many of the design constraints imposed by the three proposed location alternatives. The final rule requires only that the lamp be located on the vertical centerline of the vehicle, with no portion of the lens higher than the top of the back window nor lower than 3 inches below the bottom. NHTSA did not agree that hatchbacks and station wagons necessitated mounting the lamp on the roof, as it may be mounted at any point on the vehicle centerline within the parameters indicated. The lamp can either be inside or outside the back window. However, if it is inside, means shall be provided so that no reflections from the light of the lamp upon the rear glazing shall be visible to the driver when viewed indirectly in the rearview mirror or viewed directly. NHTSA has concluded that notwithstanding the increased latitude provided by this rule in lamp placement, the new lamp will still afford the visual cues that proved so effective in the field studies.

Lead Time

NHTSA has also decided to establish an effective date of September 1, 1985, i.e., the 1986 model year. This will provide a 2-year lead time. The agency believes that this lead time represents an appropriate balance between minimizing the period in which center high-mounted stoplamps will have to be added to existing models instead of designed into new models and beginning implementation of a very cost-effective requirement that will reduce accidents and injuries.

Photometrics

Volkswagen, SAAB, JAMA, Stimsonite, and TSEI recommended that the high-mounted stoplamp have higher photometric requirements than were proposed. The NPRM proposed a minimum of 15 cp and a maximum of 60 cp at the H-V point. Volkswagen recommended that there be a minimum of 40 cp and that the maximum be increased from 60 cp to 75 cp. The JAMA recommended that the stoplamp intensity be increased.

The research performed by Essex and Allen used stoplamps that were intended to meet the photometric requirements of SAE J186a, a minimum of 15 cp and a maximum of 60 cp at the H-V test point. The measurement on a typical sample lamp used in these studies was 32 cp at H-V, but with a maximum of 47 cp. Although the results of these studies showed reduced rear-end collisions, the comments to the docket argue for a higher limit. The agency is especially impressed by the results of the IIHS study where a 58 percent reduction in collisions was achieved using two bulbs. The candela of the two-bulb design was 126 candela at H-V with a maximum of 150. NHTSA has concluded that these results are convincing enough to justify adopting a minimum of 40 cp and a maximum of 160 cp at the H-V point, and the final rule so specifies. It is reasonable to believe that this increse will provide better detection during periods of dusk and dawn, improved visibility when the lamp lens becomes dirty, and better visibility of an inside-mounted lamp through the back window (because the window reduces the light transmittance).

Lamp Size and Shape

The NPRM specified 4.5 square inches as the minimum size of the lamp. This size of lamp was used in the research performed by Essex and Allen. In view of the favorable results obtained in those studies and in the absence of comments providing convincing arguments for a different size, 4.5 square inches is retained in the final rule. The amendment leaves the shape to the judgment of individual manufacturers.

Acclimatization Factor

A number of comments argued that once all cars are equipped with the high-mounted stoplamp, it will no longer be effective because all drivers will be "acclimatized" to its effect. According to this argument, the additional lamp will show advantages only when lamps exist on small percentages of vehicles in the total vehicle population.

The agency does not consider this argument to have merit. The addition of a single, high-mounted stoplamp on the centerline of the vehicle has several direct benefits which the agency believes will be of lasting effect. One effect is that its presence on a vehicle (vehicle 1) gives the operator of the immediately following vehicle (vehicle 2) an additional "cue" on the centerline of his vision. A second is that the driver (driver of vehicle 3) behind vehicle 2 will be able to see through that vehicle (if that vehicle is a car) and obtain advance warning about the response of vehicle 2 to vehicle 1. A third benefit is that the supplemental stoplamp will have only one possible meaning as opposed to a stoplamp in the same housing as a tail lamp: to indicate that a vehicle is slowing to stop or has stopped. In addition, the candela values adopted are substantially higher than those of lamps in the test fleets, increasing the likelihood that their signal will be perceived by following drivers.

The agency will evaluate the experience of cars equipped with the high-mounted stoplamp over a period of time and determine if there is any acclimatization. The acclimatization factor cannot be definitively determined in the absence of a substantial test fleet. The agency believes that it is at least as likely that the effectiveness of the lamp will increase as decrease in proportion to the percentage of vehicles equipped with it.

Vibration Tests

It was proposed that a high-mounted stoplamp be required to continue to provide illumination upon completion of the vibration test specified in SAE J575e. Some commenters disagreed with this requirement. The Japanese Automobile Manufacturers Association (JAMA) stated that the vibration resistance of a bulb is usually determined by making an impact test as defined in SAE J603. In the case of ordinary lamps, the breaking of a filament in the vibration test defined in SAE J575 is excluded.

JAMA argued therefore that since the conditions for mounting the stoplamp are the same as those of existing lamps such as license plate lamps, the same vibration tests should suffice. The California Highway Patrol noted that the test appeared to be oriented towards the integrity of the bulb rather than the lamp since it does not permit a failed bulb to be replaced.

The vibration section of SAE J575e was designed as a test for vehicle lamp fixtures to assure that they would not be destroyed or become ineffective in service, and that the fixture mounting was stable. It was not intended to assess the durability of bulbs. Almost all bulb failures result from using up (by boiling away) tungsten of the filament during normal operation or by a fracturing of the filament. Before a filament has been burned, it is quite ductile and can withstand substantial physical abuse without breaking. But after it has been submitted to the 4500-4800°F temperature at which it normally operates, significant changes begin to occur. As the filament is burned, the tungsten takes a different crystalline structure and in time becomes fairly brittle. Thus, as the bulb is burned in normal usage, the filament becomes mechanically weaker from the boiling away of tungsten and less tolerant of physical shock and vibration because it has become more brittle as well.

For these reasons, the agency has decided that the lamp, but not the bulb, will be subject to the vibration tests, consistent with treatment of other vehicle lamps covered by Standard No. 108.

Tailgating Education

A concerned citizen asked whether an educational program to inform the public of the hazards of "tailgating" would be more effective in reducing rear-end collisions than the installation of the high-mounted stoplamps.

For many years there have been driver education programs in public and private schools. All these courses have emphasized the hazards of driving too close to the preceding vehicle. Despite the education programs, no significant reduction in rear-end collisions appears to have resulted. In constrast, the effectiveness of the installation of center, high-mounted stoplamps in significantly reducing rear-end collisions has been demonstrated in three separate field studies.

Rural Accidents

A number of commenters correctly pointed out that the field studies (Essex, Allen, and IIHS) involve mainly urban driving. Thus, there are no data on the effectiveness of the high-mounted stoplamp in predominantly rural driving, even though some test fleet vehicles were occasionally operated in rural areas. Accordingly, the agency is assuming for strictly analytical purposes that the stoplamp will not have any effectiveness in rural driving. This assumption does not mean that NHTSA anticipates that there will not be any benefits in rural driving. The agency believes that there will be some currently unquantifiable benefits and is not aware of any evidence negating the possibility of such benefits.

Summary of Decision

NHTSA is therefore requiring that passenger cars manufactured on or after September 1, 1985, be equipped with a center high-mounted stoplamp. The lamp must be red, with a minimum effective projected luminous lens area of 4.5 square inches and must be designed to meet the requirements of SAE Recommended Practice J186a "Supplemental High Mounted Stop and Rear Turn Signal Lamps," September 1977, except that the laboratory requirements are in accordance with SAE J575e, and the photometric requirements are those specified by NHTSA. The current stoplamp requirements and functions are retained. The center high-mounted stoplamp would be actuated by the stoplamp switch. The lens center of the lamp must be mounted on the vertical centerline of the car as seen from the rear. Because of the variety of passenger car types and the need of the manufacturers to incorporate the lamp into their designs in an economical and orderly manner, it is hereby found that an effective date slightly less than 2 years after the issuance of this rule is necessary to provide adequate lead time and therefore is in the public interest.

Alternatives

With additional research, more nearly optimum specifications for stoplamp configurations may be developed. These factors may include more effective intensity, size, beamspread, and location. Other types of lamps or added functions such as deceleration signals may be desirable and should be investigated. However, to delay this rulemaking to await new improvements will result in delay of implementing requirements known to appreciably reduce accidents.

The agency also considered exempting subcompacts from the requirement. While the agency does not have a conclusive test of subcompacts with the center lamp, it knows of no reason why a center high-mounted stoplamp would not be equally effective for subcompacts.

Other alternatives now being investigated include radar or automatic braking and radar warning devices. Radar or automatic braking or warning systems have been developed and may be available as optional systems. Other systems are being developed and may also be available as optional systems. However, time will be needed to test and evaluate these systems. At least several years are likely to pass before there is a possibility that any of these systems can be proved sufficiently effective, reliable, and free of problems for the agency to consider initiating any rulemaking to permit and regulate their use. Further, the cost for automatic braking or radar warning would probably be many times the cost of the high-mounted stoplamp.

Potential Benefits, Costs, and Other Impacts

NHTSA has considered the impacts of this rule and determined that the rule is major within the meaning of Executive Order 12291 and significant within the meaning of Department of Transportation guidelines. A regulatory impact analysis discussing those impacts has been prepared and placed in the docket. A copy of the analysis may be obtained free of charge from the Docket Section whose address is given near the beginning of this notice.

Benefits

The Essex study found that for taxicabs in the Washington, D.C. area, the center high-mounted single-function stoplamps reduced relevant rear-end collisions by 54 percent. Similarly, the Allen study found that for telephone company passenger cars operating with these stoplamps in many areas of the country, relevant rear-end collisions were reduced by 53 percent. The IIHS study indicated a 44 to 58 percent reduction. Had all passenger cars been equipped with the center high-mounted stoplamp, NHTSA estimates that there would have been 900,000 fewer accidents and 40,000 fewer injuries in 1980. Available research data do not permit the agency to estimate the effectiveness of the center high-mounted stoplamp in reducing fatalities. However, the agency believes that it is reasonable to expect that the new stoplamp could reduce fatalities through making possible timely evasive action or reduction in impact speed.

In view of the potential that this rule offers in reducing traffic accidents and injuries occurring in such accidents, NHTSA has determined that promulgation of the rule is within the authority delegated by law and consistent with congressional intent, as expressed in the mandate of the National Traffic and Motor Vehicle Safety Act of 1966 (15 USC 1381 *et seq*), an act whose purpose is "to reduce traffic accidents and deaths and injuries resulting from traffic accidents." This rule satisfies the statutory criteria of meeting the need for safety, being practicable, and being stated in objective terms. NHTSA has further determined that the factual conclusions upon which this rule is based have substantial support in the agency record, viewed as a whole, with full attention to public comments in general and the comments of people directly affected by the rule in particular.

A center high-mounted system would also reduce property damage. Data on the cost to repair damage from rear-end collisions on a national scale were not available. However, both the Essex and Allen studies reported on repair costs of relevant rear-end accidents for their test fleets. The mean average repair costs per vehicle in the two studies were, consecutively, $402 for the control group and $271 for the single high-mounted stoplamp group (1982 dollars).

Based on the data summarized above, more fully set forth in the final regulatory impact analysis, NHTSA estimates that approximately $434 million (1982 dollars) would have been saved in 1980 in repairs by the avoidance of approximately 900,000 rear-end collisions and, on average, a lessening of severity in another 900,000 relevant rear-end collisions.

Costs

Manufacturers estimated that a high-mounted stoplamp will add an average of $8 to $15 to the price of each car. NHTSA's estimated consumer costs range from about $4 (for integration of the lamp into new vehicle designs) to about $7 (for adding the lamp to existing vehicle designs). The figures in this range include the cost of installation. Resolution of the differences between these estimates is not possible since the manufacturers did not provide any detailed explanation or support for their estimates. The bases for the agency's two independent estimates are set forth in the regulatory impact analysis. The initial annual consumer cost of the high-mounted stoplamp is expected to be approximately $70 million, based on an annual production of 10 million passenger cars. By model year 1988, when virtually all coupes, sedans, and station wagons could be redesigned to incorporate the lamp, the total annual consumer cost should fall to $40 million or an average cost of $4 per stoplamp per car.

Combining the benefits from reductions in property damage and costs of the high-mounted stoplamp yields a net benefit of $394 million per year. (Even if the highest of the unexplained cost figures from the manufacturers were used, there would still be net benefits of $284 million.) These net benefit figures are based on the agency's estimate that the stoplamp would be 50 percent effective in reducing relevant rear-end collisions involving passenger cars in urban areas. If the stoplamp were only 5 percent effective in reducing rear-end accidents, economic costs would just equal economic benefits (exclusive of reductions in injuries or fatalities) in the long run.

The agency anticipates that maintenance and operating costs of the new lamp will be minimal.

Potential Environmental Impacts

This action will not have a significant effect on the environment. NHTSA estimates that the increased fuel consumption caused by adding approximately one-half pound of weight to each car would be only 0.05 gallon per year. This would be a minor increase in use of fuel. The burning of this additional amount of gasoline would also be a negligible factor in air pollution. There are no other known negative environmental impacts.

In consideration of the foregoing, 49 CFR 571.108, Motor Vehicle Safety Standard No. 108 is amended as follows:

1. Table III is amended to add the following new item of lighting equipment after "stoplamps":

TABLE III—REQUIRED MOTOR VEHICLE LIGHTING EQUIPMENT

All passenger cars and motorcycles, and multipurpose passenger vehicles, trucks, trailers, and buses, of less than 80 inches overall width

Item	Passenger cars, multipurpose passenger vehicles, trucks and buses	Trailers	Motorcycles	Applicable SAE standards or recommended practices
*	* *	*	*	* *
High-mounted stoplamp	1 red, effective September 1, 1985, for passenger cars only	Not required	Not required	J186a, September 1977, except that Table 1 in that standard is replaced by Figure 10
*	* *	*	*	* *

2. Table IV is amended to add the following new item of lighting equipment after "stoplamps":

TABLE IV— LOCATION OF REQUIRED EQUIPMENT

All passenger cars and motorcycles, and multipurpose passenger vehicles, trucks, trailers, and buses, of less than 80 inches overall width

Item	Location on		Height above road surface measured from center of item on vehicle at curb weight
	Passenger cars, multipurpose passenger vehicles, trucks, trailers, and buses	Motorcycles	
Column 1	Column 2	Column 3	Column 4
* *	* *	* *	*
High-mounted stoplamp	On the rear, on the centerline [See S4.3.1.8], effective September 1, 1985, for passenger cars only	Not required	[See S4.3.1.8]
* *	* *	* *	*

* * * * * * *

3. New paragraph S4.1.1.41 is added to read:

S4.1.1.41 Each high-mounted stoplamp shall:

(a) Have an effective projected luminous area not less than 4½ square inches.

(b) Have a signal visible to the rear through a horizontal angle from 45 degrees to the left to 45 degrees to the right of the longitudinal axis of the vehicle.

(c) Have the minimum photometric values in the amount and location listed in Figure 10. At the axis reference H-V (where $H=0°$ and $V=0°$), the intensity shall be not less than 40 and not more than 160 candela.

(d) Provide access for convenient replacement of the bulb without the use of special tools.

4. New paragraph S4.3.1.8 is added to read:

S4.3.1.8 Each high-mounted stoplamp shall be mounted with its center on the vertical centerline of the passenger car as the car is viewed from the rear. No portion of the lens shall be higher than the top of the back window or lower than 3 inches below the bottom of the back window. If the lamp is mounted inside the vehicle, means shall be provided so that no reflections from the light of the lamp upon the rear window glazing shall be visible to the driver when viewed indirectly in the rearview mirror or viewed directly.

5. Paragraph S4.4.1 is amended by deleting the period at the end thereof and adding ", and no high-mounted stoplamp shall be combined with any other lamp or reflective device."

6. Paragraph S4.5.4 is amended by adding the following sentence:

S4.5.4 *** The high-mounted stoplamp on each passenger car shall be activated only upon application of the service brakes.

7. The final clause of the first sentence of paragraph S5.1 is revised to read:

S5.1 ***, for stoplamps, tail lamps, and turn signal lamps designed to conform to SAE Standards J586c, J585d/J585e, and J588e, respectively, and for high-mounted stoplamps designed to conform to SAE Recommended Practice J186a, except that Table 1 is replaced by Figure 10.

8. A new Figure 10 is added as follows:

FIGURE 10—MINIMUM DESIGN PHOTOMETRIC REQUIREMENTS FOR CENTER HIGH-MOUNTED STOPLAMPS

Test Points		Red (cd)
100	10L	13
	V	26
	10R	13
5U and 5D	10L	26
	5L	40
	V	40
	5R	40
	10R	26
H	10L	26
	5L	40
	V	40
	5R	40
	10R	26
Maximum		160*

*The lamp shall not exceed the listed maximum over an area larger than that generated by a 1/4 degree radius within a solid cone angle from 10L to 10R and from 10U to 5D.

Issued on October 13, 1983.

Diane K. Steed
Deputy Administrator

48 FR 48235
October 18, 1983

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 81-02; Notice 3)

ACTION: Final rule; response to petitions for reconsideration.

SUMMARY: This notice responds to petitions for reconsideration of the October 18, 1983 notice (48 FR 48235) amending Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, to require installation of a single center high-mounted stoplamp on passenger cars manufactured on or after September 1, 1985, in addition to the stoplamps presently required.

In response to petitions from a number of manufacturers, the requirement that the lamp be mounted not higher than the top of the rear window and not lower than 3 inches below it is amended to allow mounting above the rear window and, for convertibles only, not more than 6 inches below it. The notice also makes clear that the lamp can be mounted directly to the glazing. Because of the physical impossibility of eliminating all reflections from interior-mounted lamps shining on the rear window glazing, the agency has amended the requirement that there be no reflections, and returned to the performance level originally proposed, that means be taken to minimize reflections. Although the maximum permissible intensity of 160 candela has been retained, the minimum intensity has been lowered from 40 candela to 25 candela. The minimum lamp area of 4½ square inches has been retained. Lamps that are mounted in the vehicle interior need not meet moisture, dust, or corrosion requirements.

The notice also provides interpretations of questions that were raised by the petitioners and others. The most important of these clarifies the agency's intent that photometrics of an interior-mounted lamp be measured through the glazing as the lamp is installed in the vehicle with the rear window behind it.

EFFECTIVE DATES: September 1, 1985, except September 1, 1986, for termination of the provision permitting center high-mounted stoplamps to flash with hazard warning systems.

SUPPLEMENTARY INFORMATION: On October 18, 1983, NHTSA published a notice amending 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment* (48 FR 48235). The amendment requires installation of a single center high-mounted stoplamp on passenger cars manufactured on or after September 1, 1985, in addition to the stoplamps presently required. As adopted, the amendment requires that the lamp must have a light-emitting area of not less than 4½ square inches, produce not less than 40 candela at any point and be mounted on the vehicle's rear vertical centerline no higher than the top of the rear window and no lower than 3 inches below the lower edge of the glazing. If the lamp is mounted in the vehicle's interior, means must be taken to insure that there are no reflections from the rear glazing.

Petitions for reconsideration of the amendment were filed by General Motors, Ford Motor Co., Chrysler Corp., American Motors Corp., Motor Vehicle Manufacturers Association, Volkswagen of America, and Renault USA Inc. Some of these petitioners also raised questions of interpretation. Other requests for interpretation were received from Koito Manufacturing, Ltd., Toyo Kogyo (Mazda), Honda and Nissan Research and Development, Inc. Because these questions are of general interest and applicability, the agency has decided to respond to them in this notice as well. The agency notes that many favorable comments were received from the public at large.

Discussion of Petitions

Mounting location. Paragraph S4.3.1.8 requires in pertinent part that the high-mounted stoplamp be located with its center on the vertical centerline of the vehicle and that "no portion of the lens shall be higher than the top of the back window or lower than three inches below the bottom of the back window". Virtually all petitioners argued that this location was unduly restrictive. Many interpreted the standard as not allowing mounting of the lamp on the glazing itself. Some asked whether a "window" includes that portion of the glazing which may be opaque.

The agency proposed three alternative locations in its NPRM of January 8, 1981 (46 FR 2132) based upon mounting height of the lamp above the road surface, but eventually rejected this approach. The final rule adopted a location relative to the vehicle's back window rather than relative to vehicle height based on its opinion that the adopted approach would afford manufacturers more flexibility in vehicle design. Yet the rule appears to present problems for certain types of vehicle designs such as hatchbacks and station wagons. Several meetings were held between the agency and individual manufacturers who explained the difficulties involved, primarily on vehicles with steeply sloped rooflines and rear window glazing. Chrysler Corporation presented the additional problem of its convertibles where the bottom of the rear glazing is approximately 5 inches above the feasible location for the lamp. There was a general consensus among the petitioners that the agency should allow mounting above the back window, so as to minimize interference with the field of view in the rearview mirror and that by so doing, the integrity of rearward vision could be maintained.

Given the clear need of manufacturers faced with tooling deadlines for a more convenient location, and the agency's desire to remove unnecessary design restrictions, the agency is granting their petitions. Paragraph S4.3.1.8 is being amended to allow mounting on the vertical centerline above the back window. However, to reduce possible problems associated with contrast of lamps mounted above the roof line and to avoid confusion with emergency vehicles, the agency expects manufacturers to mount the lamps as close to the back window as possible. Allowing a minimally higher location of the lamp will preserve the visual cue provided by the system and remove a possible obstruction to rearward vision. In recognition of the rear glazing limitations of convertibles, this paragraph is being further amended to provide that no portion of the lamp lens on convertibles may be more than 6 inches below the window.

In attempting to arrive at a practicable location, some manufacturers asked NHTSA whether the top and bottom of the daylight opening could be considered the top and bottom of the window. Passenger cars, principally ones with sharply sloping rooflines, are beginning to appear with portions of the rear glazing opaque. Opaqueness is intended to reduce the amount of sun entering the passenger compartment. The agency takes this opportunity to clarify that the perimeter of the maximum unobstructed opening through the glazing surface is considered to be the perimeter of the back window. For purposes of this requirement, NHTSA considers opaqueness to constitute an obstruction.

GM petitioned the agency to specify that the center of the high-mounted stoplamp lens instead of its perimeter be the frame of reference for determining compliance with the locational requirements. The agency believes that the relaxation of the locational requirements makes adoption of this change unnecessary. The additional step of adopting the measurement change would have the effect of relaxing the locational requirement even further, an undesirable result in the agency's view.

It was unclear to many commenters that S4.3.1.8 was not intended to preclude mounting on the glazing itself. To clarify that point that mounting to the glazing is permissible, a letter was sent to the petitioners shortly after the close of the comment period and placed in the docket. The agency is amending S4.3.1.8 to reflect that letter.

Nissan asked whether the standard allows mounting of the lamp on deck lids or tail gates. The answer is yes; the agency considers each of these items a "rigid part of the vehicle . . . that is not designed to be removed except for repair" within the meaning of the specification of S4.3.1.

Nissan also asked whether it was permissible to mount the lamp so as to obscure part of the field of view stipulated in paragraph S5.1.1 of Standard No. 111, *Rearview Mirrors*. This paragraph allows the line of sight to be partially obscured only by passengers or head restraints. The agency did not propose to broaden the list of objects which may obscure the line of sight. Therefore, the lamp must be located so as not to interfere with the line of sight. Alternatively, in accordance with S5.3 of Standard No. 111, the vehicle can be equipped with an outside rear view mirror on the passenger side.

Inside reflections. As adopted, paragraph S4.3.1.8 stated that "if the lamp is mounted inside the vehicle, means shall be provided so that no reflections from the light of the lamp upon the rear window glazing shall be visible to the driver when viewed indirectly in the rear view mirror or viewed directly." NHTSA had proposed that the reflections be minimized, and the preamble to the final rule did not discuss why the agency had adopted a more stringent requirement.

Virtually all commenters objected to the elimination of reflections as physically impossible. NHTSA had assumed that mounting the lamp flush with the rear glazing, or with a protective shroud extending from the lamp to the glazing, would be a simple, feasible way to eliminate reflections. Manufacturers demonstrated, however, that the optical qualities of glass are such that not all light passes through the glazing, and that a small portion of it is reflected before it can exit, creating a "halo" effect around the perimeter of even a flush-mounted lamp, or its shroud. Accordingly, the petitioners requested that NHTSA return to the language originally proposed, a minimization of reflections.

NHTSA has carefully considered this issue and the manufacturers' views. Agency personnel have examined vehicles with prototype systems demonstrating that reflections are virtually nonexistent. The manufacturers in turn are more fully aware of NHTSA's concerns after these meetings. The design solution most likely to be adopted is a protective shroud that either contacts or extends very close to the glazing. The combined effect of the shroud location, lamp design and filament location eliminates direct reflection from the surface of the glazing. This is the same solution envisioned by NHTSA when it adopted the requirement that there be "no reflections". Given the literal impossibility of eliminating reflections entirely, NHTSA believes that the same safety goal is achieved by granting the manufacturers' petitions and amending S4.3.1.8 to require that manufacturers "minimize" reflections.

Photometric intensity and test methods. Table III of Standard No. 108 specifies that the intensity of the high-mounted stoplamp at the axis reference H-V and eight other central points shall not be less than 40, nor more than 160 candela at any test point. The NPRM had proposed a minimum of 15 and a maximum of 60 candela.

The majority of the petitioners objected to the increased photometrics and asked that the values originally proposed be adopted. Two petitioners, General Motors and Ford, conducted demonstrations for the agency with lamps of varying intensity to support their petitions.

The values adopted in the rule were based upon recommendations by five commenters to the NPRM that the new lamp have higher intensities than NHTSA proposed. They were also based upon the results of a study by the Insurance Institute for Highway Safety where a 58% reduction in collisions was achieved using two bulbs, with a maximum of 150 candela. The agency therefore concluded that higher values would ensure better detection during periods of dusk or dawn, or when the lens became dirty.

The demonstrations conducted by GM and Ford using lenses of approximately 4.5 square inch area, indicated to the NHTSA staff that 15 candela might prove too low to be effective during daytime conditions and under certain nighttime conditions on city streets because of the existence of light from many sources both on and off the roadway. These demonstrations, however, showed that a minimum of less than 40 candela appeared adequate for safety. Accordingly, NHTSA grants the petitions for a reduction in the minimum photometrics, to 25 candela and denies those seeking a decrease in the maximum. Figure 10 is amended appropriately.

General Motors believes that there is a need to specify intensity requirements for center high-mounted stoplamps with two or three compartments, to ensure that the brightness of the signal is not diminished if lamps are produced with lens areas substantially in excess of the minimum required. Motor Vehicle Manufacturers Association echoed this concern. It was also suggested that zones be established to group test points, as have been established for certain other lighting devices.

Under the existing rule, manufacturers are not precluded from offering multi-compartment or multi-bulb lamps. Because comments were not sought on intensities for multi-compartment or multi-bulb lamps, or for grouping of test points in zones, these subjects are considered not within the scope of the proposal and the rule, and the petitions regarding them are denied.

At present, most manufacturers have indicated that they will attempt to make the initial lamp as small as possible. The single compartment lamps likely to appear should therefore have adequate visibility. However, the converse could present a problem as well, where maximum intensity is emitted through minimum lens area. Should this occur, and create the potential for glare, the agency may move to institute rulemaking to ameliorate it. In the meantime, NHTSA encourages manufacturers to adopt intensity values commensurate with the amount of lens area provided. For example, 100 candela as measured outside the vehicle appears appropriate as the maximum value for a single-compartment lamp with the minimum required area of 4½ square inches and values above 100 candela could be used in designs embodying large lens areas and for multiple bulbs and compartments.

The agency received several requests for an interpretation whether photometrics of interior mounted lamps were to be measured through the glazing. NHTSA wishes to provide the clarification that photometrics are to be measured as if the light were mounted on the vehicle, and if the location is inside the passenger compartment, the agency's determination of compliance will be made by measuring photometrics with the glazing in place.

Paragraph S4.1.1.41(b) requires that the signal be "visible to the rear through a horizontal angle from 45 degrees to the left to 45 degrees to the right. . . .", Koito asked what the agency considered "visible". This appears especially important for the design of the shroud on interior mounted lamps. In the agency's opinion, the lamp must meet the test points specified in Figure 10 up to the maximum specified 10 degrees right and left. Beyond those points, until 45 degrees right and left, no requirements are established other than that the signal be "visible", which means any portion of the signal, without regard to lens area or candela.

Mazda asked whether the lamp could be tested with a rear window wiping system in the off mode. The agency will test a vehicle with all its standard and optional equipment, including rear wiping/washing systems, in the design off position. The agency emphasizes that the existence of such equipment does not affect the necessity of complying with the photometric requirements. Notwithstanding such equipment, the lamp must be positioned in such a way that it will comply when tested at any of the photometric test points specified in the standard.

Minimum area. GM asked that the minimum required area of the lamp be reduced to 3 square inches, believing that is sufficient to achieve the safety purpose for which it has been mandated. GM demonstrated a lamp of this nature to the agency, but to observers it appeared insufficient to provide a readily identifiable stopping cue under many road and environmental conditions. Lamps no smaller than the minimum 4½ square inches adopted were used in the research supporting this rule, and the agency has concluded that the minimum area should not be changed. Accordingly, GM's petition is denied.

Effective date. Ford and Chrysler petitioned that the effective date be delayed for a year; American Motors asked for six months. GM asked that the effective date be accelerated with compliance optional before September 1, 1985.

NHTSA considers it in the public interest that the new safety device should be introduced at the earliest feasible moment. To assist compliance by September 1, 1985, it has granted petitions affecting mounting location and intensity. This positive action on NHTSA's part should reduce the lead time required to tool the lamp and vehicles, and ensure that the September 1, 1985 effective date is met. The petitions for a delay in effective date are therefore denied.

GM wishes to introduce high mounted stop lamps on some models before the September 1, 1985 effective date. Accordingly, GM requested that NHTSA specify that the lamp may be introduced before the effective date, so that any State laws that might prohibit the lamp's early introduction would be preempted. The only known example at the time was California's prohibition against interior mounting on any stop lamp. A bill has been signed by the Governor of California which removes this impediment, but which adopts language similar to that contained in NHTSA's original final rule prohibiting any reflections from the lamp. Because NHTSA relaxed this prohibition elsewhere in this notice, preemption would still be necessary. For this reason, and in the event there may be unknown issues of preemption, NHTSA in a companion notice is proposing to amend the standard to allow use of the lamp on 1985 models. (49 FR ________).

Because of the way their vehicles are currently wired, both Ford and GM asked the agency to allow the high-mounted lamp to flash when the hazard warning lamps flash. To encourage an early introduction of the system and to minimize costs, the agency has decided to permit the stop lamp to flash with the hazard warning lights until September 1, 1986. The longer lead time allowed should enable manufacturers to rewire their products at minimal costs.

Test pattern. The applicable SAE requirements incorporated by reference for center high-mounted stoplamps are those of Recommended Practice J186a, September 1977. Five of the photometric test points involve measurements at test point 5D (5 degrees down, or below horizontal). GM states that there may be some current vehicle configurations and mounting locations where these test points would not be visible. This could exist when a lamp is mounted at the bottom of the glazing, and a spoiler or luggage rack is mounted on the deck lid. It therefore requested an amendment to the standard that these test points need not be met if the lamp "is visible at a point 10 feet from its lens and 35.5 inches above ground but is not visible at the 5 degree down test point". Ford asked for similar relief. Lately, a supplier of deck mounted luggage racks has told NHTSA that its business has been directly affected because of a presumed inability of some future vehicles to meet this requirement with the rack in place. However, the added flexibility in lamp location provided in this amendment should ameliorate this potential problem.

The agency has decided to deny petitions asking relief from this requirement. Such an amendment, as NHTSA interprets it, would eliminate all photometric requirements below the horizontal for all vehicles whose high-mounted lamps were mounted less than 46 inches from the ground. Visibility of the lamp from this angle could be important for viewing vehicles from the rear when coming over a hill. The agency has reduced its restrictions regarding mounting location, and if a lamp mounted in the lowest permissible position would not meet the 5 degree test points, the lamp could be located to a higher height where the requirement may be met.

Further, the photometric requirements do not specify that the entire lens must be visible from each 5 degree down test point. Instead, they specify the intensity of light that must be visible from those points. Therefore, the requirement can be met with a lamp whose lens is partially obscured by a portion of the vehicle when viewed from some of the test points.

Environmental tests. Chrysler and others asked whether there is a need to apply moisture, dust, and corrosion requirements to lamps which are located inside the vehicle. The agency agrees with the argument that these lamps will not be subject to extremes of moisture, dust, and corrosion by virtue of their interior location and therefore need not meet these requirements. NHTSA is granting these petitions by amending the standard accordingly.

Minor amendments. The notice also amends the standard in minor respects. An outdated reference to a no longer effective "Figure 3" is deleted. Exceptions from compliance with J186a have been removed from Table III and paragraph S5.1 and placed more appropriately in S4.1.1.38. A typographical error in Figure 10 shows test position "50L". The correct number is "5L" and the amended Figure 10 reflects the change.

Miscellaneous comments and interpretations. Several commenters pointed out that the center high-mounted stop lamp is currently not permitted in certain European countries and that its adoption is a step away from the goal of international harmonization. The practical effect of this is that U.S. vehicles manufactured after September 1, 1985, and intended for sale in Europe would have to be modified before sale, with the converse also being true of European cars manufactured for sale here.

While one of the agency's goals is to further international harmonization, NHTSA will not sacrifice safety benefits to achieve it. The agency will work within Working Party 29 of the United

Nation's Economic Commission of Europe to achieve harmonization on this issue.

The question was asked whether the "center" of the lamp is its geometric center, its optical center (reference center at photometric measurement) or the center of the bulb filament. The center of the lamp, in the agency's meaning, is the geometric center.

Issued on May 11, 1984.

Diane K. Steed
Administrator

49 F.R. 20818
May 17, 1984

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment [Docket No. 81-02; Notice 6]

ACTION: Final rule; Response to petition for reconsideration.

SUMMARY: On May 17, 1984 (49 FR 20879) NHTSA proposed to amend FMVSS 108 to allow use of center high mounted stop lamps beginning September 1, 1984, requiring conformance only with location and reflection minimization requirements. That action was taken pursuant to a request by General Motors Corporation that NHTSA specify that the lamp may be installed before the effective date of September 1, 1985. Adoption of an optional compliance date would preempt any State laws that might prohibit the lamp's early introduction. This Notice amends Standard No. 108 to allow installation of the lamp effective August 1, 1984. The agency anticipates that this action will promote early achievement of the safety benefits associated with the addition of center high-mounted stop lamps. This notice also responds to a petition for reconsideration of the amendments to Federal Motor Vehicle Safety Standard No. 108 published on May 17, 1984 (49 FR 20818).

EFFECTIVE DATE: For voluntarily installing center high-mounted stop lamps and for location and reflection minimization requirements for those devices: August 1, 1984.

SUPPLEMENTARY INFORMATION: In its petition for reconsideration of NHTSA's final rule establishing requirements for a center high-mounted stop lamp on passenger cars manufactured on or after September 1, 1985, (see 48 FR 48235, October 18, 1983) General Motors requested that NHTSA amend Standard No. 108 to specify that the lamp may be introduced before the effective date. The purpose of this request was to obtain earlier preemption of any State laws that might prohibit the lamp's early introduction. On May 17, 1984, NHTSA responded to GM's request (49 FR 20879) and proposed to allow (but not require) early introduction of the stop lamp. Only requirements regarding lamp location and minimization of reflections would be applicable to cars manufactured with center high-mounted stop lamps between September 1, 1984, and September 1, 1985.

Comments on the proposal were received from Chrysler Corporation, Ford Motor Company, Volkswagen of America, General Motors, and Parker Hannifin Corporation. All commenters concurred with the proposal. Ford and General Motor recommended that the final rule be effective upon its publication in the *Federal Register*. GM further commented that the proposal "did not address the after market package which General Motors had intended to make available through our dealers, since it only speaks of passenger cars manufactured between September 1, 1984 and September 1, 1985."

The agency agrees that an effective date as early as practicable is in the public interest, and, in accordance with the proposal and the comments of GM and Ford, has designated August 1, 1984, as that date. Because the vehicle certification attached pursuant to 49 CFR Part 567 requires only the month and year of manufacture, generally the agency sets an effective date for new vehicle requirements as of the first day of a month so that a manufacturer will not have to certify to differing requirements within a single month. An effective date as of the first of the month also assists the agency in its compliance efforts. NHTSA does not understand that any 1985 model vehicles equipped with the lamp will be manufactured before August 1, 1984, and consequently found no reason to adopt an effective date earlier than that date.

The agency was not aware that GM had intended to offer an aftermarket package until receiving its comment. Such an amendment would be outside the scope of the proposal, and accordingly, was not considered. Under paragraph S4.7.1, the standard covers the aftermarket only to the extent that GM (or any manufacturer) offers a lamp intended as replacement for an original equipment center high-mounted stop lamp. However, to encourage retrofit in the aftermarket, NHTSA will study GM's request and consider whatever legal action may be required to remove impediments to the lamp's use.

Parker Hannifin Corporation, manufacturer of Ideal turn signal and hazard warning signal flashers, petitioned for reconsideration of the amendment to FMVSS No. 108 published on May 17, 1984 (49 FR 20818), which was based upon the original petitions for reconsideration of the final rule requiring center mounted stop lamps. Specifically, Parker Hannifin objected to new paragraph S4.6(b) which stated that "high-mounted stop lamps on passenger cars manufactured on or after September 1, 1985, but before September 1, 1986, may flash when the hazard warning system is activated". In the commenter's opinion, the agency had given no prior notice "to this function", and stated that the agency's action will "create a chaotic condition in the automotive flasher industry." The company avers that an insufficient period of time exists "for the development of a 'due care' basis for certification of hazard warning flashers rated for seven (7) lamps for conformance to FMVSS 108". The existing basis for certification of conformance of thermal flashers is said to be "up to six (6) lamps". Parker Hannifin recommended that the agency prohibit the additional lamp from flashing, or rule that certification for flashers can exclude the center high-mounted stop lamp. In its opinion, the agency's action is the very type of substantive rulemaking without notice which the Third Circuit found objectionable in *Wagner Electric Corp. v. Volpe* (466 F.2d 1013 (3rd. Cir. 1972).

Parker Hannifin's belief that the provision allowing flashing was adopted without notice overlooks the circumstances under which the center high mounted stop lamp was made subject to a prohibition against flashing. Although the preamble to the proposed rule did not raise the issue and the commenters did not address it, the specific text of the amendment, taken in context with the other requirements of the standard, required the center high mounted stop lamp to be steady-burning. However, the agency recognizes that it was a reasonable reading of the proposal for the commenters to believe that the light could be flashing. Thus, in order to avoid imposing a burden on vehicle manufacturers due to their interpretation, the May 1984 amendment allowed the lights to flash on vehicles manufactured before September 1, 1986.

The factual situation differs greatly from that of *Wagner*. Before the amendment complained of by Wagner, flashers were required to be "designed to conform" to Standard No. 108, but the burden of certification was upon vehicle manufacturers as aftermarket equipment was not covered until January 1, 1972. NHTSA amended the standard without sufficient notice to apply it to all flashers, for whatever purpose manufactured, thus placing the certification responsibility entirely upon flasher manufacturers. Further, the flashers were required to "conform", not merely be "designed to conform". In the instant case, the effect upon flasher manufacturers is a remote one. In order to facilitate early adoption of a safety device with demonstrable public benefits, at a minimum cost, the agency has allowed vehicle manufacturers to continue to use existing wiring systems for a limited time, if they so choose. There is no requirement that the new lamp flash when the hazard warning signals do, there has been no change to existing Federal or SAE materials applicable to flashers, and given the perceived limited use of the new lamp during 1985 model production, there would appear to be minimal impact upon original equipment and aftermarket requirements for flashers of existing designs. Nor can NHTSA provide an interpretation that certification for flashers may exclude the center mounted lamp. That permission is already implicitly contained in Standard No. 108 which allows the manufacturer to specify the design load at which its flasher is intended to operate. Accordingly the agency has decided to deny parker Hannifin's petition.

NHTSA has considered the potential impacts of this rule and has determined that the rule is neither major within the meaning of Executive Order 12291 nor significant within the meaning of the Department of Transportation guidelines. The conclusions in the original regulatory evaluation for the final rule are not affected by the adoption of this rule. A free copy of that evaluation is available from the Docket Section.

The agency has also considered the impacts of these amendments under the Regulatory Flexibility Act. I certify that these amendments will not have a significant economic impact on a substantial number of small entities. Accordingly, no regulatory flexibility analysis has been prepared. Manufacturers of motor vehicles, those businesses affected by this amendment, are generally not small businesses within the meaning of the Regulatory Flexibility Act. Small organizations and governmental units which purchase cars equipped with center high-mounted stop lamps will not be significantly affected. The increase in new car prices for vehicles manufactured by companies which opt for early compliance will be negligible.

Because motor vehicle manufacturers must make timely decisions with respect to plans for the 1985 model year and because this amendment will facilitate the early introduction of a safety device, the agency finds that an effective date, earlier than 180 days after issuance of the final rule, is in the public interest. The change adopted in this notice relieves restrictions. Additional notice and comment on the August 1, 1984 early compliance date is unnecessary because of the minor nature of the change from the proposal.

In consideration of the foregoing, 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, is amended as follows:

1. A new paragraph S4.1.1.42 is added to read:

S.1.1.42 A passenger car manufactured between August 1, 1984, and September 1, 1985, may be equipped with a high-mounted stop lamp that conforms to S4.3.1.8.

2. Subparagraph (b) of paragraph S4.6 is amended by changing the date "September 1, 1985" to "August 1, 1984".

Issued on August 24, 1984.

Diane K. Steed
Administrator

49 FR 34488
August 31, 1984

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices and Associated Equipment [Docket No. 81-11; Notice 8]

ACTION: Final rule.

SUMMARY: The purpose of this notice is to amend the corrosion test requirements and procedures in Motor Vehicle Safety Standard No. 108 applicable to semi-sealed replaceable bulb headlamps and lens/reflector components of such headlamps.

The bulb removal corrosion test adopted in this notice was proposed on September 30, 1983 (48 FR 44866). In essence, it requires that the bulb be removed from the lamp and the test chamber at the end of the required 23-hour period of exposure to salt spray, for the final hour of eight of the ten 24-hour test cycles. This notice also adds motorcycles to the categories of vehicles allowed to be equipped with semi-sealed replaceable bulb headlamps. A revised bulb connector test is also adopted herein.

EFFECTIVE DATE: December 13, 1984.

SUPPLEMENTARY INFORMATION: On January 17, 1983, NHTSA proposed the adoption of a new type of headlamp system, a semi-sealed unit comprising a bonded lens/reflector and a standardized replaceable light source (48 FR 1992). To insure that the new lamps offered durability of photometrics equivalent to sealed beam systems, NHTSA proposed that the new lamps conform to certain requirements after being subjected to a battery of environmental tests.

One of the most important of these tests was intended to demonstrate resistance of the lamp to corrosion, as the agency was aware of the vulnerability of non-sealed composite headlamps to moisture. One of the reasons the agency never allowed European headlights was their lack of corrosion resistance. The ECE standard does not assure that a high level of reflector corrosion resistance is provided. German vehicle inspection data showed significant rejections due to dull, corroded and damaged headlamp reflectors. Thus, a good corrosion test for reflectors was needed—particularly since replacement lamps which include reflectors will be sold as aftermarket items. Because of this concern about corrosion resistance of the reflector, NHTSA originally requested that Ford propose a test for corrosion resistance immediately after receipt of its petition. Ford responded by proposing a 48-hour test, based on the requirements of SAE J575 June 1980 which is intended for other automotive lighting equipment. Ford later suggested a 240-hour test that was contained in a draft of a proposed SAE standard, XJ1383. The ASTM procedure (B-117-73) referred to in the proposed SAE standard is a standard method of salt spray (fog) testing, applicable to testing of ferrous and non-ferrous metals. It is also used to test inorganic and organic coatings, etc., especially where such tests are the basis for material or product specifications. Ford, which originally proposed the test in XJ1383, stated that the 240-hour period was developed with the SAE Lighting Committee to establish a minimum level of performance of a lamp exposed to typical corrosive environments encountered in the United States. The test is nearly five times longer than is now used for lighting devices. The 240-hour period is intended to simulate a level of exposure at least equivalent to that experienced during the service life of the vehicle. According to Ford, this 240-hour test is expected to detect the problems of corrosion of headlamp elements that have been a source of complaint with older European style headlamps.

Therefore, in January 1983 NHTSA proposed that the headlamp be subjected to ten 24-hour cycles of a salt spray test in which the salt spray would be activated for the first 23 hours and deactivated the 24th. At the conclusion of the test, the headlamp was to have met the photometric requirements of Standard No. 108 with no evidence of external or internal corrosion or rust. Loss of adhesion of any applied coating was not permitted more than .125 inch (3.2 mm) from any sharp edges on the inside or outside. Corrosion could occur on terminals provided there was no loss of function.

On the basis of comments, NHTSA adopted a corrosion test modified in both major and minor respects (June 2, 1983, 48 FR 24690). Corrosion was not to be visible "without magnification." Corrosion could occur on terminals "provided there is no voltage drop greater than 3 percent from that measured before the test when measured per paragraph 6.4 of SAE J580 August 1979." The major change, however, was to specify that during the hour of salt spray deactivation in each cycle the bulb was to be removed. NHTSA viewed this as a necessary change to assure adequate reflector corrosion resistance, even though it was an accelerated test. The corresponding introduction of a salt atmosphere on the inside of the lamp could create excessive salt deposits not easily removed, so NHTSA did not require that the lamp demonstrate photometric conformance.

The agency received petitions for reconsideration on various requirements of the corrosion test from Ford, Volkswagen of America, and Westfallische Metall Industrie, manufacturer of Hella lamps. Ford objected to the introduction of the voltage drop limitation on the bulb and connector, stating that it had not been proposed in the NPRM or suggested by any commenter. Ford further objected that the requirement was impracticable and unreasonable and that it appeared that the agency intended to specify 3% of the lamp's design voltage. The two other petitioners objected to the specification that the bulb be removed during the final hour of the cycle, on the basis that the requirement had not been proposed and that the test was not representative of real world conditions. The agency agreed that the connector voltage drop test should specify current drop in a fixed test setup and such a test would be adopted and it would delete reference to paragraph S6.4 of SAE J580, August 1979, to avoid confusion. To remove any question about adequacy of notice, the agency on September 30, 1983, amended paragraphs S4.1.1.36(d)(4) and S6.5 to adopt the corrosion test as originally proposed in January 1983, along with the photometric test (48 FR 44818). At the same time it published a notice of proposed rulemaking (48 FR 44866) covering the corrosion test as adopted on June 2, 1983.

Under the September 1983 NPRM, the test would be applicable to all replaceable bulb headlamps and replacement lens-reflector assemblies, and was a modified version of the one objected to by petitioners for reconsideration. With a connector attached to the terminals, the lamp would undergo the ten consecutive 24-hour cycle salt spray test, with the bulb removed for the final hour of each cycle when the spray was deactivated. The lamp would then be rinsed with deionized water and allowed to dry. The strictures against corrosion would remain, and could occur on terminals provided that the current did not decreased more than 3% compared to pretest conditions when using a test set up not identical but similar to Figure 1 in SAE J580, August 1979 and as further detailed in the proposed rule. The power source would be set to provide 12.8 volts and the resistance would be set to produce 10 amperes of current for pretest conditions.

The agency proposed the accelerated test which includes bulb removal as a reasonable way of judging resistance of the reflector to degradation caused by oxygen and moisture which are always present in the atmosphere. It is not an impracticable test; one European headlamp manufacturer, Robert Bosch, had informed NHTSA that certain of its headlamps with metal reflectors already met the standard as adopted in June 1983. In addition, the agency tested the replaceable bulb headlamp used by Ford which has a plastic reflector; it met the requirements with 10 bulb removals in a 240-hour period. The agency did receive conflicting data on the ability of various headlamps to pass the bulb removal corrosion test, but with its own tests and the data furnished by Bosch, the agency concluded that the proposed requirement would be practicable and reasonable for both metal and plastic reflector headlamps.

Finally, in line with SAE J584 and paragraph S4.1.1.34 which, in essence, allow a motorcycle to be equipped with passenger car headlighting equipment, NHTSA proposed that a motorcycle may be equipped with one or two replaceable bulb headlamps meeting all the requirements of the standard.

Comments were received, principally, from Ford Motor Company, Robert Bosch Corporation, Volkswagen of America, and General Motors Corporation. In addition, comments from Sylvania on a rulemaking petition submitted by Volkswagen to allow use of H-4 bulbs, stated that environmental tests for reflector integrity are important to lamp performance and should not be compromised.

Robert Bosch confirmed that it had run extensive tests on its lamps, and that it could meet the proposed corrosion test. In Ford's view, reflector corrosion resistance could be adequately judged by removing the bulb at the end of the first two 24-hour cycles only. It pointed out that a modification of this nature would eliminate the cost concerned with weekend overtime which would be required if the bulb had to be removed during each day of the 10-day test. Hella recommended that the bulb be allowed to remain installed for two cycles. GM recommended that the entire assembly be tested for 240 hours of continuous salt spray. VW recommended that the corrosion test not be amended, but it also presented modifications to simplify weekend scheduling problems. It suggested three alternatives to the proposal: a 5-day test, a reduction in bulb removal from 10 cycles to 8, and a variation in the 10-day cycle under which the bulb could remain out for more than one hour, and in for more than 23 hours. The agency reviewed these comments carefully and has decided to adopted VW and Hella's suggestion that the bulb be allowed to remain in the lamp for 2 of the 10 cycles, in order to accommodate weekend scheduling programs and to programs and to eliminate overtime. Although this requirement is slightly less severe than proposed, based on the agency's successful testing of a current production Mark VII headlamp at 10 cycles NHTSA has concluded that the results at 8 cycles should not differ greatly. To increase objectivity and repeatability, however, the amendment limits the periods of non-removal to the manufacturer's choice of any two periods at the end of the fourth through seventh cycles; bulb removal is specified for the first three and final three cycles. The agency is interested in being flexible in this regard without reducing the objective of the standard.

GM recommended that the entire assembly be tested for 240 hours of continuous salt spray and that afterwards there would be no evidence of corrosion that would result in failure of any other test specified for replaceable bulb headlamps, such as photometrics.

GM appears to have misinterpreted this section since the test applies to the headlamp but not to mounting and aiming hardware. In any event, the bulb removal has no effect on this aspect of performance. GM provided no substantiation for its opinion that a variability of the composition of the salt spray will have a measurable effect on lamp performance. NHTSA has dealt with this concern by restricting the location of the lamp within the cabinet, and by specifying the amount of time that the cabinet can be open. In accordance with GM's comments, language is adopted that the headlamp is mounted in the middle of the test chamber to provide a more uniform exposure of the test sample, even though sizes of test chambers may differ. Further, language is added clarifying that the bulb is removed from the test chamber during the hour of salt spray deactivation. Finally, 2 minutes is now specified as the maximum that the chamber may be opened during bulb removal or replacement.

The proposal from Ford for a change in the language of the electrical connector test has been adopted.

No comments were received on the proposal that motorcycles be added to the categories of vehicles allowed to use Standard No. 108's replaceable bulb headlighting system, and the standard is amended as proposed.

NHTSA has considered this rule and has determined that it is not major within the meaning of Executive Order 12291, "Federal Regulation," or significant under Department of Transportation regulatory policies and procedures, as its adoption does not require any person to change current practices under the standard. A regulatory evaluation was prepared for the amendment adopted on June 2, 1983, and placed in the docket. (A free copy of this document can be obtained from the Docket Section.) It is considered fully relevant for purposes of this rule.

NHTSA has concluded that this rule will not have a significant impact on the human environment. The lamps that will be manufactured pursuant to the rule are expected to be lighter, thus slightly reducing the overall material content of the automobile. This would have a small positive effect on the environment. No adverse impact on safety is anticipated.

The agency has also considered the impacts of this rule under the Regulatory Flexibility Act. I certify that this rule will not have a significant economic impact on a substantial number of small entities. Accordingly, no regulatory flexibility analysis has been prepared. Manufacturers of motor vehicles and headlamps, those affected by the rule, are generally not small businesses within the meaning of the Regulatory Flexibility Act. Further, these manufacturers would be affected only to the extent that they elected to take advantage of the new headlighting option that is amended by the rule. The number of different components in the inventories of headlamp distributors will increase, but not to the extent that any significant problem will be created. Finally, small organizations and governmental jurisdictions would be affected only to the extent that they choose to buy vehicles equipped with the new headlamps. The organization and jurisdictions making that choice would not be significantly affected by the price of the new headlamps.

The agency believes that existing headlamp bulbs and plastic reflectors can meet the requirement. Additional coats of lacquer on reflectors are an approach to improving corrosion resistance. The cost of lacquer coatings appears to be low. The agency therefore does not anticipate a significant cost impact as a result of this requirement.

Because of the criticality of reflector integrity to headlamp performance and the relationship of the corrosion test to it, it is hereby found for good cause shown that an effective date earlier than 180 days after issuance is in the public interest. Accordingly, the amendment is effective 30 days after publication in the FEDERAL REGISTER.

In consideration of the foregoing, 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, is amended as follows:

1. S4.1.1.36 is revised to read:

S4.1.1.36 Instead of being equipped with a headlighting system specified in Table I or Table III, a passenger car, multipurpose passenger vehicle, truck, bus, or motorcycle manufactured on or after July 1, 1983, may be equipped with a system of one or two replaceable bulb headlamps, if the vehicle is a motorcycle, or two replaceable bulb headlamps, if the vehicle is a passenger car, multipurpose passenger vehicle, truck, or bus, designed to conform to the following requirements.

2. S4.1.1.36(d)(4) is revised to read:

(4) After a corrosion test conducted in accordance with S6.5, there shall be no evidence of external or internal corrosion or rust visible without magnification. Loss of adhesion of any applied coating shall not occur more than 0.125 in (3.2 mm) from any sharp edge on the inside or outside. Corrosion may occur on terminals only if the current produced during the test of paragraph S6.5(c) is not less than 9.7 amperes.

3. S6.1 is amended to delete "S6.5".

4. S6.5 is revised to read:

S6.5 *Corrosion.* (a) A connector test shall be performed on each filament circuit prior to the test in subparagraph (b) according to Figure 1 of SAE Standard J580, August 1979. The power source shall be set to provide 12.8 volts and the resistance shall be set to produce 10 amperes.

(b) The headlamp with connector attached to the terminals, unfixtured and in its designed operating attitude with all drain holes, breathing devices or other designed openings in their normal operating positions, shall be subjected to a salt spray (fog) test in accordance with ASTM B117-73, "Method of Salt Spray (FOG) Testing," for a period of 240 hours, consisting of ten successive 24-hour intervals. During each interval, the headlamp shall be mounted in the middle of the chamber and exposed for 23 hours to the salt spray. The spray shall not be activated for the 24th hour. The bulb shall be removed from the headlamp and from the test chamber during the one hour of salt spray deactivation and reinserted for the start of the next test cycle, at the end of the first and last three 23-hour periods of salt spray exposure, and at the end of any two of the fourth through seventh 23 hour periods of salt-spray exposure. The test chamber shall be closed at all times except for a maximum of two minutes which is allowed for removal or replacement of a bulb during each cycle. After the ten cycles, the lens reflector unit without the bulb shall be immersed in deionized water for five minutes, then secured and allowed to dry by natural convection only.

(c) Using the voltage, resistance and pretest setup of subparagraph (a), the current in each filament circuit shall be measured after the test conducted in subparagraph (b).

Issued on November 6, 1984.

Diane K. Steed
Administrator

49 FR 44899
November 13, 1984

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Federal Motor Vehicle Safety Standards: Lamps, Reflective Devices, and Associated Equipment

[Docket No. 81-11; Notice 9]

ACTION: Response to petition for reconsideration.

SUMMARY: On November 13, 1984 (49 FR 44899), NHTSA amended Motor Vehicle Safety Standard No. 108 to alter the corrosion test requirements and procedures applicable to semi sealed replaceable bulb headlamps and lens/reflector components of such headlamps. The amendment was to become effective 30 days after publication in the Federal Register, i.e., December 13, 1984. Volkswagen of America, Inc., and its associated companies petitioned for reconsideration of the effective date to delay it until September 1, 1985, alleging insufficient time for revised certification procedures and modification if required. NHTSA has granted this petition and adopted a new effective date of September 1, 1985, to accord with manufacturer model-year practices and to alleviate any potential hardship to manufacturers of vehicles with replaceable bulb headlamps. Given the limited use of these headlamps in 1985 model cars, the existing test continues to meet the need for motor vehicle safety for the remainder of the model years.

EFFECTIVE DATE: September 1, 1985.

ADDRESS: Petitions for Reconsideration should refer to the docket number and notice number and be submitted to: Administrator, National Highway Traffic Safety Administration, Nassif Building, 400 Seventh Street, S.W., Washington, D.C. 20590.

FOR FURTHER INFORMATION CONTACT: Jere Medlin, Office of Vehicle Safety Standards, National Highway Traffic Safety Administration, 400 Seventh Street, S.W., Washington, D.C. 20590, (202) 426-2720.

SUPPLEMENTARY INFORMATION: The purpose of this notice is to postpone the effective date of the amended corrosion-test requirements and procedures applicable to semi-sealed replaceable bulb headlamps and lens/reflector components of such headlamps. These were adopted on November 13, 1984, with an effective date of December 13, 1984.

Under the test currently in effect, a replaceable bulb headlamp is tested for corrosion in a salt spray chamber with the bulb inserted at all times. Under the amendment adopted on November 13, 1984, effective December 13, 1984, the bulb is removed for the final hour of eight of the ten 24-hour test cycles, thereby exposing the interior of the lamp to the corrosive influence of the salt spray in the test chamber. On November 15, 1984, Volkswagen of America on behalf of itself, Volkswagen AG, and Audi NSU Auto Union AG petitioned for a delay in the effective date of the requirements to September 1, 1985. Its reasons were as follows. First, NHTSA has generally reserved short-time compliance schedules for relaxation of rules or optional procedures. Though installation of semi sealed headlamps is optional, those who are committed to using this technology for the 1985-model year must meet new requirements with an extremely short lead time. Second, petitioner anticipated that the final rule was to have become effective with a long enough lead time for vendor contact and certification testing to the new corrosion-resistance requirements. Finally, the petitioner notes that the imposition of new requirements in the middle of a model year is highly unusual action for the agency to take, and that "it is clearly impossible for a manufacturer to complete all of the tests and judgments necessary in a mere 30 days and to replace or modify designs without halting production on an entire model line."

The agency reviewed Volkswagen's arguments. Because of the criticality of reflector integrity to headlamp performance and the relationship of corrosion tests to it, the agency had found initially that an early effective date was in the public interest. The agency was unaware that an early effective date might have an adverse economic effect. It wishes to lessen the economic impact that an early implementation of the amendment would have in the course of the 1985 model year. The use of semi sealed headlamps in the 1985 model year is not extensive, and the test that is currently specified in Standard No. 108 is deemed sufficient for motor vehicle safety, given the limited application of the new headlighting systems. Accordingly, the agency has granted Volkswagen's petition.

In consideration of the foregoing, the effective date of the amendments to paragraphs S4.1.1.36, S4.1.1.36(d)(4), S6.1, and S6.5 made at 49 FR 44901 is changed from December 13, 1984, to September 1, 1985.

Issued on November 28, 1984.

Howard M. Smolkin
Acting Administrator

49 F.R. 47396
December 4, 1984

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Federal Motor Vehicle Safety Standards; Lamps, Reflective Devices, and Associated Equipment

[Docket No. 83-12; Notice 2]

ACTION: Final rule.

SUMMARY: This rule adopts changes in rear yellow turn-signal photometrics, license plate lamp requirements, minimum headlamp mounting heights, and test grids for stop, turn, parking, and tail lamps. The primary purpose of the amendments is to bring the requirements in Federal Motor Vehicle Safety Standard No. 108 closer to those of the Economic Commission for Europe of the United Nations (ECE). The amendments will permit cost savings without adversely affecting safety. A notice of proposed rulemaking on this subject was published on August 1, 1983.

EFFECTIVE DATE: December 26, 1984.

SUPPLEMENTARY INFORMATION: The Trade Agreements Act of 1979 (Pub. L. 96-39) imposes certain obligations upon the United States. Under Title IV, Technical Barriers to Trade (Standards), Federal agencies may not engage in any standards-related activity that creates unnecessary obstacles to the foreign commerce of the United States. Agencies shall, in developing standards, take into consideration international standards and shall, if appropriate, base the standards on international standards unless it is not appropriate for safety (19 U.S.C. 2532(2)(B)(i)).

Differences exist between Federal Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, and many of the requirements of the ECE. Some of these differences could be removed or lessened without any adverse effect on traffic safety. This would relieve both American and European vehicle manufacturers of some extra cost of designing and building vehicles for sale both in this country and Europe. It could also provide an opportunity to increase safety. Accordingly, as contemplated by the Trade Agreements Act, NHTSA proposed on August 1, 1983, several amendments to Standard No. 108 to bring its requirements closer to those of the ECE (48 FR 34784).

The first change proposed was a lower minimum value for the photometrics in yellow rear turn-signal lamps. The current Federal requirement is for a minimum of 200 candela (cd) and a maximum of 750 cd; by contrast, the minimum in ECE Regulation No. 6 is 40 cd and the maximum is 200 cd. During a meeting of The Brussels Working Group of Europe (GTB), it was recommended that the United States lower its minimum to 130 cd and that ECE raise its maximum to 350 cd. Tests conducted by the SAE have shown that a value of 130 cd for a yellow lamp is as effective as a rear red turn-signal lamp (lamps of both colors are allowed by Standard No. 108) with an output of 80 cd. Standard No. 108 specifies a minimum of 80 cd for rear red turn signals. Since this value has been adequate for motor vehicle safety, NHTSA believes that the proposed value of 130 cd for yellow rear turn signals would not have an adverse effect on safety.

It appears also that the differing ECE and U.S. requirements for license-plate lamps might be easily harmonized by adopting the latest SAE referenced standard on this item of equipment. Currently, Standard No. 108 specifies the physical and photometric relationship between the lamp or lamps, the plate and its holder but does not specify the point of measurement establishing the relationship. A similar requirement is contained in ECE Regulation No. 4, except that a specific point of measurement is included. SAE Standard J587f, "License Plate Lamps (Rear Registration Plate Lamps)," which was revised in 1981, clarifies the point of measurement of the incident light upon the plate in a manner identical to that of the ECE requirement. NHTSA therefore proposed the incorporation of the revised version of J587 into Standard No. 108.

NHTSA also proposed a reconciliation of differences in the minimum mounting height of headlamps. Standard No. 108 does not allow headlamps to be lower than 24 inches, measured from the road surface to the center of the lamp. The corresponding requirement in ECE Regulation No. 48 is 500 mm (19.7 inches) measured from the ground to the lower edge of the illuminating surface of the lamp. NHTSA proposed a harmonizing value of 22 inches, measured from the road surface to the center of the lamp, except that the distance from the ground to the lower edge of the illuminating surface of the lamp shall not be less than 19.7 inches.

The preamble to the proposal commented that there had been several studies of the effects that changes in mounting height have on seeing distances. The results from one of these studies suggested that mounting height has essentially no effect on seeing distance. The study presented the results from a series of experiments conducted by General Motors. The experiments consisted of asking observers to count the number of simulated pedestrians that were visible using a variety of headlamp configurations. The configurations differed on the basis of the type of headlamp and mounting height.

The results from another study, however, suggested that mounting height has a more definite effect on seeing distance. This study reported on a series of experiments performed by General Electric. In those experiments, the observers were riding in an automobile traveling at 40 mph. The observers were instructed to signal when they could see a target resting by the side of the road. The time of the signal and the speed of the automobile were used in estimating the distance to the target when it was first seen by the observer.

GE conducted experiments with an experimental headlamp having photometrics differing from most production lamps. These experiments showed a loss in seeing distance, but the GM experiments showed very little difference when the 24-inch height was reduced to as low as 18 inches.

To aid the agency in assessing the issue of seeing distance, the agency requested commenters to discuss the safety implications of this issue and the possible reasons for the conflict between the studies.

NHTSA also proposed certain changes regarding stop, tail, turn signal, and parking lamps in the interests of harmonization. Photometrics today are measured under Standard No. 108 at 27 different test points on stop, tail, turn signal, and parking lamps. If all 27 points equal or exceed the required minimum, the lamp complies. ECE Regulation No. 7 also measures light output at discrete test points, the principal difference being that there are only 19 test points. There are fewer intermediate test points in the European method. NHTSA believes that the eight test points in question could be deleted as sharp discontinuous changes in candlepower output across a lens surface do not occur in practice.

Alternatively, the 27 test points are separated under Standard No. 108 into 7 groups or "zones" and minima are established for each zone. If photometrics at a test point fall below the minimum, the lamp will nevertheless comply if the overall reading for the zone equals or exceeds the minimum value required for that zone.

When using the pattern of seven zones that is currently specified in Standard No. 108, with the 19 test points that were proposed, two zones have only a single point and two other zones have only two points. This small number of points in a zone tends to reduce the value of allowing an average over several points in lieu of meeting the minimum at each point. To avoid this difficulty, NHTSA proposed that only five zones be used. These five zones, using 19 points, and a corresponding table of values for each zone, expressed as a sum of the percentages of the minimum value at H-V, are presented in proposed Figure 1c. This change in the pattern of zones is necessary when the number of test points is changed from 27 to 19.

There is also a difference in the method of presentation of the distribution of minimum values over the surface of the lamp which NHTSA also proposed to harmonize. In Standard No. 108, the distributions are given in four different tables, whereas ECE uses a common grid, along with a graphical and numerical representation of the location of the test points. ECE values are expressed as percentages of the minimum H-V value. It was proposed that Standard No. 108's values be expressed in this fashion also. NHTSA decided that the least confusing way of adopting the test grid would be to substitute the pertinent portions of the text of the four SAE standards in question for the provisions currently incorporated by reference.

Comments were received from 18 motor vehicle manufacturers, motor vehicle associations, lighting equipment manufacturers, and interested related organizations such as the Insurance Institute for Highway Safety and the Department of California Highway Patrol.

All commenters discussing the proposed reduction in minimum rear yellow turn-signal candela supported it. Several, however, recommended adopting SAE values for lamps containing two and three compartments. (The agency had proposed 160 cd and 180 cd respectively, whereas the corresponding SAE values are 150 and 175.) NHTSA agrees with these recommendations. The differences between NHTSA and SAE values arose from calculations in rounding off extrapolations from the single compartment value. If it is desired to maintain the ratio of 1.6:1, for example, the exact value for two compartment lamps is 152. NHTSA chose to propose 160 cd, whereas the SAE adopted 150 cd. The SAE value is a mathematically correct way of rounding off the value, and is closer to the desired ratio. Accordingly, proposed Figure 1b is adopted with the revised values. The Notice erroneously proposed a maximum of 900 candela for both two- and three-compartmented yellow rear turn-signal lamps; the proper figure for the three compartment lamp that should have been proposed was 1050 cd, and Figure 1b as adopted corrects the error.

In commenting on the proposed adoption of the license-plate-lamp revision of SAE J587, it was pointed out that the version of August 1981 was never widely disseminated and never appeared in an SAE Handbook, whereas a version dated October 1981 has been. Only a minor editorial change distinguished the two versions. Therefore, Standard No. 108 is being amended to adopt the later version. In amending Tables I and III to specify J587 October 1981, the agency has taken the opportunity to correct erroneous footnotes and delete outdated ones. NHTSA wishes to clarify that, in accordance with paragraph S5.1 of Standard No. 108, the SAE J575 tests cross-referenced in SAE J587 are those of SAE J575e.

Similarly, a typographical error in proposed Figure 1b is corrected where the first two test points given in the proposal were "20U, 20D." The Figure adopted (Figure 1a) gives the correct ones: "10U, 10D," as well as adopting specific percentages of minima for turn-signal, stop, parking, and tail lamps.

Comments were varied on the proposed reduction in mounting height. Four commenters, California Highway patrol, Insurance Institute for Highway Safety, K-D Lamp Co., and the Auto Club of Southeast Ohio disagreed with the proposal. The principal ground of objection was the opinion that the reduction would have an adverse effect on seeing ability. Nine commenters, including the major motor vehicle manufacturers, agreed with the proposal in principle, but there was a split of opinion as to the preferred method of measurement. Three supported NHTSA's proposed dual method of measurement of 22 inches from lamp center to the roadway surface but not less than 19.7 inches to the lower edge of the illuminating surface (equivalent to the European metric method of expression). The remaining six commenters thought that the dual method was unnecessarily redundant, three supporting the 22-inch measurement, and the other three, the European method.

The agency has given considerable attention to the mounting-height comments, and reviewed all of the data relevant to this issue, particularly comments to the docket. Ford, GM and MVMA each reported upon their analytic studies of the effect of mounting height on seeing distance. Ford stated that its CHESS model, which evaluates headlamp performance, showed that "there is no significant change in the overall performance of a headlamp when its height is changed from 24 inches to 22 inches. Though there is a very small decrement in seeing distance as represented by a minuscule drop in the percentage of delineation detected . . . this is compensated in the overall performance by a similarly small decrement in the percent of drivers discomforted" due to less glare with a lower mounted headlamp.

GM's comments included a short analysis of the effect of a 2-inch reduction in headlamp mounting height. GM's analysis considered the theoretical change in seeing distance by calculating where the light would strike the road with a mounting height of 24 inches (229.5 feet) and a height of 22 inches (210.4 feet). According to GM's calculation, the 2-inch reduction in mounting height would theoretically cause the "seeing light" at the photometric test point of 0.5° down, 1.5° right, to strike the pavement 19.1 feet closer to the car.

However, according to GM, since the illumination of the light on the target is proportional to the inverse square of the distance between the light source and the target, the light striking the pavement at the point closer to the car would be brighter. Since the driver's ability to detect the target is dependent on the quantity of light falling on it, there is an intermediate distance where the light coming from the lamp at the 22-inch mounting height will have the same brightness as the lamp mounted at 24 inches does at 229.2 feet. GM calculations showed this to be at 224.5 feet down the road and, therefore, GM contends that a better estimate of the change in seeing distance would be a decrease of only 4.7 feet (229.2 feet - 224.5 feet).

MVMA conducted a series of computations utilizing the UMTRI computer program. MVMA found seeing distance reductions between 2.19 and 4.86 percent (approximately 4 to 10 feet) when using current headlamp designs. MVMA concluded that "the small variation of a few percent in threshold seeing distance attendant to a reduction in the headlamp mounting height will not alter driver safety." No other commenters provided new experimental data or analyses.

The agency has determined that the reduction in seeing distance that is attributable to a reduction of minimum mounting height to 22 inches would not have a significant effect upon safety. Other factors occurring on the road could have the same or greater effect on headlamp performance. These could include loading a vehicle with passengers, fuel, or cargo unevenly so as to lower the rear of the car, thus raising the angle of headlamp aim. At distances of 210-230 feet, the effect of changing the headlamps aim could be far greater than the effect of lowering headlamp height by 2 inches. Further, as Ford illustrated with the CHESS model, a possible beneficial effect upon safety would be the concomitant reduction in glare that a lower mounting height presents. Therefore, NHTSA has decided to adopt the proposal for a reduction in minimum mounting height.

The remaining issue, therefore, is the method by which the mounting height should be measured. After due consideration of the comments, NHTSA has decided that measuring the mounting height from the road surface to the center of the lens is the most reasonable approach. In comments to the NPRM docket on headlamp mounting height, Ford urged adoption of the 2-inch reduction in mounting height, but opposed adding a limit to the height of the bottom edge of a headlamp. Ford states that "there is no safety need to justify such a limitation on the height of the bottom edge of a headlamp when the center is specified; it is unnecessarily design restrictive; and, practically, the pendulum impact test of Part 581 of Title 49 of the Code of Federal Regulations, the Bumper Standard effectively limits the height of the bottom edge of a headlamp." The Bumper Standard specifies a pendulum impact test along a vehicle's front surface at any height from 16 to 20 inches above the ground, with no damage permitted to any lamp or reflective device except license-plate lamps. However, the impact-test pendulum has a relatively flat, 4.5-inch-high by 16-inch-wide surface, and headlamps could conceivably be recessed within a vehicle's bumper area and protected from pendulum impact. Several current vehicles have parking and turn signal-lamps recessed with the bumper, which illustrates this point. Therefore, NHTSA does not believe that the Bumper Standard effectively establishes a lower limit for headlamp mounting height.

The Department of California Highway Patrol (CHP) also commented on headlamp mounting height. CHP showed by example the inequity of the ECE method of measuring minimum headlamp height. CHP states that a potentially high-performance headlamp with a 7-inch vertical dimension would be required to have its center at 23.2 inches according to ECE regulations. On the other hand, it would permit the center of a less powerful 3.25-inch-high GM-proposed sealed beam unit to be only 21.3 inches above the ground, or 1.9 inches lower. CHP further stated that the proposed regulation would allow the smaller headlamps that had the lesser photometric performance to be mounted lower, providing a potentially greater reduction in seeing distance in comparison to the larger headlamps. Since the NPRM would not allow the center of a headlamp to be mounted lower than 22 inches, a less powerful 3.25-inch-high lamp could only be mounted at 22 inches rather than the 21.3 inches calculated by the CHP. However, as the CHP noted, the more powerful and taller headlamp would be required to have its center at 23.2 inches. Therefore, the taller headlamp would have to be mounted at a higher height and would be unfairly penalized if the ECE method were adopted in conjunction with a center-of-lens-to-roadway mounting height of 22 inches. Accordingly, this notice adopts a new minimum headlamp mounting height of 22 inches measured from the center of the lens to the road surface.

Comments to the docket on the proposed test grid amendments centered on three issues: the reduction of the number of test points from 27 to 19, the reduction of the number of zonal groups from 7 to 5, and the method of expressing the intensity of light at each test point as a percentage of the minimum H-V value.

Those commenters addressing the issue of the reduction of test points supported the agency's proposal, and the amendment is adopted. Consequently, the agency will test photometrics of stop, tail, turn-signal, and parking lamps on the basis of the 19 test points. While there was general agreement that the number of zones be reduced from seven to five, there was a difference of opinion as to the merits of the zones proposed by NHTSA, and those under consideration by the SAE in its proposed J586. Lighting equipment manufacturers generally favored the NHTSA scheme, while motor vehicle manufacturers preferred the SAE design. According to the motor vehicle manufacturers, the SAE zones consist of grouped test points with similar intensities. For example, the SAE's Zone 1 for stop lamps contains four test points with intensities of 16, 10, 10, and 16 candela, whereas NHTSA's Zone 2 for stop lamps contained three test points of 8, 8, and 28 candela. Ford Motor Co. stated that a more even pattern of light output will result from grouping points of similar intensities, and that on a grouping of test points with dissimilar intensities, a small variation in intensity of test points with higher nominal value of intensities can substantially alter the zonal sum. NHTSA has concurred with this recommendation and, to insure a more even pattern of light output, is adopting the SAE zone proposals.

However, the majority of comments were addressed to the third issue, the proposal to establish test point intensity values based on a percentage of the H-V test point value. Of the 13 comments received, only 1 one in full agreement. Two disagreed with the proposal. The remaining comments varied. Commenters basically agreed with the concept of a percentage approach but recommended that the test point values not be lower than current SAE values. It was pointed out that the NHTSA proposal adopting European rules would, in fact, lead to candela values for many of the test points that are lower than current minima required by Standard No. 108. One commenter recommended that the agency delay final rulemaking until the SAE approach on intensity values is reviewed.

The agency has carefully reviewed these comments. In reexamining the ECE and proposed NHTSA test grids, 15 common test points were found. In comparing values, NHTSA found that those for parking lamps would remain the same, but that lower values than are required at present would exist at all 15 test points for stop, tail, and turn signal lamps.

Although adoption of the proposal would come closest to achieving harmonization by using both the European test grid and the percentage values at the H-V point, the agency has concluded that this approach would not be in the interest of motor vehicle safety. Instead, it has adopted percentage values that are equivalent to those presently existing in Standard No. 108 for the four lamps in question. This will achieve a measure of harmonization, while insuring that the present level of lighting safety in the United States is not affected, and represents, the agency believes, a reasonable compromise.

NHTSA has considered this rule and has determined that it is not major within the meaning of Executive Order 12291 "Federal Regulation" or significant under Department of Transportation regulatory policies and procedures, and that neither a regulatory impact analysis nor a full regulatory evaluation is required. However, a final regulatory evaluation has been prepared and has been placed in the docket. The rule would impose no additional requirements but would permit manufacturers greater flexibility in design of motor vehicles and lighting equipment. The agency cannot predict the extent to which the manufacturers would utilize that flexibility.

NHTSA has analyzed this rule for the purposes of the National Environmental Policy Act. The amendment should have no effect on the human environment since the weight and quantity of materials used in the manufacture of head lamps is not changed. No impact on safety is anticipated.

The agency has also considered the impacts of this rule in relation to the Regulatory Flexibility Act. I certify that this rule would not have a significant economic impact on a substantial number of small entities. Accordingly, no regulatory flexibility analysis has been prepared.

Manufacturers of motor vehicles and lighting equipment, those affected by the proposal, are generally not small businesses within the meaning of the Regulatory Flexibility Act. Finally, small organizations and governmental jurisdictions would not be significantly affected since the price of new vehicles and lighting equipment will be minimally impacted.

In consideration of the foregoing 49 CFR 571.108, *Lamps, Reflective Devices, and Associated Equipment,* is amended as set forth below.

1. Paragraph S4.1.1.11 is removed, and a new paragraph S4.1.1.11 is added to read:

S4.1.1.11 A parking lamp, taillamp, stop lamp, or turn-signal lamp shall meet the minimum percentage specified in Figure 1a of the corresponding minimum allowable value specified in Figure 1b. The maximum candlepower output of each stop, turn signal, tail and parking lamp shall not exceed that prescribed in Figure 1b. The values specified in Figure 1a and Figure 1b are substituted for those specified in Table I of the following SAE Standards: J222 *Parking Lamps,* J585e; *Taillamps* (at H or above), J586c *Stop lamps* and J588e; *Turn Signal Lamps.*

2. Paragraph S4.1.1.12 is removed, and a new paragraph S4.1.1.12 is added to read:

S4.1.1.12 A parking lamp, taillamp, stop lamp or turn signal lamp is not required to meet the minimum photometric value at each test point specified in this standard if the sum of the percentage of the minimum candlepower measured at the test points is not less than that specified for each group listed in Figure 1c.

3. The references to "Figure 1" in paragraphs S4.3.1.1 and S4.3.1.7 are changed to "Figure 1c".

4. Figure 1 is removed and new Figures 1a, 1b, and 1c are added as follows:

Because of the importance of implementing the policy of the Trade Agreements Act, it is hereby found for good cause shown than an effective date earlier than 180 days after issuance is in the public interest, and the amendments are effective 30 days after publication in the *Federal Register.*

Issued on November 15, 1984.

Diane K. Steed
Administrator

49 F.R. 46386
November 26, 1984

Test points (deg)		Turn signal	Stop	Parking	Tail
10U, 10D	5L, 5R	20	20	20	20
	20L, 20R	12.5	12.5	10	15
5U, 5D	10L, 10R	37.5	37.5	20	40
	V	87.5	87.5	70	90
	10L, 10R	50	50	35	40
H	5L, 5R	100	100	90	100
	V	100	100	100	100

Figure 1a.—Required percentages of minimum candlepower of Figure 1b.

Lamp	Lighted Sections		
	1	2	3
Stop	80/300	95/360	110/420
Tail	2/18	3.5/20	5.0/25
Parking	4.0		
Red turn signal	80/300	95/360	110/420
Yellow turn signal rear	130/750	150/900	175/1050
Yellow turn signal front	200/	240/	275/
Yellow turn signal front [1]	500/	600/	685/

Figure 1b.—Minimum and maximum allowable candlepower values.

[1] Values shall apply when the optical axis (filament center) of the front-turn signal is at a spacing less than 4 inches (10 centimeters) from the lighted edge of the headlamp unit providing the lower beam, or from the lighted edge of any additional lamp installed as original equipment or used in lieu of the lower beam.

Group and test points	Turn signal	Stop	Parking	Tail
1 10U-5L, 5U-20L, 5D-20L, 10D-5L	65	65	60	70
2 5U-10L, H-10L, 5D-10L	125	125	75	120
3 H-5L, 5U-V, H-V, 5D-V, H-5R	475	475	420	480
4 5U-10R, H-10R, 5D-10R	125	125	75	120
5 10U-5R, 5U-20R, 5D-20R, 10D-5R	65	65	60	70

Figure 1c.—Sum of the percentages of grouped minimum candlepower.

5. Tables I and III, and the entry "Headlamps" in Tables II and IV are revised as follows:

Table I.—Required Motor Vehicle Lighting Equipment

Multipurpose Passenger Vehicles, Trucks, Trailers, and Buses, of 80 or More Inches Overall Width

Item	Multipurpose passenger vehicles, trucks, and buses	Trailers	Applicable SAE standard or recommended practice
Headlamps	2 white, 7-inch, Type 2 headlamp units; or 2 white, 5¾-inch, Type 1 headlamp units and 2 white 5¾-inch, Type 2 headlamp units; or 2 white Type 2A headlamp units and 2 white Type 1A headlamp units.	None	J580a, June 1966; J579a, August 1965; J571d June 1976; and J566, January 1960.
	2 white headlamps: Type 2B1 or Type 2D1; or 4 white headlamps: 2 each Type 1C1 and Type 2C1, or Type 1A1 and Type 2A1.		J580b, February 1974; J579c, December 1974; J571d, June 1976, J1132, January 1976.
Taillamps [2]	2 red	2 red	J585e, September 1977.
Stoplamps [2]	2 red	2 red	J586c, August 1970
License-plate lamp[1]	1 white	1 white	J587, October 1981.
Reflex reflectors	4 red; 2 amber	4 red; 2 amber	J594f, January 1977.
Side-marker lamps	4 red; 2 amber	2 red; 2 amber	J592e, July 1972.
Backup lamp[1]	1 white	None	J593c, February 1968.
Turn-signal lamp[2]	2 red or amber; 2 amber	2 red or amber	J588e, September 1970.
Turn-signal operating unit[3]	1	None	J589, April 1964.
Turn-signal flasher	1	None	J590b, October 1965.
Vehicular-hazard warning-signal operating unit	1	None	J910, January 1966.
Vehicular-hazard warning-signal flasher	1	None	J945, February 1966.
Identification lamps	3 amber; 3 red	3 red	J592e, July 1972.
Clearance lamps	2 amber; 2 red	2 amber; 2 red	J592e, July 1972.
Intermediate side marker lamps[4]	2 amber	2 amber	J592e, July 1972.
Intermediate side reflex reflectors[4]	2 amber	2 amber	J594f, January 1977.

[1] See S4.1.1.10. [2] See S4.1.1.11-12. [3] See S4.5.6. [4] See S4.1.1.3

TABLE II.—LOCATION OF REQUIRED EQUIPMENT—MULIIPURPOSE PASSENGER VEHICLES, TRUCKS, TRAILERS, AND BUSES, OF 80 INCHES OR MORE OVERALL WIDTH

Item	Multipurpose passenger vehicles, trucks, and buses	Trailers	Height above road surface measured from center of item on vehicle at curb weight
Col. 1	Col. 2	Col. 3	Col. 4
Headlamps	On the front, each type at the same height, 1 on each side of the vertical centerline; as far apart as practicable.	Not required	Not less than 22 in (55.9 cm) nor more than 54 inches (137.2 cm).

* * * * * * *

TABLE III.—REQUIRED MOTOR VEHICLE LIGHTING EQUIPMENT

All Passenger Cars and Motorcycles, and Multipurpose Passenger Vehicles, Trucks, and Buses, of Less Than 80 Inches Overall Width

Item	Passenger cars, multipurpose passenger vehicles, trucks, and buses	Trailers	Motorcycles	Applicable SAE standard or recommended practice
Headlamps	2 white, 7-inch, Type 2 headlamp units, or 2 white, 5¾-inch, Type 1 headlamp units or 2 white, 5¾-inch, Type 2A headlamp units and 2 white Type 1A headlamp units.			J580a, June 1956; J579a, August 1965; J571d, June 1976; and J566, January 1960.
	2 white headlamps: Type 2B1 or Type 2D1; or 4 white headlamps: 2 each Type 1C1 and Type 2C1, or Type 1A1 and Type 2A1.			J580b, February 1974; J579c, December 1974; J571d, June 1976; J1132, January 1976.
			1 white	J584, April 1964; and J566, January 1960.
Taillamps [2]	2 red	2 red	1 red	J585e, September 1977.
Stoplamps [2]	2 red	2 red	1 red	J586c, August 1970.
High-mounted stoplamp	1 red, for passenger cars only	Not required	Not required	J186a, September 1977.
License-plate lamp[1]	1 white	1 white	1 white	J587, October 1981.
Parking lamps[2]	2 amber or white	None	None	J222, December 1970.
Reflex reflectors	4 red; 4 amber	4 red; 2 amber	3 red; 2 amber	J594f, January 1977.
Intermediate side reflex reflectors[5]	2 amber	2 amber	None	J594f, January 1977.
Intermediate side marker lamps[5]	2 amber	2 amber	None	J592e, July 1972.
Side marker lamps	2 red; 2 amber	2 red; 2 amber	None	J592e, July 1972.
Backup lamp	1 white	None	None	J593c, February 1968.
Turn-signal lamps[3]	2 red or amber; 2 amber	2 red or amber	2 amber; 2 red or amber	J588e, September 1970.
Turn-signal operating unit[3,4]	1	None	1	J589, April 1964.
Turn-signal flasher	1	None	1	J590b, October 1965.
Vehicular-hazard warning-signal operating unit	1	None	None	J910, January 1966.
Vehicular-hazard warning-signal flasher	1	None	None	J945, February 1966.

[1] See S4.1.1.10. [2] See S4.1.1.11-12. [3] See S4.5.6. [4] See S4.1.1.5. [5] See S4.1.1.3.

TABLE IV.—LOCATION OF REQUIRED EQUIPMENT ALL PASSENGER CARS AND MOTORCYCLES,AND MULTIPURPOSE PASSENGER VEHICLES, TRUCKS, TRAILERS, AND BUSES OF LESS THAN 80 INCHES OVERALL WIDTH

Item	Passenger cars, multipurpose passenger vehicles, trucks, trailers, and buses	Motorcycles	Height above road surface measured from center of item on vehicle at curb weight
Col. 1	Col. 2	Col. 3	Col. 4
Headlamps................	On the front, each type at the same height, 1 on each side of the vertical centerline; as far apart as practicable.	On the front, on the vertical centerline, except that if two are used they shall be symetrically disposed about the vertical centerline.	Not less than 22 in. (55.9 cm) nor more than 54 inches (137.2 cm).

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PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Federal Motor Vehicle Safety Standards; Lamps, Reflective Devices, and Associated Equipment [Docket No. 84-04; Notice 2]

ACTION: Final rule.

SUMMARY: This notice amends Safety Standard No. 108 to allow motor vehicles to be equipped with a new four-lamp rectangular sealed beam headlamp system smaller than that currently allowed. A notice of proposed rulemaking ("NPRM") on This subject was published on April 30, 1984 (49 FR 18321).

The system, to be known as Type F, consists of two lamps which produce lower beam light and two lamps which produce upper beam light. The system will not utilize the supplementary upper beam from the lower beam headlamp as is the practice in current four-lamp systems.

Type F headlamps, though mechanically aimable, do not incorporate traditional lens-mounted aiming pads, and a special aimer adapter has been designed for the system. Because the aiming and seating planes are identical, the minimum amount of rquired horizontal aim is reduced from plus or minus 4 degrees to plus or minus 2 1/2 degrees.

The weight and volume of Type F headlamps are about half those of headlamps used in current four-lamp rectangular headlamp systems and the new system therefore offers the prospect of improved fuel economy through lighter vehicle weight and more aerodynamic front end design.

This notice completes initial rulemaking action implementing the agency's grant of petitions for rulemaking by General Motors Corporation, which developed the system, and American Motors Corporation. A second notice of proposed rulemaking on issues of simultaneous use of Type F headlamps, co-aiming and optional availability of an auxiliary filament will be published shortly.

EFFECTIVE DATE: July 1, 1985.

SUPPLEMENTARY INFORMATION: On April 30, 1984, NHTSA published a notice of proposed rulemaking implementing grants of petitions for rulemaking submitted by General Motors Corporation (GM) and American Motors Corporation (AMC) to amend Standard No. 108 to permit the use of new, smaller, rectangular sealed beam headlamps .n a four-lamp system. GM, which developed the system, believes that it offers improvements in lower and upper beam photometric output, and improved aiming characteristics. Because of reduction in weight and volume, the system offers the potential for improved aerodynamics and enhancement of fuel economy. Comments were received from eight manufacturers of vehicles or lighting equipment, the Motor Vehicle Manufacturers Association (MVMA) and the California Highway Patrol (CHP).

Characteristics of the GM System

The new four-lamp rectangular sealed-beam system features headlamps with upper and lower beam performance which is different than that currently required. The supplementary upper beam traditionally found in four lamp systems is not necessary for the system to meet photometric requirements for the upper beam. NHTSA chose to designate the lamp as Type F with a prefix indicating its function, "UF" for the upper beam Type F, and "LF" for the lower beam Type F. Each Type F headlamp is of a size, 92 mm x 150 mm, such that its overall volume and weight are approximately half those of headlamps used in the current 4 1/2″ × 6″ four-lamp rectangular system (Types 1A1 and 2A1). Thus, there is an inherent potential for more aerodynamic front ends featuring the new lighting system which, together with the lower weight of the system and its mounting hardware, offer the opportunity for improved fuel economy.

Upper Beam Performance

Auxiliary Filament

One feature of the original system that was requested by GM was an auxiliary filament in the lower beam lamp that would provide some light during upper beam operation.

The primary photometric contribution of this 35-watt, auxiliary filament would be to provide "incidental" light (5000 cd max, 1500 cd min) at the brightest light intensity test point (H-V). However, the upper beam lamp alone could meet the requirement at this test point as well as all other test points.

GM said that there were four other possible reasons for an auxiliary upper beam filament to be located in the lower beam lamp:

1. To serve as a heating element to prevent ice from forming on the lower beam lamp during upper beam use.
2. To mark the outside, leading edges of the vehicle during upper beam use.
3. To be use as a daytime front running lamp.
4. To prevent the owner from perceiving that there is less available light during upper beam use.

GM did not believe that the auxiliary filament was necessary for upper beam enhancement, heating purposes, or edge delineation, but it could be offered as a driver option to allow consumers to have a choice between more light or better fuel economy during upper beam use or, alternatively, to be used as a daytime running light. GM's wish to offer the auxiliary filament as a driver option was not accepted by NHTSA in the NPRM because no requirements were recommended, and NHTSA did not desire to propose additional requirements for switching and "tell-tales" that advise the driver about what headlamp elements would be in operation. Without proper advisories and switching safeguards, driver confusion and misuse could result.

Since the upper beam lamps alone could meet current upper beam photometric requirements NHTSA proposed use of upper beam lamps alone as one option during upper beam operation. NHTSA also proposed the option of using the lower beam lamp along with the upper beam lamp during upper beam selection. Since the 35-watt, auxiliary filament in the lower beam lamp provided only incidental light with low light-energy efficiency, the agency rejected use of this filament during ordinary upper or lower beam operation. However, the auxiliary filament could conceivably serve as a daytime running light, a concept under consideration in Canada, and the NPRM proposed that an auxiliary filament could be incorporated and used for that purpose.

In an initial response to the NPRM, GM stated that there were several good reasons for eliminating the auxiliary filament in the lower beam lamp. First, the NPRM proposed that this filament would be permitted to be used only as a daytime running lamp, and GM had found alternative methods of producing such a light at lower operating wattages. Eliminating the auxiliary filament would eliminate filament shadow and improve lamp reliability and durability. Therefore, on May 11, 1984, GM directed a letter to NHTSA and 41 other headlamp manufacturers, users, and researchers noting that GM intended to recommend eliminating the auxiliary filament and inviting comment on that recommendation.

On May 30, 1984, GM recommended deletion of the auxiliary filament instead of allowing it as an option as the NPRM had proposed. GM pointed out that this would eliminate the need to develop and provide two versions of the lower beam headlamp—one with and one without the auxiliary filament. GM noted that the proposed upper beam headlamp could be used as a daytime running light by electronically reducing the power consumption to 16 watts per upper beam lamp, which would provide a better lamp for that purpose since it would provide more efficient light with appropriate beam pattern, rather than "extraneous" or "incidental" auxiliary beam light. Other claimed advantages for eliminating the auxiliary beam were savings due to fewer connections and leakage paths in the lower beam lamp, a smaller-diameter bulb tube that might allow longer lamp life, lower piece cost, and less capital investment.

Seven other commenters recommended deletion of the auxiliary filament (Lucas Industries, VW, GE, Ford, AMC, CHP, and MVMA with the exception of Chrysler), citing advantages similar to those stated by GM and noting no disadvantages. The CHP stated they were not "overwhelmed by the ethereal reasons for lighting all four lamps" that were given by car manufacturers at the time these lamps were introduced, and therefore had no objection to deleting the auxiliary filament. Chrysler requested an opportunity to incorporate an auxiliary filament in the headlamp system so that such a filament could be used as a potential daytime running light in Canada. Chrysler's analysis indicated that incorporating the auxiliary filament might be significantly more cost efficient than adding supplemental lamps.

Sylvania believed that from a safety standpoint, it may be unwise not to emit light from the lower beam headlamp during upper beam selection because this lamp is installed at the outside edges of vehicles and serves as an indicator of car position for on-coming drivers. Because of these factors, Sylvania believed that elimination or the optional use of this capability to illuminate the lower beam lamp be given careful thought.

NHTSA considered all the above comments, and has decided not to incorporate the proposed auxiliary filament in the lower beam lamp since its removal offers overall better headlamp performance, and viable alternatives appear to exist for daytime running lights. Sylvania's recommendation to use the proposed auxiliary filament for edge delineation was considered along with other comments regarding the optional use of either the upper beam lamp alone or both the upper beam lamp and main lower beam filament during upper beam selection. NHTSA believes that there are no other safety reasons for mandating the use of the outer lamp as discussed below:

- As designed by GM the new system does not need the illumination assistance of the "extra" filaments, requiring only the single upper beam filaments to perform as well as many other lamps currently available.
- When four headlamp systems were first introduced, front parking lamps were not required to be illuminated when the headlamps were on. At that time, it probably seemed reasonable that the illuminated outboard lower beam headlamps marked the edge of the vehicle. Parking lamps are now required to be on and help perform this edge marking function.
- Additionally, when the upper beams are on, it is unlikely that side markers lamps and possibly the parking lamps would be seen, because of positional and contrast problems. Thus the relationship of the vehicle width and the inboard headlamp location would still be unknown to the oncoming driver. But it is also unlikely that upper beams would be on when oncoming drivers are close enough to need to know where the front corner of the opposing vehicle is.
- Another reason suggested in the comments for illumination of the lower beam lamp is to provide heat to prevent ice from forming on the lower beam lens while using the upper beam. While this may have been the argument for lighting the low beam when four-lamp systems were initially developed in the 1950's, the agency knows of no data which support the need to provide, by regulation, a solution to a problem of ice forming on a lens that is temporarily not in use.
- Thus, while there may be historical precedence for having the outer lower beam headlamp illuminated during upper beam use, there appears to be no valid safety-oriented basis to require it.

For the reasons discussed above, NHTSA has determined that an auxiliary filament is not needed in the Type LF lamp and therefore that feature of the April 30, 1984, NPRM has not been adopted. However, in light of the interest shown by at least one manufacturer (Chrysler) in incorporating such a filament on an optional basis, the agency will seek, in a notice to be issued shortly, additional comments as to whether to permit the inclusion of an auxiliary filament.

Simultaneous Use

More efficient and potentially effective light for upper beam enhancement seemed available from the main lower beam filament in the lower beam lamp. Instead of providing light to the right and above the road as the auxiliary beam would, the lower beam would provide significant additional light on the road, and add significant spread light to further illuminate the roadway shoulders. Using this filament during upper beam selection would also eliminate any potential concern about ice formation, edge delineation, or less available light. Preliminary GM test data were examined to evaluate potential upper beam photometric compliance problems in using this approach. NHTSA concluded that the probability of exceeding the two current maximum values, 75,000 cd. and 7,500 cds. respectively, for the brightest light intensity test point (H-V) and the foreground light test point (4D-V) was very low. Both the lower beam and the upper beam are limited in total output at or near the point of highest intensity (H-V), production practices tend to limit the number of very high output lamps, and the likelihood of four very high output lamps being placed on the same vehicle was considered to be vey low. Therefore, NHTSA proposed that manufacturers have a second option of using both the main lower beam filament and the upper beam lamp during upper beam operation and requested comment on the feasibility of this approach.

Data submitted by GM on pre-production lamps have shown, contrary to NHTSA's belief, that some photometric maxima values may be exceeded during the simultaneous use of the upper and lower beams. The CHP also expressed its concern ove the potential for this. Therefore, NHTSA has decided to reconsider this proposal in a separate notice of proposed rulemaking.

Photometric Performance

In the April 30, 1984, Notice of Proposed Rulemaking, it was proposed that the upper beam light of the Type F system would be produced by only one of the two lamps on each side of the vehicle. This is in contrast to all existing four-lamp systems, which use both lamps to produce the upper beam. It was also proposed that the manufacturer have the option of wiring a vehicle in such a way that the lower beam lamps would operate during upper beam operation. These two features of the Type F system led to a proposed set of photometric criteria for the UF lamp that are different than the upper beam criteria for other four-lamp systems. The CHP noted that this change would provide a "worthwhile" increase in required lamp output, since it was above the lowest-performing, current production designs. Based on the response to the proposed upper beam photometric values, and since they provide a level of safety equivalent to that already provided by Standard 108, NHTSA is amending Standard No. 108 to incorporate these values.

Lower Beam Performance

At present, the lower beam lamp in a four-lamp system provides some of the upper beam light—it has a second filament to do this. Also, the lens prescription of the current lower beam lamp is designed for this dual function. In the system requested by GM, the lower beam lamp produces only lower beam light and thus its lens prescription can be optimized for the low beam function. GM claimed that the benefit of using this design approach would be that the lower beam lamp could be designed for optimum performance and increased seeing light.

Except for 1 of 13 test point values, GM's final recommended lower beam photometrics were within the currently required test point value ranges. The one exception was an increase to a maximum value at a test point (½D-1½L to L) that was located near the glare zone. GM wanted to increase this value from 2,500 cd to 3,000 cd to reduce the sensitivity of the lamp to horizontal misaim and to permit more uniform left lane lighting. In conjunction with this increase, GM recommended increases in the minimum values at the seeing light test point and at spread light points.

The California Highway Patrol (CHP) believed the proposed changes would be the first concrete step taken to improve the Federal lower beam requirement, citing the increase in minimum test point values by 20% to 33% in four areas of the lower beam with no further increase in maximum glare values above the horizontal. Ford recommended that the Type F system should be approved but disagreed with all new proposed photometric values and with NHTSA's tentative position that the proposed values represented an improvement in lighting. Ford pointed out that its CHESS computer headlamp evaluation model was gaining wide respect as an appropriate and objective tool for testing lighting performance, and commented that the proposed lower beam lamp "did not show any significant improvement in overall headlamp performance" when it was evaluated by the CHESS model.

Sylvania stated that the proposal offered improvements in photometrics, noting "it is desirable to improve the performance of headlamp systems whenever they are considered. It should be the policy of NHTSA and the lighting industry to insure that any item or device that is considered, both now and in the future, be equivalent or better than existing lighting systems." Sylvania believed the increased spread light requirements of the proposed lamp system were justified and it urged adoption of these requirements.

General Electric (GE) endorsed the improved photometrics but also desired an increase in the 10U-90U glare value from 125 cd maximum to 175 cd maximum. The purpose for this glare increase would be to allow for random spots of higher intensity light that can occur from stray reflections of light inherent in halogen bulbs. NHTSA believes this increase is not the best solution because lamp designers would then be designing for a higher level of 175 cd, and increase the potential for unsafe veiling glare that would result during inclement weather.

AMC fully supported the photometric changes sought by GM and proposed in the NPRM. GM noted that it designed the proposed system for its customers, but felt that no justification had been shown that this level of performance should be required of all new headlamp systems.

The one suggested increase in a maximum test point value (½D-1½L to L) was initially of some concern to NHTSA because that test point location is close to the glare zone. Increases in this test point value could result in higher glare intensity levels if the headlamps were aimed too high, but it would also permit more uniform lighting ahead of the vehicle. A recent NHTSA study[1] recognized this potential problem, but the study also found that drivers can accept higher glare levels without discomfort. A 100% increase in this test point value was thought to be reasonable based on the study data, while GM recommended only a 20% increase.

The CHP and Ford also expressed some concern about increasing this test point value. The CHP noted that the 20% increase should allow better seeing ability, but it does not alleviate the complaints of compact-car drivers about the excessive brightness of high-mounted headlamps on taller four-wheel-drive pickups. Ford noted that photometric values are more sensitive to the vertical aim of the headlamp and an increase in the general intensity of a beam in these areas makes the lamp more susceptible to causing glare. The MVMA stated that there was no reason to expect this headlamp system to exhibit any new performance characteristic that would cause a level of glare significantly different from the glare produced by currently permitted headlamps. However, the MVMA believed that more research was needed to address the subject of discomfort glare from headlamps. GE supported this value, and no other commenters directly addressed this subject.

After considering these comments, NHTSA has concluded that the 20% increase in this test point value is well within the 100% increase thought to be reasonable by the most current research on the subject, and that adopting this value should not pose any safety problem.

In its petition, GM had also added a new test point value (1D-V) that it claimed was necessary to prevent the lower beam from being aimed too far to the right. GE, the only commenter on this subject, believed this new test point was design-restrictive and redundant, noting that the test point ½D-1½R controls excessive aim to the right. NHTSA believes that beam patterns which meet this specification at 1D-V have the potential for placing more light down the road, as the petitioner claimed. However, NHTSA accepts the GE position that the specification for this point may be redunant with the specification at ½D-1½L to R. Therefore, this specification is not adopted as part of Figure 15.

In summary, on the basis of the proposal and the comments, NHTSA continues to believe that the level of safety inherent in the proposed photometric test points is equivalent to the level provided by existing lamp systems and that the proposed photometrics are appropriate for lamp systems of this design. Additionally, NHTSA will apply these photometrics to future lamp systems of similar design, where one optical system is dedicated to lower beam use and another optical system is dedicated to upper beam use. Such systems would include those with either four lamps or four light sources.

The proposed photometric values seemed to represent an improvement in lower beam photometrics because more light would be provided in roadway locations where pedestrians and other objects must be seen and avoided. Therefore the NPRM asked whether these photometrics should be required for all headlamp systems. All commenters who addressed this question felt that it was inappropriate at that time to apply these photometric criteria to all existing systems. In the absence of significant, quantitative evidence on the safety effects of these values, the agency is not adopting their use on all headlamp systems.

[1]"Improved Low Beam Photometrics," Olson and Sivak, University of Michigan Transportation Research Institute; Interim Report No. UM-HSRI-81-4, February, 1981; Final Report No. UMTRI-83-9, March, 1983.

Additionally, NHTSA agrees with the suggestion from Ford and MVMA that some type of objective evaluation tool is needed for identifying safety improvements in roadway illumination performance. A program for development of such a tool will be initiated in the near future. This program will build on the extensive research base that already exists as well as the computer techniques that have been developed by Ford, MVMA and others.

Luminance

According to GM, the proposed lamp has a lens light-emitting area of 9,271 square mm, and the current small rectangular headlamp has a lens light-emitting area of 14,014. Therefore, the proposed lamp is about 1/3 smaller in lens light-emitting area than the current small rectangular headlamp. Since both of these lamps have similar glare point intensity limits, the proposed lamp would have a higher luminance value. (Luminance is the ratio of light intensity to the light-emitting area.) Generally, there is a potential for an increase in glare when a lamp of given intensity is reduced in lens area and, therefore, is increased in luminance. To date, there is no known recognized method to objectively compare the influence of headlamp luminance values to the potential for discomforting glare. GM stated that its subjective tests did not indicate a glare problem, and NHTSA tentatively accepted this finding. However, comment on this issue was requested in the NPRM.

Four commenters did not directly address this issue (Lucas, VW, GE, and AMC); Chrysler stated that it did not have sufficient experience with the proposed system to make any recommendations; five commenters (GM, Ford, Sylvania, MVMA, and the CHP) believed there would be no safety problem. GM noted that test results to date indicate "substantially less" light-intensity levels in the glare zone for the proposed headlamps as compared to current large rectangular headlamps (142 mm × 200 mm). As a result, GM believed these lower light-intensity levels "should more than make up for any brightness differences which may be attributed to size differences." GM also noted that for a comparable amount of seeing light, the proposed system will have a substantially lower intensity of glare light than any other headlamp size. Subjectively, GM believes that increased seeing light is the more important factor, and does not find the brightness to be objectionable.

Ford noted that the brightness distribution over the lens area of headlamps generally is not uniform—the size, shape and brightness gradients all are contributing factors. Ford surmised that although the proposed lamp is smaller, it will not exhibit any difference in glare from other headlamps of slightly greater size. Sylvania believed the design geometry of the lamp, along with the photometric requirements, would prevent the luminance factor from being a problem. The CHP and MVMA did not expect any discomfort glare effects. Since there was no objection from commenters and no additional information is available, NHTSA has concluded that luminance will likely not be a problem with the Type F headlamp system.

Improved Aiming Features

Current sealed-beam headlamps are positioned or seated in their mountings through the use of lugs located on the back of the reflector, which form a seating plane, but they are aimed through the use of aiming pads located on the lens face, which form an aiming plane. GM claimed that the proposed new headlamp would have more accurate aiming features than current sealed-beam headlamps because it would be designed to have the seating plane and the aiming plane coincide. Pads on the front of the lens-to-reflector flange would be used as a common plane to seat the lamp in its mounting and to aim the lamp.

A NHTSA evaluation of the dimensional tolerances that are allowed for current headlamp units indicated that the skew error in angular alignment between the seating and aiming planes can be as large as ±2.9°. Since the seating plane and aiming plane would be constructed to coincide in the proposed GM lamp system, this skew error would be eliminated. As a result, if a properly aimed headlamp is replaced, the replacement headlamp should remain properly aimed. Since replacement of headlamps without re-aiming has become a frequent practice, this new design should result in greater numbers of properly aimed replacement headlamps. The agency believes that proper aim reduces glare to oncoming drivers and improves seeing distance for both drivers. Eliminating the skew error would also reduce the amount of mechanical aim adjustment that must be provided to aim the lamp. Therefore, NHTSA proposed to reduce the minimum amount of required horizontal aim adjustment from ±4° to ±2½°.

And, since this approach has the potential to improve aim retention and reduce mechanical aim adjustment requirements on future headlamps, NHTSA asked whether common seating/aiming planes should be required on future headlamps.

Four commenters did not directly address this proposed common seating/aiming plane requirement (Lucas, Ford, GE, and AMC). Chrysler stated that it did not have any experience with the proposed headlamp system and could not make any recommendations, but it believed that the inclusion of design-oriented requirements inhibits design freedom and innovation. Five commenters (GM, Sylvania, VW, MVMA, and the CHP) generally agreed that the design seemed achievable and had merit. While GM and MVMA agreed that the requirements seemed appropriate for the Type F lamp system, they did not support such a requirement for other headlamp systems, noting this requirement would not necessarily be practical for replaceable bulb headlamps and could stifle future innovation.

The CHP argued this aspect should be clearly stated in the standard as a direct requirement rather than its intent being inferred by the proposed figures. NHTSA believes that the proposed rule is quite specific about requiring the lamps to be designed to meet the requirements of the new proposed figures and, therefore, does not believe further statements are necessary. Since all comments favored applying this requirement to only the proposed lamp system, and not to all future headlamp systems, NHTSA has adopted this aspect of the proposal for only the Type F system and will not consider it for all future headlamp systems.

Regarding the proposed reduction in horizontal aim adjustment, three commenters did not directly address this issue (Lucas, GE, and AMC), while six commenters (GM, Sylvania, Chrysler, VW, Ford, and the MVMA) supported the reduction and the CHP opposed it. Sylvania believed that the current horizontal and vertical aim adjustments of $\pm 4°$ were more than was necessary for any headlamp system. Chrysler submitted that current horizontal aim adjustment requirements were excessive and could be reduced for all headlamp systems. The CHP agreed that the common aiming/seating plane would eliminate the described skew error, but it also found that during its random inspection of vehicles, a number of headlamps were misaimed "considerably beyond" the 1.9° range of aim measuring equipment. Therefore, reducing the minimum adjustment range to $\pm 2.5°$ did not seem to leave much room for all the possible sources of misaim due to lamp and mounting hardware tolerances.

The report "Analysis of Sources of Error in Headlamp Aim"[2] indicates that when aiming/seating plane skew errors are eliminated, the range needed to compensate for other sources of error is about $\pm 0.115°$ when mechanically aiming and about $\pm 0.988°$ when optically aiming. An adjustment range of $\pm 2.5°$ appears adequate to compensate for errors. The standard is therefore amended to reduce horizontal aim adjustment for headlamps with a common aiming/seating plane.

GM had petitioned for, and NHTSA subsequently proposed, a method to simultaneously aim both the lower and upper beam lamps. Both lamps would be mounted in a common housing and would have a common aim adjustment. Comments from the CHP and GE noted that applying requirements to the entire headlamp assembly was not normal industry practice. The CHP also pointed out that on the requirements for aim tolerances, it is necessary to specify what portion of the $\pm 1/4°$ reaim would be applied to the lamps and what portion would be applied to the mounting assembly. CHP's suggestion about the further need for specifying such tolerances may have merit, but such changes cannot be accomplished unless the public is allowed to comment. Therefore, this proposal for simultaneous aim will be reconsidered and addressed in the separate notice of proposed rulemaking.

Headlamp Aimer Adapter

The current standard requires that all headlamps must be mechanically aimable. In order to meet these requirements, GM proposed an adapter for current mechanical aiming equipment that seemed to offer an acceptable means of mechanical aim. To provide sufficient lead time for inspection stations and repair facilities to obtain the adapters, NHTSA proposed that these adapters be provided with each vehicle that is manufactured with the proposed headlamps up to July 1, 1986.

No comments were received about the type of adapter proposed, and only GM and AMC commented on the requirement to equip vehicles with

[2] "Analysis of Sources of Error in Headlamp Aim," Olson and Mortimer, University of Michigan Transportation Research Institute, March 1974.

these adapters. Both GM and AMC project that use of the proposed lamps will be "very substantial," with GM tentatively planning to market over a half-million vehicles with the proposed headlamp system prior to July 1, 1986. GM estimated it would be issuing almost 10 times the number of adapters that are needed in the field if it must meet the proposed requirement. Therefore, as an alternative to meeting this requirement, GM proposed to assure that an ample supply of adapters would be available for sale in more than adequate time to meet any field needs. GM noted that its good faith has already been demonstrated, since it has already purchased the adapter tooling and it will not realize any profit. AMC believes that there will be sufficient motivation to supply these adapters, and with the normal industry pre-model process and practice of keeping up with new technology, there should be no problem in incorporating the use of these adapters. Therefore, both GM and AMC recommended against adoption of this aspect of the proposal. NHTSA has concurred in those comments.

Three principal aspects of the April proposal have been determined to merit further consideration. The first of these was the optional use of the lower beam during the use of the upper beam. The second was the co-aimability of the upper and lower beam Type F lamps. The last is the optional use of the auxiliary filament. The agency has decided to re-propose these features of a Type F system in a separate notice. That notice will provide an analysis of the comments on these issues from the April 1984 NPRM as well as the reasons behind the new proposal. It is anticipated that the proposed changes to the rule being adopted today will have an effective date of July 1, 1985.

NHTSA has considered this rule and has determined that it is not major within the meaning of Executive Order 12291 "Federal Regulation" or significant under Department of Transportation regulatory policies and procedures, and that neither a regulatory impact analysis nor a full regulatory evaluation is required. However, a regulatory evaluation has been prepared and placed in the public docket. Since use of Type F headlamps is optional, the rule will impose no additional requirements but will permit manufacturers greater flexibility in the use of headlighting systems.

NHTSA has analyzed this rule for the purposes of the National Environmental Policy Act. The rule may have a small positive effect on the human environment, since the weight and quantity of materials used in the manufacture of headlamps will be reduced.

The agency has also considered the impacts of this rule in relation to the Regulatory Flexibility Act. I certify that this rule would not have a significant economic impact on a substantial number of small entities. Accordingly, no regulatory flexibility analysis has been prepared. Manufacturers of motor vehicles and headlamps, those affected by the rule, are generally not small businesses within the meaning of the Regulatory Flexibility Act. Finally, small organizations and governmental jurisdictions will not be significantly affected, since the price of new vehicles, headlamps, and aimer adjusters will be minimally impacted.

In consideration of the foregoing, 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, is amended as follows:

1. Paragraph S4.1.1.34 is revised by adding the following at the end of the chart:

System	Headlamp Type	Number of Headlamps
	* * * * *	
6	Type UF ....1 and Type LF 1	

2. New sections S4.1.1.43, S4.1.1.44, and S4.1.1.45 are added to read:

* * * * *

S4.1.1.43 Instead of being equipped with a headlighting system specified in Table I or Table III, a passenger car, multipurpose passenger vehicle, truck or bus manufactured on or after July 1, 1985, may be equipped with a headlighting system of two Type UF and two Type LF headlamps designed to conform to:

(a) The dimensions specified in Figures 11, 12, 13, and 14.

(b) The photometric requirements of Figure 15.

(c) The requirements of SAE Standard J579c *Sealed Beam Headlamp Units for Motor Vehicles*, December 1978, with the following exceptions:

(1) The definitions in sections 2.4 through 2.11 do not apply.

(2) In Section 2.12, the definition of "Mechanically Aimable Sealed Beam Unit" is: "A unit having three pads, defining a mechanical aiming plane, used to adjust and inspect the aim of the unit when installed on the vehicle."

(3) In Section 2.13, the definition of "Aiming Plane" is: "A plane defined by the three aiming pads."

(4) Section 3.4 does not apply.

(5) Tables 1 and 2, and Figures 1 and 2 do not apply.

(6) In Section 3.5.1 and 3.5.3, references to "Tables 1 and 2" and Figure 3 are replaced by "Figure 15."

(7) Section 3.6 does not apply.

(d) When tested in accordance with Section 3.5.2 of SAE Standard J579c *Sealed Beam Headlamp Units for Motor Vehicles*, December 1978, the mounted assembly (either Type UF or Type LF headlamps, respective mounting ring, aiming ring, and aim adjustment mechanism) shall be designed to conform to meet the requirements of Figure 15 for upper or lower beams respectively without reaim when any conforming Type UF or LF headlamp is tested and replaced by another conforming headlamp of similar type.

(e) The requirements of SAE Standard J580, August 1979 *Sealed Beam Headlamp Assembly*, with the following exceptions:

(1) Section 2.2 Mounting Ring reads: "the adjustable ring upon which the sealed beam unit is mounted and which forces the sealed beam unit to seat against the aiming ring when assembled into a sealed beam headlamp assembly."

(2) The definition "2.3 Aiming Ring" reads: "The clamping ring that retains the sealed beam unit against the mounting ring, and that provides an interface between the unit's aiming/seating pads and the headlamp aimer adapter (locating plate)."

(3) In Section 3, the correct version of SAE J575 is "SAE 575f (April 1975).

(4) Section 4 does not apply.

(5) Section 5.1 reads: "Headlamps shall be designed so that they may be inspected and aimed by mechanical aimers as specified in SAE J602 October 1980, without the removal of any ornamental trim rings or other parts."

(6) Section 6.1.1 reads: "When the headlamp assembly is tested in the laboratory, a minimum aiming adjustment of ± 2.5 deg. shall be provided in the horizontal plane and ± 4 deg. in the vertical plane."

(7) Section 6.1.2 reads: "... through an angle of ± 2.5 deg. and ± 4 deg., respectively."

(8) Section 6.3 is retitiled "Retaining Ring/Aiming Ring Tests."

(9) In Section 6.3.2 add the flange thickness "92 × 150 mm .... 0.340 in. 8.6 mm)"

(10) Figures 2, 3, and 4 do not apply, and the reference to them in Section 6.5 is replaced by "Figure 16, Deflectometer, of Federal Motor Vehicle Safety Standard No. 108."

S4.1.1.44 The lens of each headlamp designed to conform to paragraph S4.1.1.43 shall be marked with:

(a) The designation "F" if it provides an upper beam, or "LF" if it provides a lower beam; and

(b) The symbol "DOT" (either horizontally or vertically) which shall constitute a certification that the headlamp conforms to all applicable Federal motor vehicle safety standards.

S4.1.1.45 Each headlamp designed to conform to paragraph S4.1.1.43 shall also be designed to conform to the following specifications:

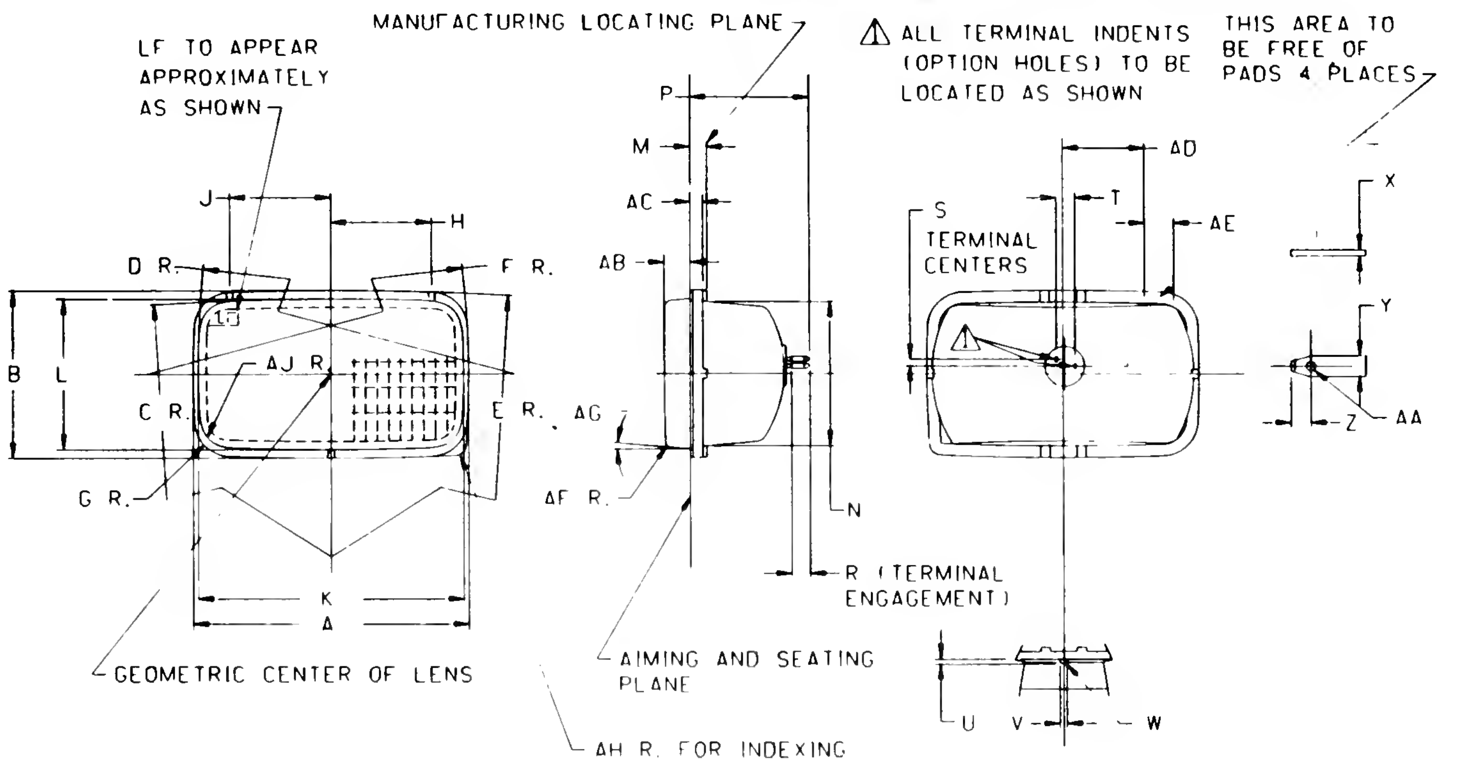
	Type LF	Type UF
Watts @ 12.8 V (design voltage	60 max	70 max.
Average Life @ 14.0 V (rated voltage)	320 hr.	150 hr.

3. New Figures 11, 12, 13, 14, 15, and 16 are added as follows:

Issued on December 20, 1984.

Diane K. Steed
Administrator

49 FR 50176
December 27, 1984



LETTER	INCH	MM
A	5.93 + .050 − .040	150 50 + 1.20 − 1.00
B	3 64 + .050 − .040	92.50 + 1.20 − 1.00
C	63.0 ± 3.94	1600.0 ± 100 0
D	23.6 ± 1.97	600.0 ± 50 0
E	63.0 ± 3.94	1600.0 ± 100 0
F	23.8 ± 1.97	600.0 ± 50.0
G	.787 ± .010	20.00 ± 0.30
H	2.16 ± .010	55.0 ± 0.30
J	2.16 ± .010	55.0 ± 0.30
K	5.689 + .008 − .040	144.50 + 0.20 − 1.00
L	3.252 + .008 − .040	82.60 + 0.20 − 1.00
M	.46 MAX.	11.7 MAX.
N	3.19 MAX.	81.0 MAX.
P	2 87 MAX.	73.0 MAX.

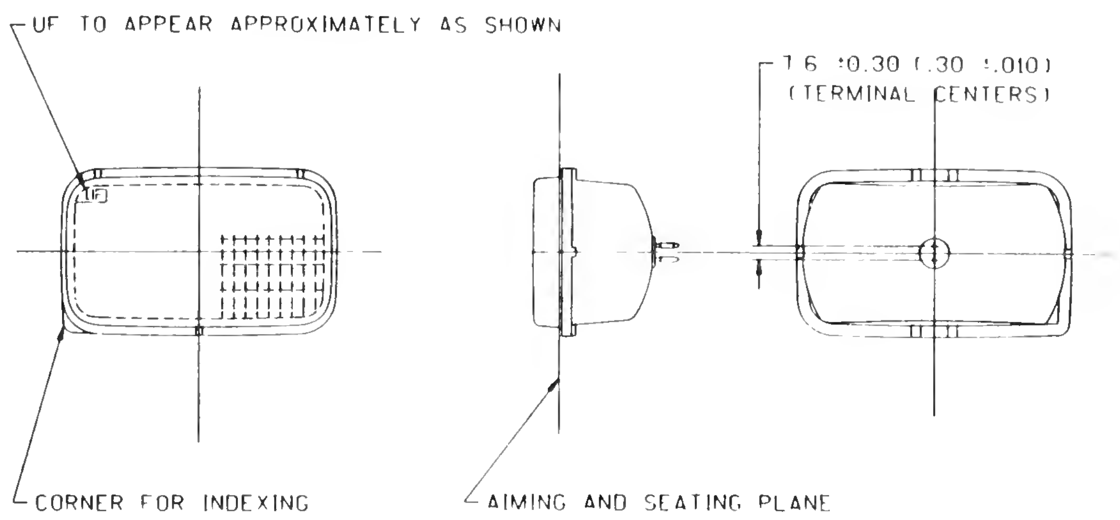
LETTER	INCH	MM
R	.41 MIN.	10 5 MIN.
S	.15 ± .010	3.8 ± 0 30
T	.41 ± .010	10 43 ± 0 30
U	.024 MIN.	0 60 MIN.
V	.315 MAX.	8 0 MAX.
W	RADIUS	RADIUS
X	.032 ± .002	0.82 ± 0.04
Y	.110 ± .004	2.80 ± 0.10
Z	.104 ± .010	2.65 ± 0.30
AA	.051 ± .010 DIA.	1.30 ± 0.30 DIA
AB	.54 ± .020	14.3 ± 0 50
AC	.295 MAX.	7.50 MAX.
AD	1.77	45.0
AE	.63	16.0
AF	.13 ± .02	3.2 ± 0 5
AG	5° ± 1°	5° ± 1°
AH	.24 ± .02	6 0 ± 0 5
AJ	.63 MIN.	16.0 MIN.

FIG. 11 -

TYPE LF

RECTANGULAR SEALED BEAM HEADLAMP UNIT

GL-176A GAF

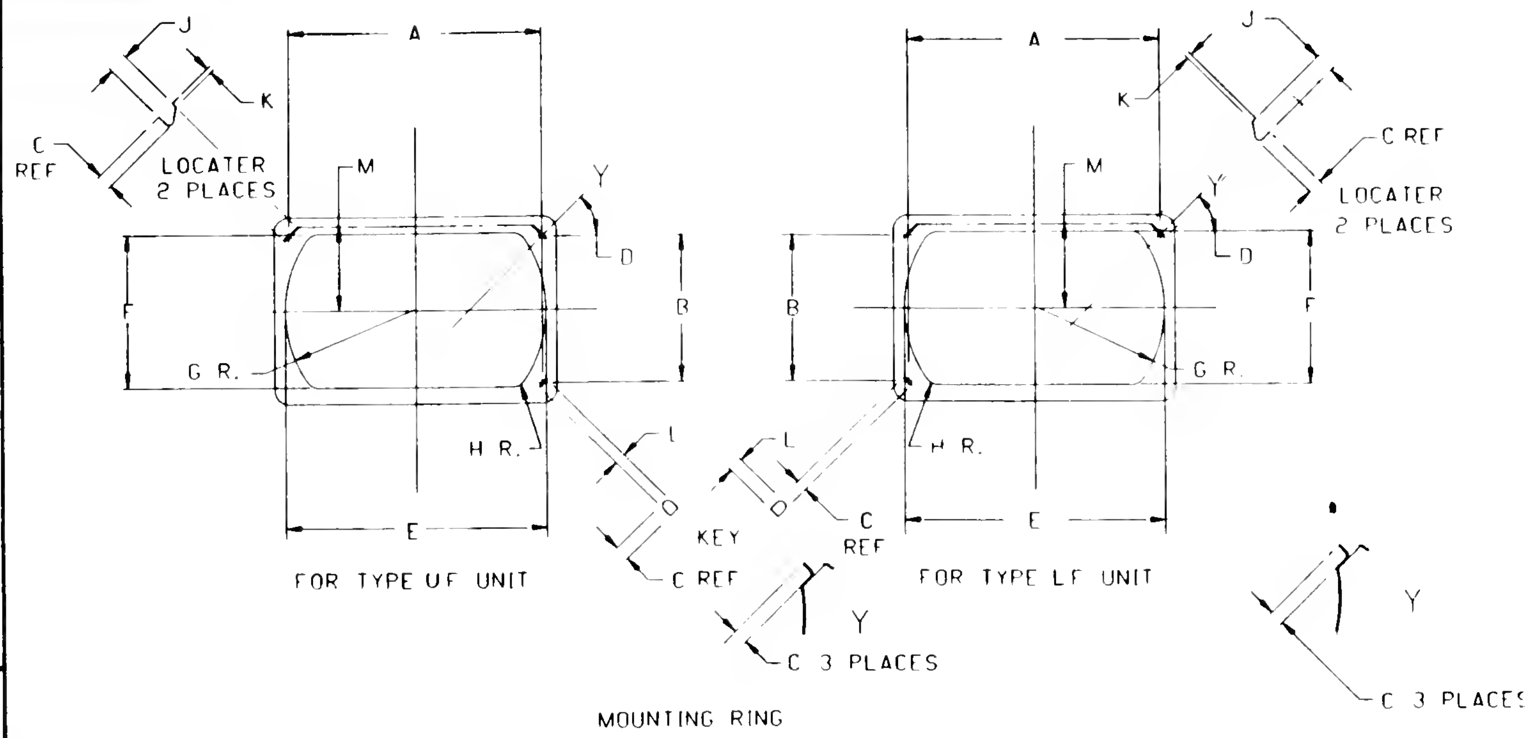


NOTE: SAME AS TYPE LF EXCEPT AS SHOWN
(.XX) INCH DIM

FIG. 12 - TYPE UF

RECTANGULAR SEALED BEAM HEADLAMP UNIT

GL-178A GAT

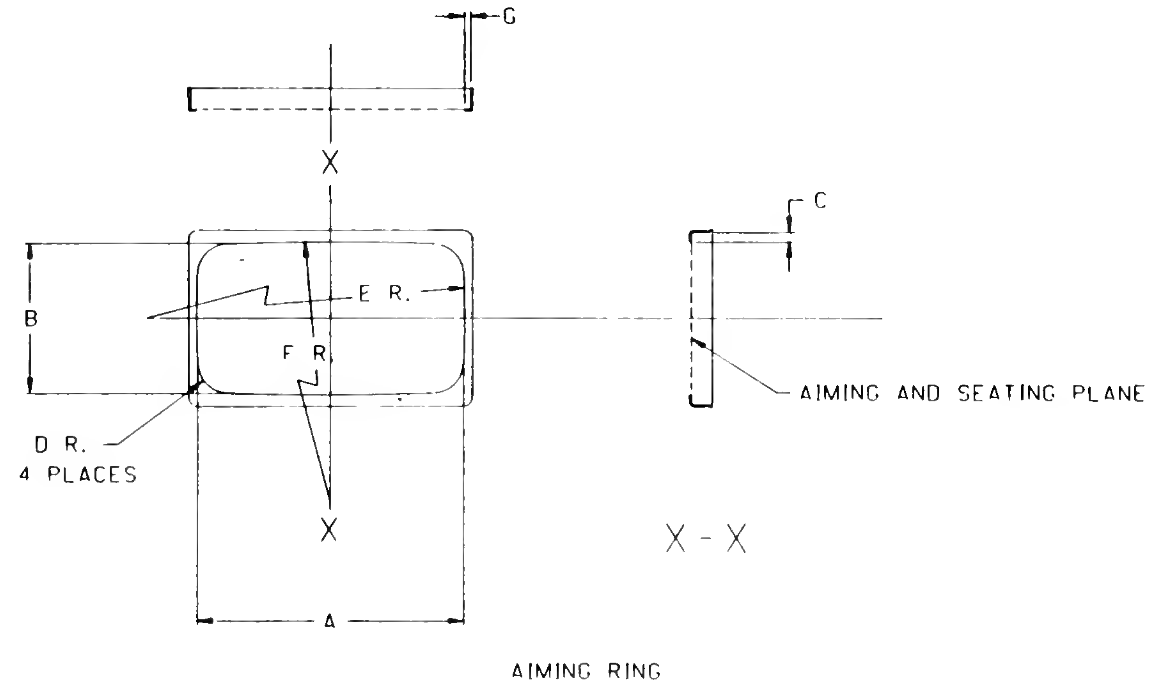


LETTER	INCH	MM
A	5.433 + .012 - .000	138.00 + 0.30 - 0.00
B	3.150 + .012 - .000	80.00 + 0.30 - 0.00
C	.315 ± .02	8.0 ± 0.5
D	45° 3 PLACES	45° 3 PLACES
E	5.63 ± .010	143.0 ± 0.30
F	3.307 ± .010	84.00 ± 0.30
G	2.79 ± .12	71.0 ± 3.0
H	.32 ± .04	8.0 ± 1.0
J	.39 ± .04	10.0 ± 1.0
K	.17 ± .07	4.3 ± 1.7
L	.24 ± .04	6.0 ± 1.0
M	1.823 ± .013	46.30 ± 0.30

FIG. 13 - FRONT VIEW OF KEYS OR LOCATORS FOR TYPE LF AND UF

RECTANGULAR SEALED BEAM HEADLAMP UNIT MOUNTING RINGS

GL-178A GAF



LETTER	INCH	MM
A	5.721 ± .006	145.30 ± 0.30
B	3.284 ± .006	83.40 ± 0.30
C	213 MIN.	5.40 MIN.
D	.670 MAX.	17.00 MAX.
E	23.7 ± 2.0	602.2 ± 50.0
F	63.0 ± 3.93	1600.0 ± 100.0
G	.134 MIN.	3.40 MIN.

FIG. 14 - AIMING/SEATING RING FOR TYPE LF AND UF RECTANGULAR SEALED BEAM HEADLAMP UNITS

GL-178A GAF

FIG. 15

PHOTOMETRIC TEST POINT VALUES

UPPER BEAM

Test Points deg[b]	cd. max.	cd. min.
2U-V	--	1,500
1U-3R and 3L	--	5,000
H-V	70,000	40,000
H-3R and 3L	--	15,000
H-6R and 6L	--	5,000
H-9R and 9L	--	3,000
H-12R and 12L	--	1,500
1-1/2D-V	--	5,000
1-1/2D-9R and 9L	--	2,000
2-1/2D-V	--	2,500
2-1/2D-12R and 12L	--	1,000
4D-V	5,000	--

LOWER BEAM

Test Points deg[b]	cd. max.	cd. min.
10U-90U[a]	125	--
1U-1-1/2L to L	700	--
1/2U-1-1/2L to L	1,000	--
1/2D-1-1/2L to L	3,000	--
1-1/2U-1R to R	1,400	--
1/2U-1R to 3R	2,700	--
1/2D-1-1/2R	20,000	10,000
1D-6L	--	1,000
1-1/2D-2R	--	15,000
1-1/2D-9L and 9R	--	1,000
2D-15L and 15R	--	850
4D-4R	12,500	--

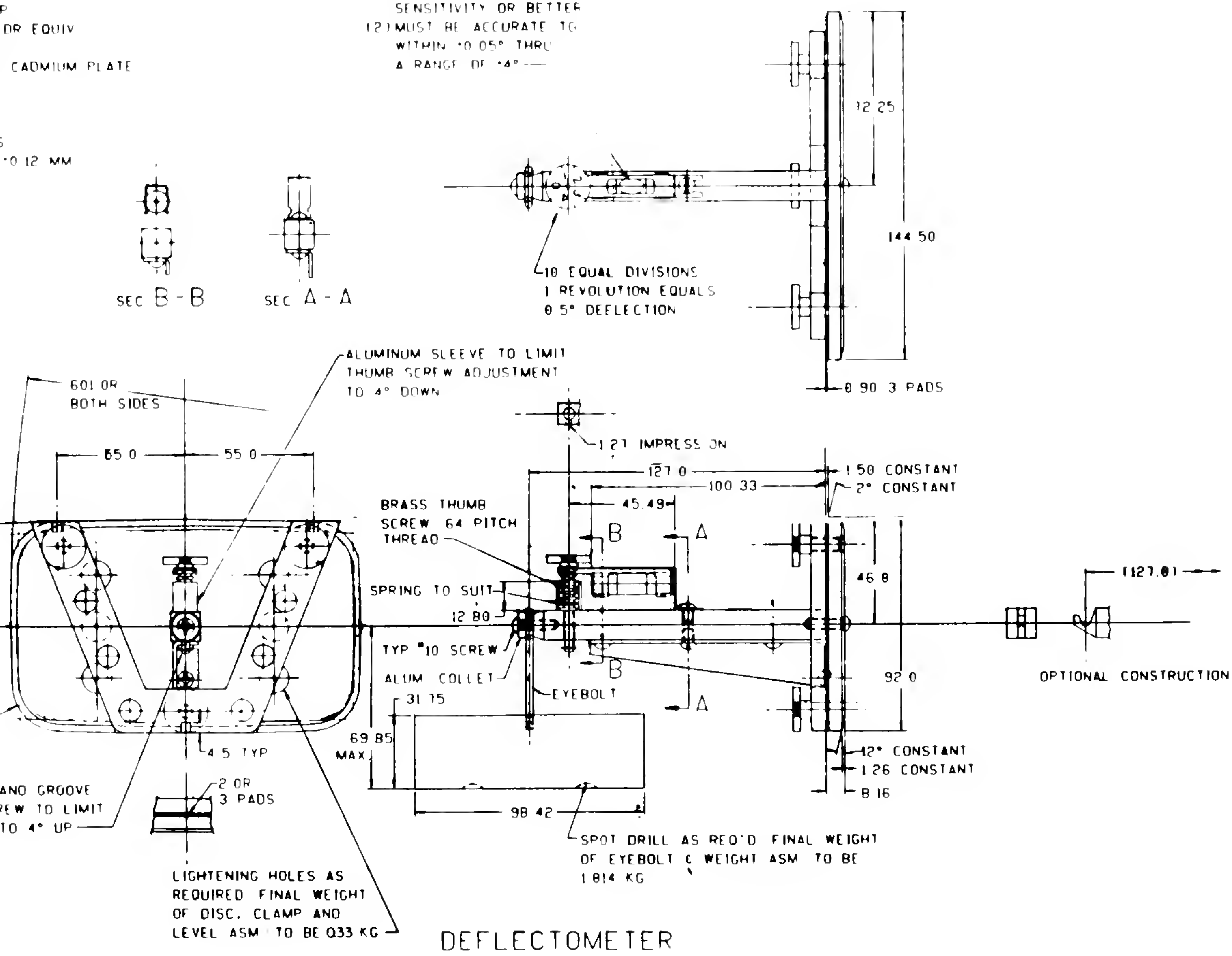
[a]From the normally exposed surface of the lens face.

[b]A tolerance of ±1/4 deg in location may be allowed for at any test point.

HEADLAMP TEST FIXTURE

92 X 150 MM

DIMENSIONS ARE IN MM
MACHINE MATERIALS
- DISC. ARM. BRACE & CLAMP
  ALUM SAE-AA-6061 T6 OR EQUIV
- COIL SPRING & LEVEL CLIP
  SPRING STEEL SAE 1050 CADMIUM PLATE
- WEIGHT & EYEBOLT ASM
  STEEL CADMIUM PLATE
- SCREWS
  ALUM MACHINE THREADS
  MACHINED DIMS ±0.12 MM



DEFLECTOMETER

FIG.-16

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices and Associated Equipment; Correction

[Docket No. 83-12; Notice 3]

ACTION: Final rule; correction.

SUMMARY: This notice corrects an error in the amendment published on November 26, 1984 (49 FR 46386) relating to lamps, reflective devices and associated equipment. The error appears in the amendment to Tables II and IV. It is therefore necessary to correct the error. The maximum mounting height for headlamps was omitted.

SUPPLEMENTARY INFORMATION: In the final rule on harmonization amendments published on November 26, 1984 (49 FR 46386), in amending Tables II and IV to reflect the revised minimum mounting height for headlamps, the maximum height was inadvertently omitted and must now be reinstated. That height is 54 inches.

PART 571—FEDERAL MOTOR VEHICLE SAFETY STANDARDS

§571.08 [Amended]

On page 46391, in Tables II and IV of 49 CFR 571.108, Column 4 of each is amended as follows:

Height above road surface measured from center of item on vehicle at curb weight
Column 4
Not less than 22 inches (55.9 cm) nor more than 54 inches (137.2 cm)

Issued on January 17, 1985.

Barry Felrice
Associate Administrator
for Rulemaking

50 FR 3911
January 29, 1985

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Federal Motor Vehicle Safety Standards; Lamps, Reflective Devices, and Associated Equipment

[Docket No. 81-11; Notice 13]

ACTION: Final rule.

SUMMARY: This notice amends Safety Standard No. 108 to allow motor vehicles to be equipped with replaceable bulb headlamp systems consisting of either four lamps with single standardized replaceable light sources, or two lamps each with two such light sources. Currently Standard No. 108 permits replaceable bulb systems only if they are comprised of two lamps with single standardized light sources. The amendment relieves the current replaceable bulb headlamp design restriction that allows only two-lamp single-light source systems.

Notice of the proposed amendment was published on December 7, 1984, and an opportunity afforded for comment (49 FR 47880). The proposal implemented the agency's grant of a petition for rulemaking by General Motors Corporation. It also responded to a petition by Volkswagen of America previously denied.

EFFECTIVE DATE: May 22, 1985.

SUPPLEMENTARY INFORMATION:

Background

On June 2, 1983, NHTSA amended Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, to allow the use of a replaceable bulb headlamp system (48 FR 24690). This system is comprised of two headlamps, each with a standardized replaceable light source containing both an upper and lower beam filament.

Among the petitions for reconsideration of the rule was one from Volkswagen of America, asking that a four-lamp system be allowed, each with its own light source, which would be the standard dual-filament light source which the agency had adopted. NHTSA denied this petition (48 FR 44815), commenting that rulemaking which would allow dual-filament light sources in a four-lamp configuration, or two dual-filament light sources in a single cavity, could not be entertained until certain issues could be considered further. As the notice stated, these issues involved whether only two lamps should be illuminated on upper beam (in four-lamp systems all four are presently required) and if so whether it is important that the front corners of the vehicle be otherwise indicated. Other issues concerned simultaneous actuation of light filaments in a headlamp system (this could produce excessive illumination) and uncertainties in the ability to insure correct simultaneous upper beam or lower beam aim if the bulb reflector systems were not separate upper and lower beam units. Subsequently, General Motors Corporation petitioned the agency for rulemaking to allow a two-lamp system with two standard dual-filament light sources in a single cavity. The agency granted that petition and published a notice of proposed rulemaking (NPRM) on December 7, 1984 (49 FR 47880). As there was a similarity between the system that VW wished the agency to consider, and the one for which a petition was granted, the two systems proposed by the NPRM were simply those incorporating quadruple light sources. The agency reviewed the issues on which the previous denial was based, and presented them for discussion and comment in the NPRM.

GM argued that the two-source system it has requested will allow it greater freedom in designing aerodynamic front ends than the present standard for replaceable bulb headlamps. Under the present standard, considering the possible out-of-focus relationship of the filament to the focal point of the reflector in a current replaceable bulb headlamp, the headlamp's vertical dimensions may be greater than desirable for aerodynamic purposes. By installing two light sources in the same headlamp, a smaller height is possible if the lower and upper beam filament are placed exactly on the focal point of their respective parabolas. Benefits attributable by GM to this intended system of headlamps of lesser height include possible improvements in photometric performance and improved fuel economy through aerodynamic efficiency by lowering the edge of the hood.

As the NPRM noted, another benefit could occur because only one filament would be in use in each dual-filament standardized replaceable light source in four-lamp systems and two-bulb systems. For example, should a lower beam filament burn out, the light source could be immediately interchanged with the adjacent upper beam light source, whose lower beam filament would not have been utilized. After the exchange, the burned-out lower filament would become irrelevant as the upper beam filament in that bulb would now be available for use.

Both existing replaceable bulb photometrics and photometrics similar to those proposed for Type F sealed beam headlamps were proposed. Comments were solicited on each photometric option.

GM would aim both bulbs in a single housing by a single adjustment, such as is currently used in the two-lamp round and larger rectangular systems. The GM system can utilize the same aimer adapters that are available for single replaceable bulb headlamps.

Four-headlamp systems such as VW contemplates offer distinctive design possibilities which are similar but not identical to those offered by systems with two bulbs per lamp. NHTSA proposed that four-lamp replaceable bulb headlamp systems consist of two lamps providing upper beam photometrics, and two lamps providing lower beam photometrics. The reflectors of these lamps would be designed to optimize the lower beam filament at the focal point of the lower beam lamp reflector and optimize the lens prescriptions for dedicated lower beam use. The upper beam lamp would be optimized in a similar manner. This type of system has been adopted for the new smaller four-lamp Type F sealed beam system (49 FR 50176). The dedicated lens prescription of each lamp would be marked "U" for upper beam, or "L" for lower beam, as appropriate. In conjunction with the option proposing Type F lamp photometrics, simultaneous use of the upper and lower beam would have been permitted as a manufacturer's option, and new glare limits would be added to the photometric requirements to help minimize potential problems from excessive foreground light during simultaneous use.

Because of the shorter life of filaments producing the upper beam, the agency also proposed that the lower beam photometrics be met by lower beam filaments alone. For the same reason, it was proposed that simultaneous activation of both filaments in a single bulb be prohibited, since the bulb is not designed to be used in this manner, and bulb life would be shortened. As this proposed amendment affects the standardized replaceable bulb, it would be applicable to all lamp configurations using that bulb, including the two-lamp/one bulb per lamp system previously adopted.

The agency also proposed revisions in the wording describing the aiming pad prescription requirements, clarifying them and relieving design restrictions. In effect, the agency would allow headlamps which may utilize mechanical aimer adapters with three adjustable legs. Accordingly, it was proposed that Figures 9-1 and 9-2 be deleted and appropriate changes made in the text.

In addition to comments on the merits of the system proposed by the NPRM, the agency was also interested in comments relating to the relationship between headlamp replacement costs and safety. Although GM has told NHTSA that the replacement cost of the glass lens/plastic reflector assembly for its new lamps would be in the neighborhood of $35, the actual cost could be several times higher for low volume designs. If that cost were not subsidized by the manufacturer, it could well be over $100 per lamp. Current retail cost for a replacement light source at Ford dealers is $16.75. Therefore, since the same light source (bulb) would be used in the GM system, the total replacement cost for the GM system, including lens/reflector assembly, two light sources, and labor, was estimated at about $80. It is estimated that about one complete headlamp will need to be replaced over the lifetime of the vehicle due to accident or stone damage. Therefore, the agency solicited specific comments on the following issues: The relationship between cost and the probability of replacement of headlamp or bulb, the time lag that may exist between outage and replacement because of costs, and the extent to which cost considerations of nonmandated headlamps should enter into the agency's rulemaking considerations.

Ford Motor Company, whose petition was implemented by the amendment (48 FR 24690), had emphasized to the agency that one of the primary safety benefits of the new type of headlamp was that the light source could be replaced without removal of the headlamp, replacement of the lens-reflector portion of the headlamp, or the necessity to reaim. With respect to the vehicle on which the system has been first installed, the Mark VII, bulb replacement is a simple matter of opening the hood, finding the rear of the headlamp, disengaging the old bulb by a twist of it in its mounting, and replacing it in a similar manner. The agency had been informed by General Motors that it intends to use replaceable bulb headlamps on a number of its 1986 model car lines, but that on two of these lines, the light source cannot be replaced without removing the headlamp itself. Since this situation was not envisioned with replaceable bulb headlamps, the agency sought comments on this issue; that is, is there a relationship between vehicle safety and the ability to replace the bulb without tools. The agency desired a quantitative assessment, to the extent practicable.

NHTSA also sought comment on the possibility of problems with aligning optical aiming equipment with lamps which have more than one bulb.

In implementation of the considerations discussed above, NHTSA proposed that the definition in paragraph S3 of "replaceable bulb headlamp" be amended to include headlamps with two standardized replaceable light sources. It was noted that this light source is the only allowable light source for use in achieving the required upper or lower headlamp beam pattern. Under NHTSA interpretations, however, the standardized replaceable light source is not the only light source which may be included in a replaceable bulb headlamp unit. Other light sources, such as parking lamps, turn signal lamps, and fog lamps are not prohibited, as long as they do not interfere with the required headlighting function.

The agency also sought to clarify the language in the standard regarding several of the testing requirements. The agency intended that headlamps utilizing the standardized replaceable bulb shall be able to meet the applicable performance requirements of Standard 108 with any standardized replaceable bulb intended for use in that lamp. Thus, for example, lamps must be able to pass the tests referenced in paragraph S4.1.1.36(b) not only with the bulb used as original equipment in that lamp but also with bulbs from other manufacturers intended for use in that lamp. Since most replaceable bulbs will be sold in the aftermarket and not as original equipment (assuming the same distribution of sales as for sealed beams), this requirement is necessary to ensure the proper functioning of the headlamp so that it meets the need for motor vehicle safety. Specifications on the bulb itself, already promulgated by the agency, ensure that manufacturers have a reasonable design envelope within which to produce their lenses and reflectors. This clarification would result in an amendment to paragraph S4.1.1.36(b).

NHTSA proposed that a headlamp with two light sources or a lamp in the system of four replaceable light sources meet the upper and lower beam photometric requirements of Table I of SAE J579c or new photometric requirements in proposed Figures 17 and 18, stating that a final decision would be made between these two choices. The agency proposed also that the aim of the upper beam of dual light source headlamps cannot be adjusted separately from that of the lower beam light source. This proposal applies only to headlamp systems which are comprised of two headlamps and contain two bulbs in each headlamp. In these instances, there is only one set of aiming pads on each lamp, yet there are two bulb reflector sets in that lamp. If both upper and lower beam lamps are not aimed simultaneouosly—that is, with a single aiming adjustment—then consumers, or repair facilities would not be able to aim the lamp using the aiming pads but would be required to disassemble the lamp to adjust each reflector separately. This proposal, which was applicable only to the two-lamp, four-bulb system ensures that proper headlamp aiming, which the agency has traditionally considered necessary for motor vehicle safety, is achievable with current aiming equipment. It was further proposed that the lower beam be produced by a filament with an average life of 320 hours, the equivalent of the current lower beam light source filament. Paragraph S4.1.1.38(d) would be modified under the proposal to check for lens deflection in front of each bulb following the internal heat test.

In adopting replaceable bulb headlamp systems, the agency, in S4.1.1.39 required, for the period July 1, 1983, to July 1, 1984, that each vehicle be equipped with a spare bulb as part of its original equipment. The agency noted that it anticipated that replaceable bulbs should be readily available through normal distribution channels at the end of the one year period. The agency is satisfied that such bulbs are available and therefore proposed the deletion of S4.1.1.39, which has expired.

Similarly, the agency adopted paragraph S8 to require, until July 1, 1984, that each vehicle also be furnished with adapters for mechanical aiming devices. The agency was convinced that sufficient adapters are available and that there should be no problems in inspection and aiming of motor vehicles with replaceable bulb headlamps which are not provided with these adapters. Therefore, NHTSA also proposed, *pro forma,* deletion of paragraph S8, which is no longer in effect.

New paragraphs would be added to S4.5 to guarantee that only appropriate filaments will be energized. For systems which use four standardized replaceable light sources, it was proposed that Tables II and IV be be amended to state that the outermost light source (in a two-lamp system) or outermost lamp (in a four-lamp system) be used to produce the lower beam. This serves to mark the width of the vehicle during low beam use, as a cue to oncoming drivers.

Paragraph S6.7, relating to temperature and internal heat tests, would be modified for multiple bulb headlamps. Both upper and lower beam photometrics would have to be met after each test. During the hot cycle, the highest combination of filament wattages capable of being used would be energized simultaneously (e.g., fog lamps, parking lamps, turn signal lamps).

Paragraph S6.8, relating to the humidity test, would be amended to add temperature tolerances to the final phase of the test which have heretofore been inadvertently omitted. Currently the specification is 73 °F (23 °C). The agency proposed adding a tolerance of +7-0 °F (+4-0 °C). In addition, the agency proposed reducing the excessively large tolerances on the humidity tolerance from ±10% to +5%-0% and the temperature from ±9 °F to +9-0 °C (+4-0 °C). This is being done to increase test result repeatability and make the test requirement more definitive.

On Figure 4-1, one aiming pad was misidentified as a Class II pad: that would be corrected. In addition, this Figure would be amended to illustrate the proposed definition of aiming reference plane. The title of Figure 4-2 would be modified to reflect its use as an example. Figure 7 would be changed to permit a wider test box since some headlamps would not fit into one of 16 inches width; 24 inches is proposed.

Issues

Comments were received on the notice from six motor vehicle manufacturers, one vehicle manufacturers trade organization, one test laboratory and the Department of California Highway Patrol; seven comments were also received from manufacturers of lighting equipment.

The major issue presented by the proposal was whether the presently applicable photometrics of SAE J579c met by the two standardized replaceable light sources in current two-lamp systems should also apply if four such sources were permitted, or whether the photometrics recently adopted for the Type F four-lamp smaller sealed beam system would be preferred. Commenters almost unanimously opposed Type F photometrics for the proposed type of headlighting system. The reason for the opposition is that the standardized replaceable light source uses transverse filaments while the filament in Type F lamps is axial. NHTSA concurs with the concerns expressed by commenters, and is adopting the existing photometrics of SAE J579c for the two headlighting systems incorporating four standardized replaceable light sources.

A second issue of concern to commenters was the proposed prohibition against simultaneous use of upper and lower beams in a four-lamp system, if the J579c photometrics were allowed, as contrasted with the lack of such a prohibition for systems with Type F photometrics. The principal reason for the difference is that Type F photometrics contemplate such use, and compensate for it, while SAE J579c does not. Therefore, on four-headlamp systems, simultaneous use of both upper and lower beam, or use of all four lamps for either upper or lower beam, is prohibited. Commenters interpreted the prohibition as forbidding use of the "optical horn" or flash-to-pass feature found on many cars. NHTSA did not intend to prohibit this feature and the final rule specifies the exception allowing momentary signaling use. On two-lamp systems, simultaneous use of both light sources in a headlamp is permitted in either the upper or lower beam mode. However, the requirement for both lamps of a two-lamp system to produce light which satisfies either the upper beam specifications of J579c or the lower beam specifications of J579c effectively prohibits other beam patterns, such as a mixture of upper and lower beam photometrics, except for momentary signaling.

Commenters were also concerned with proposed S4.1.1.36(b) which would have required compliance of each replaceable bulb headlamp "with any standardized replaceable light source intended for use in such headlamp." NHTSA's intent was that each headlamp should be designed to conform with any randomly selected bulb meeting the specifications of Figure 3 and produced by any manufacturer. General Motors and others suggested that such headlamps be "designed to conform" with any bulb, rather than "conform", and the final rule adopts this suggestion.

The proposed environmental test requirements were the source of many comments. In order to insure a humidity environment of not less than 90%, the agency proposed a relative humidity of 90-0+5%. Commenters instead interpreted this as a tolerance and suggested plus or minus 2 or 3 percent as more appropriate. NHTSA wishes to clarify that it intends a test environment "of not less than 90%" relative humidity and has therefore adopted the words as quoted. Other comments received advised NHTSA that the Notice failed to specify that the flasher, if tested simultaneously with the headlamp, should be flashing at its normal rate, and that a continuous flashing for one hour (the test period) was inappropriate. In recognition of these comments, the procedure adopted specifies that the flasher shall operate at 90 flashes a minute with a 75±2% "on time" (the rate intended to produce maximum "on time"). NHTSA believes that the one-hour duration of flashing, for the turn signal, is appropriate due to the use of these lamps as hazard warning signals. This value is based upon Figure 1, SAE Recommended Practice J590b *Automotive Turn Signal Flashers*, October 1965, already incorporated by reference in Standard No. 108 as the standard for turn signals.

With respect to lens markings, comments were received that the agency should not restrict markings to the outside of the lens, but to allow them to be placed inside for facilitation, under some circumstances, of the marking of the adjustable mechanical aimer setting. NHTSA concurs with this request, and the final rule so permits. Comments were also submitted as to the size of the lens lettering, NHTSA having proposed a minimum size of .25 inch. This size could interfere with the lens prescription of smaller headlamps. Motor Vehicle Manufacturers Association suggested .157 inch (4mm), the minimum height specified for Vehicle Identification Numbers, and NHTSA has acceded to this request. A concurring amendment also deletes dimension G in Figure 4-4.

There were a number of comments as well which raised other technical issues. Ford Motor Co. recommended deleting the language in proposed S4.1.1.36(a)(2) regarding the secondary aiming plane, saying that it was unnecessary and created confusion. However, NHTSA has adopted the language as proposed, in order to cover such theoretically possible headlamps as those with split slope, or reverse slope lens. Ford also requested that the agency not adopt a requirement that the outermost lamp or bulb produce the lower beam, arguing that it would be applicable only to replaceable bulb headlamps. The agency disagrees; Standard No. 108 already in essence requires this for sealed beam headlamps by specifying that Type 2 headlamps, those providing the lower beam, be as far apart as practicable.

Stanley Electric Co. Ltd. of Japan requested that there be no aim adjustment allowable, by consumers, between the high and low beam reflectors on headlamps with two light sources. NHTSA agrees, and this was the intent of the addition of paragraph (e)(1) to S.4.1.1.36. Stanley also requested language be added to the standard to permit adjustments during the manufacturing process. Such adjustments are already permitted and the agency believes that additional regulatory language is unnecessary. Thus, the reflector and requirements of S.4.1.1.36(e)(1) are adopted as proposed.

Ford and Volkswagen objected to the wiring harness requirements proposed in paragraph S4.5.9. VW argued that strict adherence might be precluded by assembly considerations. Ford believed it unduly design restrictive. NHTSA has concluded that this paragraph should prevent situations such as a four-lamp system from being used when only two lamps were intended to be used, and that in the absence of such a requirement there might be excessive glare and candela beyond the maximum allowed by the standard. Therefore the paragraph is being adopted as proposed.

General Electric requested a clarification of paragraph S4.1.1.36(b)(2) on how the aiming reference plane should be located in a photometer when measuring an inseparable two-lamp/two-bulb per lamp system, specifically whether the upper beam is measured on or off the photometric axis, assuming that the lower beam is measured on axis. NHTSA expects the aiming pads to be located on the optical axis of the lower beam portion of the headlamp when only one light source is used for the lower beam.

With respect to paragraph S6.7.2, Hella commented that the internal heat test for two-bulb headlamps was unnecessarily severe and costly because the test is repeated on both upper and lower beams in the same headlamp. The agency does not agree, because the power level is different for each beam, as is the location of thermal input. Thus, a warp in the headlamp housing could develop from heat in either location.

ETL Testing Laboratories raised the question as to compliance of a turn signal in a replaceable headlamp assembly. For example, if moisture is evidenced after the humidity test, does the turn signal fail to conform, even though it is required as a turn signal to meet only the water spray test in SAE J575, June 1970. NHTSA wishes to clarify that in this example, it is the headlamp assembly that is being tested for compliance, not the turn signal which, nevertheless, must conform to SAE J575 and other turn signal tests.

ETL also commented that warpage after thermal testing might be more severe above the line of the headlamp's mechanical axis. Without judging the merits of that comment, NHTSA believes that there could be a problem if the mechanical axis is not in front of a bulb; this could occur if two bulbs are used in a headlamp and the axis is midway between the bulbs. The agency is therefore revising some of the language in Subsections (A) and (B) of paragraph S4.1.1.36(d)(6). The phrase "when measured perpendicular to the aiming plane at the point of intersection of the mechanical axis with the exterior surface of the lens" is revised by deleting the word "mechanical" and substituting "replaceable light source."

The agency also asked for comments on several general issues related to replaceable bulb headlighting for which no specific requirements were proposed. NHTSA asked if there were a relationship between vehicle safety and the ability to replace a bulb without tools. As noted, NHTSA was under the impression that replaceable bulb headlamps *per se* would be designed with easily replaceable light sources, which would encourage timely replacement in the event of burn-out. Those who commented agreed with NHTSA's intuitive conclusions that safety would be benefitted but provided no quantitative assessment. GM believed that such a feature was preferable and stated that it planned to eliminate the need for tools in future designs. Comments generally supported the need for ease of replacement, and NHTSA will defer any further action on this issue for the present time.

NHTSA also expressed concern about replacement costs; the relationship between cost and the probability of replacement of the lamp or light source, the time lag that may exist between outage and replacement because of costs, and the extent to which cost consideration of non-mandated headlamps should enter into the agency's rulemaking considerations. Comments were varied and inconclusive, and the following are illustrative: a vehicle equipped with headlamps with a glass lens may have a higher lifetime cost than one equipped with headlamps with a polycarbonate lens because of the greater susceptibility to stone damage of glass lenses; the cost of light sources will probably fall when additional manufacturers enter the market; the time lag for any repair may be longer on an older car than on a newer one; no quantifiable relationship exists. If there were a common view it was that NHTSA's primary concern should be the performance of the headlamp itself, and the assurance that new types of systems should perform, at a minimum, as well as those currently allowed. Having received no clear-cut answers to its questions, NHTSA will continue to monitor these issues and defers further action.

NHTSA has considered this rule and has determined that it is not major within the meaning of Executive Order 12291, "Federal Regulation," or significant under Department of Transportation regulatory policies and procedures. A regulatory evaluation has been prepared and placed in the public docket. Since use of the proposed headlamps is optional, the rule will not impose additional requirements or costs but will permit manufacturers greater flexibility in use of headlighting systems.

NHTSA has analyzed this rule for the purposes of the National Environmental Policy Act. The rule may have a small positive effect on the human environment since the weight and quantity of materials used in the manufacture of headlamps would be reduced.

The agency has also considered the impacts of this rule in relation to the Regulatory Flexibility Act. I certify that this rule will not have a significant economic impact on a substantial number of small entities. Accordingly, no initial regulatory flexibility analysis has been prepared. Manufacturers of motor vehicle headlamps, those affected by this rule, are generally not small businesses within the meaning of the Regulatory Flexibility Act. Finally, small organizations and governmental jurisdictions would not be significantly affected since the price of new vehicles, headlamps, and aimer adjusters will be minimally impacted.

Because of the necessity of vehicle, headlamp, and bulb manufacturers to plan production and distribution on an orderly basis, it is found that an effective date earlier than 180 days after issuance of the final rule is in the public interest.

In consideration of the foregoing, 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, is amended as follows:

1. A new definition "Aiming Reference Plane" is added to Section S3 *Definitions* to read as follows:

"Aiming Reference Plane" means a plane which is perpendicular to the longitudinal axis of the vehicle and tangent to the forwardmost aiming pad on the headlamp.

2. The definition of "Replaceable Bulb Headlamp" in Section S3 *Definitions* is revised to read:

"Replaceable bulb headlamp" means a headlamp comprising a bonded lens and reflector assembly and one or two standardized replaceable light sources.

3. In paragraph S4.1.1.36 the word "two" is deleted.

4. In paragraph S4.1.1.36, the last sentence of paragraph (a)(2) is removed and the following four sentences added:

The lens of each replaceable bulb headlamp shall have three pads which meet the requirements of Figure 4. Except as provided in subparagraph (a)(3), a whole number, which represents the distance in tenths of an inch (i.e., 0.3 inch = 3) from the aiming reference plane to the respective aiming pads which are not in contact with that plane, shall be inscribed adjacent to each respective aiming pad on the lens. The height of these numbers shall be not less than .157 inch (4mm). If there is interference between the plane and the area of the lens between the aiming pads, the whole number will represent the distance to a secondary plane. The secondary plane shall be located paralled to the aiming reference plane and as close to the lens as possible without causing interference.

5. A new paragraph (a)(3) is added to paragraph S4.1.1.36 to read:

S4.1.1.36(a)(3) If the most forward aiming pad is the lower inboard aiming pad, then the dimensions may be placed anywhere on the lens. The dimension for the outboard aiming pad (Dimension F in Figure 4) shall be followed by the letter "H" and the dimension for the center aiming pad shall be followed by the letter "V". The dimensions shall be expressed in tenths of an inch.

6. Paragraph (b) of paragraph S4.1.1.36 is revised to read:

(b) Each replaceable bulb headlamp shall be designed to conform to the following sections of the specified SAE Standards and Recommended Practices with any standardized replaceable light source intended for use in such headlamp.

7. Paragraph (b)(2) of paragraph S4.1.1.36 is revised to read:

(2) Section 3.1—Test Voltage, and Section 3.5—Photometric Design Requirements, excluding Table 2, of SAE J579c "Sealed Beam Headlamp Units for Motor Vehicles" December 1978. The term "aiming plane" in paragraph 3.5 of SAE J579c shall mean "aiming reference plane."

8. Paragraphs (A) and (B) of paragraph S4.1.1.36 (d)(6) are revised by removing the words "mechanical axis" and replacing them with "axis of each replaceable light source."

9. A new paragraph (e) is added to S4.1.1.36 to read:

(e)(1) There shall be no mechanism that allows adjustment of an individual standardized replaceable light source or adjustment of reflector aim on a headlamp with two standardized replaceable light sources.

(2) Lower beam photometrics shall be provided by a filament designed with an average life of 320 hours.

(3) The lower and upper beams of a headlamp system consisting of two lamps, each containing two standardized replaceable light sources, shall be provided as follows:

(i) The lower beam shall be produced in one of the following ways:

(A) By the outboard light source (or the upper one if arranged vertically), designed to conform to the lower beam requirements of Table I of SAE Standard J579c *Sealed Beam Headlamp Units for Motor Vehicles*, Dec. 1978; or

(B) By both light sources, designed to conform to the lower beam requirements of Table I of SAE Standard J579c *Sealed Beam Headlamp Units for Motor Vehicles*, Dec. 1978.

(ii) The upper beam shall be provided in one of the following ways:

(A) By the inboard light source, (or the lower one if arranged vertically) designed to conform to the upper beam requirements of Table I of SAE Standard J579c *Sealed Beam Headlamp Units for Motor Vehicles*, Dec. 1978; or

(B) By both light sources, designed to conform to the upper beam requirements of Table I of SAE Standard J579c *Sealed Beam Headlamp Units for Motor Vehicles*, Dec. 1976.

(iii) Each such headlamp manufactured as replacement motor vehicle equipment shall be designed to meet the requirements of paragraphs (e)(3)(i) and (e)(3)(ii) of this section.

(4) The lower and upper beams of a headlamp system consisting of four lamps, each containing a single standardized replaceable light source, shall be provided as follows:

(i) The lower beam shall be produced by the outboard lamp (or upper one if arranged vertically), designed to conform to the lower beam requirements of Table I of SAE Standard J579c *Sealed Beam Headlamp Units for Motor Vehicles*, Dec. 1978. The lens of each such headlamp shall be permanently marked with the letter "L".

(ii) The upper beam shall be produced by the inboard lamp (or lower one if arranged vertically), designed to conform to the upper beam requirements of Table I of SAE Standard J579c *Sealed Beam Headlamp Units for Motor Vehicles*, Dec. 1978. The lens of each such headlamp shall be permanently marked with the letter "U".

(iii) Each such headlamp manufactured as replacement motor vehicle equipment shall be designed to meet the requirements of paragraphs (e)(4)(i) and (e)(4)(ii) of this section.

10. New paragraphs S4.5.8, S4.5.9, and S4.5.10 are added to read:

S4.5.8 The lower and upper beams of a headlamp system consisting of four lamps, each containing a single standardized replaceable light source, shall not be activated simultaneously, except momentarily for temporary signaling use.

S4.5.9 The wiring harness or connector assembly of a replaceable bulb headlamp with two standardized bulbs or a four-lamp replaceable bulb headlamp system shall be designed so that the filaments not intended to be used with the lens prescription in front of such filament shall not be illuminated.

S4.5.10 The filaments in a dual-filament standardized replaceable light source shall not be activated simultaneously except momentarily when switching between beams, or for temporary signaling use.

11. Paragraph S4.1.1.37 is revised to read:

S4.1.1.37 Each lens-reflector unit manufactured as replacement equipment for a replaceable bulb headlamp system shall be designed to conform to the requirements of S4.1.1.36 when any standardized replaceable light source is inserted in it.

12. Paragraph S4.1.1.39 and paragraph S8 are removed.

13. Paragraphs S6.7 and S6.8 are revised to read:

S6.7 *Temperature and internal heat tests*—A headlamp with one replaceable standardized light source shall be tested according to S6.7.1(a) and S6.7.2(a). A headlamp with two standardized replaceable light sources shall be tested according to S6.7.1(b), S6.7.1(c), S6.7.2(b), and S6.7.2(c).

S6.7.1 *Temperature cycle.*

S6.7.1(a) *Test for a headlamp with one standardized replaceable light source.* A headlamp, mounted on a headlamp test fixture, shall be exposed to 10 complete consecutive thermal cycles having the thermal cycle profile shown in Figure 6. During the hot cycle, the highest combination of filament wattages such as upper beam, fog lamp, parking lamp, and turn signal lamp, that are intended to be used simultaneously in the headlamp, shall be energized at design voltage commencing at point "A" of Figure 6 and deenergized at point "B". If a turn signal is provided, for test purposes it shall flash at 90 flashes per minute with a 75±2% current "on time." Separate or single test chambers may be used to separate the temperature environment described by the thermal cycle profile. All drain holes, breathing devices or other designed openings of the headlamp shall be in their normal operating positions.

(b) *Test for the lower beam of a headlamp with two standardized replaceable light sources.* A headlamp mounted on a headlamp test fixture, shall be exposed to 10 complete consecutive thermal cycles having the thermal cycle profile shown in Figure 6. During the hot cycle, the highest combination of filament wattages such as fog lamp, parking lamp, and turn signal lamp, that are intended to be used simultaneously in the headlamp when operating on lower beam shall be energized at design voltage commencing at point "A" of Figure 6 and deenergized at point "B". If a turn signal is provided, for test purposes it shall flash at 90 flashes per minute with a 75±2% current "on time." Separate or single test chambers may be used to separate the temperature environment described by the thermal cycle profile. All drain holes, breathing devices or other designed openings of the headlamp shall be in their normal operating positions.

(c) *Test for the upper beam of a headlamp with two standardized replaceable light sources.* A headlamp mounted on a headlamp test fixture shall be exposed to 10 complete consecutive thermal cycles having the thermal cycle profile shown in Figure 6. During the hot cycle, the highest combination of filament wattages such as fog lamps, parking lamps, and turn signal lamps, that are intended to be used simultaneously when the headlamp is operating on upper beam shall at design voltage be energized simultaneously commencing at point "A" of Figure 6 and deenergized at point "B". If a turn signal is provided, for test purposes it shall flash at 90 flashes per minute with a 75±2% current "on time." Separate or single test chambers may be used to generate the temperature environment described by the thermal cycle profile. All drain holes, breathing devices or other designed openings of the headlamp shall be in their normal operating position.

S6.7.2 *Internal Heat Test.*

(a) *Test for a headlamp with one standardized replaceable light source.*

(1) The lens surface of the headlamp that would normally be exposed to road dirt shall be sprayed uniformly with any appropriate mixture of dust and water or other material to reduce the photometric output at the test point H-V of the upper beam (or at the 1/2 °D-1/2 °R test point for lower beam if the headlamp is an "L" headlamp in a four-lamp system) to 25±2% of the output originally measured in the upper beam photometric test under S4.1.1.36(b). Such reduction shall be determined under the same conditions under which the original measurement was made.

(2) After the determination has been made that the photometric output of the lamp has been reduced as specified in S6.7.2(a)(1), the lamp and its mounting hardware shall be mounted in an environmental test chamber in the manner similar to that indicated in Figure 7 "Dirt-Ambient Test Setup." The headlamp shall be soaked for one hour at a temperature of 95+7-0 °F (35+4-0 °C) and then the highest combination of filament wattages that are intended to be used simultaneously when operating on upper beam (or lower beam for an "L" lamp headlamp) shall be energized for one hour in a still air condition, allowing the temperature to rise from 95 °F (35 °C).

(3) The lamp shall be returned to a room ambient temperature of 73+7-0 °F (23+4-0 °C) and relative humidity of 30±10%. The lens shall then be cleaned. Photometric output of the lamp shall be determined according to S6.1.

(b) *Test of the lower beam of a headlamp with two standardized replaceable light sources.*

(1) The lens surface of the headlamp that would normally be exposed to road dirt shall be sprayed uniformly with any appropriate mixture of dust and water or other material to reduce the photometric output at the test point 1/2 °D-1 1/2 °R or the lamp to 25±2% of the output originally measured in the lower beam photometric test under S4.1.1.36(b). Such reduction shall be determined under the same conditions under which the original measurement was made.

(2) After the determination has been made that the photometric output of the lamp has been reduced as specified in S6.7.2(b)(1), the lamp and its mounting hardware shall be mounted in an environmental test chamber in the manner similar to that indicated in Figure 7 "Dirt-Ambient Test Setup." The headlamp shall be soaked for one hour at a temperature of 95+7-0+F

(35+4-0 °C) and then the highest combination of filament wattages that are intended to be used simultaneously when operating on lower beam shall be energized simultaneously for one hour in a still air condition, allowing the temperature to rise from 95 °F (35 °C).

(3) The lamp shall be returned to a room ambient temperature 73+7-0 °F (23+4-0 °C) and relative humidity of 30±10%. The lens shall then be cleaned. The photometric output of the lamp on lower beam shall then be determined according to S6.1.

(c) *Test of the upper beam of a headlamp with two standardized replaceable light sources.*

(1) The lens surface of the headlamp that would normally be exposed to road dirt shall be sprayed uniformly with any appropriate mixture of dust and water or other material to reduce the photometric output at the test point H-V of the lamp to 25±2% of the output originally measured in the upper beam photometric test under S4.1.1.36(b). Such reduction shall be determined under the same conditions under which the original measurement was made.

(2) After the determination has been made that the photometric output of the lamp has been reduced as specified in S6.7.2(c)(1), the lamp and its mounting hardware shall be mounted in an environmental test chamber in the manner similar to that indicated in Figure 7 "Dirt-Ambient Test Setup." The headlamp shall be soaked for one hour at a temperature of 95+7-0 °F (33+4-0 °C) and then the highest combination of filament wattages that are intended to be used simultaneously when operating on upper beam shall be energized simultaneously for one hour in a still air condition, allowing the temperature to rise from 95 °F (35 °C).

(3) The lamp shall be returned to a room ambient temperature of 73+7-0 °F (23+4-0 °C) and relative humidity of 30+*10•. The lens shall then be cleaned. The photometric output of the lamp on the upper beam shall be determined according to S6.1.*

S6.8 Humidity. The headlamp mounted on a test fixture shall be placed in a controlled environment consisting of a temperature of 100+7-0 °F (38+*4-0*°C) with a relative humidity of not less than 90%. All drain holes, breathing devices, and other designed openings shall be in their normal operating positions. The headlamp shall be subjected to 20 consecutive 6-hours test cycles. In each cycle, it shall be energized for 1 hour at design voltage with the highest combination of filament wattages that are intended to be used and then deenergized for 5 hours. If the turn signal is provided, fokr test purposes it shall flash at 90 flashes per minute with a 75±2% current "on time." After completion of the last cycle, the lamp shall be soaked for 1 hour at 73+7-0 °F (20+4-0 °C) and relative humidity of 30±10% before it is removed for photometric testing. The headlamp shall be tested for photometrics at 10±1 minutes following completion of the humidity test.

14. In the Table II, under the column heading, "multipurpose passenger vehicles, trucks, and buses", the entry for the item "headlamps" is revised to read as follows:

Headlamps providing the upper beam at the same height, 1 on each side of the vertical centerline; headlamps providing the lower beam, at the same height, 1 on each side of the vertical centerline, as far apart as practicable. If a single lower beam light source is used in a headlamp with two standardized replaceable light sources, it shall be the farthest light source from the vertical centerline.

15. In Table IV, under the column heading, "Passenger cars, multipurpose passenger vehicles, trucks, and buses", the entry for the item "headlamps" is revised to read as follows:

Headlamps providing the upper beam at the same height, 1 on each side of the vertical centerline; headlamps providing the lower beam, at the same height, 1 on each side of the vertical centerline, as far apart as practicable. If a single lower beam light source is used in a headlamp with two standardized replaceable light sources, it shall be the farthest light source from the vertical centerline.

16. Fiqure 4-1 is revised as follows:

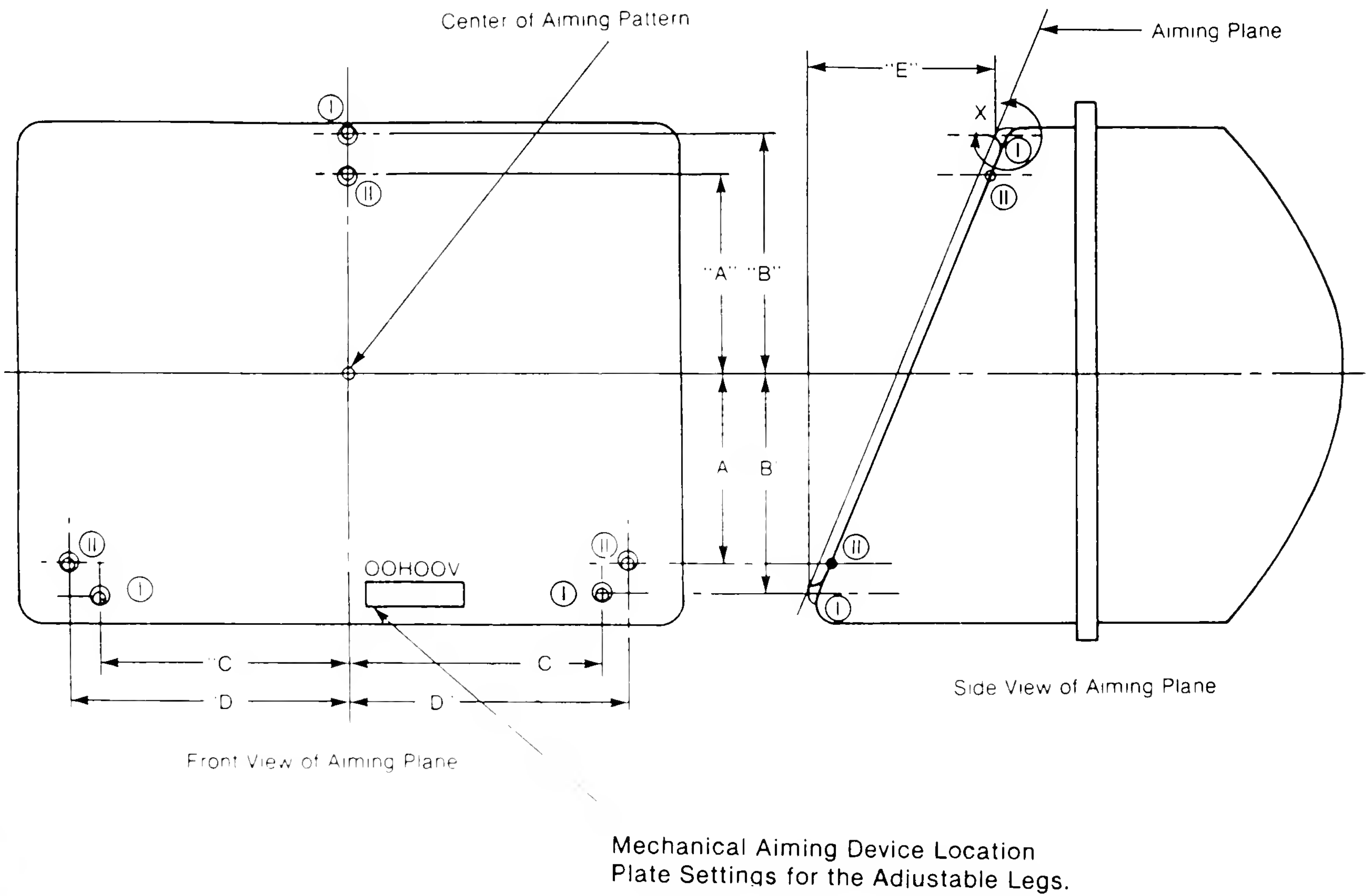


Figure 4-1. Dimensional Specifications for Location of Aiming Pads on Replaceable Bulb Headlamp Units

17. The title of Figure 4-2 is amended by removing the words "Dimensional * * * Units" from the heading.

18. In Figure 4-4 Dimension G and its dimensions in inches and millimeters are deleted.

19. In Figure 7 the width of the Block Box is changed from "16W" to "24W".

20. Figures 9-1 and 9-2 are removed.

Issued on May 17 1985

Diane K. Steed
Administrator

50 F.R. 21052
May 22, 1985

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices and Associated Equipment; Correction and Clarification [Docket No. 83-12; Notice 4]

ACTION: Final rule; correction and Clarification.

SUMMARY: This notice corrects an error in the amendment published on November 26, 1984 (49 FR 46386) relating to lamps, reflective devices and associated equipment. The error appears in Figure 1b. It is therefore necessary to correct the error. The maximum allowable value for parking lamp candlepower was omitted. Clarifications of Figure 1b are also provided.

SUPPLEMENTARY INFORMATION: In the final rule on harmonization amendments published on November 26, 1984 (49 FR 46386), in establishing Figure 1b to provide minimum and maximum candlepower values for certain lamps, the maximum allowable candlepower for parking lamps was inadvertently omitted and must now be reinstated. That value is 250 candela at test points below the horizontal and 125 canaela or above horizontal as specified by SAE Standard J222, December 1970, and is incorporated by reference in Standard No. 108. Footnotes clarifying requirements for taillamps and fron yellow turn signals are also added.

[8] 571.108 [Amended]

1. The authority citation for Part 571 continues to read as follows.

15 U.S.C. 1392, 1407; delegations of authority at 49 CFR 1.50 and 49 CFR 501.8.

2. On page 46390, Figure 1b 49 CFR 571.108 is revised as follows.

Lamp	Lighted Sections		
	1	2	3
Stop	80/300	95/360	110/420
Tail[1]	2/18	3.5/20	5.0/25
Parking[2]	4.0/125	-	-
Red Turn Signal	80/300	95/360	110/420
Yellow Turn Signal Rear	130/750	150/900	175/1050
Yellow Turn Signal Front	200/-	240/-	275/-
Yellow Turn Signal Front[3]	500/-	600/-	685/-

Figure 1b—Minimum and maximum allowable candlepower values.

1. Maximum at H or above.

2. The maximum candlepower value of 125 applies to all test points at H or above. The maximum allowable candlepower value below H is 250.

3. Values apply when the optical axis (filament center) of the front-turn signal is at a spacing less than 4 in. (10 cm.) from the lighted edge of the headlamp unit providing the lower beam, or from the lighted edge of any additional lamp installed as original equipment or used in lieu of the lower beam.

Issued on May 22, 1985

Barry Felrice
Associate Administrator
for Rulemaking

50 F.R. 21619
May 28, 1985

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO 108

Lamps, Reflective Devices and Associated Equipment; Clarifications [Docket No. 83-12; Notice 5]

ACTION: Final rule; clarifying amendments.

SUMMARY: This notice clarifies the rule published on November 26, 1984 (49 FR 46366), relating to lamps, reflective devices, and associated equipment through non-substantive amendments to paragraph S4.1.1.11 and Figure 1a.

EFFECTIVE DATE: June 6, 1985

SUPPLEMENTARY INFORMATION: Following publication of the harmonization amendments to Standard No. 108 on November 26, 1984 (49 FR 46366), the agency received several requests for clarification. After due consideration, it has decided that clarification is best provided by non-substantive amendments to the provisions in question.

The harmonization amendments substituted new paragraphs S4.1.1.11 and S4.1.1.12 for the old ones, requiring new Figures 1a, 1b, and 1c, to replace former Figure 1. With respect to motorcycle turn signal lamps, the values of Figure 1b have been substituted for those specified in paragraph S4.1.1.30 (which was unchanged and which allowed alternative compliance with either one-half of certain SAE values, or those of Figure 1). This means that S4.1.1.30 has been superseded, is technically incorrect, and may be eliminated from the standard. However, because new paragraph S4.1.1.11 has omitted stating that motorcyle turn signal lamps need meet only one-half the sums given in Figure 1b, the impression has been created that the grouped minimum candlepower method for testing motorcycle turn signal lamps is no longer available.

The agency intended no change in this requirement. NHTSA is therefore amending paragraph S4.1.1.11 to correct the misimpression, and to delete paragraph S4.1.1.30.

Paragraph S4.1.1.11 also references values in Figures 1a and 1b that are substituted for those in Table 1 of SAE "J585e Taillamps (at H or above)". The agency intended to state "(Maximum at H or above)", an omission which could create confusion and is now being corrected.

Finally a footnote is being added to Figure 1a to clarify that values shall be truncated after one digit to the right of the decimal point. For example, 95 cd x 12.6% = 11.875 cd, but the value to use is 11.8 cd, dropping the last two digits. The Figure is also being changed graphically to assure easier reading of the test grid percentages.

Because these amendments are non-substantive and provide clarifications, it is hereby found for good cause shown that notice and comment are unnecessary and an effective date earlier than 180 days after issuance is in the public interest. The amendments are effective upon publication in the *Federal Register*.

Sec. 571.108 [Amended]

The authority citation for Part 571 continues to read as follows:

1. The last sentence in paragraph S4.1.1.11 is revised to read:

S.1.1.11 ". . .The values specified in Figure 1a and Figure 1b are substituted for those specified in Table 1 of the following SAE Standards: J222 *Parking Lamps*, J585e *Taillamps* (maximum at H or above), J585c *Stop Lamps*, and J588e *Turn Signal Lamps*, except that motorcycle turn signal lamps need meet only one-half of the minimum photometric values specified in Figure 1b".

2. Paragraph S4.1.1.30 is deleted.

3. Figure 1a is revised as follows:

Test points (deg)		Turn Signal	Stop	Parking	Tail
10U, 10D......	5L, 5R	20	20	20	20
	20L, 20R	12.5	12.5	10	15
5U, 5D.......	10L, 10R	37.5	37.5	20	40
	V	87.5	87.5	70	90
	10L, 10R	50	50	35	40
H...........	5L, 5R	100	100	90	100
	V	100	100	100	100

Figure 1a—Required percentage of minimum candlepower of Figure 1b.

Minimum design candlepower requirements are determined by multiplying the percentage given in this Figure by the minimum allowable candlepower values in Figure 1b. The resulting values shall be truncated after one digit to the right of the decimal point.

Issued on May 30, 1985

Barry Felrice
Associate Administrator
for Rulemaking

50 F.R. 23813
June 6, 1985

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Federal Motor Vehicle Safety Standards; Lamps, Reflective Devices, and Associated Equipment
[Docket No. 82-16; Notice 4]

ACTION: Final rule.

SUMMARY: This notice amends Safety Standard No. 108 to allow installation of modulating headlamps on motorcycles. Such a headlamp, whose use is currently not allowed, could improve conspicuity of a motorcycle and its operator during daylight. The rule completes agency action following the agency's grant of a petition by Harley-Davidson Motor Co., Inc. A notice of proposed rulemaking (NPRM) was published on August 28, 1984, which was a revision of the notice of proposed rulemaking published on September 23, 1982. Although the notice also proposed amending Safety Standard No. 123 to establish location and operation requirements for headlamp modulator switches for new motorcycles on which modulating headlamps have been installed as original equipment, this proposal has not been adopted.

EFFECTIVE DATE: August 21, 1985.

SUPPLEMENTARY INFORMATION: Paragraph S4.6(b) of Standard No. 108 requires headlamps to be steady-burning when in use although allowing them to be flashed automatically for signalling purposes. This paragraph allows cycles of activation and deactivation of the headlamp but it has not been interpreted as allowing cycles of varying intensity (modulation).

Harley-Davidson Motor Co., Inc., of Milwaukee, a manufacturer of motorcycles, wished to introduce headlamp modulation as an option and petitioned the agency for an amendment to Standard No. 108 to allow it. The agency granted the petition and published an NPRM on September 23, 1982 (Notice 1, 47 FR 42009), later extending the time in which to comment (Notice 2, 47 FR 47896) upon petition by the American Motorcycle Association. A revised NPRM was published on August 28, 1984 (Notice 3, 49 FR 34050).

Background of 1982 NPRM

In 1979, on behalf of the agency, the Highway Safety Research Institute evaluated various means of increasing the conspicuity of motorcycles and their operators (DOT-HS-805143). More than 30 types of conspicuity treatments were developed. Three principal means of improvement were found. One was the wearing by the cyclist of a high visibility vest and helmet cover. Another was continual operation of the low beam of the headlamp during daylight (it is now the practice of virtually all cycle manufacturers to wire the headlamp so that it is on when the engine is running). The third was modulation of the upper beam of the headlamp from full to low intensity at three times per second. Data show that about 75 percent of motorcycle accidents occur in daytime. Therefore, enhancement of conspicuity during daylight hours is manifestly in the interests of motor vehicle safety. For this reason and because some State legislatures have shown interest in allowing modulated headlamps on their highways, NHTSA tentatively concluded that cyclists should be afforded an option to choose a headlamp wired to modulate on the upper beam from higher to lower intensity at a pulse rate from 150 to 240 cycles per minute.

The agency particularly solicited comments from States, and from individuals who had used these lamps. Emphasis was placed on whether there was a potential for misuse; for example, the likelihood of use of the modulating mode under conditions such as inclement weather or dusk when the steady-burning mode is required for safety.

Comments on 1982 NPRM

Over 150 comments were received on the initial NPRM, of which only 17 could be characterized as objecting to the proposal. The principal comments in opposition were submitted by the States of Maryland and Minnesota. Each raised the possibility that a motorcycle with a modulating white headlamp might be perceived as a potential emergency vehicle, since flashing white lights in those States are generally reserved for emergency vehicles. Maryland commented that a mixture of motorcycles with and without headlamps would compound the potential for confusion. It suggested mandatory usage of a measure other than modulating headlamps to enhance conspicuity. Minnesota asked for safeguards to prevent the modulator from being operated when steady-burning headlamps are required. Commenters also asked for an automatic fail-safe provision to allow headlamp use if the modulator or its circuit failed.

The issue of "photic driving" was raised by the Insurance Institute for Highway Safety, the National Society for the Prevention of Blindness, and others. This issue concerns potential adverse reactions in the central nervous system from regularly flashing lights, similar to epileptic seizures. These are termed "photic driving" and can occur in persons not otherwise prone to epilepsy. These commenters recommended that the agency determine whether modulating headlamps would cause a photic driving problem prior to permitting their use. Their main concern related to the rate of modulation that would be allowed. One commenter, the California Highway Patrol, suggested a rate between 200 and 280 cycles per minute, specified for use in that State.

A final group of commenters expressed concern that modulating headlamps would prove distracting to other drivers, either when viewed directly oncoming, or indirectly in rearview mirrors.

The agency gave lengthy consideration to all these comments and concluded that none of them justified termination of the rulemaking action. It also concluded that the standard should not be amended in the manner proposed, and that a further notice of proposed rulemaking would be required to implement the suggestions and allay the concerns expressed in the comments to the initial proposal.

The 1984 NPRM

The agency did not deem it likely that a modulating headlamp would be perceived as belonging to an emergency vehicle for several reasons. One is that usually there would be only one headlamp, or two closely spaced headlamps, flashing rather than a widely spaced pair as would be the case with an emergency vehicle. Also, emergency vehicles would normally have either red or blue flashing lights in addition to the flashing headlamps, which a motorcycle would not have. The modulated headlamp would also be substantially different than the white "strobe" lights that are used on emergency vehicles and which usually are intense, of short duration and flash at a higher rate than proposed for modulated headlamps. "Strobe" lights also have a sharp distinction between the "on" condition and the "off" condition whereas modulated headlamps make a gradual transition from a higher intensity to a lesser one.

NHTSA tentatively concurred with Minnesota's request for safeguards against misuse, and proposed, in essence, that any modulating system be automatically activated by ambient light so that when steady-burning headlamps are required (e.g., at night), the modulator could not be used. Also proposed was a requirement to prevent excessive voltage drops in the circuit caused by inferior switches. The limit for voltage drop was proposed at .45 volt.

The agency reviewed its proposed flash rate of 150 to 240 cycles per minute, and concluded that 150 cycles was too close to that of turn signals and hazard warning signals for its intended purpose. Because the State of California had specified 200 to 280 cycles per minute for 3 1/2 years with no apparent problems, the agency proposed a cycle rate of 240 ± 40 per minute.

With respect to the photic driving phenomenon, the agency tentatively concluded that modulating headlamps would cause no problem during daytime if a pulse rate of 4 per second (240 cycles per minute) were used. This conclusion was based upon two aspects of the phenomenon: the pulse rate of the light and the amount of contrast between the light and the background. From the available studies on the subject, it appeared that people are most likely to be affected if the light flashed at about 10 flashes per second (600 per minute) and/or when the background is very dark. Thus, modulation of headlamps at night within the proposed pulse rate could possibly produce a signal that is in the range of reported conditions that produce photic reactions. Accordingly, NHTSA proposed, in essence, that modulation be allowed only during daylight conditions. This could be accomplished through the use of a light sensor, which NHTSA believed could be incorporated into the system for less than $1.00. Specific comments were sought on the incremental cost of such a sensor. With such a device, headlamp modulation would cease when the level of ambient light falls below the normal daytime light level (or below the level of high intensity street lights). The sensor would be mounted either upward to measure direct light, from above the motorcycle, or downward to measure indirect light, reflected off the pavement beneath the motorcycle.

In developing this aspect of the proposal, NHTSA gave close attention to comments from Dotech, Inc., submitted to the docket on January 9, 1984, and April 30, 1984. Dotech had measured both incident light and reflected light levels from various types of street lighting in parking lots and on parkways at night to determine appropriate values for direct or reflected light to deactivate the modulator. Dotech found that incident light levels did not change significantly when it moved its light meter from waist level up and down several feet, while conducting direct light measurements under street lights located 30 feet above the pavement. Dotech initially concluded that the modulator sensor should have a vertical orientation to avoid light reflected from headlamps or other sources, and that appropriate values appeared to be 430 lux (40 foot-candles) of direct light, or 150 lux (13.9 foot-candles) of indirect reflected light. Subsequently, however, Dotech recommended 270 lux (25 foot-candles) for direct light and 60 lux (5.6 foot-candles) for reflected light as more appropriate based on its experiments. Accordingly, NHTSA proposed that modulator systems be equipped with a sensor which would deactivate the modulator whenever the light level appropriate for the sensor's orientation is reached. The upward or downward orientation of the sensor would be at the option of the manufacturer. The light source NHTSA proposed to use in its compliance test of the systems would be a tungsten filament lamp operating at 3000° Kelvin. Because of the dearth of comments in this area, other than that of Dotech, and because of Dotech's own modified conclusions, NHTSA was particularly interested in additional comments on the appropriateness of the values of direct and reflected light that is proposed.

There were also additional features that were not proposed in the initial notice that NHTSA proposed to incorporate into a modulating headlamp standard. The first of these was the proposal of a modulation depth limit to assure that not less than 17 percent of full luminous intensity is available regardless of lamp wattage. This would serve to prevent early bulb filament failure and to ensure that a distinction remains between the modulating headlamp and flashing strobe lights used on emergency vehicles, as well as lessening the likelihood of a "photic response".

To assure performance of the headlamp modulator, NHTSA proposed an accelerated environmental requirement comprised of a temperature and humidity test. NHTSA proposed to use the SAE Standard for vehicle hazard warning signal flashers, J945b, as a guide to thermal extremes, acceptable voltage variation and general procedure. Humidity exposure was added as were performance checks at each environmental extreme. The test duration proposed was 60 hours.

With respect to the aftermarket, NHTSA proposed only that each modulator be labelled with the maximum wattage for which it is intended. Some motorcycles, for example, may have two 70-watt headlamps while others may have a single 35-watt headlamp. The consumer must be provided information to determine whether a modulator is sufficient to drive high-wattage or multiple headlamps.

A companion amendment to Standard No. 123, *Motorcycle Controls and Displays*, was proposed for location and operation requirements for modulator switches on vehicles equipped by their manufacturers with modulating headlamps. The agency specifically invited comments on the location of the Modulate position on the Headlamp Beam Control Switch.

Comments on 1984 NPRM

Over 50 comments were received in response to the second NPRM, virtually all of which supported it and some of which suggested minor modifications and refinements that the agency has adopted.

The first significant issue raised was whether modulation might not be allowed on the lower beam (only the upper beam was proposed), with some commenters expressing the opinion that the lower beam modulation might be less irritating to oncoming drivers, as well as being consistent with the driving requirement of dimming upper beams when approaching other vehicles. Intuitively this comment has appeal and NHTSA has concluded that lower beam modulation should be permitted for the reasons discussed below.

In studies of daytime running lights, a value of 1500 candela has been found sufficient to demonstrate conspicuity of a passenger car more than a mile away. Therefore, the 3000 candela that most motorcycle headlamps have at the H-V test point would be more than sufficient for conspicuity. In addition, the requirement that the minimum intensity during modulation be not less that 17% of full-on intensity during modulation reduces the possibility that modulation will be less effective for conspicuity than a steady-burning lower beam.

There are additional factors in support of allowing modulation on the lower beam. An increasing number of motorcycles are being equipped with headlamps of greater wattage. For these motorcycles, use of the upper beam for modulation might create a glare problem. On the other hand, smaller motorcycles with headlamps of no greater output than 35 watts may find an upper beam modulator more effective. Based upon the comments, NHTSA has decided to allow modulation on either the upper or lower beam, at the manufacturer's option. The headlamp would not be permitted to modulate on the beam not chosen, and therefore, the operator would not be able to switch the beam for which modulation was produced by the manufacturer. NHTSA also proposed that the modulator be equipped with a sensor that would activate and deactivate it. Comments were generally directed to factors which might impair satisfactory operation of the sensor, such as mounting in a shielded location where light might not reach it, or in a location where it could be obscured by dirt. The effect of either of these factors would be to deactivate the device at a time when it should be functioning. No further comments were received on the issue of photic driving.

Harley-Davidson expressed particular concern that the reliability of the sensor would be reduced by the addition of components to provide the light sensing functions, raising the possibility that if it failed in one mode it might not operate at all, but that failure in another would cause continuous operation. Further, comments were made to the effect that a manufacturer of a modulator, Dotech, had applied for patents that cover the construction of the light sensor and that NHTSA might be in the position of having written a standard that mandated a design that was under the monopoly control of the patent holder. NHTSA has reviewed these comments. The manual by-pass switch required for these systems will assure the restoration of normal operation in the event of a malfunction in the modulator. Further, the humidity-temperature test that was proposed and now adopted will insure system reliability. Although Dotech has applied for patents, it is only one manufacturer of modulating devices. While Dotech uses a light sensing transistor for a light detector, a number of other types of light sensors can be used, such as solar cells and light dependent resistors.

The notice proposed a maximum allowable voltage drop of .45 volt across the modulator during operation. Koito commented that it was impossible to meet this requirement with high wattage headlamps since the voltage drop across the transistor is increased. Koito recommended 1.5 volts, or, alternatively no requirement. The suggested 1.5 volt value is unacceptable to the agency as it could result in a reduction to 65% of normal intensity during nighttime when the lights are steady-burning. NHTSA is aware of transistor switches which are available which can handle power requirements without excessive voltage drop. Another possible solution to the problem is the use of mechanical relays in a hybrid circuit with switch transistors. Therefore NHTSA has adopted the proposed voltage drop of .45.

Part of the proposed temperature-humidity test involves operation of the modulator at -25 °F for three hours. Some commenters objected to the temperature arguing that few will ride their motorcycles at such an extremely low temperature. The agency wishes to insure that modulators remain operative when subjected to temperatures of the sort that have been experienced through wide areas of the United States during winters in the past ten years. Motorcycles may be exposed to this extreme at times other than when in use; for example, when parked overnight. Current SAE standards on flashers and switches require operation at -25 °F and the proposed test values were taken from these SAE requirements which reflect industry capability and practice. The agency understands that modulators can operate at this temperature, and is therefore adopting the value as proposed.

NHTSA also proposed that the headlamp dimmer switch incorporate a modulator position when this feature is offered as original equipment. Two commenters indicated that frequent use of the modulator switch is not required, and that it does not have to be as accessible as the upper-lower beam switch. In addition, the requirement would not cover the switch for aftermarket modulators.

For these reasons, NHTSA has not adopted the position indicator proposal, nor the companion proposal to amend Safety Standard No. 123 to identify the modulator position.

NHTSA has considered the impacts of this rule and has determined that it is neither major within the meaning of Executive Order 12291 nor significant under Department of Transportation guidelines regarding regulatory policy and procedure. The rule will have an impact only on those who voluntarily choose to produce and buy an alternative headlamp. Because the modulating headlamp will not be required but is simply an option to a standard motorcycle headlamp, there will be no mandatory increased manufacturing costs connected with this proposal. The cost to the purchaser who chooses a headlamp with a modulating switch would be about $40. However, since this feature would presumably be desired only by those purchasers who selected it as an option, NHTSA does not anticipate any impact on motorcycle sales. The impacts of this rule are so minimal that preparation of a regulatory impact analysis or a full regulatory evaluation is not warranted.

NHTSA has analyzed this rule for the purpose of the National Environmental Policy Act, and has determined that it would not have a significant effect on the human environment since neither the weight not quantity of materials used in the manufacture of the lamps is greatly affected.

The agency has also considered the impacts of this rule in relation to the Regulatory Flexibility Act. I certify that this rule would not have a significant economic impact on a substantial number of small entities. Accordingly, the agency has not prepared a flexibility analysis. Manufacturers of motorcycle headlamps and modulators, those affected by the proposal, are generally not small businesses within the meaning of the Regulatory Flexibility Act. Further, compliance with the adopted changes is optional. Small organizations and governmental jurisdictions would be affected only to the extent that law enforcement agencies chose to purchase motorcycles with modulating headlamps.

Because the amendment relieves a restriction and does not impose a burden upon any party, it is hereby found for good cause shown that an effective date earlier than 180 days after issuance is in the public interest, and its amendment is effective 30 days after publication in the Federal Register.

The engineer and attorney primarily responsible for this notice are Jere Medlin and Taylor Vinson, respectively.

List of Subjects in 49 CFR Part 571

Imports, Motor vehicle safety, Motor vehicles, Motor vehicle equipment, Lamps-reflective devices and associated equipment.

PART 571—FEDERAL MOTOR VEHICLE SAFETY STANDARDS

In consideration of the foregoing, 49 CFR 571.108 is amended as follows:

§ 571.108 [Amended]

1. The authority citation for Part 571 continues to read as follows:

Authority: 15 U.S.C. 1392, 1401, 1403, 1407; delegation of authority at 49 CFR 1.50.

2. Paragraph S4.6 is redesignated S4.5.11 and revised to read:

S4.5.11 The wiring requirements for lighting equipment in use are:

(a) Turn signal lamps, hazard warning signal lamps, and school bus warning lamps shall be wired to flash;

(b) High-mounted stop lamps on passenger cars manufactured on or after August 1, 1984, but before September 1, 1986, may flash when the hazard warning system is activated;

(c) Headlamps and side marker lamps may be wired to flash for signalling purposes;

(d) A motorcycle headlamp may be wired to allow either its upper beam or its lower beam, but not both, to modulate from a higher intensity to a lower intensity in accordance with section S4.6;

(e) All other lamps shall be wired to be steady-burning.

3. A new section S4.6, *Motorcycle headlamp modulation system* is adopted to read:

S4.6 *Motorcycle headlamp modulation system.*

S4.6.1 A headlamp on a motorcycle may be wired to modulate either the upper beam or the lower beam from its maximum intensity to a lesser intensity provided that:

(a) The rate of modulation shall be 240$\pm$40 cycles per minute.

(b) The headlamp shall be operated at maximum power for 50 to 70 percent of each cycle.

(c) The lowest intensity at any test point shall be not less than 17 percent of the maximum intensity measured at the same point.

(d) The modulator switch shall be wired in the power lead of the beam filament being modulated and not in the ground side of the circuit.

(e) Means shall be provided so that both the lower beam and upper beam remain operable in the event of a modulator failure.

(f) The system shall include a sensor mounted with the axis of its sensing element perpendicular to a horizontal plane. Headlamp modulation shall cease whenever the level of light emitted by a tungsten filament light operating at 3000° Kelvin is either less than 270 lux (25 foot candles) of direct light for upward pointing sensors or less than 60 lux (5.6 foot-candles) of reflected light for downward pointing sensors. The light is measured by a silicon cell type light meter that is located at the sensor and pointing in the same direction as the sensor. A Kodak Gray Card (Kodak R-27) is placed at ground level to simulate the road surface in testing downward pointing sensors.

(g) When tested in accordance with the test profile shown in Figure 9, the voltage drop across the modulator when the lamp is on at all test conditions for 12 volt systems and 6 volt systems shall not be greater that .45 volt. The modulator shall meet all the provisions of the standard after completion of the test profile shown in Figure 9.

(h) Means shall be provided so that both the lower and upper beam function at design voltage when the headlamp beam control switch is in either the lower or upper beam position when the modulator is off.

S4.6.2(a) Each motorcycle headlamp modulator not intended as original equipment, or its container, shall be labelled with the maximum wattage, and the minimum wattage, appropriate for its use. Additionally, each such modulator shall comply with S4.6.1 (a) through (g) when connected to a headlamp of the maximum rated power and a headlamp of the minimum rated power and shall provide means so that the modulated beam functions at design voltage when the modulator is off.

(b) Instructions, with a diagram, shall be provided for mounting the light sensor including location on the motorcycle, distance above the road surface, and orientation with respect to the light.

4. A new Figure 9 would be added as follows:

Issued on July 16, 1985

Diane K. Steed
Administrator

50 F.R. 29676
July 22, 1985

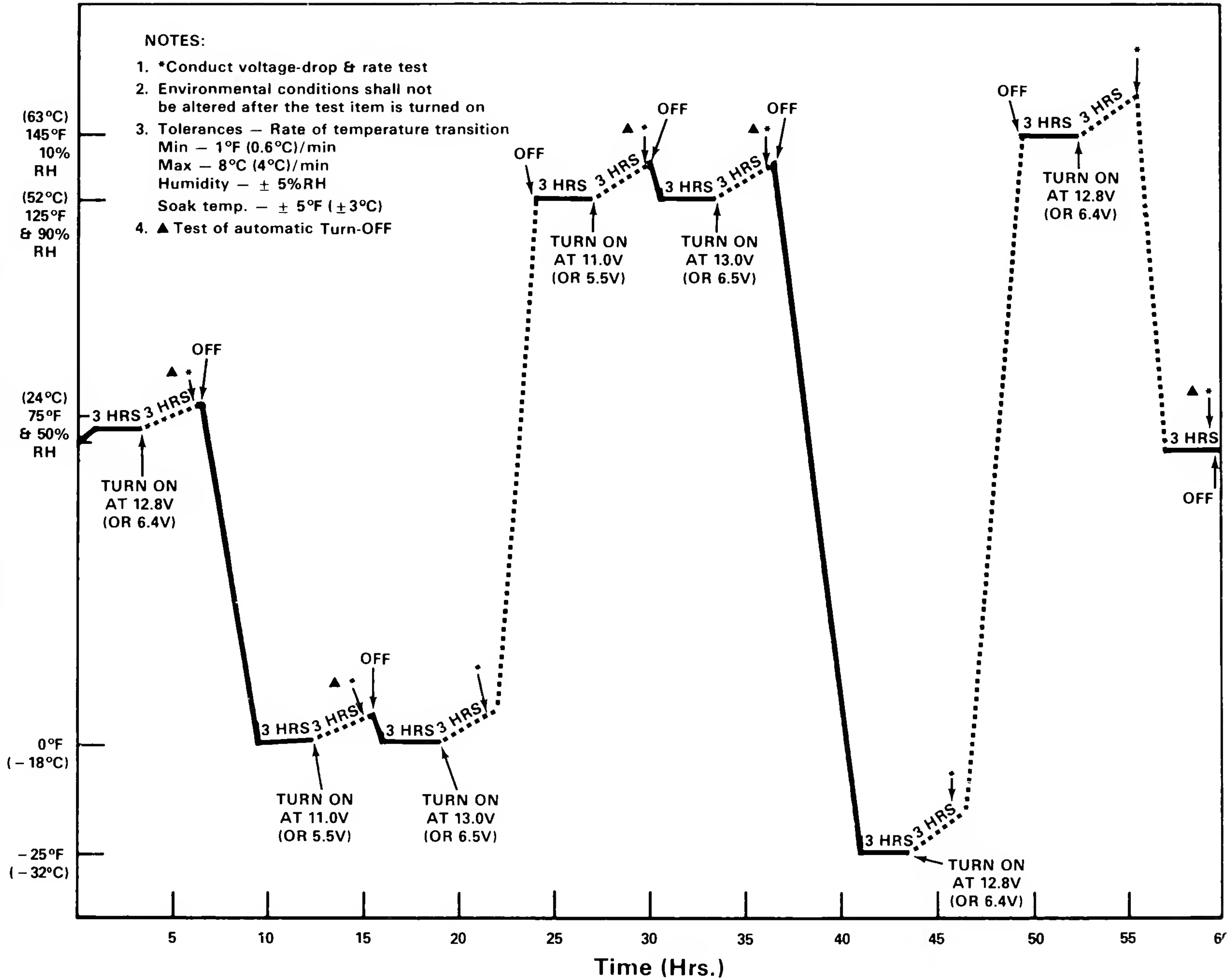


Figure 9
Temperature-Humidity Environmental Test Profile

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Federal Motor Vehicle Safety Standards; Lamps, Reflective Devices, and Associated Equipment [Docket No. 82-04; Notice 2]

ACTION: Final rule.

SUMMARY: This notice amends Safety Standard No. 108 to provide an alternate location for front identification lamps on multipurpose passenger vehicles, trucks and buses whose overall width exceeds 80 inches. The rule allows them to be mounted on the top of the cab instead of "as close as practicable to the top of the vehicle." This action completes rulemaking on a petition by the Truck Body and Equipment Association.

EFFECTIVE DATE: October 12, 1985

SUPPLEMENTARY INFORMATION: Paragraph S4.1.1 and Table I of 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, requires trucks, multipurpose passenger vehicles, and buses of 80 or more inches overall width to be equipped with a series of three identification lamps mounted on the front and rear of the vehicle. According to Table II of Standard No. 108, this location must be "as close as practicable to the top of the vehicle." The Truck Body and Equipment Association (TBEA) petitioned for an amendment that would allow front identification lamps to be mounted, as an alternative, on the cab. In TBEA's view, safety would not be reduced since the lamps would still perform their function of identifying the presence of large vehicles in the roadway, and clearance lamps would still mark the height and width of the vehicle. It argued that an analogous precedent was found in paragraph S4.3.1.6 which allows clearance lamps to be mounted on the cab of a truck tractor to indicate overall width of the cab rather than the vehicle. To allow identification lamps also to be mounted on the cab will, in TBEA's opinion, reduce manufacturing costs.

A notice of proposed rulemaking on this subject was published on February 22, 1982, and an opportunity afforded for comment (47 FR 7711).

Nine comments were received on the proposal, six of them directly supporting it. The three remaining comments were directed towards an alleged necessity for a general review of requirements for identification lamps. Motor Vehicle Manufacturers Association and American Trucking Association commented that in their view no safety basis existed for evaluating the proposal. Wisconsin Electric Power Company suggested that the lamps could be eliminated.

The agency did not consider elimination of the identification lamps, convinced that they are needed on larger vehicles to indicate their presence on narrow or congested roads, curves, and during inclement weather, in order to afford other motorists a cue to vehicle size, assisting them in avoiding accidents.

Those supporting the proposal pointed out that tractor-trailers are required to have identification lamps on the truck tractor cab, but not on the trailer, and therefore the cab is an appropriate location for them. Further, there is a potential for a small cost savings. Many chassis-cab manufacturers install identification lamps on the cab. If the body mounted to it is higher than the cab, the final-stage manufacturer must now add an additional set of identification lamps to meet the requirement that they be located "as close as practicable to the top of the vehicle." Implementation of the proposal will relieve the final-stage manufacturer of the necessity of adding identification lamps when they are already on the chassis-cab. This would serve to reduce costs where this manufacturing practice is being followed.

NHTSA has decided to adop the proposal. In recognition of the fact that many manufacturers may wish to avail themselves of this option on a regular basis, NHTSA is amending Table II to specify that mounting the identification lamps as close as practicable to the top of the cab is an alternate location rather than one which is only an exception to the general rule that such lamps be mounted as close as practicable to the top of the vehicle.

Potential Benefits, Costs and Other Impacts

The primary benefit attributable to implementation of the rule is the slight reduction in the cost of manufacturing which petitioner believes will occur. Because identification lamps are presently required, there will be no increased manufacturing cost connected with this rule. NHTSA has considered the impacts of this rule and has determined that it is neither major within the meaning of E.O. 12291 nor significant under Department of Transportation guidelines regarding regulatory policy and procedure. The rule will have an impact only on those who voluntarily change their lighting systems from one location to another. The impacts are so minimal that preparation of a regulatory evaluation is not warranted. This rule would not have a significant effect on the human environment since neither the weight nor quantity of materials used in the manufacture on installation of the lamps is affected. Further, no impact on safety is anticipated. I certify that this rule would not have a significant economic impact on a substantial number of small entities. Manufacturers of motor vehicles and chassis-cabs, those affected by the rule, are generally not small businesses within the meaning of the Regulatory Flexibility Act. Further, those effects would not be significant given the minimal cost reductions associated with the rule.

Finally, small organizations and governmental jurisdictions will not be significantly affected since the price of new vehicles will be minimally impacted.

Because the rule relieves a restriction and imposes on additional burdent on any person, it is hereby found for good cause shown that an effective date earlier that 180 days after issuance is in the public interest. The admendment is effective 30 days after its publication in the *Federal Register.*

In consideration of the foregoing, Table II of 49 CFR 571.108 is amended as follows:

TABLE II—LOCATION OF REQUIRED EQUIPMENT

Multipurpose Passenger Vehicles, Trucks, Trailers, and Buses, of 80 or More Inches Overall Width

Item	Location on— Multipurpose passenger vehicles, trucks, and buses	**	*
*	* *	*	*
Identification lamps	On the front and rear—3 lamps, amber in front, red in rear, as close as practicable to the top of the vehicle, at the same height, as close as practicable to the vertical centerline, with lamp centers spaced not less than 6 inches or more than 12 inches apart. Alternatively, the front lamps may be located as close as practicable to the top of the cab.		
*	* *	*	*

Issued on September 4, 1985

Dianne K. Steed
Administrator

50 FR 36995
September 11, 1985

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLES SAFETY STANDARD NO. 108

Lamps, Reflective Devices and Associated Equipment; Corrections [Docket No. 81-11; Notice 14]

ACTION: Final rule; corrections.

SUMMARY: This notice corrects three errors in the amendment published on May 22, 1985, relating to lamps, reflective devices and associated equipment. The errors appear in the amendments to paragraph S4.1.1.36, paragraph S4.1.1.36(e)(4)(ii), and paragraph S6.7.1(a). It is therefore necessary to correct the errors.

SUPPLEMENTARY INFORMATION: On May 22, 1985, Motor Vehicle Safety Standard No. 108 was amended to allow motor vehicles other than motorcycles to be equipped with replaceable bulb headlamp systems consisting of either four lamps with single standardized replaceable light sources, or two lamps each with two such light sources. (50 FR 21052) The Notice consisted of 20 amendments and contained several errors. This notice refers to the numbers of the amendments containing the errors, and corrects them.

In amendment 3, paragraph S4.1.1.36 was amended to delete the word "two." That word, however, appears in two places in the paragraph and it was NHTSA's intent to delete it only with reference to permissible headlighting systems on four-wheeled motor vehicles, and not to delete it for motorcycles. In reviewing this error, NHTSA has concluded that the paragraph should be rewritten to more clearly state NHTSA's intent, and thus is correcting the error by revising this paragraph in a manner which does so.

In amendment 9, as published, the last sentence of paragraph S4.1.1.36(e)(4)(ii) reads: "The lens of each such headlamps shall be permanently marked with the letter 'U.'" A corrective amendment is made to delete a superfluous "such."

In amendment 13, the title of paragraph S6.7.1(a) appeared as "Test for a headlamp with on standardized replaceable light source." "On" should be "one."

1. Paragraph S4.1.1.36 is revised to read:

"S4.1.1.36 Instead of being equipped with a headlighting system specified in Table I or Table III, a motor vehicle manufacturer on or after July 1, 1983, may be equipped with a system of one or two replaceable bulb headlamps, if the vehicle is a motorcycle, or two or four replaceable bulb headlamps, if the vehicle is a passenger car, multipurpose passenger vehicle, truck or bus. Each replaceable bulb headlamp shall be designed to conform to the following requirements."

2. On page 21056, the last sentence of subparagraph (e)(4)(ii) of paragraph S4.1.1.36 is revised to read: "The lens of each such headlamp shall be permanently marked with the letter 'U.'"

3. On page 21057, the title of subparagraph (a) of paragraph S6.7.1 is revised to read "(a) *Test for a headlamp with one standarized replaceable light source.*"

Issued on September 10, 1985

Barry Felrice
Associate Administrator
for Ruleing King

50 FR 37857
September 18, 1985

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices and Associated Equipment

(Docket No. 84-4; Notice 4)

ACTION: Final Rule—Modifications to Type F Headlamp Systems: Optional Compliance.

SUMMARY: This notice amends Safety Standard No. 108 to allow a manufacturer to provide an enhanced upper beam in Type F headlamp systems by wiring the lower beam headlamp to be activated simultaneously with the upper beam headlamp.

Type F headlamps feature identical aiming and seating planes, with the intention that re-aiming will not be necessary when a correctly aimed Type F headlamp is replaced with another Type F. The standard is also amended to provide that each half of the system may be aimed simultaneously if the manufacturer chooses (aiming the lower beam headlamp would automatically re-aim the upper beam lamp), but in order to permit this option, the re-aim tolerance of 1/4 degree for photometric performance compliance will not be permitted for the upper beam headlamp in the Type F system.

This rule is based upon comments to a notice of proposed rulemaking published on May 13, 1985. The agency also proposed, but is not adopting the proposal that Type F lamps be permitted to have an auxiliary filament in the lower beam lamp to be used for purposes other than upper or lower beam performance.

EFFECTIVE DATE: April 18, 1986

SUPPLEMENTARY INFORMATION: When Standard No. 108 was amended to adopt the small four-lamp rectangular headlamp system known as Type F (49 FR 50176), three aspects of the original proposal (49 FR 18321) were reserved for further discussion. These were the use of the lower beam headlamps (Type LF) when the upper beam lamps (Type UF) were activated, simultaneous aim of pairs of headlamps on each side of the vehicle, and the desirability of an optional auxiliary filament in the lower beam lamp. NHTSA had decided that further comment on these issues was desirable before a decision could be made about incorporating them into the Type F system, and issued a second proposal on May 13, 1985 (50 FR 19986). This notice discusses the second proposal and NHTSA's decisions with respect to modifications in the Type F system.

Simultaneous Use of Upper and Lower Beam Headlamps

NHTSA finds merit in the concept of having additional light available during upper beam operation to increase roadway illumination. Such light is readily available from the lower beam filament in the LF lamp. However, since Type F's upper beam (Type UF) lamp alone can meet current upper beam photometric requirements and already exceeds current minimum requirements, there is little or no basis upon which to mandate even more light by requiring the simultaneous use of both beams during upper beam selection, and NHTSA therefore proposed that this method of wiring the headlamps be at the option of the vehicle manufacturer. However, in order to reduce the possibility of excessive foreground light and glare resulting from simultaneous use, NHTSA proposed two new lower beam test points in Type LF lamps, and maximum photometric values for them, 7,000 cd at test point 4D-V (Down-Vertical), and 5,000 cd at the H-V (Horizontal-Vertical) axis. NHTSA tentatively concluded that adopting these new maximum values at 4D-V and H-V would allow safe simultaneous use of the lower and upper beam headlamps during upper beam operation.

Commenters supported the proposal as specified. The California Highway Patrol (CHP) expressed reservations about removing the option from the driver's control though convinced of the occasional utility of a supplement to the upper beam.

NHTSA does not agree with the CHP on this issue. While a driver might be in the best position to decide whether to use additional illumination, as NHTSA has stated before, it believes that additional specifications would be needed to ensure fail-safe switching from the upper beam or upper/lower beam to the lower beam alone, and that an additional warning telltale might be required as well. NHTSA does not believe that the benefits of allowing this choice to the driver would outweigh the costs, and the final rule adopts simultaneous use as a wiring option for the manufacturer rather than an operational option for the driver.

Simultaneous Aim (Co-Aiming) of Headlamps

General Motors, the developer of the Type F system, recommended a method to aim simultaneously both the upper and lower beam headlamps. Both lamps would be mounted in a common housing and have a common aim adjustment to permit such "co-aiming". It would be possible to co-aim both lamps as long as the combination of the two lamps in the common co-aiming assembly could meet the overall photometric requirements. The agency proposed that Type F lamps could be mounted on common and parallel seating and aiming planes provided that: (a) when tested in accordance with the provisions of Standard No. 108, the assembly is designed to conform to the test point values of the revised Figure 15 and (b) there shall be no provision for adjustment between the common or parallel aiming and seating planes of the two lamps. The agency also proposed to remove the ±1/4 degree re-aim tolerance for the UF headlamp and to permit that tolerance to be allowed for the co-aiming assembly.

Ten of the 11 commenters to the docket concurred, the eleventh, Insurance Institute for Highway Safety, offering no comment on the point. Many of the comments asked for clarification of the language in the test procedure for co-aiming. The agency has clarified the test procedure by providing that the assembly shall be located on a goniometer placed at least 60 feet from the photometer. The LF lamp is aimed mechanically by centering the unit on the photometer axis and aligning its aiming plane to be perpendicular to the photometer axis. The assembly is then moved in a plane parallel to the established aiming plane of the LF unit until the UF lamp is centered on the photometer axis. The photometry measurement of the UF lamp is completed by using the aiming plane thus established, and allowing a ±1/4 degree re-aim tolerance for meeting the test points as measured in the co-aimed assembly.

To provide consistency in the aiming requirements, it was also proposed that testing of the individual lamps could not include a ±1/4 degree re-aim tolerance for the UF lamp alone. Therefore, paragraph S4.1.1.43(b) and Figure 15 have been revised to accomplish this. Heretofore, such allowances were placed in Figure 15, however for regulatory consistency, such allowances and restrictions should be placed in the text as other requirements are. Paragraph S4.1.1.43(b) now includes such requirements and Figure 15 does not. This arrangement of photometric and construction specifications assures that the entire assembly will be properly aimed in service if a mechanical aimer is used to aim the LF lamp in co-aimed assembly. However, if optical aiming is used or if a mechanical aimer is used in conjunction with the UF lamp of the assembly, the in-service aim of the assembly may be in error. As a partial remedy to the possibility of using a mechanical aimer in conjunction with the UF lamp, a safeguard was originally proposed in the first NPRM for the Type F headlamp system. This proposal would have required manufacturers to provide a means of preventing use of the mechanical aimer on the UF lamp of the co-aimed assembly. However, the proposal was not included in the second NPRM because NHTSA tentatively concluded that without similar provision to prevent optical or visual aiming, only a portion of the problem would be addressed. Labelling could be provided as a guide to reduce the likelihood of optical aim, but the likelihood of success is unknown.

There is also the question of whether or not the possibility of use of inappropriate aiming procedures in service is likely to have a significant safety impact. NHTSA believes that the likelihood of there being a significant safety impact is low. Because properly aimed Type F headlamps may be replaced without re-aim, and because the co-aim assembly will have only two aiming screws, NHTSA believes that these assemblies will usually be treated as a two beam headlamp is treated in that the lower beam is used for aiming purposes. Consequently, NHTSA will allow the optional use of co-aiming, using the clarified procedure above, but will not require the prevention of aim of the upper beam lamp.

Optional Auxiliary Filament in the Lower Beam Lamp

Incorporation of an optional auxiliary filament in the Type F system was a feature of the original GM design, which was subsequently deleted by the developer. In the original rulemaking, NHTSA determined that there were no safety reasons to mandate or permit its use. However, because Chrysler Corporation strongly recommended the incorporation of the auxiliary filament for safety purposes other than upper beam or lower beam use, the agency again proposed its optional inclusion. Specifically, Chrysler would use the auxiliary filament to increase conspicuity of the vehicle during daytime operation.

Five commenters opposed the proposal while three were in favor of it and one, the California Highway Patrol, was neutral. Of the three, Chrysler suggested that it could be used to provide a daytime running light. North American Phillips saw no reason to oppose it. American Motors commented that manufacturers should have the design flexibility to use such a filament. GM offered arguments against the auxiliary filament similarly to those previously offered, stating that the auxiliary filament would reduce lamp life and reliability, reduce bulb reliability, cause a filament shadow during lower beam use, and increase cost. Commenters recommended against it on the basis that it was premature to permit such a feature which could adversely affect headlamp performance when the need and specifications for daytime running lights remain to be determined. Additionally, because the auxiliary filament would be unregulated in both design and performance, manufacturers could choose to use the filament for other functions where optics must be controlled, such as for use as driving or fog lamps, with the possibility of a resulting optical prescription for the lens that would be in conflict with that necessary for a headlamp. The inappropriate prescription would thereby compromise lower beam performance. Should lamps with auxiliary filaments be produced, the headlamps would be physically interchangeable, but would not be functionally interchangeable. In addition this would result in proliferation without accompanying advantages for the public. Accordingly, NHTSA has not adopted the proposal to allow a third type of Type F headlamp, one incorporating an auxiliary filament.

Standardization of SAE References

Under Standard No. 108, Type F headlamps and those incorporating standardized replaceable light sources are designed to meet the requirements of SAE J579c, December 1978, but original equipment sealed beam headlamps must conform to SAE J579c, December 1974. For regulatory clarity, NHTSA proposed that the December 1978 version be the sole version incorporated by reference. Similarly it proposed that a standardized reference to SAE J580 be adopted. The changes between the earlier and later versions of the two SAE standards were discussed in detail in the notice of proposed rulemaking and their effect deemed non-substantive. These changes have been adopted, there being no negative comments submitted.

In consideration of the foregoing, Motor Vehicle Safety Standard No. 108, *Lamps Reflective Devices, and Associated Equipment,* is amended as follows:

The authority citation for Part 571 is revised to read as follows:

Authority: 15 U.S.C. 1392, 1401, 1403, 1407; delegation of authority at 49 CFR 1.50.

1. Subparagraph (b) of paragraph S4.1.1.43 is revised to read:

(b) The photometric requirements of Figure 15. A re-aim tolerance of $\pm 1/4$ degree is allowed for any test point on the Type LF lamp when tested alone, and such a tolerance is not allowed for the type UF lamp when tested alone. For the test point 10U-90U, measurement shall be from the normally exposed surface of the lens face.

2. A new paragraph S4.1.1.46 is added to read:

* * * * *

S4.1.1.46 Type F headlamps may be mounted on common or parallel seating and aiming planes to permit simultaneous aiming of both headlamps provided that or when tested with any conforming Type UF and LF headlamps according to paragraph S8, (a) the assembly (consisting of the Type UF and LF headlamps, mounting rings, the aiming/seating rings, and aim adjustment mechanism), shall be designed to conform to the test point values of Figure 15. (b) There shall be no provision for adjustment between the common or parallel aiming and seating planes of the two lamps.

3. A new paragraph S4.5.12 is added to read:

* * * * *

S4.5.12 On a motor vehicle equipped with a Type F headlighting system, the lower beam headlamps (Type LF) may be wired to remain permanently activated when the upper beam headlamps (Type UF) are activated.

* * * * *

4. A new paragraph S8 is added to read:

S8 Photometry Test for Simultaneous Aim, Type F Headlamps. The assembly shall be located on a goniometer placed not less than 60 feet (18.3 m) from the photometer. The LF unit shall be aimed mechanically by centering the unit on the photometer axis and aligning the aiming plane of the lens perpendicular to the photometer axis. Then the assembly shall be moved in a plane parallel to the established aiming plane of the LF headlamp until the UF headlamp is centered on the photometer axis. Photometry measurements of the UF photometry unit shall be completed using the aiming plane so established. A re-aim tolerance of ±¼ degree is allowed for any test point.

5. Figure 15 is revised as follows:

FIGURE 15

Photometric Test Point Values

Upper Beam			*Lower Beam*		
Test Points deg	*cd. max.*	*cd. min.*	*Test Points deg*	*cd. max.*	*cd. min.*
2U-V	—	1,500	10U-90U	125	—
1U-3R and 3L	—	5,000	1U-1-½L to L	700	—
H-V	70,000	40,000	½U-1-½L to L	1,000	—
			½D-1-½L to L	3,000	—
			1-½U-1R to R	1,400	—
H-3R and 3L	—	15,000			
H-6R and 6L	—	5,000	½U-1R to 3R	2,700	—
H-9R and 9L	—	3,000	½D-1-½R	20,000	10,000
H-12R and 12L	—	1,500	1D-6L	—	1,000
			1-½D-2R	—	15,000
1-½D-V	—	5,000	1-½D-9L and 9R	—	1,000
1-½D-9R and 9L	—	2,000	2D-15L and 15R	—	850
2-½D-V	—	2,500	4D-4R	12,500	—
2-½D-12R and 12L	—	1,000			
4D-V	5,000	—	4D-V	7,000	—
			H-V	5,000	—

6. Paragraphs S4.1.1.13(b), S4.1.1.21, S4.1.1.33, S5.1 and Tables I and III (under the right hand column "Applicable SAE standard or recommended practice" parallel to the item "Headlamps") are amended by changing "December 1974" to "December 1978."

7. (a) In Tables I and III the right hand columns "Applicable SAE standard or recommended practice" are amended by adding the wording "(See S5 for subreferenced SAE materials)".

(b) Tables I and III (under the right hand column "Applicable SAE standard or recommended practice" parallel to the item "Headlamps") are amended by changing "J580b February 1974" to "J580 AUG 79".

Issued on March 13, 1986.

Diane K. Steed
Administrator

51 F.R. 9455
March 19, 1986

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 81-11; Notice 17)*

ACTION: Final rule.

SUMMARY: *Changes in Replaceable Light Source Specifications.* This notice amends Safety Standard No. 108 to modify the specifications for the standardized replaceable light source. This will allow a manufacturer to determine the diameter of the glass capsule, while specifying the location of the black cap for assuring the interchangeability of the standardized light source in different lamp designs to achieve the required photometric performance. The amendment relieves certain design restrictions currently in effect, and achieves greater interchangeability for the light source. A notice of proposed rulemaking was published on September 18, 1985.

DATES: The effective date for the amendment to Figure 3-2 is November 3, 1986. The effective date for the remaining amendments is May 7, 1986.

SUPPLEMENTARY INFORMATION: On September 18, 1985, NHTSA proposed certain modifications to the standardized replaceable light source which is specified by Motor Vehicle Safety Standard No. 108 for use in headlamps (50 FR 37882). The purpose of the proposal was to allow a manufacturer more flexibility in specifying the diameter of the glass capsule of the light source, and to revise the method for specifying the location of the black cap.

The proposal incorporated the following elements: a revised "interchangeability drawing" for the headlamp bulb assembly's halogen capsule (Figure 3-5) with certain angles and dimensions different than those presently specified; a revised lumen test necessitated by testing the light source with the black cap in place, requiring amendments to paragraph S4.1.1.38 (the test being currently performed without the black cap); finally, a modification in the allowable tolerances of the light source with a view towards a more accurate orientation of beam pattern, while permitting greater headlamp styling freedom. Here NHTSA proposed tolerances petitioned for by General Motors, and NHTSA's own alternative values.

Comments were received on the proposal from vehicle manufacturers (Chrysler Corporation, American Motors Corporation, SAAB-Scania of North America, Volkswagen of America, General Motors Corporation, Ford Motor Company), lighting equipment manufacturers (Koito Manufacturing Co., GTE/Sylvania, General Electric Company, North American Philips Lighting Corporation), the Department of California Highway Patrol, and the SAE Replaceable Headlamp Bulb Task Force. The proposal was supported, with suggested modifications.

The purpose of the rulemaking with respect to the location of the black cap was to relieve a burden to manufacturers of having to build a light source with a narrowly specified glass cap diameter. To accomplish this, the location of the black cap and that of the undistorted glass must be specified in a manner which would be tolerant of changes in diameter while assuring that photometric performance was maintained. This led to the angular method used in the Notice of Proposed Rulemaking for specifying these locations. The method of dimensioning used the light source base as a reference because this would provide the easiest measurement reference for determining compliance of these parameters, and measurements could be more easily performed using vernier calipers rather than the more difficult optical comparator.

The proposed method of specifying the black cap location assumed that it would be installed on the light source after the capsule was installed on the base, but as commenters pointed out, this is not always the way that a light source is manufactured. Sylvania, for example, first installs the black cap on the capsule, then determines for what application the completed capsule will be used. Thus, the method NHTSA proposed would impose a burden of tolerance stackup which has the potential of creating noncompliances or possible photometric errors if the

*Inadvertently published in the *Federal Register* as Notice 18.

assembly procedure remained unchanged. Therefore, Sylvania and other commenters recommended using the actual location of the lower beam filament as a reference. NHTSA considers this a reasonable alternative, and in view of the fact that some manufacturers are already producing light sources in this fashion, the agency is amending Figure 3-5 to accommodate this comment.

Commenters also suggested that NHTSA adopt other changes for Figure 3-5 which would help clarify it, namely the revisions put forth by the SAE Replaceable Headlamp Bulb Task Force. These involve deletion of certain dimensions and redrawing of others, and changes in Notes. NHTSA has made appropriate modifications in line with the comments.

The September 1985 notice proposed alternative tolerances for the lower beam filament, one based upon a set of tolerances petitioned for by General Motors, and the other developed by NHTSA. Commenters objected to both alternatives, and recommended the tolerances developed by the SAE Task Force. These tolerances are based upon those that industry believes are consistently achievable with today's state-of-the-art in production machinery and quality assurance equipment. Ford and VW commented that the SAE tolerances would help improve the maintenance of beam pattern after bulb replacement. Tighter filament tolerances will also permit greater freedom in headlamp styling and manufacture. Judging by the comments received on the notice, there is little support for retaining the existing tolerances, and little support for either the GM or NHTSA alternative tolerances that were proposed. The SAE tolerances lie between the current ones and those proposed; since this represents a consensus among those who chose to comment, NHTSA has adopted it, and is amending the dimensions in Figure 3-2 appropriately. The new tolerances for the lower beam ahead/behind are plus or minus 0.010 inch, and plus or minus 0.015 inch for up/down and left/right. For the upper beam, the tolerance is 0.025 inch for ahead/behind and up/down and 0.032 inch for left/right.

Comments about lumen values generally accorded with the proposal, to test with the black cap on, rather than without. SAAB argued that the values were too low while the California Highway Patrol thought that there was a large disparity in making the conversion from values without a black cap to those with a cap. NHTSA believes that a number of factors must be considered when making such a conversion. The black cap blocks off light to the front of the capsule and causes a drop in light output, but the filament still emits the same amount of light as it did without the cap. The location of the cap may vary plus or minus 1 mm. Filament variances plus cap location will cause a greater variation of light output from a capped bulb, than one that has no cap, where only the filament variances affect light output. These two factors cause a drop in measured light output from capped bulbs and cause the tolerance to increase. However, the light source is still the same one that had previously been tested without the black cap, and is still designed to conform to the other requirements so that the headlamp will perform in accordance with the requirements of the standard, and thus the lumen values have been adopted as proposed.

Koito requested that a more detailed specification be provided for the "opaque white colored cover" that is to be used in the lumen test (S4.1.1.38(b)(7)). The agency has added this clarification to the language otherwise proposed and adopted: "This cover shall be used to eliminate the likelihood of incorrect lumen measurement that would occur should the reflectance of the light source base and electrical connector be low."

The agency had proposed that the amendments be effective upon publication of the final rule in the *Federal Register*. Ford commented that this would be impracticable in that it would not allow enough time for both vehicle and light source manufacturers to prepare for building complying hardware, and it asked for lead time of one year. No other vehicle or light source manufacturer requested such an extension, and the agency has concluded that no need has been shown for a delay of the nature Ford requested. Therefore, amendments that reduce an industry burden (those pertaining to capsule diameter, black cap placement, and revised lumen values) are made effective on the publication date of the final rule, as proposed. However, the amendment that places tighter tolerances on the filaments, and thus which has the potential of increasing an industry burden, will become effective six months following the publication of the rule.

Except for the amendment to Figure 3-2, the amendments are effective upon publication of the final rule in the *Federal Register*. Because the rule would relieve a restriction and create no additional burden, it is hereby found for good cause shown that an effective date earlier than 180 days after issuance of the final rule is in the public interest. The amendment to Figure 3-2 is effective November 3, 1986.

NHTSA has considered this rule and has determined that it is not major within the meaning of Executive Order 12291 "Federal Regulation" or significant under Department of Transportation regulatory policies and procedures, and that neither a regulatory impact analysis nor a full regulatory evaluation is required. While the rule does impose minor additional requirements and costs, it also permits manufacturers greater flexibility in the styling and design of headlighting systems.

In consideration of the foregoing, 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, is amended as follows:

1. The authority citation for Part 571 continues to read as follows:

AUTHORITY: 15 U.S.C. 1392, 1401, 1403, 1407; delegation of authority at 49 CFR 1.50.

§571.108 [Amended]

2. The first sentence of paragraph (b) of paragraph S4.1.1.38 is revised to read:

(b) The standardized replaceable light source shall meet the requirements in paragraphs (b)(1) through (b)(7) of this section.

3. In paragraph (b)(1) of paragraph S4.1.1.38 the tabular portion of the general specifications is amended as follows:

	Lower beam	Upper beam
* * * * *		
Lumens (with black cap at 12.8V design voltage)	700+/−15%	1200+/−15%
* * * * *		

4. A new paragraph (b)(7) is added to paragraph S4.1.1.38 to read:

(b)(7) Lumens shall be measured in accordance with the Illuminating Society of North America, LM-45: IES Approved Method for Electrical and Photometric Measurements of General Service Incandescent Filaments Lamps (April 1980), and with that electrical connector and light source base (except for the portion normally located within the interior of a lamp housing) shrouded with an opaque white colored cover. This cover shall be used to eliminate the likelihood of incorrect lumen measurement that would occur should the reflectance of the light source base and electrical connector be low.

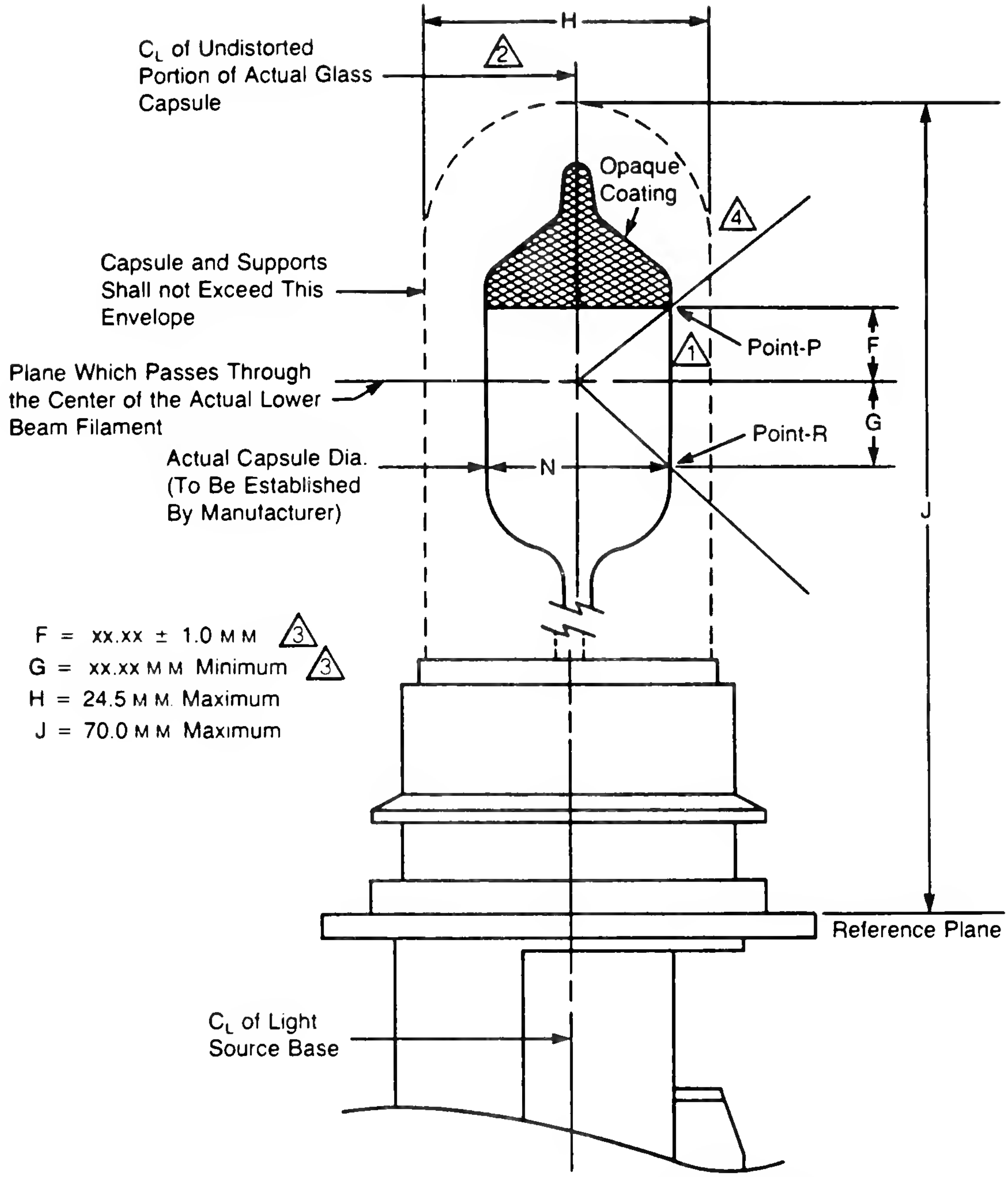
5. Figure 3-2 is revised as follows:

FIGURE 3-2
INTERCHANGEABILITY DRAWING
HEADLAMP BULB ASSEMBLY

[Dimensional specifications for Figure 3-1]

DIMENSION	INCHES	MILLIMETERS
A	(0.085 to 0.083) 0.002 either side CL	(2.15 to 2.10) 0.05 either side CL
F	0.906	23.00
H	0.079	2.00
K:Lower beam	1.752+/−0.010	44.50+/−0.25
Upper beam	CL to he within +/−0.025 of CL of lower beam	CL to be within +/−0.64 of CL of lower beam
M	0.974	24.75
N	(1.335 to 1.331) 0.002 either side CL	(33.90) to (33.80) 0.05 either side CL
O	0.517+/−0.020	13.13+/−0.50
P	1.673	42.50
R	(1.126 to 1.122) 0.002 either side CL	(28.60 to 28.50) 0.05 either side CL
U	1.181	30.00
V	0.413	10.50
W	0.128	3.25
X	0.189	4.80
AC	0.045+/−0.015	1.15+/−0.38
AD	0.091+/−0.025	2.30+/−0.64
AE	0.047+/−0.015	1.20+/−0.38
AF	0.094+/−0.032	2.40+/−0.81
AH	0.356	9.05
AM	0.415	10.54
AN	0.673	17.10

6. Figure 3-5 is revised as follows:



△1 Glass Capsule Periphery Shall be Optically Distortion Free Between the Planes Perpendicular to the Centerline at Points P and R.

△2 Diameter "H" Shall be Concentric with the Centerline of the Light Source Base.

△3 Exact Values of F and G Shall be Determined by Using the Following:
F = (N/2) Tan 38
G = (N/2) Tan 43

△4 Entire Radius and Distorted Glass Shall be Covered to the Plane Passing Through Point "P", Perpendicular to the Glass Capsule Centerline.

Figure 3-5. Halogen Capsule

7. Figure 3-6 is deleted.

Issued on April 29, 1986

Diane K. Steed
Administrator

51 F.R. 16847
May 7, 1986

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108
Lamps, Reflective Devices, and Associated Equipment

(Docket No. 81-11; Notice 18)*

ACTION: Final rule.

SUMMARY: This notice adopts two new types of standardized replaceable light sources to be used in replaceable bulb headlighting systems on motor vehicles. In a two light source system developed by General Motors Corporation ("GM") one source provides the upper beam, and the other, the lower beam. The new light sources will be known as "HB3" and "HB4". The present standardized replaceable light source is now designated "HB1".

The rule is based upon a notice published January 7, 1986, that proposed dimensional changes differing from those originally proposed on May 13, 1985.

EFFECTIVE DATE: June 2, 1986.

SUPPLEMENTARY INFORMATION: On May 13, 1985, NHTSA published a proposal to allow new types of standardized replaceable light sources in motor vehicle headlamps (50 FR 19961). Two of these light sources were designed by GM, one intended to provide the upper beam, which would be denominated HB3, and the other to provide the lower beam, to be denominated HB4. After the close of the comment period, GM submitted new drawings and specifications for the light sources which it felt met the needs of the industry as a result of its efforts with the SAE Replaceable Bulb Task Force. Later it submitted further updates of specifications.

Accordingly, on January 7, 1986, NHTSA published a second NPRM on this subject, proposing a revision in dimensional specifications (Figures 19 and 20) incorporating the GM changes, which included the provision for a seal (51 FR 641). NHTSA is now amending Standard No. 108 to add the HB3 and HB4 light sources in accordance with the previous proposals.

In the May 1985 notice, NHTSA proposed that the light sources meet the photometric requirements of Type F sealed beam headlighting systems. With reference to the internal heat tests of S6.7, no flash rate is currently specified for a turn signal that is incorporated into a headlamp housing. NHTSA, believing that there could be excessive buildup of heat from a steady burning signal, proposed to include a flashing turn signal at the test condition of 90 flashes per minute with a 75 plus or minus 2% current "on-time" performance. Because HB3 and HB4 have filament locations different from that of the current standardized replaceable light source (to be known from now on as "HB1"), NHTSA proposed changing the bulb deflection test to accommodate these differences. The point of deflection would be at a specific measured distance from a reference plane instead of being located by reference to the filament. This change was also proposed for the HB1 with the actual deflection point remaining the same. Additionally, for HB3 and HB4, the direction of force application was specified to be radially inward anywhere in the perpendicular plane located at the application point.

In its proposal, NHTSA also sought comment on whether there were any safety reasons, such as excessive glare, excessive candela, or insufficient illumination to prohibit intermixes of the HB1 with HB3 and HB4 and conversely to seek appropriate photometric and other specifications which would be required to permit such intermix, should commenters deem that course of action desirable.

The proposals in the second notice published in January 1986 were confined to dimensional changes, and the addition of a protective seal for HB3 and HB4 meeting the performance criteria proposed.

Comments were received on both proposals from major vehicle and lighting equipment manufacturers. With regard to the photometry of HB3 and HB4, Chrysler Corporation and Ford Motor Company urged that only one photometric performance requirement be implemented for all headlamp systems. Because three performance requirements currently exist; Type F, SAE J579a, and SAE J579c, this suggestion cannot be implemented at this time. Accordingly, NHTSA has proceeded to adopt the Type F photometrics for the HB3 and HB4, a proposal that was supported by Sylvania GTE, Department of California Highway Patrol, and GM among others. Further, the comments generally supported intermixing of

*Inadvertently published in the *Federal Register* as Notice 17.

light sources, given that headlamp systems are all required to meet minimum photometric requirements, and that NHTSA has proposed labeling of the headlamp lens to denote the type of light source used. Ford commented that intermixing will permit designers to optimize lighting for glare and seeing distance. On the other hand, GTE Sylvania and General Electric were opposed to intermixing until further study of the likely effects can be completed. Sylvania suggested that the SAE Lighting Committee should resolve the questions of intermixing and the related simplification of photometrics to achieve a single performance level. NHTSA believes that as long as photometric performance is met, and the lens identifies the light source, there is no reason to prohibit intermixing, and is amending the standard to allow it provided that the system meets Type F photometrics.

The proposed bulb deflection test specified that the direction of the application of force be radially inward anywhere in the perpendicular plane located at the application point. All those who commented recommended a revised procedure that would exercise the deflection resistance performance while simplifying the test. The basis for the recommendations is the SAE Replaceable Headlamp Bulb Task Force work on SAE XJ1496, Recommended Practice for Headlamp Light Sources. This states essentially that the deflection force should be applied radially at four equally spaced intervals at the light center length of the lower beam filament (or upper if there is only an upper beam filament), beginning at the weakest axis of the bulb crimp. NHTSA agrees with this recommendation because it is a simpler method of achieving the same goal, and the standard is amended accordingly. Comments also supported the proposed test conditions for turn signals in replaceable bulb headlamps (amended in Item 4, 50 FR 21056) and the standard has been amended accordingly.

Regarding the specification changes proposed in January 1986, all comments except those received from Hella and Sylvania supported the proposal. Hella requested ECE tolerances, but would accept the recommendation by the SAE Bulb Task Force. Sylvania in essence requested a capsule and support envelope with a diameter of at least 19.68 mm for the HB3, because of limitations of its manufacturing equipment, and NHTSA is making this change to accommodate this concern. However, it necessitates the addition of a note requiring the capsule and supports to provide for insertion into the lamp without interfering with the lamp's key. The numbers suggested by the SAE Headlamp Bulb Task Force have been added to Figure 20. The larger diameters could create a burden for headlamp manufacturers but not light source manufacturers such as Sylvania because space will be removed that was previously reserved for internal lamp parts; however, the agency knows of no instance in which lamp design has been so far finalized that this would occur. The NPRM of May 1985 contained a note to the Figures: "Bulb envelope must not exceed this area". This was changed to "Bulb envelope must not exceed this volume" in the January 1986 NPRM. To achieve consistency in the standard and to more clearly state the note, NHTSA is adopting the language used in a similar note for the HB1 light source: "Capsule and supports shall not exceed this envelope."

The commenters discussed other issues of interest as well. Both the Federal Highway Administration (FHWA) and Volkswagen addressed the need to assure adequate illumination of overhead signs, and other highway indicators. The FHWA suggested that new minimum test point values be added to the photometric performance requirements for all headlamps. While this is beyond the scope of the present rulemaking, it will remain under consideration.

Hella recommended that a "standardized bulb" rather than "any" bulb be used for compliance testing, specifically the bulb set forth in the SAE XJ1496 document. NHTSA continues to believe that any light source which is available to the consumer in the market place should be used for compliance testing, rather than one specially prepared for laboratory use.

Some commenters felt that industry terms, such as "9004", should be used to designate light sources rather than NHTSA's terminology, such as "HB1". Other commenters felt that the terminology should be applied in a sequence different from that proposed, such as the 9005 being HB5 and 9006 being HB6. The agency does not deem either of these suggestions desirable. In the first case, should a light source meeting HB1 specifications be developed that uses less power to achieve the same performance, the HB1 nomenclature would allow it to be used in any headlamp designed to use the original light source. But the updated replacement would probably have some other trade number, 9008 for example, to indicate its lower power consumption. This difference in trade numbers could be confusing to consumers seeking to replace the light source. Therefore, NHTSA intends to continue Standard No. 108's nomenclature for headlighting systems. Industry, of course, is free to assign any trade numbers it wishes, but is required to certify that the light source is designed to conform to the requirements of Standard No. 108. The same logic has been applied to replaceable headlamp light sources. In the second case, on the application of the NHTSA terminology, NHTSA proposed the HB number sequence based on the order in which light sources were received for incorporation into the Standard. Additionally, because the European H-4 light source could be different from the proposed U.S. version of that light source and not have the same uses in the U.S. market as it has traditionally had, a distinctly different nomenclature is deemed necessary. Therefore, NHTSA is implementing the nomenclature as proposed for the HB1, HB3 and HB4.

With respect to "designed to conform", some commenters noted that the language proposed for S4.1.1.39 contemplated light sources that "conform" as contrasted with the requirement in S4.1.1.36 that headlamps other than sealed beam be equipped with light sources "designed to conform". To remove this inconsistency with paragraph S4.1.1.36, NHTSA has adopted the "design to conform" language in S4.1.1.39.

The comments reflected a wide range of opinion about the need for labelling of headlamp lenses with information such as light source type, beam type, and photometric performance designation. Lamp manufacturers are concerned about the adverse effects on headlamp performance, especially if the location of the labelling is a specified one. NHTSA has concluded that motor vehicle safety requires identification of the light source, and the proper function of a headlamp (upper or lower beam) when two headlamp types are used on a vehicle. It is not necessary to provide photometric performance information when the lens identifies the light source. Replacement of a light source with one of the same type will assure equivalent and compatible lighting performance. However, there is no compelling reason to specify that any information be located at the lens center. NHTSA has decided to leave placement of the information to the discretion of the manufacturer, as long as the information is placed on the lens area in front of, and used by the light source it is designating.

ETL Testing Laboratories asked for three clarifications of the proposal. The language in proposed S4.1.1.39(f) and (h) regarding "low pressure side" was unclear. The "low pressure side" is the connector side of the HB3 or HB4 light source base. This test of the sealing mechanism does not apply to the HB1. The second point of confusion was the extent of the photometry test of S6.7.2. Except for a headlamp with a single HB1 light source, the photometry test is intended to be a complete testing of all test points for the beam or beams produced by the lamp. Finally, in S6.7.2, a statement was requested on the conditions of time lapse or temperature stabilization occurring after the high temperature test and before the photometry test. NHTSA replies that there should be sufficient time for the temperature of the lamp to stabilize to room ambient temperature.

NHTSA has considered this rule and has determined that it is not major within the meaning of Executive Order No. 12291 "Federal Regulation" or significant under Department of Transportation regulatory policies and procedures, and that neither a regulatory impact analysis nor a full regulatory evaluation is required. However, a regulatory evaluation has been prepared and placed in the public docket. Since use of the two light sources is optional, the rule would not impose additional costs or requirements but would permit manufacturers greater flexibility in the use of headlighting systems.

NHTSA has analyzed this rule for the purposes of the National Environmental Policy Act. The rule may have a small positive effect on the human environment since the weight and quantity of materials used in the manufacture of headlamps would be reduced.

The agency has also considered the impacts of this rule in relation to the Regulatory Flexibility Act. I certify that this rule will not have a significant economic impact on a substantial number of small entities. Accordingly, no regulatory flexibility analysis has been prepared. Manufacturers of motor vehicles and headlamps, those affected by the rule, are generally not small businesses within the meaning of the Regulatory Flexibility Act. Finally, small organizations and governmental jurisdictions would not be significantly affected since the price of new vehicles, headlamps, and aimer adjusters will be minimally impacted.

Because of the necessity for vehicle, headlamp, and replaceable light source manufacturers to plan production and distribution on an orderly basis, it is hereby found that an effective date earlier than 180 days after issuance of the final rule is in the public interest.

The engineer and lawyer primarily responsible for this rule are Richard Van Iderstine and Taylor Vinson, respectively.

List of Subjects in 49 CFR Part 571

Imports, Motor vehicle safety, Motor vehicles, Rubber and rubber products, Tires.

Part 571 - [AMENDED]

In consideration of the foregoing, 49 CFR Part 571 and 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment* is amended as follows:

The authority citation for Part 571 continues to read as follows:

Authority: 15 U.S.C. 1392, 1401, 1403, 1407; delegation of authority at 49 CFR 1.50.

§571.108 [Amended]

1. The definition of "Standardized replaceable light source" in S3 *Definitions* is revised to read:

"Standardized replaceable light source" means an assembly of a capsule, base, and terminals that meets the requirements of S4.1.1.39.

2. In paragraph S4.1.1.36, paragraph (a)(1) is revised to read:

(a)(1) Each replaceable bulb headlamp shall include components which are designed to conform to the applicable specifications of paragraphs S4.1.1.37, S4.1.1.38 and S4.1.1.39.

3. The first sentence of Paragraph (b)(2) of S4.1.1.36 is revised to read:

(2) Section 3.1 – Test Voltage and Section 3.5 – Photometric Design Requirements, excluding Tables 1 and 2 for headlamps equipped with Type HB3, Type HB4, Types HB1 and HB3, or Types HB1 and HB4, and excluding Table 2 of SAE J579c *Sealed Beam Headlamp Units for Motor Vehicles* December 1978 for headlamps in systems with only Type HB1.

4. In Paragraphs (d)(1), (d)(3), (d)(5), (d)(6)(A), (d)(6)(B), and (d)(7) of paragraph S4.1.1.36, the words "of SAE J579c *Sealed Beam Headlamp Units for Motor Vehicles*, December 1978" are removed and the words "applicable to the headlamp system under test" substituted.

5. A new paragraph (e) is added to S4.1.1.36, before (e)(1) to read: "For a headlamp equipped with one or two Type HB1 light sources the following requirements apply."

6. A new paragraph (f) is added to S4.1.1.36 to read:

"For headlamp systems equipped with Type HB3 and HB4, HB1 and HB3, or HB1 and HB4 light sources, the following requirements apply:"

(1) There shall be no mechanism that allows adjustment of an individual light source, or adjustment of reflector aim on a headlamp with two light sources.

(2) Lower beam photometrics shall be provided by filaments with a minimum average design life of not less than 320 hours.

(3) The lower and upper beams of a headlamp system consisting of two lamps, each containing two light sources (type HB3 and HB4, or type HB1 with HB3 or HB4) shall be provided only as follows:

(i) The lower beam shall be produced in one of the following ways:

(A) By the outboard light source (or the uppermost if arranged vertically) or single light source, designed to conform to the lower beam requirements of Figure 17; or,

(B) By both light sources, designed to conform to the lower beam requirements of Figure 17.

(ii) The upper beam shall be provided in one of the following ways:

(A) By the inboard light source (or the lower one if arranged vertically) or single light source, designed to conform to the upper beam requirements of Figure 17; or

(B) By both light sources, designed to conform to the upper beam requirements of Figure 17.

(4) The lower and upper beams of a headlamp system consisting of four lamps, using HB3 and HB4, HB1 and HB3, or HB1 and HB4 light sources, each containing only a single light source, shall be provided only as follows:

(i) The lower beam shall be produced by the outboard lamp (or upper one if arranged vertically), designed to conform to the lower beam requirements of Figure 15. The lens of each such headlamp shall be permanently marked with the letter "L".

(ii) The upper beam shall be produced by the inboard lamp (or lower one if arranged vertically), designed to conform to the upper beam requirements of Figure 15. The lens of each such headlamp shall be permanently marked with the letter "U".

(5) For replaceable bulb headlamps, a +/−¼ degree reaim tolerance is permitted for the test points of Figures 15 and 17. The test point 10U-90U shall be measured from the normally exposed surface of the lens face.

7. Paragraph S4.1.1.37 is revised to read:

S4.1.1.37 Each lens-reflector unit manufactured as replacement equipment for a replaceable bulb headlamp system shall be designed to conform to the requirement of S4.1.1.36 when any standardized replaceable light source appropriate for such unit is inserted in it.

8. Section 4.1.1.39 is removed. S4.1.1.40 is redesignated S4.1.1.38 and revised as follows.

S4.1.1.38 The lens of each replaceable bulb headlamp and the base of each standardized replaceable light source shall be marked as follows:

(a) With the symbol "DOT" horizontally or vertically which shall constitute certification that the headlamp or light source conforms to all applicable Federal motor vehicle safety standards.

(b) The base of each Type HB3 and HB4 light source shall also be marked by its manufacturer or importer with its HB Type Designation and the name or trademark registered with the U.S. Patent Office of the manufacturer and importer (if applicable).

(c) The lens of each replaceable bulb headlamp using HB3 or HB4 light sources, or HB1 light sources in conjunction with HB3 or HB4 light sources within a headlamp system on a motor vehicle shall permanently display the Type Designation(s) for that standardized replaceable light source on the lens in front of each light source.

9. Paragraph S4.1.1.38 is redesignated S4.1.1.39 and revised as follows:

S4.1.1.39 Each standardized replaceable light source shall be designed to conform to the following requirements:

(a) A type HB1 light source shall be designed to conform to the dimensions specified in Figure 3 and shall incorporate a silicone O-ring. A Type HB3 light source shall be designed to conform to the dimensions specified in Figure 19. A Type HB4 light source shall be designed to conform to the dimensions specified in Figure 20.

(b) Each standardized replaceable light source shall be designed to conform to the following general specifications:

Specification	Lower Beam	Upper Beam
Maximum power, watts		
HB1	50	70
HB3	----	70
HB4	60	----
Luminous flux, lumens:		
HB1	700±15%	1200±15%
HB3	----	1700±12%
HB4	1,000±15%	----
Minimum average design life, hours: all	320	150

(c) The standardized replaceable light source filament(s) shall be subject to seasoning before measurement of maximum power and luminous flux.

(d) Measurement of maximum power and luminous flux shall be made with the direct current test voltage regulated within one quarter of one percent. The test voltage shall be design voltage, 12.8v. The measurement of luminous flux for the HB1 shall be in accordance with the Illuminating Society of North America, LM-45: *IES Approved Method for Electrical and Photometric Measurements of General Service Incandescent Filament Lamps* (April 1980), shall be made with the black cap installed on HB1 and HB4, and shall be made with the electrical connector and light source base shrouded with an opaque white colored cover, except for the portion normally located within the interior of the lamp housing. The measurement of luminous flux for the HB3 and HB4 shall be with the base covered with a white cover shown in Figures 19-1 and 20-1. The white covers are used to eliminate the likelihood of incorrect lumen measurement that will occur should the reflectance of the light source base and electrical connector be low.

(e) Measurement of minimum average design life shall be made at 14.0v for all light sources. Testing is conducted in a completed headlamp assembly, or equivalent, placed in the attitude in which the assembly is to be installed on a motor vehicle.

(f) The capsule, lead wires and/or terminals on each Type HB1, Type HB3 and Type HB4 light source shall be installed in the base so as to provide an airtight seal. Such a seal exists on Type HB3 and Type HB4 when no air bubbles shall appear on the low pressure (connector) side after the light source has been immersed in water for one minute while inserted in a cylindrical aperture of 0.796 ± 0.004 in. (20.22 ± 0.10 mm) (Type HB3) or 0.875 ± 0.004 in. (22.22 ± 0.1 mm) (Type HB4) and subjected to a minimum air pressure of 69kPa (10 P.S.I.G.) on the glass capsule side.

(g) After the force deflection test conducted in accordance with S7, the permanent deflection of the glass envelope shall not exceed 0.005 in. (0.13 mm) in the direction of the applied force.

(h) A general tolerance shall apply to Figure 3 as follows: +/−0.004 in. (0.10 mm) to all linear dimensions and +/−1°0′ to all angular dimensions except for referenced dimensions and unless otherwise specified.

10. Paragraph S4.5.8 is amended by adding the following as a second sentence:

S4.5.8***On a motor vehicle equipped with a headlighting system comprising four replaceable bulb headlamps designed to conform to the photometry of Figure 15, the lamps marked "L" may be wired to remain permanently activated when the lamps marked "U" are activated.

11. Paragraph S4.5.9 is revised to read:

S4.5.9 The wiring harness or connector assembly of a replaceable bulb headlamp with two identical standardized replaceable light sources or a four-lamp replaceable bulb headlamp system which uses identical light sources in all four lamps shall be designed so that the filaments not intended to be used with the lens prescription in front of such filament shall not be illuminated.

12. Paragraph S6.1 is revised is to read:

S6.1 *Photometry.* A replaceable bulb headlamp shall be tested according to paragraph S3.5, Photometric Design Requirements, and Table 1 of SAE Standard J579c *Sealed Beam Headlamp Units for Motor Vehicles,* Dec. 1978, or by Figure 15 or 17 of Standard 108, as applicable, after the tests specified in S6.2, S6.4, S6.6, S6.7.1, S6.7.2 and S6.8

13. Paragraphs S6.7 and S6.8 are revised to read:

S6.7 *Temperature and internal heat tests.* A headlamp with one or more standardized replaceable light sources shall be tested according to S6.7.1 and S6.7.2. Tests shall be made with all filaments lighted at design voltage that are intended to be used simultaneously in the headlamp and which in combination draw the highest total wattage. These include but are not limited to filaments used for turn signal lamps, fog lamps, parking lamps, and headlamp lower beams lighted with upper beams when the wiring harness is so connected on the vehicle. If a turn signal is included in the headlamp assembly, it shall be operated at 90 flashes a minute with a 75+/−2% current "on time". If the lamp produces both the upper and lower beam, it shall be tested in both the upper beam mode and the lower beam mode under the conditions above described, except for a headlamp with a single HB1 light source.

S6.7.1 *Temperature cycle.* A headlamp mounted on a headlamp test fixture shall be subjected to 10 complete consecutive cycles having the thermal cycle profile shown in Figure 6. During the hot cycle, the lamp shall be energized commencing at point "A" of Figure 6 and de-energized at point "B". Separate or single test chambers may be used to generate the environment of Figure 6. All drain holes, breathing devices or other openings or vents of the headlamp shall be in their normal operating positions.

S6.7.2 *Internal heat test.*

(a) The headlamp lens surface that would normally be exposed to road dirt shall be uniformly sprayed with any appropriate mixture of dust and water or other appropriate materials to reduce the photometric output at the H-V test point of the upper beam (or the 1/2D-1 1/2R test point of the lower beam as appropriate) to 25+/−2% of the output originally measured in the photometric test performed under S4.1.1.36(b). A headlamp with a single HB1 light source shall be tested on the upper beam only. Such reduction shall be determined under the same conditions as that of the original photometric measurement.

(b) After the determination has been made that the photometric output of the lamp has been reduced as specified in S6.7.2(a), the lamp and its mounting hardware shall be mounted in an environmental chamber in a manner similar to that indicated in Figure 7, "Dirt/Ambient Test Setup". The headlamp shall be soaked for one hour at a temperature of 95+7−0 degrees F (35+4−0 degrees C) and then the lamp shall be energized according to S6.7 for one hour in a still air condition, allowing the temperature to rise from the soak temperature.

(c) The lamp shall be returned to a room ambient temperature of 73+7−0 degrees F (23+4−0 degrees C) and a relative humidity of 40+/−10% and allowed to stabilize to the room ambient termperature. The lens shall then be cleaned.

S6.8 *Humidity.* The headlamp mounted on a test fixture shall be placed in a controlled environment consisting of a temperature of 100+7−0°F (38+4−0°C) with a relative humidity of not less than 90%. All drain holes, breathing devices, and other designed openings shall be in their normal operating positions. The headlamp shall be subjected to 20 consecutive 6-hour test cycles. In each cycle, it shall be energized at design voltage with the highest combination of filament wattages that are intended to be used, including a turn signal flashing at 90 flashes a minute with a 75±2% current "on-time, if so equipped, and then de-energized for 5 hours. After completion of the last cycle, the lamp shall be soaked for 1 hour at 73+7−0°F (20+4−0°C) and relative humidity of 40±10% before it is removed for photometric testing. The headlamp shall be tested for photometrics at 10±1 minutes following completion of the humidity test.

14. Section S7 is revised to read:

S7 *Deflection test for standardized replaceable light sources.*

(a) *Type HB1 light source.* With the light source rigidly mounted in a fixture in a manner indicated in Figure 8, apply a force of 4.0±0.1 pounds (17.8±0.4N) at a distance "A" from the reference plane perpendicular to the longitudinal axis of the glass capsule and parallel to the smallest dimension of the pressed glass capsule seal. The force application shall be applied using a rod with a hard rubber tip with a minimum spherical radius of 0.039 in (1 mm). The bulb deflection shall be measured at the glass capsule surface at 180 degrees opposite to the force application.

(b) *Type HB3 and HB4 light sources.* The deflection test is conducted according to paragraph (a), except that the force shall be applied radially to the surface of the glass capsule in four locations in a plane parallel to the reference plane and spaced at a distance "A" from that plane. These force applications shall be spaced 90 degrees apart starting at the point perpendicular to the smallest dimension of the pressed seal of the glass capsule.

15. In Tables II and IV, Column 2 for the Headlamps is revised to read:

Headlamps...	On the front, each headlamp providing the upper beam, at the same height, 1 on each side of the vertical centerline, each headlamp providing the lower beam, at the same height, 1 on each side of the vertical centerline, as far apart as practicable. If a single standardized replaceable light source is used to provide the power beam in a headlamp with two standardized replaceable light sources, it shall be the farthest one from the vertical centerline.

16. The title of Figure 3 is revised to read "Specifications for the Type HB1 Standardized Replaceable Light Source."

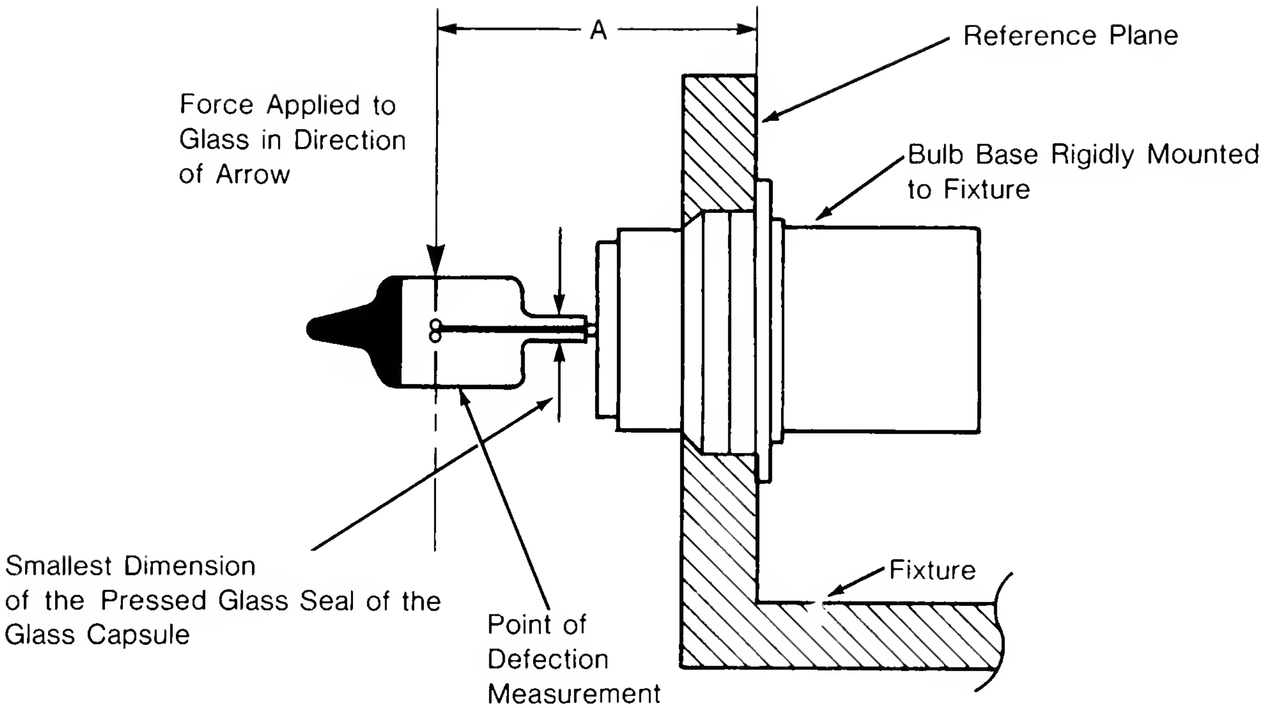
17. Figure 8 is revised as follows:

18. New Figures 17, 19 and 20 are added as follows:

Issued on April 28, 1986

Diane K. Steed
Administrator

51 F.R. 16325
May 2, 1986



Standardized Replaceable Light Source Type	Dimension "A"
HB1	44.50 ± 0.38 MM (1.75 ± 0.015 In)
HB3	31.50 ± 0.20 MM (1.24 ± 0.008 In)
HB4	31.50 ± 0.20 MM (1.24 ± 0.008 In)

Figure 8 - Bulb Deflection Test

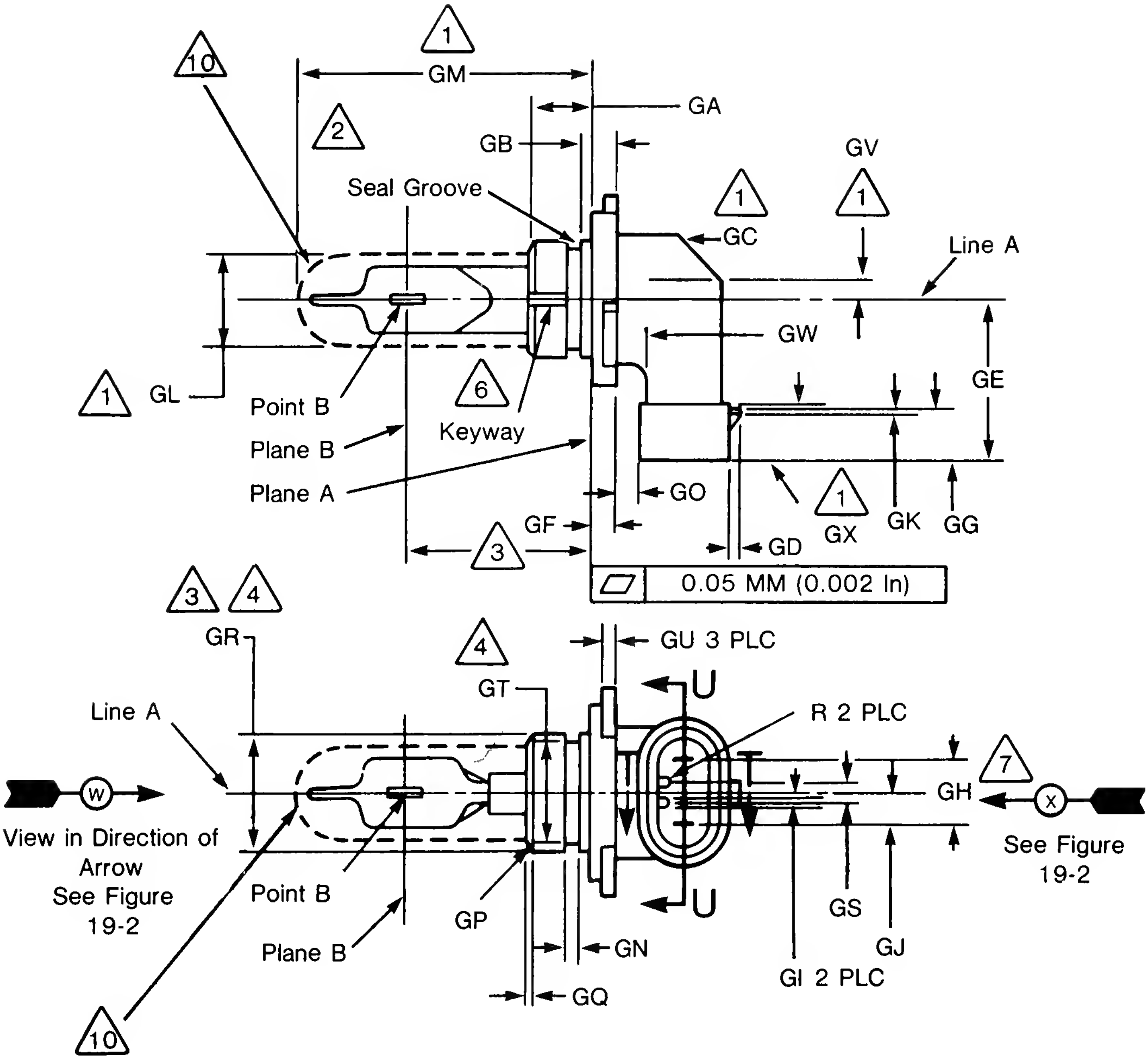


Figure 19 - Specifications for the Type HB3 Standardized Replaceable Light Source

Dimension	Inches	Millimetres
GA	0.591 Max / 0.217 Min	15.00 Max / 5.50 Min
GB	0.236	6.00'
GC	45°	45°
GD	0.079	2.00
GE	1.09	27.8
GF	0.165	4.20
GG	0.346	8.80
GH	0.433	11.00
GI	0.055	1.40
GJ	0.217 ± 0.006	5.50 ± 0.15
GK	0.06	1.5
GL	0.775 Dia	19.68 Dia
GM	2.165	55.00
GN	0.093	2.36
GO	0.157	4.00
GP	45° Chamfer	45° Chamfer
GQ	0.039	1.00
GR	0.787 ± 0.002 Dia	22.00 ± 0.05 Dia
GS	0.138	3.50
GT	$0.687 {}^{+0.004}_{-0.000}$ Dia	$17.46 {}^{+0.10}_{-0.00}$ Dia
GU	0.079	2.00
GV	0.138	3.5
GW	0.209 Min	5.30 Min
GX	0.378	9.60

△1 Dimensions Shown Are Maximum-May Be Smaller

△2 Bulbs Must Be Equipped With a Seal The Bulb-Seal Assembly Must Withstand a Minimum of 69kPA (10 P.S.I.G.) When the Assembly Is Inserted into a Cylindrical Aperture of 22.22 ± 0.10 MM (0.875 ± 0.004 IN)

△3 See Figure 20-5

△4 Diameters Must Be Concentric Within 0.20 MM (0.008 IN)

△5 Glass Bulb Periphery Must Be Optically Distortion Free Axially Within the Included Angles About Point B

△6 Key and Keyway Are Optional Construction Keyway Required for Aftermarket Only

△7 Measured at Terminal Base Terminals Must Be Perpendicular to Base and Parallel Within ± 1.5°

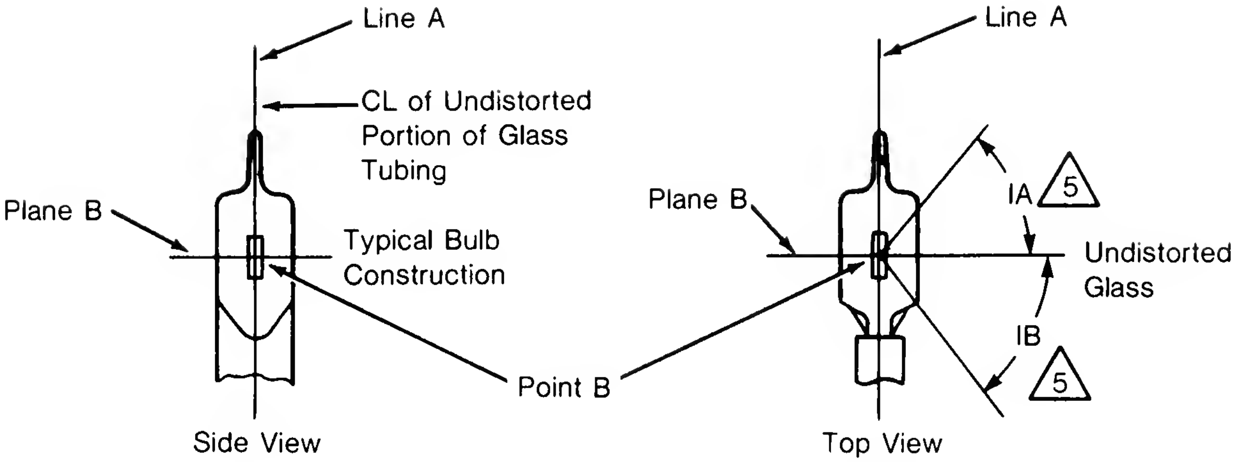
△8 Diameters Must Be Concentric Within 0.20 MM (0.008 IN)

△9 Absolute Dimension, No Tolerance

△10 Glass Capsule and Supports Shall Not Exceed This Envelope

Tolerances Unless Otherwise Specified	
Inches	Millimetres
2 Place Decimals ± .02	1 Place Decimals ± 0.5
3 Place Decimals ± .010	2 Place Decimals ± 0.30
Angular ± 1°	Angular ± 1°

Figure 19 - Specifications for the Type HB3 Standardized Replaceable Light Source (CONT.)



Point B Is Intersection of Plane B and Centerline of Undistorted Glass Tubing

Dimension	Inches	Millimetres
IA	45° Min	45° Min
IB	52° Min	52° Min

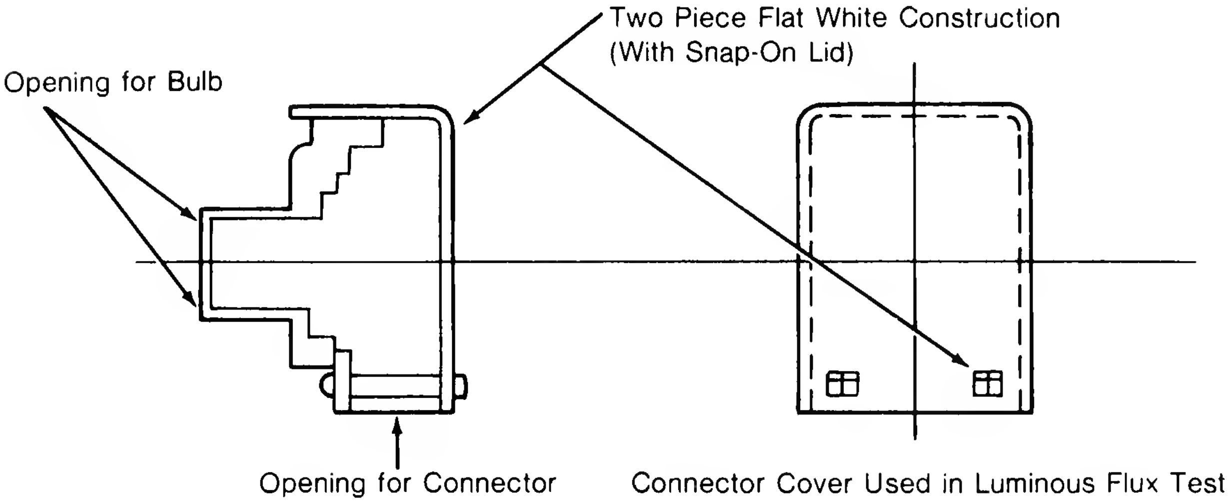
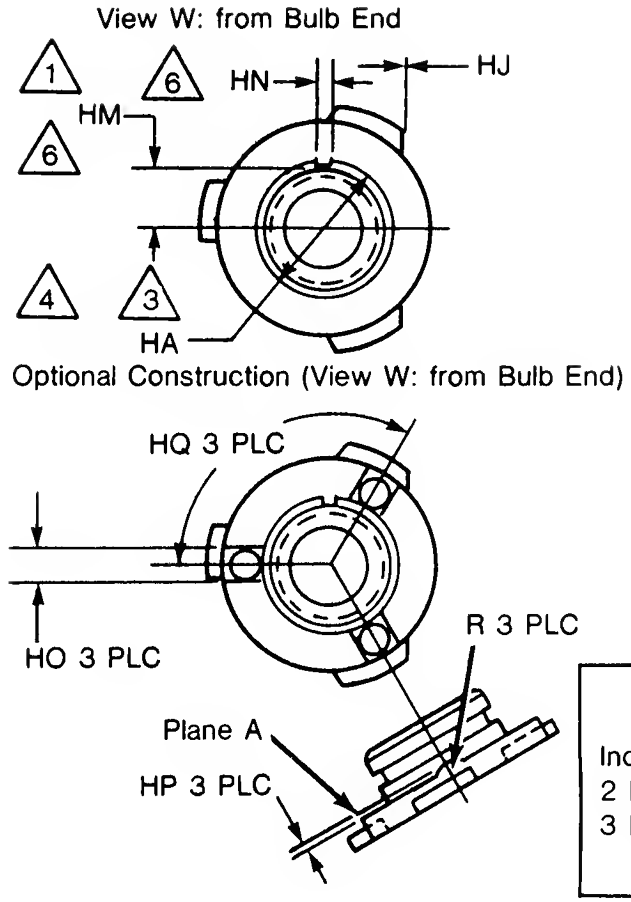
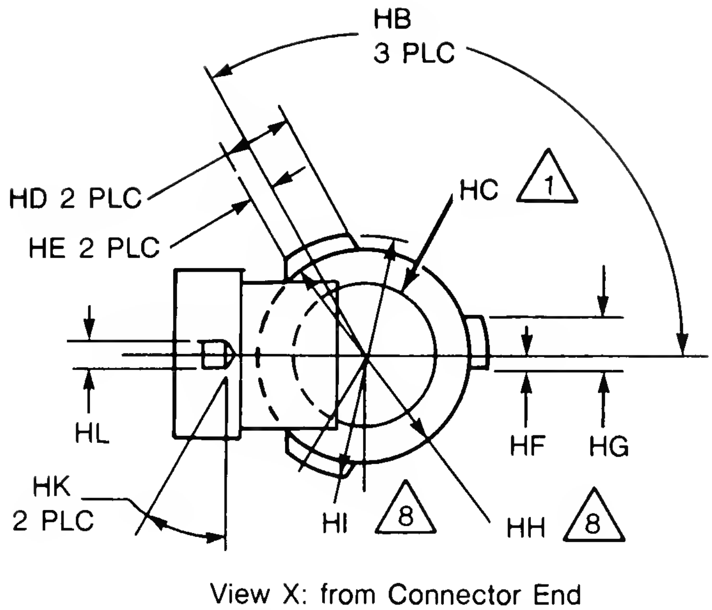


Figure 19-1 - Specifications for the Type HB3 Standardized Replaceable Light Source

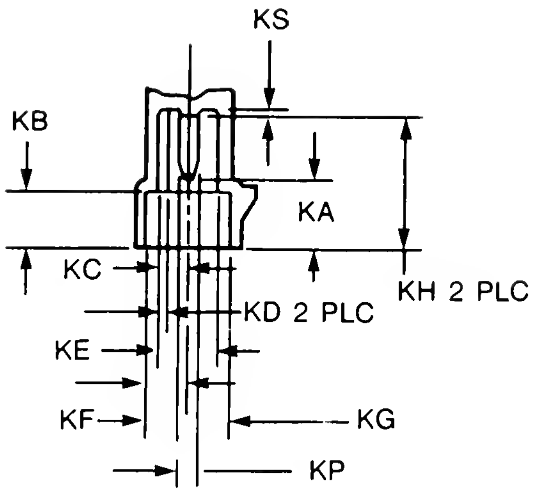




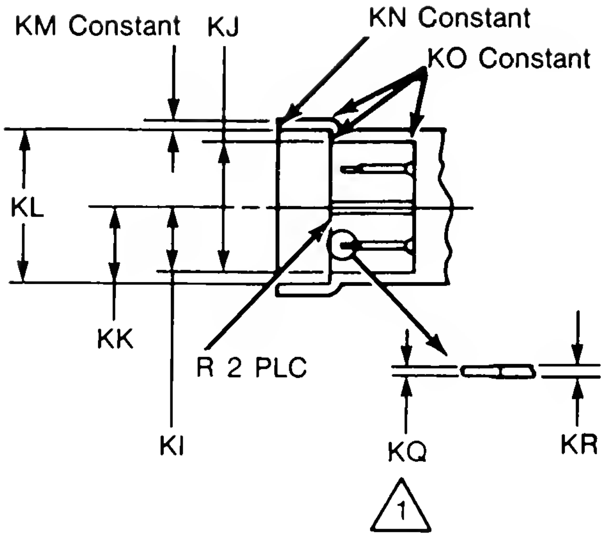
Tolerances Unless Otherwise Specified	
Inches	Millimetres
2 Place Decimals ± 0.02	1 Place Decimals ± 0.5
3 Place Decimals ± 0.010	2 Place Decimals ± 0.30
Angular ± 1°	Angular ± 1°

Dimensions	Inches	Millimetres
HA	0.787 ±0.002 Dia	20.00 ±0.05 Dia
HB	120°±0°30	120°±0°30
HC	0.866 Dia	22.00 Dia
HD	0.394	10.00
HE	0.118	3.00
HF	0.079	2.00
HG	0.315	8.00
HH	1.181 Dia	30.00 Dia
HI	1.417 Dia	36.00 Dia
HJ	3°	3°
HK	30°	30°
HL	0.157	4.00
HM	0.35	8.9
HN	0.079 ±0.004	2.00 ±0.10
HO	0.20	5.0
HP	0.030	0.75
HQ	120° Typ	120° Typ

Figure 19-2 - Specifications for the Type HB3 Standardized Replaceable Light Source



Section T-T (from Fig 19)

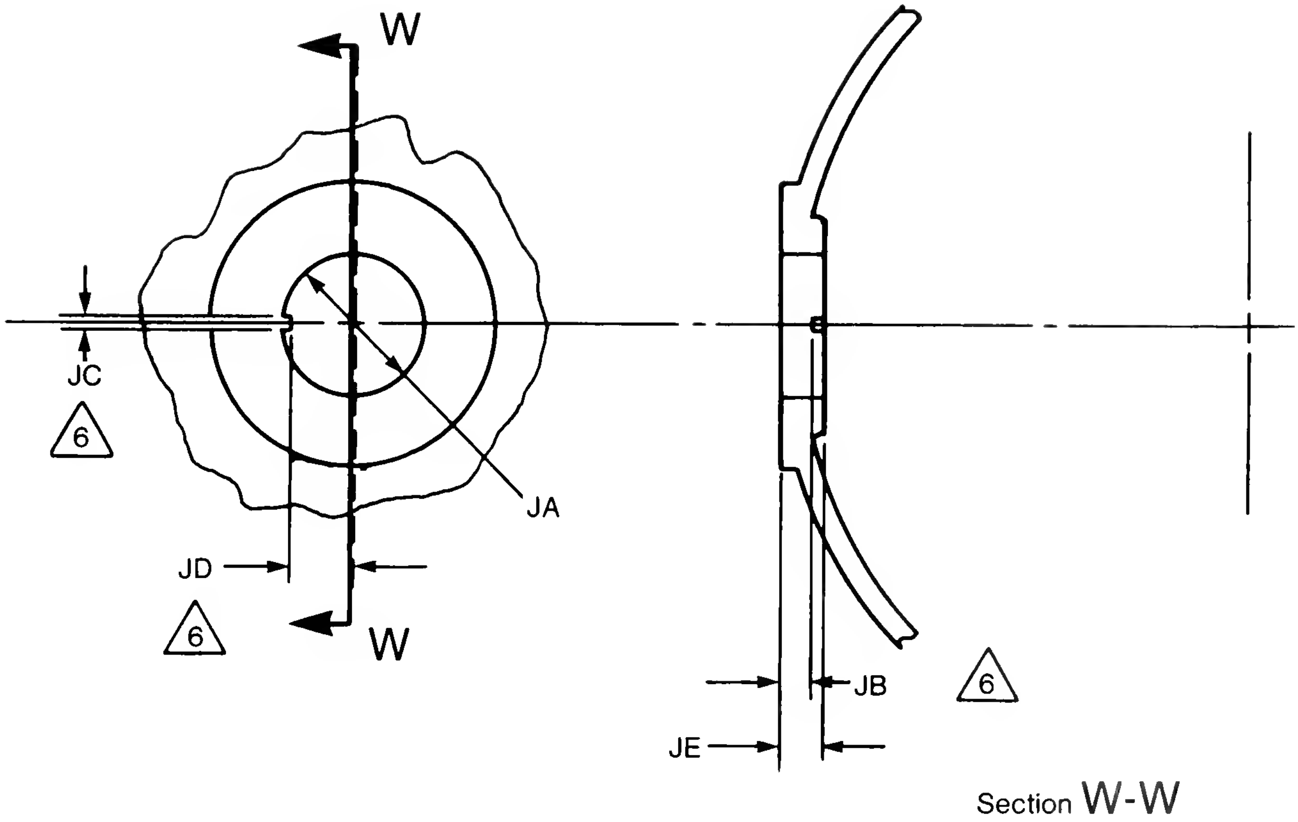


Section U-U (from Fig 19)

Dimensions	Inches	Millimetres
KA	0.384	9.75
KB	0.315	8.00
KC	0.171	4.35
KD	0.055	1.40
KE	0.343	8.70
KF	0.242 ±0.006	6.15 ±0.15
KG	0.484	12.30
KH	0.748	19.00
KI	0.368 ±0.006	9.35 ±0.15
KJ	0.736	18.70
KK	0.439 ±0.006	11.15 ±0.15
KL	0.878	22.30
KM	0.059	1.50
KN	0.03 R	0.8 R
KO	0.016 R	0.40 R
KP	0.110 ±0.004	2.8 ±0.10
KQ	0.024	0.60
KR	0.033 ±0.001	0.83 ±0.03
KS	0.039 Min	1.00 Min

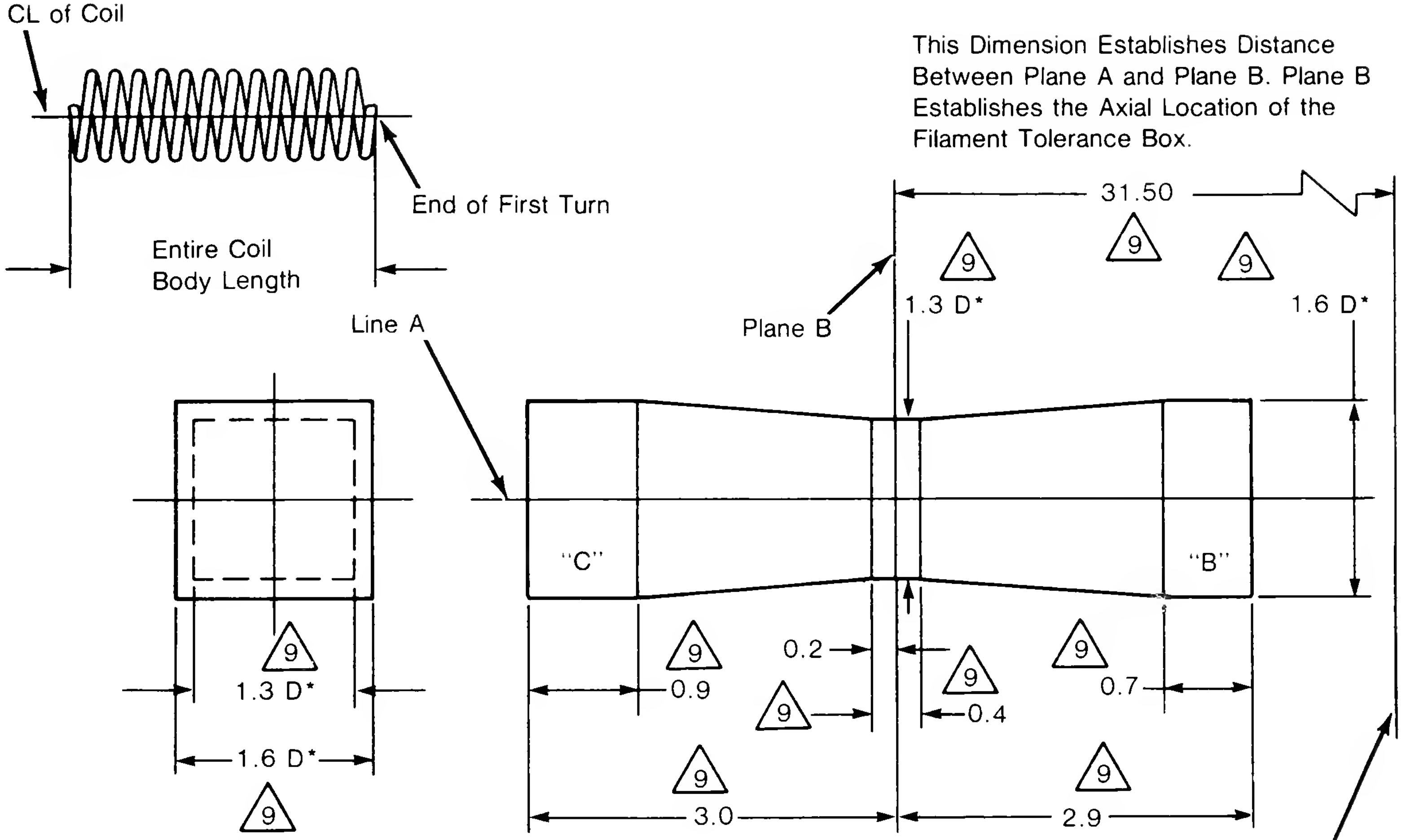
Tolerances Unless Otherwise Specified	
Inches	Millimetres
2 Place Decimals ± 0.02	1 Place Decimals ± 0.5
3 Place Decimals ± 0.010	2 Place Decimals ± 0.30
Angular ± 1°	Angular ± 1°

Figure 19-3 - Specifications for the Type HB3 Standardized Replaceable Light Source



Dimensions	Inches	Millimetres
JA	0.796 ± 0.004 Dia	20.22 ± 0.10 Dia
JB	0.172 +0.010 −0.000	4.36 +0.30 −0.00
JC	0.067 ±0.004 +0.004	1.70 ±0.10 +0.10
JD	0.352 −0.000	8.95 −0.00
JE	0.236 Min	6.00 Min

Figure 19-4 - Specifications for the Type HB3 Standardized Replaceable Light Source Socket (in Reflector)



Plane B Is Parallel to Plane A.
The Entire Coil Body at Design Volts (12.8) Must Be Contained Within the Volume as Specified. The End of the First Turn of the Coil Must Lie Within Volume "B" and The End of the Last Turn of the Coil Must Lie Within Volume "C"
Line A Is Perpendicular to Plane A and Concentric with the 17.46 MM Diameter of the Base.

*D = Diameter of Filament Coil

Dimensions Shown Are in Millimetres

Figure 19-5 - Specifications for the Type HB3 Standardized Replaceable Light Source

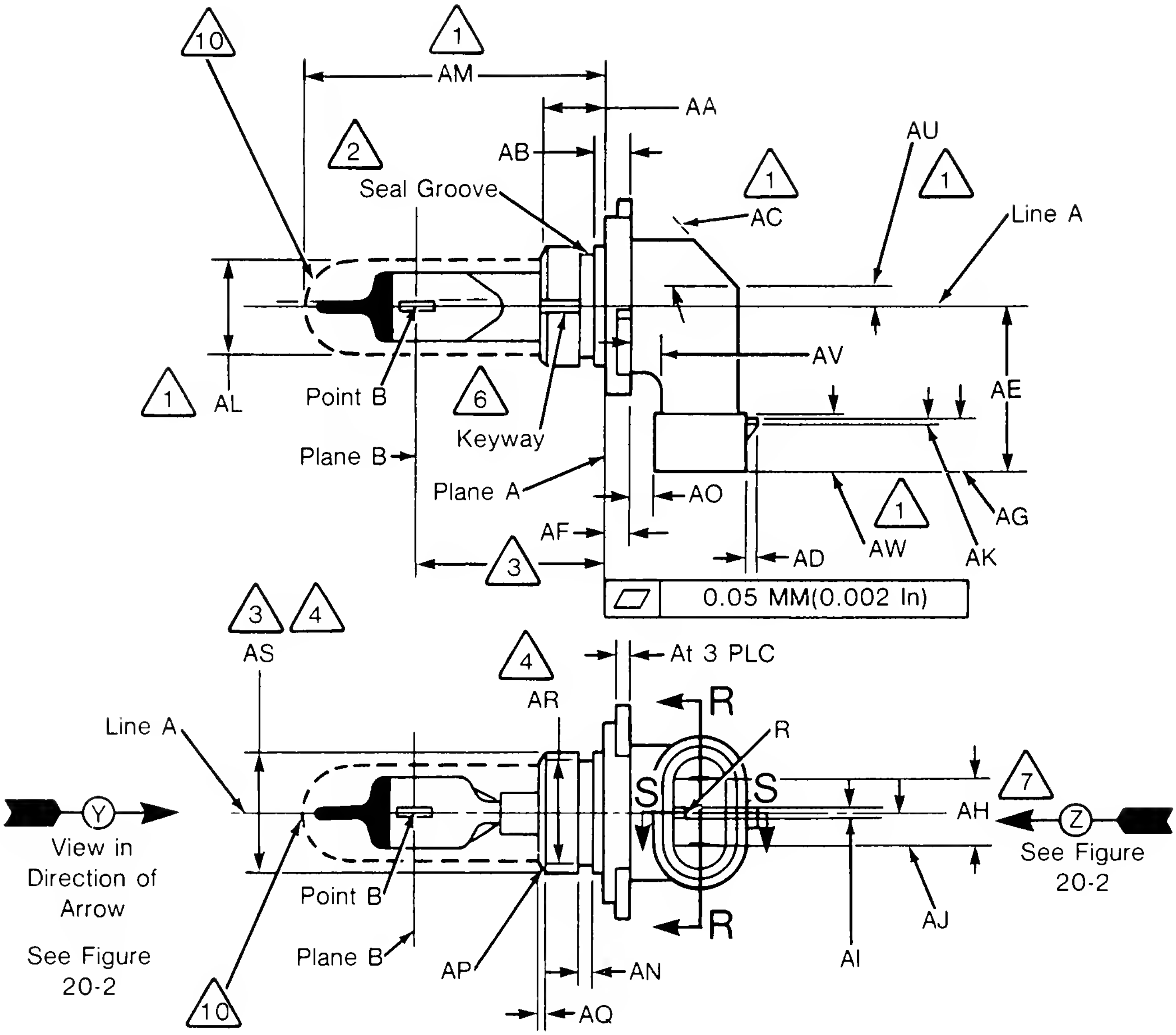


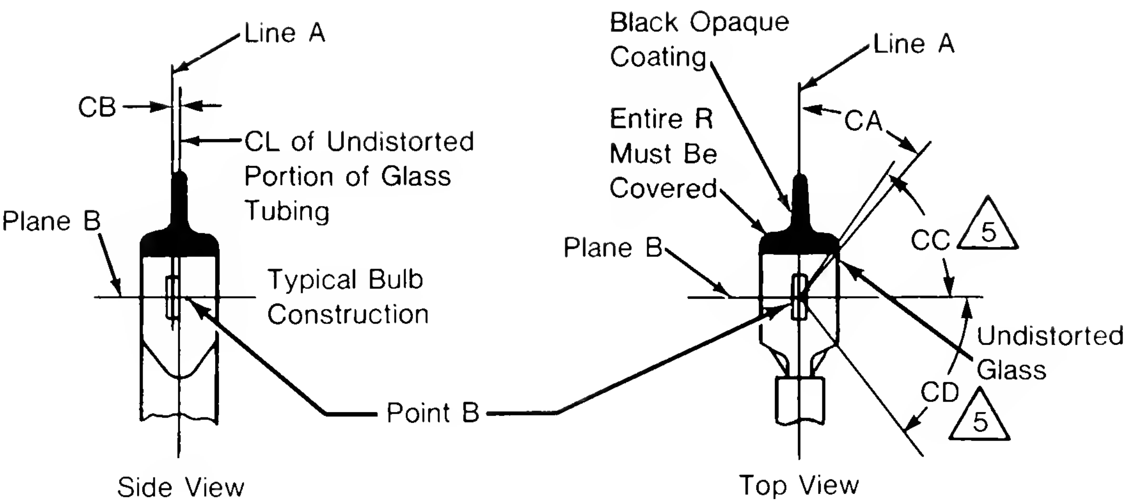
Figure 20 - Specifications for the Type HB4 Standardized Replaceable Light Source

Dimension	Inches	Millimetres
AA	0.591 Max / 0.217 Min	15.00 Max / 5.50 Min
AB	0.236	6.00
AC	45°	45°
AD	0.079	2.00
AE	1.09	27.8
AF	0.165	4.20
AG	0.346	8.80
AH	0.433	11.00
AI	0.055	1.40
AJ	0.217 ± 0.006	5.50 ± 0.15
AK	0.06	1.5
AL	0.780 Dia	19.81 Dia
AM	2.165	55.00
AN	0.093	2.36
AO	0.157	4.00
AP	45° Chamfer	45° Chamfer
AQ	0.039	1.00
AR	$0.766 \begin{smallmatrix}+0.004 \\ -0.000\end{smallmatrix}$ Dia	$19.46 \begin{smallmatrix}+0.10 \\ -0.00\end{smallmatrix}$ Dia
AS	0.866 ± 0.002 Dia	22.00 ± 0.05 Dia
AT	0.079	2.00
AU	0.138	3.5
AV	0.209 Min	5.30 Min
AW	0.378	9.60

1. Dimensions Shown Are Maximum-May Be Smaller
2. Bulbs Must Be Equipped With a Seal. The Bulb-Seal Assembly Must Withstand a Minimum of 69kPA (10 P.S.I.G.) When the Assembly Is Inserted into a Cylindrical Aperture of 22.22 ± 0.10 MM (0.875 ± 0.004 IN).
3. See Figure 20-5
4. Diameters Must Be Concentric Within 0.20 MM (0.008 IN).
5. Glass Bulb Periphery Must Be Optically Distortion Free Axially Within the Included Angles About Point B
6. Key and Keyway Are Optional Construction. Keyway Required for Aftermarket Only.
7. Measured at Terminal Base. Terminals Must Be Perpendicular to Base and Parallel Within ± 1 5°
8. Diameters Must Be Concentric Within 0 2.0 MM (0 008 IN)
9. Absolute Dimension, No Tolerance
10. Glass Capsule and Supports Shall Not Exceed This Envelope

Tolerances Unless Otherwise Specified	
Inches	Millimetres
2 Place Decimals ± 02	1 Place Decimals ± 0 5
3 Place Decimals ± 010	2 Place Decimals ± 0.30
Angular ± 1°	Angular ± 1°

Figure 20 - Specifications for the Type HB4 Standardized Replaceable Light Source (CONT.)



Point B Is Intersection of Plane B and Centerline of Undistorted Glass Tubing

Dimension	Inches	Millimetres
CA	45° ± 5°	45° ± 5°
CB	0.030 ± 0.020	0.75 ± 0.50
CC	50° Min	50° Min
CD	52° Min	52° Min

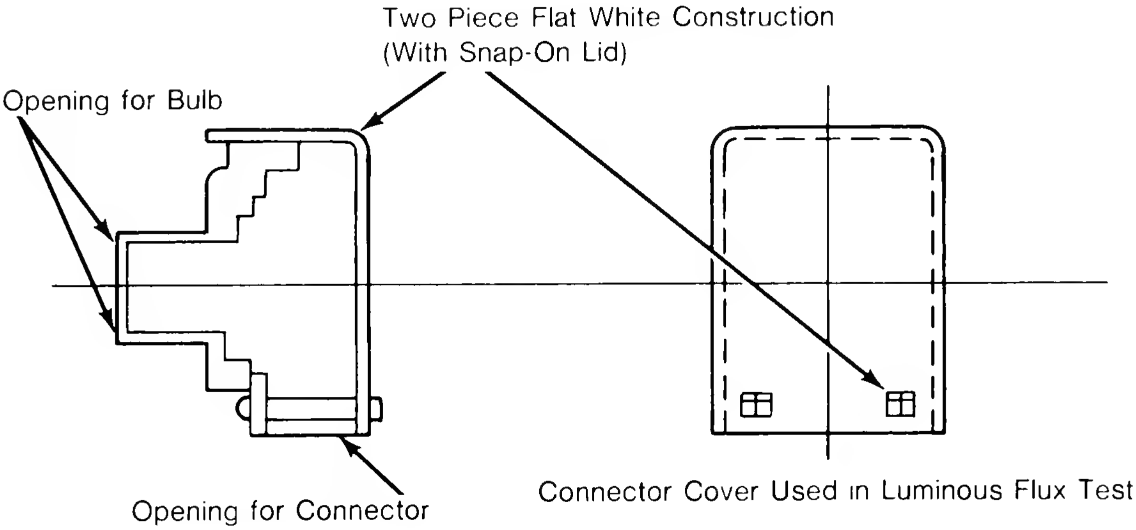
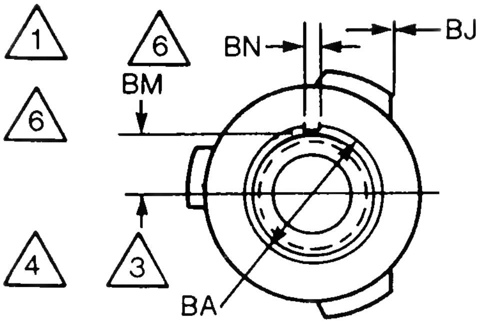
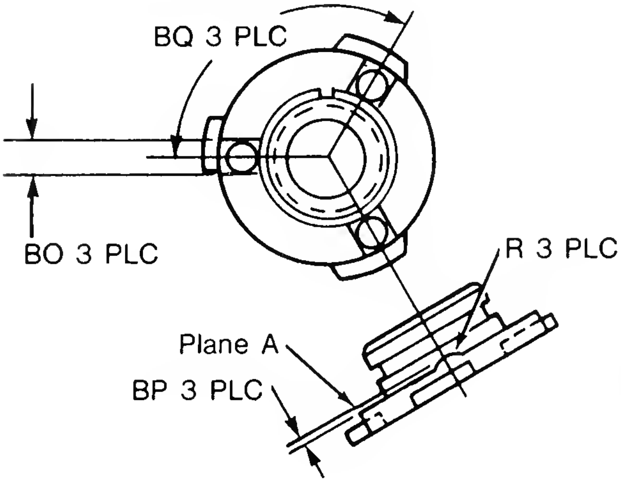


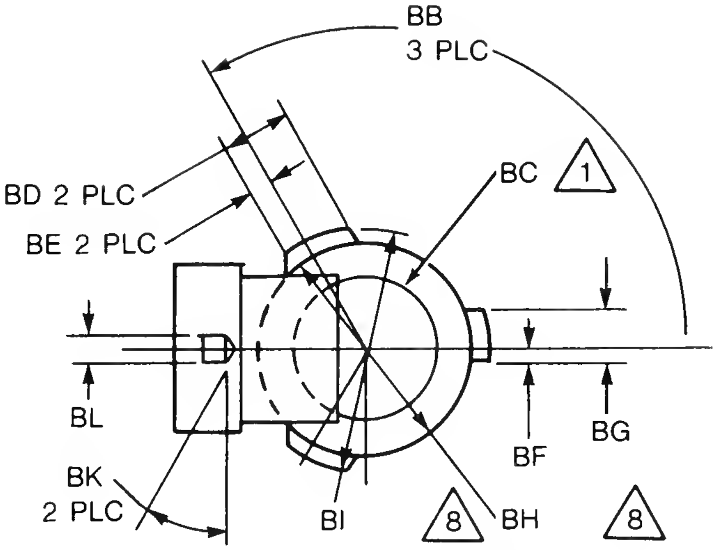
Figure 20-1 - Specifications for the Type HB4 Standardized Replaceable Light Source

View Y: from Bulb End



Optional Construction (View Y: from Bulb End)



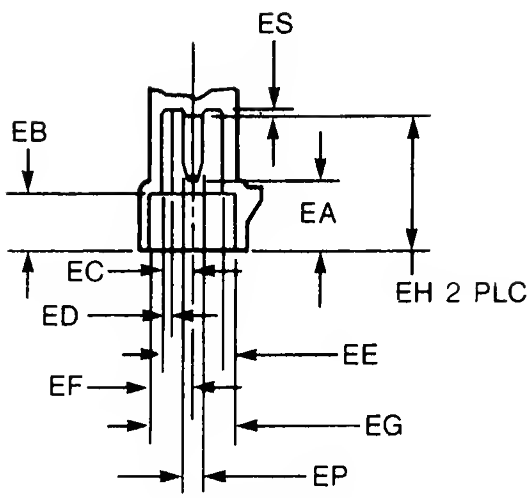


View Z: from Connector End

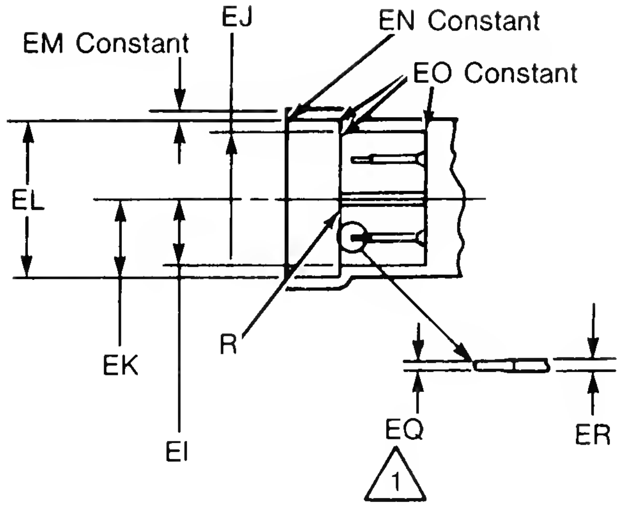
Tolerances Unless Otherwise Specified	
Inches	Millimetres
2 Place Decimals ± 0.02	1 Place Decimals ± 0.5
3 Place Decimals ± 0.010	2 Place Decimals ± 0.30
Angular ± 1°	Angular ± 1°

Dimensions	Inches	Millimetres
BA	0.866 ±0.002 Dia	22.00 ±0.05 Dia
BB	120°±0°30	120°±0°30
BC	0.866 Dia	22.00 Dia
BD	0.394	10.00
BE	0.118	3.00
BF	0.079	2.00
BG	0.315	8.00
BH	1.181 Dia	30.00 Dia
BI	1.417 Dia	36.00 Dia
BJ	3°	3°
BK	30°	30°
BL	0.157	4.00
BM	0.39	9.9
BN	0.079 ±0.004	2.00 ±0.10
BO	0.20	5.0
BP	0.030	0.75
BQ	120° Typ	120° Typ

Figure 20-2 - Specifications for the Type HB4 Standardized Replaceable Light Source



Section S-S (from Fig 20)

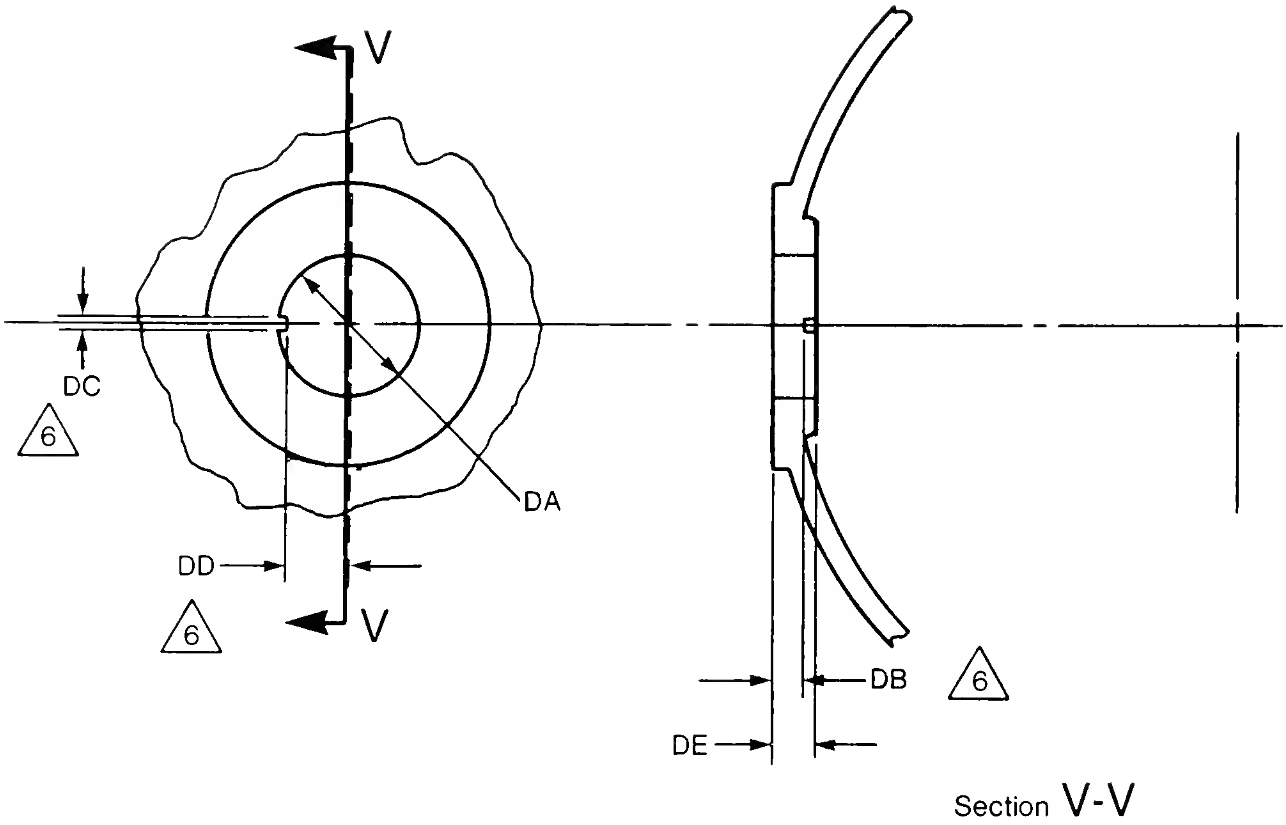


Section R-R (From Fig 20)

Dimensions	Inches	Millimetres
EA	0.384	9.75
EB	0.315	8.00
EC	0.171	4.35
ED	0.079	2.00
EE	0.343	8.70
EF	0.242 ±0.006	6.15 ±0.15
EG	0.484	12.30
EH	0.748	19.00
EI	0.368 ±0.006	9.35 ±0.15
EJ	0.736	18.70
EK	0.439 ±0.006	11.15 ±0.15
EL	0.878	22.30
EM	0.059	1.50
EN	0.03 R	0.8 R
EO	0.016 R	0.40 R
EP	0.110 ±0.004	2.8 ±0.10)
EQ	0.024	0.60
ER	0.033 ±0.001	0.83 ±0.03
ES	0.039 Min	1.00 Min

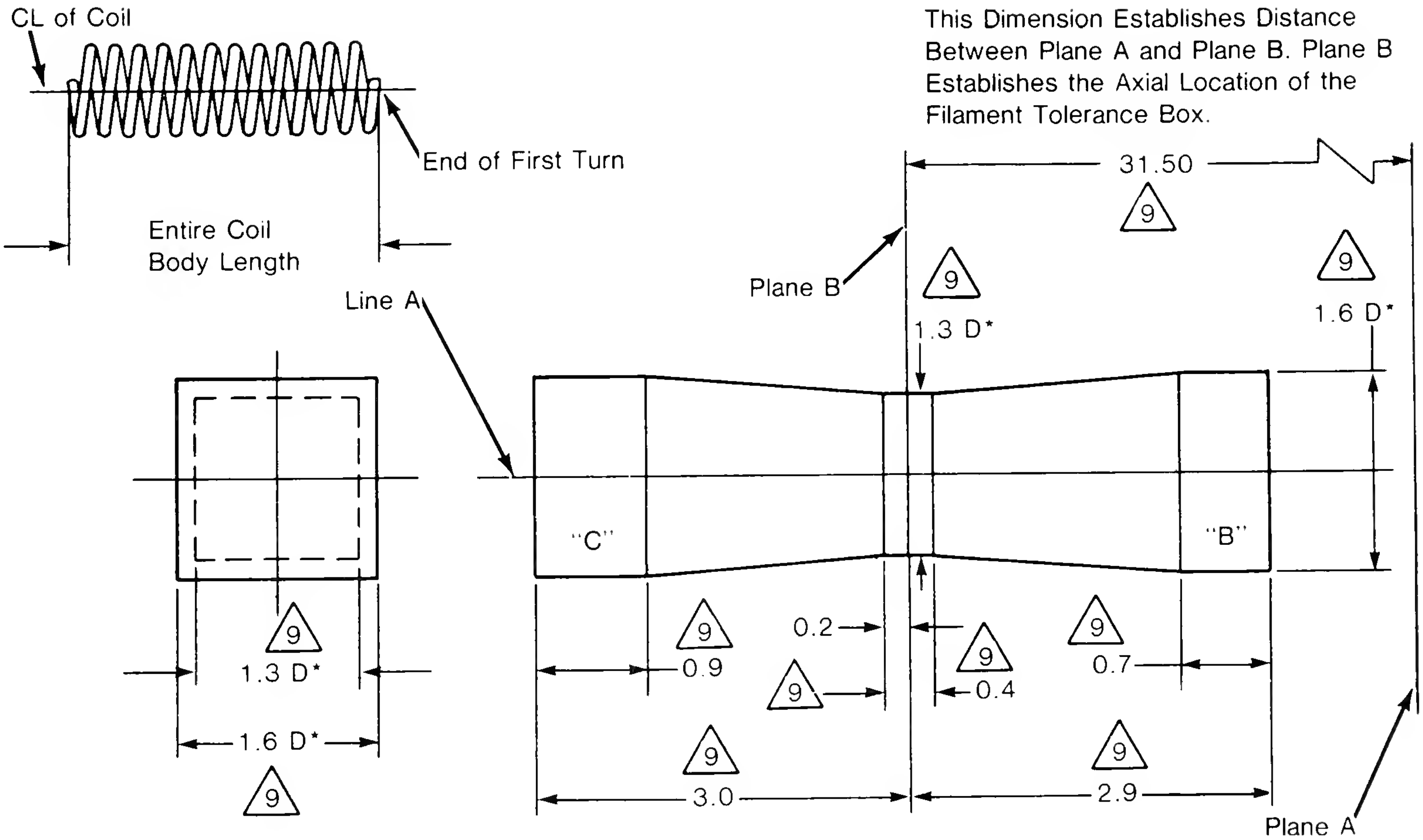
Tolerances Unless Otherwise Specified	
Inches	Millimetres
2 Place Decimals ± 0.02	1 Place Decimals ± 0.5
3 Place Decimals ± 0.010	2 Place Decimals ± 0.30
Angular ± 1°	Angular ± 1°

Figure 20-3 - Specifications for the Type HB4 Standardized Replaceable Light Source



Dimensions	Inches	Millimetres
DA	0.875 ±0.004 Dia	22.22 ±0.10 Dia
DB	0.172 +0.010 −0.000	4.36 +0.30 −0.00
DC	0.067 ±0.004	1.70 ±0.10
DD	0.392 +0.004 −0.000	9.95 +0.10 −0.00
DE	0.236 Min	6.00 Min

Figure 20-4 - Specifications for the Type HB4 Standardized Replaceable Light Source Socket (in Reflector)



Plane B Is Parallel to Plane A.

The Entire Coil Body at Design Volts (12.8) Must Be Contained Within the Volume as Specified. The End of the First Turn of the Coil Must Lie Within Volume "B" and the End of the Last Turn of the Coil Must Lie Within Volume "C"
Line A Is Perpendicular to Plane A and Concentric with the 19.46 MM Diameter of the Base.

*D = Diameter of Filament Coil

Dimensions Shown Are in Millimetres

Figure 20-5 - Specifications for the Type HB4 Standardization Replaceable Light Source

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 81-11; Notice 14)

ACTION: Response to petition for reconsideration; correction.

SUMMARY: This notice responds to a petition for reconsideration of the May 22, 1985, notice amending Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment,* to allow motor vehicles to be equipped with replaceable bulb headlamp systems consisting of either four lamps with single standardized replaceable light sources, or two lamps each with two such light sources.

The petition was filed by Ford Motor Company. Petitioner asked for the deletion of paragraph S4.5.8 which prohibits simultaneous activation of the upper and lower beams of a four lamp system each containing a single standardized replaceable light source, claiming that the agency has shown no safety need for it. The petition is denied because of the potential that combined beam use could result in more than 75,000 candela emission at the H-V test point on each side of the vehicle and more than 5,000 candela at the 4D-V test point. This could cause excess glare down the road to oncoming drivers and excess glare in the foreground.

Petitioner also called attention to duplicative language in paragraph S4.1.1.36(a)(2). Its petition for correction is granted and the standard is amended to remove that language.

EFFECTIVE DATE: July 2, 1986.

SUPPLEMENTARY INFORMATION: On May 22, 1985, NHTSA published a notice amending 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment* (50 FR 21052). The amendment allowed motor vehicles to be equipped with replaceable bulb headlamp systems consisting of either four lamps, each with a single standardized replaceable light source, or two lamps each with two such light sources. Included in the amendment was the prohibition against simultaneous activation (except momentarily for temporary signalling use) of the upper and lower beams of a headlighting system consisting of four lamps each with its own single light source.

On June 21, 1985, Ford Motor Company petitioned for reconsideration of the prohibition, claiming it was an "unwarranted new design restrictive requirement." Citing the agency's rationale for the prohibition, as expressed in the preamble to the notice (the photometric requirements of SAE J579c do not contemplate such use), Ford argued that "no data were presented or referenced by NHTSA in support of this claim, nor have any data been presented to suggest that activating the lower beam simultaneously with the upper beam presents any risk to motor vehicle safety." In Ford's opinion, "Such use of combined beams may well improve the overall upper beam performance and therefore contribute to motor vehicle safety (indeed such use is contemplated by NHTSA in its rulemaking for Type F sealed beam headlamps)." Ford observed that "As no vehicle manufacturer, to our knowledge, has ever marketed a vehicle in which the upper and lower beam could be combined, except as part of a "flash to pass" feature, there is no practical evidence that such a system would harm motor vehicle safety." Ford concluded by suggesting "that if the agency wishes to continue rulemaking in this area, the appropriate course of action would be to issue a notice of proposed rulemaking which would provide both detailed reasons and demonstrate a safety need for such a prohibition."

NHTSA believes that the rulemaking history of paragraph S4.5.8 and the discussion in Notice 3 of Docket 84-04, May 13, 1985, for simultaneous beam use in the Type F system, demonstrate the need for such a prohibition and has offered ample opportunity for public comment. As NHTSA noted in the preamble to the final rule (p. 21054) "A second issue of concern to commenters was the proposed prohibition against simultaneous use of upper and lower beams in a four-lamp system if the J579c photo metrics were allowed, as contrasted with the lack of such a prohibition for systems with Type F photometrics."

Under Standard No. 108, the maximum candela at the H-V test point of the upper beam cannot exceed 75,000 on each side of the front of the vehicle. Beyond that, as the agency has noted, benefits attributable to increased light output rapidly diminish, and the possibility of glare greatly increases. There are also restrictions on the maximum intensity of upper beam light permitted at the 4D-V test point.

The primary reason for not permitting simultaneous use of upper and lower beams in four-lamp, four-light source systems is the potential for such use to result in situations where the photometric limits are exceeded at these test points. These situations may arise because of the way headlamp units are defined in the standard, and because of the way photometric requirements apply to these units.

The photometric tables, in this case from SAE J579c, pertain to a headlamp unit, not to individual filaments or bulbs that may be a part of the unit. Standard No. 108 applies only Table 1 to replaceable bulb headlamps, which provides for a single lower beam, and/or a single upper beam to be produced by a headlamp unit. Thus, in the case of the two-lamp, four-light source system, the standard does not place any limitations on how the photometric requirements for each lamp are to be met as long as the lamp provides a lower beam and an upper beam. Manufacturers are allowed to design lamps to produce the required light patterns with one of the light sources or both of the light sources present in the headlamp because they have complete control over lamp design. Manufacturers can determine how much each light source, reflector, and lens component within each headlamp unit will contribute in producing the required lower beam light and the upper beam light.

Such is not the case in the four-lamp, four-light source system. Here, each lamp must be designed to conform with either the lower beam requirements *or* the upper beam requirements of SAE J579c, Table 1. Thus, it is conceivable that when a lower beam lamp from one manufacturer is activated simultaneously with an upper beam lamp from another manufacturer, as could occur with replacement lamps, the combined output might exceed the photometric maximums allowed at certain critical test point locations such as H-V, or 4D-V.

Some vehicle manufacturers might volunarily equip their products with four lamp systems where the combined output would not exceed maximum limits, but consumers would have no guarantee of this. The potential for mismatch would be even greater when the vehicle owner is required to purchase a replacement lamp in the aftermarket. For lamp units designed to conform with SAE J579c, the only way to prevent the possibility of excessive and potentially unsafe combinations of lamp output, is to prohibit their simultaneous use.

Ford also called the agency's attention to the amendment to S4.1.1.36(a)(2) effectuated on May 22 which added five sentences (not four as the amendatory language mistakenly stated). The first new sentence is redundant with the unamended existing first sentence to the section. Ford recommended removing the second sentence that was added on May 22, i.e., "The lens of each replaceable bulb headlamp shall have three pads which meet the requirements of Figure 4."

The agency agrees that there is a redundancy, and has granted Ford's petition; but it has chosen to remove the existing first sentence, rather than the second sentence added on May 22. The text to be deleted describes the aiming pads, the aiming plane, and the method for determining the settings for the adjustable aiming device locating plate. It states that the aiming pads form the aiming plane which is no longer true. The pads are used for positioning the aimer legs. The aimer legs, having been set to the correct setting as engraved on the lamp lens, determine the aiming plane.

In consideration of the foregoing, 49 CFR 571.108, Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment,* is amended as follows:

The first two sentences of paragraph (a)(2) of paragraph S4.1.1.36 are removed, and the following sentence is added to read:

(a)(2) The lens of each replaceable bulb headlamp shall have three pads which meet the requirements of Figure 4, *Dimensional Specifications for Location of Aiming Pads on Replaceable Bulb Headlamp Units.*

Issued on June 27, 1986.

Barry Felrice
Associate Administrator
for Rulemaking
51 F.R. 24152
July 2, 1986

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 85-10; Notice 2)

ACTION: Final Rule.

SUMMARY: This notice makes nonsubstantive amendments to Federal Motor Vehicle Safety Standard No. 108 to remove original equipment requirements that are no longer in effect and to clarify that most of those requirements may still be met by equipment manufactured to replace such original equipment, to adopt a common typographical manner in referring to materials incorporated by reference, and to correct errors appearing in the *Code of Federal Regulations*.

EFFECTIVE DATE: August 6, 1986.

SUPPLEMENTARY INFORMATION: The agency has recently reviewed 49 CFR 571.108 Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment* as published in the *Code of Federal Regulations*, revised as of October 1, 1985. In so doing, it noted three subject areas where nonsubstantive amendments could be made to clarify and simplify the standard, to remove inconsistencies in titles of SAE of other materials incorportaed by reference, and to correct minor errors.

Clarification of Current Coverage

Standard No. 108 contains certain requirements that applied to vehicles manufactured between certain dates in the past. For example, Paragraph S4.1.1.6 permitted stop lamps on vehicles manufactured between January 1, 1973, and September 1, 1978, to be designed to conform to SAE Standard J586b *Stop Lamps*, as an exception to the requirement for SAE J586c stop lamps in Table III. Although stop lamps meeting J586b may no longer be used as original equipment on passenger cars, their manufacture as replacements for original equipment J586b stop lamps remains permissible. Therefore, the agency is revising S4.1.1.6 in part, from "Each stop lamp on any motor vehicle manufactured between January 1, 1973, and September 1, 1978, may be designed to conform to SAE Standard J586b. . . " to "Each stop lamp manufactured to replace a stop lamp designed to conform to SAE Standard J586b *Stop Lamps*, June 1966, may also be designed to conform to SAE Standard J586b. . ." Similar changes are made to paragraphs S4.1.1.7, S4.1.1.28, S4.1.1.29, and S4.1.1.35. Paragraph S4.1.1.19 and 20 apply to lamps manufactured on or after January 1, 1974; there appears to be no need to retain the effective date on this requirement, nor for the effective date of the lens marking requirement in paragraph S4.1.1.21, and the second paragraph of its subsection (f). Paragraph S4.1.2(a) applies to plastic materials manufactured before January 1, 1976, and may be deleted. Succeeding subparagraphs are redesignated, and references to J576b are deleted.

Consistency in SAE, OSHA, and ASTM References.

Titles of SAE, OSHA, and ASTM materials incorporated by reference appear at some place in the standard in quotation marks, and at other places in italics. The agency has concluded that the style of reference should be consistent, and that italics are preferable to quotation marks because the presence of incorporated materials will be more readily apparent to the reader. Changes from quotation marks to italics are made in the following paragraphs: S.4.1.1.1, S4.1.1.4, S4.1.1.8, S4.1.1.13(a), (b), and (c), S4.1.1.19, S4.1.1.20, S.4.1.1.22, S4.1.1.25, S4.1.1.36(b)(1), (2), and (3), S4.1.1.36(d)(1), (3), (5), (6)(A) and (B), and (7), S4.1.2 (ASTM reference), S.4.1.4(a) and (b), S4.2.1, S4.3.1.5, S4.3.1.7, S4.5.1, S4.5.6, S6.1, S6.4(b)(1) (OSHA reference), S6.5 (ASTM reference), S6.6 (ASTM reference), and S6.7.2(b)(2) and (c)(2) (Title of Figure 7).

Typographical Errors

Typographical errors appear in the following sections and will be corrected: S4.1.1.43(c)(2), and S4.4.1 (this designation is unnecessary as there is no longer a paragraph S4.4.2, and an appropriate correction is made).

In consideration of the foregoing 49 CFR Part 571 and 571.108 Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment* are amended as follows:

1. In paragraph S4.1.1.1, paragraph S4.3.1.7, and paragraph S4.5.6, the words "Turn Signal Lamps" are changed to read *"Turn Signal Lamps"*.

2. In paragraph S4.1.1.4 the words "Sheeting and Tape, Reflective Non-exposed Lens, Adhesive Backing" are revised to read *"Sheeting and Tape, Reflective Non-exposed Lens, Adhesive Backing"*, and the words "Reflex Reflectors" are changed to read *"Reflex Reflectors"*.

3. In paragraph S4.1.1.6 the following changes are made:

(a) The first sentence is revised to read "Each stop lamp manufactured to replace a stop lamp that was designed to conform to SAE Standard J586b *Stop Lamps*, June 1966, may also be designed to conform to J586b."

(b) The third sentence is revise by inserting the words "manufactured for use" between the words "Each such lamp" and "on a passenger car".

4. In paragraph S4.1.1.7 the following changes are made:

(a) The first sentence is revised to read "Each turn signal lamp manufactured to replace a turn signal lamp that was designed to conform to SAE Standard J588d, *Turn Signal Lamps*, June 1966, may also be designed to conform to J588d."

(b) The third sentence is revised by inserting the words "manufactured for use" between the words "Each such lamp" and "on a passenger car."

(c) The last sentence is revised by inserting the words "manufactured for use" between the words "Each such lamp" and "on a multipurpose passenger vehicle".

5. In paragraph S4.1.1.8 the words "Clearance, Side Marker, and Identification Lamps" are changed to *"Clearance, Side Marker, and Identification Lamps"*.

6. In paragraph S4.1.1.13(a) the words "Dimensional Specifications for Sealed Beam Units for Motor Vehicles" are changed to *"Dimensional Specifications for Sealed Beam Headlamps Units"*.

7. In paragraph S4.1.1.13(b), paragraph S4.1.1.36(b)(2), paragraph S4.1.1.36(d)(1), (d)(3), (d)(5), paragraph S4.1.1.36(d)(6)(A), (6)(B), and (6)(C), paragraph S4.1.1.36(d)(7) and paragraph S6.1 the words "Sealed Beam Headlamp Units for Motor Vehicle" are changed to *"Sealed Beam Headlamp Units for Motor Vehicles"*.

8. In paragraph S4.1.1.13(c) and paragraph S4.1.1.36(b)(3), the words "Seal Beam Headlamp Assembly" are changed to *"Sealed Beam Headlamp Assembly"*.

9. In paragraph S4.1.1.19 (a) the words "manufactured on or after January 1, 1974, and" are deleted.

10. In paragraph S4.1.1.20, the words "manufactured on or after January 1, 1974" are deleted.

11. In paragraph S.4.1.1.19 and S4.1.1.20, (b) the words "Lamp Bulbs and Sealed Units" are changed to *"Lamp Bulbs and Sealed Units"*.

12. In paragraph S4.1.1.21, the words "manufactured on or after July 1, 1979" are deleted.

13. The second paragraph of S4.1.1.21(f) is deleted.

14. In paragraph S4.1.1.22, the words "Backup Lamps" are changed to *"Backup Lamps*, February 1968".

15. In paragraph S4.1.1.35, the words "Backup Lamps" are changed to *"Backup Lamps"*.

16. Paragraph S4.1.1.25 is amended as follows:

(a) The words "Dimensional Specifications for Sealed Beam Headlamp Units" are changed to *"Dimensional Specifications for Sealed Beam Headlamps Units"*.

(b) The words "142 mm × 200 mm Sealed Beam Headlamp Unit" are changed to *"142 mm × Sealed Beam Headlamp Unit"*.

17. Paragraph S4.1.1.28 is revised to read:

S4.1.1.28 Each taillamp manufactured to replace a taillamp designed to conform to SEA Standard J585d *Tail Lamps*, August 1970, may also be designed to conform to J585d.

18. Paragraph S4.1.1.29 is revised to read:

S4.1.1.29 Each turn signal lamp manufactured to replace a turn signal lamp (on a motorcycle) that was designed to conform to SAE Standard J588d, *Turn Signal Lamps*, June 1966, may also be designed to conform to J588d.

19. Paragraph S4.1.1.35 is revised to read:

S4.1.1.35 Each headlamp manufactured to replace a headlamp designed to conform to SAE Standard J580a, *Sealed Beam Headlamp*, June 1966, may also be designed to conform to J580a.

20. Paragraph S4.1.1.36(b)(1) is revised to read:

(1) Section 4.6—Photometry of SAE J575 JUN 80 *Tests for Motor Vehicle Lighting Devices and Components*.

21. The following changes are made to paragraph S4.1.1.43:

(a) In subparagraph (c)(2), the word "amiable" is change to "aimable"

(b) In subparagraph (e), the words "August 1979" are changed to "AUG 79".

(c) In subparagraph (e)(5), the words "October 1980" are changed to "OCT 80 *Headlamp Aiming Device for Mechanically Aimable Sealed Beam Headlamp Units*"

22. In paragraph S4.1.1.44 subparagraph "(1)" is changed to "(a)".

23. The following changes are made to paragraph S4.1.2:

(a) Subparagraph (a) is deleted, and subparagraph (b), (c), and (d) are redesignated "(a)", "(b)", and "(c)" respectively.

(b) Redesignated subparagraph (a) is revised to read:

(a) Plastic lenses used for inner lenses or those covered by another material and not exposed directly to sunlight shall meet the requirements of paragraphs 3.4 and 4.2 of SAE J576c when convered by the outer lens or other material;

(c) In redesignated subparagraph (b) the words "Haze and Luminous Transmittance of Transparent Plastic" are changed to *"Haze and Luminous Transmittance of Transparent Plastic"*.

(d) Redesignated subparagraph (c) is revised to read:

(c) After the outdoor exposure test, plastic materials used for reflex reflectors shall meet the appearance requirements of paragraph 4.2.2. of SAE J576c.

24. In paragraph S4.1.4(a) and (b), and in paragraph S4.2.1, the words "School Bus Red Signal Lamps" are changed to *"School Bus Red Signal Lamps"*.

25. Paragraph S4.1.5 is revised to read:

S4.1.5 The color in all lamps, reflective devices, and associated equipment to which this standard applies shall comply with SAE Standard J578c, *Color Specifications for Electric Signal Lighting Devices*, February 1977.

26. Paragraph S4.4 *Equipment combinations* is amended by deleting the numbers "S4.4.1".

27. The following changes are made to paragraph S4.5.1:

(a) The words "Headlamp Beam Switching" are changed to *"Headlamd Beam Switching"*.

(b) The words "Semi-Automatic Headlamps Beam Switching Devices" are changed to *"Semi-Automatic Headlamp Beam Switching Devices"*.

28. In paragraph S6.3 the words "Tests for Motor Vehicle Lighting Devices and Components" are changed to read *"Tests for Motor Vehicle Lighting Devices and Components"*.

29. In paragraph S6.4(b)(1) the words "Handling Storage and Use of Flammable Combustible Liquids" are changed to *"Handling Storage and Use of Flammable Combustible Liquids"*.

30. S6.5(a) the words "August 1979" are revised to read "AUG 79 *Sealed Beam Headlamp Assembly*".

31. In paragraph S6.5(b) the words "Method of Salt Spray (FOG) Testing" are changed to *"Method of Salt Spray (FOG) Testing"*.

32. In paragraph S6.6 the words "specification for Portland Cement" are changed to *"Specification for Portland Cement"*.

33. In paragraphs S6.7.2(a)(2), (b)(2), and (c)(2) the words "Dirt-Ambient Test Setup" are revised to read *"Dirt/Ambient Test Setup"*.

34. In paragraph S6.7.2(c)(3) the tolerances on relative humidity of '30 + 10%" are changed to "30 ± 10%".

35. In paragraph S6.8 the tolerance of "73 ± 7 − 0 °F (20 ± 4-0 °C)" are changed to "73 + 7 − 0 °F (20 + 4 − 0 °C)"

36. In S4.1.1.36(b)(3) the words "SAE J580 Sealed Beam Headlamp Assembly August 1979" are revised to read "SAE J580 AUG 79 *Sealed Beam Headlamp Assembly*".

Issued on July 31, 1986

Diane K. Steed
Administrator

51 F.R. 28238
August 6, 1986

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 81-11; Notice 19)

ACTION: Correction.

SUMMARY: This notice corrects errors occurring in the final rule published on May 2, 1986, adopting HB3 and HB4 light sources for replaceable bulb headlamps. The notice also clarifies an apparent discrepancy between the amendment published on May 2, and an amendment published on May 7 with reference to the amendment of paragraph S4.1.1.38 and its redesignation as paragraph S4.1.1.39. An error in Figure 13 is corrected. An explanation is provided with respect to two of the nonsubstantive amendments published on August 8, 1986.

EFFECTIVE DATE: The corrections are effective October 2, 1986.

SUPPLEMENTARY INFORMATION: During the first week of May 1986 the agency published two notices amending Standard No. 108. The notice that appeared on May 2 (51 FR 16325) adopted the HB3 and HB4 light sources for use in replaceable bulb headlamps, and redesignated the existing light source as HB1. This amendment was not effective until June 2. Several days later, on May 7, a notice was published (51 FR 16847) amending the specifications for the existing light source, but this notice was effective upon publication.

When read in order of publication, some confusion results. The notice of May 2 removes S4.1.1.39, redesignates S4.1.1.40 as S4.1.1.38 and revises it, and redesignates S4.1.1.38 as S4.1.1.39 and revises it. The notice of May 7 revises S4.1.1.38. It is impossible to revise S4.1.1.38 (formerly S4.1.1.40) as adopted on May 2 on the basis of the revision of S4.1.1.38 published on May 7. However, there should be no confusion when revision is made on the basis of the effective dates of May 7 and June 2: S4.1.1.38 (as it appears in 49 CFR 571.108 as of October 1, 1985) is revised for the period May 7-June 2, 1986; on June 2 S4.1.1.38 is redesignated as S4.1.1.39 and further revised. On June 2 the existing S4.1.1.40 becomes the new S4.1.1.38 and is revised in certain respects. Because amendments are effective on the date specified, there is no legal reason to republish the May 2 amendments, and the agency regrets any confusion that may have been caused by publication of the notices out of sequence.

The notice of May 2, however, does contain errors in the text of S6.7.2(c) and S6.8. In both these sections the value of relative humidity is given as 40 plus or minus 10%. Although this was the value initially proposed, between the time of the proposal and the rule NHTSA had adopted 30% as the value in another rulemaking (50 FR 21052, May 22, 1985); therefore correction is made to specify 30 plus or minus 10%. In the amendment redesignating S4.1.1.38 as S4.1.1.39, the plus sign was inadvertently omitted from the general specification for lower beam of the HB1 light source, and the word "Engineering" was omitted from the title of the Illuminating Engineering Society of North America. In paragraph S4.5.8 the word "replacement" should have been "replaceable."

General Motors has brought to the agency's attention the fact that the value for dimension AB in Figure 11 is properly .56 inch rather than .54 inch, and an appropriate correction is made.

The agency has found an error in Figure 13 pertaining to the Type LF headlamp unit, in which letters representing Dimensions C and L were transposed. This notice republishes Figure 13 to correct that error.

Finally, the nonsubstantive amendments published on August 6, 1986, (51 FR 28238) purported to change paragraphs S6.7.2(a)(2), (b)(2), and (c)(2), and S6.7.2(c)(3); however, the three subparagraphs (2), and subparagraph (3) were eliminated by the amendments published on May 2, so that the purported amendments are without legal effect.

Because the amendments are corrective in nature and impose no additional burdens on any person, it is hereby found that for good cause shown that an effective date earlier than 180 days after issuance of the rule is in the public interest, and the amendment is effective upon publication in the *Federal Register*.

In consideration of the foregoing Part 571 is amended as follows:

In Subparagraph (b) of paragraoh S4.1.1.39 the lower beam for the HB1 Specification is changed from "700 - 15 percent" to "700 ± 15 percent."

In Subparagraph (d) of paragraph S4.1.1.39 the word "Engineering" is inserted between the words "Illuminating" and "Society."

In Paragraph S4.5.8 the word "replacement" is corrected to read "replaceable."

Subparagraph (c) of paragraph S6.7.2 is revised by changing the numeral "40" to "30."

In the penultimate sentence of paragraph S6.8 the numeral "40" is changed to "30."

In Figure 11 the value ".54" for letter AB occurring under the column headed "Inch" is changed to ".56."

In Figure 13 under the diagram pertaining to the Type LF headlamp unit, the letters "C REF" and "L" are transposed.

Issued on September 26, 1986

Barry Felrice
Associate Administrator
for Rulemaking

51 F.R. 35222
October 2, 1986

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 81-11; Notice 20)

ACTION: Corrections.

SUMMARY: This notice corrects two errors appearing in the final rule published on May 2, 1986, adopting HB3 and HB4 light sources for replaceable bulb headlamps, specifically in paragraphs S6.7.2(b) and S6.8.

EFFECTIVE DATE: The corrections are effective October 3, 1986.

SUPPLEMENTARY INFORMATION: NHTSA published a final rule on May 2, 1986, amending Federal Motor Vehicle Safety Standard No. 108 (51 FR 16325) which, in pertinent part, revised the internal heat test and humidity test for replaceable bulb headlamps (paragraph S6.7.2 and S6.8 respectively). In paragraph S6.7.2(b) the Celsius value for the headlamp soak temperature was mistakenly given as "34 + 4 - 0 degrees C;" the correct value is "35 + 4 - 0 degrees C." In paragraph S6.8 the Celsius value for the headlamp soak temperature was erroneously given as "20 + 4 - 0 degrees C;" the correct value is "23 + 4 - 0 degrees C". These errors are corrected.

Because the amendments are corrective in nature and impose no additional burdens on any person, it is hereby found for good cause shown that an effective date earlier than 180 days after issuance of the rule is in the public interest, and the amendments are effective upon publication in the *Federal Register.*

In consideration of the foregoing Part 571 is amended as follows:

Sec. 571.108 (Corrected)

In the final sentence of subparagraph (b) of paragraph S6.7.2, the numeral "34" is changed to "35."

In the penultimate sentence of paragraph S6.8 the numeral "20" is changed to "23."

Issued on October 1, 1986

Barry Felrice
Associate Administrator
for Rulemaking

51 F.R. 35357
October 3, 1986

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment

(Docket No. 85-02; Notice 2)

ACTION: Final Rule.

SUMMARY: This notice adopts amendments to Safety Standard No. 108 to allow motor vehicles including motorcycles to be equipped with Type A and Type E headlamps with a simplified mounting system intended to improve the incidence of correct headlamp aim. The headlamps are designated Type G and Type H. The retaining ring and mounting ring assembly used to hold the headlamp in place are eliminated. The new mounting system incorporates integral mounting/aiming tabs on the body of the headlamp and permits the headlamp to attach directly to the aiming screws, and thus the car body.

DATE: Effective date of the amendment is November 12, 1986.

SUPPLEMENTARY INFORMATION: On December 20, 1984, Chrysler Corporation petitioned the National Highway Traffic Safety Administration for rulemaking to amend 49 CFR 571.108 Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment* to allow the use of a new mounting system it had developed for plastic headlamps. According to Chrysler, its new system reduces vehicle weight, is less costly, and simplifies headlamp aim and replacement. The headlamps and their mounting system continue to meet all applicable performance requirements of Standard No. 108, including vibration, corrosion, and photometrics. The agency granted Chrysler's petition, and on March 25, 1986, published a *Notice of Proposed Rulemaking* (51 FR 10237).

Until 1983, headlamp systems specified by Standard No. 108, consisted of sealed beam headlamps, rings for mounting and aiming purposes, and rings for retaining the headlamps. At that time Standard No. 108 was amended to permit the replaceable bulb headlamp in which the size and shape are left to the manufacturer's design and thereby vary significantly from that of traditional sealed beam lamps. Attendant with this styling freedom was the freedom to mount the lamps in whatever manner the designer chose though continuing to meet aim performance requirements. The method that has evolved is the placement of mounting tabs and ball joints on the rear of the reflector area. These integral mounting tabs attach to the screws and pivots which are the headlamp's aim adjustment mechanism, and the traditional metal mounting and retaining rings are eliminated.

Chrysler's petition expands the use of such integral mounting/aiming systems from replaceable bulb headlamps to two types of sealed beam headlamps. As the *Notice of Proposed Rulemaking* observed, the new mounting system, which Chrysler calls the "Integral Mount Sealed Beam Headlamp System" eliminates the traditional metal retaining ring and metal mounting ring assembly used to hold a sealed beam headlamp in the vehicle. This simplified mounting system incorporates integral mounting/aiming tabs on the body of the sealed beam headlamp and permits the headlamp to attach directly to the aiming screws, and thus the car body. Chrysler wishes to introduce this integral mounting system on headlamps which are physically and functionally similar to the Type A, the four lamp, small rectangular, headlamp system, and the Type E, the two lamp, small rectangular headlamp system. Because the mounting system would be an integral part of the headlamp, the headlamps so manufactured would not be interchangeable with Type A or Type E sealed beam headlamps. Therefore, Type A and Type E headlamp systems incorporating such an integral mount would be considered a "new" system and would need a designation to differentiate them from standard Type A and Type E systems. Accordingly, Chrysler suggested Type G and Type H as the new designations.

The two major changes to the standard desired by Chrysler deal with the dimensional aspects of sealed beam headlamp design related to interchangeability features and the lamp system nomenclature. Chrysler suggested permitting vehicles to be equipped with two Type 1G1 and two Type 2G1, or two Type 2H1 headlamps, designed to conform to the dimensional requirements and the applicable performance requirements normally required of existing sealed beam headlamps and headlamp systems.

Chrysler attributed the following benefits to the simplified mounting system:

• Weight savings of one half pound per headlamp over existing plastic sealed beam headlamp systems. This will enhance fuel economy.

• Simplified headlamp replacement; only two screws (instead of four) required to remove the lamp and install its replacement.

• Lamp reaim upon replacement is unnecessary if the aiming screws are not disturbed. Chrysler claims that, because it has specified a certain close relationship between the aiming pads and the mounting tabs/mounting ball, lamp aim will be unaffected by replacement.

• Simplified aiming process because fewer adjustments are necessary for proper aim than current aiming systems. Chrysler also claims that headlamp aiming, when re-aiming is necessary, will be performed better, faster and more willingly.

In support of some of those claims. Chrysler provided pertinent data. For example, to demonstrate the improvement in aimability, Chrysler performed an aim deviation test where integral mount lamp assemblies were exercised through the full range of aim adjustment, vertically or horizontally. Chrysler found that the mean vertical aim deviation with the integral mount system was 32 percent of that of the standard Chrysler headlamp mounting system and 14 percent of the mean deviation in the horizontal axis.

Chrysler specified a close relationship in the aiming and mounting planes so that replacement lamps will achieve essentially the same aim as the originals. The petitioner offered data which show the variability in aim when standard sealed beam lamps are replaced, and when integral mount sealed beam lamps are replaced. The standard lamps had a mean aim deviation of 1.262 inces horizontal and 3.374 inches vertical. The integral mount lamps had a mean aim deviation of 0.799 inch horizontal and 0.879 inch vertical. This shows a replacement aim error improvement of 31 percent horizontal and 74 percent vertical for the samples tested. Based on the results, Chrysler argued that the new system can be replaced without reaim. This is in distinct contrast to most existing sealed beam lamps which often require reaim upon replacement.

To assure that proper interchangeability occurs with sealed beam headlamps incorporating the integral mounting system, Chrysler submitted drawings which prescribe the necessary interchangeability dimensions and features (proposed as Figures 17 and 18). These figures also require that the nearly-identical Type 2G1 and the 1G1, be designed with a different spacing on the mounting tabs to assure non-interchangeability since one is a lower beam lamp and the other is an upper.

Additionally, Chrysler stated that the new headlamp systems will be designed to conform to all applicable tests as met by existing sealed beam lamps. This would include lamp retention, torque deflection, aim adjustment, inward force, connector tests, and photometry tests.

After review of the new mounting system, NHTSA tentatively concluded that it offers the potential for improved headlamp aim at the time of the vehicle's manufacture with the possibility of no further reaim during the life of the vehicle, even upon headlamp replacement. This would provide an enhancement of motor vehicle safety, though the benefits cannot be quantified. To achieve these benefits, when the lamp systems go into production, they must achieve the same level of aim performance that the prototypes achieved. If production tolerances closely approximate those of the prototypes, the system will be likely to remain properly aimed over the vehicle's life, and fulfill Chrysler's expectations for it.

Therefore, NHTSA proposed on March 25, 1986, amendments of the nature Chrysler requested, however, the system would be a modification of all Type A and Type E headlamps and not just those with plastic lenses. NHTSA also proposed that Type G and Type H be available for use on motorcycles, though benefits for that application are less clear.

Seven comments were received on the proposal. The new headlamps and mounting system were endorsed by Ford Motor Company, Chrysler, GE, and Volkswagen of America. Ford and Chrysler suggested a clarification of the torque deflection test to specify that a second reading on the thumb wheel shall be taken. The agency concurs, and the rule adopts this suggestion. General Electric stated that the consumer's best interests are not necessarily served by the action, because it is unlikely that retail automotive parts outlets will stock presumably low-demand Type G and Type H headlamps. While this may be true, the new headlamps should be available from the parts departments of all dealers who sell vehicles equipped with the new headlamps, and the consumer's search for a replacement lamp need not compromise safety. Corning also opposed the new system for the same reason. Stanley Electric Co., and Koito also raised the issue of proliferation. Both Koito Electric Co. and Stanley objected to the proposal because it covers a design of a proprietary nature, and that its use, at least in the United States, should be on a royalty-free basis. After reviewing these comments, Chrysler filed a statement in the docket on June 10, 1986, that "all manufacturers of motor vehicles, headlamps or headlamp components" wishing to manufacture or use the new system "will be granted royalty-free non-exclusive licenses to use the mounting system upon request, under U.S. patents and U.S. patent applications . . . to the extent that use of the mounting system is necessary to employ the proposed optional headlamp system on motor vehicles regulated by the U.S. Motor Vehicle Safety Standards." NHTSA has therefore decided to adopt the rule as proposed.

NHTSA has considered this rule and has determined that it is not major within the meaning of Executive Order 12291 "Federal Regulation" or significant under Department of Transportation regulatory policies and procedures. The economic impact is expected to be minimal and therefore, a regulatory evaluation has not been prepared. Since use of the headlamps is optional, the rule will not impose additional requirements or costs but will permit manufacturers greater flexibility in use of headlighting systems.

Because this amendment relieves a restriction and because of the necessity of vehicle, headlamp, and bulb manufacturers to plan production and distribution on an orderly basis, the agency finds that an immediate effective date is in the public interest.

In consideration of the foregoing, 49 CFR 571.108 Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment* is amended as follows:

1. In paragraph S4.1.1.34 the following are added to the chart of headlighting types.

System	Headlamp Type	Number of Headlamps
* ----------	* -----------------------	*
7 ----------	Type 1G1 and ----------- Type 2G1	1 lamp each
8 ----------	Type 2H1---------------	1 lamp

2. New paragraphs S4.1.1.47 and S4.1.1.48 are added to read:

S4.1.1.47 Instead of being equipped with a headlamp system specified in Table I and Table III, a passenger car, multipurpose passenger vehicle, truck, or bus manufactured on or after September 1, 1986, may be equipped with a Type G headlamp system consisting of two type 1G1 and two type 2G1 headlamps or a Type H headlamp system consisting of two type 2H1 headlamps that are designed to conform to the following requirements:

(a) The dimensions specified in Figures 21 and 22.

(b) The requirements of SAE Standard J579c, *Sealed Beam Headlamp Units for Motor Vehicles*, December 1978.

(c) The requirements of SAE Standard J580 August 1979, *Sealed Beam Headlamp Assembly*, with the following exceptions:

(1) Sections 2.2, 2.3, 4, 6.3 and 6.5

(2) In place of Sections 6.3 and 6.5, the following requirements shall be met:

(i) *Retention Test*. The sealed beam unit shall remain held securely in its design position after 20 replacements.

(ii) *Torque Deflection Test*. The headlamp assembly to be tested shall be mounted in the designed vehicle position and set at nominal aim (0.0). A special adaptor (Figure 18) for the deflectometer of Figure 3 shall be clamped onto the headlamp assembly. A torque of 20 lb.-in. (2.25 N-m) shall be applied to the headlamp assembly through the deflectometer, and a reading on the thumb wheel shall be taken. The torque shall be removed and a second reading on the thumb wheel shall be taken. The difference between the two readings shall not exceed 0.30 degree.

S4.1.1.48 The lens of each headlamp designed to conform with paragraph S4.1.1.47 shall be marked with the symbol "DOT" (either horizontally or vertically) which shall constitute certification that the headlamp conforms to applicable Federal motor vehicle safety standards, and with one of the following designations as appropriate:

(a) A lens for a headlamp, nominal size 100 x 165mm, incorporating an upper beam only and meeting the upper beam performance requirement of SAE J579c December 1978, Table 2, Upper Beam, shall be labeled 1G1.

(b) A lens for a headlamp, nominal size 100 x 165 mm, incorporating both an upper beam and a lower beam meeting the performance requirements of SAE J579c December 1978, Table 2 Upper Beam and Lower Beam shall be labelled 2G1.

(c) A lens for a headlamp, nominal size 100 x 165 mm, incorporating both an upper beam and a lower beam meeting the performance requirements of SAE J579c December 1978, Table 1 shall be labelled 2H1.

3. Figures 18, 21, and 22 are added as follows:

Issued on November 4, 1986.

Diane K. Steed
Administrator

51 F.R. 40979
November 12, 1986

PREAMBLE TO AN AMENDMENT TO MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment [Docket No. 83-12; Notice 5]

ACTION: Corrections

SUMMARY: This notice corrects two errors occurring in the final rule published on November 28, 1984, amending the standard to bring certain of its requirements closer to those of the Economic Commission of Europe. Table I was inadvertently amended to specify four, instead of two, rear side marker lamps for wide vehicles. Table III contains a typographical error in the section on reflex reflectors.

EFFECTIVE DATE: The corrections are effective February 17, 1987.

SUPPLEMENTARY INFORMATION: Federal Motor Vehicle Safety Standard No. 108 *Lamps, Reflective Devices, and Associated Equipment* was amended on November 28, 1984, to bring certain of its requirements closer to those of the Economic Commission for Europe of the United Nations (ECE) (49 FR 46386). As part of this notice, Standard No. 108's Tables I and III as amended were republished in full. Heretofore Table I had required multipurpose passenger vehicles, trucks, and buses with an overall width of 80 or more inches to have "2 red; 2 amber" side marker lamps, but the Table as amended specified "4 red; 2 amber." It was not the agency's intent to change the number of rear side marker lamps on these vehicles, and Table I is being corrected to "2 red; 2 amber."

In the amendment to Table III that occurred at the same time, the reflex reflectors required for passenger cars, multipurpose passenger vehicles, trucks, and buses was stated as "4 reds; 2 amber," and the Table is being amended to read "4 red; 2 amber." In this regard NHTSA notes that its own publication "Federal Motor Vehicle Safety Standards and Regulations, With Amendments and Interpretations Issued Through December 1984" erroneously gives the number of reflex reflectors as "4 red; 4 amber." NHTSA advises owners of this publication to change the number of amber reflectors to two.

Because the amendments are corrective in nature and impose no additional burden upon any person, it is hereby found for good cause shown that an effective date earlier than 180 days after issuance of the rule is in the public interest, and the amendments are effective upon publication in the *Federal Register*.

In consideration of the foregoing, Part 571 is amended as follows:

1. In Table I under the column headed "Multipurpose passenger vehicles, trucks, and buses" the number of side marker lamps is corrected to read "2 red; 2 amber."
2. In Table III under the column headed "Passenger cars, multipurpose passenger vehicles, trucks, and buses" the number of reflex reflectors is corrected to read "4 red; 2 amber."

Issued on: Feb. 10, 1987

Barry Felrice
Associate Administrator
for Rulemaking

52 F.R. 4774
February 17, 1987

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices and Associated Equipment (Docket No. 81-11; Notice 23)

ACTION: Final Rule.

SUMMARY: This notice adopts a technical amendment which, in effect, permits aiming pad configurations specified for sealed beam headlamps with circular lenses to be used on replaceable bulb headlamps. The notice implements the grant of a rulemaking petition filed by BMW of North America, Inc. A Notice of Proposed Rulemaking on this subject was published in February 1987.

DATE: Effective date of the amendment is October 14, 1987.

SUPPLEMENTARY INFORMATION: Late in 1986, BMW of North America, Inc., filed a petition for rulemaking to amend Motor Vehicle Safety Standard No. 108, to clarify that replaceable bulb headlamp systems may incorporate aiming pad configurations identical to those required on sealed-beam headlamps with circular lenses, saying that it wished to introduce a replaceable bulb headlamp with a circular lens whose diameter is equal to that of a 5 3/4 inch sealed beam headlamp. However, it is impossible for BMW's new headlamp to meet the aiming pad configurations specified by Figure 4 of Standard No. 108 for replaceable bulb headlamps, though it can meet those specified for sealed beam headlamps with a lens diameter of 5 3/4 inches. It therefore petitioned NHTSA for an alternative to Figure 4 which would allow replaceable bulb lamp lenses to "be designed so that the lamp may be inspected and aimed by mechanical aimers as specified in SAE J602 October 1980, without the removal of any ornamental trim rings or other parts."

In amending Standard No. 108 to allow use of replaceable bulb headlamps with the attendant styling freedom, NHTSA did not deem it likely that a manufacturer would wish to introduce such a lamp with a size identical to one of the four then permitted. Thus, the petitioner was correct in concluding that the apparent exclusion of replaceable bulb headlamp systems from sealed beam aiming pad location requirements was inadvertent. Therefore, NHTSA granted BMW's petition, and issued a Notice of Proposed Rulemaking, published in the *Federal Register* on February 25, 1987 (52 FR 5563). It proposed an amendment of paragraph S4.1.1.36(a)(2) that would allow replaceable bulb headlamps the option of incorporating aiming pads as specified for 7-inch, or 5 3/4-inch diameter sealed beam headlamps as specified in SAE Standard J571d, and that would require such headlamps to be designed so that they could be inspected and aimed by mechanical aimers as specified in SAE Standard J602. This is necessary because the universal adapter used on other types of replaceable bulb headlamps is not designed for use on headlamps of the sizes covered by SAE J571d.

At that time the agency was considering the advisability of requiring headlamps on which the universal adapter cannot be used to bear permanent identification of the type adapter for which it is designed, and whether such an adapter has been provided with the vehicle, as well as the advisability of placing this information in the operator's manual. NHTSA requested comments on the necessity for the provision of that information.

Seven brief comments were received on the proposal, none of which opposed it. In the proposal the last sentence of S4.1.1.36(a)(2) stated that a headlamp with aiming pads meeting the requirements of SAE J571d for circular headlamps shall be designed so that it may be inspected and aimed by a mechanical aimer as specified in SAE J602c. However, upon review, NHTSA has concluded that this language is unnecessary and has removed it from S4.1.1.36(a)(2) which is otherwise unchanged from the language proposed; the language, in essence, already appears in the first sentence of (a)(2).

The petitioner, BMW, asked an interpretative question. It requested confirmation that aiming dimensions do not have to be marked on the lenses because sealed beam headlamps aimed by a mechanical aimer as specified in SAE J602c do not have to be marked. The agency confirms BMW's understanding. Aiming dimensions do not have to be marked on the lens of a headlamp using existing adapters for headlamps with diameters of 5 3/4 inches and 7 inches because of the exception in (a)(3) provided for in (a)(2). This exception (Section 5 of SAE J580 AUG79) regulates the design of sealed beam headlamps with those diameters.

In response to NHTSA's request for comments on the advisability of marking adapter information on the lenses of headlamps unable to accommodate the universal adapter, and associated Operator's Manual information, manufacturers generally opposed these ideas. Chrysler Corporation expressed its belief that personnel involved in aiming headlamps are already knowledgable about appropriate adapters. Because vehicle owners generally do not mechanically aim their headlamps, adapter information in the Operator's Manual would serve no useful purpose. Perhaps most importantly, adapters are not standardized, and standardization would have to occur before any regulation relating to them could be promulgated. Volkswagen of America felt that the number of adapters is so small and the physical differences between them so obvious that no markings are required. Ford Motor Company also opposed any regulation. General Motors does not anticipate that a significant number of new types of adapters will be forthcoming in the future, as it believes there will be a trend away from the use of aiming pads on the face of the lens towards on-vehicle aiming systems. In view of these comments the agency does not intend to consider these topics as candidates for rulemaking.

In consideration of the foregoing, 49 CFR Part 571 and 571.108 is amended as follows:

Subparagraph (a)(2) of Paragraph S4.1.1.36 is revised to read

"S4.1.1.36"

(a)(2) The exterior face of the lens of each replaceable bulb headlamp shall have three pads which meet the requirements of either Figure 4, *Dimensional Specifications for Location of Aiming Pads on Replaceable Bulb Headlamp Units*, or SAE Standard J571d *Dimensional Specifications for Sealed Beam Headlamp Units*, June 1976, as specified for a headlamp with a diameter of 5 3/4 inches or 7 inches. Except as provided in subparagraph (a)(3), a whole number which represents the distance in tenths of an inch (i.e., 0.3 inch=3) from the aiming reference plane to the respective aiming pads which are not in contact with that plane, shall be inscribed adjacent to each respective aiming pad on the lens of a headlamp whose pads meet the requirements of Figure 4. The height of these numbers shall not be less than .157 inch (4mm). If there is interference between the plane and the area of the lens between the aiming pads, the whole number will represent the distance to a secondary plane. The secondary plane shall be located parallel to the aiming reference plane and as close as possible to the lens without causing interference.

Issued on September 8, 1987

Diane K. Steed
Administrator

52 F.R. 34654
September 14, 1987

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices and Associated Equipment (Docket No. 83-12; Notice 12)

ACTION: Technical amendment.

SUMMARY: This notice constitutes a technical amendment of Safety Standard No. 108 to reflect the agency's intent in Footnote 3 to Figure 1b. The Footnote in part establishes a minimum separation distance between a turn signal lamp of certain minimum candela and the lower beam headlamp, "or from the lighted edge of any additional lamp installed as original equipment or used in lieu of the lower beam." The distance intended by the agency is between the turn signal lamp and the edge of the lower beam headlamp, or from the lighted edge of any additional lamp installed as original equipment which supplements the lower beam.

EFFECTIVE DATE: November 16, 1987.

SUPPLEMENTARY INFORMATION: With the advent of the replaceable bulb headlamp, motor vehicle and lighting manufacturers have shown an interest in headlamp designs which combine headlighting with other lighting functions such as parking lamps or fog lamps. Figure 1b of Standard No. 108 establishes the minimum and maximum allowable candle power values for several items of lighting equipment required as original equipment on motor vehicles, including yellow front turn signals. According to Footnote 3 to Figure 1b some of these values "apply when the optical axis (filament center) of the front-turn signal is at a spacing less than 4 in. (10 cm.) from the lighted edge of the headlamp unit providing the lower beam, or from the lighted edge of any additional lamp installed as original equipment or used in lieu of the lower beam." Manufacturers have asked the agency for interpretations of this language as it affects the spacing between turn signals and front lamps that combine headlighting with other functions. These requests have demonstrated that a literal reading of the language results in an overly restrictive interpretation and one which the agency did not intend.

For example, Koito Manufacturing Co. of Japan submitted a drawing depicting a headlamp and a parking lamp in a common chamber, unpartitioned, consisting of a lens and a reflector. The parking lamp would be separate and outboard of the headlamp-parking lamp. Koito asked whether the 4 inches specified is to be measured from the edge of the effective area of the optical design of the headlamp or from the edge of the lens adjacent to the parking lamp. Because a parking lamp is an "additional lamp installed as original equipment," a literal interpretation requires that measurement be made from the edge of the lens adjacent to the parking lamp. However, the candela of the parking lamp is so low compared with that of the turn signal lamp, 500 minimum, that it will never conflict with it, and there is no safety reason requiring that measurement take it into account. In adopting Footnote 3 the agency had in mind lamps that are not covered by Standard No. 108 but which a manufacturer might wish to install as original equipment, such as fog lamps or passing lamps. Unlike parking lamps, these lamps supplement the lower beam headlamp, and this fact gave rise to the agency's erroneous phrase "or used in lieu of the lower beam." The agency is not aware of any State in which a lamp may be used in place of the lower beam during such time as headlamp use is required.

The agency has therefore concluded that a technical correction to Footnote 3 is required to reflect its true intent. It is amending the phrase "from the lighted edge of any additional lamp installed as original equipment or used in lieu of the lower beam" to read "from the lighted edge of any additional lamp installed as original equipment and which supplements the lower beam."

In consideration of the foregoing Part 571 is amended as follows:

Footnote 3 to Figure 1b is revised to read:

3 Values apply when the optical axis (filament center) of the front turn signal is at a spacing less than 4 in. (10 cm.) from the lighted edge of the headlamp unit providing the lower beam, or from the lighted edge of any additional lamp installed as original equipment and which supplements the lower beam.

Issued on: October 9, 1987

Barry Felrice
Associate Administrator
for Rulemaking

52 F.R. 38427
October 16, 1987

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices and Associated Equipment
(Docket No. 81-11; Notice 24)

ACTION: Corrections.

SUMMARY: This notice corrects an error in the heading and an error in the text in the amendment published on September 14, 1987 to Federal Motor Vehicle Safety Standard No. 108 responsive to the petition by BMW of North America. The word "devises" was used instead of "devices". Language previously removed from paragraph S4.1.1.36(a)(2) was erroneously reinstated. It is therefore necessary to correct these errors.

SUPPLEMENTARY INFORMATION: On September 14, 1987, the agency amended paragraph S4.1.1.36(a)(2) of 49 CFR 571.108 Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment* (52 FR 34654) to permit aiming pad configurations specified for sealed beam headlamps with circular lenses to be used on replaceable bulb headlamps. This action was taken pursuant to a proposal published on February 25, 1987 (52 FR 5563). For clarity's sake the entire text of S4.1.1.36(a)(2) was published, and not just the changes or additions to it. In both the proposal and final rule the paragraph began with the words "(2) The exterior face of the lens of each replaceable bulb headlamp . . . ." However, S4.1.1.36(a)(2) had been amended in July 1986 to begin "(2) The lens of each replaceable bulb headlamp . . . ." (51 FR 24152), and the words "exterior face of the " added on September 14 are incorrect and must be deleted.

In addition, the term "reflective devises" appeared in the title to the standard; the correct word is "devices".

Because the amendments are corrections they may be made effective immediately.

In consideration of the foregoing, 49 CFR Part 571 is amended as follows:

In the title of Sec. 571.108, the word "devises" is changed to read "devices".

In the first sentence of Paragraph (a)(2) of paragraph S4.1.1.36, the words "exterior face of the" are deleted.

Issued on December 18, 1987

Barry Felrice
Associate Administrator
for Rulemaking

52 F.R. 48690
December 18, 1987

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment (Docket No. 81-11; Notice 25)

ACTION: Final rule.

SUMMARY: This notice amends the specifications for gasoline, tar remover, and power steering fluid, used in the chemical resistance test for replaceable bulb headlamps with plastic lenses. After consideration of comments received in response to a proposal published in March 1987, the agency is adopting through incorporation by reference ASTM Reference Fuel C as the specification for gasoline. Tar remover is to consist by volume of 45% xylene and 55% petroleum base mineral spirits. The power steering fluid used in the test is to be that specified by the vehicle manufacturer for use in the vehicle on which the headlamp is intended to be installed. The reason for the restated test fuels is that the original specification for gasoline failed to take into consideration the existence and concentration of aromatic hydrocarbons, the specification for tar remover could be clarified, and that the composition of power steering fluid differed from vehicle to vehicle. The effect of the amendment is that Reference Fuel C will be more representative of unleaded gasoline in the chemical resistance test. Tar remover will have the composition of that used in the Canadian standard and will promote international harmonization. Power steering fluid will be that recommended for use in the vehicle by its manufacturer, that fluid being the most likely type of power steering fluid to contact the headlamp of the vehicle.

DATE: The effective date of the rule is September 16, 1988. The incorporation by reference of certain publications listed in the rule is approved by the Director of the Federal Register as of September 16, 1988.

SUPPLEMENTARY INFORMATION: On March 18, 1987, NHTSA published Notice 22 to Docket 81-11 (52 FR 8482) in which it granted and denied several petitions for rulemaking to amend Federal Motor Vehicle Safety Standard No. 108 *Lamps, Reflective Devices, and Associated Equipment.* One of these petitions was filed by Ford Motor Company, and related to aspects of the chemical resistance tests for replaceable bulb headlamps with plastic lenses. In Ford's view, the definitions of gasoline and tar remover, two of the fluids prescribed for the tests, were imprecise. The agency agreed with Ford, and granted its petition, although it did not concur with the definitions that Ford recommended as substitutes.

For the reasons given in Notice 22 NHTSA proposed that the composition of the previously specified unleaded gasoline of 89 octane or above be 47% toluene, 3% benzene, and 50% iso-octane. It proposed that tar remover consist by volume of 45% xylene and 55% petroleum base mineral spirits. The agency had also tentatively concluded that power steering fluid should be clarified to mean the fluid recommended by the vehicle manufacturer for use in the vehicle on which the headlamp was intended to be installed.

Six commenters responded to the proposal: Ford, General Motors Corporation, Chrysler Corporation, Volkswagen of North America, ETL Laboratories, Inc., and Corning. The commenters either supported or were silent regarding the proposed composition of tar remover. Therefore, this composition (identical to that specified by Canada in its chemical resistance test) has been adopted. Xylene is found in most gasoline, and because NHTSA's proposed gasoline test fluid composition does not include xylene, it was deemed desirable to have some testing with fluid containing xylene.

GM and Chrysler supported the proposal regarding power steering fluid. Ford, however, commented that it saw no safety need for the fluid's inclusion in the standard, but that if it were to be specified, its elements ought to be representative of power steering fluids, as a surrogate for actual fluids. However, power steering fluids differ significantly in their compositions, and some manufacturers, e.g., Honda, recommend that operators use only one specific fluid and none other to avoid damaging the power steering system. Other manufacturers recommend a specific fluid but mention an allowable substitute. This has led NHTSA to conclude that the power steering fluid to be used in the chemical resistance test must be that recommended for use in the vehicle, Ford's comment notwithstanding. No commenters, other than Ford, objected to this proposal. Power steering fluid reservoirs in some instances are located near a headlamp. The fluid is subject to spillage and overflow under pressure or when overheated with heat from the engine. After considering these comments, the agency is amending the requirement to specify that the fluid used in the test is the power steering fluid recommended by the vehicle manufacturer for use in the vehicle on which the headlamp is to be installed.

The composition of gasoline occasioned the most comment. NHTSA had proposed a fuel composed of 47% toluene, 3% benzene, and 50% iso-octane. Ford continued to support ASTM Reference Fuel D (40% toluene, 60% iso-octane). Chrysler and GM suggested ASTM Reference Fuel C (50% toluene, 50% iso-octane). ETL was in favor of "gasoline the consumer uses" on the basis that it provides a "real world" test. Volkswagen advised against use of a formula that might become quickly outdated. Corning urged adoption of two or more formulas that would represent the extremes of composition.

The agency has decided to adopt ASTM Reference Fuel C, as recommended by GM and Chrysler. The composition is substantially similar to that proposed by NHTSA, and eliminates benzene, a toxic fluid determined to be a carcinogen. Reference Fuel C is a standard solvent used primarily for testing the effect of liquids on rubber. An octane number is irrelevant for its use and has not been adopted. Aromatic hydrocarbons (which include both toluene and benzene) are the active ingredients of gasoline which are likely to attack plastic materials upon exposure. NHTSA believes that the percentage (by volume) of aromatic hydrocarbons in the gasoline test fluid should correspond approximately to the maximum percentage found in commercially available unleaded high octane gasoline. In adopting Reference Fuel C, the agency rejects a suggestion by Ford for specifying a fluid with 40% toluene and 60% iso-octane (ASTM Reference Fuel D). In its comment, Ford said that a 40% level of toluene, an aromatic hydrocarbon, was selected as representative of a level more stringent than that found in 97% of commercially available gasoline. The agency believes that the stringency of the test fluid should be referenced to the level found in *unleaded* gasolines, rather than that found in *all* commercially available gasoline. Hence, a level more stringent than that found in approximately 97% of unleaded gasoline with 89 or greater octane is deemed appropriate. The 97% figure is in accord with that suggested by Ford. In its comments, Ford stated that data obtained in the MVMA Gasoline Survey for the 1983 Winter Season resulted in an average value (mean) of 33.6% aromatic hydrocarbons and a standard deviation of 8.4% for premium unleaded gasoline. Extrapolating that data with the use of standard statistical methods leads to the conclusion that a 50.4% (33.6+2(8.4)) level of aromatic hydrocarbons would equal or exceed the level found in 97% of commercially available premium unleaded gasoline. Thus, the use of ASTM Reference Fuel C, with 50% toluene, is deemed appropriate. ETL's suggestion to use commercially available gasoline was not adopted because the instability of hydrocarbons in gasoline between the time the fluid is removed from the tank and the time it is used in compliance testing was the basis for the agency's conclusion that a different fuel was required.

The final rule incorporates by reference ASTM Reference Fuel C as specified in ASTM D 471-79 *Standard Test Method for Rubber Property—Effect of Liquids* used as specified in Annex 2 to Motor Fuels Section 1 *Test Methods for Rating Motor, Diesel, Aviation Fuels,* 1985 Annual Book of ASTM Standards. These materials have been submitted to the Director of Federal Register for approval by the effective date of the rule, in accordance with regulations of both the Federal Register and NHTSA (5 USC 552(a) and 1 CFR Part 51, and 49 CFR 571.5(a) respectively).

In consideration of the foregoing, 49 CFR Part 571 is amended as follows:

Paragraphs (b)(1), (b)(2), and (b)(3) of paragraph S6.4 of Sec. 571.108 are revised to read as follows:

S6.4 Chemical resistance.

*   *   *   *   *

(b) * * *

(1) ASTM Reference Fuel C, as specified in Table 2 *ASTM Reference Fuels* and its footnotes (except that Footnote A reads "Isooctane conforming to Annex A2.1.1 Motor Fuels Section of the 1985 Annual Book of ASTM Standards Vol. 05.04"), in ASTM D 471-79 *Standard Test Method for Rubber Property—Effect of Liquids,* and used as specified in:

(i) paragraph A2.3.2 and A2.3.3 of Annex 2 to *Motor Fuels, Section 1* in the 1985 Annual Book of ASTM Standards; and

(ii) OSHA Standard 29 CFR 1910.106—*Handling Storage and Use of Flammable Combustible Liquids.*

(2) Tar remover (consisting by volume of 45% xylene and 55% petroleum base mineral spirits).

(3) Power steering fluid (as specified by the vehicle manufacturer for use in the motor vehicle on which the headlamp is intended to be installed).

*   *   *   *   *

Issued on June 21, 1988

Diane K. Steed
Administrator

53 F.R. 8755
March 17, 1988

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment
(Docket No. 85-15; Notice 8)
RIN 2127-AC53

ACTION: Final rule.

SUMMARY: This notice amends the headlighting requirements of Standard No. 108 by deleting certain external dimensions for sealed beam headlamps, lifetime requirements for sealed beam headlamps and standardized replaceable light sources, photometric requirements for headlamps designed to conform to SAE J579a, and certain durability requirements for headlamps. A new category is added—headlamps without dimensional requirements. Two new sizes of sealed beam headlamps petitioned for by General Motors Corporation and GTE Sylvania are the first systems eligible for inclusion in this category, to be known as "integral beam headlamps." An on-vehicle mechanical aim alternative to existing off-vehicle mechanical aim is also adopted. The effect of these amendments is to eliminate design restrictions not necessary for safety, resulting in a more performance-oriented standard, as required by the National Traffic and Motor Vehicle Safety Act. The amendments should encourage innovation in headlighting systems.

DATE: The effective date of the rule is June 8, 1989.

SUPPLEMENTARY INFORMATION: The publication of this final rule completes some aspects of rulemaking initiated on October 22, 1985, when NHTSA published a notice of Request for Comments that concentrated on certain areas of the headlighting requirements of Standard No. 108 (50 FR 42735, with extension of comment time at 51 FR 1542 and correction at 51 FR 2536). Subsequently, a Notice of Proposed Rulemaking responding to the comments submitted on the October 1985 request was published on December 29, 1987 (52 FR 49038), presenting NHTSA's recommendations for short term simplification of the headlighting requirements of Motor Vehicle Safety Standard No. 108.

I. Photometric Performance

The initial headlighting photometric requirements of Standard No. 108, effective January 1, 1968, were those of SAE Standard J579a, August 1965. They remained the sole photometrics permissible for motor vehicles other than motorcycles until 1978 when the standard was amended to allow optional compliance with the photometrics of SAE Standard J579c, December 1974 (now December 1978). The principal difference between the two SAE requirements is the allowance of up to 100% more total candela on the upper beam of the J579c lamps. Also, the lower beam of a J579c lamp is aimed more to the left and has a higher intensity, and the upper beam is aimed higher. These differences proved of such benefit and interest to the consumer that, by the early 1980's, virtually all original equipment headlamps were designed to conform to J579c; as a result, there is very little market today for even replacement headlamps designed to conform to J579a. As NHTSA commented in its 1985 notice, "The existence of three photometric requirements, one of which is for all practical purposes nearly obsolete, promotes unnecessary confusion and serves no apparent safety purposes." (50 FR 42739) The agency therefore proposed the elimination of SAE J579a from Standard No. 108 in December 1987. This proposal was supported by virtually all commenters, and Standard No. 108 is being amended to delete SAE J579a.

II. Elimination of Certain Dimensional Specifications

From its beginning, Standard No. 108 has incorporated by reference detailed SAE drawings prescribing dimensions for most types of sealed beam headlamps. More recently, in the absence of SAE references, detailed drawings have been directly incorporated into the standard. These dimensions relate to the fit of the lamp into the housing, the size and shape of the lamp and retaining rings, seating plane lugs, electrical prongs, and headlamp mounting ring notches. The primary rationale for their incorporation has been to ensure compatibility between original and replacement equipment, so that proper replacement equipment shall be readily available, shall fit only in the proper receptacle to assure a photometrically correct system, and shall perform with the equivalence of the original lighting equipment.

NHTSA tentatively concluded that most dimensional specifications for new types of nonstandardized headlighting systems were not necessary for motor vehicle safety. Accordingly in December 1987, NHTSA proposed two means for dealing with headlamp dimensions. First, for existing standardized sealed beam headlighting systems, the agency proposed deleting dimensions that are not necessary for interchangeability. The agency decided that requirements necessary for interchangeability should be retained for existing sealed beam systems in order to ensure that replacement headlamps manufactured after the effective date of the final rule will in fact fit. Consequently, the agency proposed incorporating by reference SAE Standard J1383 APR85 *Performance Requirements for Motor Vehicle Headlamps* which retains only those dimensional requirements necessary for interchangeability of Type A through Type E headlamps, and deleting the SAE standards that are incorporated by reference in Tables I and III of Standard No. 108 which have been the source of excess dimensional requirements. Commenters generally agreed with these deletions and the incorporation of J1383, and Standard No. 108 has been amended accordingly. However, dimensions for Types F, G, and H headlamps are not included in J1383, and remain unchanged from those presently in Standard No. 108.

Additionally, as part of its analysis of issues relating to dimensions, NHTSA proposed a new category of headlighting system, to be known as an "integral beam headlighting system." The integral beam headlamp is not required to have industry or federally standardized dimensions, yet is similar in concept to existing sealed beam headlighting systems. The integral beam headlamp is defined as incorporating a lens, reflector and light source in an indivisible unit, but is not necessarily "sealed" since this is a design-related aspect. All new headlamp systems that do not have replaceable bulbs will be treated as integral beam systems as of the amendment of Standard No. 108.

Comments supported the proposal and it has been adopted. NHTSA sought comments on the issue of availability of replacement parts of new systems. Some commenters expressed concern about the availability of replacement parts for dimensionally unregulated headlamps, but provided no actual indication that such has occurred in practice after a short time has passed following introduction of new lamps or light sources. The agency believes that experience in practice should not differ from that of replaceable bulb headlamps, whose dimensions are also unregulated, and where no problem of availability has been reported.

Headlamps that will be able to take advantage of the new integral beam category are a sealed beam system of four 55 × 135 mm headlamps petitioned for by General Motors Corporation, and a system developed by GTE Sylvania of eight miniature headlamps, which Sylvania refers to as "Multi-beam." The adoption of this rule constitutes the granting of the petition by Sylvania (the GM petition was previously granted).

Essentially, the design of the size and shape of an integral beam headlighting system is left to the vehicle or lighting manufacturer. The photometric performance required of integral beam headlighting systems is that prescribed by either SAE J579c (using either two or four headlamps per system), or Type F photometry of Figure 15 or 17 of Standard No. 108 (using two or more headlamps per system). The environmental performance required of this system is that presently required of existing replaceable bulb headlighting systems. However if the lamp is of a "sealed" design, the manufacturer is relieved of certifying compliance to certain performance requirements that do not apply to sealed lamps.

For aim retention upon lamp replacement, the integral beam headlighting will have a common aiming and mounting plane, which will result in greatly reduced aiming error upon headlamp replacement. It will perform in much the same manner as the present standardized replaceable light source in that the lamp may be replaced with little effect on headlamp aim. This common aiming and mounting plane is also presently specified for the most recently permitted sealed beam headlighting systems, Types F, G, and H.

To ensure mechanical aimability, the integral beam systems will have either aiming pads for use with existing off-vehicle mechanical aimers, or fiducial marks with an integral on-vehicle aiming and mounting mechanism. The use of fiducial marks (as an option to present lens-mounted aiming pads) permits greater headlamp styling freedom, and can potentially provide better aim retention depending on the manufacturers' actual designs. The specification for fiducial marks is a recognition that they are acceptable substitutes for the aiming pads that are presently found on the lenses of headlamps and are used for the purpose of determining photometric conformance to Standard No. 108, and for mechanical aiming purposes. As discussed in Section V below, the agency has adopted this requirement for either aiming pads or fiducial marks for all new headlighting system designs of both integral beam and replaceable bulb types.

Because NHTSA does not specify the dimensions of integral beam headlamps, they are not required to be standardized. They will, however, have to meet all headlamp performance requirements such as photometry, environmental degradation, and aimability. Under the rule, a manufacturer seeking to introduce a new integral beam system can do so without the necessity of petitioning for an amendment of Standard No. 108.

III. Life Expectancy of Headlamps

Standard No. 108 at present is regulatorily inconsistent, specifying average design life requirements for its standardized replaceable light sources and two of its sealed beam systems, but not for the remaining six sealed beam systems designed to conform to SAE J579c. For regulatory consistency, NHTSA noted in the NPRM that the standard should either extend average design life requirements to all headlighting systems, or delete them for those presently covered. As the agency noted in its October 1985 notice, other options are to delete longevity requirements but require manufacturers to rate life expectancy on the bulb package, to require that the headlamp last the life of the vehicle, and to retain the existing requirements. The agency believes that the competitive forces of the marketplace will encourage manufacturers to maintain, or improve, the life-expectancy of light sources. Therefore the agency proposed that all longevity requirements be deleted. However, because life of a light source has an influence on the total number of lamp outages during the life of a vehicle, thus possibly some influence on crash risk as well, NHTSA sought specific comments on whether or not the absence of an average design life requirement would have a discernible effect on the actual life of light sources in headlighting systems. Because filament life and lumen output (and hence photometric performance) are inversely related, NHTSA envisions that trade-offs could occur, with performance gains for lesser lamp life. With the apparent need of vehicle manufacturers for headlamps with minimum vertical height, low-profile lamps may have to sacrifice some longevity in order to achieve the required minimum photometric specifications. These trade-offs have cost, quality, and performance effects on headlighting systems, their manufacturers, and their users. Therefore, NHTSA solicited comment on the proposed deletion of average design life requirements in order to understand more completely how these trade-offs may affect safety.

Of the 23 comments on this issue, 14 opposed deletion of design life requirements. The basis for the opposition was the potential for the decrease in life expectancy of headlamps. The agency is concerned about this issue but in the absence of proof that this will occur finds this a speculative argument. Those headlamps manufactured today without a Federal design life requirement appear to have a life equivalent to those with a required average design life. Therefore, the majority of the comments notwithstanding, NHTSA has decided to adopt the proposed deletion.

IV. Durability

As a further simplification of headlighting requirements relating to durability and aim retention, NHTSA proposed deletion of certain portions of SAE J580 DEC86 *Sealed Beam Headlamp Assembly*, which were adopted in the initial standard (SAE J580a, June 1966), and which may no longer be necessary for safety. These deletions included paragraphs 3.3 (vibration test), 6.1.3 (test for 20 cycles of full range aim adjustment), 6.3.1 (test for 20 cycles of retaining ring removal and installation), 6.2 and subparagraphs and 6.5 and subparagraphs (the inward force test and torque deflection test, respectively, except for all headlamps using externally applied mechanical aimers).

Durability tests exercise a headlighting system's ability to withstand the anticipated environment in service while still providing acceptable roadway illumination. The deletions for 20-cycle aim range and retaining ring installation were deemed to be of little significance to safety. The deletion of inward force and torque deflection is appropriate for headlighting systems which do not use externally applied aimers, since these tests are intended to show resistance to the effects of the weight and application of *external* aimers. North American Philips Lighting Corporation was in favor of retaining the inward force and force deflection tests, not only for guarding against the misaim of headlamps from the force of headlamp aimers, but also to ensure against misaim if force is applied against the headlamp when the vehicle is pushed by hand. NHTSA believes that vehicle manufacturers will be cautious enough to design vehicles to withstand the likelihood of misaim in this event, and, considering the deletion appropriate only for headlamps which do not have aiming pads for external mechanical aimers, has adopted the proposed modification of applicability of inward force and torque deflection tests. Commenters generally supported the proposed deletions for aim range and retaining ring installation; however, the State of Minnesota stated its belief that some form of test is necessary to assure that the lamps can be reaimed throughout their life and survive in real world conditions. The agency agrees, but notes that the tests proposed for deletion do not appear to prevent long term deterioration of aimability. Little relevant information on this issue was presented by any other commenter, and consequently they are being deleted as proposed.

As NHTSA noted in the NPRM's preamble, the proposal for deletion of the vibration test was not as straightforward, and the comments received were mixed. While vibration testing is intended to anticipate such on-vehicle vibration effects as broken or cracked lenses, reflectors, light source mountings or aim hardware, NHTSA was of the opinion that the existing vibration procedure may not accurately test the lamp system for these adverse effects. Despite this, the present test procedure has produced signal lamp failures that were also found in vehicles-in-use. Since this procedure currently applies to all lighting devices, and not just headlighting systems, NHTSA noted that it was difficult to justify deletion for headlamps only. However, no headlamp vibration test failures have been found to date (although Ford in its petition for rulemaking (now pending) to adopt the 9007 as a standardized replaceable light source implied that the HB1 light source may experience burnout from vibration). Consequently, it is currently not known whether there is a safety benefit from vibration testing of headlighting systems. The agency requested comment on deletion or development of a more correlated vibration performance specification. Ford argued that there is no reason to retain the vibration test. GTE/Sylvania recommended development of a vibration test more correlated to safety. Saab suggested adoption of SAE J575 for a vibration test, while Stanley Electric thought SAE J1383 would be better, since it was specifically written for headlamps. The comments varied widely, and NHTSA has decided to retain the current requirement with which the industry is familiar. The agency urges manufacturers to work toward development of a more correlated vibration performance specification.

Two other durability tests concerned NHTSA, the Temperature Cycle Test (numbered S8.6.1 in the Proposal's revised format), and the Impact Test (S8.8). Presently these remain as part of the requirements for headlighting systems since the purpose of these requirements continues to be valid. However, NHTSA is concerned that the requirements may not fully reflect the real world. The temperature range may be too small in view of the ambient environmental temperatures that occur in the United States and in today's high temperature engine compartments. The impact energy also appears too low to simulate accurately the actual stone damage that can occur. NHTSA sought comment on these procedures, and if appropriate, a more correlated set of procedures or performance requirements. Few commented on the temperature test, but Stanley Electric recommended even higher performances. It also supported deletion of the impact test, as did many other commenters. It thought that it provided little in terms of safety, given the typical impact resistance of plastic lenses. The agency has decided to retain the temperature test as written, but will consider proposing to amend the procedure in a future rulemaking proceeding. Also, in a companion notice under preparation on the longer term aspects of headlighting simplification, the agency will formally propose deletion of the impact test.

V. Headlamp Aimability and Aim

A further aspect of Standard No. 108 to which the agency turned its attention in the NPRM was headlamp aimability. Currently, headlamps must be capable of mechanical aim using equipment specified by SAE J602. However, with the proliferation in sizes and shapes of headlighting systems permissible under Standard No. 108 since 1983 has come a corresponding proliferation in adapters necessary for mechanical aimers to perform their purpose. This has created confusion, difficulty, and higher potential for aiming error. The agency therefore developed a general aiming performance requirement that would permit headlamps to be aimed by means other than use of existing mechanical aimers and lens-mounted aiming pads if the new methods could perform as well as existing mechanical aimers, and if no excessive off-vehicle equipment would be required. One example of a new method for vertical aim inspection would be a spirit level incorporated in the headlamp housing which, when the vehicle attitude was horizontal and the air bubble was centered properly, would indicate proper vertical aim.

Under the proposal, and adopted in the final rule, each headlamp will have fiducial marks (or aiming pads if its manufacturer chose to retain its existing design) for the purpose of determining the reference axis to be used for photometric performance testing; such marks will also be the aiming reference when the headlamp is installed on the vehicle. The headlamp is then installed in the vehicle using a mounting/aiming mechanism incorporating vertical and horizontal aiming adjustments and optional aiming references. It is aimable using either conventional off-vehicle mechanical aimers or, should the manufacturer so decide, by optional on-vehicle aimers which use only a floor slope measurement as the off-vehicle reference. The on-vehicle aiming mechanism is termed a "Vehicle Headlamp Aiming Device," or "VHAD." Vehicle manufacturers commenting on the subject were unanimously in favor of the concept of a vehicle based aiming performance requirement. However, many felt that the requirement proposed was overly stringent and unnecessary for safety. Lamp manufacturers were generally agreeable to the proposal but also had recommendations for modifications to the proposal.

The agency disagrees that the VHAD proposal is restrictive. The proposal was based specifically on the performance of the mechanical headlamp aiming device performance currently specified in SAE Standard J602 OCT80 *Headlamp Aiming Device for Mechanically Aimable Sealed Beam Headlamp Units.* All existing headlamp designs allowed by Standard No. 108 have been required to be aimable with aiming devices meeting the SAE standard. In order for the present level of safety to be maintained, any new mechanical aiming method must have at least the accuracy of the method presently in use. Therefore, the agency is adopting the requirements based on J602 performance as proposed. The proposal for aiming instructions of the VHAD was not specific in detail in an attempt to provide the widest latitude for manufacturers. The actual proposed text of the VHAD has been rewritten in part to clarify the agency's intent.

Under the proposal, headlamp aim accuracy was to be verified upon completion of the manufacture of the vehicle. Many manufacturers claimed that they could not meet it under those circumstances. General Motors presented quality assurance data showing that most of its production can meet the +/− 4 inch horizontal and vertical performance that is required in most States, but not the tighter aim tolerance that was proposed. Ford claimed that the proposed factory aiming requirement cannot be achieved by today's state-of-the-art equipment. NHTSA appreciates that between the time headlamps are aimed on a vehicle assembly line and when again checked by quality assurance inspectors, the vehicle could have settled, causing errors in aiming. Upon reflection, the proposed requirement appears impracticable because of its tighter aim tolerance, and it has not been adopted.

Another issue of concern to vehicle manufacturers was the transfer of range of aim adjustment from the performance of a headlighting system in a laboratory to the system as installed on a vehicle. NHTSA firmly believes that aiming range performance met under test conditions must be replicated when a headlighting system is used in real world conditions, and the NPRM was meant to clarify NHTSA's intent. The benefit to safety of such a requirement is that headlamps could continue to be aimable at the extremes of changes in vehicle attitude. Vehicle manufacturers are concerned that a large adjustment range will require a correspondingly large opening surrounding the headlamp; the smaller the adjustment range, the smaller the opening. NHTSA has modified the aim range to accommodate these concerns.

In countries other than the United States, the opening surrounding the lamp has been eliminated by fixing the headlamp housing and lens to the car body and by providing a movable reflector inside the headlamp housing to accommodate aiming the headlamp's beam. Nissan commented that the on-vehicle aimability performance proposal would allow headlamps with movable reflectors, an approach desirable from its standpoint. NHTSA agrees that this is true, provided that headlamps of this design comply with the photometric performance requirements with the lens in all possible positions relative to the position of the reflector, as all headlamps under Standard No. 108 must. Paragraph S7.7.2.2 has been added to clarify this. Nissan questioned, however, whether Standard No. 108 would permit replaceable bulb headlamps to have adjustable reflectors because the definition requires a bonded lens and reflector assembly, and its interpretation is that the lens must always be bonded directly to the reflector. This is not always true. NHTSA does not interpret the standard as prohibiting reflector assemblies with movable reflectors because a replaceable bulb headlamp is defined in pertinent part as one "comprising a bonded lens and reflector *assembly*" (emphasis added). The definition does not specify the portion of the assembly that must be bonded to the lens. The "assembly" as currently used in the industry incorporates internal light shields, gear boxes for changing the direction of rotation of aiming screws that are incorporated, and other hardware.

However, with respect to the aim adjustment range that so concerned some commenters, NHTSA believes that the original proposal may be modified with no detriment to safety. Under the proposal, the aim range required was (in pertinent part) from "the greater of the following: +/− 4 deg. V or the full range of vehicle pitch. . . ." The text now reads in pertinent part "+/− 4 degrees vertical in the laboratory, and on the vehicle, not less than the full range of vehicle pitch." This modification results in performance essentially identical to that achieved on vehicles today, and is deemed proper for the on-vehicle aim range.

As part of the proposal, NHTSA used the most recent SAE Standards and Recommended Practices for reference. Many of these updated references include performance or aspects not currently incorporated in Standard No. 108. Consequently, exceptions where necessary were stated in the NPRM so that the requirements that have been adopted are essentially identical to those which currently exist.

Finally, as part of the revision of Standard No. 108, NHTSA is separating the Scope and Purpose sections in line with its practice in a majority of the safety standards and reorganizing the various headlighting requirements into a new section S7 *Headlighting Requirements.* Of necessity, the remaining sections of the standard have been renumbered.

VI. Consumer Information

Because of the increasing variety of headlamps available today and those that may result from the integral beam amendments, NHTSA proposed that identifying information, sufficient to ensure proper replacement, be made available to the consumer at the time a vehicle was purchased. In response, Nissan suggested that the manufacturer's part number could be marked on original and replacement headlamps, obviating the need for an amendment to the consumer information regulations. NHTSA had already in essence proposed such a requirement when it proposed adoption of SAE J1383 which incorporates equipment marking. Given that replacement headlamp light sources are standardized for performance and interchangeability, and that headlamp housings are now designed to be vehicle-specific, the agency has decided that little reason exists to require identification information in any location other than on the object itself. For those devices that are vehicle-specific, replacement parts should always be available at the appropriate dealership. For those items presently standardized by Standard No. 108, ready availability already exists. Accordingly, NHTSA is not adopting the amendments proposed for 49 CFR Part 575, but is specifying appropriate equipment marking.

VII. Miscellaneous Amendments

Certain minor amendments are necessary for full allowance of the new GM small rectangular headlamp system. The system generally meets the photometrics of present Figure 15 of Standard No. 108, except that the upper beam test point values at 2½D–V and 2½D–12R and 12L apply to the lower beam headlamp and not to the upper beam headlamp, and the upper beam test point value at 1½D–9R and 9L is 1,000 candela (See S7.4(a)). Paragraph S5.5.8 permits headlighting systems designed to conform with Figure 15 to be wired so that the lower beam remains permanently activated when the upper beam is activated; this section is amended to require such an activation for headlamps meeting the excepted photometrics of Figure 15. Similar accommodations are made in paragraphs S7.4(d), S7.4(h), and the second sentence of S7.7.2.1.

As noted previously, the amendments will allow a system of miniature headlamps, petitioned for by GTE Sylvania, in which two such lamps provide a single beam. Amendments of terminology appear required for implementation of the Sylvania system. Where appropriate (for example, as in lens marking) the term "beam contributor" is used in place of "headlamp," because a single device provides only half of the beam.

Clarifying amendments are also adopted. With respect to aiming pad location, NHTSA has said that it expected the aiming pad pattern to be located on the lower beam part of a headlamp lens. However, there is no need for such a requirement, and S7.7.5.1(d)(1) states that "The aiming pads need not be centered at the geometric center of the lens or on the optical axis." Proposed S7.7.5.1(e) has been adopted with language intended to assure that the locating plates and the aiming pads to which they will interface are compatible. Paragraph S7.7.5 has not been adopted exactly as proposed; it now addresses headlamp wipers. These are permitted for integral beam headlighting systems and replaceable bulb headlamps as long as the applicable photometric performance can be met with the wiper stopped in any location in front of the lens. Pursuant to a comment by Ford Motor Company that the standard should not restrict the VHAD to be solely an "at the headlamp" indicator or adjustment (a headlamp system could be designed to be aimed from the driver's seat or by automatic means) paragraph S7.7.5.2(a)(iii) adds language that distinguishes between direct reading analog indicators and remote reading indicators.

The following proposals have also been adopted, though not necessarily under the section numbers indicated in the NPRM: a new marking requirement for the HB1 standardized replaceable light source, to assure proper identification and for consistency with the marking requirements for HB3 and HB4 light sources; a pressure sealing test requirement for the HB1 light source, to assure the intended sealing performance, and for consistency with HB3 and HB4 light sources; and integral beam headlamps which do not have both an integral mounting and aiming mechanism *and* a VHAD must incorporate common or parallel mounting and aiming planes, intended to eliminate a major source of aiming error that occurs upon headlamp replacement. However, this proposal (proposed S7.4(j)) was design restrictive as written but as adopted has been replaced with a more performance-oriented requirement that achieves the same result: any headlamp or beam contributor that does not have a VHAD as an integral and indivisible part of its housing shall meet a lamp replacement test, under which photometric performance must be met when any correctly aimed and photometrically conforming lamp or beam contributor is removed from its mounting and aiming mechanism and replaced without reaim by another conforming lamp or beam contributor of the same type.

VIII. Impacts

NHTSA has considered this rule and has determined that it is not major within the meaning of Executive Order 12291 "Federal Regulation" but is significant under Department of Transportation regulatory policies and procedures. A Regulatory Evaluation (RE) has been prepared and placed in the Docket. The amendments are intended to relieve a regulatory burden unnecessary for safety by affording manufacturers greater flexibility in the design of headlighting systems. This is likely to result in an increase in the number of types of headlamps on motor vehicles. An increase in the number of types of headlamps could affect to some degree the volume of business of some small gas or service stations that currently carry replacement headlamps in stock, by causing them to carry only the most popular types. However, the inability to stock parts has been a developing trend, and many stations have converted to a "gas only" operation and others order parts from distributors on an "as needed" basis.

NHTSA has analyzed this rule for the purposes of the National Environmental Policy Act. It is not anticipated that the rule will have a significant effect upon the environment. The design and composition of headlamps are not expected to change from those presently in production. However, should this rulemaking result in headlamps or bulbs with a shorter life, there will be a greater demand for replacement headlamps or bulbs and a corresponding increase in materials necessary for their manufacture. This possibility is speculative.

Additionally, with the movement away from Federal regulation of dimensions for the interchangeability of headlamps, the only source of vehicle-specific replacement headlamps may become the vehicle manufacturer and its authorized dealers, although this possibility also is speculative.

The agency has also considered the impacts of this rule in relation to the Regulatory Flexibility Act. I certify that this rule will not have a significant economic impact upon a substantial number of small entities. Accordingly, no regulatory flexibility analysis has been prepared. Manufacturers of motor vehicles and headlamps, those affected by the proposal, are generally not small businesses within the meaning of the Regulatory Flexibility Act. Finally, small organizations and governmental jurisdictions will not be significantly affected since the price of new vehicles and replacement headlamps should be minimally impacted by the substitution of one type of headlighting system for another.

The equipment marking requirements in this rule are considered to be information collection requirements, as that term is defined by the Office of Management and Budget (OMB) in 5 CFR Part 1320. Accordingly, these requirements are being submitted to the OMB for its approval, pursuant to the requirements of the Paperwork Reduction Act (44 U.S.C. 3501 *et seq.*).

This action has been analyzed in accordance with the principles and criteria contained in Executive Order 12612 "Federalism," and it has been determined that the final rule does not have sufficient federalism implications to warrant preparation of a federalism assessment. To the extent that a State law covering the same aspect of performance as the rule is not identical to it, it will be preempted, pursuant to the specific preemption provisions of 15 U.S.C. 1392(d). However, the agency is not aware of any State laws that conflict with the rule.

IX. Effective Dates

Because of the need to relieve design restrictions and encourage innovation, it is hereby found for good cause shown that an effective date earlier than 180 days after publication of the final rule is in the public interest, and the amendment is effective 30 days after its publication in the *Federal Register.* However because the marking requirements of paragraphs S7.2 and S7.6(i) are mandatory, by their terms those sections shall not become effective until December 1, 1989. Marking requirements currently in effect remain unchanged.

PART 571 (AMENDED)

Sec. 571.108 (amended)

In consideration of the foregoing, 49 CFR 571.108 Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment* is amended as follows:

1. The authority citation for Part 571 continues to read as follows: *Authority*: 15 U.S.C. 1392, 1401, 1403, 1407; delegation of authority at 49 CFR 1.50, and 501.4

2. The text of 49 CFR 571.108 (Paragraphs S1 through S8) is revised as follows:

FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108 LAMPS, REFLECTIVE DEVICES, AND ASSOCIATED EQUIPMENT

S1. *Scope.* This standard specifies requirements for original and replacement lamps, reflective devices, and associated equipment.

S2. *Purpose.* The purpose of this standard is to reduce traffic accidents and deaths and injuries resulting from traffic accidents, by providing adequate illumination of the roadway, and by enhancing the conspicuity of motor vehicles on the public roads so that their presence is perceived and their signals understood, both in daylight and in darkness or other conditions of reduced visibility.

S3. *Application.* This standard applies to passenger cars, multipurpose passenger vehicles, trucks, buses, trailers (except pole trailers and trailer converter dollies), and motorcycles, and to lamps, reflective devices, and associated equipment for replacement of like equipment on vehicles to which this standard applies.

S4. *Definitions.*

"Aiming Reference Plane" means a plane which is perpendicular to the longitudinal axis of the vehicle and tangent to the forwardmost aiming pad on the headlamp.

"Flash" means a cycle of activation and deactivation of a lamp by automatic means, continuing until stopped either automatically or manually.

"Headlamp test fixture" means a device designed to support a headlamp or headlamp assembly in the test position specified in the laboratory tests and whose mounting hardware and components are those necessary to operate the headlamp as installed in a motor vehicle.

"Integral Beam Headlamp" means a headlamp comprising an integral and indivisible optical assembly including lens, reflector, and light source, that is neither a standardized sealed beam headlamp designed to conform to paragraph S7.3 nor a replaceable bulb headlamp designed to conform to paragraph S7.5.

"Replaceable bulb headlamp" means a headlamp comprising a bonded lens and reflector assembly and one or two standardized replaceable light sources.

"Seasoning" means a process of energizing the filament of a headlamp, at design voltage, for a period of time equal to 1 percent of average rated laboratory life.

"Standardized replaceable light source" means an assembly of a capsule, base, and terminals that meets the requirements of S7.6.

S5. *Requirements.*

S5.1 *Required motor vehicle lighting equipment.*

S5.1.1 Except as provided in succeeding paragraphs of this S5.1.1, each vehicle shall be equipped with at least the number of lamps, reflective devices, and associated equipment specified in Tables I and III, as applicable. Required equipment shall be designed to conform to the SAE Standards or Recommended Practices referenced in those tables. Table I applies to multipurpose passenger vehicles, trucks, trailers, and buses, 80 or more inches in overall width. Table III applies to passenger cars and motorcycles and to multipurpose passenger vehicles, trucks, trailers, and buses, less than 80 inches in overall width.

S5.1.1.1 A truck tractor need not be equipped with turn signal lamps mounted on the rear if the turn signal lamps at or near the front are so constructed (double-faced) and so located that they meet the requirements for double-faced turn signals specified in SAE Standard J588e, *Turn Signal Lamps*, September 1970.

S5.1.1.2 A truck tractor need not be equipped with any rear side marker devices, rear clearance lamps, and rear identification lamps.

S5.1.1.3 Intermediate side marker devices are not required on vehicles less than 30 feet in overall length.

S5.1.1.4 Reflective material conforming to Federal Specification L–S–300, *Sheeting and Tape, Reflective; Non-exposed Lens, Adhesive Backing*, September 7, 1965, may be used for side reflex reflectors if this material as used on the vehicle meets the performance standards in either Table I or Table IA of SAE Standard J594f, *Reflex Reflectors*, January 1977.

S5.1.1.5 The turn signal operating unit on each passenger car, and multipurpose passenger vehicle, truck, and bus, less than 80 inches in overall width, shall be self-canceling by steering wheel rotation and capable of cancellation by a manually operated control.

S5.1.1.6 Each stop lamp manufactured to replace a stop lamp that was designed to conform to SAE Standard J586b, *Stop Lamps*, June 1966, may also be designed to conform to J586b. It shall meet the photometric minimum candlepower requirements for Class A red turn signal lamps specified in SAE Standard J575d, *Test for Motor Vehicle Lighting Devices and Components*, August 1967. Each such lamp manufactured for use on a passenger car and on a multipurpose passenger vehicle, truck, trailer or bus, less than 80 inches in overall width, shall have an effective projected luminous area not less than 3½ square inches. If multiple compartment lamps or multiple lamps are used, the effective projected luminous area of each compartment or lamp shall be not less than 3½ square inches; however, the photometric requirements may be met by a combination of compartments or lamps.

S5.1.1.7 Each turn signal lamp manufactured to replace a turn signal lamp that was designed to conform to SAE Standard J588d, *Turn Signal Lamps*, June 1966, may also be designed to conform to J588d, and shall meet the photometric minimum candlepower requirements for Class A turn signal lamps specified in SAE Standard J575d, *Tests for Motor Vehicle Lighting Devices and Components*, August 1967. Each such lamp manufactured for use on a passenger car and on a multipurpose passenger vehicle, truck, trailer or bus, less than 80 inches in overall width, shall have an effective projected luminous area not less than 3½ square inches. If multiple compartment lamps or multiple lamps are used, the effected projected luminous area of each compartment or lamp shall be not less than 3½ square inches; however, the photometric requirements may be met by a combination of compartments or lamps. Each such lamp manufactured for use on a multipurpose passenger vehicle, truck, trailer or bus 80 inches or more in overall width, shall have an effective projected luminous area not less than 12 square inches.

S5.1.1.8 For each motor vehicle less than 30 feet in overall length, the photometric and minimum candlepower requirements for side marker lamps specified in SAE Standard J592e, *Clearance, Side Marker, and Identification Lamps,* July 1972, may be met for all inboard test points at a distance of 15 feet from the vehicle and on a vertical plane that is perpendicular to the longitudinal axis of the vehicle and located midway between the front and rear side marker lamps.

S5.1.1.9 A boat trailer whose overall width is 80 inches or more need not be equipped with both front and rear clearance lamps provided an amber (to front) and red (to rear) clearance lamp is located at or near the midpoint on each side so as to indicate its extreme width.

S5.1.1.10 Multiple license plate lamps and backup lamps may be used to fulfill the requirements of the SAE Standards applicable to such lamps referenced in Tables I and III.

S5.1.1.11 A parking lamp, tail lamp, stop lamp, or turn signal lamp shall meet the minimum percentage specified in Figure 1a of the corresponding minimum allowable value specified in Figure 1b. The maximum candlepower output of each stop, turn signal, tail and parking lamp shall not exceed that prescribed in Figure 1b. The values specified in Figure 1a and Figure 1b are substituted for those specified in Table 1 of the following SAE Standards: J222 *Parking Lamps,* J585e *Tail Lamps* (maximum at H or above), J585c *Stop Lamps,* and J588e *Turn Signal Lamps,* except that motorcycle turn signal lamps need meet only one-half of the minimum photometric values specified in Figure 1b.

S5.1.1.12 A parking lamp, tail lamp, stop lamp or turn signal lamp is not required to meet the minimum photometric value at each test point specified in this standard if the sum of the percentages of the minimum candlepower measured at the test points is not less than that specified for each group listed in Figure 1c.

S5.1.1.13 Each passenger car, and each multipurpose passenger vehicle, truck, and bus, of less than 80 inches overall width, shall be equipped with a turn signal operating unit designed to complete a durability test of 100,000 cycles.

S5.1.1.14 A trailer that is less than 80 inches in overall width may be equipped with only one tail lamp, stop lamp, and rear reflex reflector, which shall be located at or near its vertical centerline.

S5.1.1.15 A trailer that is less than 6 feet in overall length, including the trailer tongue, need not be equipped with front side marker lamps and front side reflex reflectors.

S5.1.1.16 A lamp designed to use a type of bulb that has not been assigned a mean spherical candlepower rating by its manufacturer and is not listed in SAE Standard J573d, *Lamp Bulbs and Sealed Units,* December 1968, shall meet the applicable requirements of this standard when used with any bulb of the type specified by the lamp manufacturer, operated at the bulb's design voltage. A lamp that contains a sealed-in bulb shall meet these requirements with the bulb operated at the bulb's design voltage.

S5.1.1.17 Except for a lamp having a sealed-in bulb, a lamp shall meet the applicable requirements of this standard when tested with a bulb whose filament is positioned within $\pm$.010 inch of the nominal design position specified in SAE Standard J573d, *Lamp Bulbs and Sealed Units,* December 1968, or specified by the bulb manufacturer.

S5.1.1.18 A backup lamp is not required to meet the minimum photometric values at each test point specified in Table I of SAE Standard J593c, *Backup Lamps,* February 1968, if the sum of the candlepower measured at the test points within each group listed in Figure 2 is not less than the group totals specified in that figure.

S5.1.1.19 Each variable load turn signal flasher shall comply with voltage drop and durability requirements of SAE Standard J590b, *Turn Signal Flashers,* October 1965, with the maximum design load connected, and shall comply with starting time, flash rate, and percent current "on" time requirements of J590b both with the minimum and with the maximum design load connected.

S5.1.1.20 The lowest voltage drop for turn signal flashers and hazard warning signal flashers measured between the input and load terminals shall not exceed 0.8 volt.

S5.1.1.21 A motor-driven cycle whose speed attainable in 1 mile is 30 mph or less need not be equipped with turn signal lamps.

S5.1.1.22 A motor-driven cycle whose speed attainable in 1 mile is 30 mph or less may be equipped with a stop lamp whose effective projected luminous lens area is not less than 3½ square inches and whose photometric output for the groups of test points specified in Figure 1 is at least one-half of the minimum values set forth in that figure.

S5.1.1.23 Each tail lamp manufactured to replace a tail lamp designed to conform to SAE Standard J585d, *Tail Lamps,* August 1970, may also be designed to conform to J585d.

S5.1.1.24 Each turn signal lamp manufactured to replace a turn signal lamp (on a motorcycle) that was designed to conform to SAE Standard J588d, *Turn Signal Lamps,* June 1966, may also be designed to conform to J588d.

S5.1.1.25 Each turn signal lamp on a motorcycle manufactured on and after January 1, 1973, shall have an effective projected luminous area of not less than 3½ square inches.

S5.1.1.26 Note 6 of Table 1 in SAE Standard J588e, *Turn Signal Lamps,* September 1970, does not apply. A stop lamp that is not optically combined with a turn signal lamp shall remain activated when the turn signal is flashing.

S5.1.1.27 Each passenger car manufactured on or after September 1, 1985, shall be equipped with a high-mounted stop lamp which:

(a) Shall have an effective projected luminous area not less than 4½ square inches.

(b) Shall have a signal visible to the rear through a horizontal angle from 45 degrees to the left to 45 degrees to the right of the longitudinal axis of the vehicle.

(c) Shall have the minimum photometric values in the amount and location listed in Figure 10, instead of those in Table 1 of SAE Recommended Practice J186a, *Supplemental High-Mounted Stop and Rear Turn Signal Lamps,* September 1977.

(d) Need not meet the requirements of paragraphs 3.1.6 Moisture Test, 3.1.7 Dust Test, and 3.1.8 Corrosion Test of SAE Recommended Practice J186a if it is mounted inside the vehicle.

(e) Shall provide access for convenient replacement of the bulb without the use of special tools.

S5.1.1.28 Instead of the headlamps specified by Table III, a motorcycle may be equipped with one-half of any headlighting system specified in S7 which provides both a full upper beam and full lower beam, and where more than one lamp must be used, the lamps shall be mounted vertically, with the lower beam as high as practicable. When installed on a motorcycle such half system need not meet the aiming requirements specified in S7.

S5.1.2 Plastic materials used for optical parts such as lenses and reflectors shall conform to SAE Recommended Practice J576c, May 1970, except that:

(a) Plastic lenses used for inner lenses or those covered by another material and not exposed directly to sunlight shall meet the requirements of paragraphs 3.4 and 4.2 of SAE J576c, when covered by the outer lens or other material;

(b) After the outdoor exposure test, the haze and loss of surface luster of plastic materials used for lamp lenses shall not be greater than 30 percent haze as measured by ASTM–1003–61, *Haze and Luminous Transmittance of Transparent Plastic*; and

(c) After the outdoor exposure test, plastic materials used for reflex reflectors shall meet the appearance requirements of paragraph 4.2.2 of SAE J576c.

S5.1.3 No additional lamp, reflective device or other motor vehicle equipment shall be installed that impairs the effectiveness of lighting equipment required by this standard.

S5.1.4 Each school bus shall be equipped with a system of either:

(a) Four red signal lamps designed to conform to SAE Standard J887, *School Bus Red Signal Lamps,* July 1964, and installed in accordance with that standard; or

(b) Four red signal lamps designed to conform to SAE Standard J887, *School Bus Red Signal Lamps,* July 1964, and four amber signal lamps designed to conform to that standard, except for their color, and except that their candlepower shall be at least 2½ times that specified for red signal lamps. Both red and amber lamps shall be installed in accordance with SAE Standard J887, except that:

(i) Each amber signal lamp shall be located near each red signal lamp, at the same level, but closer to the vertical centerline of the bus; and

(ii) The system shall be wired so that the amber signal lamps are activated only by manual or foot operation, and if activated, are automatically deactivated and the red signal lamps automatically activated when the bus entrance door is opened.

S5.1.5 The color in all lamps, reflective devices, and associated equipment to which this standard applies shall comply with SAE Standard J578c, *Color Specification for Electric Signal Lighting Devices,* February 1977.

S5.2 *Other requirements.*

S5.2.1 The words "it is recommended that," "recommendations," or "should be" appearing in any SAE Standard or Recommended Practice referenced or subreferenced in this standard shall be read as setting forth mandatory requirements, except that the aiming pads on the lens face and the black area surrounding the signal lamp recommended in SAE Standard J887, *School Bus Red Signal Lamps,* July 1964, are not required.

S5.2.2 The words "Type 1 (5¾")," "Type 2 (5¾")," "Type 2 (7")," "Type 1A," "Type 2A," and "Type 2B" appearing in any SAE Standard or Recommended Practice referenced or subreferenced in this standard shall also be read as setting forth requirements respectively for the following types of headlamps: 1C1, 2C1, 2D1, 1A1, 2A1, and 2B1.

S5.3 *Location of required equipment.*

S5.3.1 Except as provided in succeeding paragraphs of S5.3.1, each lamp, reflective device, and item of associated equipment shall be securely mounted on a rigid part of the vehicle other than glazing that is not designed to be removed except for repair, in accordance with the requirements of Table I or III and in location specified in Table II (multipurpose passenger vehicles, trucks, trailers, and buses, 80 or more inches in overall width) or Table IV (all passenger cars, and motorcycles, and multipurpose passenger vehicles, truck, trailers and buses, less than 80 inches in overall width), as applicable.

S5.3.1.1 Except as provided in S5.3.1.1.1, each lamp and reflective device shall be located so that it meets the visibility requirements specified in any applicable SAE Standard or Recommended Practice. In addition, no part of the vehicle shall prevent a parking lamp, tail lamp, stop lamp, turn signal lamp, or backup lamp from meeting its photometric output at any applicable group of test points specified in Figures 1c and 2, or prevent any other lamp from meeting the photometric output at any test point specified in any applicable SAE Standard or Recommended Practice. However, if motor vehicle equipment (e.g., mirrors, snow plows, wrecker booms, backhoes, and winches) prevents compliance with this paragraph by any required lamp or reflective devices, an auxiliary lamp or device meeting the requirements of this paragraph shall be provided.

S5.3.1.1.1 Clearance lamps may be mounted at a location other than on the front and rear if necessary to indicate the overall width of a vehicle, or for protection from damage during normal operation of the vehicle, and at such a location they need not be visible at 45 degrees inboard.

S5.3.1.2 On a truck tractor, the red rear reflex reflectors may be mounted on the back of the cab, at a minimum height not less than 4 inches above the height of the rear tires.

S5.3.1.3 On a trailer, the amber front side reflex reflectors and amber front side marker lamps may be located as far forward as practicable exclusive of the trailer tongue.

S5.3.1.4 When the rear identification lamps are mounted at the extreme height of a vehicle, rear clearance lamps need not meet the requirement of Table II that they be located as close as practicable to the top of the vehicle.

S5.3.1.5 The center of the lens referred to in SAE Standard J593c, *Backup Lamps*, February 1968, is the optical center.

S5.3.1.6 On a truck tractor, clearance lamps mounted on the cab may be located to indicate the width of the cab, rather than the overall width of the vehicle.

S5.3.1.7 The requirement that there be not less than 4 inches between a front turn signal lamp and a low beam headlamp, specified in SAE Standard J588e, *Turn Signal Lamps*, September 1970, shall not apply if the sum of the candlepower values of the turn signal lamp measured at the test points within each group listed in Figure 1c is not less than two and one-half times the sum specified for each group for yellow turn signal lamps.

S5.3.1.8 Each high-mounted stop lamp shall be mounted with its center on the vertical centerline of the passenger car as the car is viewed from the rear. The lamp may be mounted at any position on the centerline, including the glazing. If the lamp is mounted inside the vehicle, means shall be provided to minimize reflections from the light of the lamp upon the rear window glazing that might be visible to the driver when viewed directly, or indirectly in the rearview mirror. If the lamp is mounted below the rear window, no portion of the lens shall be lower than 6 inches below the rear window on convertibles, or 3 inches on other passenger cars.

S5.4 *Equipment combinations.*

S5.4.1 Two or more lamps, reflective devices, or items of associated equipment may be combined if the requirements for each lamp, reflective device, and item of associated equipment are met, except that no clearance lamp may be combined optically with any tail lamp or identification lamp, and no high-mounted stop lamp shall be combined with any other lamp or reflective device.

S5.5 *Special wiring requirements.*

S5.5.1 Each vehicle shall have a means of switching between lower and upper beams that conforms to SAE Recommended Practice J564a, *Headlamp Beam Switching*, April 1964, or to SAE Recommended Practice J565b, *Semi-Automatic Headlamp Beam Switching Devices*, February 1969. Except as provided in S5.5.8, the lower and upper beams shall not be energized simultaneously except momentarily for temporary signalling purposes or during switching between beams.

S5.5.2 Each vehicle shall have a means for indicating to the driver when the upper beams of the headlamps are on that conforms to SAE Recommended Practice J564a, April 1964, except that the signal color need not be red.

S5.5.3 The tail lamps on each vehicle shall be activated when the headlamps are activated in a steady-burning state.

S5.5.4 The stop lamps on each vehicle shall be activated upon application of the service brakes. The high-mounted stop lamp on each passenger car shall be activated only upon application of the service brakes.

S5.5.5 The vehicular hazard warning signal operating unit on each vehicle shall operate independently of the ignition or equivalent switch, and when activated, shall cause to flash simultaneously sufficient turn signal lamps to meet, as a minimum, the turn signal lamp photometric requirements of this standard.

S5.5.6 Each vehicle equipped with a turn signal operating unit shall also have an illuminated pilot indicator. Failure of one or more turn signal lamps to operate shall be indicated in accordance with SAE Standard J588e, *Turn Signal Lamps,* September 1970, except when a variable-load turn signal flasher is used on a truck, bus, or multipurpose passenger vehicle, 80 or more inches in overall width, on a truck that is capable of accommodating a slide-in camper, or on any vehicle equipped to tow trailers.

S5.5.7 On each passenger car and motorcycle, and on each multipurpose passenger vehicle, truck, and bus, of less than 80 inches overall width:

(a) When the parking lamps are activated, the tail lamps, license plate lamps, and side marker lamps shall also be activated; and

(b) When the headlamps are activated in a steady-burning state, the tail lamps, parking lamps, license plate lamps and side marker lamps shall also be activated.

S5.5.8 On a motor vehicle equipped with a headlighting system designed to conform to the photometric requirements of Figure 15, the lamps marked "L" or "LF" may be wired to remain permanently activated when the lamps marked "U" or "UF" are activated. On a motor vehicle equipped with an Integral Beam headlighting system meeting the photometric requirements of paragraph S7.4(a)(2), the lower beam headlamps shall be wired to remain permanently activated when the upper beam headlamps are activated.

S5.5.9 The wiring harness or connector assembly of each headlamp system shall be designed so that only those filaments necessary for meeting lower beam photometrics are energized when the beam selector switch is in the lower beam position, and that only those filaments necessary for meeting upper beam photometrics are energized when the beam selector switch is in the upper beam position.

S5.5.10 The wiring requirements for lighting equipment in use are:

(a) Turn signal lamps, hazard warning signal lamps, and school bus warning lamps shall be wired to flash;

(b) High-mounted stop lamps on passenger cars manufactured on or after August 1, 1984, but before September 1, 1986, may flash when the hazard warning system is activated.

(c) Headlamps and side marker lamps may be wired to flash for signaling purposes;

(d) A motorcycle headlamp may be wired to allow either its upper beam or its lower beam, but not both, to modulate from a higher intensity to a lower intensity in accordance with section S5.6;

(e) All other lamps shall be wired to be steady-burning.

S5.6 *Motorcycle headlamp modulation system.*

S5.6.1 A headlamp on a motorcycle may be wired to modulate either the upper beam or the lower beam from its maximum intensity to a lesser intensity provided that:

(a) The rate of modulation shall be 240 $\pm$ 40 cycles per minute.

(b) The headlamp shall be operated at maximum power for 50 to 70 percent of each cycle.

(c) The lowest intensity at any test point shall be not less than 17 percent of the maximum intensity measured at the same point.

(d) The modulator switch shall be wired in the power lead of the beam filament being modulated and not in the ground side of the circuit.

(e) Means shall be provided so that both the lower beam and upper beam remain operable in the event of a modulator failure.

(f) The system shall include a sensor mounted with the axis of its sensing element perpendicular to a horizontal plane. Headlamp modulation shall cease whenever the level of light emitted by a tungsten filament light operating at 3000° Kelvin is either less than 270 lux (25 foot-candles) of direct light for upward pointing sensors or less than 60 lux (5.6 foot-candles) of reflected light for downward pointing sensors. The light is measured by a silicon cell type light meter that is located at the sensor and pointing in the same direction as the sensor. A Kodak Gray Card (Kodak R–27) is placed at ground level to simulate the road surface in testing downward pointing sensors.

(g) When tested in accordance with the test profile shown in Figure 9, the voltage drop across the modulator when the lamp is on at all test conditions for 12 volt systems and 6 volt systems shall not be greater than .45 volt. The modulator shall meet all the provisions of the standard after completion of the test profile shown in Figure 9.

(h) Means shall be provided so that both the lower and upper beam function at design voltage when the headlamp control switch is in either the lower or upper beam position when the modulator is off.

S5.6.2(a) Each motorcycle headlamp modulator not intended as original equipment, or its container, shall be labeled with the maximum wattage, and the minimum wattage appropriate for its use. Additionally, each such modulator shall comply with S5.6.1(a) through (g) when connected to a headlamp of the maximum rated power and a headlamp of the minimum rated power, and shall provide means so that the modulated beam functions at design voltage when the modulator is off.

(b) Instructions, with a diagram, shall be provided for mounting the light sensor including location on the motorcycle, distance above the road surface, and orientation with respect to the light.

S5.7 *Replacement equipment.*

S5.7.1 Each lamp, reflective device, or item of associated equipment manufactured to replace any lamp, reflective device, or item of associated equipment on any vehicle to which this standard applies shall be designed to conform with this standard.

S5.7.2 Unless otherwise specified in this standard, each lamp, reflective device, or item of associated equipment to which section S5.7.1 applies may be labeled with the symbol DOT, which shall constitute a certification that it conforms to applicable Federal motor vehicle safety standards.

S6. *Subreferenced SAE Standards and Recommended Practices.*

S6.1 SAE Standards and Recommended Practices subreferenced by the SAE Standards and Recommended Practices included in Tables I and III and paragraphs S5.1.4 and S5.5.1 are those published in the 1970 edition of the SAE Handbook, except that the SAE standard referred to as "J575" is J575e, *Tests for Motor Vehicle Lighting Devices and Components*, August 1970, for stop lamps, tail lamps, and turn signal lamps designed to conform to SAE Standards J586c, J585d/J585e, and J588e, respectively, and for high-mounted stop lamps designed to conform to SAE Recommended Practice J186a. The reference in J585e to J256 does not apply. For headlamps, unless otherwise specified in this standard, the version of SAE Standard J575 is JUN80, and the version of SAE Standard J602 is OCT80.

S6.2 Requirements of SAE Standards incorporated by reference in this standard, other than J576b and J576c, do not include test for warpage of devices with plastic lenses.

S7 *Headlighting requirements.*

S7.1 Each passenger car, multipurpose passenger vehicle, truck, and bus shall be equipped with a headlighting system designed to conform to the requirements of S7.3, S7.4, or S7.5.

S7.2 The lens of each original equipment and replacement equipment headlamp, and each beam contributor manufactured on or after December 1, 1989, shall be marked with the symbol "DOT," either horizontally or vertically, which shall constitute the certification required by 15 U.S.C. 1403. The lens of each headlamp and each beam contributor manufactured on or after December 1, 1989, shall also be marked with the manufacturer's or importer's name and/or trademark registered with the U.S. Patent Office, and each headlamp or beam contributor with its voltage, and with its part or trade number.

S7.3 *Sealed beam headlighting system.* A sealed beam headlighting system shall be designed to meet the requirements of one of the following subparagraphs of S7.3.2 through S7.3.9. In references to Figures in SAE J1383 APR85 for headlamp dimensional requirements, only those dimensions marked "I" for interchangeability are applicable.

S7.3.1 The lens of each sealed beam headlamp designed to conform to S7.3.2 through S7.3.6 shall be marked according to paragraph 5.4.3 through 5.4.5 of SAE Standard J1383 APR85 *Performance Requirements for Motor Vehicle Headlamps.*

S7.3.2 *Type A headlighting system.* A Type A headlighting system consists of two Type 1A1 and two Type 2A1 headlamps and associated hardware, which are designed to conform to the following requirements:

(a) SAE Standard J1383 APR85 *Performance Requirements for Motor Vehicle Headlamps*, with the following exceptions:

(1) Paragraphs 1, 2.1.2, 2.8.2, 3, 4.1.1, 4.1.3, 4.4, 4.6, 4.8 through 4.18, 5.1.1, 5.1.3, 5.1.5, 5.1.7 through 5.1.16, 5.2.2, 5.3.5, 5.4.1, 5.4.2, and 6 through 6.4 do not apply.

(2) In paragraph 5.3.2, the words "and retaining rings" are omitted.

(3) In paragraphs 4.5.2 and 5.1.6, the words "either Table 1 or Table 2 of SAE J579 DEC84 as appropriate" are substituted for "Table 3."

(b) SAE Standard J580 DEC86 *Sealed Beam Headlamp Assembly* (except paragraphs 3, 4.1.1, 5.1.1.1, 5.1.2.3, and the second sentence of 5.1.6); in 5.2.1, delete t' ; words "and retaining rings"; the correct reference is SAE J1383 Figure 6, 9, 12 and 14.

(c) After a vibration test conducted in accordance with paragraph S8.9, there shall be no evidence of loose or broken parts, other than filaments, visible without magnification.

(d) The maximum wattage at 12.8 volts (design voltage): Single filament headlamp, 55 watts on the upper beam; dual filament headlamp, 43 watts on the upper beam and 65 watts on the lower beam.

S7.3.3 *Type B headlighting system.* A Type B headlighting system consists of two Type 2B1 headlamps and associated hardware, which are designed to conform to the following requirements:

(a) The requirements of paragraphs S7.3.2(a) through (c).

(b) The maximum wattage at 12.8 volts (design voltage): 70 watts on the upper beam and 60 watts on the lower beam.

S7.3.4 *Type C headlighting system.* A Type C headlighting system consists of two Type 1C1 and two Type 2C1 headlamps and associated hardware, which are designed to conform to the requirements of paragraph S7.3.2(a) through (d).

S7.3.5 *Type D headlighting system.* A Type D headlighting system consists of two Type 2D1 headlamps and associated hardware, which are designed to conform to the requirements of paragraph S7.3.2(a) through (c).

S7.3.6 *Type E headlighting system.* A Type E headlighting system consists of two Type 2E1 headlamps and associated hardware, which are designed to conform to the requirements of paragraph S7.3.2(a) through (c).

S7.3.7 *Type F headlighting system.* A Type F headlighting system consists of two Type UF and two Type LF headlamps and associated hardware, which are designed to conform to the following requirements:

(a) Figures 11, 12, 13, and 14 as appropriate.

(b) The photometric requirements of Figure 15 of this standard. A reaim tolerance of +/− 1/4 degree is allowed for any test point on the Type LF lamp when tested alone, but is not allowed on the Type UF lamp when tested alone. For the test point 10U–90U, measurement shall be from the normally exposed surface of the lens face.

(c) SAE Standard J1383 APR85 *Performance Requirements for Motor Vehicle Headlamps*, Sections 2.4, 2.5, 2.6, 4.1, and 4.1.4.

(d) When tested in accordance with section (c), the mounted assembly (either Type UF or Type LF headlamps, respective mounting ring, aiming ring, and aim adjustment mechanism) shall be designed to conform to the requirements of Figure 15 for upper or lower beams respectively without reaim when any conforming Type UF or LF headlamp is tested and replaced by another conforming headlamp of the same Type.

(e) SAE J580 DEC86 *Sealed Beam Headlamp Assembly* with the following exceptions:

(1) Section 2.2 Mounting Ring reads: "the adjustable ring upon which the sealed beam unit is mounted and which forces the sealed beam unit to seat against the aiming ring when assembled into a sealed beam assembly."

(2) The definition "2.3 Aiming Ring" reads: "The clamping ring that retains the sealed beam unit against the mounting ring, and that provides an interface between the unit's aiming/seating pads and the headlamp aimer adapter (locating plate)."

(3) Section 4.1.1 Vibration Test does not apply.

(4) Section 5.1.1.1 does not apply.

(5) Section 5.1.2.1 reads: "When the headlamp assembly is tested in the laboratory, a minimum aiming adjustment of +/− 2.5 degrees shall be provided in the horizontal plane and +/− 4 degrees in the vertical plane."

(6) Section 5.1.2.2 concludes: ". . . through an angle of +/− 2.5 degrees and +/− 4 degrees respectively."

(7) Section 5.1.6 is retitled "Retaining Ring/Aiming Ring Tests," and add: "92 × 150 mm . . . 0.340 in (8.6 mm)."

(8) Figures 2, 3, and 4 do not apply, and the reference to them in section 4.5 is replaced by "Figure 16, Deflectometer, of Federal Motor Vehicle Safety Standard No. 108."

(f) A lens for a Type F headlamp incorporating an upper beam shall be labeled "UF." A lens for a Type F headlamp incorporating a lower beam shall be labeled "LF." The face of letters, numbers, or other symbols molded on the surface of the lens shall not be raised more than 0.020 in (0.5 mm), and shall be placed no closer to the photometric center of the lens than 2.75 in (70 mm). The marking shall be molded in the lens and shall be not less than 1/4 in (6.35 mm) in size.

(g) The maximum wattage at 12.8 volts (design voltage): 70 watts on the upper beam and 60 watts on the lower beam.

(h) Type F headlamps may be mounted on common or parallel seating and aiming planes to permit simultaneous aiming of both headlamps provided that when tested with any conforming Type UF and LF headlamps according to Section S10:

(1) The assembly (consisting of the Type UF and LF headlamps, mounting rings, the aiming/seating rings, and aim adjustment mechanism), shall be designed to conform to the test point values of Figure 15.

(2) There shall be no provision for adjustment between the common or parallel aiming and seating planes of the two lamps.

(i) After a vibration test conducted in accordance with paragraph S8.9, the Type F system shall show no evidence of loose or broken parts, other than filaments, visible without magnification.

S7.3.8 *Type G headlighting system.* A Type G headlamp system consists of two Type 1G1 headlamps and two Type 2G1 headlamps each of which is designed to conform to the following requirements:

(a) Figures 18 and 21.

(b) SAE Standard J1383 APR85 *Performance Requirements for Motor Vehicle Headlamps* (except paragraphs 1, 2.1.2, 2.8.2, 3, 4.1.1, 4.1.3, 4.4, 4.6, 4.8 through 4.18, 5.1.1, 5.1.3, 5.1.5 through 5.1.16, 5.2.2, 5.3.5 through 6.4). In paragraph 5.3.2 the words "and retaining rings" are omitted. In paragraph 4.5.2, the words "either Table 1 or Table 2 of SAE J579 DEC84, as appropriate" are substituted for the words "Table 3."

(c) SAE Standard J580 DEC86 *Sealed Beam Headlamp Assembly*, with the following exceptions:

(1) Sections 2.2, 2.3, 4.1.1, 5.1.1.1, 5.1.2.3, 5.1.6, and 5.2.1.

(2) Section 4.5 reads: "*Torque Deflection Test.* The headlamp assembly to be tested shall be mounted in the designed vehicle position and set at nominal aim (0.0). A special adapter (Figure 22) for the deflectometer (Figure 3) shall be clamped onto the headlamp assembly. A torque of 20 in/lbs (2.25 N–m) shall be applied to the headlamp assembly through the deflectometer, and a reading on the thumb wheel shall

be taken. The torque shall be removed and a second reading on the thumb wheel shall be taken."

(d) After a vibration test conducted in accordance with paragraph S8.9, there shall be no evidence of loose or broken parts, other than filaments, visible without magnification.

(e) The maximum wattage at 12.8 volts (design voltage) for the 1G1 and 2G1 upper beam is 55 watts and 43 watts respectively; for the 2G1 lower beam, 65 watts.

(f) A lens for a Type G headlamp incorporating only part of an upper beam shall be labeled 1G1. A lens for a Type G headlamp incorporating both part of an upper beam and a lower beam shall be labeled 2G1. The face of letters, numbers, or other symbols molded on the surface of the lens shall not be raised more than 0.020 in (0.5 mm), and shall be placed no closer to the geometric center of the lens than 2.75 in (70 mm). The marking shall be molded in the lens and shall be not less than ¼ in. (6.35 mm) in size.

S7.3.9 *Type H headlighting system.* A Type H headlamp system consisting of two Type 2H1 headlamps and associated hardware, which are designed to conform to the following requirements:

(a) Paragraph S7.3.8(a) through (d).

(b) The maximum wattage at 12.8 volts (design voltage): 70 watts on the upper beam and 60 watts on the lower beam.

(c) A lens for a Type H headlamp incorporating both an upper beam and a lower beam shall be labeled 2H1. The face of letters, numbers, or other symbols molded on the surface of the lens shall not be raised more than 0.020 in (0.5 mm), and shall be placed no closer to the geometric center of the lens than 2.75 in (70 mm). The marking shall be molded in the lens and shall be not less than ¼ in (6.35 mm) in size.

S7.4 *Integral beam headlighting system.* An integral beam headlighting system shall be designed to conform to the following requirements:

(a) The system shall provide in total not more than two upper beams and two lower beams of the performance described in one of the following:

(1) Figure 15;

(2) Figure 15 except that the upper beam test point values at 2½D–V and 2½D–12R and 12L shall apply to the lower beam headlamp and not to the upper beam headlamp and the upper beam test point value at 1½D–9R and 9L shall be 1,000;

(3) Figure 17;

(4) Table 1 of SAE J579 DEC84; or

(5) Table 2 of SAE J579 DEC84.

(b) In a four-headlamp system, each upper beam headlamp and each lower beam headlamp shall be designed to conform to the photometrics of one of the following:

(1) Figure 15;

(2) Figure 15 with the exceptions specified in subsection (a) of this section; or

(3) Table 2 of SAE J579 DEC84.

(c) In a two-headlamp system, each headlamp shall be designed to conform to the photometrics of one of the following:

(1) Figure 17; or

(2) Table 1 of SAE J579 DEC84.

(d) In a system in which there is more than one beam contributor providing a lower beam, and/or more than one beam contributor providing an upper beam, each beam contributor in the system shall be designed to meet only the photometric performance requirements of paragraph S7.4(a)(1) based upon the following mathematical expression: conforming test point value = 2(Figure 15 test point value)/total number of lower or upper beam contributors for the vehicle, as appropriate. The system shall be designed to use the Vehicle Headlamp Aiming Device (VHAD) as specified in paragraph S7.7.5.2.

(e) The lower and upper beams shall be provided only as follows where each headlamp contains two light sources:

(1) The lower beam shall be provided either by the most outboard light source (or the uppermost if arranged vertically), or by all light sources.

(2) The upper beam shall be provided either by the most inboard light source (or the lowermost if arranged vertically), or by all light sources.

(f) The lower and upper beams shall be provided only as follows where each headlamp contains a single filament:

(1) The lower beam shall be provided by the most outboard headlamps (or the uppermost if arranged vertically), and the lens of each such headlamp shall be permanently marked with the letter "L."

(2) The upper beam shall be provided by the most inboard headlamps (or lowermost if arranged vertically), and the lens of each such headlamp shall be permanently marked with the letter "U."

(g) A tolerance of +/− ¼ degree reaim tolerance during photometric performance tests is permitted for any headlamp. The test point 10U–90U shall be measured from the normally exposed surface of the lens face.

(h) A headlamp or beam contributor designed to meet S7.4(b) and S7.7.5.1 may be mounted in an assembly to permit simultaneous aiming of the beam(s) contributors, provided that with any complying contributor the assembly complete with all lamps meets the appropriate photometric requirements when tested in accordance with S10.

(i) Each integral beam headlamp system shall be designed to conform to the applicable photometric performance requirements in subsections (a) through (d) of this section when tested in accordance with sections 4.1 and 4.1.4 of SAE Standard J1383 APR85 with any headlamp intended for use in such system. The term "aiming plane" means "aiming reference plane," or an appropriate vertical plane defined by the manufacturer as required in paragraph S7.7.1.

(j) The system shall be aimable in accordance with the requirements of paragraph S7.7. A system that incorporates any headlamp or beam contributor that does not have a VHAD as an integral and indivisible part of the headlamp or beam contributor shall be designed so that the appropriate photometrics are met when any correctly aimed and photometrically conforming headlamp or beam contributor is removed from its mounting and aiming mechanism, and is replaced without reaim by any conforming headlamp or beam contributor of the same type.

(k) A headlamp with a glass lens need not meet the abrasion resistance (S8.2), chemical resistance (S8.3), or impact (S8.8) tests. If, in addition to a glass lens, the headlamp uses a non-plastic reflector, it need not meet the internal heat test of paragraph S8.6.2. A headlamp of sealed design as verified in paragraph S8.10 *Sealing* need not meet the corrosion (S8.4), dust (S8.5), or humidity (S8.7) tests; however, the headlamp shall meet the requirements of paragraphs 4.1, 4.1.2, 4.4 and 5.1.4 for corrosion and connector of SAE Standard J580 DEC86 *Sealed Beam Headlamp Assembly.*

(1) When tested according to any of the procedures indicated in subparagraphs (i) through (viii) each headlamp or beam contributor shall meet the appropriate requirement:

(i) After an abrasion test conducted in accordance with paragraph S8.2, the headlamp shall meet the photometric requirements applicable to the headlamp system under test.

(ii) After a chemical resistance test involving exposure to any of the fluids listed in paragraph S8.3, there shall be no surface deterioration, coating delamination, fractures, deterioration of bonding materials, color bleeding or color pickup visible without magnification, and the headlamp shall meet the photometric requirements applicable to the headlamp system under test.

(iii) After a corrosion test conducted in accordance with paragraph S8.4 there shall be no evidence of external or internal corrosion or rust visible without magnification. Loss of adhesion of any applied coating shall not occur more than 0.125 in (3.2 mm) from any sharp edge on the inside or outside. Corrosion may occur on terminals only if the current produced during the test of paragraph S8.4(c) is not less than 9.7 amperes.

(iv) After a dust test conducted in accordance with paragraph S8.5, the headlamp shall meet the photometric requirements applicable to the headlamp system under test.

(v) The headlamp shall first meet the requirements of subparagraph (A) and then those of subparagraph (B).

(A) After a temperature cycle test conducted in accordance with paragraph S8.6.1, the headlamp shall show no evidence of delamination, fractures, entry of moisture or deterioration of bonding material, color bleeding, warpage or deformation visible without magnification or lens warpage greater than 0.118 in (3 mm) when measured parallel to the optical axis at the point of intersection of the axis of each light source with the exterior surface of the lens, and it shall meet the photometric requirements applicable to the headlamp system under test.

(B) After an internal heat test conducted in accordance with paragraph S8.6.2, there shall be no lens warpage greater than 0.118 in (3 mm) when measured parallel to the optical axis at the point of intersection of the axis of each light source with the exterior surface of the lens, and it shall meet the photometric requirements applicable to the headlamp system under test.

(vi) After a humidity test conducted in accordance with paragraph S8.7, the inside of the headlamp shall show no evidence of delamination or moisture, fogging or condensation visible without magnification, and the headlamp shall meet the photometric requirements applicable to the headlamp system under test.

(vii) After an impact test on a headlamp with a plastic lens, conducted in accordance with paragraph S8.8, there shall be no fracture of the adhesion of the lens coating or delamination of materials visible without magnification, and the lens shall not be broken, cracked, or chipped.

(viii) After a vibration test conducted in accordance with paragraph S8.9, there shall be no evidence of loose or broken parts, other than filaments, visible without magnification.

S7.5 *Replaceable bulb headlamp system.* Each replaceable bulb headlamp system shall be designed to conform to the following requirements:

(a) The system shall provide only two lower beams and two upper beams and shall incorporate not more than two standardized replaceable light sources in each headlamp.

(b) The photometrics as specified in subsections (c) through (f) below using any standardized replaceable light source of the type intended for use in such system.

(c) The test requirements of sections 4.1 and 4.1.4 of SAE J1383 APR85, using the photometric requirements specified in (a) through (c). The term "aiming plane" means "aiming reference plane," or an appropriate vertical plane defined by the manufacturer as required in paragraph S7.7.1. A ¼ degree reaim tolerance is permitted for any test point. The test point 10U–90U shall be measured from the normally exposed surface of the lens face.

(d) For a headlamp equipped with one or two Type HB1 light sources, the following requirements apply:

(1) There shall be no mechanism that allows adjustment of an individual light source or, if there are two light sources, independent adjustment of each reflector.

(2) The lower and upper beams of a headlamp system consisting of two lamps, each containing two light sources, shall be provided as follows:

(i) The lower beam shall be provided in one of the following ways:

(A) By the outboard light source (or the upper one if arranged vertically) designed to conform to the lower beam requirements of Table 1 of SAE Standard J579 DEC84 or

(B) By both light sources, designed to conform to the lower beam requirements of Table 1 of SAE Standard J579 DEC84.

(ii) The upper beam shall be provided in one of the following ways:

(A) By the inboard light source (or the lower one if arranged vertically) designed to conform to the upper beam requirements of Table 1 of SAE Standard J579 DEC84 or

(B) By both light sources, designed to conform to the upper beam requirements of Table 1 of SAE Standard J579 DEC84.

(3) The lower and upper beams of a headlamp system consisting of four lamps, each containing a single light source, shall be provided as follows:

(i) The lower beam shall be provided by the outboard lamp (or upper one if arranged vertically), designed to conform to the lower beam requirements of Table 1 of SAE Standard J579 DEC84. The lens of each such headlamp shall be marked with the letter "L."

(ii) The upper beam shall be provided by the inboard lamp (or lower one if arranged vertically), designed to conform to the upper beam requirements of Table 1 of SAE Standard J579 DEC84. The lens of each such headlamp shall be marked with the letter "U."

(e) The following requirements apply to a headlamp system equipped with Type HB3 and HB4, HB1 and HB3, or HB1 and HB4 light sources:

(1) There shall be no mechanism that allows adjustment of an individual light source, or, if there are two light sources, independent adjustment of each reflector.

(2) The lower and upper beams of a headlamp system consisting of two lamps, each containing two light sources (Type HB3 and HB4, or Type HB1 with HB3 or HB4) shall be provided only as follows:

(i) The lower beam shall be provided in one of the following ways:

(A) By the outboard light source (or the uppermost if arranged vertically) designed to conform to the lower beam requirements of Figure 17; or

(B) By both light sources, designed to conform to the lower beam requirements of Figure 17.

(ii) The upper beam shall be provided in one of the following ways:

(A) By the inboard light source (or the lower one if arranged vertically) designed to conform to the upper beam requirements of Figure 17; or

(B) By both light sources, designed to conform to the upper beam requirements of Figure 17.

(3) The lower and upper beams of a headlamp system consisting of four lamps, using Type HB3 and HB4, HB1 and HB3, or HB1 and HB4 light sources, each containing only a single light source, shall be provided only as follows:

(i) The lower beam shall be produced by the outboard lamp (or upper one if arranged vertically), designed to conform to the lower beam requirements of Figure 15. The lens of each such headlamp shall be permanently marked with the letter "L."

(ii) The upper beam shall be produced by the inboard lamp (or lower one if arranged vertically), designed to conform to the upper beam requirements of Figure 15. The lens of each such headlamp shall be marked with the letter "U."

(f) Each lens reflector unit manufactured as replacement equipment shall be designed to conform to the requirements of paragraphs (e) and (f) of this section when any standardized replaceable light source appropriate for such unit is inserted in it.

(g) The lens of each replaceable bulb headlamp using Type HB3 or HB4 light sources, or Type HB1 light sources in conjunction with Type HB3 or HB4 light sources within a headlamp system on a motor vehicle, shall permanently display the Type designation(s) for that light source on the lens in front of each light source.

(h) The system shall be aimable in accordance with paragraph S7.7.

(i) Each headlamp shall meet the requirements of paragraphs S7.4(k) and (l), except that the sentence in (k) to verify sealing according to S8.10 *Sealing* does not apply.

S7.6 *Standardized replaceable light sources.* Each standardized replaceable light source shall be designed to conform to the following requirements:

(a) A Type HB1 light source shall be designed to conform to the dimensions specified in Figure 3 and shall incorporate a silicone O-ring. Its maximum power on the lower beam shall be 50 watts, and on the upper beam, 70 watts. Its luminous flux in lumens shall be 700 +/− 15% on the lower beam and 1200 +/− 15% on the upper beam.

(b) A Type HB3 light source shall be designed to conform to the dimensions specified in Figure 19. Its maximum power on the upper beam shall be 70 watts. Its luminous flux in lumens shall be 1700 +/− 12% on the upper beam.

(c) A Type HB4 light source shall be designed to conform to the dimensions specified in Figure 20. Its maximum power shall be 60 watts on the lower beam, and its luminous flux in lumens on the lower beam shall be 1000 +/− 15%.

(d) The filament of a light source shall be seasoned before measurement of maximum power and luminous flux.

(e) Measurement of maximum power and luminous flux shall be made with the direct current test voltage regulated within one-quarter of 1 percent. The test voltage shall be design voltage, 12.8 V. The measurement of luminous flux shall be in accordance with the Illuminating Engineering Society of North America, LM–45; *IES Approved Method for Electrical and Photometric Measurements of General Service Incandescent Filament Lamps* (April 1980), shall be made with the black cap installed on Type HB1 and HB4, and shall be made with the electrical conductor and light source base shrouded with an opaque white colored cover, except for the portion normally located within the interior of the lamp housing. The measurement of luminous flux for the Types HB3 and HB4 shall be with the base covered with a white cover shown in Figures 19–1 and 20–1. The white covers are used to eliminate the likelihood of incorrect lumen measurement that will occur should the reflectance of the light source base and electrical connector be low.

(f) The capsule, lead wires and/or terminals, and seal on each Type HB1, Type HB3, and Type HB4 light source shall be installed in the base so as to provide an airtight seal. Such a seal exists when no air bubbles shall appear on the low pressure (connector) side after the light source has been immersed in water for one minute while inserted in a cylindrical aperture of 1.350 to 1.346 in (34.30 to 34.2 mm) (Type HB1), or 0.796 +/− 0.004 in (20.22 +/− 0.10 mm) (Type HB3), or 0.875 +/− 0.004 in (22.2 +/− 0.1 mm) (Type HB4) and subjected to a minimum air pressure of 70kPa (10 P.S.I.G.) on the glass capsule side.

(g) After the force deflection test conducted in accordance with S9, the permanent deflection of the glass envelope shall not exceed 0.005 in (0.13 mm) in the direction of the applied force.

(h) A general tolerance shall apply to Figure 3 as follows: +/− 0.004 in (0.10 mm) to all linear dimensions and +/− 1 degree 00 minutes to all angular dimensions except for referenced dimensions and unless otherwise specified.

(i) Each standardized light source manufactured on or after December 1, 1989, shall be marked with the symbol DOT horizontally or vertically, which shall constitute the certification required by 15 U.S.C. 1403, and its base marked with its HB Type designation, and either with the manufacturer's or importer's name or with the manufacturer's or importer's trademark that is registered with the U.S. Patent Office.

S7.7 *Aimability performance requirements.*

S7.7.1 Each headlamp (other than a headlamp designed to conform to paragraph S7.3), or beam contributor, shall be equipped with fiducial marks, aiming pads or similar references of sufficient detail and accuracy for determination of an appropriate vertical plane to be used with the photometric procedures of SAE J1383 APR85 for correct alignment with the photometer axis when being tested for photometric compliance, and to serve for the aiming reference when the lamp is installed on a motor vehicle. The fiducial marks, aiming pads, or similar references are protrusions, bubble vials, holes, indentations, ridges, scribed lines, or other readily identifiable marks established and described by the vehicle or lamp manufacturer.

S7.7.2 Each headlamp shall be installed on a motor vehicle with a mounting and aiming mechanism that allows aim inspection and adjustment of both vertical and horizontal aim, and is accessible for those uses without removal of any vehicle parts, except for protective covers removable without the use of tools.

S7.7.2.1 When installed on the vehicle, adjustment of one aim axis through its full on-vehicle range shall not cause the aim of the other axis to deviate more than +/− 0.76 degree. If this performance is not achievable, a label meeting the requirements of paragraph S7.7.5.2(b) shall be attached adjacent to each Vehicle Headlamp Aiming Device (VHAD).

S7.7.2.2 If a headlamp is aimed by moving the reflector relative to the lens and headlamp housing, or vice versa, it shall conform with the photometrics applicable to it with the lens at any position relative to the reflector within the aim range limits of paragraphs S7.7.3 and S7.7.4, or any combination.

S7.7.3 When a headlamp system is tested in a laboratory, the range of its vertical aim shall not be less than +/− 4 degrees from the nominal correct aim position for the intended vehicle application. When installed on a motor vehicle, the range of vertical aim shall be not less than the full range of pitch of the vehicle on which the headlamp system is installed. The installed range of pitch angle shall as a minimum be determined from unloaded vehicle weight to gross vehicle weight rating, and incorporate pitch angle effects from maximum trailer or trunk loadings, the full range of tire intermix sizes and suspensions recommended and/or installed by the vehicle manufacturer, and the anticipated effects of suspension sag and variable passenger loading. The vertical aim adjustment mechanism shall be continuously adjustable over the full range.

S7.7.4 When a headlamp system is tested in a laboratory, the range of its horizontal aim shall not be not less than 2.5 degrees from the nominal correct aim position for the intended vehicle application.

S7.7.5 When a headlamp system is installed on a motor vehicle, it shall be aimable with either an externally applied aiming device or on-vehicle headlamp aiming devices installed by the vehicle manufacturer. When activated in a steady-burning state, headlamps shall not have any styling ornament or other feature, such as a translucent cover or grill, in front of the lens. Headlamp wipers may be used in front of the lens provided that the headlamp system is designed to conform with all applicable photometric requirements with the wiper stopped in any position in front of the lens.

S7.7.5.1 *External aiming.* Each headlamp system that is capable of being mechanically aimed by externally applied headlamp aiming devices shall be mechanically aimable using the equipment specified in SAE Standard J602 OCT80 *Headlamp Aiming Device for Mechanically Aimable Sealed Beam Headlamp Units* without the removal of any ornamental trim rings, covers, wipers or other vehicle parts.

(a) Each headlamp system that is designed to use such external aiming devices shall not deviate more than 0.30 degree when a downward torque of 20 lb-in (2.25 N–m) is applied to the headlamp in its normal operating position, through the lamp's mechanical axis at the plane of the forwardmost aiming pad.

(b) When a headlamp is installed on a motor vehicle, its aim in any direction shall not change by more than 0.30 degree nor shall the lamp recede more than 0.1 in (2.5 mm) after being subjected to an inward force of 50 pounds (222 newtons) applied evenly to the lens parallel to the mechanical axis.

(c) Each headlamp system mounting and aiming mechanism shall be subjected to a salt spray (fog) test in accordance with ASTM B117–73 *Method of Salt Spray (Fog) Testing* for a period of 50 hours, consisting of two successive 25-hour periods of 24-hours exposure followed by 1 hour of drying. At the end of 50 hours, the headlamp system shall be capable of meeting any of the applicable requirements of paragraph S7.7.

(d) Each headlamp system which is designed to use the Headlamp Aiming Device Locating Plates with adjustable legs for the 100 × 165 mm unit and the 142 × 200 mm unit, and which has adjustable length legs, shall meet the requirements of subparagraphs (1) and (2) below.

(1) The lens shall have three aiming pads which meet the requirements of Figure 4, *Dimensional Specifications for Location of Aiming Pads on Replaceable Bulb Headlamp Units.* The aiming pads need not be centered at the geometric center of the lens, or on the optical axis. Except as provided in subparagraph (2), a whole number, which represents the distance in tenths of an inch (i.e., 0.3 inch = 3) from the aiming reference plane to the respective aiming pads which are not in contact with that plane, shall be inscribed adjacent to each respective aiming pad on the lens. The height of these numbers shall be not less than 0.157 in (4 mm). If there is interference between the plane and the area of the lens between the aiming pads, the whole number represents the distance to a secondary plane. The secondary plane shall be located parallel to the aiming reference plane and as close to the lens as possible without causing interference.

(2) If the most forward aiming pad is the lower inboard aiming pad, then the dimensions may be placed anywhere on the lens. The dimension for the outboard aiming pad (Dimension F in Figure 4) shall be followed by the letter "H" and the dimension for the center aiming pad shall be followed by the letter "V." The dimensions shall be expressed in tenths of an inch.

(e) Each headlamp may be designed to use the nonadjustable Headlamp Aiming Device Locating Plate for the 100 × 165 mm unit, the 142 × 200 mm unit, the 146 mm diameter unit, or the 178 mm diameter unit of SAE J602, or the 92 × 150 mm Type F unit, and incorporate lens mounted aiming pads as specified for those units in Figures 10, 13, 5, or 7 respectively in SAE J1383 APR85, or Figure 11 of this standard for the Type F unit. If so designed, no additional lens marking is necessary to designate the type of plate or dimensions.

S7.7.5.2 *On-vehicle aiming.* Each headlamp system that is capable of being aimed by equipment installed on the vehicle shall include a Vehicle Headlamp Aiming Device (VHAD) that conforms to the following requirements:

(a) *Aim.* The VHAD shall provide for headlamp aim inspection and adjustment in both the vertical and horizontal axes.

(1) *Vertical aim.* The VHAD shall include the necessary references and scales relative to the horizontal plane to assure correct vertical aim for photometry and aiming purposes. An off-vehicle measurement of the angle of the plane of the ground is permitted. In addition, an equal number of graduations from the "0" position representing angular

changes in the axis in the upward and downward directions shall be provided.

(i) Each graduation shall represent a change in the vertical position of the mechanical axis not larger than 0.19 degree (1 in at 25 ft) to provide for variations in aim at least 1.2 degrees above and below the horizontal, and have an accuracy relative to the zero mark of less than 0.1 degree.

(ii) The VHAD shall be marked to indicate headlamp aim movement in the upward and downward directions.

(iii) Each graduation shall indicate a linear movement of the scale indicator of not less than 0.05 in (1.27 mm) if a direct reading analog indicator is used. If a remote reading indicator is provided, it shall represent the actual aim movement in a clear, understandable format.

(iv) The vertical indicator shall perform through a minimum range of +/− 1.2 degrees.

(v) Means shall be provided in the VHAD for compensating for deviations in floor slope not less than 1.2 degrees from the horizontal that would affect the correct positioning of the headlamp for vertical aim.

(vi) The graduations shall be legible under an illumination level not greater than 30 foot candles, measured at the top of the radiator, by an observer having 20/20 vision (Snellen), and shall permit aim adjustment to within 0.19 degree (1 in at 25 ft).

(2) *Horizontal aim.* The VHAD shall include references and scales relative to the longitudinal axis of the vehicle necessary to assure correct horizontal aim for photometry and aiming purposes. An "0" mark shall be used to indicate alignment of the headlamps relative to the longitudinal axis of the vehicle. In addition, an equal number of graduations from the "0" position representing equal angular changes in the axis relative to the vehicle axis shall be provided.

(i) Each graduation shall represent a change in the horizontal position of the mechanical axis not greater than 0.38 degree (2 in at 25 ft) to provide for variations in aim at least 0.76 degree (4 in. at 25 ft.) to the left and right of the longitudinal axis of the vehicle, and shall have an accuracy relative to the zero mark of less than 0.1 degree.

(ii) The VHAD shall be marked to indicate headlamp aim movement in the left and right directions.

(iii) The graduations shall be legible under an illumination level not greater than 30 foot candles, measured at the top of the radiator, by an observer having 20/20 vision (Snellen), and shall permit aim adjustment to within 0.38 degree (2 in at 25 ft).

(iv) The horizontal indicator shall perform through a minimum range of +/− 0.76 degree (4 in. at 25 ft.); however, the indicator itself shall be capable of recalibration over a movement of +/− 2.5 degrees relative to the longitudinal axis of the vehicle to accommodate any adjustment necessary for recalibrating the indicator after vehicle repair from accident damage.

(b) *Aiming instructions.* The instructions for properly aiming the headlighting system using the VHAD shall be provided on a label permanently affixed to the vehicle adjacent to the VHAD, or in the vehicle operator's manual. The instructions shall advise that the headlighting system is properly aimed if the appropriate vertical plane (as defined by the vehicle manufacturer) is perpendicular to both the longitudinal axis of the vehicle, and a horizontal plane when the vehicle is on a horizontal surface, and the VHAD is set at "0" vertical and "0" horizontal. Should a remote indicator or a remote indicator and adjuster be provided, the instructions shall be placed in the operator's manual, and may also be placed on a label adjacent to the VHAD.

(c) *Testing the VHAD.*

(1) The headlamp assembly (the headlamp(s) and the integral or separate VHAD mechanism) shall be mounted on a level goniometer, aligned to a photometer located not less than 60 ft (18.3 m) from the VHAD assembly. The assembly shall be mechanically aimed using the VHAD in accordance with the manufacturer's instructions as provided with the vehicle on which the VHAD is intended to be used. A ¼ degree reaim is permitted in any direction at any test point to allow for variations in readings between laboratories. The test shall be conducted in accordance with the procedures of paragraphs 4.1 and 4.1.4 of SAE J1383 APR85. Under these conditions the mounted headlamp assembly shall be designed to conform to the photometric requirements appropriate for the headlamp system under test.

(2) When tested in accordance with subsection (1) of this section, with any replacement headlamp unit(s) or light sources intended for use in the system under test, the VHAD and headlamp system shall be designed to conform to the photometric performance requirements appropriate for the system under test.

(3) The same VHAD and associated headlamp(s) (or headlamp assembly) shall be rigidly mounted in a headlamp test fixture and comply with the following laboratory test procedures:

(i) Each graduation on the horizontal and vertical aim scales shall be checked and any variation from the correct aim shall not exceed +/− 0.2 degree, and +/− 0.1 degree respectively.

(ii) With the aiming plane horizontal and vertical and with the scale on the device set at 0, the aimer shall be adjusted before each of the following tests to assure that the indicators are centered at 0.

(iii) The VHAD and an unlighted headlamp assembly shall be stabilized at 20 +/− 5 degrees F (−7 +/− 3 degrees C) in a circulating air environmental test chamber. After a period of 30 minutes, when measured at that soak temperature, the variation from correct horizontal or vertical aim shall not exceed +/− 0.2 degree, and +/− 0.1 degree, respectively.

(iv) The VHAD, and the headlamp assembly with its highest wattage filament (or combination of filaments intended to be used simultaneously) energized at its design voltage, shall then be stabilized at 100 +/− 5 degrees F (38 +/− 3 degrees C) in a circulating air environmental test chamber. After a period of 30 minutes, when measured at that soak temperature, the variation from correct horizontal and vertical aim shall not exceed +/− 0.2 degree, and +/− 0.1 degree, respectively.

(v) The VHAD and an unlighted headlamp assembly shall then be placed in a circulating air environmental test chamber and exposed to a temperature of 140 +/− 5 degrees F (60 +/− 3 degrees C) for 24 hours, followed by a temperature of −40 +/− 5 degrees F (−40 +/− 3 degrees C) for 24 hours and then permitted to return to room temperature, after which the VHAD and headlamp assembly shall show no damage which would impair its ability to perform as specified herein. The variation from correct horizontal or vertical aim shall not exceed +/− 0.2 degree, and +/− 0.1 degree, respectively.

(vi) The VHAD and headlamp assembly shall then be tested according to the corrosion test procedure of paragraph S7.7.5.1(c).

(vii) The VHAD and headlamp assembly shall then be tested for photometric compliance as specified in paragraphs S7.7.5.2(c)(1) and (2).

S8 *Tests and procedures for integral beam and replaceable bulb headlighting systems.* When tested in accordance with the following procedures, each integral beam headlamp shall meet the requirements of paragraph S7.4, and each replaceable bulb headlamp shall meet the requirements of paragraph S7.5.

S8.1 *Photometry.* Each headlamp to which paragraph S8 applies shall be tested according to paragraphs 4.1 and 4.1.4 of SAE Standard J1383 APR85 for meeting the applicable photometric requirements, after each test specified in paragraphs S8.2, S8.3, S8.5, S8.6.1, S8.6.2, and S8.7. A ¼ degree reaim is permitted in any direction at any testpoint.

S8.2 *Abrasion.* (a) A headlamp shall be mounted in the abrasion test fixture in the manner indicated in Figure 5 with the lens facing upward.

(b) An abrading pad meeting the requirements in paragraphs (c)(1) through (c)(4) of this section shall be cycled back and forth (1 cycle) for 11 cycles at 4 ± 0.8 in. (10 cm ± 2 cm) per second over at least 80 percent of the lens surface, including all the area between the upper and lower aiming pads, but not including lens trim rings and edges.

(c)(1) The abrading pad shall be not less than 1.0 ± 0.04 in. (2.5 cm ± 0.1 cm) wide, constructed of 0000 steel wool, and rubber cemented to a rigid base shaped to the same vertical contour of the lens. The "grain" of the pad shall be perpendicular to the direction of motion.

(2) The abrading pad support shall be equal in size to the pad and the center of the support surface shall be within ± .08 in (± 2 mm) of parallel to the lens surface.

(3) The density of the abrading pad shall be such that when the pad is mounted to its support and is resting unweighted on the lens, the base of the pad shall be no closer than 0.125 in (3.2 mm) to the lens at its closest point.

(4) When mounted on its support and resting on the lens of the test headlamp, the abrading pad shall then be weighted such that a pad pressure of 2.0 ± 0.15 psi (14 ± 1 kPa) exists at the center and perpendicular to the face of the lens.

(d) A pivot shall be used if it is required to follow the contour of the lens.

(e) Unused steel wool shall be used for each test.

S8.3 *Chemical resistance.* (a) The entire exterior lens surface of the headlamp in the headlamp test fixture and top surface of the lens-reflector joint shall be wiped once to the left and once to the right with a 6-inch square soft cotton cloth (with pressure equally applied) which has been saturated once in a container with 2 ounces of a test fluid as listed in paragraph (b). The lamp shall be wiped within 5 seconds after removal of the cloth from the test fluid.

(b) The test fluids are:

(1) ASTM Reference Fuel C, which is composed of Isooctane 50 volume % and Toluene 50 volume %. Isooctane must conform to A2.7 in Annex 2 of the Motor Fuels Section of the *1985 Annual Book of ASTM Standards*, Vol. 05.04, and Toluene must conform to ASTM specification D362–84, *Standard Specification for Industrial Grade Toluene.* ASTM Reference Fuel C must be used as specified in:

(i) Paragraph A2.3.2 and A2.3.3 of Annex 2 to *Motor Fuels, Section 1* in the *1985 Annual Book of ASTM Standards*; and

(ii) OSHA Standard 29 CFR 1910.106—*Handling Storage and Use of Flammable Combustible Liquids.*

(2) Tar remover (consisting by volume of 45% xylene and 55% petroleum base mineral spirits).

(3) Power steering fluid (as specified by the vehicle manufacturer for use in the motor vehicle on which the headlamp is intended to be installed).

(4) Windshield washer fluid consisting of 0.5% monoethanolamine with the remainder 50% concentration of methanol/distilled water by volume.

(5) Antifreeze (50% concentration of ethylene glycol/distilled water by volume).

(c) After the headlamp has been wiped with the test fluid, it shall be stored in its designed operating attitude for 48 hours at a temperature of 73°F ± 7° (23°C ± 4°) and a relative humidity of 30 ± 10 percent. At the end of the 48-hour period, the headlamp shall be wiped clean with a soft dry cotton cloth and visually inspected.

S8.4 *Corrosion.* (a) A connector test shall be performed on each filament circuit prior to the test in subparagraph (b) according to Figure 1 of SAE Standard J580 DEC86. The power source shall be set to provide 12.8 volts and the resistance shall be set to produce 10 amperes.

(b) The headlamp with connector attached to the terminals, unfixtured and its designed operating attitude with all drain holes, breathing devices or other designed openings in their normal operatlng positions, shall be subjected to a salt spray (fog) test in accordance with ASTM B117-73, *Method of Salt Spray (Fog) Testing*, for 240 hours, consisting of ten successive 24-hour periods. During each period, the headlamp shall be mounted in the middle of the chamber and exposed for 23 hours to the salt spray. The spray shall not be activated during the 24th hour. The bulb shall be removed from the headlamp and from the test chamber during the one hour of salt spray deactivation and reinserted for the start of the next test period, at the end of the first and last three 23-hour periods of salt spray exposure, and at the end of any two of the fourth through seventh 23-hour periods of salt-spray exposure. The test chamber shall be closed at all times except for a maximum of 2 minutes which is allowed for removal or replacement of a bulb during each period. After the ten periods, the lens reflector unit without the bulb shall be immersed in deionized water for 5 minutes, then secured and allowed to dry by natural convection only.

(c) Using the voltage, resistance and pretest set up of paragraph (a) the current in each filament circuit shall be measured after the test conducted in paragraph (b).

S8.5 *Dust.* The headlamp, mounted on a headlamp test fixture, with all drain holes, breathing devices or other designed openings in their normal operating positions, shall be positioned within a cubical box, with inside measurements of 35.4 in. (900 mm) on each side or larger if required for adequate wall clearance, i.e., a distance of at least 5.9 in (150 mm) between the headlamp and any wall of the box. The box shall contain 9.9 lb (4.5 kg) of fine powdered cement which conforms to the ASTM C150-77 specification for Portland Cement. Every 15 minutes, the cement shall be agitated by compressed air or fan blower(s) by projecting blasts of air for a two-second period in a downward direction so that the cement is diffused as uniformly as possible throughout the entire box. This test shall be continued for five hours after which the exterior surfaces of the headlamp shall be wiped clean.

S8.6 *Temperature and internal heat tests.* A headlamp with one or more replaceable standardized light sources shall be tested according to paragraphs S8.6.1 and S8.6.2. Tests shall be made with all filaments lighted at design voltage that are intended to be used simultaneously in the headlamp and which in combination draw the highest total wattage. These include but are not limited to filaments used for turn signal lamps, fog lamps, parking lamps, and headlamp lower beams lighted with upper beams when the wiring harness is so connected on the vehicle. If a turn signal is included in the headlamp assembly, it shall be operated at 90 flashes a minute with a 75 ± 2 % current "on time." If the lamp produces both the upper and lower beam, it shall be tested in both the upper beam mode and the lower beam mode under the conditions above described, except for a headlamp with a single HB1 light source.

S8.6.1 *Temperature cycle.* A headlamp, mounted on a headlamp test fixture, shall be subjected to 10 complete consecutive cycles having the thermal cycle profile shown in Figure 6. During the hot cycle, the lamp shall be energized commencing at point "A" of Figure 6 and de-energized at point "B." Separate or single test chambers may be used to generate the environment of Figure 6. All drain holes, breathing devices or other openings or vents of the headlamps shall be in their normal operating positions.

S8.6.2 *Internal Heat Test.* (a) The headlamp lens surface that would normally be exposed to road dirt shall be uniformly sprayed with any appropriate mixture of dust and water or other materials to reduce the photometric output at the H-V test point of the upper beam (or the ½D-1½R test point of the lower beam as appropriate) to 25 ± 2% of the output originally measured in the photometric test conducted pursuant to paragraphs S7.4(i), or S7.5(a) through (e), as applicable. A headlamp with a single HB1 light source shall be tested on the upper beam only. Such reduction shall be determined under the same conditions as that of the original photometric measurement.

(b) After the photometric output of the lamp has been reduced as specified in paragraph (a), the lamp and its mounting hardware shall be mounted in an environmental chamber in a manner similar to that indicated in Figure 7 "Dirt/Ambient Test Setup." The headlamp shall be soaked for one hour at a temperature of 95 + 7 − 0 degrees F (35 + 4 − 0 degrees C) and then the lamp shall be energized according to paragraph S8.6 for one hour in a still air condition, allowing the temperature to rise from the soak temperature.

(c) The lamp shall be returned to a room ambient temperature of 73 + 7 − 0 degrees F (23 + 4 − 0 degrees C) and a relative humidity of 30 ± 10% and allowed to stabilize to the room ambient temperature. The lens shall then be cleaned.

S8.7 *Humidity*. The headlamp mounted on a headlamp test fixture shall be placed in a controlled environment consisting of a temperature of 100 + 7 − 0 degrees F (38 + 4 − 0 degrees C) with a relative humidity of not less than 90%. All drain holes, breathing devices, and other designed openings shall be in their normal operating positions. The headlamp shall be subjected to 20 consecutive 6-hour test cycles. In each cycle it shall be energized for 1 hour at design voltage with the highest combination of filament wattages that are intended to be used, including a turn signal flashing at 90 flashes per minute with a 75 ± 2% current "on time," if so equipped, and then de-energized for 5 hours. After completion of the last cycle, the lamp shall be soaked for 1 hour at 73 ± 7 − 0 degrees F (20 ± 4 − 0 degrees C) and relative humidity of 30 ± 10% before it is removed for photometric testing. The headlamp shall be tested for photometrics at 10 ± 1 minutes following completion of the humidity test.

S8.8 *Impact*. The headlamp shall be rigidly mounted in a headlamp test fixture on the seating lugs with the mechanical axis (bulb socket axis) vertical, and the lens upward. The seating plane of the test fixture shall consist of oakwood 0.5 in (13 mm) thick. One impact shall be delivered to the center of the lens on the mechanical axis using a steel ball bearing with a diameter of .9055 in (23 mm) weighing 1.76 oz (50 grams), dropped freely from a distance of 15.75 in (40 cm) from the bottom of the ball to the surface of the lens, at the intersection of the ball trajectory and the mechanical axis of the headlamp.

S8.9 *Vibration*. A vibration test shall be conducted in accordance with the procedures of SAE Standard J575e, *Tests for Motor Vehicle Lighting Devices and Components*, August 1970, and the following: the table on the adapter plate shall be of sufficient size to completely contain the test fixture base with no overhang. The vibration shall be applied in the vertical axis of the headlamp system as mounted on the vehicle. The filament shall not be energized.

S8.10 *Sealing*. An unfixtured headlamp in its design mounting position shall be placed in water at a temperature of 176 +/− 5 degrees F (60 +/− 3 degrees C) for one hour. The headlamp shall be energized in its highest wattage mode, with the test voltage at 12.8 +/− 0.1 V during immersion. The lamp shall then be de-energized and immediately submerged in its design mounting position into water at 32 +5 − 0 degrees F (0 +3 − 0 degrees C). The water shall be in a pressurized vessel, and the pressure shall be increased to 10 psi (69 kPa), upon placing the lamp in the water. The lamp shall remain in the pressurized vessel for a period of thirty minutes. This entire procedure shall be repeated for four cycles. Then the lamp shall be inspected for any signs of water on its interior. During the high temperature portion of the cycles, the lamp shall be observed for signs of air escaping from its interior. If any water occurs on the interior or air escapes, the lamp is not a sealed lamp.

S9. *Deflection test for standardized replaceable light sources.*

With the light source rigidly mounted in a fixture in a manner indicated in Figure 8, a force of 4.0 ± 0.1 pound (17.8 ± 0.4N) is applied at a distance "A" from the reference plane perpendicular to the longitudinal axis of the glass capsule and parallel to the smallest dimension of the pressed glass capsule seal. The force shall be applied (using a rod with a hard rubber tip with a minimum spherical radius of .039 in (1 mm)) radially to the surface of the glass capsule in four locations in a plane parallel to the reference plane and spaced at a distance "A" from that plane. These force applications shall be spaced 90 degrees apart starting at the point perpendicular to the smallest dimension of the pressed seal of the glass capsule. The bulb deflection shall be measured at the glass capsule surface at 180 degrees opposite to the force application.

S10. *Simultaneous aim photometry tests.*

(a) *Type F headlamp systems*. The assembly shall be located on a goniometer placed not less than 60 feet (18.3m) from the photometer. The LF unit shall be aimed mechanically by centering the unit on the photometer axis and by aligning the aiming plane of the lens perpendicular to the photometer axis. Then the assembly shall be moved in a plane parallel to the established aiming plane of the LF headlamp until the UF headlamp is centered on the photometer axis. Photometry measurements of the UF photometry unit shall be completed using the aiming plane so established, and the procedures of section S4.1 and 4.1.4 Standard J1383 APR83, and Figure 15. A reaim tolerance of ±¼ degree is permitted in any direction at any test point.

(b) *Integral Beam Headlamp Systems*. The assembly used for simultaneously aiming more than one integral beam headlamp shall be placed on a test fixture on a goniometer located not less than 60 feet (18.3 m) from the photometer. The assembly shall be aimed by centering the geometric center of the lower beam lens(es) on the photometer axis and by aligning the photometer axis to be perpendicular to the aiming reference plane or appropriate vertical plane defined by the manufacturer of any lower beam contributor. Photometric compliance of the lower beam shall be determined with all lower beam contributors illuminated and in accordance with sections 4.1 and 4.1.6 of SAE Standard J1383 APR83, and Figure 15. The assembly shall then be moved in a plane parallel to the established aiming plane of the lower beam until the assembly is located with the geometric center of the upper lens(es) on the photometer axis. Photometric compliance for the upper beam shall now be determined using the figure and procedure specified for the lower beam. During photometric testing, a ¼ degree reaim is permitted in any direction at any test point.

3. The item "Headlamps" of Tables I and III are amended by deleting all specifications for number and type under the second column and all references to SAE materials under the final column in each Table, and by adding "See S7" to the second column.

4. The footnotes in Tables I, II, and III, are revised by changing the prefix of each from "S4" to "S5."

5. Footnote 2 in Table IV is changed to read "S5.1.1.15."

Issued on April 26, 1989

Howard M. Smolkin
Managing Director

54 F.R. 20066
May 9, 1989

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment
(Docket No. 81-11; Notice 26)

ACTION: Technical amendment.

SUMMARY: The purpose of this amendment is to correct an error in the Note to Figure 3-1 of the Federal motor vehicle safety standard on lighting.

DATE: The amendment is effective June 19, 1989.

SUPPLEMENTARY INFORMATION: On June 2, 1983, NHTSA amended Motor Vehicle Safety Standard No. 108 to allow the use of replaceable bulb headlamps (48 FR 24690). As part of that amendment, Figure 3-1 Interchangeability Drawing Headlamp Bulb Assembly was adopted. In the Note for that Figure, a general tolerance of ± 1 degree was stated to apply to all angular dimensions specified in Figure 3.

When the agency responded to petitions for reconsideration of the June rule on September 30, 1983, (48 FR 44815), Figure 3-1 was republished. However, in redrawing the artwork for Figure 3-1, the degree symbol mistakenly became the percent symbol, so that the general tolerance became one of plus or minus one percent. This error passed unnoticed until recently. NHTSA is therefore publishing this technical amendment to correct it. Because the amendment corrects a technical error and neither imposes nor relieves a burden on any regulated person, it may be published without prior notice or comment thereon (5 USC 553(b)). For the same reason, it is found for good cause shown that an effective date earlier than 180 days after issuance is in the public interest, and the amendment is effective June 19, 1989.

In consideration of the foregoing, the Note to Figure 3-1 of 49 CFR 571.108 Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment,* is revised to read as follows:

"NOTE: Unless otherwise specified, a general tolerance of plus or minus .004 in, (0.10 mm) shall apply to all linear dimensions and plus or minus 1 degree shall apply to all angular dimensions specified in Fig. 3." (15 U.S.C. 1392, 1407; delegations of authority at 49 CFR 1.50 and 501.8)

Issued on: May 15, 1989

Barry Felrice
Associate Administrator for Rulemaking

54 F.R. 21624
May 19, 1989

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment
(Docket No. 81-11; Notice 27)

ACTION: Final rule.

SUMMARY: This notice adopts an additional type of a standardized replaceable light source to be used in replaceable bulb headlamps on motor vehicles. The light source, which will be known as Type HB2, is a modification of the European bulb known as the H-4. The final rule follows a notice of proposed rulemaking issued in May 1985, and a supplemental notice published in June 1986.

This final rule adopts more stringent bulb filament and bulb/socket fit tolerances than those permitted on the H-4, but allows a 1/4 degree reaim provision in the photometric test. Headlamps equipped with Type HB2 light sources are required to meet the same photometric requirements as Type F sealed beam headlamps.

The final rule does not allow "European Headlamps" nor does it allow the European (ECE) H-4 bulb to be used in passenger cars, multipurpose passenger vehicles, trucks, or buses. The effect of the rule is only to permit the HB2 light source in headlamps designed to meet rigorous environmental tests imposed by Standard No. 108 for all replaceable bulb headlamps intended for sale in the U.S. The HB2 bulb is an improved, tighter-toleranced version, of the H-4 bulb, and it is designed to be used in mechanically aimable headlamps. The HB2 bulb has to be marked "D.O.T." to certify compliance with these requirements. The H-4 bulb may not legally be so marked.

Because their headlamps are not required to be mechanically aimable, motorcycles may use an H-4 bulb, however, under the final rule, the lenses of these headlamps are required to be marked "Motorcycle", and they may not be used in other motor vehicles.

This notice completes action on a petition for rulemaking submitted by Volkswagen of America Corp.

EFFECTIVE DATE: The effective date of the final rule is July 31, 1989.

SUPPLEMENTARY INFORMATION:

Background of These Amendments

For over 40 years, the sealed beam headlamp in standardized shapes and sizes was the principal motor vehicle headlamp unit on the American market. With the advent of Federal Motor Vehicle Safety Standard No. 108, effective January 1, 1968, the sealed beam headlamp became the only permissible one.

In August 1981, Ford Motor Company filed a petition for rulemaking to amend Standard No. 108, to allow a new type of headlamp that it had developed in conjunction with GTE Products Corp. ("Sylvania"). This headlamp differed from those previously permitted in that it was not an indivisible unit, but one consisting of two parts, a lens-reflector assembly bonded together, and a standardized light source that could be replaced in the event of burn-out. The agency granted the petition, and proposed adoption of the Ford/Sylvania light source on January 17, 1983 (48 FR 1992). NHTSA amended the standard on June 2, 1983, to allow headlamps with the Ford/Sylvania light source (48 FR 24690).

Subsequently, Volkswagen of America petitioned NHTSA for rulemaking to allow the H-4. Although the H-4 has always been allocated under Standard No. 108 for motorcycle usage because mechanically aimable headlamps were not required for this type of motor vehicle, it had not been allowed for other motor vehicles which were required to have such headlamps. This petition was granted in part. On May 13, 1985, the agency proposed the adoption not of the H-4, but of a modified version of that light source called the HB2 (50 FR 19961). At the same time, the agency also proposed allowing two additional light sources for which General Motors Corporation ("GM") had petitioned.

The May 1985 proposal highlighted significant differences between the European H-4 and the proposed Type HB2. First a headlamp with a Type HB2 light source would be required to meet the photometrics of Motor Vehicle Safety Standard No. 108 rather than those of the European regulation. Second, because no life requirement was prescribed by the European standard, NHTSA proposed that HB2 be designed to meet the same average life requirements as the Ford/Sylvania HB1, 320 hours for the lower beam and 150 hours for the upper beam, at 14 volts. Third, because no durability requirements were prescribed by the European standard, NHTSA proposed that headlamps which use the HB2, meet the same environmental test requirements as headlamps which use the HB1.

NHTSA also observed that some special interface between the bulb and socket was needed to distinguish between lamp systems presently using the existing H-4 bulb and those that would use the proposed HB2 bulb. In the agency's view, these modifications would help prevent inadvertent use of light source and lamp assemblies that may be available and legal for single headlamp motorcycle use under Standard No. 108, but which do not meet all specifications set forth for multiple headlamp passenger cars. To assure the capability of mechanical aim, tighter specifications and tolerances for fit between the HB2 light source and the headlamp socket and for filament position with respect to the base were proposed which were comparable to those already required for the Ford/Sylvania HB1. This was intended to help reduce the problems associated with mechanical aiming that would exist if the European specifications were used. Mechanical aim is not required on ECE headlamps and the tolerances on bulb-socket fit and filament location are not adequate to assure mechanical aim capability for headlamps using the H-4 bulb.

The principal commenters on the proposed HB2 were six manufacturers of lighting equipment: Sylvania, General Electric Corp. ("GE"), OSRAM, Hella, Thorn, and North American Phillips Co. ("Phillips"). Nine vehicle manufacturers also commented: Volkswagen, Rolls-Royce, GM, AMC, Chrysler, Fiat, Mercedes Benz, BMW, and Ford. Although use of the existing H-4 was opposed by Sylvania, GE, and Ford, the majority of the commenters supported the May 1985 proposal but urged modifications in it.

On May 2, 1986, NHTSA amended Standard No. 108 to allow the two GM light sources (51 FR 16235) set forth in the May 1985 proposal. At that time, the agency adopted its 1985 proposal to designate the Ford/Sylvania light source as Type HB1, and the GM sources as Types HB3 and HB4. Final action was not taken in that notice on Type HB2. Instead of proceeding directly to a final rule, the agency issued a supplementary proposal regarding Type HB2 on June 13, 1986 (51 FR 21696), to consider the modifications urged by the commenters on the May 1985 proposal. The June 1986 proposal stated that issues relating to the other aspects of the May 1985 proposal would be addressed in the next rulemaking action.

Technical Issues of the May 1985 and June 1986 Proposals

The June 1986 proposal addressed four major issues.

1. Design of the base of the HB2.

The May 1985 notice proposed that there be a difference in physical appearance and type of fit between the bases of the HB2 and H-4 light sources in order to minimize the potential misuse of bulbs that had higher-than-permitted light output, broader tolerances, etc. Virtually all of the 12 commenters on this issue objected on the ground that it would result in increased manufacturing costs and probably not have the desired effect as illegal versions of the HB2 lacking the different base could easily be developed. The June 1986 notice therefore proposed that the HB2 use the IEC P43t-38 base found on existing H-4 bulbs but with tighter fit tolerances. As an additional aid to proper use of replaceable lighting sources, that proposal also proposed that bulbs and lenses of motorcycle headlamps be labeled "motorcycle" if the replaceable light source were other than the HB series (e.g., an unmodified H-4).

2. Tolerances on the fit between the base and socket of the HB2.

In response to the May 1985 proposal, GE, OSRAM, Hella, Philips, Volkswagen, GM, and Rolls-Royce supported use of the existing H-4 but with reduced filament, filament-to-shield, and filament location tolerances, as well as new socket fit specifications. OSRAM suggested additional changes to assure that beam pattern and aim requirements would be met after bulb replacement when using mechanical aiming. Thorn recommended changes in dimensions and tolerances to improve manufacturability. OSRAM and Volkswagen suggested new ECE references for referral to the H-4 bulb and socket. In response, the June 1986 notice proposed reductions in tolerances on reflector cavity dimensions, and the angle locating the two lower sockets for reference lugs. HB2 cap tolerance reductions were also proposed. Other changes were also proposed to ensure a tighter bulb-socket fit to assure correct aim with any HB2 bulb in a mechanically aimed headlamp.

3. Tolerance on the location of HB2 filaments.

The consensus of the commenters on the May 1985 proposal was that the proposed tolerances on the location of the HB2 filaments were not sufficiently small to assure proper aim after bulb replacement. Accordingly, the June 1986 notice proposed reduced bulb filament tolerances suggested by OSRAM and

Philips, and bulb/socket fit tolerances revised from those of the May 1985 proposal.

The June 1986 notice also proposed elimination of the 1/4 degree realm allowance on each test point during photometric testing, a proposal not included in the May 1985 notice. Such an allowance had been permitted heretofore to compensate for variations in the accuracy of laboratory equipment and to ensure a greater degree of repeatability when headlamps are tested by different laboratories. However, data submitted by VW on prototype headlamps using the H-4 bulb, indicated that the H-4 can produce a high gradient photometric pattern, with the result that a shift of 1/4 degree can produce up to a 5000 candela change in intensity. This would allow the intensity at a test point such as 1/2D-1 1/2R to be as low as 3000 candela compared with the 8000 candela minimum required by Standard No. 108. Such a disparity does not exist in the lower gradient beam patterns produced by most headlamps heretofore designed to meet Standard No. 108. The proposed reduced filament tolerances were intended as a complement because NHTSA concluded that HB2 replacement bulbs covering the full range of permissible H-4 European tolerances could not meet photometric requirements when the realm allowance was eliminated.

4. Bulb rating, performance requirements.

NHTSA originally proposed that maximum power and luminous flux be measured at 13.2 volts, but in response to a comment by GM, the June 1986 proposal substituted 12.8 design volts. It was also proposed that the design luminous flux be changed from 1000 to 910 lumens on the lower beam and from 1650 to 1500 lumens on the upper beam (with tolerances of 10 percent for each), when measured at the lower design voltage.

Finally, the June 1986 notice proposed deleting the note in the European H-4 drawings which allows obscuration of light output from the bulb by means other than a black cap.

Type HB2 as Adopted

Therefore, on the basis of the proposals in the May 1985 and June 1986 notices, and available information, including the comments submitted in response to these notices, NHTSA is amending Federal Motor Vehicle Safety Standard No. 108 to allow the HB2 replaceable light source with the following characteristics:

1. Photometrics.

In the May 1985 proposal, NHTSA asked for comments on alternative proposals, that a headlamp with a Type HB2 light source meet photometrics required for Type F sealed beam headlamps, or that it meet the requirements for headlamps designed to conform to SAE Standard J579c. In response to the May 1985 proposal, Volkswagen, as petitioner, commented that it had no preference. However, it recommended that NHTSA remove the 20,000 candela maximum at the seeing distance point 1/2D, 1-1/2R to R, to take full advantage of H-4 capabilities. NHTSA will not remove the 20,000 candela limit at the test point noted above. The possibility of new photometric requirements is being studies, and VW's recommendation is properly a part of that study.

NHTSA has decided that Type HB2 shall meet Type F photometrics. Higher minimum light levels at critical seeing distance points can be achieved with Type F photometrics.

2. Design of the base of the HB2 and fit/socket tolerances.

Volkswagen, Hella, and OSRAM agreed that the dimension of the bulb base, Dimension "M", can be tightened to improve mechanical aim, supporting the agency opinion that eccentricity control of the diameter is essential for accurate mechanical aim. The headlamp socket Dimension "Z" will also be tightened to improve mechanical aim capability. Otherwise, the bulb base tolerances will remain identical to those specified for the H-4, as will the headlamp socket dimensions.

3. Tolerances on filament locations.

The tolerances that were proposed in the June 1986 notice have been adopted, with only minor changes. They are more stringent than the ECE standard requires of the H-4. This restriction is necessary to ensure that a headlamp with any Type HB2 replaceable bulb installed will continue to meet original equipment photometrics when mechanically aimed.

4. Allowance of reaim during photometric tests.

Commenters generally did not favor elimination of the 1/4 degree reaim allowance. The high gradient beam pattern condition can exist even if a shielded filament light source like the HB2 is not used. Thus, the condition can exist even if an H-4 type light source is not used. The agency believes that the gradient issue is a separate one and has declined to defer the issue for consideration in future rulemakings on beam patterns.

5. HB2 performance and ratings.

NHTSA proposed a lumen tolerance of 10 percent, as contrasted with an ECE tolerance of 15 percent. Since no commenters opposed this proposal, it has been adopted. Further, performance will be measured at 12.8 volts as with other replaceable light sources, and not 13.2 as with ECE ratings. The wattage values have been changed to reflect the test voltage. As with all other replaceable bulbs, a white shield will be used over the rear of the HB2 bulb base during the bulb lumen test.

6. Marking of motorcycle headlamps.

The agency had proposed the marking of motorcycle headlamp lenses and bulbs with the words "For motorcycle use only" in characters 4mm high. A new commenter to the June 1986 proposal, American Honda, objected on the grounds that H-4 bulbs also have off-road applications in vehicles other than motorcycles. Another commenter, Stanley Electric Co., stated that it already uses the word "Motorcycle" in 3mm characters on its headlamps, and therefore did not agree with the agency's rather different proposal. NHTSA considers these points well made, and is amending Standard No. 108 to require the word "Motorcycle" to appear on the lens, and in characters 3mm high, on motorcycle headlamps equipped with a replaceable bulb other than one specified in Standard No. 108. No bulb marking will be required. Standard No. 108 does not require the type of bulb used in motorcycle headlamps to be marked on the lens.

Comments in Opposition

Issues of safety, economic impact, and fairness have been raised by the two principal opponents of Type HB2, Sylvania and GE. Sylvania argues that "NHTSA's finding that the H-4 light source meets U.S. safety standards would effectively lower U.S. standards rather than enhance the safety of replaceable light sources". It bases this conclusion upon the following concerns:

1. "Because the H-4 is designed for use in a non-sealed headlamp system, the system is prone to reflector and lens corrosion, reducing light output to unsafe levels over time."

2. "The looser 'fit' and tolerances of the H-4 increases significantly the potential for unsafe oncoming driver glare."

3. "The H-4 lamp, which incorporates an internal light-absorbing shield over the low beam filament, provides less on-the-road light for the driver compared to the HB1."

4. "The shield in the H-4 reflects more light upwards in front of the driver, resulting in excessive glare when driving in snow or fog."

5. "Headlamps that are equipped with H-4 bulbs may not provide adequate light for visibility of overhead interstate highway signs that are not artificially lighted."

6. "As the H-4 is currently available in wattages higher than the petition permits (e.g., 100W vs. 65W high beam), there is potential that oncoming drivers can experience disabling glare coming from these higher wattage bulbs. There is no provision in the proposed rules for making such bulbs noninterchangeable."

NHTSA agrees that the H-4 is designed for use in a non-sealed headlamp system, and that, in the absence of environmental testing designed to address the problem, non-sealed systems can be prone to reflector and lens corrosion, which over time will reduce light output. One of the agency's primary and long-standing concerns about non-sealed beam headlamps was the marginal resistance to corrosion of the reflectors, as noted in the German TUV inspection reports, and Swedish "Weak Points of Motor Vehicles," among other sources. This was one of the reasons that the agency in the late 1970's denied several petitions for rulemaking to allow European headlamps. Accordingly, when NHTSA amended Standard No. 108 to allow a headlamp that was not a sealed beam (incorporating the HB1 light source), it adopted stringent environmental tests including a 240-hour salt spray test to demonstrate corrosion resistance. Volkswagen, in fact, petitioned NHTSA to reduce the length of this test, and its petition was denied. Because all replaceable bulb headlamps must meet this corrosion performance test, NHTSA believes it consistent with the intent of the National Traffic and Motor Vehicle Safety Act to leave the design solution (i.e., seal or no seal) to the manufacturer.

The petitioner for the HB1 included a seal in its design. Originally, the petitioner for the HB3 and HB4 submitted drawings in which a seal was lacking; however, subsequently it revised its design to include a seal because it appeared to provide a better control of the positioning of the filament, and the HB3 and HB4 as adopted contain a sealing feature. Because all replaceable bulb headlamps must meet identical environmental performance requirements, NHTSA does not agree that all future replaceable bulbs must also have a seal.

The sealing issue was the basis of an argument by Sylvania that the June 1986 notice was ambiguous and hence procedurally deficient. The Summary to that notice stated that it would cover only bulb and socket dimensions, and bulb rating and performance, and that "other HB2 issues will be addressed in the next rulemaking action." According to its comment, NHTSA's statement could mean either that the matter is deferred or that the agency had nothing further to add to its May 1985 notice. Sylvania believes that "it seems plain that some reasonable laymen could have reserved comment on sealing under the belief that the matter had been deferred. Such ambiguity renders the notice legally defective." Sylvania cites NHTSA's actions in proposing no-seal designs for HB2, HB3 and HB4 in May 1985, and subsequently adopting seal designs for HB3 and HB4 shortly before the June 1986 notice appeared. Comments Sylvania: "(The June 1986 notice). . . was silent on how the new safety rationale of venting-plus-sealing should apply to the HB2. Like the HB3 and HB4, the HB2 is designed for use in vented assemblies. . . .If NHTSA has grounds to believe that safety requires seals for the vented HB3 and HB4 lamps but not for the vented HB2 lamp, it should expose those reasons to public scrutiny and comment."

NHTSA finds Sylvania's position without legal merit, and has concluded that the spirit and the letter of the Administrative Procedure Act have been met by the rulemaking history of HB2, and HB3 and HB4. The May 1985 notice provided an opportunity to comment on the subject matter therein, including the fact that, unlike the HB1, the proposed additional light sources did not incorporate seals. Because the notice adopting the modified HB3 and HB4 light sources appeared in advance of the supplemental proposal on HB2, the June 1986 notice provided a further opportunity for comment on the sealing issue, even if that issue was not directly addressed. Those aspects of the May 1985 proposal that were not addressed in June 1986 remained in effect and were not suspended pending "the next rulemaking action," whether that action was an amendment or a further proposal.

As to Sylvania's second concern about the H-4, NHTSA also agrees that the looser "fit" and tolerances of H-4 are undesirable, and that is why they have been tightened on Type HB2. With regard to Sylvania's arguments that the H-4 bulb would provide less light on the road and be more prone to glare problems because of its internal shield, again NHTSA has proposed the same photometric performance specifications for the HB2 bulb as exist for other conforming headlamps. As long as the headlamp is made to comply with these performance requirements, its internal design features are not at issue.

Because the shield may restrict the upper portion of the beam, Sylvania believes that visibility of overhead signs will be impeded. It is true that a shield can restrict a bulb's upper directed light, however homofocal reflector designs or lensing can compensate for it by directing the bulb's unshielded light upward.

There is no way that NHTSA can prevent deliberate substitution by an owner of an H-4 bulb for an HB2, but the tighter bulb-socket fit tolerances will ensure that not all H-4s will be interchangeable with Type HB2.

Another concern expressed by Sylvania is that of energy efficiency. Both Sylvania and GE argue that inefficiency results with a 55 watt lower beam and use of the internal shield. The agency acknowledges these remarks, but believes that they do not bear on the question of whether HB2 should be permitted, since they relate to efficiency of operation and not to motor vehicle safety. The agency notes, for example, that Sylvania's own HB1 requires a high profile reflector. Since 1981, NHTSA's policy has been to try to remove restrictions barring the entry in the marketplace of products of comparative safety performance; Sylvania was one of the first beneficiaries of this policy. No manufacturer is required to adopt HB2. Since its use is optional, potential users in the marketplace will decide the importance of the energy issues raised by the commenters.

Some commenters strongly opposed the rulemaking on economic grounds, citing alleged competitive disadvantages. While, as discussed below, NHTSA concludes that the record in any event does not support those commenters' allegations, the agency has also considered how such arguments should be viewed in light of the statutory criteria for establishing standards. Section 103 of the National Traffic and Motor Vehicle Safety Act requires that each Federal motor vehicle safety standard must be practicable, meet the need for motor vehicle safety, and be stated in objective terms.

Since there is no statutory definition of "practicable," this agency follows the example of the courts and other agencies under other statutes of using the dictionary to interpret the term. The dictionary defines "practicable" as "capable of being done, effected, or put into practice, with the available means; feasible." *Random House Dictionary of the English Language*, unabridged edition. Thus, the requirement that a standard be practicable means that a standard must be "capable of being done," i.e., capable of being complied with. Court decisions indicate that a number of economic factors are comprehended by the term "practicable," including economic hardship of compliance. For example, in *H & H Tire Co. v. Department of Transportation*, 471 F.2D 350 (7th Cir. 1972), the court concluded that NHTSA, in establishing a standard for retreaded tires, must consider the deleterious economic impact that the retreaded tire industry would experience if it had to comply with the standard. Where the *addition* of a compliance *option* is at issue, however, alleged economic hardship is not related to whether compliance with the standard is capable of being done, since no manufacturer is *required* to choose the new option. Instead, what is alleged to be economic hardship is simply the result of competition in the marketplace by various manufacturers making different choices among the available compliance options.

As indicated above, NHTSA has striven since 1981 to remove restrictions barring the entry into the marketplace of products of comparative safety performance. This policy has been pursued evenhandedly, and a number of companies, as well as the public as a whole, have been its beneficiaries. While NHTSA recognizes that the statutory criterion of practicability requires it to consider economic factors, it rejects any notion that Congress intended that the Safety Act be used to prohibit or inhibit technological alternatives in order to favor existing products and companies. To the contrary, Congress specified that safety standards be expressed in terms of performance rather than design because it did *not* want the standards to "stifle innovation in automobile design." See S. Rep. No. 1301, 89th Cong., 2d Sess. (1966). Further, the Trade Agreement Act of 1979 admonishes Federal regulatory agencies not to establish or retain standards that act as non-tariff trade barriers by excluding products on grounds unrelated to the purposes of those standards.

NHTSA believes that the case of *Chrysler v. Department of Transportation*, 515 F.2d 1053 (6th Cir. 1975), supports its view of practicability, with respect to optional provisions in safety standards. In that case, Chrysler sought review of a lighting standard amendment which permitted the use of rectangular headlamps for a specified period of time, during which the agency would decide whether to permit such headlamps permanently. The company stated that it would be unable to take advantage of the option because it could not complete the necessary engineering and retooling in time to produce automobiles equipped with the new headlamps before the option expired, and that the earlier termination date was therefore impracticable. The court stated:

> *We have some doubt that practicability is a significant principle in the context of an optional provision in a safety standard. A review of the cases in this area suggests the practicability requirement was designed primarily to prevent the NHSTA from establishing mandatory safety standards that are economically or technologically infeasible.... In the case at bar, however, the use of rectangular headlamps is not required, and Chrysler is subject to none of the statutory penalties if it fails to comply with this aspect of Standard No. 108.*
>
> Even assuming that the practicability requirement is fully applicable in this situation, it would be difficult to conclude that the rectangular headlamp option is impracticable in any absolute sense. The record reveals that at least two manufacturers are presently capable of producing rectangular headlamps. It may be that lead-time problems will make it difficult or impossible for Chrysler to take advantage of the new headlamp option, but we decline to construe the practicability requirement to invalidate a permissive safety standard merely because all manufacturers do not derive benefits from it. (515 F.2d at 1060.)

The agency notes that Chrysler also argued that the time limitation would confer a competitive advantage upon General Motors, thereby violating both the reasonableness standard of the Safety Act and the "arbitrary and capricious" standard of the Administrative Procedure Act. The court stated that it was not unsympathetic to this predicament, but also stated that the early effective date seemed more justifiable since any delay would be at the expense of the manufacturer which had invested time and money to incorporate new headlamps and taken the risk that NHTSA might reject its proposal. (See 515 F.2d at 1060.)

In the current factual situation, NHTSA has *already* permitted opponents' new headlamps. For example, in the rulemaking to permit headlamps with the Ford/Sylvania light source, Sylvania requested (through its co-developer's petition) and received the benefits from the very type of rulemaking it now opposes. Now, as discussed below, Sylvania asserts that this rulemaking is unfair to it, since it has invested substantial money to manufacture its product. NHTSA, however, sees nothing fair in permitting one manufacturer's new product and then declining to permit another manufacturer's competing product of comparative safety performance, simply to confer a competitive advantage on the first manufacturer.

The economic impact issue raised by the opponents is essentially one of competitiveness. HB2's principal opponents are manufacturers of the HB1, which for three years was the only type of standardized replaceable light source permitted by Standard No. 108. NHTSA believes the following summarizes Sylvania's position on trade and U.S. employment implications if the HB2 were approved:

1. Because the HB2 is less complex than the HB1, it is "less costly to manufacture."
2. With substantial foreign lighting and automobile manufacturer experience with the H-4, relatively easy convertibility to the HB2, and lower cost, the HB2 bulb would then become the "de facto world standard."
3. There are no domestic producers of the H4 or HB2. There are a number of foreign manufacturers of the H4. As there is excess capacity of H4 production worldwide, these manufacturers would have "unfettered access to the U.S. market."
4. Asian and European automobile manufacturers would switch to the H4 light source in automobiles targeted for the U.S. market. Thus, approval of the H4 light source would immediately deprive U.S. manufacturers of millions of dollars of export sales and, while the American automobile manufacturers indicated they would not switch to the H4 immediately because of the investment in current tooling, they would likely switch in the future when new cars are designed for the world market.
5. Auto companies "want to deal only with automotive lighting manufacturers who can provide them with a full line of products." Thus, if Sylvania and other U.S. manufacturers "are driven out of the replaceable light source business, it will put them in an untenable position with respect to other automotive lighting products."

6. The end result of the above could be "no U.S. manufacturers left in the U.S. automotive lighting business." If U.S. manufacturers are unable to compete in the automotive lighting business, as many as 15,000 U.S. jobs could be lost."

In amplification, Sylvania has commented that because the HB2 does not incorporate an "O" ring and a base of high temperature plastic, manufacturing costs will be less, and manufacturers of motor vehicles will shift to the HB2. Accordingly, Sylvania predicts that it and GE will lose not only the original equipment market, but also the associated replacement market that would have accrued to those headlamps. Sylvania predicted that adoption of HB2 "could lead to the eventual demise of the U.S. domestic headlamp industry."

The agency has carefully considered the remarks of the commenters. It is true that there is a difference in design and materials among the HB series of replaceable light sources. This is because NHTSA has sought to respond in a positive manner to the particular, differing designs of the petitioners for these sources. Both the Sylvania/Ford (HB1) and GM (HB3 and HB4) designs incorporated "O" rings, Ford/Sylvania's to provide a semi-seal for non-vented headlamps, and GM's as an aid to correctly seating the bulb in the lamp. On the other hand, Volkswagen's petition for the adoption of the H-4 did not include an "O" ring as a feature of the design. Although one design may differ from another, all replaceable bulb headlamps must meet the same environmental performance test requirements.

NHTSA is cognizant of the commenter's argument that allowance of the HB2 "would result in the H-4 becoming the de facto world standard," but the truth of the matter is that the H-4 appears already to be acceptable in every country of the world except the United States.

The opponents did not submit any comparative cost figures. The agency concluded that the HB2 could initially cost vehicle manufacturers about $0.15 to $0.60 less than the HB1, primarily because manufacturers of the HB2 have over 20 years of experience in producing a similar bulb (the H-4) and in many cases, their facility costs have been amortized. However, GE, a U.S. light source manufacturer, believes that the HB2 and HB1 will eventually cost the same, as manufacturers of the HB1 convert to highly automated and efficient production, which they have already begun to do. The agency also believes that any competitive advantage the HB2 might have (bulb cost, ease of meeting U.S. and European photometric requirements) would be very slight, if any, and may be balanced by an advantage for the HB1 in meeting U.S. durability requirements, its energy efficiency, and its more familiar U.S. lower beam pattern.

On the trade issue, the agency believes that adoption of the HB2 will allow domestic motor vehicles produced for foreign markets to be equipped with the same light source that require no prior approval before sale. General Motors has argued that NHTSA should adopt the HB2 for trade purposes. And while Sylvania argued that adoption of the HB2 will result in the loss of all U.S. automotive lighting business, it failed to support this allegation, after repeated agency attempts to obtain such documentation. The agency's own questioning of GM, Ford, and Chrysler, all of whom are Sylvania customers, uncovered little or no interest in the HB2, thus negating Sylvania's claim.

This comparison of cost and competitiveness may well be academic because the agency also believes that future headlamp designs for both HB1 and HB2 sources will be limited in number. NHTSA believes that, except for certain European makes retaining traditional vertical or squared grilles and associated bluff frontal surfaces, there is an almost universal trend in vehicle design worldwide to aerodynamic low profile front ends, and smaller lamps with axial filaments are being developed in response to manufacturers' needs for them. The high profile HB1 or HB2 lamps are not as suitable for these needs as the HB3 or HB4 lamps, or other lighting systems known to be under development, such as Sylvania's own eight-unit "multi-beam" system (whose petition for rulemaking is now pending at NHTSA). If there is a competitive challenge to HB1, it does not come from HB2 in the agency's view. It comes from the exigenicies of future design. For example, Sylvania's low profile system seems likely to cut into the market for its higher profile HB1. As Sylvania itself has recently said: "In the increasingly technologic world of automotive lighting, the only constant is change" (advertisement, Automotive Engineering, February 1987, p. 161).

Finally, the commenters raise the fairness issue, stated as follows:

1. "Sylvania and other U.S. manufacturers have invested substantial sums of money to manufacture a product in accordance with NHTSA's recent 1983 rulemaking (HB1 approval). Approval of the H-4 would render obsolete this investment."

2. "U.S. manufacturers cannot sell U.S. standard headlamps in most foreign markets because of foreign standards."

3. "Approval of the H-4 would expose U.S. manufacturers to competition in the U.S. market with no reciprocal trade opportunities made available in foreign markets."

4. "The major beneficiaries of the NHTSA proposal would be European and Japanese lighting companies."

As the agency commented above, the investment represented in HB1 tooling may be rendered obsolete by advancements in lighting technologies rather than by competition from a newly-permitted but existing light source, and U.S. lighting manufacturers themselves will be the major contributors to this normal process of technological changeover. As to the lack of reciprocal trade opportunities, NHTSA notes that developers of the HB1 had not tried to get permission to market it in Europe. Therefore, on April 22, 1987, NHTSA formally petitioned the Economic Commission for Europe (ECE) to amend its relevant regulations to permit the use of the HB1, HB3, and HB4 replaceable light sources. The proposal was considered at the June 1987 meeting of WP29 (the Working Party on Construction of Vehicles), and referred to its Meeting of Experts on Lighting (GRE) for action. The Groupe de Travail de Bruxelles (GTB), an active participant in the GRE, was asked by the GRE to review the request. As of January 1989, that review was not complete, but it is expected that the review of HB3 and HB4 will be completed soon. In the meantime, use of headlamps with HB3 and HB4 light sources has become legal in Germany (through exemptions granted individual vehicle lines by the Senator for the Interior of the Free Hanseatic City of Bremen). With respect to HB1, a study is underweay in GTB to determine if it is feasible to produce a sharp cut-off beam pattern. NHTSA is an active participant in the work of the GRE, and will continue to pursue the matter aggressively within that group and at WP29. Given the likelihood that HB3 and HB4 will be approved in the near term, NHTSA declines to accept the commenter's recommendation that the allowance of HB2 be tabled "until such time as a worldwide headlamp standard is established under the auspices of the Society of Automotive Engineers (SAE) and Brussels Working Group (GTB)."

After the close of the comment period Sylvania sought to persuade the agency that allowance of the HB2 would result in a substantial loss of sales. NHTSA asked Sylvania, in an effort to obtain more information, to support its allegations. Sylvania submitted a document under a claim of confidentiality, which it claimed supported its position. The agency reviewed this information and concluded that it provided little support. It showed some interest on the part of some unidentified manufacturers to use the European H-4 (although not necessarily the HB2). However, Sylvania's submission included some manufacturers who are not Sylvania customers, as well as some manufacturers who are not presently selling vehicles in the United States. Although repeatedly requested by the agency to do so, as the record indicates, Sylvania did not disaggregate its data; therefore the agency could not assess the impact on *Sylvania's* sales since it did not have the data to do so. Subsequently, NHTSA independently sought and obtained data from several vehicle manufacturers who sell their products in the United States (including the largest domestic manufacturers). That data, which is available in the Docket, indicates that the largest manufacturers have little interest in and no immediate plans to switch to the Type HB2 in the event that Standard No. 108 is amended to allow it. Although the precise quantification of Sylvania's market share and its distribution among its customers (the vehicle manufacturers) is confidential, the agency is of the opinion that, based on the information it obtained, Sylvania's volume of lighting products will not be substantially affected by allowing the HB2. Sylvania did not submit any actual data to contradict this conclusion.

This amendment becomes effective in 30 days. Since the amendment does not impose any new requirements but instead relieves a restriction, the agency finds for good cause shown that an effective date earlier than 180 days is in the public interest.

In consideration of the foregoing, 49 CFR Part 571 and Sec. 571.108 Motor Vehicle Safety Standards No. 108, *Lamps, Reflective Devices, and Associated Equipment*, is amended as follows:

A new paragraph S5.1.1.29 is added to read:

S5.1.1.29 Each replaceable bulb headlamp that is designed to meet the photometric requirements of SAE Recommended Practice J584, *Motorcycle Headlamps*, April 1964, and that is equipped with a light source other than a standardized replaceable light source, shall have the word "motorcycle" permanently marked on the lens in characters not less than 0.114 inch (3 mm.) in height.

Paragraph (d) of section S7.5 is revised to read: "For a headlamp equipped with one or two Type HB1 light sources, or one or two Type HB2 light sources, the following requirements apply:"

Subparagraphs (2)(i)(A) and (B) of paragraph (d) of section S7.5 are deleted, and new subparagraphs (2)(i)(A), (2)(i)(A)(*1*), (*2*), and (B) are added to read:

"(2)(i)(A) By the outboard light source (or upper one if arranged vertically) designed to conform to:

(*1*) the lower beam requirements of Table 1 of SAE Standard J579 DEC84, if the light sources are Type HB1; or

(*2*) the lower beam requirements of Figure 17, if the light sources are Type HB2; or

(B) By both light sources, designed to conform to the lower beam requirements specified above for their Type.

Subparagraphs (2)(ii)(A) and (B) of paragraph (d) are deleted, and new subparagraphs (2)(ii)(A), (2)(ii)(A)(*1*), (*2*) and (B) are added to read:

"(2)(ii)(A) By the inboard light source (or the lower one if arranged vertically) designed to conform to:

(*1*) the upper beam requirements of Table 1 of SAE Standard J579 DEC84, if the light sources are Type HB1; or

(2) the upper beam requirements of Figure 17, if the light sources are Type HB2; or

(B) By both light sources, designed to conform to the upper beam photometrics specified above for their type."

Paragraphs (d)(3)(i) and (d)(3)(ii) of section S7.5 are revised to read:

"(d)(i) The lower beam shall be provided by the outboard lamp (or the upper one if arranged vertically), designed to conform to:

(A) the lower beam requirements of Table 1 of SAE Standard J579 DEC84, if the light sources are Type HB1; or

(B) the lower beam requirements of Figure 15, if the light sources are Type HB2; and
the lens of each such headlamp shall be marked with the letter 'L'.

(d)(ii) The upper beam shall be provided by the inboard lamp) or the lower one if arranged vertically), designed to conform to:

(A) the upper beam requirements of Table 1 of SAE Standard J579 DEC84, if the light sources are Type HB1; or

(B) the upper beam requirements of Figure 15, if the light sources are Type HB2; and
the lens of each such headlamp shall be marked with the letter 'U'."

In paragraph (e) of S7.5, the words "or Type HB2 and any Type" are added between the words "HB1 and HB4" and "light sources."

In paragraph (e)(2) of S7.5, the parenthetical phrase is revised to read: "(Type HB1 with Types HB3 or HB4, Type HB2 and any Type, and Types HB3 and HB4)".

Subparagraph (3) of paragraph (e) of section S7.5 is revised to read: "The lower and upper beams of a headlamp system consisting of four lamps, using Type HB1 and Types HB3 or HB4, Type HB2 and any Type, and Types HB3 and HB4 light sources, each containing only a single light source, shall be provided only as follows:"

Paragraph (g) of section S7.5 is revised to read:

"(g) The lens of each replaceable bulb headlamp using Type HB2, Type HB3, or Type HB4 light sources, or Type HB1 light sources in conjunction with any other Type of light source within a headlamp system of a motor vehicle, shall permanently display the Type designation(s) for that light source on the lens in front of each light source."

In section S7.6, paragraphs (b), (c), (d), (e), (f), (g), (h), and (i), are redesignated respectively (c), (d), (e), (f), (g), (h), (i), and (j), and a new paragraph (b) is added to read:

"(b) A type HB2 light source shall be designed to conform with the dimensions specified in Figure 23. Its maximum power on the lower beam shall be 66 watts, and on the upper beam, 75 watts. Its luminous flux in lumens shall be 1000 plus or minus 10% on the lower beam, and 1650 plus or minus 10% on the upper beam."

In paragraphs S8.6, and S8.6.2 the word "HB1" is deleted and the words "Types HB1 or HB2" is substituted.

Figure 23 is added, and Figure 8 is revised as follows:

Issued on: JUN 22 1989

Jeffery R. Miller
Acting Administrator

54 FR 27362
June 29, 1989

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment (Docket No. 85-15; Notice 9)

ACTION: Technical amendments; final rule

SUMMARY: This notice contains technical amendments of the final rule published on May 9, 1989, which revised requirements for headlamps. Section S7.4 is reparagraphed for clarity on the basis of early public reaction. A reference in paragraph (f) of section S7.5 to other paragraphs is corrected. Relevant revisions of equipment and location requirement paragraphs, and the Tables in Motor Vehicle Safety Standard No. 108 were not made, and the technical amendments of this notice complete the revisions of that standard. The notice also corrects typographical errors appearing in the final rule.

EFFECTIVE DATE: The amendments are effective on July 19, 1989.

SUPPLEMENTARY INFORMATION: Federal Motor Vehicle Safety Standard No. 108 *Lamps, Reflective Devices, and Associated Equipment* was republished in its entirety on May 9, 1989, and amended to incorporate revised requirements for headlamps (54 FR 20066). One of these amendments was the adoption of Section S7.4. Early public reaction indicates that readers find the paragraphing confusing. To clarify the rule, the agency is deleting a redundancy created by paragraphs (a)(1) through (a)(5) of that section, and redesignating the succeeding paragraphs of S7.4.

Additionally, paragraph (f) of Section S7.5 references "paragraphs (e) and (f)" when the correct reference is to "paragraphs (d) and (e)", and the notice corrects this error.

Because all headlighting performance requirements are now specified in new section S7 (other than for motorcycles), the continued reference to them in the "required equipment" Tables I and III is unnecessary, and NHTSA is amending the Tables to omit them. A corresponding corrective amendment is made to paragraph S5.1.1. Certain locational requirements also now appear in section S7, and their continued presence in "location" Tables II and IV are unnecessary. They are deleted. A corresponding corrective amendment is made to paragraph S5.3.1. The final rule contained several typographical errors, some attributable to NHTSA, others to the Federal Register. They are corrected.

Because the amendments are technical in nature and have no substantive impact, it is hereby found that notice and public comment thereon are unnecessary. Further, because the amendments are technical in nature, it is hereby found for good cause shown that an effective date earlier than 180 days after issuance of the rule is in the public interest, and the amendments are effective upon publication in the Federal Register.

In consideration of the foregoing Part 571 is amended as follows:

Paragraph S5.1.1 is amended by adding the words "and S7," after the words "Tables I and III,". The word "of" appearing between "Standards" and "Recommended" is corrected to read "or".

In paragraph S5.1.1.7 in the sentence beginning "If multiple compartment lamps" the word "effected" is corrected to read "effective".

Paragraph S5.3.1 is amended by adding the words "and S7," after "S5.3.1", and by revising the phrase "Table I or III and in location" to read "Table I and Table III, as applicable, and S7, and in the location".

The paragraph designated "S5.3.1" that begins "Except as provided in S5.3.1.1.1" is redesignated "S5.3.1.1".

In paragraph S5.7.1 the word "comform" is corrected to read "conform".

In paragraph S7.3.5, the word "heardware" is corrected to read "hardware".

In section (c)(2) of paragraph S7.3.8, the figure "20 in/lbs" is corrected to read "20 in.-lbs."

In section (c) of paragraph S7.3.9, in the first sentence the word "and" appearing between "both" and "upper" is corrected to read "an".

In section (1)(ii) of paragraph S7.4, the word "deterioriation" is corrected to read "deterioration".

Section S7.4 is revised as follows: subparagraphs (1) through (5) of paragraph (a) are deleted; paragraph (b) and subparagraphs (b)(1), (b)(2), and (b)(3) are redesignated respectively subparagraph (a)(1), (a)(1)(i), (a)(1)(ii), and (a)(1)(iii); paragraph (c) and subparagraphs (c)(1) and (c)(2) are redesignated respectively subparagraph (a)(2), (a)(2)(i) and (a)(2)(ii); paragraph (d) is redesignated subparagraph (a)(3); and paragraphs (e), (f), (g), (h), (i), (j), (k), and (l) are redesignated respectively paragraphs (b), (c), (d), (e), (f), (g), (h), and (i).

In paragraph (f) of Section S7.5, the phrase "paragraphs (e) and (f)" is revised to read "paragraphs (d) and (e)."

In paragraph (f) of Section S7.6, (as redesignated in the amendments published on June 29, 1989 (54 FR 27362, at 27368)), the word "Fugures" in the penultimate sentence is corrected to read "Figures".

In paragraph (a) of Section S7.7.5.1, the word "downwad" is corrected to read "downward".

In Section S7.7.5.2, the following corrections are made:

(a) Paragraph "(a)(l)(vi)" appearing after (a)(1)(iv) is redesignated "(a)(1)(v)",

(b) In paragraph (a)(2)(iv) the word "horizonal" is corrected to read "horizontal",

(c) In paragraph (b), the words "set a 'O'" appearing in the penultimate sentence are corrected to read "set at '0'", and

(d) In paragraph (c)(3)(iv) the word "small" appearing in the last sentence is corrected to read "shall".

In paragraph (b) of Section S8.4, the word "hours" appearing at the end of the third sentence is corrected to read "hour".

In Section S8.7, in the penultimate sentence the phrase "73 +/− 7 − 0 degrees F (20 +/−4 − 0 degrees C)" is corrected to read "73 + 7 − 0 degrees F (23 + 4 − 0 degrees C)".

In the Title of Table I the words "OTHER THAN HEADLAMPS" are added after the word "EQUIPMENT"; in Table I the item "Headlamps" under the first column, the two paragraphs associated with headlamps under the second column, the word "None" associated with headlamps under the third column, and the two paragraphs of SAE references associated with headlamps under the fourth column, are all deleted.

In Table III, the two paragraphs associated with headlamps under the second column are deleted, and the words "See S7" substituted; the two paragraphs of SAE references under the fifth column associated with headlamp paragraphs of the second column are deleted.

The second columns of Table II and Table IV are amended by deleting the second sentence of the paragraph associated with headlamps (which begins "If a single. . . ."), and by adding a sentence to read "See also S7."

Issued on: July 5, 1989

Jeffrey R. Miller
Acting Administrator

54 F.R. 30223
July 19, 1989

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment
(Docket No. 85-15; Notice 10)
RIN 2127-AC53

ACTION: Interim final rule.

SUMMARY: This interim final rule suspends the effectiveness of the downward torque deflection requirements for external mechanical aiming of replaceable bulb headlamps (paragraph S7.7.5.1(a)) and establishes a new effective date. It is occasioned by a July 12, 1989 petition from General Motors which argued that NHTSA, in setting the original effective date of June 8, 1989 for these and other amendments to Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, had erroneously concluded that the only effect of the amendments was to relieve restrictions. The petitioner informed the agency that the June effective date for the downward torque deflection requirements for replaceable bulb headlamps posed compliance difficulties for a model line beginning production July 27, 1989. In recognition that the amendments did add a new requirement for manufacturers of systems incorporating replaceable bulb headlamps, NHTSA grants the petition, and adopts a new effective date of December 1, 1989 for the downward torque deflection requirements.

This notice is published as an interim final rule without prior notice and the opportunity for comment. However, NHTSA requests comments on this rule. Following the close of the comment period, NHTSA will publish a notice responding to the comments, and, if appropriate, NHTSA will further amend the provisions of this rule.

DATES: The rule is effective August 1, 1989. Comments on this interim rule are due not later than August 31, 1989.

SUPPLEMENTARY INFORMATION: Following consideration of comments received regarding a notice of proposed rulemaking published on December 29, 1987 (52 FR 49038), NHTSA published amendments to Federal Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment,* on May 9, 1989 (54 FR 20066). With the exception of two requirements for equipment marking, the amendments became effective 30 days after their publication in the *Federal Register.*

With respect to the May 1989 amendments, the Managing Director of NHTSA announced that "Because of the need to relieve design restrictions and encourage innovation", good cause had been shown for an effective date earlier than 180 days after issuance of the rule, and that the effective date would be 30 days after publication. The finding of good cause was made pursuant to section 103(e) of the National Traffic and Motor Vehicle Safety Act (15 U.S.C. 1392(e)), which provides that amendments to the Federal safety standards shall become effective not "sooner than one hundred and eighty days from the date" the amendment is issued, "unless the [Administrator] finds, for good cause show, that an earlier or later effective date is in the public interest, and publishes his reason for such finding." Excepted from the effective date of 30 days after publication were two new "mandatory" equipment marking provisions. An effective date of December 1, 1989, was specified for both of those provisions.

General Motors (GM) has submitted a petition noting that paragraph S7.7.5.1(a) does not relieve design restrictions or encourage innovation for replaceable bulb headlamps. Instead, its downward torque deflection test imposes a new requirement for systems of replaceable bulb headlamps (though such a test has been applicable for some time to sealed beam headlamps). GM further argued that imposition of the requirement without sufficient lead time for manufacturers to design, validate, and adopt product changes is not in the public interest. It asked that the effective date of December 1, 1989, be extended to the downward torque deflection requirements of paragraph S7.7.5.1(a) applicable to replaceable bulb headlamps, consistent with the requirements of section 103(e) of the Act.

The December 1987 proposal involved both a reparagraphing of existing requirements of Standard No. 108, and amendments intended to simplify the standard by relieving design restrictions. It also sought regulatory symmetry by extending some requirements applicable to sealed beam headlamps, to those with replaceable bulbs. Proposals of this nature, of course, would impose new requirements on manufacturers of replaceable bulb headlamps. In reviewing comments on the December 1, 1987 notice, however, NHTSA found no indication from any commenter that an effective date other than the proposed one of 30 days after publication of the final rule would be required for compliance with the downward torque deflection requirements. Accordingly, the agency adopted the effective date as proposed, with the two exceptions previously noted.

GM is technically correct that the agency's previous finding of relief of a design restriction was erroneous with respect to the downward torque deflection requirement. NHTSA grants its petition, and is issuing this interim final rule amending paragraph S7.7.5.1(a) immediately to specify that it becomes effective on December 1, 1989 with respect to headlighting systems designed to conform to paragraph S7.5 (replaceable bulb headlamps).

This notice is published as an interim final rule, without prior notice and opportunity to comment. NHTSA believes that there is good cause for its finding that notice and comment is impracticable, unnecessary, and contrary to the public interest in this instance within the meaning of 5 U.S.C. 553(b)(3)(B). This conclusion is based upon the facts that the requirements to which it is directed have been in effect since June 8, 1989, that NHTSA was unaware of GM's compliance difficulties before receipt of the July 12, 1989 petition, that GM cannot achieve compliance with respect to a model line beginning production on July 27, 1989, and that an immediate amendment is therefore required to afford relief from the prematurely imposed requirements. This means that good cause is found for an immediate effective date within the meaning of 5 U.S.C. 553(d)(1), with the relief of a restriction.

As an interim final rule, this regulation is fully in effect upon its publication in the *Federal Register.* No further regulatory action by NHTSA is essential to the effectiveness of this rule.

However, in order to benefit from comments which interested persons and the public may make, the agency requests that comments be submitted to the docket for this notice. Commenters are asked to address the question of whether the duration of the suspension of the effectiveness of the downward torque deflection requirements should be shorter or longer than December 1, 1989. All comments submitted in response to this notice will be considered by the agency. Following the close of the comment period, NHTSA will publish a notice responding to the comments, and, if appropriate, NHTSA will amend the provisions of this rule.

This notice provides a comment period of 30 days instead of the usual 60 days to facilitate the efforts of the agency to take final action as quickly as possible regarding the length of the suspension.

The publication of this interim final rule affects none of the impacts of the final rule as discussed in the May 9, 1989 notice adopting amendments to Standard No. 108, or the Federalism assessment.

Interested persons are invited to submit comments on this interim final rule. It is requested, but not required, that 10 copies be submitted. All comments must not exceed 15 pages in length (49 CFR 553.21). Necessary attachments may be appended to these submissions without regard to the 15-page limit. This limitation is intended to encourage commenters to detail their preliminary arguments in a concise fashion. All comments received before the close of business on the comment closing date listed above will be considered and will be available in the docket for examination both before and after that date. To the extent possible, comments filed after the closing date will also be considered. Following the close of the comment period, NHTSA will publish a notice responding to comments and, if appropriate, will amend the provisions of this rule. Comments received too late for consideration will be considered as suggestions for future rulemaking action. The agency will continue to file relevant information as it becomes available. It is recommended that interested persons continue to examine the docket for new material. Those persons desiring to be notified upon receipt of their comments by the docket should enclose a stamped self-addressed postcard in the envelope with their comments. Upon receiving the comments, the docket supervisor will return the postcard by mail.

List of Subjects in 49 CFR Part 571

Imports, motor vehicle safety, motor vehicles.

In consideration of the foregoing, 49 CFR 571.108 Motor Vehicle Safety Standard No. 108 *Lamps, Reflective Devices, and Associated Equipment* is amended as follows:

Paragraph S7.7.5.1(a) is revised to read as follows:

* * * * *

(a) Each headlamp system, other than a headlamp system designed to conform to paragraph S7.5, that is designed to use such external aiming devices shall not deviate more than 0.30 degree when a downward torque of 20 lb.-in. (2.25 N-m) is applied to the headlamp in its normal operating position, through the lamp's mechanical axis at the plane of the forwardmost aiming pad. Each headlamp system that is designed to conform to paragraph S7.5 and that is designed to use such external aiming devices, and which is manufactured on or after December 1, 1989, shall comply with this paragraph.

* * * * *

Issued on July 27, 1989.

Jeffrey R. Miller
Acting Administrator,
National Highway Traffic Safety Administration.

54 F.R. 31687
August 1, 1989

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment
(Docket No. 81-11; Notice 28)

ACTION: Final rule.

SUMMARY: This final rule delays the effective date of the lens making requirements for motorcycle headlamps equipped with a light source other than the HB Types specified in Motor Vehicle Safety Standard No. 108 (paragraph S5.1.1.29) and establishes a new effective date. It responds to a July 13, 1989, petition from BMW of North America, Inc., for reconsideration of a June 1989 final rule. In its petition, BMW stated that it could not comply with the requirement with only a month's leadtime. Leadtime of 30 days was provided, based on the rationale that the June final rule would relieve restrictions.

In recognition that the amendments did add a new requirement for manufacturers of systems incorporating replaceable bulb headlamps, NHTSA grants the petition, and adopts a new effective date of January 1, 1990 for the lens marking requirement.

DATES: The amendment made by this notice to Standard No. 108 is effective August 2, 1989.

SUPPLEMENTARY INFORMATION: NHTSA published a notice amending Federal Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment,* on June 29, 1989 (54 FR 27362), the primary purpose of which was to allow manufacturers of motor vehicles to use a new type of standardized replaceable light source in headlamps, as an alternative to existing light sources. The effective date set by the notice is July 31, 1989.

With respect to these amendments, the agency announced that "Since the amendment does not impose any new requirements but instead relieves a restriction, the agency finds for good cause shown that an effective date earlier than 180 days is in the public interest. This finding was made pursuant to section 103(e) of the National Traffic and Motor Vehicle Safety Act (15 U.S.C. 1392(e)), which provides that the effective date of an amendment to a Federal motor vehicle safety standard "shall not be sooner than one hundred and eighty days or later than one year from the date the order is issued, unless the Secretary finds, for good cause shown, that an earlier or later effective date is in the public interest, and publishes his reasons for such finding."

The June amendment allows motor vehicle manufacturers to use a new standardized replaceable light source in headlamps, known as HB2, as an alternative to Types HB1, HB3, and HB4. Type HB2 is a modification of a European light source, known as H-4. Because their headlamps are not required to be mechnically aimable, motorcycles may use the H-4 bulb, and have done so for years. However, under newly adopted paragraph S5.1.29, the lenses of motorcycle headlamps equipped with a replaceable bulb other than a standardized replaceable light source (i.e., Types HB1, HB2, HB3, or HB4) are required to be marked "motorcycle," to prevent their inadvertent use on other types of motor vehicles. This requirement will apply to motorcycle headlamps equipped with H-4 bulbs.

BMW of North America, Inc., submitted a petition for reconsideration stating that an effective date of July 31, 1989, for paragraph S5.1.1.29 affords insufficient leadtime for compliance. It argued that such a short lead time renders compliance impracticable and unreasonable. The petitioner stated that an effective date of September 1, 1990, would afford "a normal leadtime for such hardware changes," which is reasonable "because the requirement is not needed immediately to solve a safety problem."

The agency has carefully considered BMW's petition. It has concluded that while overall the amendments of June 29 do relieve a restriction, the requirements of paragraph S5.1.1.29 impose a new obligation upon manufacturers. It appears that the agency made an overly inclusive finding of good cause for an effective date earlier than 180 days after issuance of the final rule. For this reason, and because of BMW's compliance difficulties, NHTSA grants BMW's petition. However, the agency has not followed BMW's preference for an effective date of

September 1, 1990. That date is 14 months after issuance of the final rule and would itself require a finding that good cause has been shown for delaying the date more than a year beyond issuance. The agency does not agree with BMW's statement that "the requirement is not needed immediately to solve a safety problem" because headlamps using H-4 bulbs are interchangeable with those installed on four-wheeled motor vehicles, but do not meet all specifications set forth for multiple headlamp vehicles. Therefore, NHTSA is establishing a new effective date that slightly exceeds the specified 180-day minimum. It is issuing this final rule amending paragraph S5.1.1.29 immediately to specify that it becomes effective on January 1, 1990.

The change in the effective date made by this notice does not affect any of the conclusions in the June 29, 1989, final rule regarding the impacts of that final rule. For the same reasons stated in that June 29 notice, this final rule is not major within the meaning of Executive Order 12291, nor significant within the meaning of the Department's regulatory policies and procedures. I certify that it will not significantly affect a substantial number of small entities. Finally, after reviewing this final rule under Executive Order 12612, the agency has determined that it will not have sufficient federalism implications to warrant preparation of a Federalism Assessment.

In consideration of the foregoing, 49 CFR 571.108 Motor Vehicle Safety Standard No. 108 *Lamps, Reflective Devices, and Associated Equipment* is amended as follows:

Paragraph S5.1.1.29 is revised to read as follows:

S51.1.29 Each replaceable bulb headlamp that is designed to meet the photometric requirements of SAE Recommended Practice J584, *Motorcycle Headlamps,* April 1964, that is equipped with a light source other than a standardized replaceable light source, and that is manufactured on or after January 1, 1990, shall have the word "motorcycle" permanently marked on the lens in characters not less than 0.114 inch (3 mm) in height.

Issued on July 28, 1989

Jeffery R. Miller
Acting Administrator

54 FR 31840
August 2, 1989

PREAMBLE TO AN AMENDMENT TO FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment (Docket No. 85-15; Notice 11) RIN 2127-AC53

ACTION: Final rule

SUMMARY: This notice further delays the effectiveness of the downward torque deflection requirements for external mechanical aiming of replaceable bulb headlamps (paragraph S7.7.5.1(a)), from December 1, 1989, to September 1, 1990. It is occasioned by comments in response to a request published on August 1, 1989.

EFFECTIVE DATE: November 30, 1989

SUPPLEMENTARY INFORMATION: NHTSA published amendments to Federal Motor Vehicle Safety Standard No. 108, *Lamps, Reflective Devices, and Associated Equipment*, on May 9, 1989 (54 FR 20066). With the exception of two requirements for equipment marking, the amendments became effective 30 days after their publication in the *Federal Register*.

With respect to the May 1989 amendments, the Managing Director of NHTSA announced that "Because of the need to relieve design restrictions and encourage innovation", good cause had been shown for an effective date earlier than 180 days after issuance of the rule, and that the effective date would be 30 days after publication. General Motors (GM) submitted a petition for reconsideration noting that paragraph S7.7.5.1(a) did not relieve design restrictions or encourage innovation for replaceable bulb headlamps. Instead, its downward torque deflection test imposed a new requirement for systems of replaceable bulb headlamps (though such a test has been applicable for some time to sealed beam headlamps). GM further argued that imposition of the requirement without sufficient lead time for manufacturers to design, validate, and adopt product changes is not in the public interest. It asked that an effective date of December 1, 1989, be established for the downward torque deflection requirements of paragraph S7.7.5.1(a) applicable to replaceable bulb headlamps. NHTSA granted its petition, and published an interim final rule amending paragraph S7.7.5.1(a) to specify an effective date of December 1, 1989 with respect to headlighting systems designed to conform to paragraph S7.5 (replaceable bulb headlamps) (54 FR 31687).

The notice of the interim final rule also asked for comments on whether the duration of the suspension of the effectiveness should be longer or shorter than December 1, 1989. Six comments were received in response to this request, from General Motors Corporation (GM), Volkswagen of America (VW), Chrysler Motors, Robert Bosch, GMBH, Koito Manufacturing Co., Ltd., and Motor Vehicle Manufacturers Association (MVMA).

These comments addressed not only the effective date but also the requirement itself. Chrysler believes that the requirement is premature until an appropriate test procedure has been developed, and incorporated into the standard. Koito requested that test procedures, especially regarding deflectometers, should be clarified to ensure repeatability of test results between differing laboratories. MVMA submitted a similar comment. The agency concurs in these comments. This issue will be addressed in detail in a forthcoming notice responding to petitions for reconsideration of the May 1989 amendments. However, the agency does not concur with comments that the effective date should be suspended until the procedures have been implemented. Instead, it has decided to further postpone the effective date until a time subsequent to the amendments that will be made in response to the petitions for reconsideration, and in accordance with the comments received in response to the interim final rule.

The effective date of December 1, 1989, was supported by GM, who had requested it, and MVMA. As noted above, Chrysler viewed any effective date as premature until acceptable test procedures are established. Bosch opposed it on the ground that not all its headlighting systems complied with the requirement, and insufficient time remained to achieve compliance. It suggested making the requirement applicable "only to new designs which come into series production after December 1, 1989." VW asked that the effectiveness be deferred until September 1, 1990, to allow engineering changes necessary to conformance of certain Audi models that do not comply with S7.7.5.1(a), and could not comply by December 1, 1989. It supports the September date as consistent with model year timing considerations. Koito recommended that the requirement apply only to "new vehicle models and that those should be limited for new vehicle models to be introduced on or after 1991." In response to these comments, the agency is further deferring the effective date of the requirement to September 1, 1990.

In consideration of the foregoing, 49 CFR 571.108 Motor Vehicle Safety Standard No. 108 *Lamps, Reflective Devices, and Associated Equipment* is amended as follows: In the last sentence of section S7.7.5.1(a), the date "December 1, 1989" is revised to read "September 1, 1990".

Issued on November 27, 1989.

Jeffrey R. Miller
Acting Administrator

54 F.R. 49296
November 30, 1989

FEDERAL MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment (Docket No. 81-11; Notice 29)

ACTION: Final rule; response to petitions for reconsideration.

SUMMARY: This notice responds to petitions for reconsideration of the final rule published on June 29, 1989, permitting an additional standardized replaceable light source known as Type HB2.

EFFECTIVE DATE: January 1, 1990. The lens marking requirements of S5.1.1.29 are further deferred to September 1, 1990.

SUPPLEMENTARY INFORMATION: On June 29, 1989, NHTSA amended Federal Motor Vehicle Safety Standard No. 108 *Lamps, Reflective Devices, and Associated Equipment* to adopt an additional type of a standardized replaceable light source to be used in replaceable bulb headlamps on motor vehicles (Notice 27, 54 FR 27362). Thereafter, on August 2, 1989, pursuant to a petition for reconsideration by BMW of North America, Inc., NHTSA published a notice delaying the effective date of the lens marking requirements to January 1, 1990, for motorcycle headlamps that had been specified in the June notice (Notice 28, 54 FR 31840).

Petitions for reconsideration of various aspects of the final rule were also filed by Hella, K.G. ("Hella"), American Honda Motor Co., Inc. ("Honda"), GTE Sylvania Miniature Lighting ("Sylvania"), Motorcycle Industry Council ("MIC"), and Koito Manufacturing Co., Ltd. ("Koito").

Discussion of Petitions

Issue of Marking of Motorcycle Headlamps

As noted above, on August 2, 1989, NHTSA amended section S5.1.1.29 to defer the effective date for the marking of motorcycle lenses to January 1, 1990. This section requires the word "motorcycle" to be marked on the headlamp lens if the light source is other than one of Standard No. 108's specified HB Types (*e.g.*, an H-4). In addition to BMW, comments were received from Hella, Honda, MIC, and Koito. Hella requested an extension of the effective date, citing tooling difficulties, as did Koito, which specifically requested a year's grace. In the alternative, Hella requested permission to mark according to SAE J759, and Koito, to mark only those motorcycle headlamps which are of the same size as sealed beam headlamps Types A through D. Honda and MIC also requested a delayed effective date, to the beginning of the 1991 model year, arguing that this was the most efficient way for the industry to proceed. Both also asked for a clarification that the requirement did not extend to the marking of replacement lenses intended for use on headlamps on pre-1991 model year motorcycles.

The agency wishes to clarify that the marking requirement applies only to lenses manufactured to replace those on headlamps whose lenses were marked in accordance with S5.1.1.29. The requirement will not apply retroactively to any other motorcycle headlamp lens. Although the primary intent of the marking requirement is to minimize the possibility that a motorcycle headlamp could be used on a passenger car should it contain an H-4 light source, NHTSA notes that no "motorcycle" lens marking would be required were the manufacturer to install the corresponding Type HB2 light source that meets the automotive photometrics of Figure 17 of Standard No. 108.

Koito's petition that would restrict marking only to motorcycle headlamps that are physically interchangeable with sealed beam headlamps of specified sizes might have been more appropriate before the agency amended Standard No. 108 to specify the integral beam headlamp system. Replaceable bulb and integral beam headlamps that do not have standardized dimensional specifications will be produced. Thus, it is important that motorcycle headlamps that are not equipped with HB Type light sources be distinguishable from these headlamps. Retaining marking requirements unchanged from the final rule will help achieve this goal. Therefore, Koito's petition is denied.

Finally, the agency has considered the arguments for a further extension of the effective date of the lens marking requirement. In view of the necessity to use present stock, and of the industry practice in orderly changes at the beginning of model years, the agency is granting the petitions for a deferred effective date, until the beginning of the next model year, and is amending S5.1.1.29 to specify September 1, 1990 as the date on which the lens marking requirement becomes effective.

Issue of Bulb Ratings

Koito commented that the bulb wattage and luminous flux values differ from the H-4 bulb, that they are inappropriate, and that the agency provided no explanation for this. The agency agrees with this comment. The values established related to the test voltage of 13.2V initially proposed for HB2, rather than the 12.8V which was the basis of the second proposal. The agency is correcting S7.6(b) to specify that the maximum power on the HB2 on lower beam shall be 65 watts and 72 watts on the upper beam. The luminous flux of HB2 shall be 910 plus or minus 10% on the lower beam, and 1500 plus or minus 10% on the upper beam.

Issue of Safety of Bulb Substitution

Sylvania petitioned that the rule be deferred, pending a fuller analysis of safety issues involving "substitution for the HB2 of high-wattage H4 motorcycle and off-road vehicle headlamp bulbs not sanctioned for highway use." The crux of petitioner's argument is that the agency originally proposed to differentiate the base of the HB2 from that of the H-4, so as to reduce the risk of illegal substitution of the H-4 with its high glare potential. It argues that the abandonment of that proposal merits reconsideration in the public interest, and, in essence, that the agency return to its former position.

In response to this petition, Volkswagen of America, though not a petitioner for reconsideration, filed a rebuttal which stated that the HB2 light source uses a base similar to the European P43t base, while the high wattage or rally bulb that is similar in design to the H-4 that will be supplied by major manufacturers of the H-4 to the US market is designed with the PU43t base. Because of a projection in the PU43t base, it cannot be installed in lamps designed to use bulbs with the P43t base. Two major suppliers of the H-4 to the American market had previously confirmed to NHTSA that, notwithstanding the lack of a requirement for bulb differentiation, they will supply high wattage or rally H-4 type bulbs with bases that are designed not to fit headlamps that accept the HB2. The agency believes that this undertaking by bulb manufacturers is sufficient to address the concern of Sylvania, and denies its petition.

In consideration of the foregoing, 49 CFR 571.108 Motor Vehicle Safety Standard No. 108 *Lamps, Reflective Devices, and Associated Equipment,* is amended as follows:

In section S5.1.1.29, the date "January 1, 1990" is revised to read "September 1, 1990".

In section S7.6(b), the numbers "66", "75", "1000", and "1650" are removed and the numbers "65", "72", "910", and "1500", respectively, are inserted in their place.

In section S7.6(f), the phrase "Type HB1 and HB4" is revised to read "Types HB1, HB2, and HB4".

Issued on December 20, 1989.

Jeffrey R. Miller
Deputy Administrator

54 F.R. 53069
December 27, 1989

MOTOR VEHICLE SAFETY STANDARD NO. 108

Lamps, Reflective Devices, and Associated Equipment—Passenger Cars, Multipurpose Passenger Vehicles, Trucks, Buses, Trailers, and Motorcycles

(Docket No. 69-18)

S1. Scope. This standard specifies requirements for original and replacement lamps, reflective devices, and associated equipment.

S2 Purpose. The purpose of this standard is to reduce traffic accidents and deaths and injuries resulting from traffic accidents, by providing adequate illumination of the roadway, and by enhancing the conspicuity of motor vehicles on the public roads so that their presence is perceived and their signals understood, both in daylight and in darkness or other conditions of reduced visibility.

S3. Application. This standard applies to passenger cars, multipurpose passenger vehicles, trucks, buses, trailers (except pole trailers and trailer converter dollies), and motorcycles, and to lamps, reflective devices, and associated equipment for replacement of like equipment on vehicles to which this standard applies.

S4. Definitions. "Aiming Reference Plane" means a plane which is perpendicular to the longitudinal axis of the vehicle and tangent to the forwardmost aiming pad on the headlamp.

"Flash" means a cycle of activation and deactivation of a lamp by automatic means, continuing until stopped either automatically or manually.

"Headlamp test fixture" means a device designed to support a headlamp or headlamp assembly in the test position specified in the laboratory tests and whose mounting hardware and components are those necessary to operate the headlamp as installed in a motor vehicle.

"Integral Beam Headlamp" means a headlamp comprising an integral and indivisible optical assembly including lens, reflector, and light source, that is neither a standardized sealed beam headlamp designed to conform to paragraph S7.3 nor a replaceable bulb headlamp designed to conform to paragraph S7.5.

"Replaceable bulb headlamp" means a headlamp comprising a bonded lens and reflector assembly and one or two standardized replaceable light sources.

"Seasoning" means a process of energizing the filament of a headlamp, at design voltage, for a period of time equal to 1 percent of average rated laboratory life.

"Standardized replaceable light source" means an assembly of a capsule, base, and terminals, that meets the requirements of S7.6.

S5. Requirements.

S5.1 Required motor-vehicle lighting equipment.

S5.1.1. Except as provided in succeeding paragraphs of S5.1.1., each vehicle shall be equipped with at least the number of lamps, reflective devices, and associated equipment specified in Tables I and III [and S7], as applicable. Required equipment shall be designed to conform to the SAE Standards or Recommended Practices referenced in those tables. Table I applies to multipurpose passenger vehicles, trucks, trailers, and buses, 80 or more inches in overall width. Table III applies to passenger cars and motorcycles and to multipurpose passenger vehicles, trucks, trailers, and buses less than 80 inches in overall width. **(54 F.R. 30223—July 19, 1989. Effective: June 8, 1989)]**

S5.1.1.1. A truck tractor need not be equipped with turn-signal lamps mounted on the rear if the turn signal lamps at or near the front are so constructed (double-faced) and so located that they meet the hequirements for double-faced turn signals specified in SAE Standard J588e, *Turn Signal Lamps,* September 1970.

S5.1.1.2. A truck tractor need not be equipped with any rear side-marker devices, rear clearance lamps, and rear identification lamps.

S5.1.1.3. Intermediate side-marker devices are not required on vehicles less than 30 feet in overall length.

S5.1.1.4. Reflective material conforming to Federal Specification L-S-300, *Sheeting and*

Tape, Reflective; Non-exposed Lens, Adhesive Backing, September 7, 1965, may be used for side reflex reflectors if this material, as used on the vehicle, meets the performance standards in either Table I or Table IA of SAE Standard J594f, *Reflex Reflectors,* January 1977.

Test points (deg)		*Turn signal*	*Stop*	*Parking*	*Tail*
10U, 10D	5L, 5R	20	20	20	20
	20L, 20R	12.5	12.5	10	15
5U, 5D	10L, 10R	37.5	37.5	20	40
	V	87.5	87.5	70	90
	10L, 10R	50	50	35	40
H	5L, 5R	100	100	90	100
	V	100	100	100	100

FIGURE 1a.—Required percentages of minimum candlepower of Figure 1b.

Minimum design candlepower requirements are determined by multiplying the percentage given in this Figure by the minimum allowable candlepower values in Figure 1b. The resulting values shall be truncated after one digit to the right of the decimal point.

[S5.1.1.5 The turn-signal operating unit on each passenger car and multipurpose passenger vehicle, truck, and bus less than 80 inches in overall width shall be self-cancelling by steering wheel rotation and capable of cancellation by a manually operated control. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]**

[S5.1.1.6.] Each stop lamp manufactured to replace a stop lamp that was designed to conform to SAE Standard J586b *Stop Lamps,* June 1966, may also be designed to conform to J586b. It shall meet the photometric minimum candlepower requirements for Class A red turn-signal lamps specified in SAE Standard J575d, *Tests for Motor Vehicle Lighting Devices and Components,* August 1967. Each such lamp manufactured for use on a passenger car and on a multipurpose passenger vehicle, truck, trailer, or bus less than 80 inches in overall width shall have an effective projected luminous area not less than 3½ square inches. If multiple compartment lamps or multiple lamps are used, the effective projected luminous area of each compartment or lamp shall be not less than 3½ square inches; however, the photometric requirements may be met by a combination of compartments or lamps.

[S5.1.1.7.] Each turn signal lamp manufactured to replace a turn signal lamp that was designed to conform to SAE Standard J588d *Turn Signal Lamps,* June 1966, may also be designed to conform to J588d, [and shall meet the photometric minimum candlepower requirements for Class A turn signal lamps specified in SAE Standard J575d, *Tests for Motor Vehicle Lighting Devices and Components,* August 1967.] Each such lamp manufactured for use on a passenger car and on a multipurpose passenger vehicle, truck, trailer or bus less than 80 inches in overall width shsll have an effective projected luminous area not less than 3½ square inches. If multiple compartment lamps or multiple lamps are used, the effective projected luminous area of each compartment or lamp shall be not less than 3½ square inches; however, the photometric requirements may be met by a combination of compartments or lamps. Each such lamp manufactured for use on a multipurpose passenger vehicle, truck, trailer or bus 80 inches or more in overall width shall have an effective projected luminous area not less than 12 square inches. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)**

[S5.1.1.8.] For each motor vehicle less than 30 feet in overall length, the photometric-minimum candlepower requirements for side marker lamps specified in SAE Standard J592e, *Clearance, Side Marker, and Identification Lamps,* July 1972, may be met for all inboard test points at a distance of 15 feet from the vehicle and on a vertical plane that is perpendicular to the longitudinal axis of the vehicle and located midway between the front and rear side-marker lamps.

[S5.1.1.9. A boat trailer whose overall width is 80 inches or more need not be equipped with both front and rear clearance lamps provided an amber (to front) and red (to rear) clearance lamp is located at or near the midpoint on each side so as to indicate its extreme width. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]**

[S5.1.1.10.] Multiple license-plate lamps and backup lamps may be used to fulfill the requirements of the SAE Standards applicable to such lamps referenced in Tables I and III.

[S5.1.1.11.] A parking lamp, taillamp, stop lamp, or turn-signal lamp shall meet the minimum percentage specified in Figure 1a of the corresponding minimum allowable value specified in Figure 1b. The maximum candlepower output of each stop, turn signal, tail and parking lamp shall not exceed that prescribed in Figure 1b. The values specified in Figure 1a and Figure 1b are substituted for those specified in Table I of the following SAE Standards: J222 *Parking Lamps,* J585e *Taillamps* (maximum at H or above), J585c *Stop Lamps,* and J588e *Turn Signal Lamps,* except that motorcycle turn signal lamps need meet only one-half of the minimum photometric values specified in Figure 1b.

Lamp	*Lighted Sections* 1	2	3
Stop	80/300	95/360	110/420
Tail[1]	2/18	3.5/20	5.0/25
Parking[2]	4.0/125	......	......
Red turn signal	80/300	95/360	110/420
Yellow turn signal rear	130/750	150/900	175/1050
Yellow turn signal front	200/ -	240/ -	275/ -
Yellow turn signal front[3]	500/ -	600/ -	685/ -

FIGURE 1b.—Minimum and maximum allowable candlepower values.

[1] Maximum at H or above.

[2] The maximum candlepower value of 125 applies to all test points at H or above. The maximum allowable candlepower value below H is 250.

[3] Values apply when the optical axis (filament center) of the front-turn signal is at a spacing less than 4 inches (10 cm.) from the lighted edge of the headlamp unit providing the lower beam, or from the lighted edge of any additional lamp installed as original equipment and which supplements the lower beam.lower beam.

S5.1.1.12. A parking lamp, taillamp, stop lamp, or turn-signal lamp is not required to meet the minimum photometric value at each test point specified in this standard if the sum of the percentage of the minimum candlepower measured at the test points is not less than that specified for each group listed in Figure 1c.

Groups and test points	*Turn signal*	*Stop*	*Parking*	*Tail*
10U-5L, 5U-20L, 5D-20L, 10D-5L	65	65	60	70
5U-10L, H-10L, 5D-10L	125	125	75	120
H-5L, 5U-V, H-V, 5D-V, H-5R	475	475	420	480
5U-10R, H-10R, 5D-10R	125	125	75	120
10U-5R, 5U-20R, 5D-20R, 10D-5R	65	65	60	70

FIGURE 1c.—Sum of the percentages of grouped minimum candlepower.

S5.1.1.13. Each passenger car, and each multipurpose passenger vehicle, truck, and bus of less than 80 inches overall width, shall be equipped with a turn signal operating unit designed to complete a durability test of 100,000 cycles.

S5.1.1.14. A trailer that is less than 30 inches in overall width may be equipped with only one tail lamp, stop lamp, and rear reflex reflector, which shall be located at or near its vertical centerline.

S5.1.1.15. A trailer that is less than 6 feet in overall length, including the tongue, need not be equipped with front side marker lamps and front side reflex reflectors.

S5.1.1.16. A lamp designed to use a type of bulb that has not been assigned a mean spherical candlepower rating by its manufacturer and is not listed in SAE Standard J 573d, *Lamp Bulbs and Sealed Units,* December 1986, shall meet the applicable requirements of this standard when used with any bulb of the type specified by the lamp manufacturer, operated at the bulb's design voltage. A lamp that contains a sealed-in bulb shall meet these requirements with the bulb operated at the bulb's design voltage.

S5.1.1.17. Except for a lamp having a sealed-in bulb, a lamp shall meet the applicable requirements of this standard when tested with a bulb whose fliament is positioned within ±.010 inch of the nominal design position specified in SAE Standard J573d, *Lamp Bulbs and Sealed Units,* December 1968, or specified by the bulb manufacturer.

S5.1.1.18. A backup lamp is not required to meet the minimum photometric values at each test point specified in Table I of SAE Standard J593c, *Backup Lamps,* February 1968 if the sum of the candlepower measured at the test points within each group listed in Figure 2 is not less than the group totals specified in that figure.

[(a) Each headlamp system, other than a headlamp system designed to conform to paragraph S7.5, that is designed to use such external aiming devices shall not deviate more than 0.30 degree when a downward torque of 20lb.-in. (2.25 N-m) is applied to the headlamp in its normal operating position, through the lamp's mechanical axis at the plane of the forwardmost aiming pad. Each headlamp system that is designed to conform to paragraph S7.5 and that is designed to use such external aiming devices, and which is manufactured on or after September 1, 1990, shall comply with this paragraph. **(54 F.R. 49296. November 30, 1989. Effective: November 30, 1989)]**

S5.1.1.19. Each variable load turn signal flasher shall comply with voltage drop and durability requirements of SAE Standard J590b, *Turn Signal Flasher*, October 1965 with the maximum design load connected, and shall comply with starting time, flash rate, and percent current "on" time requirements of J590b both with the minimum and with the maximum design load connected.

S5.1.1.20. The lowest voltage drop for turn signal flasher and hazard warning signal flasher measured between the input and load terminals shall not exceed 0.8 volt.

S5.1.1.21. A motor-driven cycle whose speed attainable in 1 mile is 30 mph or less need not be equipped with turn signal lamps.

S5.1.1.22. A motor-driven cycle whose speed attainable in 1 mile is 30 mph or less may be equipped with a stop lamp whose effective projected luminous lens area is not less than 3½ square inches and whose photometric output for the groups of test points specified in Figure 1 is at least one-half of the minimum values set forth in that figure.

S5.1.1.23. Each tail lamp manufactured to replace the tail lamp designed to conform to SAE Standard J585d, *Tail Lamps*, August 1970, may also be designed to conform to J585d.

S5.1.1.24. Each turn signal lamp manufactured to replace a turn signal lamp (on a motorcycle) that was designed to conform to SAE Standard J588d, *Turn Signal Lamps*, June 1966, may also be designed to conform to J588d.

S5.1.1.25. Each turn signal lamp on a motorcycle manufactured on an after January 1, 1973, shall have an effective projected luminous area of not less than 3½ square inches.

S5.1.1.26. Note 6 of Table 1 in SAE Standard J588e, *Turn Signal Lamps*, September 1970, does not apply. A stop lamp that is not optically combined with a turn signal lamp shall remain activiated when the turn signal is flashing.

S5.1.1.27. Each passenger car manufactured on or after September 1, 1985, shall be equipped with a high-mounted stop lamp which:

(a) Shall have an effective projected luminous area not less than 4½ square inches.

(b) Shall have a signal visible to the rear through a horizontal angle from 45 degrees to the left to 45 degrees to the right of the longitudinal axis of the vehicle.

(c) Shall have the minimum photometric values in the amount and location listed in Figure 10, instead of those in Table 1 of SAE Recommended Practice J186a, *Supplemental High-Mounted Stop and Rear Turn Signal Lamps*, September 1977.

(d) Need not meet the requirements of paragraphs 3.1.6 Moisture Test, 3.1.7 Dust Test, and 3.1.8 Corrosion Test of SAE Recommended Practice J186a if it is mounted inside the vehicle.

(e) Shall provide access for convenient replacement of the bulb without the use of special tools.

S5.1.1.28. Instead of the headlamps specified by Table III, a motorcycle may be equipped with one half of any headlighting system specified in S7 which provides both a full upper beam and full lower beam, and where more than one lamp must be used, the lamps shall be mounted vertically, with the lower beam as high as practicable. When installed on a motorcycle such half system need not meet the aiming requirements specified in S7.

S5.1.1.29. Each replaceable bulb headlamp that is designed to meet the photometric requirements of SAE Recommended Practice J584, *Motorcycle Headlamp*, April 1964, and that is equipped with a light source other than a standardized replaceable light source, and that is manufactured on or after [September 1, 1990] shall have the word "motorcycle" permanently marked on the lens in characters not less than 0.114 inch (3mm.) in height. **(54 F.R. 53069—December 27, 1989. Effective: September 1, 1990)**

S5.1.2. Plastic materials used for optical parts such as lenses and reflectors shall conform to SAE *Recommended Practice* J576c, May 1970, except that:

(a) Plastic lenses used for inner lenses or those covered by another material and not exposed directly to sunlight shall meet the requirements of paragraphs 3.4 and 4.2 of SAE J576c, when covered by the outer lens or other material;

(b) After the outdoor-exposure test, the haze and loss of surface luster of plastic materials used for lamp lenses shall not be greater than 30 percent haze as measured by ASTM-1003-61, *Haze and Luminous Transmittance of Transparent Plastics*; and

(c) After the outdoor-exposure test, plastic materials used for reflex reflectors shall meet the appearance requirements of paragraph 4.2.2 of SAE J576c.

S5.1.3. No additional lamp, reflective device, or other motor vehicle equipment shall be installed that impairs the effectiveness of lighting equipment required by this standard.

S5.1.4. Each school bus shall be equipped with a system of either:

(a) Four red signal lamps designed to conform to SAE Standard J887, *School Bus Red Signal Lamps*, July 1964, and installed in accordance with that standard; or

(b) Four red signal lamps designed to conform to SAE Standard J887, *School Bus Red Signal Lamps*, July 1964, and four amber signal lamps designed to conform to that standard, except for their color, and except that their candlepower shall be at least 2½ times that specified for red signal lamps. Both red and amber lamps shall be installed in accordance with SAE Standard J887, except that:

(i) Each amber signal lamp shall be located near each red signal lamp, at the same level, but closer to the vertical centerline of the bus; and

(ii) The system shall be wired so that the amber signal lamps are activated only by manual or foot operation, and if activated, are automatically deactivated and the red signal lamps automatically activated when the bus entrance door is opened.

S5.1.5. The color in all lamps, reflective devices, and associated equipment to which this standard applies shall comply with SAE Standard J578c, *Color Specification for Electric Signal Lighting Devices*, February 1977.

S5.2. Other requirements.

S5.2.1. The words "it is recommended that," "recommendations," or "should be" appearing in any SAE Standard or Recommended Practice referenced or subreferenced in this standard shall be read as setting forth mandatory requirements, except that the aiming pads on the lens face and the black area surrounding the signal lamp, recommended in SAE Standard J887, *School Bus Red Signal Lamps*, July 1964, are not required.

S5.2.2. The words "Type 1 (5¾")," "Type 2 (5¾")," "Type 2 (7")," "Type 1A," "Type 2A," and "Type 2B" appearing in any SAE Standard or Recommended Practice referenced or subreferenced in this standard shall also be read as setting forth requirements respectively for the following types of headlamps: 1C1, 2C1, 2D1, 1A1, 2A1, and 2B1.

S4.3. Location of required equipment.

5.3.1. Except as provided in succeeding paragraphs of S5.3.1, [and S7] each lamp, reflective device, and item of associated equipment shall be securely mounted on a rigid part of the vehicle other than glazing that is not designed to be removed except for repair, in accordance with the requirements of Tables I or III [as applicable, and S7, and in the location] specified in Table II (multipurpose passenger vehicles, trucks, trailers, and buses 80 or more inches in overall width) and Table IV (all passenger cars, and motorcycles, and multipurpose passenger vehicles, trucks, trailers, and buses less than 80 inches in overall width), as applicable. **(54 F.R. 30223—July 19, 1989. Effective: July 19, 1989)**

S5.3.1.1. Except as provided in S5.3.1.1.1, each lamp and reflective device shall be located so that it meets the visibility requirements specified in any applicable SAE Standard or Recommended Practice. In addition, no part of the vehicle shall prevent a parking lamp, taillamp, stop lamp, turn-signal lamp, or backup lamp from meeting its photometric output at any applicable group of test points specified in Figures 1c and 2, or prevent any other lamp from meeting the photometric output at any test point specified in any applicable SAE Standard or Recommended Practice. However, if motor vehicle equipment (e.g., mirrors, snow plows, wrecker booms, backhoes, and winches) prevents compliance with this paragraph by any required lamp or reflective devices, an auxiliary lamp or device meeting the requirements of this paragraph shall be provided.

S5.3.1.1.1. Clearance lamps may be mounted at a location other than on the front and rear if necessary to indicate the overall width of a vehicle, or for protection from damage during normal operation of the vehicle, and at such a location they need not be visible at 45 degrees inboard.

S5.3.1.2. On a truck tractor, the red rear reflex reflectors may be mounted on the back of the cab, at a minimum height not less than 4 inches above the height of the rear tires.

S5.3.1.3. On a trailer, the amber front side reflex reflectors and amber front side-marker lamps may be located as far forward as practicable exclusive of the trailer tongue.

S5.3.1.4. When the rear identification lamps are mounted at the extreme height of a vehicle, rear clearance lamps need not meet the requirement of Table II that they be located as close as practicable to the top of the vehicle.

S5.3.1.5. The center of the lens referred to in SAE Standard J593c, *Backup Lamps*, February 1968, is the optical center.

[S5.3.1.6.] On a truck tractor, clearance lamps mounted on the cab may be located to indicate the width of the cab, rather than the overall width of the vehicle.

[S5.3.1.7.] The requirement that there be not less than 4 inches between a front turn-signal lamp and a low-beam headlamp, specified in SAE Standard J588e, *Turn Signal Lamps*, September 1970, shall not apply if the sum of the candlepower values of the turn-signal lamp measured at the test points within each group listed in Figure 1c is not less than two and one-half times the sum specified for each group for yellow turn-signal lamps.

[S5.3.1.8. Each high-mounted stop lamp shall be mounted with its center on the vertical centerline of the passenger car as the car is viewed from the rear. The lamp may be mounted at any position on the centerline, including the glazing. If the lamp is mounted inside the vehicle, means shall be provided to minimize reflections from the light of the lamp upon the rear window glazing that might be visible to the driver when viewed directly, or indirectly in the rearview mirror. If the lamp is mounted below the rear window, no portion of the lens shall be lower than 6 inches below the rear window on convertibles, or 3 inches on other passenger cars. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]**

[S5.4.] Equipment combination

[S5.4.1 Two or more lamps, reflective devices, or items of associated equipment may be combined if the requirements for each lamp, reflective device, and item of associated equipment are met, except that no clearance lamp may be combined optically with any taillamp or identification lamp, and no high-mounted stop lamp shall be combined with any other lamp or reflective device. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]**

[S5.5.] Special wiring requirements.

[S5.5.1.] Each vehicle shall have a means of switching between lower and upper headlamp beams that conforms to SAE Recommended Practice J564a, *Headlamp Beam Switching*, April 1964, or to SAE Recommended Practice J565b, *Semi-Automatic Headlamp Beam Switching Devices*, February 1969. [Except as provided in S5.5.8, the lower and upper beams shall not be energized simultaneously except momentarily for temporary signalling purposes or during switching between beams. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]**

[S5.5.2.] Each vehicle shall have a means for indicating to the driver when the upper beams of the headlamps are on that conforms to SAE Recommended Practice J564a, April 1964, except that the signal color need not be red.

[S5.5.3.] The taillamps on each vehicle shall be activated when the headlamps are activated in a steady-burning state.

[S5.5.4.] The stoplamps on each vehicle shall be activated upon application of the service brakes. The high-mounted stoplamp on each passenger car shall be activated only upon application of the service brakes.

[S5.5.5.] The vehicular-hazard warning-signal operating unit on each vehicle shall operate independently of the ignition or equivalent switch, and when activated, shall cause to flash simultaneously sufficient turn-signal lamps to meet, as a minimum, the turn-signal lamp photometric requirements of this standard.

[S5.5.6.] Each vehicle equipped with a turn-signal operating unit shall also have an illuminated pilot indicator. Failure of one or more turn-signal lamps to operate shall be indicated in accordance with SAE Standard J588e, *Turn Signal Lamps*, September 1970, except when a variable-load turn-signal flasher is used on a truck, bus, or multipurpose passenger vehicle 80 or more inches in overall width, on a truck that is capable of accommodating a slide-in camper, or on any vehicle equipped to tow trailers.

[S5.5.7.] On each passenger car, and motorcycle, and multipurpose passenger vehicle, truck, and buse of less than 80 inches overall width:

(a) When the parking lamps are activated, the taillamps, license plate lamps, and side-marker lamps shall also be activated; and

(b) When the headlamps are activated in a steady-burning state, the taillamps, parking lamps, license plate lamps and side-marker lamps shall also be activated.

[S5.5.8. On a motor vehicle equipped with a headlighting system conform to the photometric requirements of Figure 15, the lamps marked "L" or "LF" may be wired to remain permanently activated when the lamps marked "U" or "LF" are activated. On a motor equipped with an Integral Beam headlighting system meeting the photometric requirements of paragraph S7.4(a)(2), the lower beam headlamps shall be wired to remain permanently activated when the upper beam headlamps are activated. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]**

[S5.5.9. The wiring harness or connector assembly of each headlamp system shall be designed so that only those filaments necessary for meeting lower beam photometrics are energized when the beam selector switch is in the lower beam position, and that only those filaments necessary for meeting upper beam photometrics are energized when the beam selector switch is in the upper beam position. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]**

[S5.5.10.] The wiring requirements for lighting equipment in use are:

(a) Turn signal lamps, hazard warning signal lamps, and school bus warning lamps shall be wired to flash;

(b) High-mounted stop lamps, on passenger cars manufactured on or after August 1, 1984, but before September 1, 1986, may flash when the hazard warning system is activated;

(c) Headlamps and side-marker lamps may be wired to flash for signalling purposes;

(d) A motorcycle headlamp may be wired to allow either its upper beam or its lower beam, but not both, to modulate from a higher intensity to a lower intensity in accordance with Section S4.6;

(e) All other lamps shall be wired to be steady-burning.

[S5.6.] Motorcycle headlamp modulation system.

[S5.6.1.] A headlamp on a motorcycle may be wired to modulate either the upper beam or the lower beam from its maximum intensity to a lesser intensity provided that:

(a) The rate of modulation shall be 240 ± 40 cycles per minute.

(b) The headlamp shall be operated at maximum power for 50 to 70 percent of each cycle.

(c) The lowest intensity at any test point shall be not less than 17 percent of the maximum intensity measured at the same point.

(d) The modulator switch shall be wired in the power lead of the beam filament being modulated and not in the ground side of the circuit.

(e) Means shall be provided so that both the lower beam and upper beam remain operable in the event of a modulator failure.

(f) The system shall include a sensor mounted with the axis of its sensing element perpendicular to a horizontal plane. Headlamp modulation shall cease whenever the level of light emitted by a tungsten filament light operating at 3000° Kelvin is either less than 270 lux (25 footcandles) of direct light for upward pointing sensors or less than 60 lux (5.6 footcandles) of reflected light for downward pointing sensors. The light is measured by a silicon cell type light meter that is located at the sensor and pointing in the same direction as the sensor. A Kodak Gray Card (Kodak R-27) is placed at ground level to simulate the road surface in testing downward-pointing sensors.

(g) When tested in accordance with the test profile shown in Figure 9, the voltage drop across the modulator when the lamp is on at all test conditions for 12-volt systems and 6-volt systems shall not be greater than .45 volt. The modulator shall meet all the provisions of the standard after completion of the test profile shown in Figure 9.

(h) Means shall be provided so that both the lower and upper beam function at design voltage when the headlamp beam control switch is in either the lower or upper beam position when the modulator is off.

[S5.6.2. (a)] Each motorcycle headlamp modulator not intended as original equipment, or its container, shall be labelled with the maximum wattage, and the minimum wattage, appropriate for its use. Additionally, each such modulator shall comply with [S5.6.1] (a) through (g) when connected to a headlamp of the maximum rated power and a headlamp of the minimum rated power and shall provide means so that the modulated beam functions at design voltage when the modulator is off.

(b) Instructions, with a diagram, shall be provided for mounting the light sensor including location on the motorcycle, distance above the road surface, and orientation with respect to the light.

[S5.7.] Replacement equipment.

[S5.7.1.] Each lamp, reflective device, or item of associated equipment manufactured to replace any lamp, reflective device, or item of associated equipment on any vehicle to which this standard applies, shall be designed to conform with this standard.

[S5.7.2.] Unless otherwise specified in this standard, each lamp, reflective device, or item of associated equipment to which section [S5.7.1] applies may be labeled with the symbol DOT, which shall constitute a certification that it conforms to applicable Federal motor vehicle safety standards.

[S6.] Subreferenced SAE Standards and Recommended Practices.

[S6.1.] SAE Standards and Recommended Practices subreferenced by the SAE Standards and Recommended Practices included in Tables I and III and paragraphs [S5.1.4] and [S5.5.1] are those published in the 1970 edition of the SAE Handbook, except that the SAE standard referred to as "J575" is J575e, *Tests for Motor Vehicle Lighting Devices and Components,* August 1970, for stoplamps, taillamps, and turn-signal lamps designed to conform to SAE Standards J586c, J585d/J585e, and J588e, respectively, and for high-mounted stoplamps designed to conform to SAE Recommended Practice J186a. [The reference in J585e to J256 does not apply. For headlamps, unless otherwise specified in this standard, the version of SAE Standard J575 is JUN 80, and the version of SAE Standard J602 is OCT 80. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]**

[S6.2.] Requirements of SAE Standards incorporated by reference in this standard, other than J576b and J576c, do not include tests for warpage of devices with plastic lenses.

[S7. Headlighting requirements.

[S7.1. Each passenger car, multipurpose passenger vehicle, truck, and bus shall be equipped with a headlighting system designed to conform to the requirements of S7.3, S7.4, or S7.5. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]**

[S7.2. The lens of each original equipment and replacement equipment headlamp, and each beam contributor manufactured on or after December 1, 1989, shall be marked with the symbol "DOT," either horizontally or vertically, which shall constitute the certification required by 15 U.S.C. 1403. The lens of each headlamp and each beam contributor manufactured on or after December 1, 1989, shall also be marked with the manufacturer's or importer's name and/or trademark registered with the U.S. Patent Office, and each headlamp or beam contributor with its voltage, and with its part or trade number. **(54 F.R. 20006—May 9, 1989. Effective: December 1 , 1989)]**

[S7.3 Sealed beam headlighting system. A sealed beam headlighting system shall be designed to meet the requirements of one of the following subparagraphs of S7.3.2 through S7.3.9. In references to Figures in SAE J1383 APR 85 for headlamp dimensional requirements, only those dimensions marked "I" for interchangeability are applicable.

[S7.3.1 The lens of each sealed beam headlamp designed to conform to S7.3.2 through S7.3.6 shall be marked according to paragraph 5.4.3 through 5.4.5 of SAE Standard J1383 April 85 *Performance Requirements for Motor Vehicle Headlamps.*

[S7.3.2 Type A headlighting system. A Type A headlighting system consists of two type 1A1 and two Type 2A1 headlamps and associated hardware, which are designed to conform to the following requirements:

(a) SAE Standard J1383 APR 85 *Performance Requirements for Motor Vehicle Headlamps,* with the following exceptions:

(1) Paragraphs 1, 2.1.2, 2.8.2, 3, 4.1.1, 4.1.3, 4.4, 4.6, 4.8 through 4.18, 5.1.1, 5.1.3, 5.1.5, 5.1.7 through 5.1.16, 5.2.2, 5.3.5, 5.4.1, 5.4.2, and 6 through 6.4 do not apply.

(2) In paragraph 5.3.2, the words "and retaining rings" are omitted.

(3) In paragraphs 4.5.2 and 5.1.6, the words "either Table 1 or Table 2 of SAE J579 DEC 84 as appropriate" are substituted for "Table 3."

(b) SAE Standard J580 DEC 86 *Sealed Beam Headlamp Assembly* (except paragraphs 3, 4.1.1, 5.1.1.1, 5.1.2.3, and the second sentence of 5.1.6); in 5.2.1, delete the words "and retaining rings;" the correct reference is SAE J1383 Figure 6, 9, 12 and 14.

(c) After a vibration test conducted in accordance with paragraph S8.9, there shall be no evidence of loose or broken parts, other than filaments, visible without magification.

(d) The maximum wattage at 12.8 volts (design voltage): Single filament headlamp, 55 watts on the upper beam; dual filament headlamp, 43 watts on the upper beam and 65 watts on the lower beam.

[**S7.3.3 Type B Headlighting system.** A Type B headlighting system consists of two Type 2B1 headlamps and associated hardware, which are designed to conform to the following requirements:

(a) The requirements of paragraphs S7.3.2(a) through (c).

(b) The maximum wattage at 12.8 volts (design voltage): 70 watts on the upper beam and 60 watts on the lower beam.

[**S7.3.4 Type C headlighting system.** A Type C headlighting system consists of two Type 1C1 and two Type 2C1 headlamps and associated hardware, which are designed to conform to the requirements of paragraph S7.3.2(a) through (d).

[**S7.3.5 Type D headlighting system.** A Type D headlighting system consists of two Type 2D1 headlamps and associated hardware, which are designed to conform to the requirements of paragraph S7.3.2(a) through (c).

[**S7.3.6 Type E headlighting system.** A Type E headlighting system consists of two Type 2E1 headlamps and associated hardware, which are designed to conform to the requirements of paragraph S7.3.2(a) through (c).

[**S7.3.7 Type F headlighting system.** A Type F headlighting system consists of two Type UF and two Type LF headlamps and associated hardware, which are designed to conform to the following requirements:

(a) Figures 11, 12, 13, and 14 as appropriate.

(b) The photometric requirements of Figure 15 of this standard. A reaim tolerance of +/− 1/4 degree is allowed for any test point on the Type LF lamp when tested alone, but is not allowed on the Type UF lamp when tested alone. For the test point 10U-90U, measurement shall be from the normally exposed surface of the lens face.

(c) SAE Standard J1383 APR 85 *Performance Requirements for Motor Vehicle Headlamps*, Sections 2.4, 2.5, 2.6, 4.1, and 4.1.4.

(d) When tested in accordance with section (c), the mounted assembly (either Type UF or Type LF headlamps, respective mounting ring, aiming ring, and aim adjustment mechanism) shall be designed to conform to the requirements of Figure 15 for upper or lower beams respectively without reaim when any conforming Type UF or LF headlamp is tested and replaced by another conforming headlamp of the same Type.

(e) SAE J580 DEC 86 *Sealed Beam Headlamp Assembly* with the following exceptions:

(1) Section 2.2 Mounting Ring reads: "the adjustable ring upon which the sealed beam unit is mounted and which forces the sealed beam unit to seat against the aiming ring when assembled into a sealed beam assembly."

(2) The definition "2.3 Aiming Ring" reads: "The clamping ring that retains the sealed beam unit against the mounting ring, and that provides an interface between the unit's aiming/seating pads and the headlamp aimer adapter (locating plate)."

(3) Section 4.1.1 Vibration Test does not apply.

(4) Section 5.1.1.1 does not apply.

(5) Section 5.1.2.1 reads: "When the headlamp assembly is tested in the laboratory, a minimum aiming adjustment of +/− 2.5 degrees shall be provided in the horizontal plane and +/− 4 degrees in the vertical plane."

(6) Section 5.1.2.2 concludes:". . . through and angle of +/− 2.5 degrees and +/− 4 degrees respectively."

(7) Section 5.1.6 is retitled "Retaining Ring /Aiming Ring Tests," and add: "92 x 150mm. . . .0.340 in (8.6 mm).

(8) Figures 2, 3, and 4 do not apply, and the reference to them in section 4.5 is replaced by "Figure 16, Deflectometer, of Federal Motor Vehicle Safety Standard No. 108."

(f) A lens for Type F headlamp incorporating an upper beam shall be labeled "UF". A lens for a Type F headlamp incorporating a lower beam shall be labeled "LF". The face of letters, numbers, or other symbols molded on the surface of the lens shall not be raised more tha 0.020 in (0.5 mm), and shall be placed no closer to the photometric center of the lens than 2.75 in (70 mm.). The marking shall be molded in the lens and shall be not less than 1/4 in. (6.35 mm.) in size.

(g) The maximum wattage at 12.8 volts (design voltage): 70 watts on the upper beam and 60 watts on the lower beam.

(h) Type F headlamps may be mounted on common or parallel seating and aiming planes to permit simultaneous aiming of both headlamps provided that when tested with any conforming Type UF and LF headlamps according to Section S10:

(1) The assembly (consisting of the Type UF and LF headlamps, mounting rings, the aiming/seating rings, and aim adjustment mechanism), shall be designed to conform to the test point values of Figure 15.

(2) There shall be no provision for adjustment between the common or parallel aiming and seating planes of the two lamps.

(i) After a vibration test conducted in accordance with paragraph S8.9, the Type F system shall show no evidence of loose or broken parts, other than filaments, visible without magnification.

[**S7.3.8 Type G headlighting system.** A Type G headlighting system consists of two Type 1G1 headlamps and two Type 2G1 headlamps each of which is designed to conform to the following requirements:

(a) Figures 18 and 21.

(b) SAE Standard J1383 APR 85 *Performance Requirements for Motor Vehicle Headlamps* (except paragraphs 1, 2.1.2, 2.8.2, 3, 4.1.1, 4.1.3, 4.4, 4.6, 4.8 through 4.18, 5.1.1, 5.1.3, 5.1.5 through 5.1.16, 5.2.2, 5.3.5 through 6.4). In paragraph 5.3.2 the words "and retaining rings" are omitted. In paragraph 4.5.2, the words either Table 1 or Table 2 or SAE J579 DEC 84, as appropriate" are substituted for the words "Table 3."

(c) SAE Standard J580 DEC 86 *Sealed Beam Headlamp Assembly*, with the following exception:

(1) Sections 2.2, 2.3, 4.1.1, 5.1.1.1, 5.1.2.3, 5.1.6 and 5.2.1.

(2) Section 4.5 reads: "*Torque Deflection Test.* The headlamp assembly to be tested shall be mounted in the designed vehicle position and set at nominal aim (0.0). A special adapter (Figure 22) for the deflectometer (Figure 3) shall be clamped onto the headlamp assembly. A torgue of 20 in.-lbs. (2.25 N-m) shall be applied to the headlamp assembly through the deflectometer, and a reading on the thumb wheel shall be taken. The torque shall be removed and a second reading on the thumb wheel shall be taken."

(d) After a vibration test conducted in accordance with paragraph S8.9, there shall be no evidence of loose or broken parts, other than filaments, visible without magnification.

(e) The maximum wattage at 12.8 volts (design voltage) for the 1G1 and 2G1 upper beam is 55 watts and 43 watts respectively; for the 2G1 lower beam, 65 watts.

(f) A lens for Type G headlamp incorporating only part of an upper beam shall be labeled 1G1. A lens for a Type G headlamp incorporating both part of an upper beam and a lower beam shall be labeled 2G1. The face of letters, numbers, or other symbols molded on the surface of the lens shall not be raised more than 0.020 in. (0.5 mm.), and shall be placed no closer to the geometric center of the lens than 2.75 in. (70 mm.). The marking shall be molded in the lens and shall be not less than ¼ in. (6.35 mm) in size.

[**S7.3.9 Type H headlighting system.** A Type H headlamp system consisting of two Type 2H1 headlamps and associated hardware, which are designed to conform to the following requirements:

(a) Paragraph S7.3.8(a) through (d).

(b) The maximum wattage at 12.8 volts (design voltage): 70 watts on the upper beam and 60 watts on the lower beam.

(c) A lens for a Type H headlamp incorporating both an upper beam and a lower beam shall be labeled 2H1. The face of letters, numbers, or other symbols molded on the surface of the lens shall not be raised more than 0.020 in. (0.5 mm), and shall be placed no closer to the geometric center of the lens than 2.75 in. (70 mm.) The marking shall be molded in the lens and shall be not less than ¼ in. (6.35 mm) in size. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]**

[**S7.4 Integral Beam Headlighting System.** An integral beam headlighting system shall be designed to conform to the following requirements:

(a) The system shall provide in total not more than two upper beams and two lower beams of the performance described in one of the following:

[(a)(1)] In a four-headlamp system, each upper beam headlamp and each lower beam headlamp shall be designed to conform to the photometrics of one of the following:

[(a)(1)(i)] Figure 15;

[(a)(1)(ii)] Figure 15 with the exceptions specified in subsection (a) of this section; or

[(a)(1)(iii)] Table 2 of SAE J579 DEC 84.

[(a)(2)] In a two-headlamp system, each headlamp shall be designed to conform to the photometrics of one of the following:

[(a)(2)(i)] Figure 17; or

[(a)(2)(ii)] Table 1 of SAE J579 DEC 84.

[(a)(3)] In a system in which there is more than one beam contributor providing a lower beam, and /or more than one beam contributor providing an upper beam, each beam contributor in the system shall be designed to meet only the photometric performance requirements of paragraph S7.4(a)(1) based upon the following mathematical expression: conforming test point value = 2 (Figure 15 test point value)/total number of lower or upper beam contributors for the vehicle, as appropriate. The system shall be designed to use the Vehicle Headlamp Aiming Device (VHAD) as specified in paragraph S7.7.5.2.

[(b)] The lower and upper beams shall be provided only as follows where each headlamp contains two light sources:

(1) The lower beam shall be provided either by the most outboard light source (or the uppermost if arranged vertically), or by all light sources.

(2) The upper beam shall be provided either by the most inboard light source (or the uppermost if arranged vertically), or by all light sources.

[(c)] The lower and upper beams shall be provided only as follows where each headlamp contains a signal filament.

(1) The lower beam shall be provided by the most outboard headlamps (or the uppermost if arranged vertically), and the lens of each such headlamp shall be permanently marked with the letter "L."

(2) The upper shall be provided by the most inboard headlamps (or lowermost if arranged vertically), and the lens of each such headlamp shall be permanently marked with the letter "U."

[(d)] A tolerance of +/- ¼ degree reaim tolerance during photometric performance tests is permitted for any headlamp. The test point 10U-90U shall be measured from the normally exposed surface of the lens face.

[(e)] A headlamp or beam contributor designed to meet S7.4(b) and S7.7.5.1 may be mounted in an assembly to permit simultaneous aiming of the beam(s) contributors, provided that with any complying contributor the assembly complete with all lamps meets the appropriate photometric requirements when tested in accordance with S10.

[(f)] Each integral beam headlamp system shall be designed to conform to the applicable photometric performance requirements in subsections (a) through (d) of this section when tested in accordance with Sections 4.1 and 4.1.4 of SAE Standard J1383 APR 85 with any headlamp intended for use in such system. The term "aiming plane" means "aiming reference plane," or an appropriate vertical plane defined by the manufacturer as required in paragraph S7.7.1.

[(g)] The system shall be aimable in accordance with the requirements of paragraph S7.7. A system that incorporates any headlamp or beam contributor that does not have a VHAD as an integral and indivisible part of the headlamp or beam contributor shall be designed so that the appropriate photometrics are met when any correctly aimed and photometrically conforming headlamp or beam contributor is removed from its mounting and aiming mechanism, and is replaced without reaim by any conforming headlamp or beam contributor of the same type.

[(h)] A headlamp with a glass lens need not meet the abrasion resistance (S8.2), chemical resistance (S8.3), or impact (S8.8) tests. If, in addition to a glass lens, the headlamp uses a non-plastic reflector, it need not meet the internal heat test of paragraph S8.6.2. A headlamp of sealed design as verified in paragraph S8.10 *Sealing* need not meet the corrosion (S8.4), dust (S8.5), or humidity (S8.7) tests, however, the headlamp shall meet the requirements of paragraphs 4.1, 4.1.2, 4.4 and 5.1.4 for corrosion and connector of SAE Standard J580 DEC 86 *Sealed Beam Headlamp Assembly*.

[(i)] When tested according to any of the procedures indicated in subparagraphs (i) through (viii) each headlamp or beam contributor shall meet the appropriate requirement:

(i) After an abrasion test conducted in accordance with paragraph S8.2, the headlamp shall meet the photometric requirement applicable to the headlamp system under test.

(ii) After a chemical resistance test involving exposure to any of the fluids listed in paragraph S8.3, there shall be no surface deterioration, coating delamination, fractures, deterioration of bonding materials, color bleeding or color pickup visible without magnification, and the headlamp shall meet the photometric requirements applicable to the headlamp system under test.

(iii) After a corrosion test conducted in accordance with paragraph S8.4 there shall be no evidence of external or internal corrosion or rust visible without magnification. Loss of adhesion of any applied coating shall not occur more than 0.125 in. (3.2 mm) from any sharp edge on the inside or outside. Corrosion may occur on terminals only if the current produced during the test of paragraph S8.4(c) is not less than 9.7 amperes.

(iv) After a dust test conducted in accordance with paragraph S8.5, the headlamp shall meet the photometric requirements applicable to the headlamp system under test.

(v) The headlamp shall first meet the requirements of subparagraph (A) and then those of subparagraph (B).

(A) After a temperature cycle test conducted in accordance with paragraph S8.6.1, the headlamp shall show no evidence of delamination, fractures, entry of moisture or deterioration of bonding material, color bleeding, warpage or deformation visible without magnification or lens warpage greater than .118 in (3 mm) when measured parallel to the optical axis at the point of intersection of the axis of each light source with the exterior surface of the lens, and its shall meet the photometric requirements applicable to the headlamp system under test.

(B) After an internal heat test conducted in accordance with paragraph S8.6.2, there shall be no lens warpage greater than .118 in (3 mm) when measured parallel to the optical axis at the point of intersection of the axis of each light source with the exterior surface of the lens, and it shall meet the photometric requirements applicable to the headlamp system under test.

(vi) After a humidity test conducted in accordance with paragraph S8.7, the inside of the headlamp shall show no evidence of delamination or moisture, fogging or condensation visible without magnification, and the headlamp shall meet the photometric requirements applicable to the headlamp system under test.

(vii) After an impact test on a headlamp with a plastic lens, conducted in accordance with paragraph S8.8, there shall be no fracture of the adhesion of the lens coating or delamination of materials visible without magnification, and the lens shall not be broken, cracked, or chipped.

(viii) After a vibration test conducted in accordance with paragraph S8.9, there shall be no evidence of loose or broken parts, other than filaments, visible without magnification. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]**

S7.5 Replaceable Bulb Headlamp System. Each replaceable bulb headlamp system shall be designed to conform to the following requirements:

(a) The system shall provide only two lower beams and two upper beams and shall incorporate not more than two standarized replaceable light sources in each headlamp.

(b) The photometrics as specified in subsections (c) through (f) below using any standardized replaceable light source of the type intended for use in such system.

(c) The test requirements of sectons 4.1 and 4.1.4 of SAE J1383 April 85, using the photometric requirements specified in (a) through (c). The term "aiming plane" means "aiming reference plane," or an appropriate vertical plane defined by the manufacturer as required in paragraph S7.7.1. A 1/4 degree reaim tolerance is permitted for any test point. The test point 10U-90U shall be measured form the normally exposed surface of the lens face.

(d) ["For a headlamp equipped with one or two Type HB1 light sources, or one or two Type HB2 light sources, the following requirements apply:" **(54 F.R. 27362—June 29, 1989. Effective: July 31, 1989)]**

(1) There shall be no mechanism that allows adjustment of an individual light source or, if there are two light sources, independent adjustment of each reflector.

(2) The lower and upper beams of a headlamp system consisting of two lamps, each containing two light sources, shall be provided as follows:

(i) The lower beam shall be provided in one of the following ways:

(A) [By the outboard light source (or upper one if arranged vertically) designed to conform to:

(1) the lower beam requirements of Table 1 of SAE Standard J579 DEC 84, if the light sources are Type HB1; or

(2) the lower beam requirements of Figure 17, if the light sources are type HB2; or

(B) Both light sources, designed to conform to the lower beam requirements specified above for their Type.

(ii) The upper beam shall be provided in one of the following ways:

(A) By the inboard light source (or the lower one if arranged vertically) designed to conform to:

(1) the upper beam requirements of Table 1 of SAE Standard J579 DEC, if the light sources are Type HB1; or

(2) the upper beam requirements of Figure 17, if the light sources are Type HB2; or

(B) By both light sources, designed to conform to the upper beam photometrics specified above for their type.

(3) The lower and upper beams of a headlamp system consisting of four lamps, each containing a single light source, shall be provided as follows:

(i) The lower beam shall be provided by the outboard lamp (or upper one if arranged vertically), designed to conform to:

(A) the lower beam requirements of Table 1 of SAE Standard J579 DEC 84, if the light sources are Type HB1; or

(B) the lower beam requirements of Figure 15, if the light sources are Type HB2; and

the lens of each such headlamp shall be marked with the letter "L."

(ii) The upper beam shall be provided by the inboard lamp (or the lower one if arranged vertically), designed to conform to:

(A) the upper beam requirements of Table 1 of SAE Standard J579 DEC 84, if the light sources are Type HB1; or

(B) the upper beam requirements of Figure 15, if the light sources are Type HB2; and

the lens of each such headlamp shall be marked with the letter "U." **(54 F.R. 27362—June 29, 1989. Effective: July 31, 1989)]**

(e) The following requirements apply to a headlamp system equipped with Type HB3 and HB4, HB1 and HB3, or HBI and HB4 [or Type HB2 and any Type light sources. **(54 F.R. 27362—June 29, 1989. Effective: July 31, 1989)]**

(1) There shall be no mechanism that allows adjustment of an individual light source, or, if there are two light sources, independent adjustment of each reflector.

(2) The lower and upper beams of a headlamp system consisting of two lamps, each containing two light sources [(Type HB1 with Types HB3 or HB4, Type HB2 and any Type, and Types HB3 and HB4)] shall be provided only as follows: **(54 F.R. 27362—June 29, 1989. Effective: July 31, 1989)]**

(i) The lower beam shall be provided in one of the following ways:

(A) By the outboard light source (or the uppermost if arranged vertically) designed to conform to the lower beam requirements of Figure 17; or

(B) By both light sources, designed to conform to the lower beam requirements of Figure 17.

(ii) The upper beam shall be provided in one of the following ways:

(A) By the inboard light source (or the lower one if arranged vertically) designed to conform to the upper beam requirements of Figure 17; or

(B) By both light sources, designed to conform to the upper beam requirements of Figure 17.

(3) [The lower and upper beams of a headlamp system consisting of four lamps, using Type HB1 and Types HB3 or HB4, Type HB2 and any Type, and Types HB3 and HB4 light sources, each containing only a single light source, shall be provided only as follows: **(54 F.R. 27362—June 29, 1989. Effective: July 31, 1989)]**

(i) The lower beam shall be produced by the outboard lamp (or upper one if arranged vertically), designed to conform to the lower beam requirements of Figure 15. The lens of each such headlamp shall be permanently marked with the letter "L."

(ii) The upper beam shall be produced by the inboard lamp (or lower one if arranged vertically), designed to conform to the upper beam requirements of Figure 15. The lens of each such headlamp shall be marked with the letter "U."

(f) Each lens reflector unit manufactured as replacement equipment shall be designed to conform to the requirements of paragraphs (d) and (e) of this section when any standardized replaceable light source appropriate for such unit is inserted in it.

(g) The lens of each replaceable bulb headlamp using Type HB2, Type HB3, or HB4 light sources, or Type HB1 light sources in conjunction with any other Type of light source within a headlamp system on a motor vehicle, shall permanently display the Type designation(s) for that light source on the lens in front of each light source.

(h) The system shall be aimable in accordance with paragraph S7.7.

(i) Each headlamp shall meet the requirements of paragraphs S7.4(k) and (1), except that the sentence in (k) to verify sealing according to S8.10 *Sealing* does not apply.

S7.6 Standardized Replaceable Light Sources. Each standardized replaceable light source shall be designed to conform to the following requirements:

(a) A Type HB1 light source shall be designed to conform to the dimensions specified in Figure 3 and shall incorporate a silicone O-ring. Its maximum power on the lower beam shall be 50 watts, and on the upper beam, 70 watts. Its luminous flux in lumens shall be 700 +/- 15% on the lower beam and 1200 +/- on the upper beam.

(b) A Type HB2 light source shall be designed to conform with the dimensions specified in Figure 23. Its maximum power on the lower beam shall be [65] watts, and on the upper beam, [72] watts. Its luminous flux in lumens shall be [910] plus or minus 10% on the lower beam, and [1500] plus or minus 10% on the upper beam. **(54 F.R. 53069—December 27, 1989. Effective: January 26, 1990)]**

(c) A Type HB3 light source shall be designed to conform to the dimensions specified in Figure 19. Its maximum power on the upper beam shall be 70 watts. Its luminous flux in lumens shall be 1700 +/- 12% on the upper beam.

(d) A Type HB4 light source shall be designed to conform to the dimensions specified in Figure 20. Its maximum power shall be 60 watts on the lower beam, and its luminous flux in lumens on the lower beam shall be 1000 +/- 15%.

(e) The filament of a light source shall be seasoned before measurement of maximum power and luminous flux.

(f) Measurement of maximum power and luminous flux shall be made with the direct current test voltage regulated within one quarter of one percent. The test voltage shall be design voltage, 12.8v. The measurement of luminous flux shall be in accordance with the Illuminating Engineering Society of North America, LM-45; *IES Approved Method for Electrical and Photometric Measurements of General Service Incandescent Filament Lamps* (April 1980), shall be made with the black cap installed on [Types HB1, HB2, and HB4,] and shall be made with the electrical conductor and light source base shrouded with an opaque white colored cover, except for the portion normally located within the interior of the lamp housing. The measurement of luminous flux for the Types HB3 and HB4 shall be with the base covered with a white cover shown in Figures 19-1 and 20-1. The white covers are used to eliminate the likelihood of incorrect lumen measurment that will occur should the reflectance of the light source base and electrical connector be low. **(54 F.R. 53069—December 27, 1989. Effective: January 26, 1990)**

(g) The capsule, lead wires and/or terminals, and seal on each Type HB1, Type HB3, and Type HB4 light source shall be installed in the base so as to provide an airtight seal. Such a seal exists when no air bubbles shall appear on the low pressure (connector) side after the light source has been immersed in water for one minute while inserted in a cylindrical aperture of 1.350 to 1.346 in. (34.30 to 34.2 mm)(Type HB1), or 0.796 +/- 0.004 in (20.22 +/- 0.10 mm)(Type HB3), or 0.875 +/- 0.004 in (22.2 +/- 0.1 mm) (Type HB4) and subjected to a minimum air pressure of 70kPa (10 P.S.I.G.) on the glass capsule side.

(h) After the force deflection test conducted in accordance with S9, the permanent deflection of the glass envelope shall not exceed 0.005 in. (0.13mm) in the direction of the applied force.

(i) A general tollerance shall apply to Figure 3 as follows: +/- 0.004 in. (0.10 mm) to all linear dimensions and +/- 1 degree 00 minutes to all angular dimensions except for referenced dimensions and unless otherwise specified.

(j) Each standardized light source manufactured on or after December 1, 1989, shall be marked with the symbol DOT horixontally or vertically, which shall constitute the certification required by 15 U.S.C. 1403, and its base marked with its HB Type designation, and either with manufacturer's or importer's name or with the manufacturer's or importer's trademark that is registered with the U.S. Patent Office.

[S7.7 Aimability Performance Requirements.

[S7.7.1 Each headlamp (other than a headlamp designed to conform to paragraph S7.3), or beam contributor, shall be equipped with fiducial marks, aiming pads or similar references of sufficient detail and accuracy for determination of an appropriate vertical plane to be used with the photometric procedures of SAE J1383 APR 85 for correct alignment with the photometer axis when being when being tested for photometric compliance, and to serve for the aiming reference when the lamp is installed on a motor vehicle. The fiducial marks, aiming pads, or similar references are protrusions, bubble vials, holes, indentations, ridges, scribed lines, or other readily identifiable marks established and described by the vehicle or lamp manufacturer.

[S7.7.2 Each headlamp shall be installed on a motor vehicle with a mounting and aiming mechanism that allows aim inspection and adjustment of both vertical and horizontal aim, and is accessible for those uses without removal of any vehicle parts, except for protective covers removable without the use of tools.

[S7.7.2.1. When installed on the vehicle, adjustment of one aim axis through its full on-vehicle range shall not cause the aim of the other axis to deviate more than +/- 0.76 degree. If this performance is not achievable, a label meeting the requirements of paragraph S7.7.5.2(b) shall be attached adjacent to each Vehicle Headlamp Aiming Device (VHAD).

[S7.7.2.2. If a headlamp is aimed by moving the reflector relative to the lens and headlamp housing, or vice versa, it shall conform with the photometrics applicable to it with the lens at any position relative to the reflector within the aim range limits of paragraphs S7.7.3 and S7.7.4, or any combination.

[S7.7.3. When a headlamp system is tested in a laboratory, the range of its vertical aim shall not be less than +/- 4 degrees from the nominal correct air position for the intended vehicle application. When installed on a motor vehicle, the range of vertical aim shall be not less than the full range of pitch of the vehicle on which the headlamp system is installed. The installed range of pitch angle shall as a minimum be determined from unloaded vehicle weight to gross vehicle weight rating, and incorporate pitch angle effects from maximum trailer or trunk loadings, the full range of tire intermix sizes and suspensions recommended and/or installed by the vehicle manufacturer, and the anticipated effects of suspension sag and variable passenger loading. The vertical aim adjustment mechanism shall be continuously adjustable over the full range.

[S7.7.4. When a headlamp system is tested in a laboratory, the range of its horizontal aim shall not be not less than 2.5 degrees from the nominal correct aim position for the intended vehcile application.

[S7.7.5. When a headlamp system is installed on a motor vehicle, it shall be aimable with either an externally applied aiming device or on-vehicle headlamp aiming devices installed by the vehicle manufacturer. When activated in a steady-burning state, headlamps shall not have any styling ornament or other feature, such as a translucent cover or grill, in front of the lens. Headlamp wipers may be used in front of the lens provided that the headlamp system is designed to conform with all applicable photometric requirements with the wiper stopper in any position in front of the lens.

[S7.7.5.1. External aiming. Each headlamp system that is capable of being mechanically aimed by externally applied headlamp aiming devices shall be mechanically aimable using the equipment specified in SAE Standard J602 OCT 80 *Headlamp Aiming Device for Mechanically Aimable Sealed Beam Headlamp Units* without the removal of any ornamental trim rings, covers, wipers or other vehicle parts.

Group	Test point, degrees	Total for group, candela (see note 1)
1[1]	45L-5U, 45L-H, 45L-5D, ...	45
2[1]	30L-H, 30L-5D	50
3	10L-10U, 10L-5U, V-10U, V-5U, 10R-10U, 10R-5U ...	100
4	10L-H, 10L-5D, V-H, V-5D, 10R-H, 10R-5D	360
5[1]	30R-H, 30R-5D	50
6[1]	45R-5U, 45R-H, 45R-5D ...	45

FIGURE 2—Minimum Luminous Intensity Requirement for Backup Lamps

[1] When 2 lamps of the same or symmetrically opposite design are used, the reading along the vertical axis and the averages of the readings for the same angles left and right of vertical for 1 lamp shall be used to determine compliance with the requirements. If 2 lamps of differing designs are used, they shall be tested individually and the values added to determine that the combined units meet twice the candela requirements.

When only 1 backup lamp is used on the vehicle, it shall be tested to twice the candela requirements.

(b) When a headlamp is installed on a motor vehicle, its aim in any direction shall not change by more than 0.30 degree nor shall the lamp recede more than 0.1 in. (2.5 mm.) after being subjected to an inward force of 50 pounds (222 newtons) applied evenly to the lens parallel to the mechanical axis.

(c) Each headlamp system mounting and aiming mechanism shall be subjected to a salt spray (fog) test in accordance with ASTM B117-73 *Method of Salt Spray (Fog) Testing* for a period of 50 hours, consisting of two successive 25 hour periods of 24 hours exposure followed by 1 hour of drying. At the end of 50 hours, the headlamp system shall be capable of meeting any of the applicable requirements of paragraph S7.7.

(d) Each headlamp system which is designed to use the Headlamp Aiming Device Locating Plates with adjustable legs for the 100 × 165 mm unit and the 142 × 200 mm unit, and which has adjustable length legs, shall meet the requirements of subparagraphs (1) and (2) below.

(1) The lens shall have three aiming pads which meet the requirements of Figure 4, *Dimensional Specifications for Location of Aiming Pads on Replaceable Bulb Headlamp Units.* The aiming pads need not be centered at the geometric center of the lens, or on the optical axis. Except as provided in subparagraph (2), a whole number, which represents the distance in tenths of an inch (i.e. 0.3 inch = 3) from the aiming reference plane to the respective aiming pads which are not in contact with that plane, shall be inscribed adjacent to each respective aiming pad on the lens. The height of these numbers shall be not less than .157 in (4 mm). If there is interference between the plane and the area of the lens between the aiming pads, the whole number represents the distance to a secondary plane. The secondary plane shall be located parallel to the aiming reference plane and as close to the lens as possible without causing interference.

(2) If the most forward aiming pad is the lower inboard aiming pad, then the dimensions may be placed anywhere on the lens. The dimension for the outboard aiming pad (Dimension F in Figure 4) shall be followed by the letter "H" and the dimension for the center aiming pad shall be followed by the letter "V." The dimensions shall be expressed in tenths of an inch.

(e) Each headlamp may be designed to use the nonadjustable Headlamp Aiming Device Locating Plate for the 100 × 165 mm unit, the 142 × 200mm unit, the 146 mm diameter unit, or the 178 mm diameter unit of SAE J602, or the 92 × 150 mm Type F unit, and incorporate lens mounted aiming pads as specified for those units in Figures 10, 13, 5, or 7 respectively in SAE J1383 APR 85, or Figure 11 of this standard for the Type F unit. If so designed, no additional lens marking is necessary to designate the type of plate or dimensions.

[S7.7.5.2 On-vehicle aiming. Each headlamp system that is capable of being aimed by equipment installed on the vehicle shall include a Vehicle Headlamp Aiming Device (VHAD) that conforms to the following requirements:

(a) *Aim.* The VHAD shall provide for headlamp air inspection and adjustment in both the vertical and horizontal axes.

(1) *Vertical aim*: The VHAD shall include the necessary references and scales relative to the horizontal plane to assure correct vertical aim for photometry and aiming purposes. An off-vehicle measurement of the angle of the plane of the ground is permitted. In addition, an equal number of graduations from the "O" position representing angular changes in the axis in the upward and downward directions shall be provided.

(i) Each graduation shall represent a change in the vertical position of the mechanical axis not larger then 0.19 degree (1 in. at 25 ft.) to provide for variations in aim at least 1.2 degrees above and below the horizontal, and have an accuracy relative to the zero mark of less than 0.1 degree.

(ii) The VHAD shall be marked to indicate headlamp aim movement in the upward and downward direction.

(iii) Each graduation shall indicate a linear movement of the scale indicator of not less than 0.05 in. (1.27 mm) if a direct reading analog indicator is used. If a remote reading indicator is provided, it shall represent the actual aim movement in a clear, understandable format.

(iv) The vertical indicator shall perform through a minimum range of +/− 1.2 degrees.

(v) Means shall be provided in the VHAD for compensation for deviations in floor slope not less than 1.2 degrees from the horizontal that would affect the correct positioning of the headlamp for vertical aim.

(vi) The graduations shall be legible under an illumination level not greater than 30 foot candles, measured at the top of the radiator, by an observer having 20/20 vision (Snellen), and shall permit aim adjustment to within 0.19 degree (1 in. at 25 ft.).

(2) *Horizontal aim.* The VHAD shall include references and scales relative to the longitudinal axis of the vehicle necessary to assure correct horizontal aim for photometry and aiming purposes. An "O" mark shall be used to indicate alignment of the headlamps relative to the longitudinal axis of the vehicle. In addition, an equal number of graduations from the "O" position representing equal angular changes in the axis relative to the vehicle axis shal be provided.

(i) Each graduation shall represent a change in the horizontal position of the mechanical axis not greater than 0.38 degree (2 in. at 25 ft.) to provide for variations in aim at least 0.76 degree (4 in. at 25 ft.) to the left and right of the longitudinal axis of the vehicle, and shall have an accuracy relative to the zero mark of less than 0.1 degree.

(ii) The VHAD shall be marked to indicate headlamp aim movement in the left and right directions.

(iii) The graduations shall be legible under an illumination level not greater than 30 foot candles, measured at the top of the top of the radiator, by an observer having 20/20 vision (Snellen), and shall permit aim adjustment to within 0.38 degree (2 in. at 25 ft.).

(iv) The horizontal indicator shall perform through a minimum range of +/− 0.76 degree (4 in. at 25 ft.); however, the indicator itself shall be capable of recalibration over a movement of +/− 2.5 degrees relative to the longitudinal axis of the vehicle to accommodate any adjustment necessary for recalibrating the indicator after vehicle repair from accident damage.

(b) *Aiming instructions.* The instructions for properly aiming the headlighting system using the VHAD shall be provided on a label permanently affixed to the vehicle adjacent to the VHAD, or in the vehicle operator's manual. The instructions shall advise that the headlighting system is properly aimed if the appropriate vertical plane (as defined by the vehicle manufacturer) is perpendicular to both the longitudinal axis of the vehicle, and a horizontal plane when the vehicle is on a horizontal surface, and the VHAD is set at "O" vertical and "O" horizontal. Should a remote indicator or a remote indicator and adjuster be provided, the instructions shall be placed in the operator's manual, and may also be placed on a label adjacent to the VHAD.

(c) *Testing the VHAD.*

(1) The headlamp assembly (the headlamp(s) and the integral or separate VHAD mechanism) shall be mounted on a level goniometer, aligned to a photometer located not less than 60 ft. (18.3m) from the VHAD assembly. The assembly shall be mechanically aimed using the VHAD in accordance with the manufacturer's instructions as provided with the vehicle on which the VHAD is intended to be used. A ¼ degree reaim is permitted in any direction at any test point to allow for variations in readings between laboratories. The test shall be conducted in accordance with the procedures of paragraphs 4.1 and 4.1.4 of SAE J1383 APR 85. Under these conditions the mounted headlamp assembly shall be designed to conform to the photometric requirements appropriate for the headlamp system under test.

(2) When tested in accordance with subsection (1) of this section, with any replacement headlamp unit(s) or light sources intended for use in the system under test, the VHAD and headlamp system shall be designed to conform to the photometric performance requirements appropriate for the system under test.

(3) The same VHAD and associated headlamp(s) (or headlamp assembly) shall be rigidly mounted in a headlamp test fixture and comply with the following laboratory test procedures:

(i) Each graduation on the horizontal and vertical aim scales shall be checked and any variation from the correct aim shall not exceed +/- 0.2 degree, and +/- 0.1 degree, respectively.

(ii) With the aiming plane horizontal and vertical and with the scale on the device set at O, the aimer shall be adjusted before each of the following tests to assure that the indicators are centered at O.

(iii) The VHAD and an unlighted headlamp assembly shall be stabilized at 20 +/- 5 degrees F (-7 +/- 3 degrees C) in a circulating air environmental test chamber. After a period of 30 minutes, when measured at that soak temperature, the variation from correct horizontal or vertical aim shall not exceed +/- 0.2 degree, and +/- 0.1 degree, respectively.

(iv) The VHAD, and the headlamp assembly with it highest wattage filament (or combination of filaments intended to be used simultaneously) energized at its design voltage, shall than be stabilized at 100 +/- 5 degrees F (38 +/- 3 degrees C) in a circulating air environmental test chamber. After a period of 30 minutes, when measured at that soak temperature, the variation from correct horizontal and vertical aim shall not exceed +/- 0.2 degree, and +/- 0.1 degree, respectively.

(v) The VHAD and an unlighted headlamp assembly shall then be placed in a circulating air environmental test chamber and exposed to a temperature of 140 +/- 5 degrees F (60 +/- 3 degrees C) for 24 hours, followed by a temperature of -40 5 degrees F (-40 +/- 3 degrees C) for 24 hours and then permitted to return to room temperature, after which the VHAD and headlamp assembly shall show no damage which would impair its ability to perform as specified herein. The variation from correct horizontal or vertical aim shall not exceed +/- 0.2 degree, and +/- 0.1 degree, respectively.

(vi) The VHAD and headlamp assembly shall then be tested according to the corrosion test procedure of paragraph S7.7.5.1(c).

(vii) The VHAD and headlamp assembly shall then be tested for photometric compliance as specified in paragraphs S7.7.5.2(c)(1) and (2). **(54 F.R. 27362—May 9, 1989. Effective: June 8, 1989)]**

[S8 Tests and Procedures for Integral Beam and Replaceable Bulb Headlighting Systems. When tested in accordance with the following procedures, each integral beam headlamp shall meet the requirements of paragraph S7.4, and each replaceable bulb headlamp shall meet the requirements of paragraph S7.5.

[S8.1 Photometry. Each headlamp to which paragraph S8 applies shall be tested according to paragraphs 4.1 and 4.1.4 of SAE Standard J1383 APR 85 for meeting the applicable photometric requirements, after each test specified in paragraphs S8.2, S8.3, S8.5, S8.6.1, S8.6.2, and S8.7. A ¼ degree reaim is permitted in any direction at any testpoint. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]**

[S8.2.] Abrasion. (a) A headlamp shall be mounted in the abrasion-test fixture in the manner indicated in Figure 5 with the lens facing upward.

(b) An abrading pad meeting the requirements in paragraph (c) (1) through (c) (4) of this section shall be cycled back and forth (1 cycle) for 11 cycles at 4 ± 0.8 in. (10 cm ± 2 cm) per second over at least 80 percent of the lens surface, including all the area between the upper and lower aiming pads, but not including lens covers and edges.

(c) (1) The abrading pad shall be not less than 1.0 ± .04 in. (2.5 cm ± .1 cm) wide, constructed of 0000 steel wool, and rubber cemented to a rigid base shaped to the same vertical contour of the lens. The "grain" of the pad shall be perpendicular to the direction of motion.

(2) The abrading-pad support shall be equal in size to the pad and the center of the support surface shall be within ± .08 in. (± 2 mm) of parallel to the lens surface.

(3) The density of the abrading pad shall be such that when the pad is mounted to its support and is resting unweighted on the lens, the base of the pad shall be no closer than .125 in. (3.2 mm) to the lens at its closest point.

(4) When mounted on its support and resting on the lens of the test headlamp, the abrading pad shall then be weighted such that a pad

pressure of 2.0 ± .15 psi (14 ± 1 KPa) exists at the center and perpendicular to the face of the lens.

(d) A pivot shall be used if it is required to follow the contour of the lens.

(e) Unused steel wool shall be used for each test.

[S8.3.] Chemical resistance. (a) The entire exterior lens surface of the fixtured headlamp and top surface of the lens-reflector joint shall be wiped once to the left and once to the right with a 6-inch-square soft cotton cloth (with pressure equally applied) which has been saturated once in a container with 2 ounces of one of the test fluids listed in paragraph (b) of this section. The lamp shall be wiped within 5 seconds after removal of the cloth from the test fluid.

(b) The test fluids are:

(1) ASTM Reference Fuel C, which is composed of Isooctane 50 volume % and Toluene 50 volume %. Isooctane must conform to A2.7 in Annex 2 of the Motor Fuels Section of the 1985 *Annual Book of ASTM Standards* Vol. 05.04, and Toluene must conform to ASTM specification D362-84, *Standard Specification for Industrial Grade Toluene*. ASTM Reference Fuel C must be used as specified in:

(i) Paragraph A2.3.2 and A2.3.3 of Annex 2 to *Motor Fuels, Section 1* in the *1985 Annual Book of ASTM Standards*; and

(ii) OSHA Standard 29 CFR 1910.106–*Handling Storage and Use of Flammable Combustible Liquids*.

(2) Tar remover (consisting by volume of 45% xylene and 55% petroleum base mineral spirits).

(3) Power steering fluid (as specified by the vehicle manufacturer for use in the motor vehicle on which the headlamp is intended to be installed).

(4) Windshield washer fluid consisting of 0.5% monoethanolamine with the remainder 50% concentrations of methanol/distilled water by volume.

(5) Antifreeze (50% concentration of ethylene glycol/distilled water by volume).

(c) After the headlamp has been wiped with the test fluid, it shall be stored in designed operating attitude for 48 hours at a temperature of 73°F ± 7° (23°C ± 4°) and a relative humidity of 30 ± 10 percent. At the end of the 48-hour period, the headlamp shall be wiped clean with a soft dry cotton cloth and visually inspected.

[S8.4.] Corrosion. (a) A connector test shall be performed on each filament circuit prior to the test in subparagraph (b) according to Figure 1 of SAE Standard J580, **[**DEC 86**]**. The power source shall be set to provide 12.8 volts and the resistance shall be set to produce 10 amperes.

(b) The headlamp with connector attached to the terminals, unfixtured and in its designed operating attitude with all drain holes, breathing devices or other designed openings in their normal operating positions, shall be subjected to a salt spray (fog) test in accordance with ASTM B117–73, *Method of Salt Spray (FOG) Testing*, for a period of 240 hours, consisting of 10 successive 24-hour periods. During each interval, the headlamp shall be mounted in the middle of the chamber and exposed for 23 hours to the salt spray. The spray shall not be activated for the 24th hour. The bulb shall be removed from the headlamp and from the test chamber during the one hour of salt spray deactivation and reinserted for the start of the next test cycle, at the end of the first and last three 23-hour periods of salt spray exposure, and at the end of any two of the fourth through seventh 23-hour periods of salt-spray exposure. The test chamber shall be closed at all times except for a maximum of 2 minutes which is allowed for removal or replacement of a bulb during each period. After the ten cycles, the lens reflector unit without the bulb shall be immersed in deionized water for five minutes, then secured and allowed to dry by natural convection only.

(c) Using the voltage, resistance and pretest setup of subparagraph (a), the current in each filament circuit shall be measured after the test conducted in subparagraph (b).

[S8.5.] Dust. The headlamp, mounted on a test fixture, with all drain holes, breathing devices or other designed openings in their normal operating positions, shall be positioned within a cubical box, with inside measurements of 35.4 in. (900 mm) on each side, or larger if required for adequate wall clearance, i.e., a distance of at least 5.9 in. (150 mm) between the headlamp and any wall of the box. The box shall contain 9.9 lb. (4.5 kg) of fine powdered cement which conforms to the ASTM C150–77 *Specification for Portland Cement*. Every 15 minutes, the cement shall be agitated by compressed air or fan blower(s) by projecting blasts of air for a 2-second period in a downward direction so that the cement is diffused as uniformly as possible throughout the entire box. This test shall be continued for 5 hours, after which the exterior surfaces of the headlamp shall be wiped clean.

[S8.6.] Temperature and internal heat tests. A headlamp with one or more standardized replaceable light sources shall be tested according to [S8.6.1] and [S8.6.2.] Tests shall be made with all filaments lighted at design voltage that are intended to be used simultaneously in the headlamp and which in combination draw the highest total wattage. These include but are not limited to filaments used for turn signal lamps, fog lamps, parking lamps, and headlamp lower beams lighted with upper beams when the wiring harness is so connected on the vehicle. If a turn signal is included in the headlamp assembly, it shall be operated at 90 flashes a minute with a 75±2% current "on time". If the lamp produces both the upper and lower beam, it shall be tested in both the upper beam mode and the lower beam mode under the conditions above described, except for a headlamp with a single [Type HB1 or HB2] light source.

[S8.6.1.] Temperature cycle. A headlamp, mounted on a headlamp test fixture, shall be subjected to 10 complete consecutive cycles having the thermal cycle profile shown in Figure 6. During the hot cycle, the lamp shall be energized commencing at point "A" of Figure 6 and de-energized at point "B." Separate or single test chambers may be used to generate the environment of Figure 6. All drain holes, breathing devices or other openings or vents of the headlamp shall be in their normal operating positions.

[S8.6.2.] Internal Heat Test. (a) The headlamp lens surface that would normally be exposed to road dirt shall be uniformly sprayed with any appropriate mixture of dust and water or other appropriate materials to reduce the photometric output at the H-V test point of the upper beam (or the ½D–1 ½R test point of the lower beam as appropriate) to 25±2% of the output originally measured in the photometric test [conducted pursuant to paragraphs S7.4(i), or S7.5(a) through (e), as applicable. A headlamp with a single [Type HB1 or HB2] light source shall be tested on the upper beam only].

A headlamp with a single HB1 light source shall be tested on the upper beam only. Such reduction shall be determined under the same conditions as that of the original photometric measurement.

(b) After the photometric output of the lamp has been reduced as specified in paragraph (a), the lamp and its mounting hardware shall be mounted in an environmental chamber in a manner similar to that indicated in Figure 7, *Dirt/Ambient Test Setup*. The headlamp shall be soaked for one hour at a temperature of 95+7−0 degrees F (35+4−0 degrees C) and then the lamp shall be energized according to [S8.6] for one hour in a still air condition, allowing the temperature to rise from the soak temperature.

(c) The lamp shall be returned to a room ambient temperature of 73+7−0 degrees F (23+4−0 degrees C) and a relative humidity of 30±10% and allowed to stabilize to the room ambient temperature. The lens shall then be cleaned.

[S8.7.] Humidity. The headlamp mounted on a test fixture shall be placed in a controlled environment consisting of a temperature of 100+7−0 degrees F (38 +4−0 degrees C) with a relative humidity of not less than 90%. All drain holes, breathing devices, and other designed openings shall be in their normal operating positions. The headlamp shall be subjected to 20 consecutive 6-hour test cycles. In each cycle, it shall be energized for 1 hour at design voltage with the highest combination of filament wattages that are intended to be used, including a turn signal flashing at 90 flashes a minute with a 75±2% current "on-time," if so equipped, and then de-energized for 5 hours. After completion of the last cycle, the lamp shall be soaked for 1 hour at 73+7−0 degrees F 23+4−0 degrees C) and relative humidity of 30±10% before it is removed for photometric testing. The headlamp shall be tested for photometrics at 10±1 minute following completion of the humidity test.

[S8.8.] Impact. The headlamp shall be rigidly mounted in a headlamp test fixture on the seating lugs with the mechanical axis (bulb/socket axis) vertical, and the lens upward. The seating plane of the test fixture shall consist of oak wood 0.5 inch (13 mm) thick. One impact shall be delivered to the center of the lens on the mechanical axis, using a steel ball bearing with a diameter of .9055 in. (23 mm) weighing 1.76 oz. (50 gm), dropped freely from a distance of 15.75 in. (40 cm) from the bottom of the ball to the surface of the lens, at the intersection of the ball trajectory and the mechanical axis of the headlamp.

[S8.9 Vibration. A vibration test shall be conducted in accordance with the procedures of SAE Standard J575e *Tests for Motor Vehicle Lighting Devices and Components* August 1970, and the following: The table on the adapter plate shall be of sufficient size to completely contain the test fixture base with no overhang. The vibration shall be applied in the vertical axis of the headlamp system as mounted on the vehicle. The filament shall not be energized. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]**

[S8.10 Sealing. An unfixtured headlamp in its design mounting position shall be placed in water at a temperature of 176 +/− 5 degrees F (60 +/− 3 degrees C) for one hour. The headlamp shall be energized in its highest wattage mode, with the test voltage at 12.8 +/− 0.1 V. during immersion. The lamp shall then be de-energized and immediately submerged in its design mounting position into water at 32 +5−0 degrees F (0 +3−0 degrees C). The water shall be in a pressurized vessel, and the pressure shall be increased to psi (69 kPa), upon placing the lamp in the water. The lamp shall remain in the pressurized vessel for a period of thirty minutes. This entire procedure shall be repeated for four cycles. Then the lamp shall be inspected for any signs of water on its interior. During the high temperature portion of the cycles, the lamp shall be observed for signs of air escaping from its interior. If any water occurs on the interior or air escapes, the lamp in not a sealed lamp. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]**

[S9. Deflection test for standardized replaceable light sources. With the light source rigidly mounted in a fixture in a manner indicated in Figure 8, a force of 4.0 ± 0.1 pounds (17.8 ± 0.4N) is applied at a distance "A" from the reference plane perpendicular to the longitudinal axis of the glass capsule and parallel to the smallest dimension of the pressed glass capsule seal. The force shall be applied (using a rod with a hard rubber tip with a minimum spherical radius of .039 in (1 mm) radially to the surface of the glass capsule in four locations in a plane parallel to the reference plane and spaced at a distance "A" from that plane. These force applications shall be spaced 90 degrees apart starting at the point perpendicular to the smallest dimension of the pressed seal of the glass capsule. The bulb deflection shall be measured at the glass capsule surface at 180 degrees opposite to the force application. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]**

S10. Simultaneous Aim Photometry Tests. [(a) *Type F Headlamp Systems.* The assembly shall be located on a goniometer placed not less than 60 feet (18.3m) from the photometer. The LF unit shall be aimed mechanically by centering the unit on the photometer axis and by alingning the aiming plane of the lens perpendicular to the photometer axis. Then the assembly shall be moved in a plane parallel to the established aiming plane of the LF headlamp until the UF headlamp is centered on the photometer axis. Photometry measurements of the UF photometry unit shall be completed using the aiming plane so extablished, and the precedures of section S4.1 and 4.1.4 Standard J1383 APR 83, and Figure 15. A reaim tolerance of ± 1/4 degree is permitted in any direction at any test point.

(b) *Integral Beam Headlamp Systems.* The assembly used for simultaneously aiming more than one integral beam headlamp shall be placed on a test fixture on a goniometer located not less than 60 feet (18.3m.) from the photometer. The assembly shall be aimed by centering the geometric center of the lower beam lens(es) on the photometer axis and by aligning the photometer axis to be perpendicular to the aiming reference plane or appropriate vertical plane defined by the manufacturer of any lower beam contributor. Photometric compliance of the lower beam shall be determined with all lower beam contributors illiminated and in accordance with sections 4.1 and 4.1.6 of SAE Standard J1383 APR 83, and Figure 15. The assembly shall then be moved in a plane parallel to the established aiming plane of the lower beam until the assembly is located with the geometric center of the upper lens(es) on the photometer axis. Photometric compliance for upper beam shall now be determined using the figure and procedure specified for the lower beam. During photometric testing, a 1/4 degree reaim is permitted in any direction at any test point. **(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]**

35 F.R. 16842
October 31, 1970

TABLE I.—Required Motor Vehicle Lighting Equipment [Other Than Headlamps]—Multipurpose Passenger Vehicles, Trucks, Trailers, and Buses, of 80 or More Inches Overall Width

Item Column 1	Multipurpose passenger vehicles, trucks and buses Column 2	Trailers Column 3	Applicable SAE standards or recommended practice Column 4
	[Deleted 54 F.R. 30223. July 19, 1989]		
Taillamps [2]	2 red	2 red	J585e, September 1977
Stoplamps [2]	2 red	2 red	J586c, August 1970
License-plate lamp [1]	1 white	1 white	J587, October 1981
Reflex reflectors	4 red; 2 amber	4 red; 2 amber	J594f, January 1977
Side-marker lamps	4 red; 2 amber	2 red; 2 amber	J592e, July 1972
Backup lamp [1]	1 white	None	J593c, February 1968
Turn-signal lamps [2]	2 red or amber; 2 amber	2 red or amber.	J588e, September 1970
Turn signal operating unit. [3]	1	None	J589, April 1964
Turn-signal flasher	1	None	J590b, October 1965
Vehicular hazard-warning signal operating unit	1	None	J910, January 1966
Vehicular hazard warning signal flasher	1	None	J945, February 1966
Identification lamps	3 amber; 3 red	3 red	J592e, July 1972
Clearance lamps	2 amber; 2 red	2 amber; 2 red	J592e, July 1972
Intermediate side-marker lamps. [4]	2 amber	2 amber	J592e, July 1972
Intermediate side reflex reflectors [4]	2 amber	2 amber	J594f, January 1977

[1] See S5.1.1.10. [2] See S5.1.1.11-12. [3] See S5.5.6. [4] See S5.1.1.3.

TABLE II.—Location of Required Motor Vehicle Lighting Equipment Multipurpose Passenger Vehicles, Trucks, Trailers, and Buses, Of 80 Or More Inches Overall Width

Item Column 1	Location on— Multipurpose passenger vehicles, trucks, and buses Column 2	Location on— Trailers Column 3	Height above road surface measured from center of item on vehicle at curb weight Column 4
Headlamps	On the front, each headlamp providing the upper beam, at the same height, 1 on each side of the vertical centerline, each headlamp providing the lower beam, at the same height, 1 on each side of the vertical centerline, as far apart as practicable. [See also S7]	Not required	Not less than 22 inches (55.9 cm) nor more than 54 inches (137.2 cm)
Taillamps	On the rear, 1 on each side of the vertical centerline, at the same height, and as far apart as practicable	On the rear, 1 on each side of the vertical centerline, at the same height, and as far apart as practicable	Not less than 15 inches, nor more than 72 inches
Stoplamps	On the rear, 1 on each side of the vertical centerline, at the same height, and as far apart as practicable	On the rear, 1 on each side of the vertical centerline, at the same height, and as far apart as practicable	Not less than 15 inches, nor more than 72 inches
License-plate lamp.	At rear license plate, to illuminate the plate from the top or sides	At rear license plate to illuminate the plate from the top or sides	No requirement
Backup lamp	On the rear	Not required	No requirement
Turn-signal lamps.	At or near the front—1 amber on each side of the vertical centerline, at the same height, and as far apart as practicable. On the rear—1 red or amber on each side of the vertical centerline, at the same height, and as far apart as practicable	On the rear—1 red or amber on each side of the vertical centerline, at the same height, and as far apart as practicable	Not less than 15 inches, nor more than 83 inches
Identification lamps	On the front and rear—3 lamps, amber in front, red in rear, as close as practicable to the top of the vehicle, at the same height, as close as practicable to the vertical centerline, with lamp centers spaced not less than 6 inches or more than 12 inches apart. Alternatively, the front lamps may be located as close as practicable to the top of the cab.	(On the rear—3 lamps as close as practicable to the top of the vehicle at the same height, as close as practicable to the vertical centerline, with lamp centers spaced not less than 6 inches or more than 12 inches apart.)	On the front only—No part of the lamp or mountings shall extend below the top of the vehicle's windshield
Clearance lamps	On the front and rear—2 amber lamps on front, 2 red lamps on rear, to indicate the overall width of the vehicle, one on each side of the vertical centerline, at the same height, and as near the top as practicable	On the front and rear—2 amber lamps on front, 2 red lamps on rear, to indicate the overall width of the vehicle, one on each side of the vertical centerline, at the same height, and as near the top thereof as practicable	No requirement
Intermediate side marker lamps	On each side—1 amber lamp located at or near the midpoint between the front and rear side-marker lamps	On each side—1 amber lamp located at or near the midpoint between the front and rear side marker lamps	Not less than 15 inches
Intermediate side reflex reflectors	On each side—1 amber located at or near the midpoint between the front and rear side reflex reflectors	On each side—1 amber located at or near the midpoint between the front and rear side reflex reflectors	Not less than 15 inches nor more than 60 inches
Reflex reflectors	On the rear—1 red on each side of the vertical centerline, as far apart as practicable, and at the same height On each side—1 red as far to the rear as practicable, and 1 amber as far to the front as practicable	On the rear—1 red on each side of the vertical centerline, as far apart as practicable, and at the same height On each side—1 red as far to the rear as practicable, and 1 amber as far to the front as practicable	Not less than 15 inches nor more than 60 inches
Side marker lamps	On each side—1 red as far to the rear as practicable, and 1 amber as far to the front as practicable	On each side—1 red as far to the rear as practicable, and 1 amber as far to the front as practicable	Not less than 15 inches, and on the rear of trailers not more than 60 inches

* [(54 F.R. 30223—July 19, 1986. Effective: July 19, 1986)]

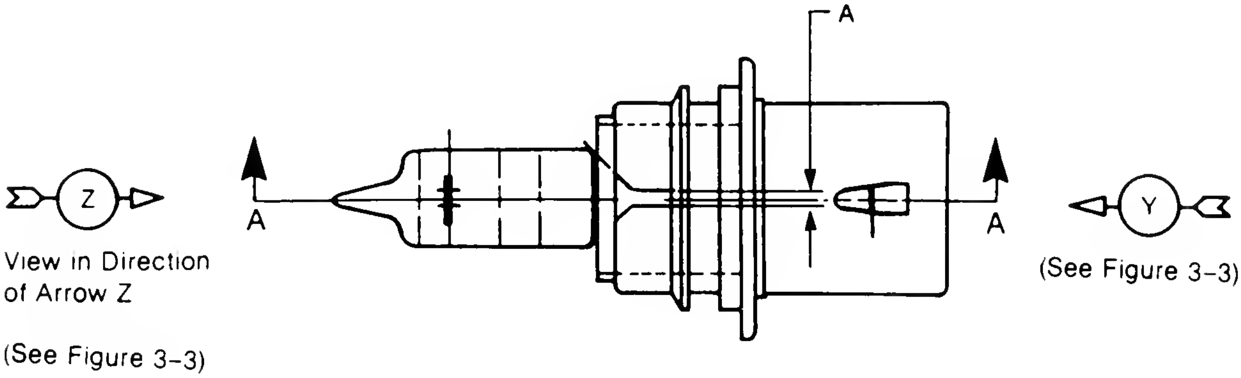
TABLE III.—Required Motor Vehicle Lighting Equipment
All Passenger Cars and Motorcycles, and Multipurpose Passenger Vehicles, Trucks, Trailers, and Buses, of Less Than 80 Inches Overall Width

Item Column 1	Passenger cars, multipurpose passenger vehicles, trucks, and buses Column 2	Trailers Column 3	Motorcycles Column 4	Applicable SAE standards or recommended practices Column 5
Headlamps	[See S7]			
Taillamps [2]	2 red	2 red	1 red	J585e, September 1977.
Stoplamps [2]	2 red	2 red	1 red	J586c, August 1970.
High-mounted stoplamp	1 red, for passenger cars only	Not required	Not required	J186a, September 1977
License-plate lamp [1]	1 white	1 white	1 white	J587, October 1981.
Parking lamps [2]	2 amber or white	None	None	J222, December 1970.
Reflex reflectors	4 red, [2] amber	4 red; 2 amber	3 red; 2 amber	J594f, January 1977.
Intermediate side reflex reflectors. [5]	2 amber	2 amber	None	J594f, January 1977.
Intermediate side-marker lamps. [5]	2 amber	2 amber	None	J592e, July 1972.
Side-marker lamps	2 red, 2 amber	2 red; 2 amber	None	J592e, July 1972.
Backup lamp	1 white	None	None	J593c, February 1968.
Turn-signal lamps [3]	2 red or amber; 2 amber.	2 red or amber.	2 amber; 2 red or amber.	J588, September 1970.
Turn-signal operating unit. [3 4]	1	None	1	J589, April 1964.
Turn-signal flasher	1	None	1	J590b, October 1965.
Vehicular hazard-warning signal operating unit	1	None	None	J910, January 1966.
Vehicular hazard-warning signal flasher	1	None	None	J945, February 1966.

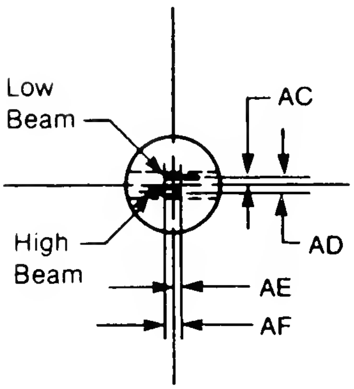
[(54 F.R. 20006—May 9, 1989. Effective: June 8, 1989)]

[[1] See S5.1.1.10.] [[2] See S5.1.1.11-12.] [[3] See S5.5.6.] [[4] See S5.1.1.5.] [[5] See S5.1.1.3.]

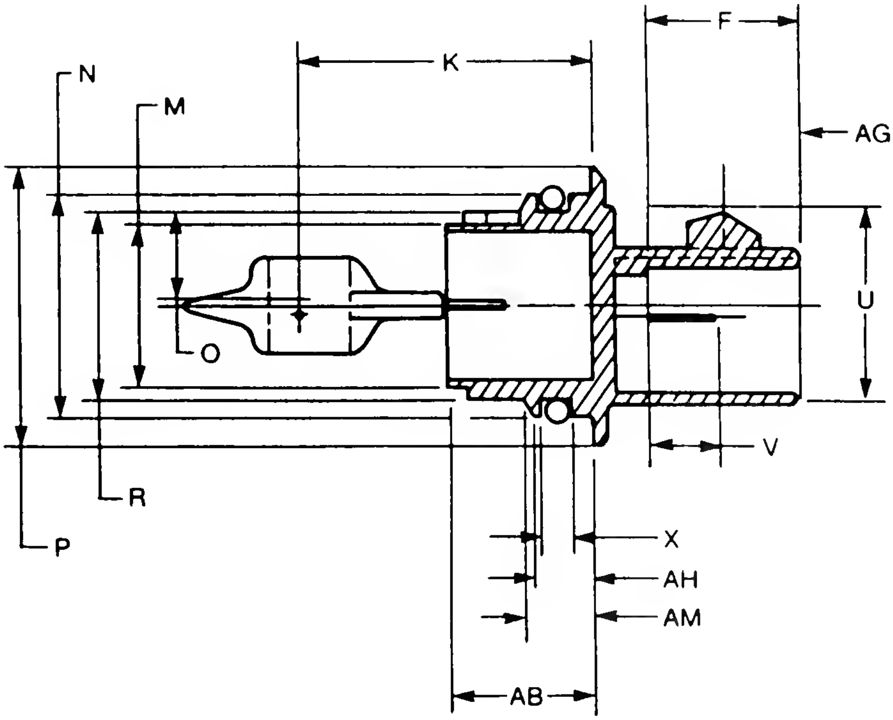
Figure 3: Specifications for the [Type HB 1] Standardized Replaceable Light Source



Plan View of Bulb



Front End View of Bulb



Side Sectional View of Bulb—(Section A)

Figure 3-1. Interchangeability Drawing of Headlamp Bulb Assembly

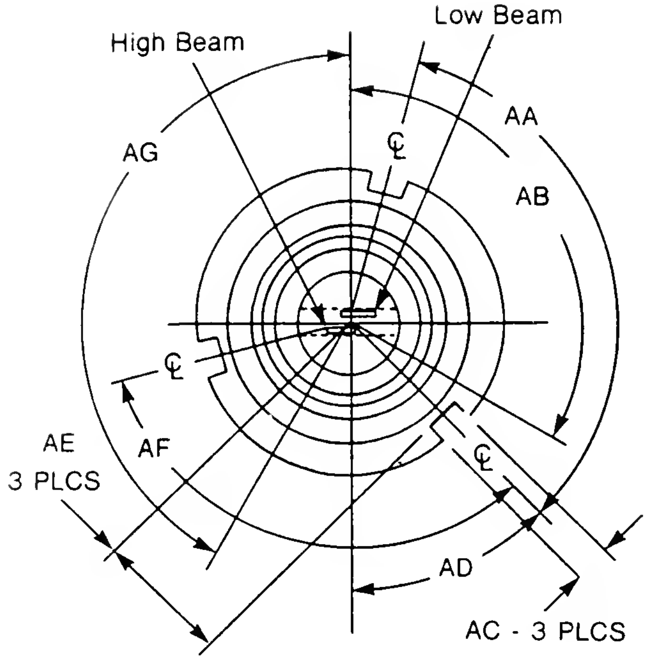
[Note: Unless otherwise specified, a general tolerance of ±004 in. (0.10mm) shall apply to all linear dimensions and ± 1° shall apply to all angular dimensions specified in Fig. 3 (48 F.R. 44815—September 30, 1983. Effective: September 30, 1983.)]

(See reverse page for dimensional specifications)

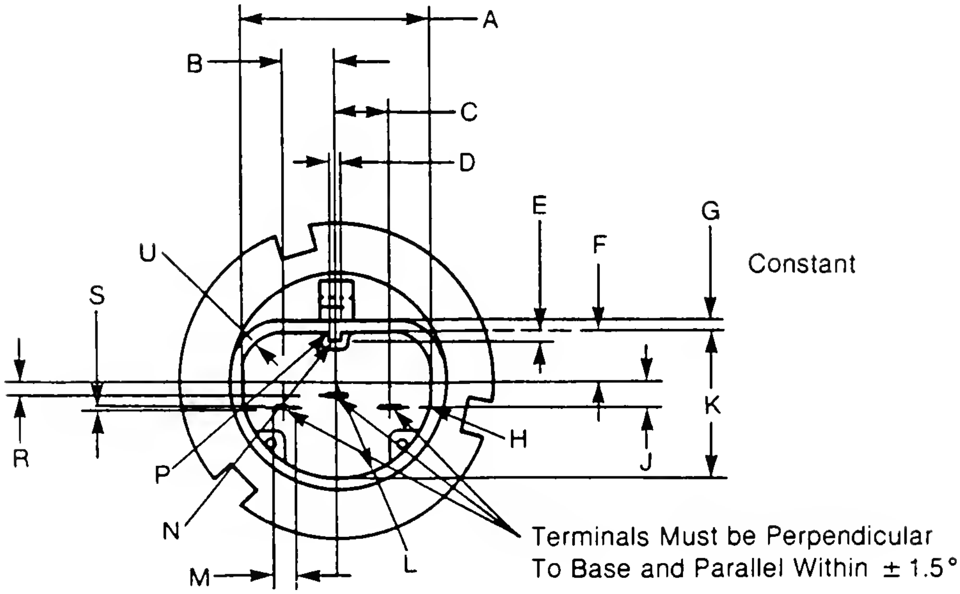
Dimension	Inches	Millimeters
A	.085 to .083 .002 either side CL	2.15 to 2.10 .05 either side CL
F	.906	23.00
H	.079	2.00
K low beam high beam	1.752 ± .010 CL within ±.025 of low beam	44.50 ± .25 CL to be within ± 0.64 of CL of low beam
M	.974	24.75
N	(1.335 to 1.331) .CC2 either side CL	(33.90 to 33.80) .05 either side CL
O	.517 ± 0.020	13.13 ± .050
P	1.673	42.50
R	(1.126 to 1.122) .002 either side CL	(28.60 to 28.50) .05 either side CL
U	1.181	30.00
V	.413	10.50
W	.128	3.25
X	.189	4.80
AC	.045 ± .015	1.15 ± .38
AD	.091 ± .025	2.30 ± .64
AE	.047 ± .015	1.20 ± .38
AF	.094 ± .032	2.40 ± .81
AH	.356	9.05
AM	.415	10.54
AN	.673	17.10

[Note:(Otherwise specified, a general tolerance of ±004 in. (0.10 mm) shall apply to all linear dimensions and ± 1% shall apply to all angular dimensions specified in Fig. 3. (48 F.R. 44815—September 30, 1983. Effective: September 30, 1983)]

Figure 3-2. Dimensional Specifications



View Z—From Bulb End



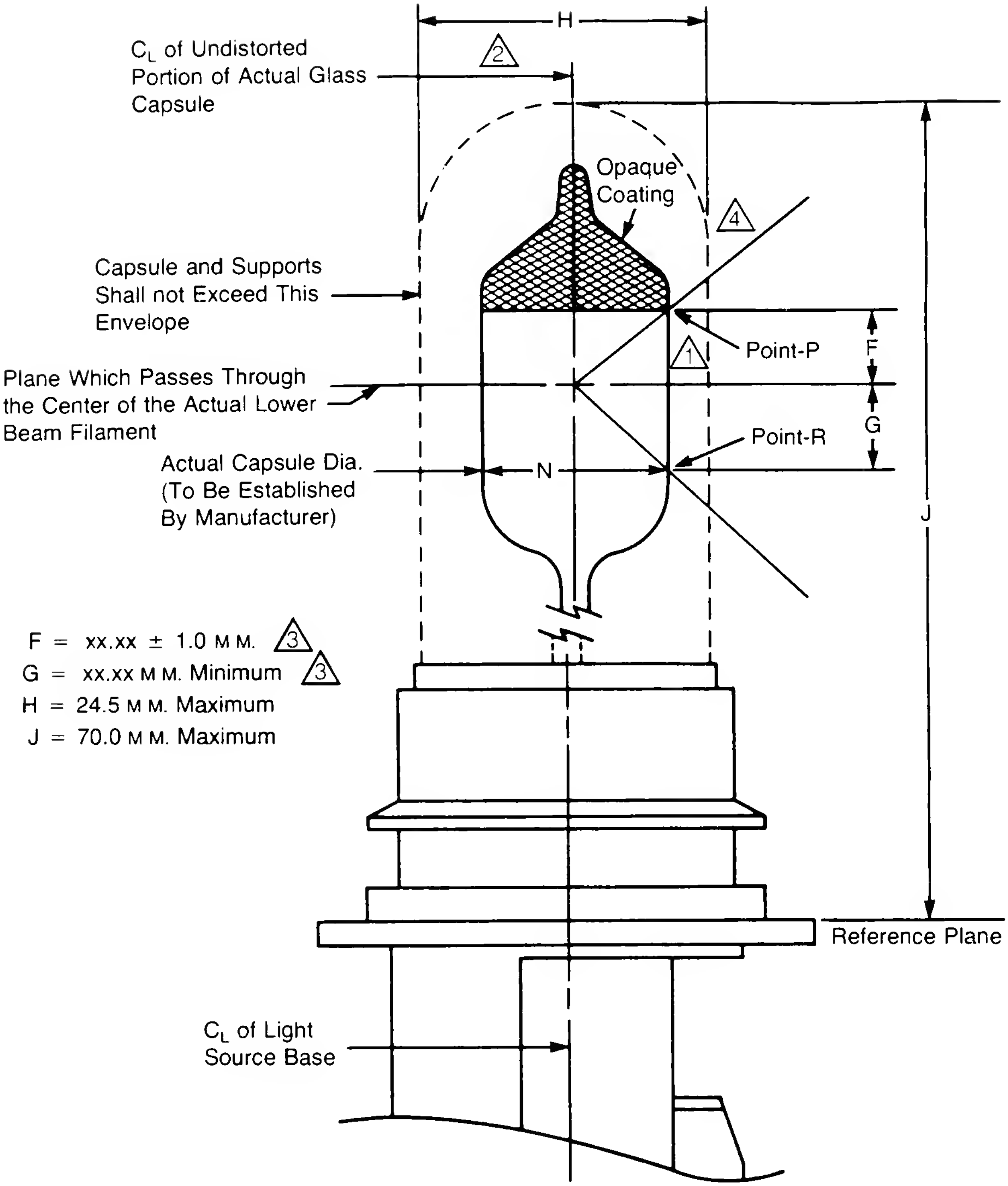
View Y—From Connector End

Figure 3-3. Bulb End and Connector End

(See reverse page for dimensional specifications)

Dimension	Inches	Millimeters
AA	120°	120°
AB	120°	120°
AC	.197	5.0
AD	44° 30°	44° 30°
AE	.722	18.35
AF	120°	120°
AG	150°	150°
AJ	.138	3.50
A	1.024	26.00
B	.289 ± .010	7.35 ± .25
C	.289 ± .010	7.35 ± .25
D	.055	1.40
E	.059	1.50
F	.278	7.05
G	.059	1.50
J	.142 ± .010	3.60 ± .25
K	.807	20.50
L	.531 R	13.50 R
M	.118	3.00
R	.075 ± .010	1.90 ± .25
S	.025 ± .002	.63 ± .25
U	.222 R	5.65 R

Figure 3-4. (Continued). Dimensional Specifications



1 Glass Capsule Periphery Shall be Optically Distortion Free Between the Planes Perpendicular to the Centerline at Points P and R.

2 Diameter "H" Shall be Concentric with the Centerline of the Light Source Base.

3 Exact Values of F and G Shall be Determined by Using the Following:

F = (N/2) Tan 38

G = (N/2) Tan 43

4 Entire Radius and Distorted Glass Shall be Covered to the Plane Passing Through Point "P", Perpendicular to the Glass Capsule Centerline.

Figure 3-5. Halogen Capsule

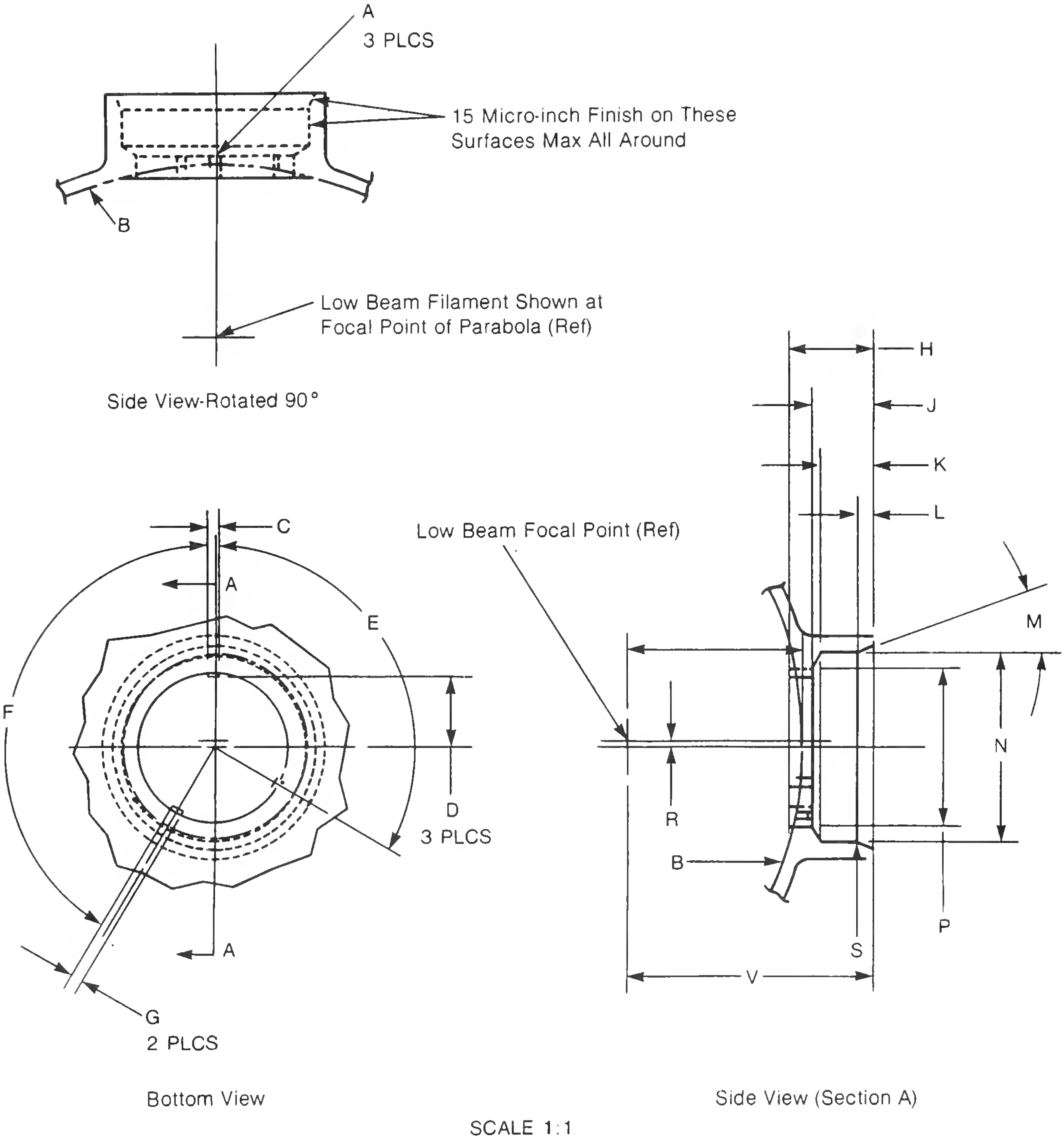


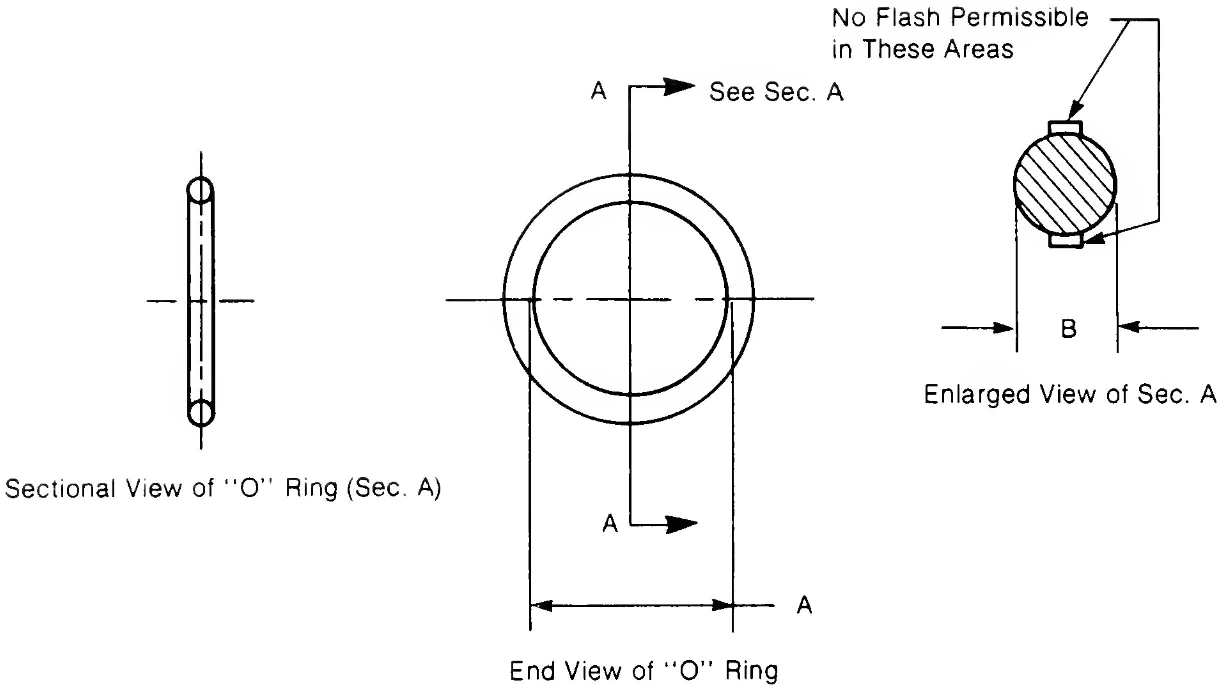
Figure 3-7. Socket (in reflector)

(See reverse page for dimensional specifications)

Specifications

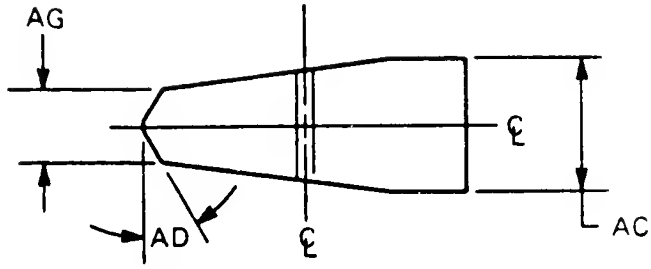
Dimension	Inches	Millimeters
B	Ref Line Lamp Parabola	Ref Line Lamp Parabola
C	.079 ± .002 + .002 Either side of CL	2.00 ± .05 .05 Either Side of CL
D	.502	12.75
E	120°	120°
F	150°	150°
G	.079	2.00
H	.596	15.15
J	.433	11.00
K	.374	9.50
L	.108	2.75
N	(1.350 to 1.346) .002 Either Side of CL	(34.30 to 34.20) .05 Either side of CL
P	(1.132 to 1.128) .002 Either side of CL	(28.75 to 28.65) .05 Either side of CL
R	.045	1.15

Figure 3-8. Dimensional Specifications

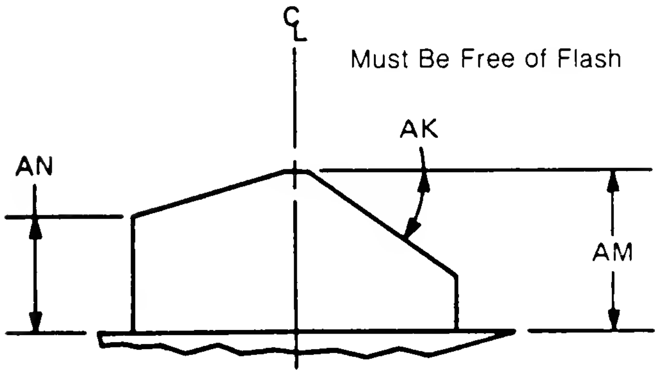


Dimensions	Inches	Millimeters
A	1.109 ± .012	28.17 ± 0.30
B	.139 ± .004	3.53 ± 0.10

Figure 3-9. 'O' Ring



Exploded View W Four Times Size



Exploded View of Locking Feature

Figure 3-10. Exploded Views

Letter	*Inches*	*Millimeters*
AC	.179	4.55
AD	30°	30°
AG	.098	2.50
AK	35°	35°
AM	.217	5.50
AN	.157	4.00

Figure 3-11. Dimensional Specifications

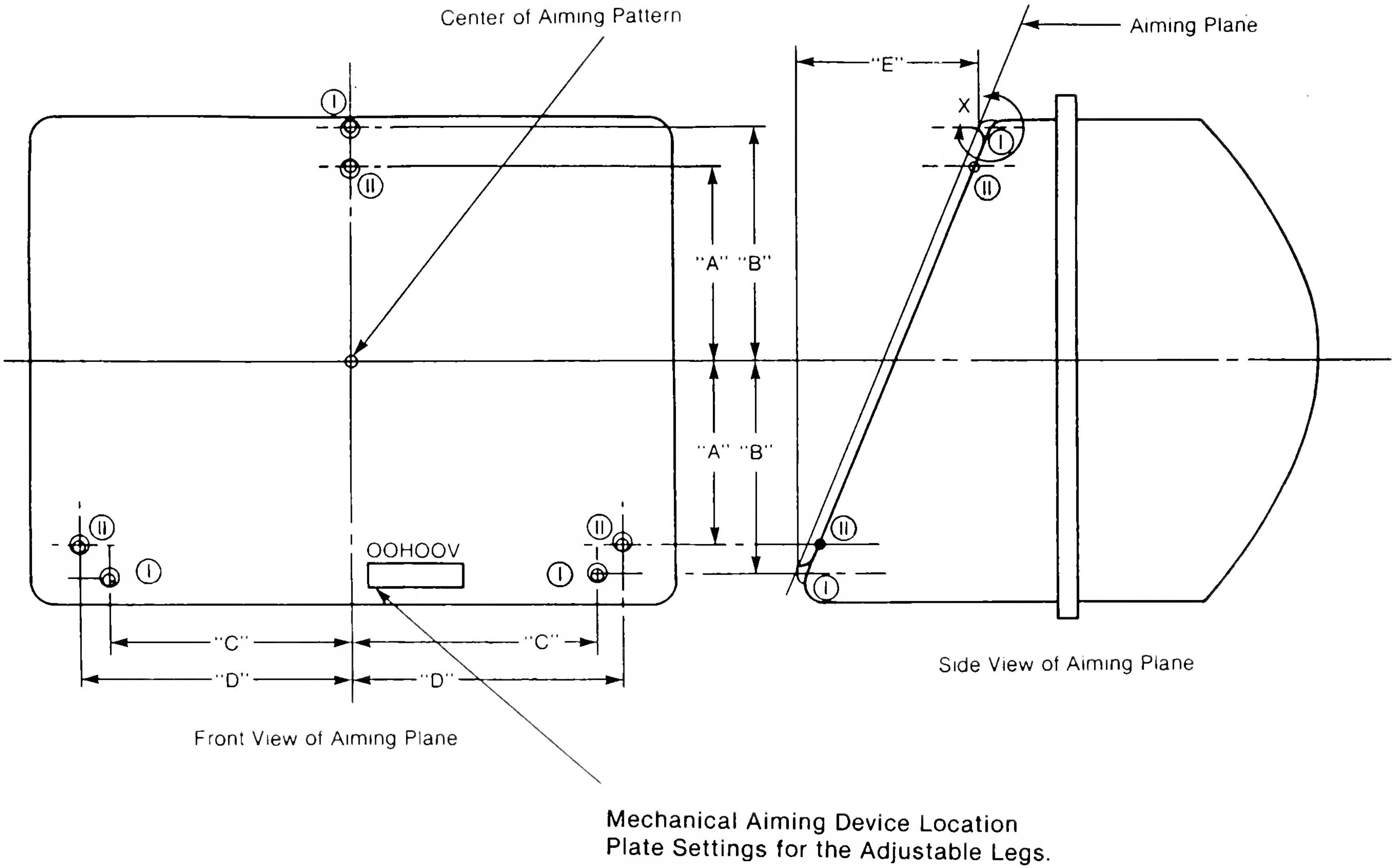


Figure 4-1. Dimensional Specifications for Location of Aiming Pads on Replaceable Bulb Headlamp Units

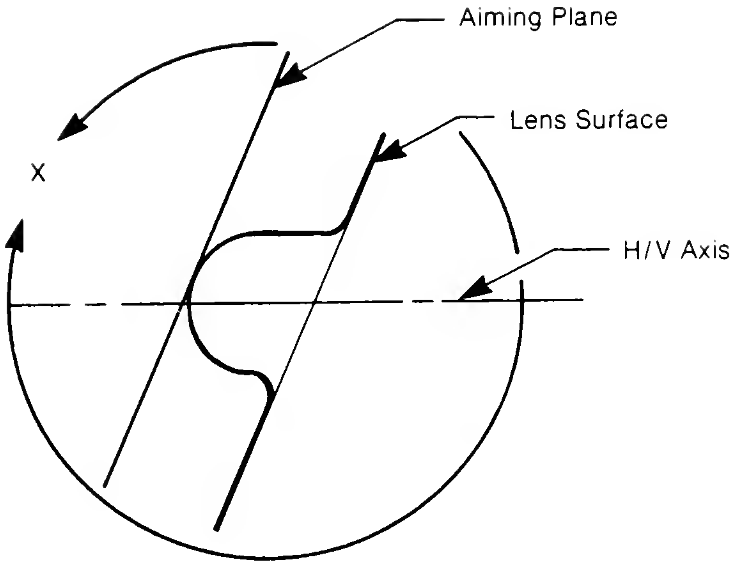
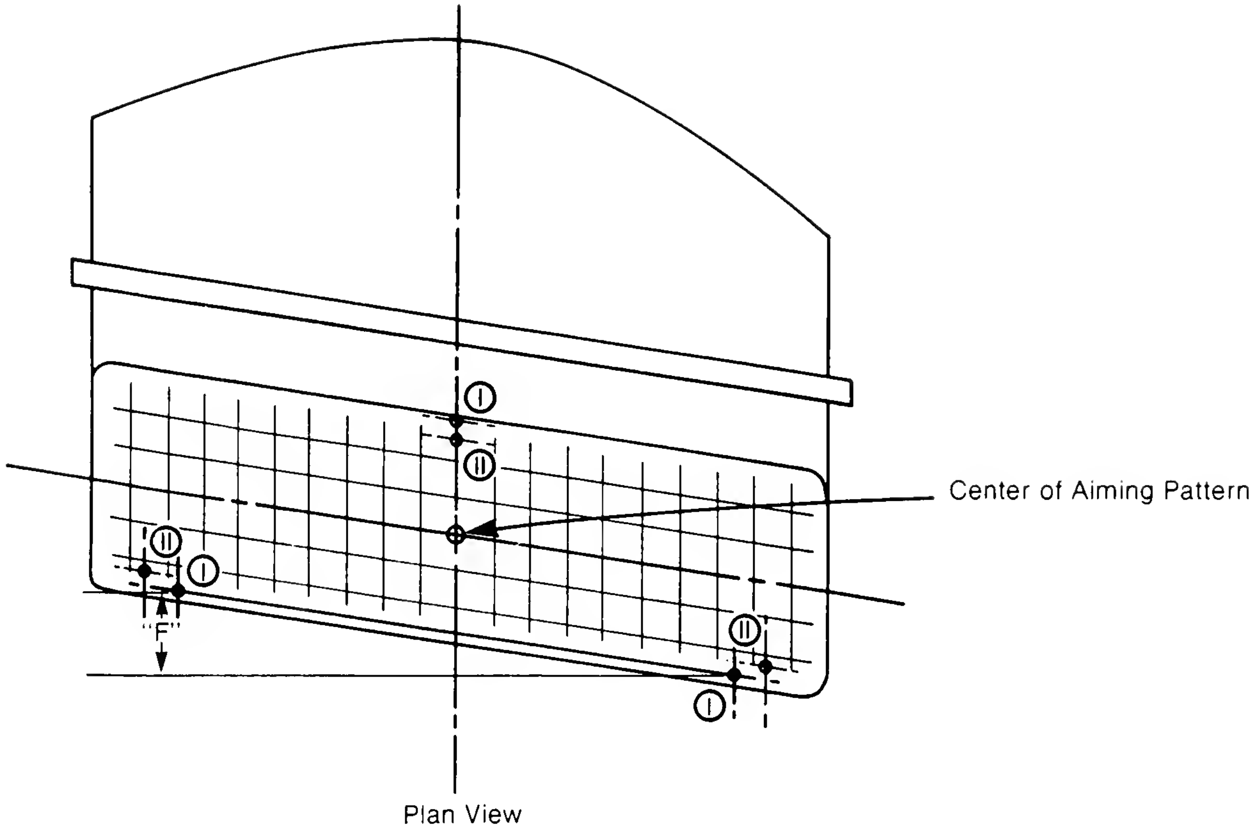


Figure 4-2. Detail Example of Aiming Pad



NOTES

- Group I or Group II aiming pad locations may be used.
- Group I aiming pad location (front view) is that prescribed for 2B1 sealed beam units
- Group II aiming pad location (front view) is that prescribed for 1A1 2A1 sealed beam units

Figure 4-3. Specifications for Location of Aiming Pads on Replaceable Bulb

(50 F.R. 21052. May 22, 1985. Effective: May 15, 1985)

Dimension	*Millimeters*	*Inches*
A	42.16 ± 0.25	1.660 ± 0.010
B	60.05 ± 1.00	2.364 ± 0.039
C	64.0 ± 1.00	2.520 ± 0.039
D	68.58 ± 0.51	2.700 ± 0.020
E	Mechanical aiming device locating plate setting for the vertical adjustable leg.	
F	Mechanical aiming device locating plate setting for the horizontal adjustable leg.	

Figure 4-4. Dimensional Specifications

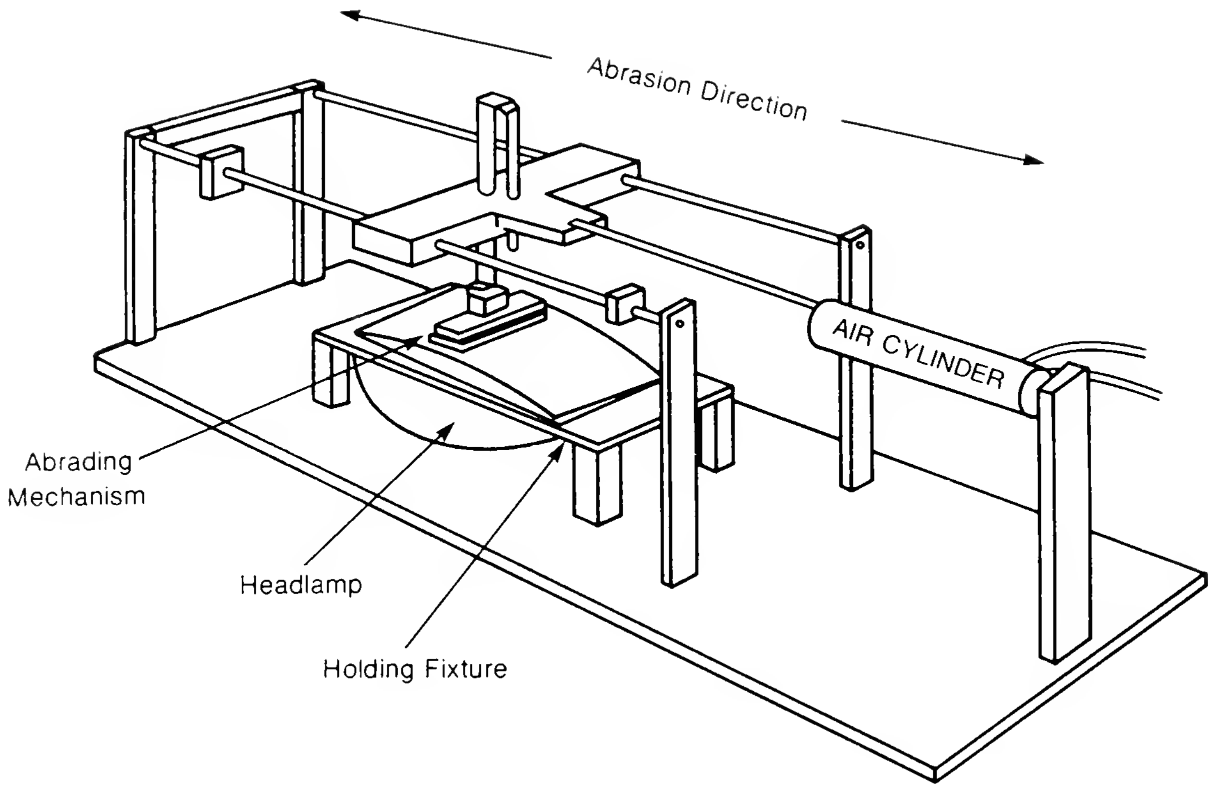


Figure 5. Abrasion Test Fixture

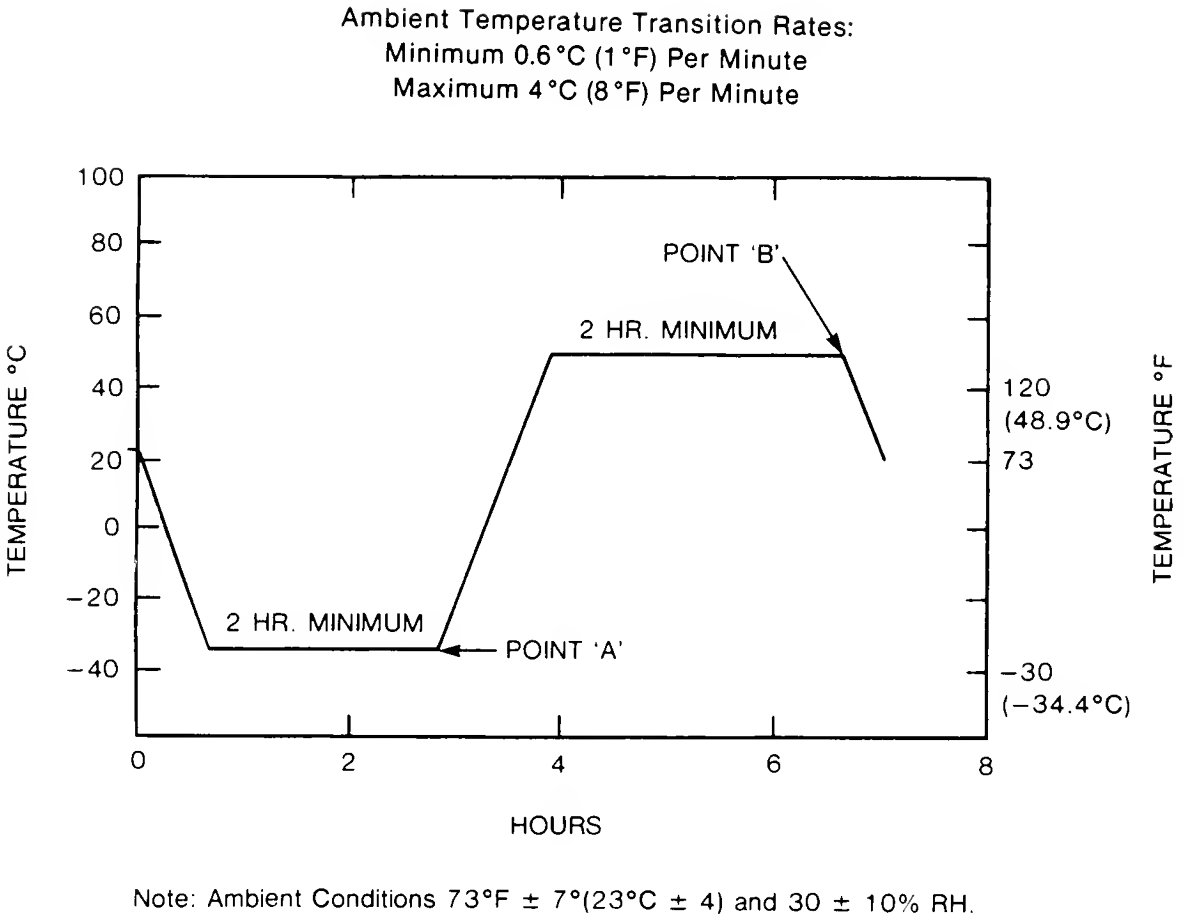


Figure 6. Thermal Cycle Profile

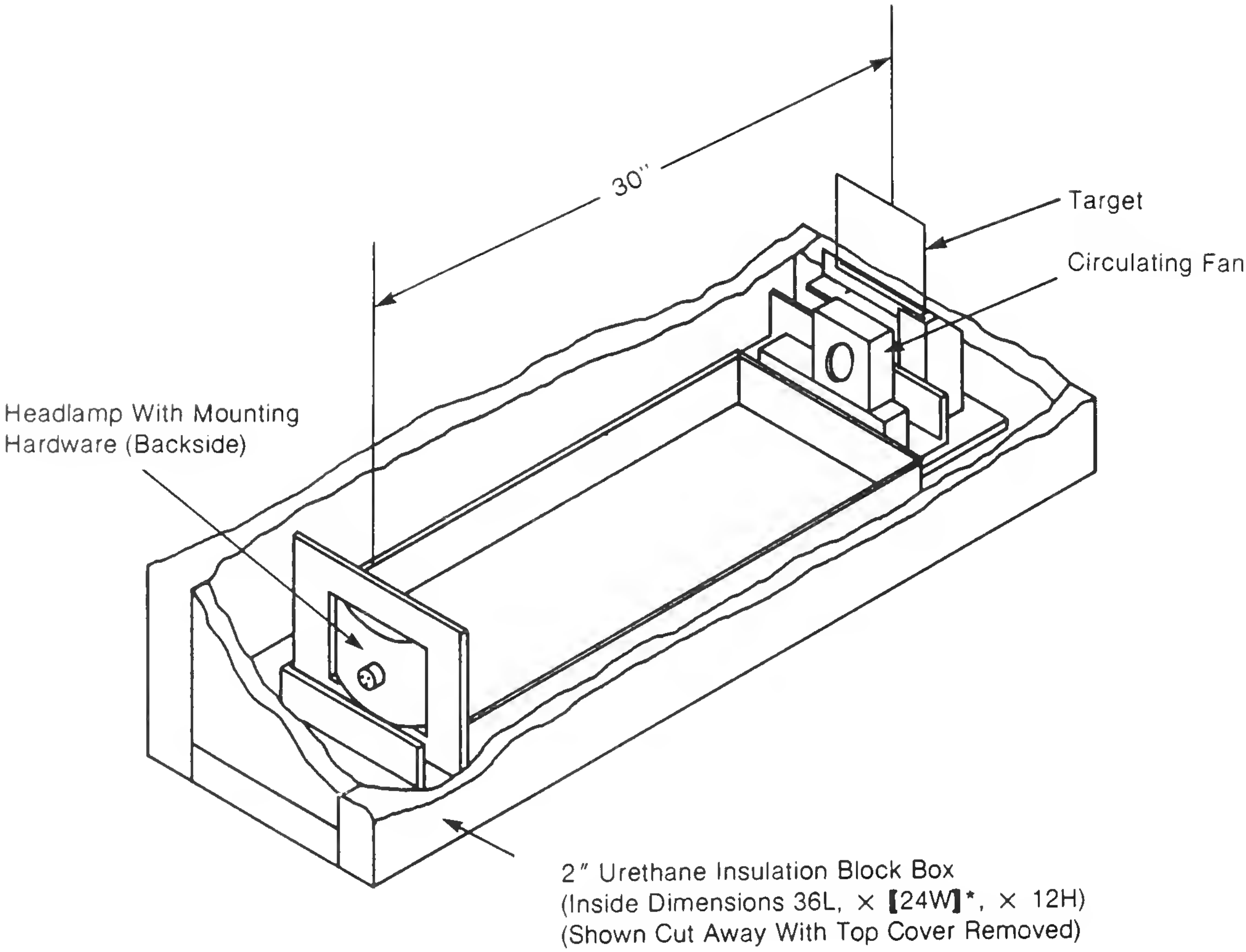
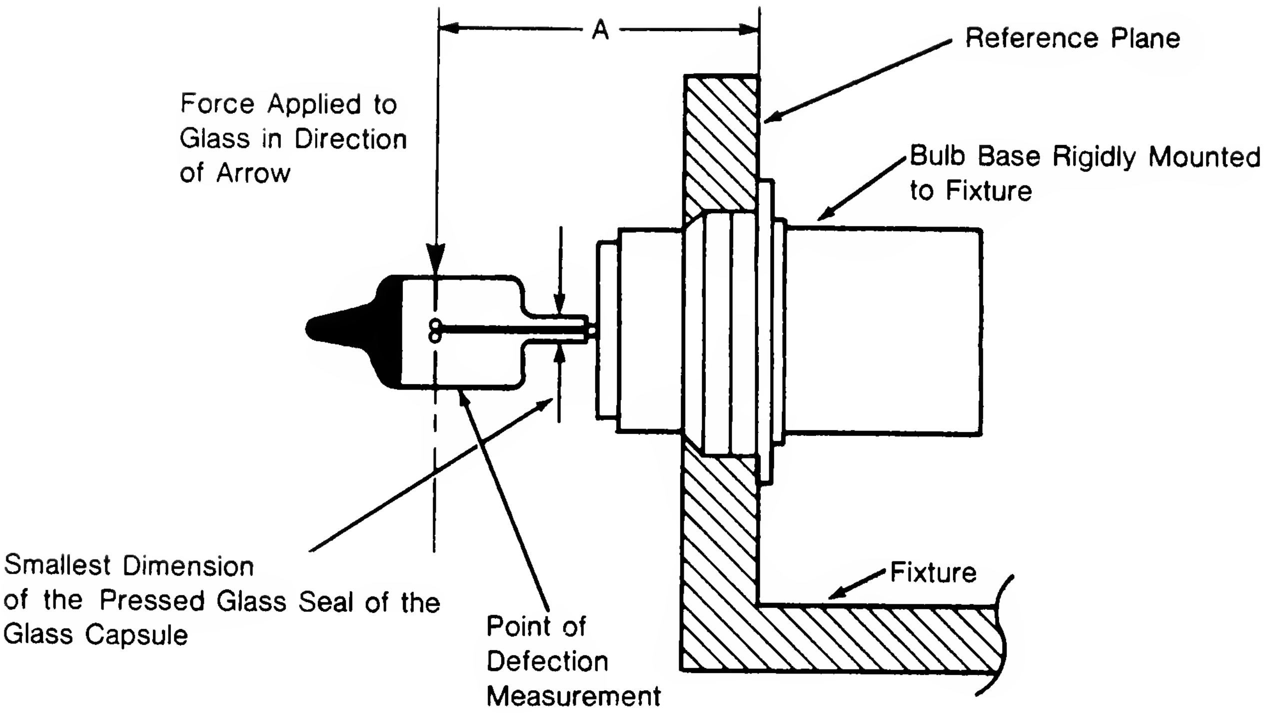


Figure 7. Dirt/Ambient Test Setup

* [50 F.R. 21052—May 22, 1985. Effective: May 15, 1985]



Standardized Replaceable Light Source Type	Dimension "A"
HB1	44.50 ± 0.38 mm (1.75 ± 0.015 in)
[HB2	31.25 ± 0.40 mm (1.23 ± 0.012 in)]
HB3	31.50 ± 0.20 mm (1.24 ± 0.008 in)
HB4	31.50 ± 0.20 mm (1.24 ± 0.008 in)

* [(54 F.R. 27362—June 29, 1989. Effective: July 31, 1989)]

Figure 8 - Bulb Deflection Test

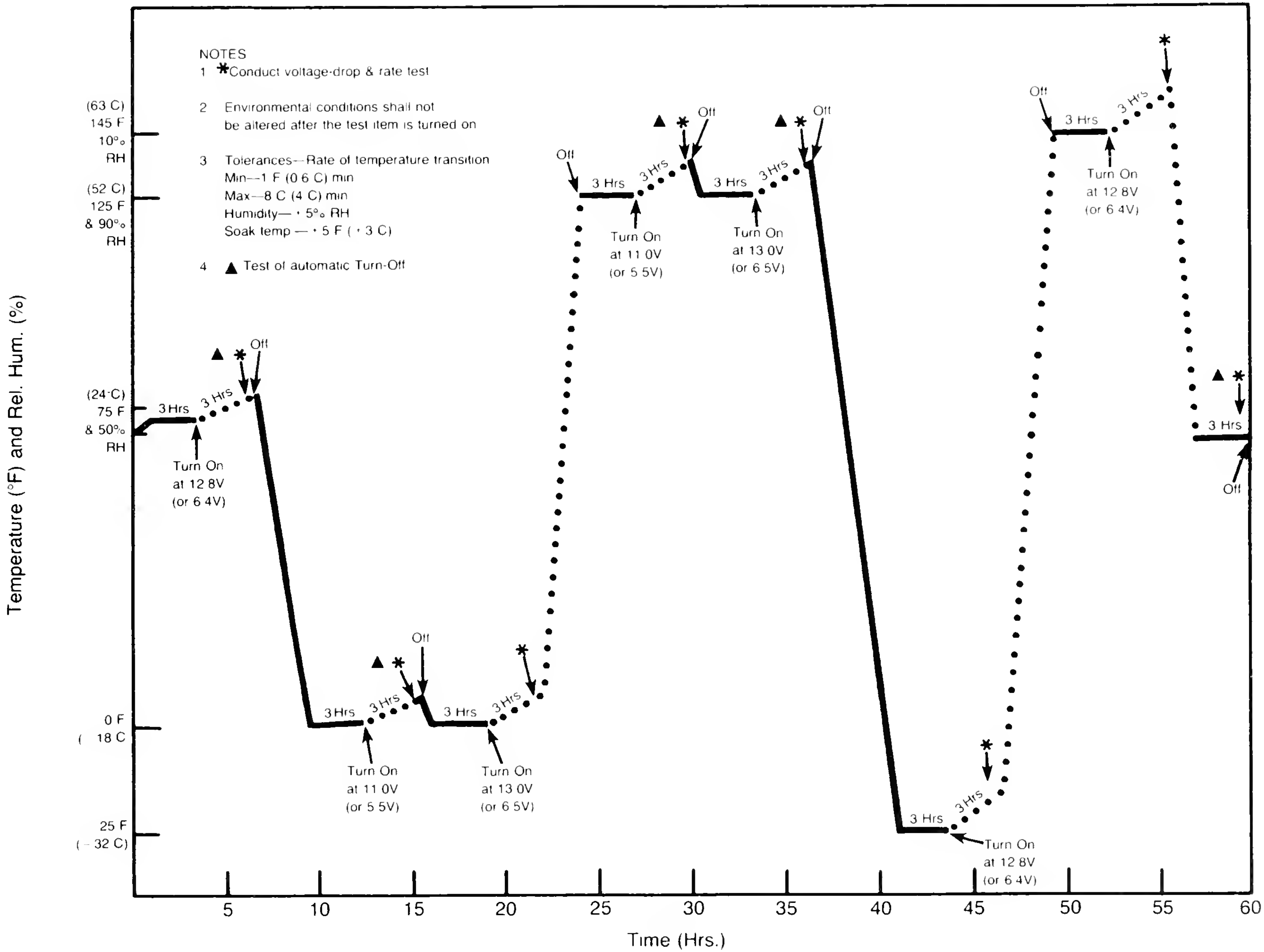
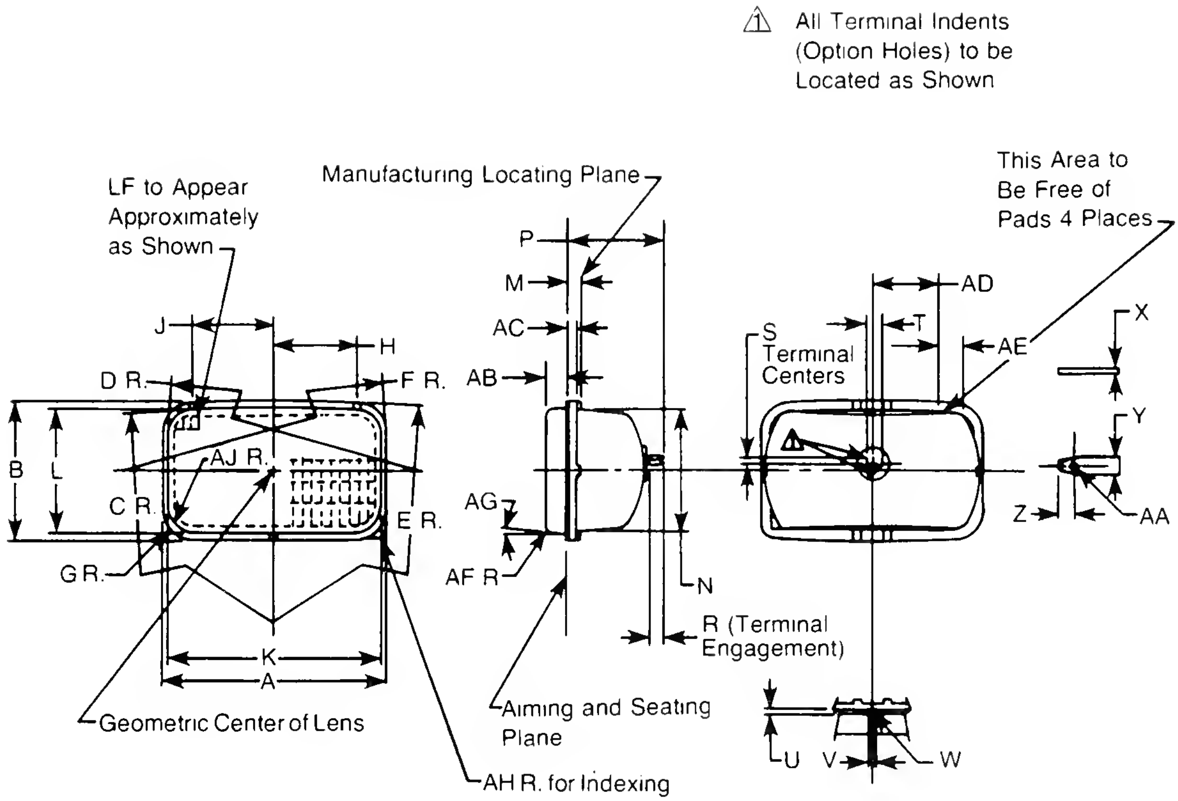


Figure 9. Temperature-Humidity Environmental Test Profile

FIGURE 10—MINIMUM DESIGN PHOTOMETRIC REQUIREMENTS FOR CENTER HIGH-MOUNTED STOP LAMPS

	Test points	Red (cd)
10U	10L	8
	V	16
	10R	8
5U and 5D	10L	16
	5L	25
	V	25
	5R	25
	10R	16
H	5L	25
	V	25
	5R	25
	10R	16
	Maximum 160 [1]	

[1] The lamp shall not exceed the listed maximum over an area larger than that generated by a ¼ degree radius within a solid cone angle from 10L to 10R and from 10U to 5D.



Letter	Inch	MM	Letter	Inch	MM
A	5.93 +.050 −.040	150.50 +1.20 −1.00	R	.41 Min.	10.5 Min.
B	3.64 +.050 −.040	92.50 +1.20 −1.00	S	.15 ± .010	3.8 ± 0.30
C	63.0 ± 3.94	1600.0 ± 100.0	T	.41 ± .010	10.43 ± 0.30
D	23.6 ± 1.97	600.0 ± 50.0	U	.024 Min.	0.60 Min.
E	63.0 ± 3.94	1600.0 ± 100.0	V	.315 Max.	8.0 Max.
F	23.8 ± 1.97	600.0 ± 50.0	W	Radius	Radius
G	.787 ± .010	20.00 ± 0.30	X	.032 ± .002	0.82 ± 0.04
H	2.16 ± .010	55.0 ± 0.30	Y	.110 ± .004	2.80 ± 0.10
J	2.16 ± .010	55.0 ± 0.30	Z	104 ± .010	2.65 ± 0.30
K	5.689 +.008 −.040	144.50 +0.20 −1.00	AA	.051 ± .010 Dia.	1.30 ± 0.30 Dia.
L	3.252 +.008 −.040	82.60 +0.20 −1.00	AB	.54 ± .020	14.3 ± 0.50
M	.46 Max.	11.7 Max.	AC	.295 Max.	7.50 Max.
N	3.19 Max.	81.0 Max.	AD	1.77	45.0
P	2.87 Max.	73.0 Max.	AE	.63	16.0
			AF	.13 ± .02	3.2 ± 0.5
			AG	5° ± 1°	5° ± 1°
			AH	.24 ± .02	6.0 ± 0.5
			AJ	63 Min.	16.0 Min.

Figure 11. Type LF Rectangular Sealed Beam Headlamp Unit

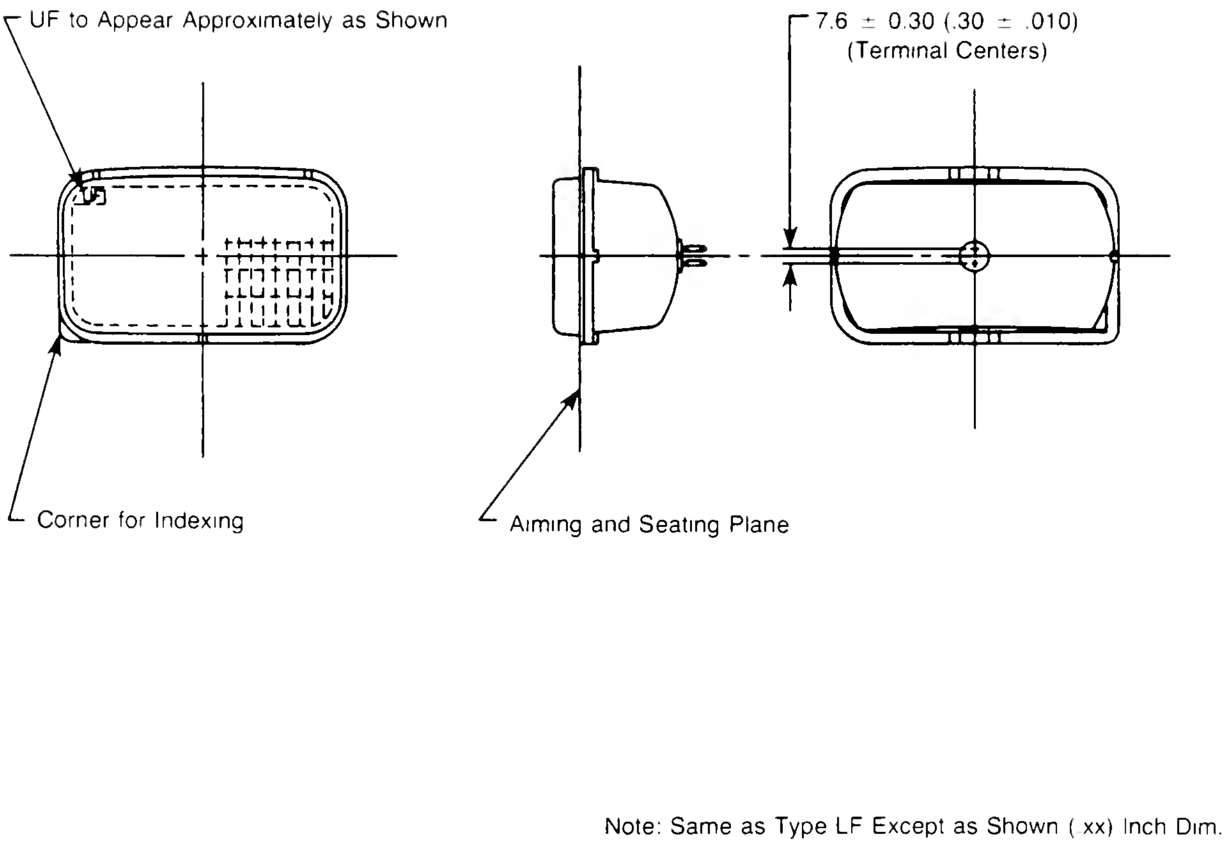
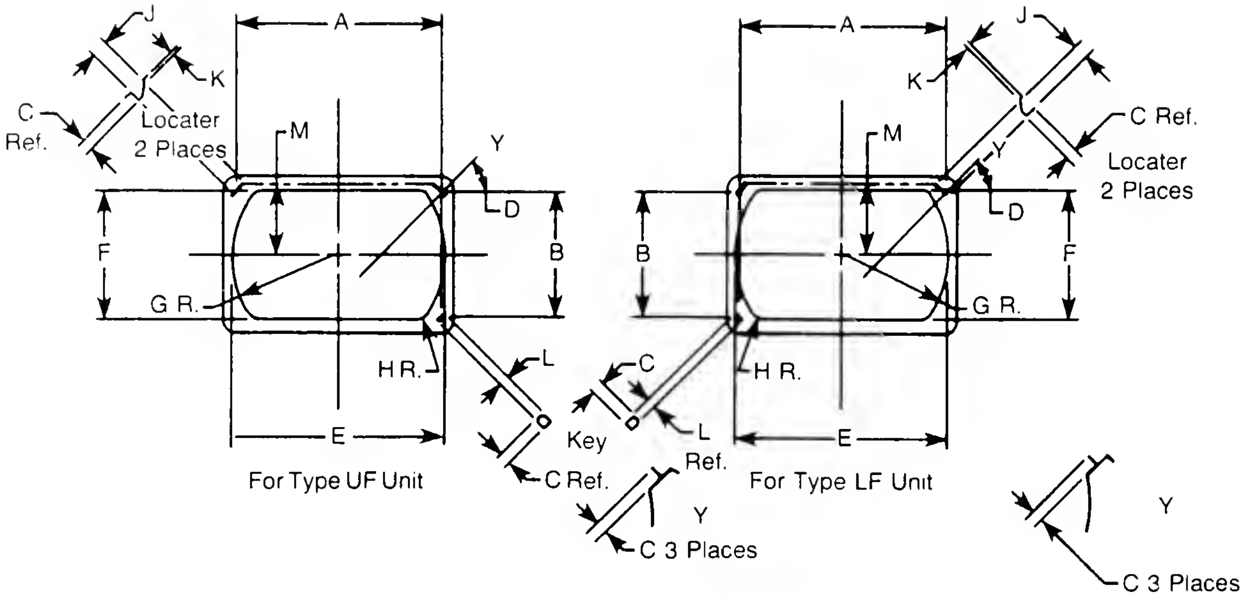


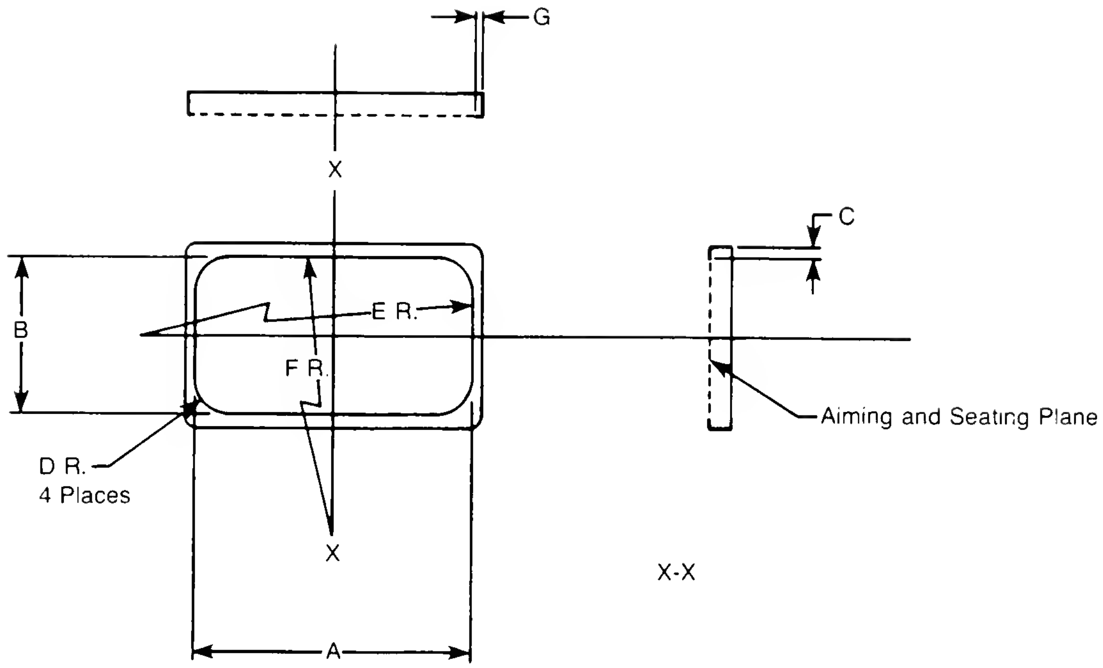
Figure 12. Type UF Rectangular Sealed Beam Headlamp Unit



Mounting Ring

Letter	Inch	MM
A	5.433 $^{+.012}_{-.000}$	138.00 $^{+0.30}_{-0.00}$
B	3.150 $^{+.012}_{-.000}$	80.00 $^{+0.30}_{-0.00}$
C	.315 ± .02	8.0 ±0.5
D	45° 3 Places	45° 3 Places
E	5.63 ± .010	143.0 ± 0.30
F	3.307 ± .010	84.00 ± 0.30
G	2.79 ± .12	71.0 ± 3.0
H	.32 ± .04	8.0 ± 1.0
J	.39 ± .04	10.0 ± 1.0
K	.17 ± .07	4.3 ± 1.7
L	.24 ± .04	6.0 ± 1.0
M	1.823 ± 013	46.30 ± 0.30

Figure 13. Front View of Keys of Locators for Type LF and UF Rectangular Sealed Beam Headlamp Unit Mounting Rings



Aiming Ring

Letter	Inch	MM
A	5.721 ± .006	145.30 ± 0.30
B	3.284 ± .006	83.40 ± 0.30
C	.213 Min.	5.40 Min.
D	.670 Max.	17.00 Max.
E	23.7 ± 2.0	602.2 ± 50.0
F	63.0 ± 3.93	1600.0 ± 100.0
G	.134 Min.	3.40 Min.

Figure 14. Aiming/Seating Ring for Type LF and UF Rectangular Sealed Beam Headlamp Units

UPPER BEAM			LOWER BEAM		
Test Points deg	cd. max.	cd. min.	Test Points deg	cd. max.	cd. min.
2U-V	—	1,500	10U-90U	125	—
1U-3R and 3L	—	5,000	1U-1-1/2L to L	700	—
H-V	70,000	40,000	1/2U-1-1/2L to L	1,000	—
			1/2D-1-1/2L to L	3,000	—
H-3R and 3L	—	15,000			
H-6R and 6L	—	5,000	1/2U-1R to 3R	2,700	—
H-9R and 9L	—	3,000	1/2D-1-1/2R	20,000	10,000
H-12R and 12L	—	1,500	1D-6L	—	1,000
			1-1/2D-2R	—	15,000
1-1/2D-V	—	5,000	1-1/2D-9L and 9R	—	1,000
1-1/2D-9R and 9L	—	2,000	2D-15L and 15R	—	850
2-1/2D-V	—	2,500	4D-4R	12,500	—
2-1/2D-12R and 12L	—	1,000			
4D-V	5,000	—	4D-V	7,000	—
			H-V	5,000	—

Figure 15. Photometric Test Point Values

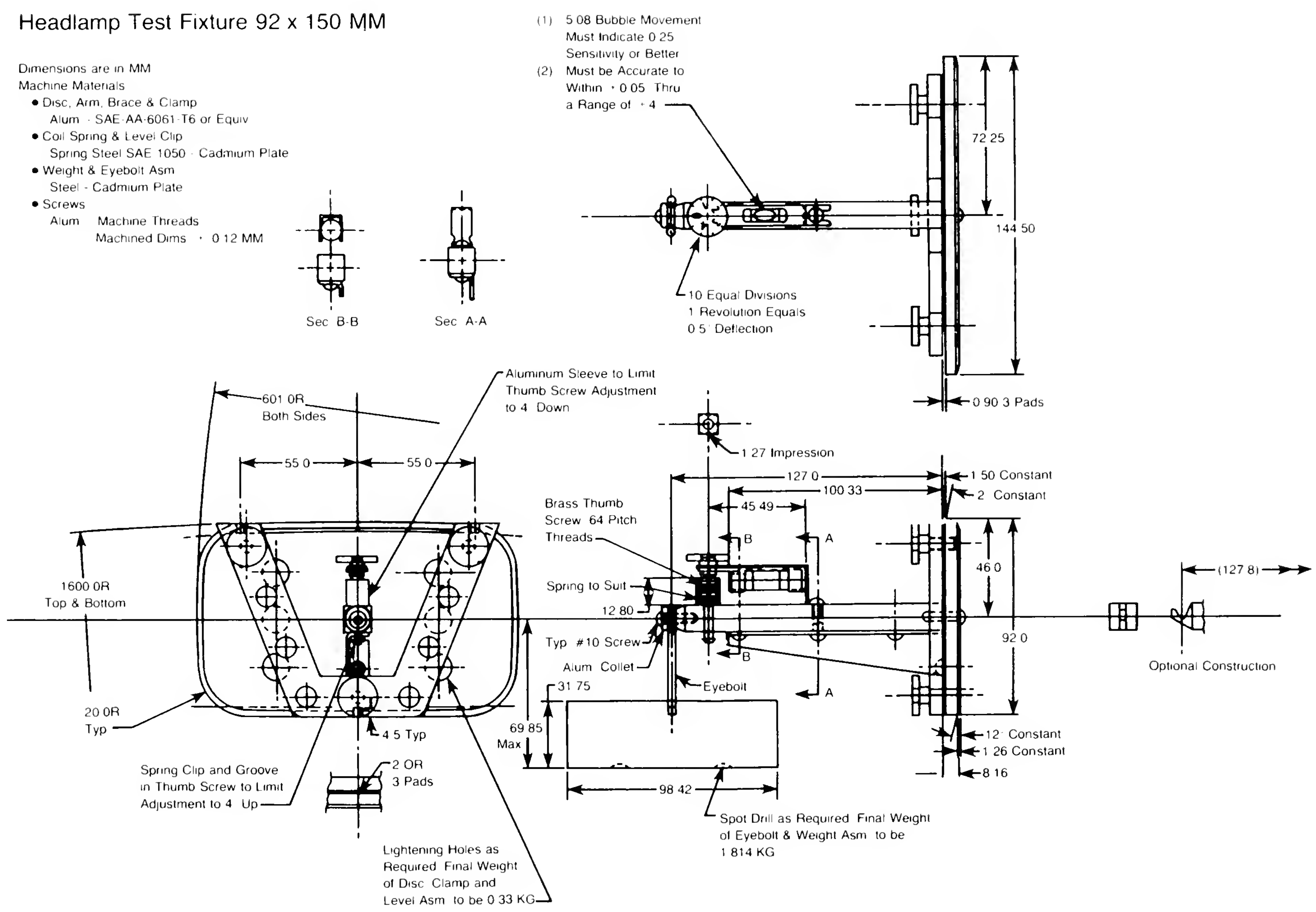
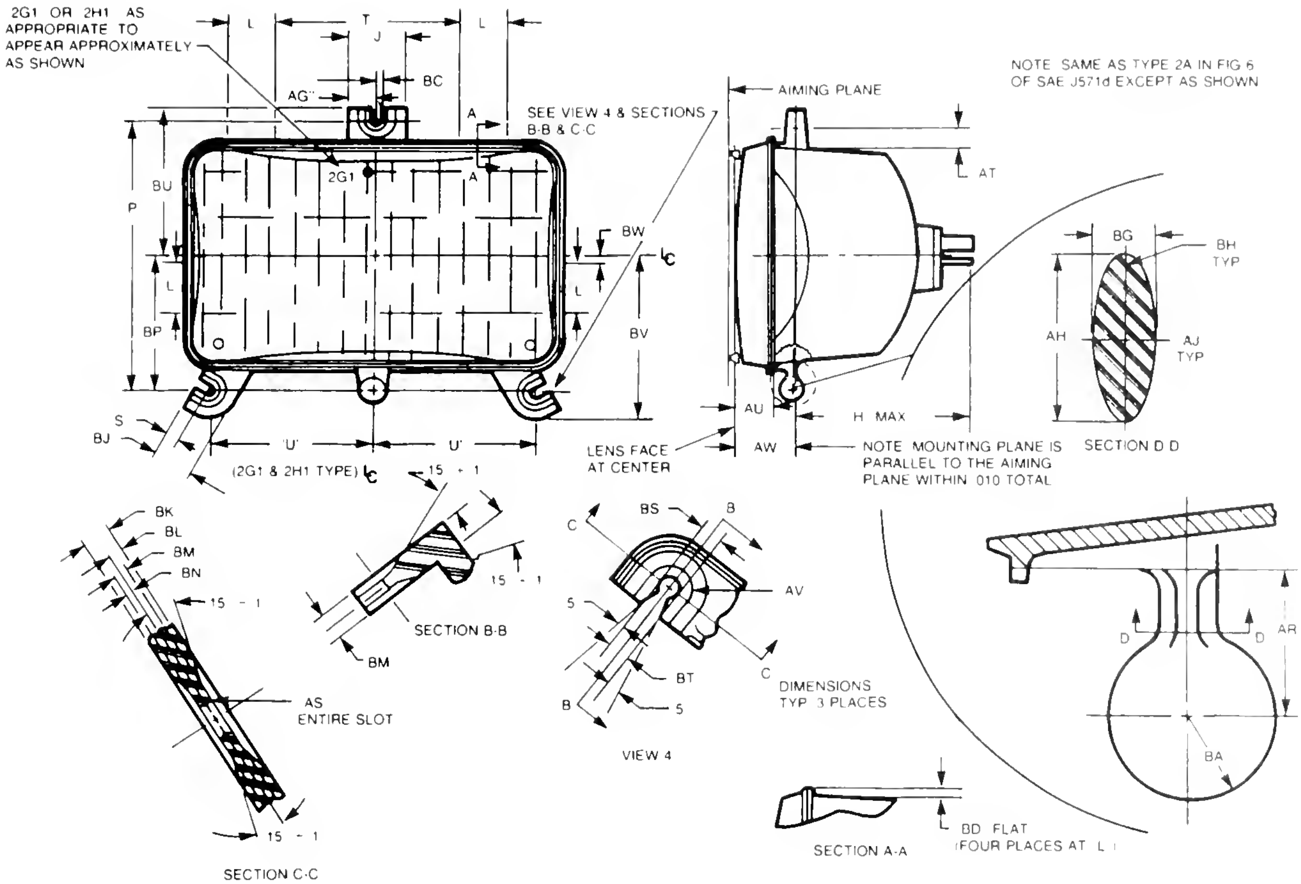


Figure 16. Deflectometer

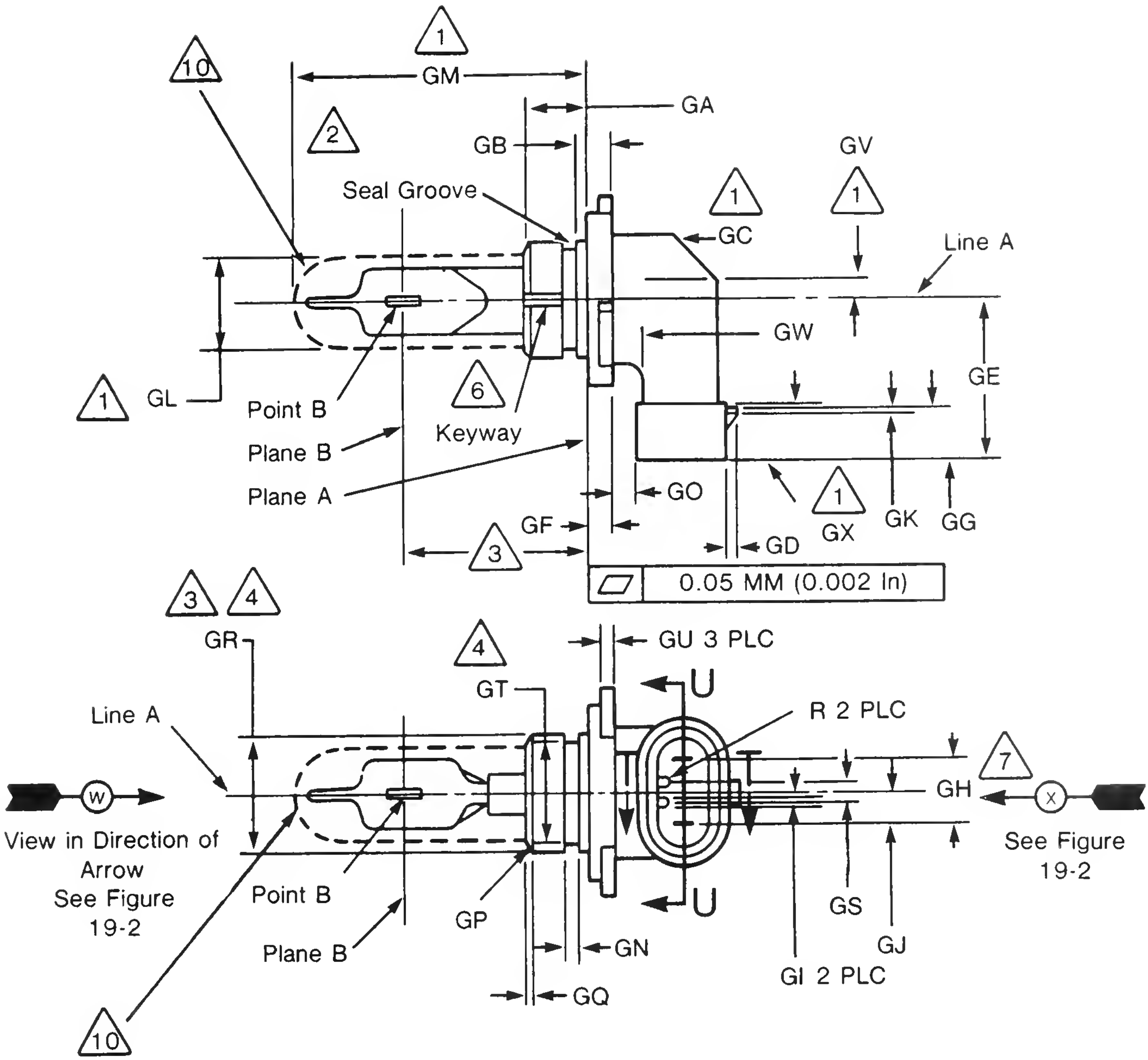
Upper Beam			Lower Beam		
Test Points deg	cd max.	cd min.	Test Points deg	cd max.	cd min.
2U-V	—	1,500	1OU-9OU	125	—
1U-3R and 3L	—	5,000	1U-1-1/2L to L	700	—
H-V	75,000	40,000	1/2U-1-1/2L to L	1,000	—
			1/2D-1-1/2L to L	3,000	—
			1-1/2U-1R to R	1,400	—
H-3R and 3L	—	15,000			
H-6R and 6L	—	5,000	1/2U-1R to 3R	2,700	—
H-9R and 9L	—	3,000	1/2D-1-1/2R	20,000	10,000
H-12R and 12L	—	1,500	1D-6L	—	1,000
			1-1/2D-2R	—	15,000
1-1/2D-V	—	5,000	1-1/2D-9L and 9R	—	1,000
1-1/2D-9R and 9L	—	2,000	2D-15L and 15R	—	850
2-1/2D-V	—	2,500	4D-4R	12,500	—
2-1/2D-12R and 12L	—	1,000			
4D-V	12,000	—			

Figure 17 - Photometric Test Point Values (2-Lamp Systems)



LETTER	IN	mm	LETTER	IN	mm
H MAX	3 499 ± 0 015	88 868 ± 0 381	BA	0 220 SPHER R	5 59 SPER R
J	1 00 ± 0 015	25.40 ± 0 381	BC	0 197 ± 0 005	5 004 ± 0 127
L	1 25 MIN	31 75	BD	0 040 MIN	1 016 MIN
P	4 80 ± 0 026	121 92 ± 0 660	BG	0 150 ± 0 010	3 81 ± 0 254
S	0 250 ± 0 005	6 35 ± 0 127	BH	0 032R	0 813R
T	2 26 ± 0 01	57 40 ± 0 25	BJ	0 720 ± 0 015	18 288 ± 0 381
U	2 82 ± 0 015	71 63 ± 0 381	BK	0 125 ± 0 005	3 175 ± 0 127
AG	0 500 ± 0 01	12 70 ± 0 25	BL	0 062 ± 0 005	1 575 ± 0 127
AH	0 410 ± 0.010	10 414 ± 0 254	BM	0 064 ± 0 004	1 62 ± 0 102
AJ	0 42 ± 0 010	10 668 ± 0 254	BN	0 032 ± 0 004	0 813 ± 0 102
AR	0 37 MIN	9 40 MIN	BP	2 45 ± 0 015	62 23 ± 0 381
AS	0 03R + 0 0 -0 03	0 76R + 0 0 -0 76	BS	0 178,0 181 DIA	4 521, 4.597 DIA
AT	0 230 MIN	5 84 MIN	BT	0 174, 0 176	4 420, 4 470
AU	0 66 ± 0 040	16 76 ± 1 02	BU	2 73 ± 0 015	69 342 ± 0 381
AV	0 20 ± 0 01R	5 08 ± 0 254	BV	2 980 ± 0 015	75 692 ± 0 381
AW	1 100 ± 0 040	27 94 ± 1 02	BW	0 160 ± 0 01	4 06 ± 0 25

Figure 18 — Dimensional Specifications for Integral Mount Sealed Beam Headlamps, Types G and H



(Also see continuation page)

Figure 19 - Specifications for the Type HB3 Standardized Replaceable Light Source

Dimension	Inches	Millimetres
GA	0.591 Max / 0.217 Min	15.00 Max / 5.50 Min
GB	0.236	6.00
GC	45°	45°
GD	0.079	2.00
GE	1.09	27.8
GF	0.165	4.20
GG	0.346	8.80
GH	0.433	11.00
GI	0.055	1.40
GJ	0.217 ± 0.006	5.50 ± 0.15
GK	0.06	1.5
GL	0.775 Dia	19.68 Dia
GM	2.165	55.00
GN	0.093	2.36
GO	0.157	4.00
GP	45° Chamfer	45° Chamfer
GQ	0.039	1.00
GR	0.787 ± 0.002 Dia	22.00 ± 0.05 Dia
GS	0.138	3.50
GT	$0.687 \begin{smallmatrix}+0.004 \\ -0.000\end{smallmatrix}$ Dia	$17.46 \begin{smallmatrix}+0.10 \\ -0.00\end{smallmatrix}$ Dia
GU	0.079	2.00
GV	0.138	3.5
GW	0.209 Min	5.30 Min
GX	0.378	9.60

1 Dimensions Shown Are Maximum-May Be Smaller

2 Bulbs Must Be Equipped With a Seal. The Bulb-Seal Assembly Must Withstand a Minimum of 69kPA. (10 P.S.I G.) When the Assembly Is Inserted into a Cylindrical Aperture of 22 22 ± 0.10 MM (0.875 ± 0.004 IN)

3 See Figure 20-5

4 Diameters Must Be Concentric Within 0.20 MM (0 008 IN).

5 Glass Bulb Periphery Must Be Optically Distortion Free Axially Within the Included Angles About Point B

6 Key and Keyway Are Optional Construction. Keyway Required for Aftermarket Only.

7 Measured at Terminal Base. Terminals Must Be Perpendicular to Base and Parallel Within ± 1 5°

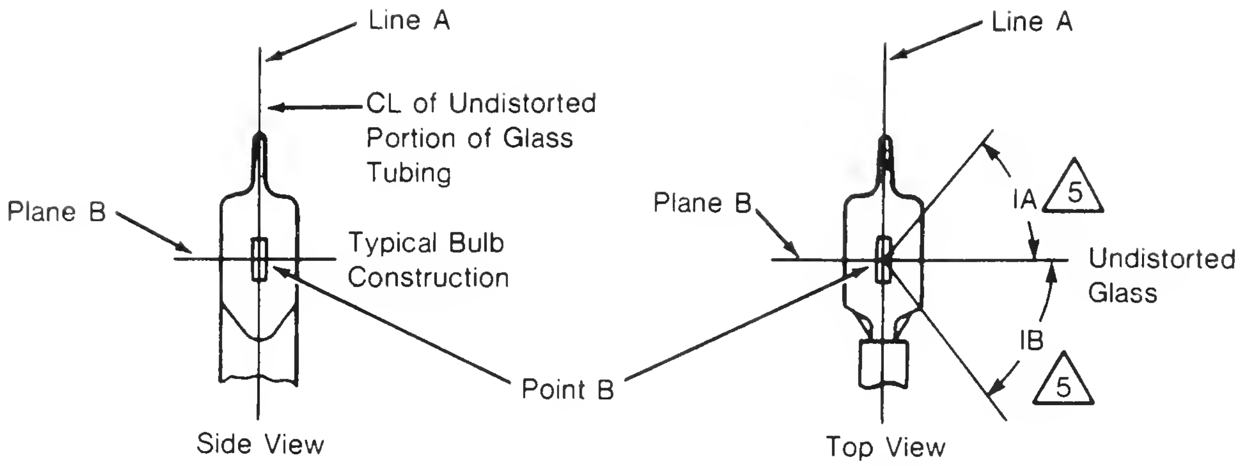
8 Diameters Must Be Concentric Within 0 20 MM (0 008 IN)

9 Absolute Dimension, No Tolerance

10 Glass Capsule and Supports Shall Not Exceed This Envelope

Tolerances Unless Otherwise Specified	
Inches 2 Place Decimals ± 02 3 Place Decimals ± 010 Angular ± 1°	Millimetres 1 Place Decimals ± 0.5 2 Place Decimals ± 0.30 Angular ± 1°

Figure 19 - (Continued) Specifications for the Type HB3 Standardized Replaceable Light Source



Point B Is Intersection of Plane B and Centerline of Undistorted Glass Tubing

Dimension	Inches	Millimetres
IA	45° Min	45° Min
IB	52° Min	52° Min

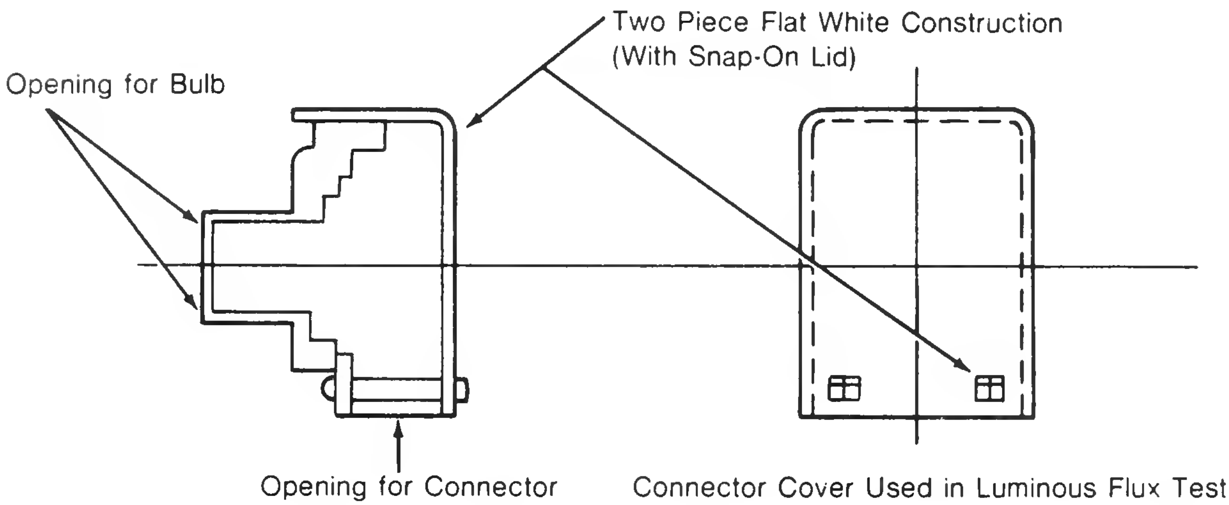
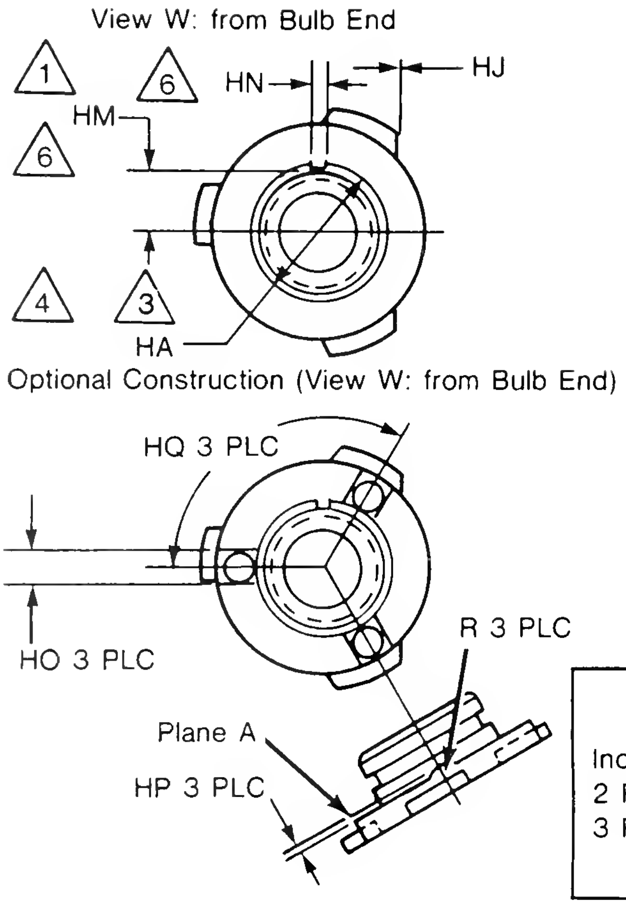
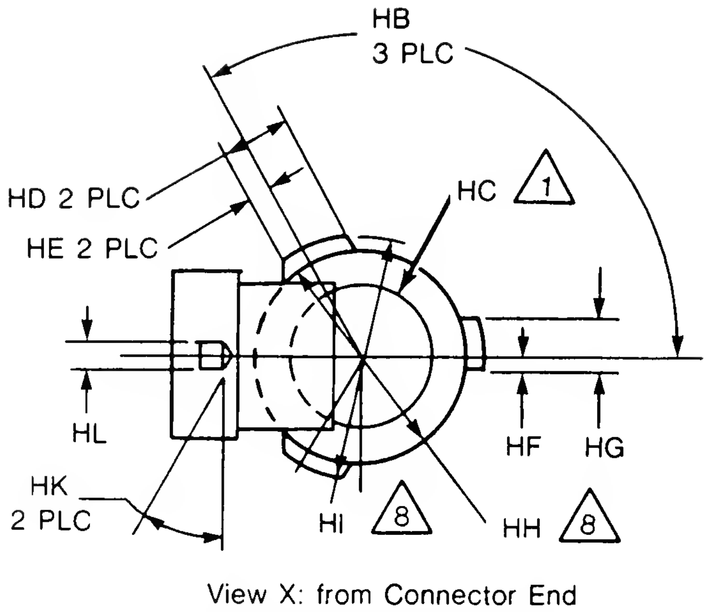


Figure 19-1 - Specifications for the Type HB3 Standardized Replaceable Light Source

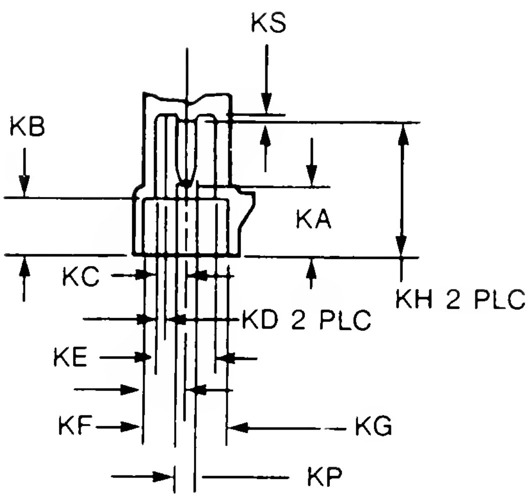




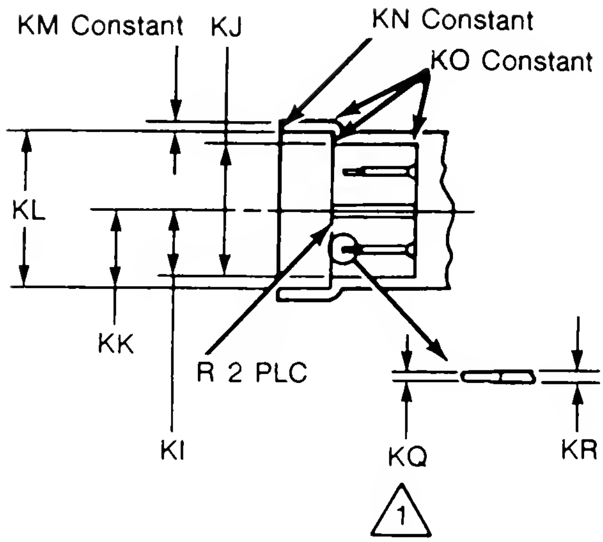
Tolerances Unless Otherwise Specified	
Inches	Millimetres
2 Place Decimals ± 0.02	1 Place Decimals ± 0.5
3 Place Decimals ± 0.010	2 Place Decimals ± 0.30
Angular ± 1°	Angular ± 1°

Dimensions	Inches	Millimetres
HA	0.787 ±0.002 Dia	20.00 ±0.05 Dia
HB	120°±0°30	120°±0°30
HC	0.866 Dia	22.00 Dia
HD	0.394	10.00
HE	0.118	3.00
HF	0.079	2.00
HG	0.315	8.00
HH	1.181 Dia	30.00 Dia
HI	1.417 Dia	36.00 Dia
HJ	3°	3°
HK	30°	30°
HL	0.157	4.00
HM	0.35	8.9
HN	0.079 ±0.004	2.00 ±0.10
HO	0.20	5.0
HP	0.030	0.75
HQ	120° Typ	120° Typ

Figure 19-2 - Specifications for the Type HB3 Standardized Replaceable Light Source



Section T-T (from Fig 19)

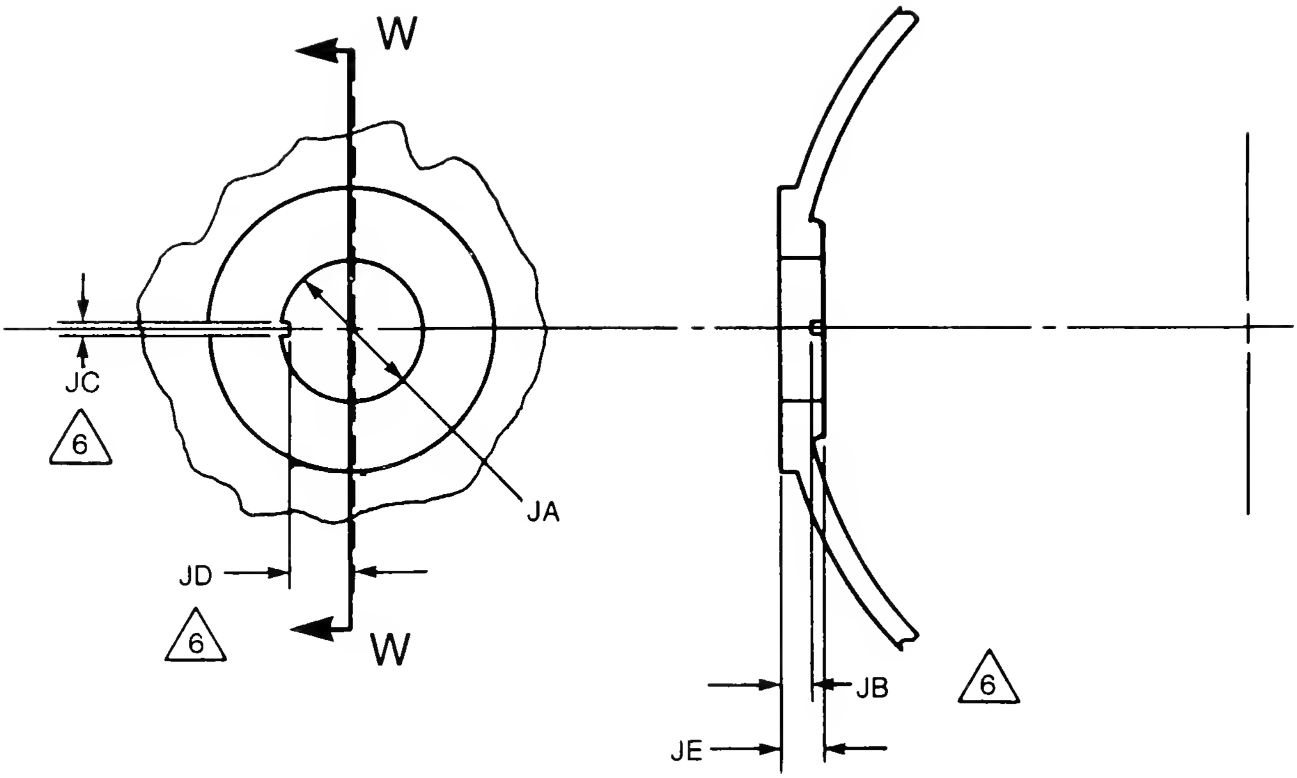


Section U-U (from Fig 19)

Dimensions	Inches	Millimetres
KA	0.384	9.75
KB	0.315	8.00
KC	0.171	4.35
KD	0.055	1.40
KE	0.343	8.70
KF	0.242 ±0.006	6.15 ±0.15
KG	0.484	12.30
KH	0.748	19.00
KI	0.368 ±0.006	9.35 ±0.15
KJ	0.736	18.70
KK	0.439 ±0.006	11.15 ±0.15
KL	0.878	22.30
KM	0.059	1.50
KN	0.03 R	0.8 R
KO	0.016 R	0.40 R
KP	0.110 ±0.004	2.8 ±0.10
KQ	0.024	0.60
KR	0.033 ±0.001	0.83 ±0.03
KS	0.039 Min	1.00 Min

Tolerances Unless Otherwise Specified	
Inches	Millimetres
2 Place Decimals ± 0.02	1 Place Decimals ± 0.5
3 Place Decimals ± 0.010	2 Place Decimals ± 0.30
Angular ± 1°	Angular ± 1°

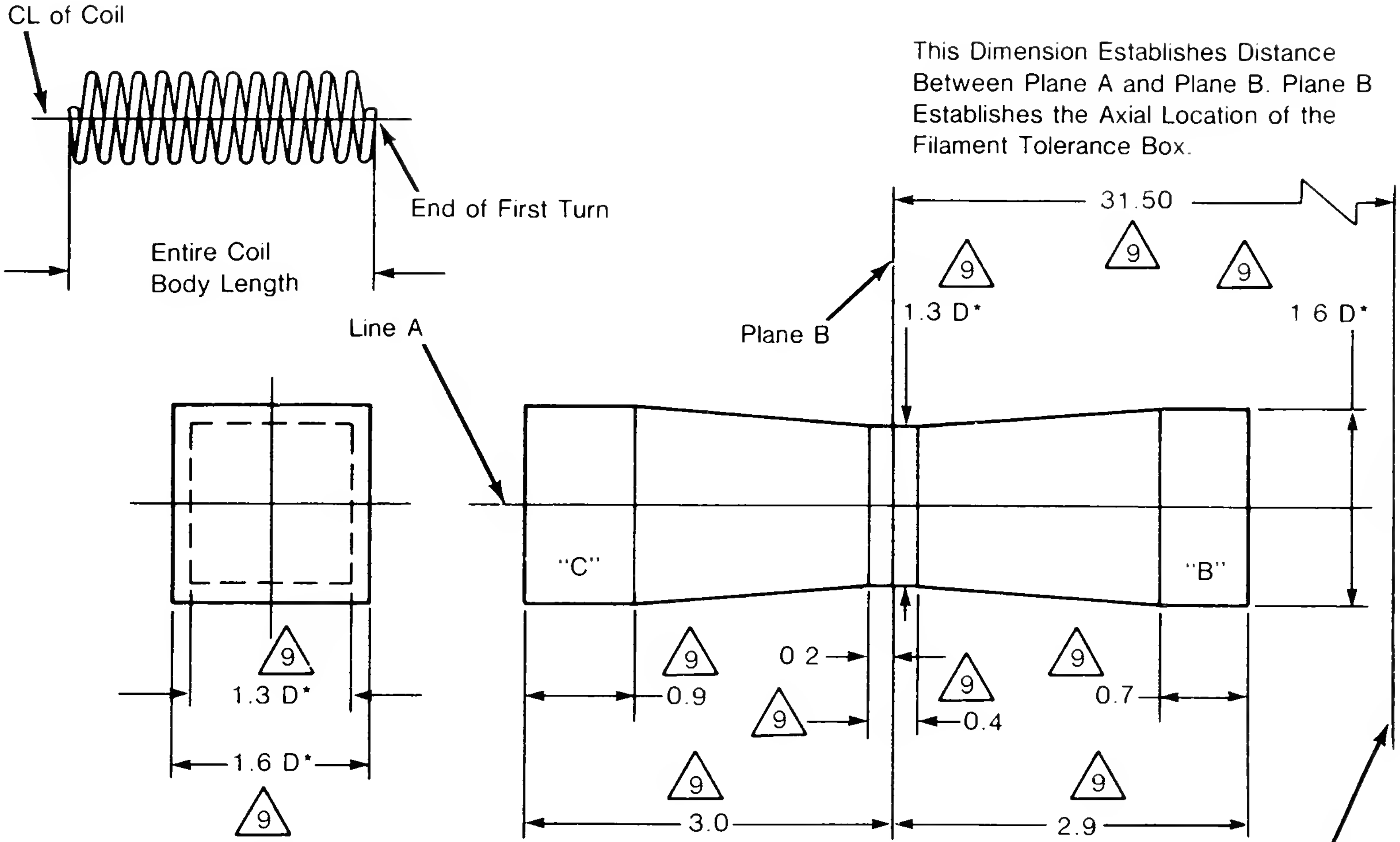
Figure 19-3 - Specifications for the Type HB3 Standardized Replaceable Light Source



Section W-W

Dimensions	Inches	Millimetres
JA	0.796 ± 0.004 Dia	20.22 ± 0.10 Dia
JB	0.172 +0.010 −0.000	4.36 +0.30 −0.00
JC	0.067 ±0.004 +0.004	1.70 ±0.10 +0.10
JD	0.352 −0.000	8.95 −0.00
JE	0.236 Min	6.00 Min

Figure 19-4 - Specifications for the Type HB3 Standardized Replaceable Light Source Socket (in Reflector)

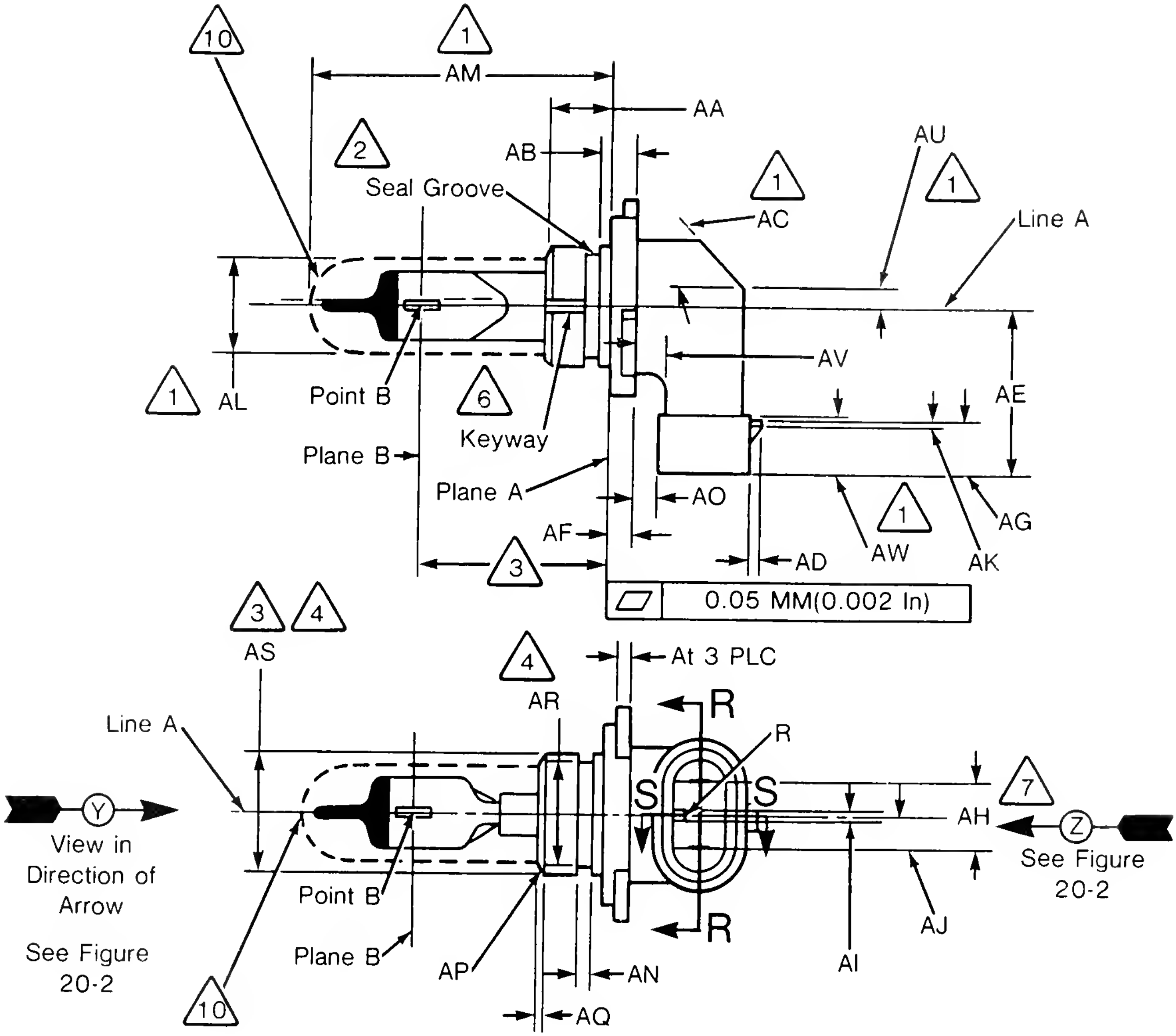


Plane B Is Parallel to Plane A.
The Entire Coil Body at Design Volts (12.8) Must Be Contained Within the Volume as Specified. The End of the First Turn of the Coil Must Lie Within Volume "B" and The End of the Last Turn of the Coil Must Lie Within Volume "C".
Line A Is Perpendicular to Plane A and Concentric with the 17.46 MM Diameter of the Base.

*D = Diameter of Filament Coil

Dimensions Shown Are in Millimetres

Figure 19-5 - Specifications for the Type HB3 Standardized Replaceable Light Source



(Also see continuation page)

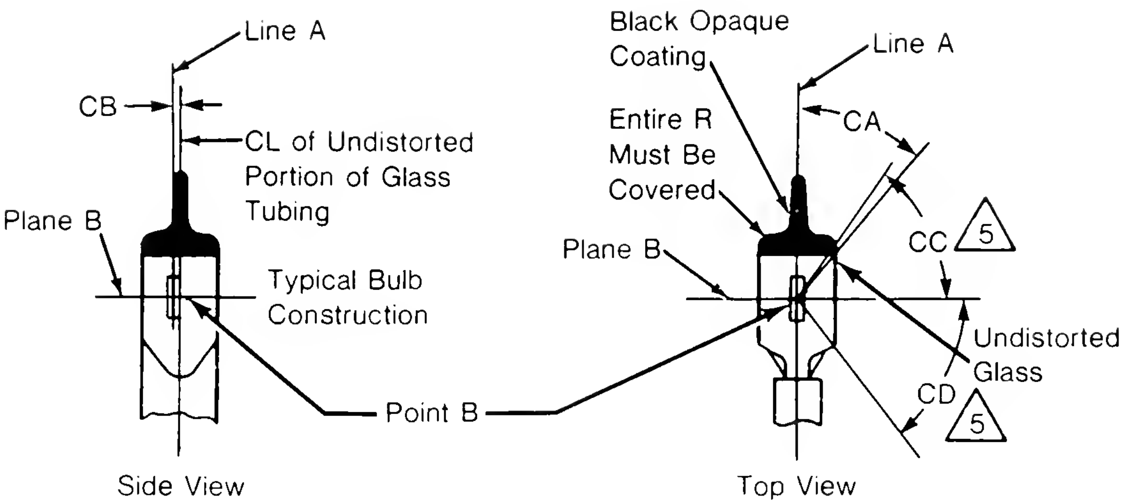
Figure 20 - Specifications for the Type HB4 Standardized Replaceable Light Source

Dimension	Inches	Millimetres
AA	0.591 Max / 0.217 Min	15.00 Max / 5.50 Min
AB	0.236	6.00
AC	45°	45°
AD	0.079	2.00
AE	1.09	27.8
AF	0.165	4.20
AG	0.346	8.80
AH	0.433	11.00
AI	0.055	1.40
AJ	0.217 ± 0.006	5.50 ± 0.15
AK	0.06	1.5
AL	0.780 Dia	19.81 Dia
AM	2.165	55.00
AN	0.093	2.36
AO	0.157	4.00
AP	45° Chamfer	45° Chamfer
AQ	0.039	1.00
AR	$0.766 \begin{matrix}+0.004 \\ -0.000\end{matrix}$ Dia	$19.46 \begin{matrix}+0.10 \\ -0.00\end{matrix}$ Dia
AS	0.866 ± 0.002 Dia	22.00 ± 0.05 Dia
AT	0.079	2.00
AU	0.138	3.5
AV	0.209 Min	5.30 Min
AW	0.378	9.60

1. Dimensions Shown Are Maximum-May Be Smaller
2. Bulbs Must Be Equipped With a Seal. The Bulb-Seal Assembly Must Withstand a Minimum of 69kPA (10 P S I G) When the Assembly Is Inserted into a Cylindrical Aperture of 22 22 ± 0 10 MM (0 875 ± 0 004 IN)
3. See Figure 20-5
4. Diameters Must Be Concentric Within 0 20 MM (0 008 IN)
5. Glass Bulb Periphery Must Be Optically Distortion Free Axially Within the Included Angles About Point B
6. Key and Keyway Are Optional Construction Keyway Required for Aftermarket Only
7. Measured at Terminal Base Terminals Must Be Perpendicular to Base and Parallel Within ± 1 5°
8. Diameters Must Be Concentric Within 0 20 MM (0 008 IN)
9. Absolute Dimension No Tolerance
10. Glass Capsule and Supports Shall Not Exceed This Envelope

Tolerances Unless Otherwise Specified	
Inches	Millimetres
2 Place Decimals ± 02	1 Place Decimals ± 0 5
3 Place Decimals ± 010	2 Place Decimals ± 0 30
Angular ± 1°	Angular ± 1°

Figure 20 - (Continued) Specifications for the Type HB4 Standardized Replaceable Light Source



Point B Is Intersection of Plane B and Centerline of Undistorted Glass Tubing

Dimension	Inches	Millimetres
CA	45° ± 5°	45° ± 5°
CB	0.030 ± 0.020	0.75 ± 0.50
CC	50° Min	50° Min
CD	52° Min	52° Min

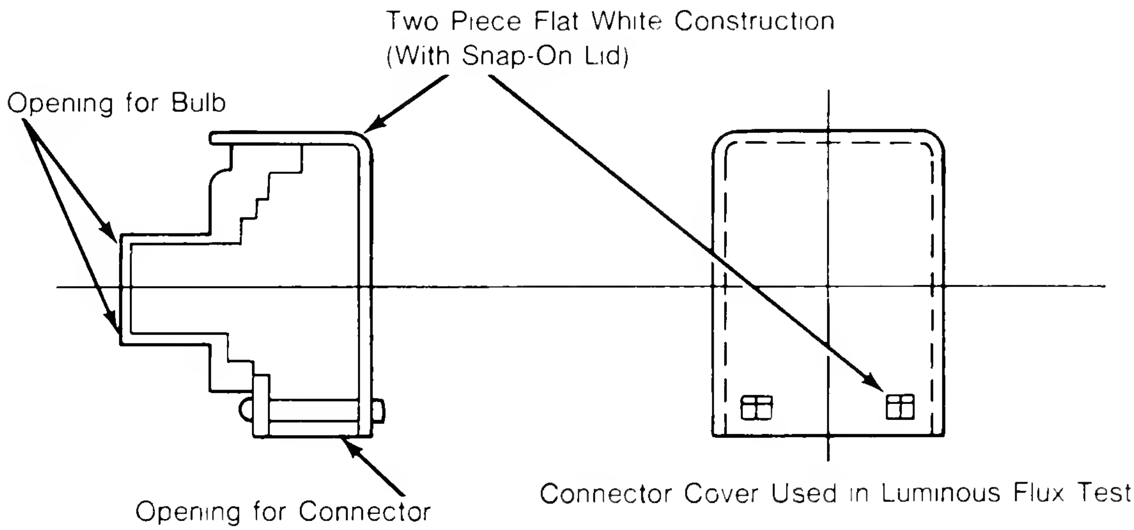
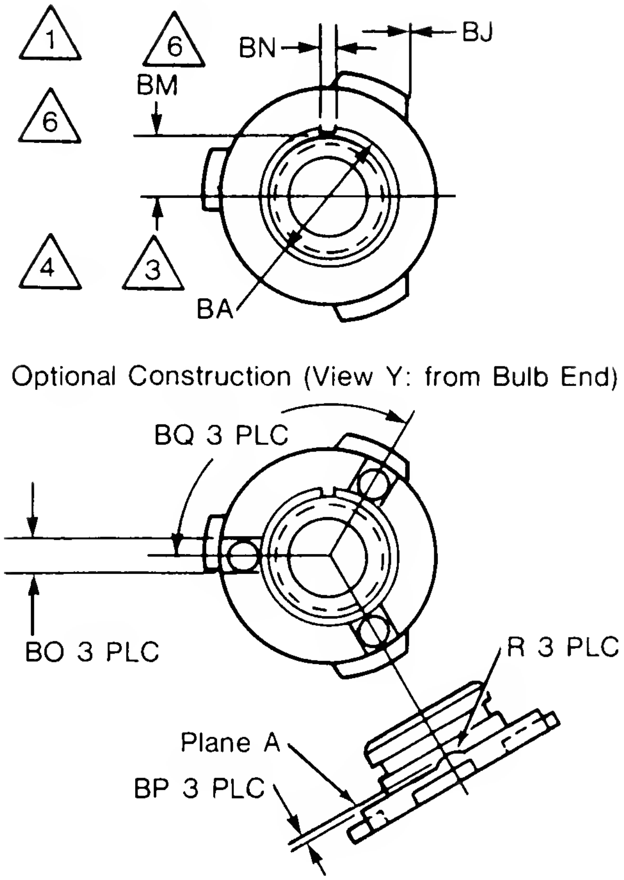
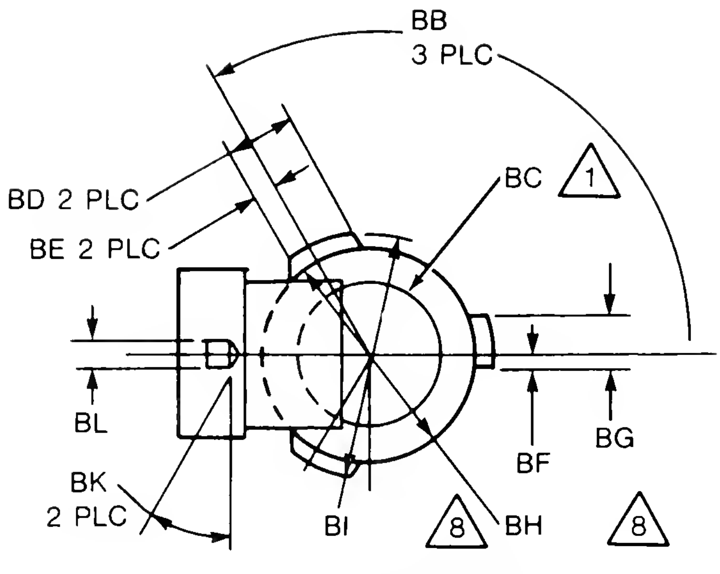


Figure 20-1 - Specifications for the Type HB4 Standardized Replaceable Light Source

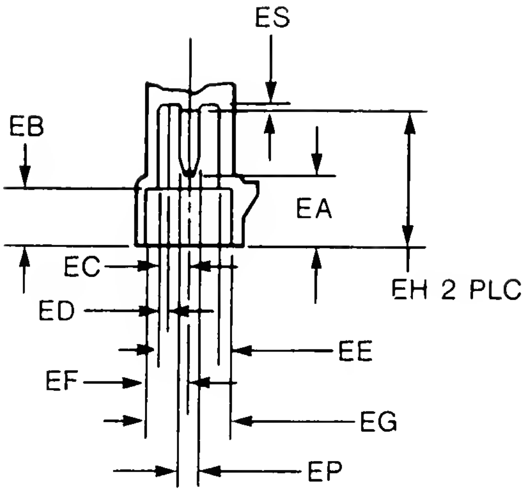




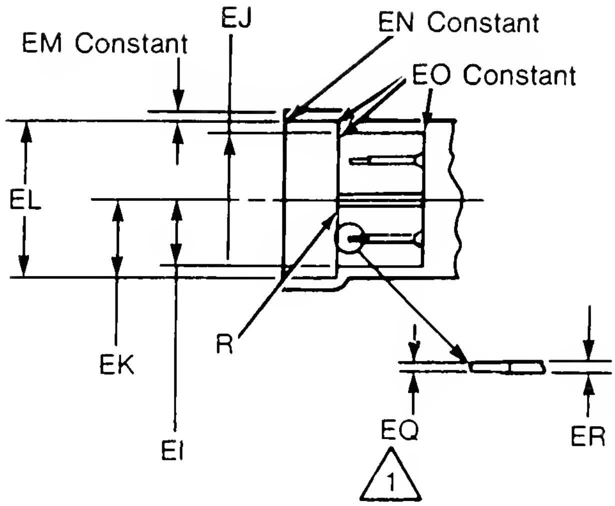
Tolerances Unless Otherwise Specified	
Inches	Millimetres
2 Place Decimals ± 0.02	1 Place Decimals ± 0.5
3 Place Decimals ± 0.010	2 Place Decimals ± 0.30
Angular ± 1°	Angular ± 1°

Dimensions	Inches	Millimetres
BA	0.866 ±0.002 Dia	22.00 ±0.05 Dia
BB	120°±0°30	120°±0°30
BC	0.866 Dia	22.00 Dia
BD	0.394	10.00
BE	0.118	3.00
BF	0.079	2.00
BG	0.315	8.00
BH	1.181 Dia	30.00 Dia
BI	1.417 Dia	36.00 Dia
BJ	3°	3°
BK	30°	30°
BL	0.157	4.00
BM	0.39	9.9
BN	0.079 ±0.004	2.00 ±0.10
BO	0.20	5.0
BP	0.030	0.75
BQ	120° Typ	120° Typ

Figure 20-2 - Specifications for the Type HB4 Standardized Replaceable Light Source



Section S-S (from Fig 20)

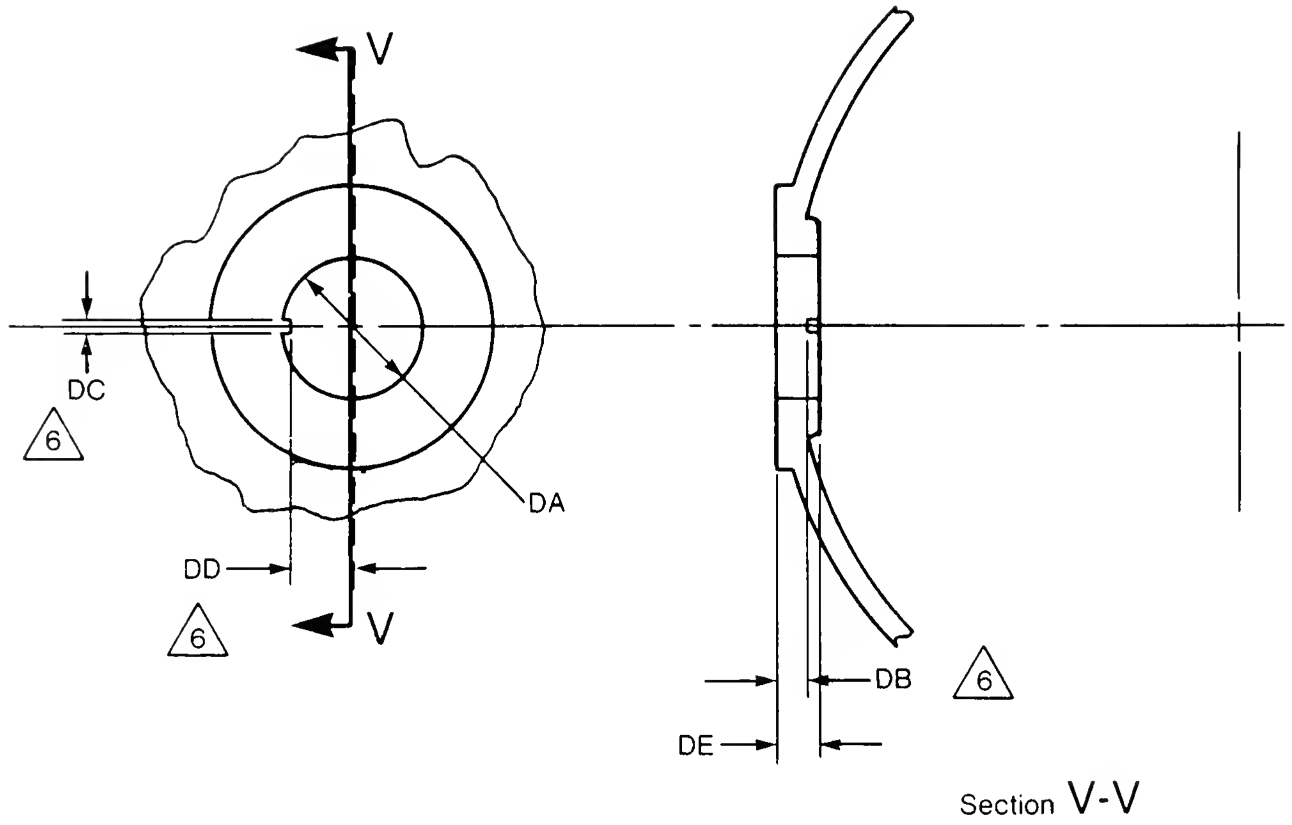


Section R-R (From Fig 20)

Dimensions	Inches	Millimetres
EA	0.384	9.75
EB	0.315	8.00
EC	0.171	4.35
ED	0.079	2.00
EE	0.343	8.70
EF	0.242 ±0.006	6.15 ±0.15
EG	0.484	12.30
EH	0.748	19.00
EI	0.368 ±0.006	9.35 ±0.15
EJ	0.736	18.70
EK	0.439 ±0.006	11.15 ±0.15
EL	0.878	22.30
EM	0.059	1.50
EN	0.03 R	0.8 R
EO	0.016 R	0.40 R
EP	0.110 ±0.004	2.8 ±0.10)
EQ	0.024	0.60
ER	0.033 ±0.001	0.83 ±0.03
ES	0.039 Min	1.00 Min

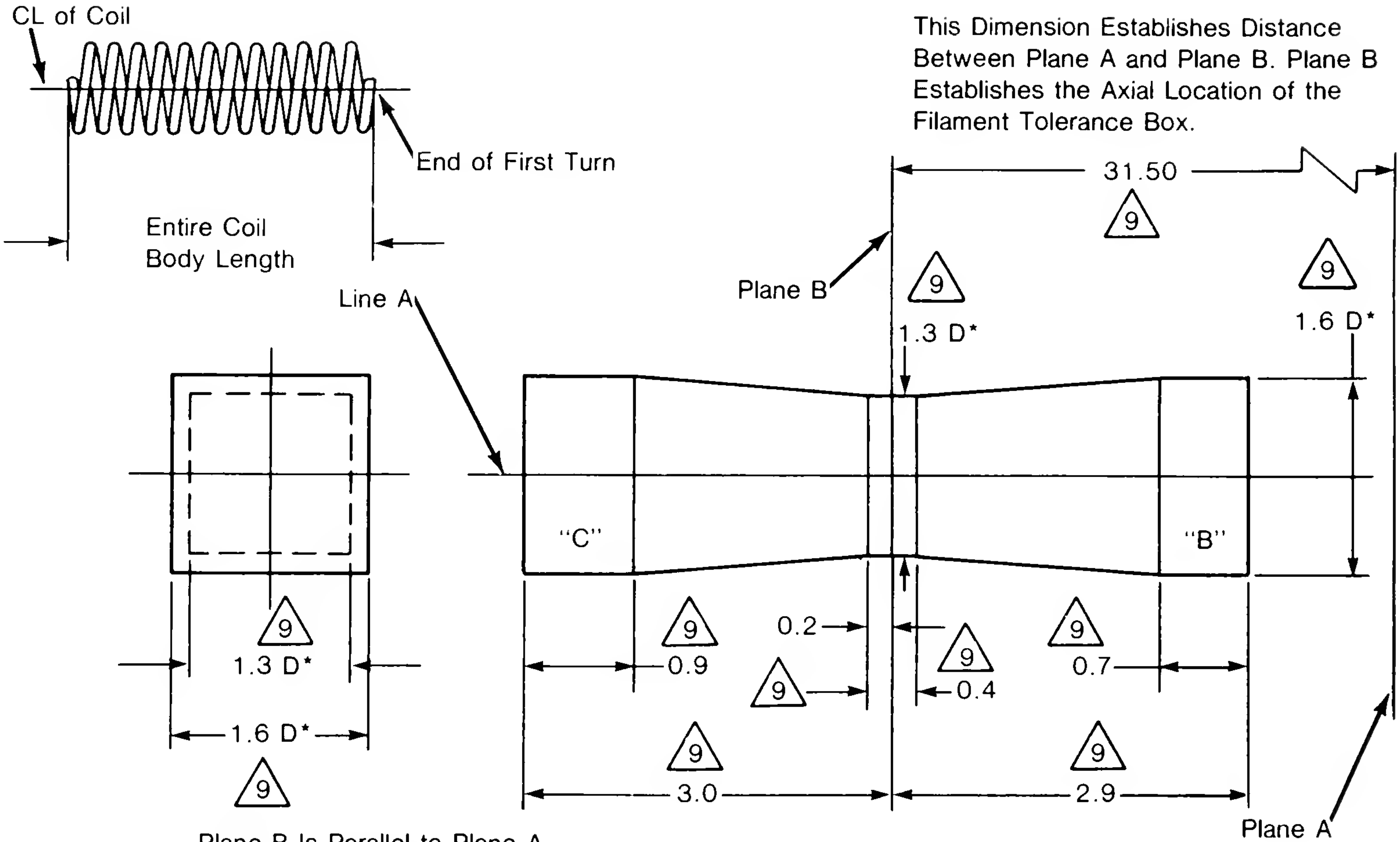
Tolerances Unless Otherwise Specified	
Inches	Millimetres
2 Place Decimals ± 0.02	1 Place Decimals ± 0.5
3 Place Decimals ± 0.010	2 Place Decimals ± 0.30
Angular ± 1°	Angular ± 1°

Figure 20-3 - Specifications for the Type HB4 Standardized Replaceable Light Source



Dimensions	Inches	Millimetres
DA	0.875 ±0.004 Dia	22.22 ±0.10 Dia
DB	0.172 +0.010 −0.000	4.36 +0.30 −0.00
DC	0.067 ±0.004	1.70 ±0.10
DD	0.392 +0.004 −0.000	9.95 +0.10 −0.00
DE	0.236 Min	6.00 Min

Figure 20-4 - Specifications for the Type HB4 Standardized Replaceable Light Source Socket (in Reflector)



Plane B Is Parallel to Plane A.

The Entire Coil Body at Design Volts (12.8) Must Be Contained Within the Volume as Specified. The End of the First Turn of the Coil Must Lie Within Volume "B" and the End of the Last Turn of the Coil Must Lie Within Volume "C"
Line A Is Perpendicular to Plane A and Concentric with the 19.46 MM Diameter of the Base.

*D = Diameter of Filament Coil

Dimensions Shown Are in Millimetres

Figure 20-5 - Specifications for the Type HB4 Standardization Replaceable Light Source

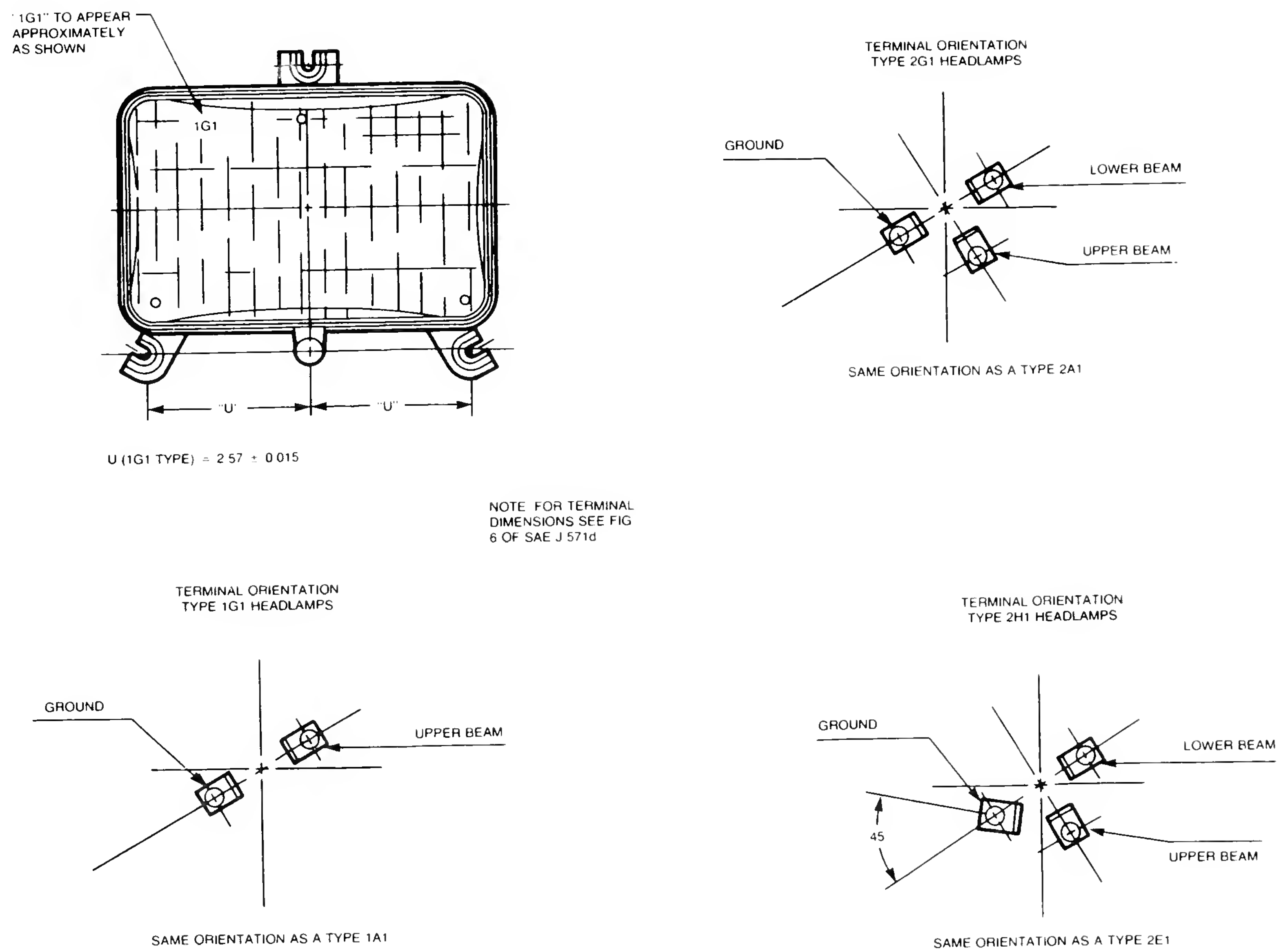


Figure 21 — Non-Interchangeability Configurations for Integral Mount Sealed Beam Headlamps, Types G and H

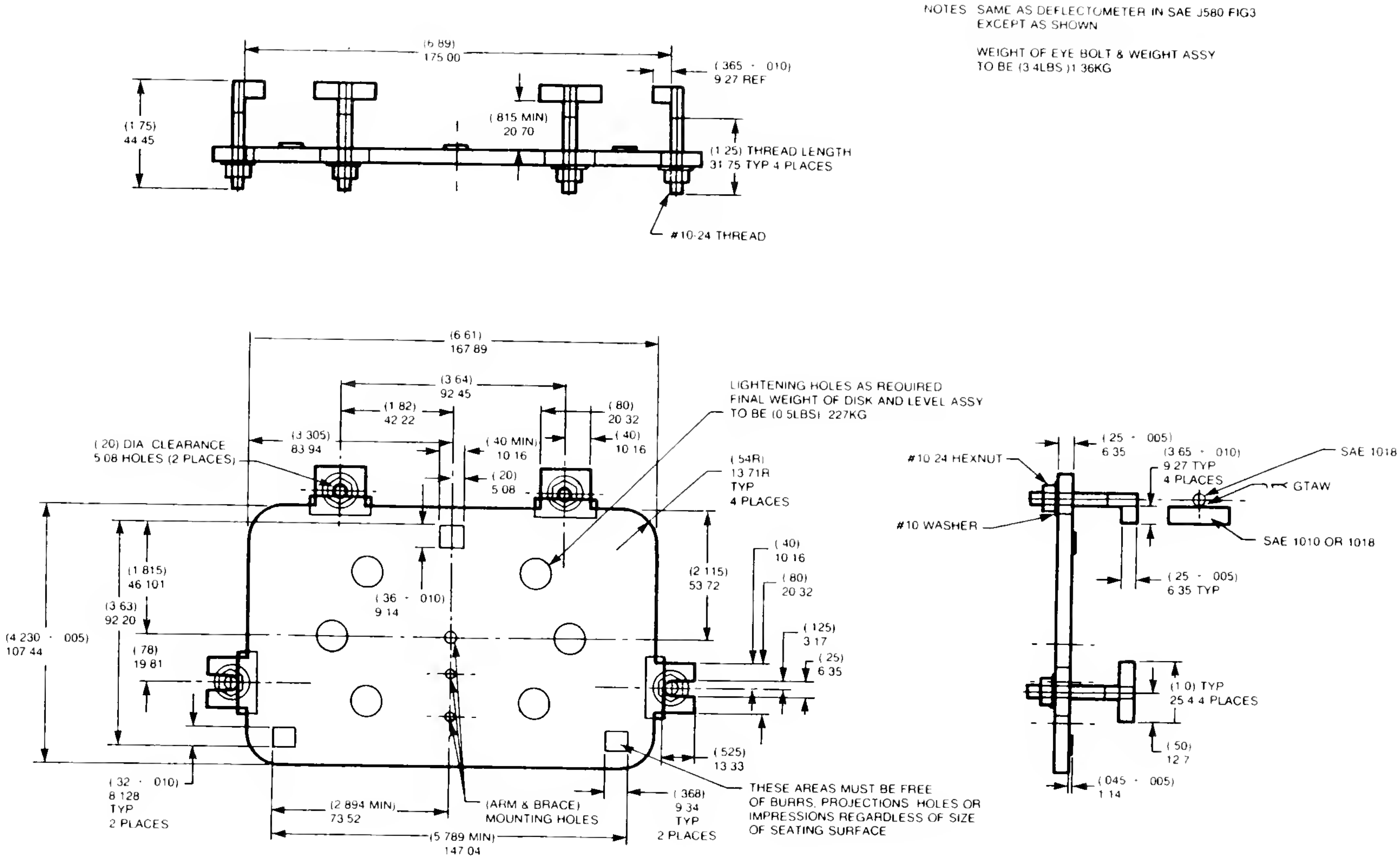
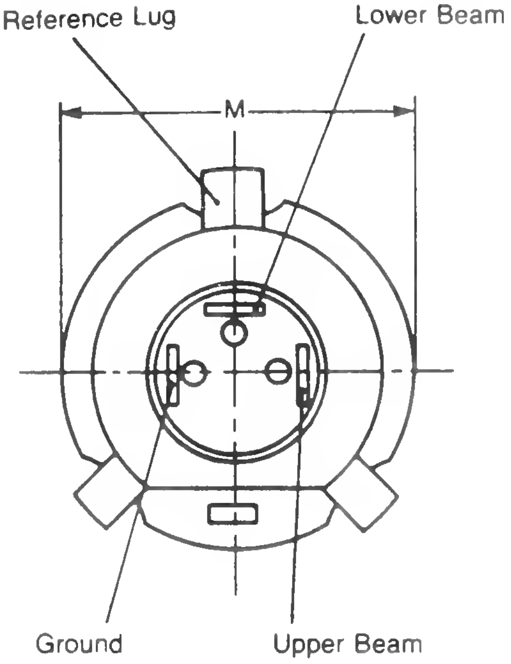
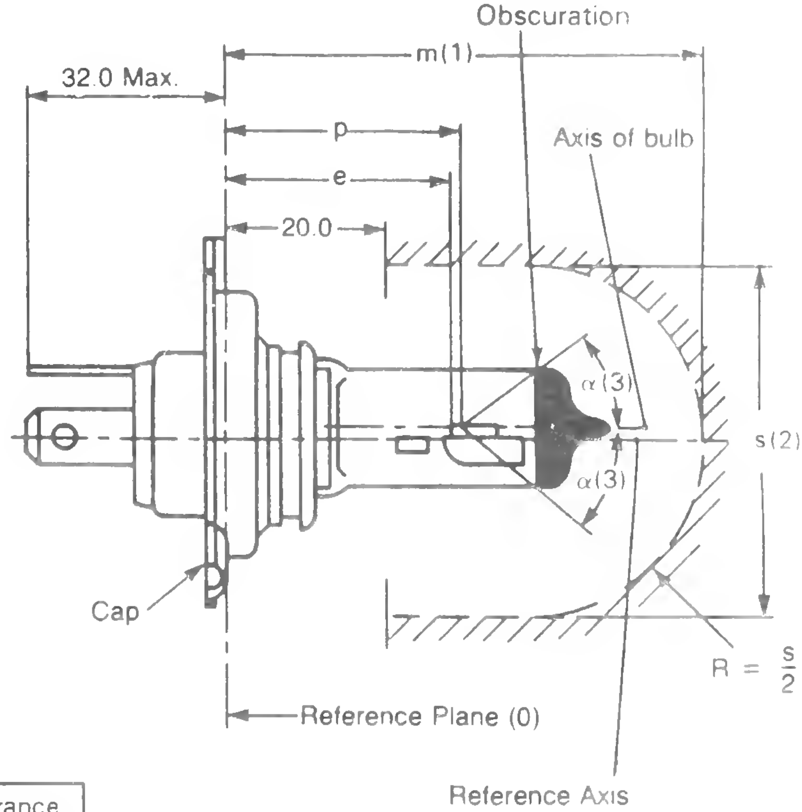


Figure 22 — Deflectometer Adaptor for Torque Deflection Tests on Type G and H Headlamp Systems





Reference	Dimension	Tolerance
e	28.5	+0.35 −0.15
p	28.95	—
m(1)	max. 60.0	—
s(2)	45.0	—
α(3)	max. 40°	—

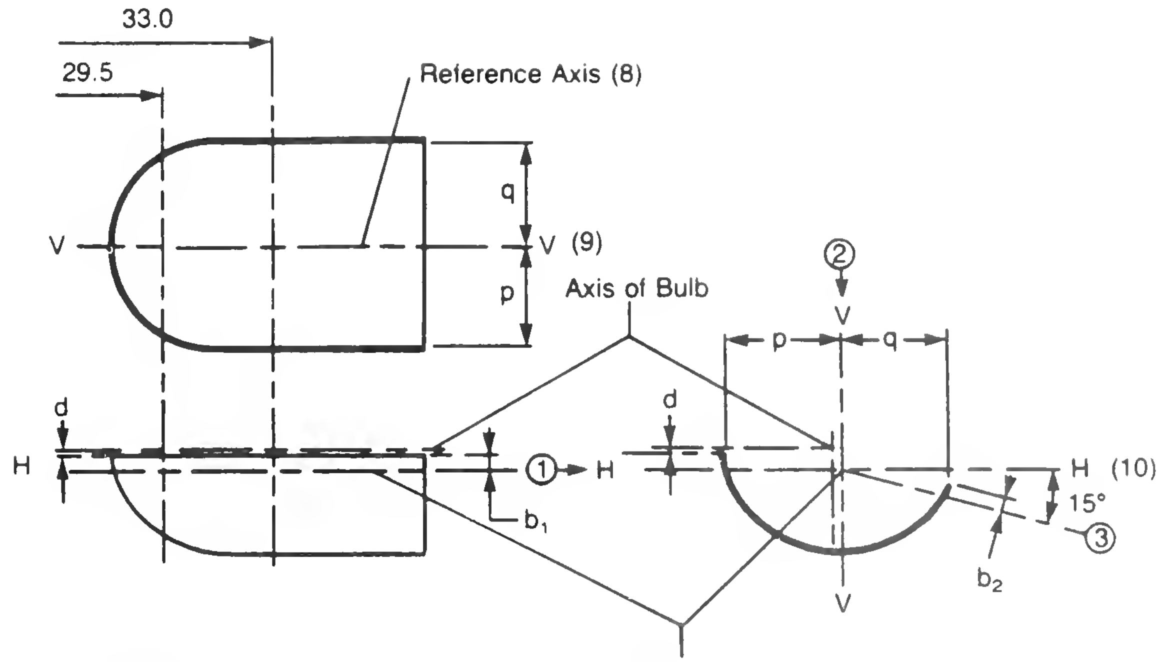
Dimensions in millimeters

(0) The reference plane is the plane formed by the seating points of the three lugs of the base ring.
(1) "m" denotes the maximum length of the light source.
(2) It must be possible to insert the light source into a cylinder of diameter "s" concentric with the reference axis and limited at one end by a plane parallel to and 20 mm distant from the reference plane and at the other end by a hemisphere of radius s/2.
(3) The obscuration must extend at least as far as the cylindrical part of the glass bulb. It must also overlap the internal shield when the latter is viewed in a direction perpendicular to the reference axis.

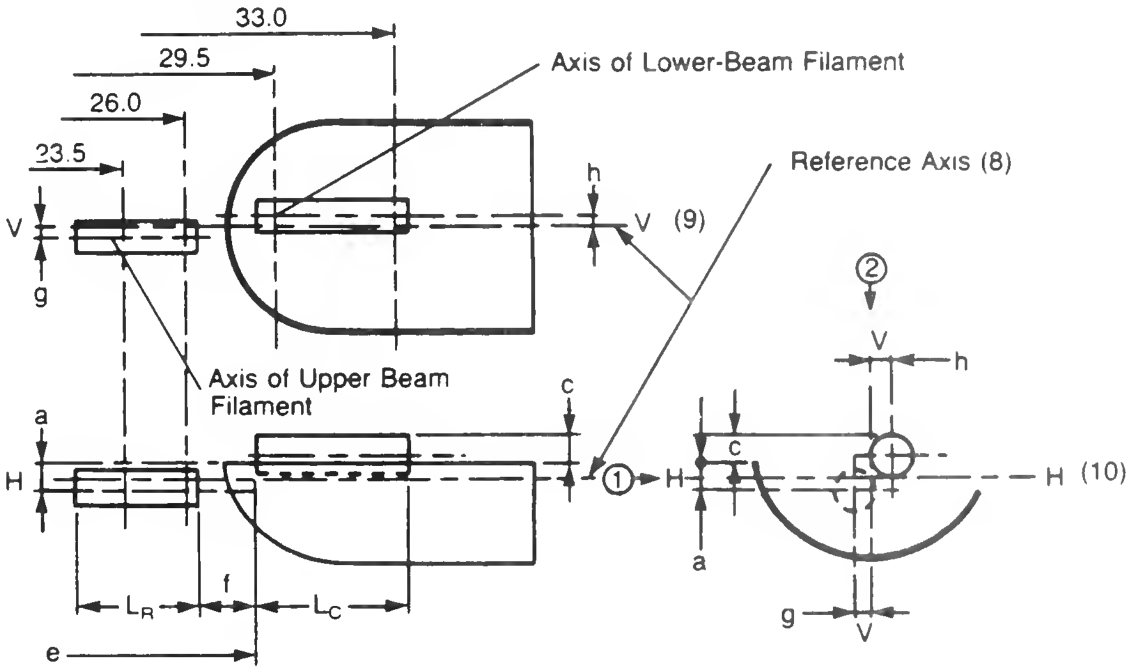
* Figure 23-1. Type HB-2 Replaceable Light Source — Dimensional Specifications

* [(54 F.R. 27362—June 29, 1989. Effective: July 31, 1989)]

POSITION OF SHIELD.



POSITION OF FILAMENTS.



(Also see continuation page)

*** Figure 23-2. Type HB-2 Replaceable Light Source — Shield and Filament Position Dimensional Specifications**

* [(54 F.R. 27362—June 29, 1989. Effective: July 31, 1989)]

Reference	Dimension	Tolerance
a/26°	0.8	±0.30
a 23.5°	0.8	±0.40
b_1/29 5°	0	±0.25
b_1/33°	b_1/29.5vm**	± 0.20
b_2/29.5°	0	±0.25
b_2/33°	b_2/29.5vm**	± 0.20
c/29 5°	0.6	± 0.30
c/33°	c/29.5vm**	±0.30
d	min 0.1	—
e(6)	28.5	+ 0.35 − 0.15
f(4)(5)(7)	1.7	− 0.30 + 0.30

Dimension	Reference	Tolerance
g/26°	0	±0.4
g/23.5°	0	±0.5
h/29.5°	0	±0.5
h/33°	h/29.5vm**	± 0.35
$l_{R(5)(7)}$	4.5	±0.8
$l_{c(5)(5)}$	5.5	±0.8
P/33°	Depends on the shape of the shield	—
q/33°	$\frac{p+q}{2}$	±0.6
b_1-b_2	0	± 0.25

* Dimension will be measured at the distance from the reference plane indicated in mm afer the stroke.

** ./29.5vm means the value measured at a distance of 29.5 mm from the reference plane.

Dimensions indicated in the table above are measured in three directions:

Direction ① for dimensions a, b_1, c, d, e, f, 1_R and 1C;

Direction ② for dimensions g, h, p and q;

Direction ③ for dimensions b_2.

Dimensions p and q are measured in a plane parallel to and 33 mm away from the reference plane.

Dimensions b_1, b_2, c and h are measured in planes parallel to and 20.5 mm and 33 mm away from the reference plane.

Dimensions a and g are measured in planes parallel to and 26.0 mm and 23.5 mm away from the reference plane.

(4) The end turns of the filaments are defined as being the first luminous turn and the last luminous turn that are at substantially the correct helix angle.

(5) For the lower-beam filament the points to be measured are the intersections, seen in direction ①, of the lateral edge of the shield with the outside of the end turns defined under footnote 4.

(6) "e" denotes the distance from the reference plane to the beginning of the lower-beam filament as defined under footnote 4

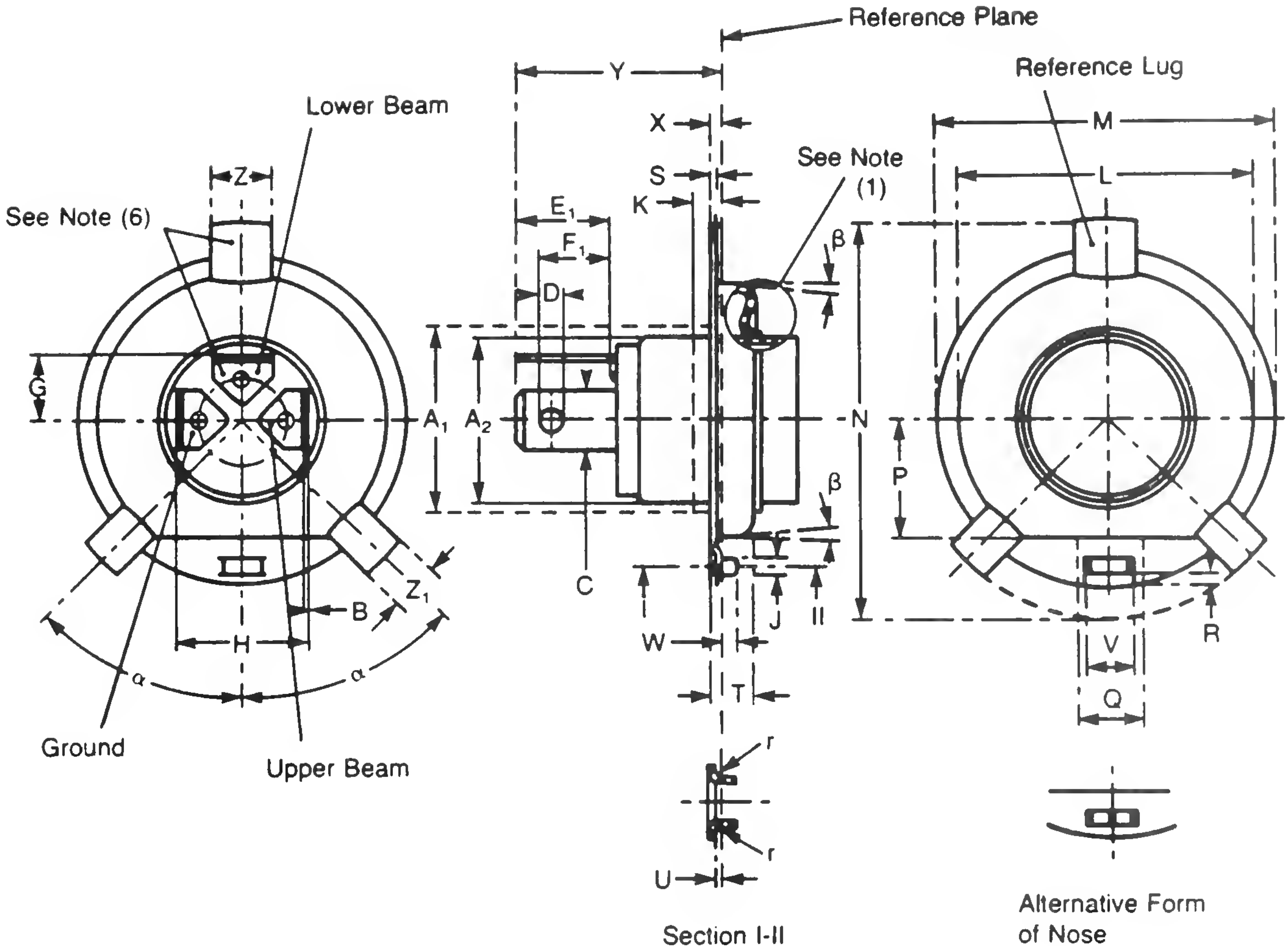
(7) For the upper-beam filament the points to be measured are the intersections, seen in direction ①, of a plane parallel to plane HH and situated at a distance of 0.8 mm below it, with the end turns defined under footnote 4.

(8) The reference axis is the line perpendicular to the reference plane and passing through the center of the circle of diameter "M".

(9) Plane VV is the plane perpendicular to the reference plane and passing through the reference axis and through the intersection of the circle of diameter "M" with the axis of the reference lug.

(10) Plane HH is the plane perpendicular to both the reference plane and plane VV and passing through the reference axis

Figure 23-3. (Continued) Type HB-2 Replaceable Light Source — Shield and Filament Position Dimensional Specifications



(Also see continuation page)

*** Figure 23-4. Type HB-2 Replaceable Light Source — Assembled Base P43t-38 on Finished Light Source — Dimensional Specifications**

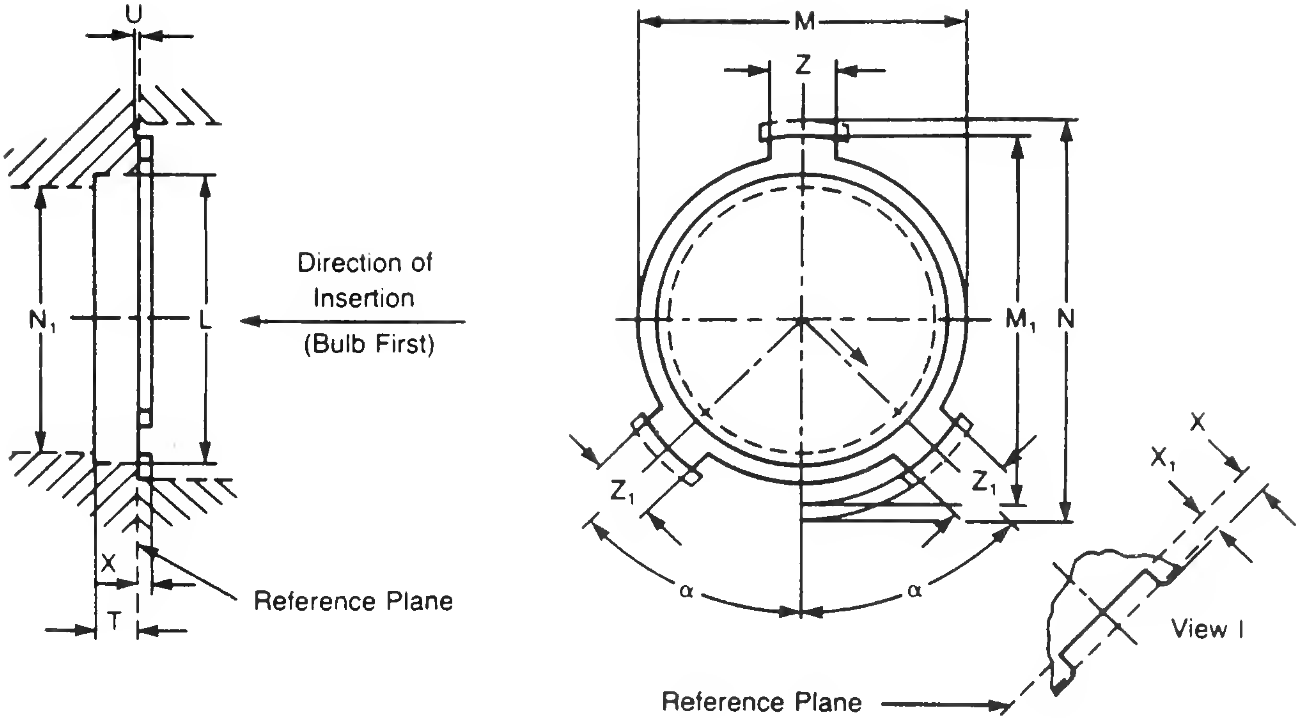
* [(54 F.R. 27362—June 29, 1989. Effective: July 31, 1989)]

Dimension	Min.	Max.	Dimension	Min.	Max.
A_1 (8)	25.0		Q (2) (7)	8.5	—
A_2 (10)	Nominal	22.0	R	1.3	1.7
B	0.7	0.8	S	0.5	—
C	7.7	8.1	T	5.0	6.0
D	3.0	3.3	U	(9)	
E_1	11.8	13.6	V (2) (5)	6.3	6.5
F_1	8.8	10.3	W	1.8	2.2
G	8.5	9.0	X	1.1	1.3
H	17.0	17.9	Y	—	32.0
J	1.9	2.1	Z	7.9	8.0
K (10)	2.0		Z_1	5.8	6.2
L (2) (4)	37.8	38.0	r	(9)	
M(3)	42.9	43.0	α	44°	46°
N	51.6	52.0	β	—	5°
P (2) (7)	15.3	15.5			

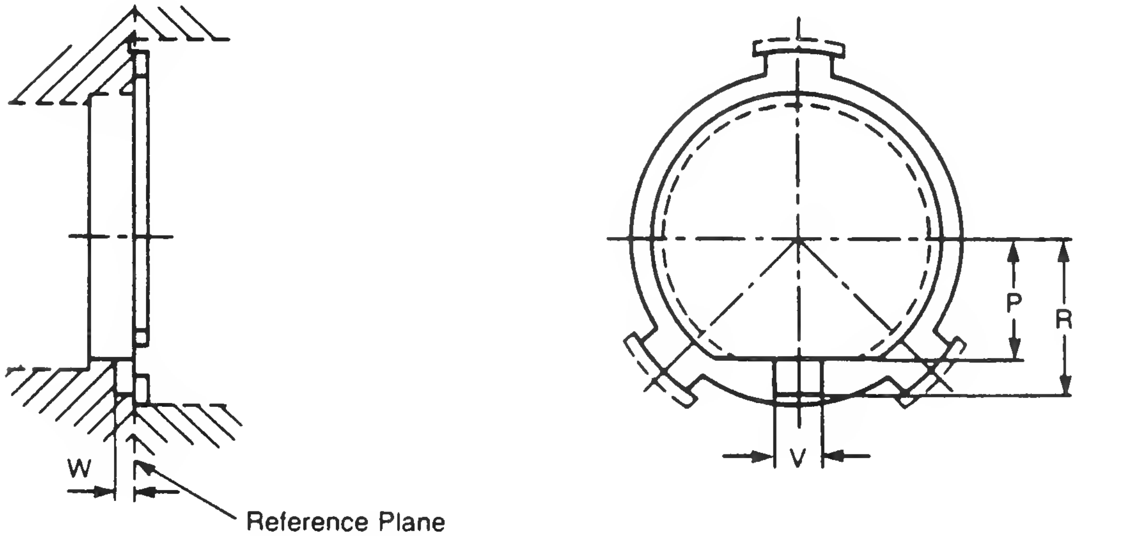
Dimensions in millimeters.
The drawing is intended only to indicate the dimensions essential for interchangeability

(1) The form of this part of the ring is optional and may be flat or recessed. However, the form shall be such that it will not cause any abnormal glare from the lower beam filament when the light source is in its normal operating position in the vehicle.
(2) This dimension is measured at the reference plane.
(3) Dimension M is the diameter on which the light source is centered when checking its dimensional characteristics.
(4) The maximum allowable eccentricity of cylinder L with respect to the circle of diameter M is 0.05 mm.
(5) The maximum allowable displacement of the center of the nose from the line running through the centers of the reference lug and the circle of diameter M is 0.05 mm. The sides of the nose shall not bend outwards.
(6) [Reserved]
(7) Dimension Q denotes the minimum width over which both the minimum and maximum limits of dimension P shall be measured. Outside dimension Q, the maximum limit for dimension P shall not be exceeded.
(8) The means of securing the ring in the headlamp shall not encroach on this cylindrical zone, which extends over the full length of the shell shown on this side of the ring.
(9) The radius r shall be equal to or smaller than dimension U.
(10) Beyond distance K, in the direction of the contact tabs, both the minimum and the maximum limits of dimension A_2 shall be measured.

Figure 23-5. (Continued) Type HB-2 Replaceable Light Source — Assembled Base P43t-38 on Finished Light Source — Dimensional Specifications



OPTIONAL FEATURES TO ENSURE CORRECT INSERTION



(Also see continuation page)

***Figure 23-6. Type HB-2 Replaceable Light Source — Reflector Bulb Cavity P43t — Dimensional Specifications**

* [(54 F.R. 27362—June 29, 1989. Effective: July 31, 1989)]

Dimension	Min.	Max.
L (4)	38.2	None
M	43.02 (1)	43.2
M_1	—	49.0
N (5)	52.5	
N_1	(6)	
P (3)	16.0	—
R (4)	20.5	—
T	5.5	—

Dimension	Min.	Max
U	0.4	—
V (4)	6.8	—
W (4)	2.5	—
X (3)	1.8	—
X_1 (2)	1.4	—
Z (3)	8.05	8.13
Z_1 (3)	8.0	8.5
α	44°	46°

Dimensions in millimeters
The drawing is intended only to indicate the dimensions essential for interchangeability.

The socket shall be so designed that the light source will be retained in it only when the light source is in the correct position.

The means of retention shall make contact only with the prefocus base ring and the total force exerted, when the light source is in position, shall be not less than 10 N and be not more than 60 N.

(1) This value shall be complied with between the rim of the socket and the reference plane (dimension X). However, it may be reduced to 38.5 mm within the dimensions Z and Z_1 which correspond with the support points for the lugs of the ring.

(2) Dimension X_1 denotes the minimum distance over which dimensions Z and Z_1 shall apply. Outside dimension X_1 the slots may be chamfered or rounded.

(3) Wrong adjustment of the light source in the socket can be prevented in different ways, e.g.:
— by applying the additional optional features. (See lower drawing on Figure 23.6).
— by decreasing dimension Z_1 to 7.5–7.7 mm followed by a decrease of the tolerance for α to give values of 44°40′–45°20′.
— by using a sufficiently large value of X depending on the construction of the socket.

(4) If dimension L is smaller than 40.5 mm, dimension V, R and W shall apply.

(5) Dimension N delineates the minimum free space to be reserved for the three lugs of the ring.

(6) Dimension N_1 shall be not less than 35 mm diameter over a distance of 20 mm from the reference plane and shall be not less than 45 mm diameter at any distance greater than 20 mm from the reference plane.

Figure 23-7. (Continued) Type HB-2 Replaceable Light Source Reflector Bulb Cavity P43t — Dimensional Specifications