CONCRETE HIGHWAYS

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CONCRETE HIGHWAYS

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PUBLISHED BY THE

ASSOCIATION OF AMERICAN PORTLAND CEMENT MANUFACTURERS

LAND TITLE BUILDING, PHILADELPHIA, PA.

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Concrete Highways

INTRODUCTION

The purpose of a road is to provide the shortest and easiest possible means of passage between different points.

History of Highways

The earliest roads of history were the great highways for war and commerce extending into districts not readily accessible by water. Most of these, however, were merely footpaths, until the Carthaginians began and the Romans developed the science of road building. The best of these Roman roads were three feet thick, laid in four courses. A foundation of large flat stones laid in lime mortar was covered with a well-compacted concrete of lime and broken stones in the proportion of about one to three. On top of this was placed another layer of concrete, which was not tamped and which was a mixture of old building materials and hot lime. The wearing course consisted of irregularly shaped flat stones, about six inches thick, carefully fitted and laid in lime mortar. This form of construction was undoubtedly not the first method used, but was the result of much experience. Even these early road builders appreciated the value of placing in the road a material providing a positive mechanical bonding strength between the stones.

With the fall of the Roman Empire came a decline in road construction and for several centuries no further attempt was made to improve highways. The revival of paving came in the building of streets in the larger cities. This was followed by the improvement of the through routes between the centers of population.

It was not until the latter part of the 18th century and the early part of the 19th, that a truly scientific attempt was made at road building. The methods employed during that period are in use to-day, in slightly modified form, in our country and village roads.

Effects of Changes in Traffic

The decided change in the mode of transportation on our highways during the last few years has necessitated new methods of construction. The lasting quality of a macadam road depends greatly upon the natural cementing value of the stone composing it. Until the advent of the automobile, the binding material of the surface was disturbed by the horses' shoes and blown away by the wind; more binder was then chipped off the stone, compressed by the steel-tired vehicles and reformed by absorbing moisture from the atmosphere. The automobile prevents this

FIG. 1.—COMMONWEALTH AVE., NEWTON, MASS.
Note wear on macadam as shown by string and block of wood. Worn down four inches in less than one year.

remaking of the binder. The action of the rear driving-wheels displaces not only the surface binder but the road materials as well, scattering them beyond recovery. (Fig. 1.) When this occurs rain penetrates the road and softens the base and foundation. The road in turn settles, breaking the bond and thus permitting the loosened stones to be displaced.

Permanent Binder Required

In order to prevent these defects a permanent binder, such as cement, must be incorporated with the other road materials. The most exact and economical method of combining Portland cement with the materials at present used in road construction is to mix it with them, forming concrete.

GOOD HIGHWAYS—HOW TO BUILD THEM

Firm Sub-base

The first and most important essential for a successful pavement is a firm and unyielding sub-base. Since all the loads brought upon the surface are transferred to the base, that base must be in a condition to sustain these loads; that is, it must be dry and thoroughly compacted, and it must not contain any vegetable, perishable or yielding matter.

FIG. 2.—LA SALLE-OGLESBY ROAD, ILL.
Concrete road subjected to floods which ruined all previous roads.

Good Drainage

A proper and lasting sub-base can be secured only by keeping out moisture. Drainage must be established so as to facilitate the flow of water away from the sub-soil and even from the side ditches as quickly as possible. The sub-base must be dry, fairly hard and unyielding, or no material placed upon it will prove satisfactory in giving low cost of maintenance and long life. (Fig. 2.)

Dependable Foundation

Upon such a well prepared sub-base is laid a "foundation for the wearing surface." Experience has demonstrated the fact that concrete makes the best foundation. The concrete must be properly proportioned, well mixed, and laid smooth to conform to the grade of the finished pavement. Concrete properly proportioned and mixed is impervious to water—a most essential feature for a "wearing surface foundation." Water cannot penetrate to the carefully prepared sub-base and destroy it, rendering it unfit to sustain traffic. Concrete will not only sustain the pressure imposed upon it by traffic, but will distribute the same over a considerable area, thus much reducing the load to be carried by the sub-soil. This

FIG. 3.—CONCRETE ROAD, NAZARETH, NORTHAMPTON CO., PA.

characteristic of concrete makes possible the laying of a pavement upon many sub-soils, the cost of the preparation of which would be prohibitive were concrete not used. A concrete foundation when once laid will give an asset which can be counted on for all time, while a broken stone foundation is necessarily of a more or less temporary nature, owing to its displacement under travel and its disappearance into the soil which supports it. The success of those city streets which have stood so many years with little cost of maintenance under heavy traffic conditions can be traced directly to well-built concrete foundations.

In city and town streets it is frequently necessary to lay or make repairs to pipes. This can easily be accomplished on a concrete street and the concrete can be replaced leaving the surface in perfect condition.

Lasting Wearing Surface

The traffic upon highways is increasing yearly. Each year highways are subjected to constantly increasing loads. The public demands rapid transportation and quick delivery of its goods; consequently the nature of traffic is rapidly changing from horse-drawn to motor-driven vehicles.

Moreover, the public demands that all unimproved highways be surfaced and that these surfaces be kept in good condition. If roads are built in accordance with the ordinary methods of country road construction, under the new conditions of traffic, their life is short and their cost of maintenance is high.

With a little more care in construction, the concrete foundation, which is essential to every wearing surface, can be allowed to take the wear itself, thus giving a permanent pavement of low cost. (Fig. 3.)

This use of concrete as a wearing surface, as well as a foundation, makes possible permanent highways, where otherwise the cost would be beyond the financial resources of many communities.

UTILITY OF CONCRETE AS A HIGHWAY MATERIAL

Concrete possesses all the essentials and fulfills all the requirements of a good pavement. The cement holds the aggregate in position so firmly that the action of the most rapidly moving vehicles will not disturb it. Wear under iron-bound traffic is scarcely perceptible. Therefore the length of service ob-

Permanence

FIG. 4.—A CONCRETE HIGHWAY, MORRIS TURNPIKE, WARREN CO., NEW JERSEY.

FIG. 5.—CONCRETE AUTOMOBILE TRACK, MOLINE, ILL.

tained, and the lack of maintenance charges, as well as the cheapness in first cost, permit the taxes to be used for the construction of new roads rather than upon the maintenance of those already built.

Comfort

A very light transverse grade is required to make the road self-cleaning and to carry the surface water to the side gutter or ditch. In roads requiring a higher crown for drainage, travel takes the center of the road, so that all the wheels may be at about the same height. On concrete roads, due to their flat slopes, traffic is not forced to the middle of the pavement, but can comfortably keep to the side and thus avoid danger in passing other vehicles. (Fig. 4.)

Upon the smoothness of the road depend the cost and comfort of travel, and the price of a marketable product to the consumer. Concrete can be made as smooth as is desired to allow the proper foothold for horses, thus giving the least resistance to traction with the consequent quick and cheap delivery of goods and the pleasure of the traveler.

There is no material in road construction which can be made to conform so easily and harmoniously with the general color scheme of the surroundings as can concrete. By mixing mineral pigment with the concrete any color of roadway desired can be obtained. (Fig. 5.)

Fig. 6.—Concrete Road, Lake Shore Road, Kenosha, Kenosha Co., Wis.

Use of Local Materials

The bulk of the materials from which good concrete is made can be found in nearly every locality. Where the sand, gravel and stone are to be had from local pits and quarries, the normally low cost of concrete roads can be still further reduced by the use of these local materials, with a consequent saving of freight charges.

Most of the labor for the preparation of the materials and for the mixing and placing of the concrete can be secured in the locality in which the road is to be built. By the utilization of home products and home labor the money expended on the concrete road remains in the community paying for it.

Value

Bond issues are required in many cities and townships to obtain the necessary funds for pavement and road construction. Unless concrete is used in the work, the pavements are entirely worn out long before the bonds mature. The result is that the public must either increase their bonded indebtedness or suffer the inconvenience of using bad highways. This inconvenience will reduce the earning capacity of the community and the value of the adjacent property.

Cost The real cost of an improvement is measured by the service which it yields in proportion to the money invested in it. The chief elements in real cost are first cost and maintenance expense. (Fig. 6.) The first cost of a road is dependent largely upon the cost of the materials entering into its construction. When proper materials are to be had locally, the first cost of a concrete pavement is slightly in excess of the initial cost of a first-class water-bound macadam road. Where the materials must be brought from a distance, a concrete road can generally be built at less expense than any other type, due to the smaller amount of materials needed for a road of concrete.

As has been explained, under combined traffic the macadam roads fail rapidly. This necessitates extensive and continuous repairs. The average amount expended per mile per year for maintenance and repairs during the last five years in the states of Connecticut, Massachusetts, New Jersey, New York and Rhode Island was $649. During 1912 it amounted to $814.

The cost of surface repairs and refilling of joints during 1913 of the 51 miles of concrete roads built previous to that time in Wayne County, Michigan, was $28.43 per mile including over-head charges.

Certainly no community can afford to invest its taxes in any class of roads known to deteriorate rapidly, requiring a large yearly expenditure for maintenance, since concrete as a road material is little higher in first cost and is practically without cost of maintenance.

VARIOUS TYPES OF CONCRETE PAVEMENTS

The first concrete roads in this country were built over twenty years ago. Naturally the method of construction of these roads followed the ordinary lines of sidewalk building. Subsequent development has produced the following types of Concrete Highways:

(a) *One-Course Pavement.*—That in which the full depth of the pavement is built in one layer and of the same mixture throughout. (See Specifications, page 57.)

(b) *Two-Course Pavement.*—Consists of a base of a rather lean mixture and a wearing surface of a rich mixture. (See Specifications, page 62.)

(c) *One and Two-Course Pavement* Reinforced. (See Specifications, pages 57 and 62.)

(d) *Grouted Pavement.*—Broken stone pavement, grouted with Portland Cement Mortar. (See page 48.)

FIG. 7.—MICHIGAN AVE., WAYNE CO., MICH.

ONE-COURSE PAVEMENT

Michigan Avenue, Wayne County, Michigan

Built 1911

Thickness 7 inches; width 16 to 20 feet; length 7½ miles.
Joints placed every 25 feet and filled with one layer of three-ply tar paper; edges protected by Baker armored plates.
Crown $\frac{1}{100}$ the width of pavement.
Built by the Board of County Road Commissioners, Detroit, Mich.
Commissioners: John S. Haggerty, Chairman, William Murdoch, Edward N. Hines.
Engineers: George A. Dingman, George A. Burley, George F. Key.

The concrete was proportioned 1 part Portland cement; 1½ parts sand (graded from ¼ inch down, with the dust out) and 3 parts gravel (graded from ¼ to 1¼ inches).

The concrete was mixed with a batch mixer, which moved under its own power. A boom attached to the mixer carries a bucket into which the concrete is dumped direct from the mixer. This boom swings in a

FIG. 8.—GRAND RIVER ROAD, WAYNE CO., MICH.

semi-circle, and is long enough to allow the concrete to be deposited direct from the bucket in place on the road.

To confine the concrete within the proper limits and to provide forms along the side of the road, a 2 x 8-inch plank was firmly staked to line and grade. The upper edge of each plank was protected by an angle iron. A strike-off templet, made from a 2 x 8-inch plank, cut to the proper crown, and with its lower edge steel bound, was moved along the top of the side forms. This was followed by a heavy 2 x 8-inch plank box templet-tamper, also traveling on the top of the forms. Two finishers with wooden floats worked from a bridge supported on the side forms. It will be noted that these side pieces act not only as forms, but also provide a track upon which rest all the necessary tools to shape and finish the concrete. By the use of these tools and the bridge, all labor was absolutely kept off the road during the placing and finishing of the concrete.

Before the concrete hardened the forms were removed and the edges beveled by breaking them down with a shovel. This was done in order to remove abrupt edges and to better join the road with the shoulders.

FIG. 9.—METHOD OF CONSTRUCTION ON GRAND RIVER ROAD, WAYNE CO., MICH. BUILT 1911.

Thickness 7 inches; width 16 feet; length 2½ miles. Construction similar to Michigan Avenue, at a cost of $1.35 per sq. yard, with mixer, conveying bucket, templet tamper, bridge for finishers, and joint protecting plates held together by clamps which are later removed.

After the concrete was sufficiently hard to bear the weight of a man, the surface was covered with about 2 inches of sand or earth and sprinkled with water several times daily for one week. All travel was kept off for two weeks.

On each side of the concrete a gravel shoulder was built varying in width from 2 to 4 feet, and 8 inches deep. Trolley tracks are along one side of the road. Between these tracks and the road a longitudinal concrete tile drain was laid. On the other side an open ditch was dug.

The cost of the concrete in place was about $1.47 per square yard.

OTHER EXAMPLES OF ONE-COURSE PAVEMENTS

Main Street, South Milwaukee, Wisconsin

Built 1913

Thickness 6 inches at edge, 8 inches in center; width 50 feet.

Proportions: 1 part Portland cement, 2 parts sand, 3½ parts gravel (graded from ¼ to 1½ inches).

Batch mixer used.

Joints: Steel protected, ¼ inch wide, filled with tar paper, every 30 feet across street, and longitudinal in center; continuous joints also along curbs.

Concrete laid on sandy clay sub-soil. Surface finished with wooden float. Protected by light cover of dirt kept wet for five days. Traffic barred for three weeks.

Cost: $1.35 per square yard.

H. J. Kuelling, Engineer.

Greenfield Avenue, Ardmore, Montgomery Co., Pa.

Built 1913

Thickness 5 inches at edge, 7 inches in center; width 16 feet; length 1419 feet; crown 2 inches.

Proportions: 1 part Portland cement, 2 parts sand, 4 parts gravel.

Batch mixer used.

Joints: ¼ inch wide, filled with tar, every 25 feet across street.

Foundation laid on old macadam.

Surface finished by brooming.

Protected by light cover of sand kept wet for one week. Traffic barred for two weeks. This street subjected to excessive motor truck traffic.

Cost: $1.30 per square yard.

John S. G. Dunne, Engineer.

Ambler & Davis, Contractors.

FIG. 10.—MAIN STREET, SOUTH MILWAUKEE, WIS.

FIG. 11.—GREENFIELD AVENUE, ARDMORE, MONTGOMERY CO., PA.

Jennings Street, Sioux City, Iowa

Built 1911

Thickness 5 inches; width 38 feet; length 21 miles of this class of street.

Proportions: 1 part Portland cement, 3 parts sand, 4½ parts stone (Sioux Falls Jasper, graded ¼ to 1½ inches).

Joints: ½ inch wide, filled with asphalt every 25 feet across street and continuous along curbs.

Laid on 14 per cent. grade, with surface grooves across street ½ inch deep, every 5 inches. To allow mortar to take wear, the stone was forced below surface by tamping with special tool, 12 inches square faced with ½-inch bars set on diagonal edge, 1 inch apart. Laborers kept off concrete by "eternal vigilance and use of big stick."

Protected by sprinkling for four days. Traffic barred for three weeks.

Temperature reached 35° F. below zero during winter of 1911–12 without ill effect to the pavement.

Cost: $1.27 per square yard.

K. C. Gaynor, City Engineer.

Flinn & Hanlon, Contractors.

Front Street, Boise, Idaho

Built 1909

Thickness 8 inches; width 69½ feet; length about 1 mile.

Crown 9 inches, straight slope.

Proportions: 1 part Portland cement, 3 parts sand (30 per cent. voids), 7 parts gravel (graded from ¼ to 2½ inches). Batch mixer used.

Joints: ½ inch wide, filled with tar, pitch and sand heated together and poured hot (two applications required to complete joint) every 25 feet across the street and continuous along curbs.

Finished with wooden float.

Protected by 2-inch layer of earth sprinkled for one week. Traffic barred for twenty-eight days.

Care exercised in construction has been well repaid. Has stood traffic from freight depots, heaviest in city, for four years with only $10.00 spent on maintenance.

Cost: $1.15 per square yard.

Ern G. Eagleson, City Engineer. J. B. Marcellus, Assistant Engineer.

J. Gustafson, Contractor.

FIG. 12.—JENNINGS STREET, SIOUX CITY, IOWA.

FIG. 13.—FRONT STREET, BOISE, IDA.

Elkton-Northeast State Road, Cecil Co., Md.

Built 1913

Thickness 5 inches at sides, 7 inches at center; width 16 feet; length 2 miles.

Proportions: 1 part Portland cement, 2 parts sand, 4 parts gravel.

Joints: Filled with tar paper, every 25 feet across the street.

Laid on sandy clay sub-soil.

Protected by sprinkling for seven days. Traffic barred for two weeks.

Cost: $1.20 per square yard.

H. G. Shirley, State Highway Engineer.

E. Ward Brown, Contractor.

College Campus, Iowa State College, Ames, Iowa

Built 1912

Thickness 6 inches at sides, 7 inches at center; width 26 feet; length 2400 feet.

Proportions: 1 part Portland cement, 2½ parts sand, 5 parts stone.

Joints: ⅜ inch wide filled with asphalt every 50 feet across street, and ¾ inch asphalt filled joints continuous along curbs.

Finished with wooden float.

Protection: No effort made to protect road during hardening of concrete. Traffic barred two weeks.

Cost: 95 cents per square yard.

T. H. MacDonald, State Highway Commissioner.

Contractor: Done by Force account.

Fig. 14.—Elkton-Northeast State Road, Cecil Co., Md.

Fig. 15.—College Campus, Iowa State College, Ames, Iowa.

Bonneauville Road, McSherrystown, Pennsylvania

Built 1909

Thickness 5 inches; width 16 feet; length about ½ mile.
Proportions: 1 part Portland cement, 3 parts sand, 5 parts broken stone. Hand mixed.
Joints: ¼ inch wide, filled with sand and clay, every 50 feet across the road.
Built on earth fill, 2 to 4 feet deep, covered by 5-inch well-rolled Telford foundation. Earth shoulder, 3 feet wide on one side and rip-rap on the other. This road is flooded at times of high water, and has withstood this action admirably. Other types of road washed away.
Protected by spreading canvas. Traffic barred for one week.
Cost: 83 cents per square yard, exclusive of grading and Telford.
Pennsylvania State Highway Commission.
Edward S. Frey, Assistant Engineer.
W. B. Johnston, Contractor.

Cemetery Road, Red Oak, Iowa

Built 1911

Thickness 6 inches; width 14 feet; length about ½ mile; crown 3 inches.
Proportions: 1 part Portland cement, 2 parts sand, 4 parts limestone (graded ¼ to 1½ inches).
Joints: ¼ inch wide, filled with asphalt, every 16 feet across road. Edges of joints rounded to small radius.
Wooden templet used to give crown.
Laid on grade from flat to 5 per cent. Tamped with 25 pound tool.
Finished by rough troweling and brooming.
Planks used to keep laborers off concrete.
Cost: $1.27 per square yard.
Richard Roberts, Engineer.
J. S. McLaughlin & Sons, Contractors.

FIG. 16.—BONNEAUVILLE ROAD, MCSHERRYSTOWN, PA.

FIG. 17.—CEMETERY ROAD, RED OAK, IA.

Chelsea Street, Memphis, Tennessee

Built 1910

Thickness 6 inches; width 36 feet; length 1 mile.

Proportions: 1 part Portland cement, 2½ parts sand, 4½ parts crushed stone.

Joints: Every 50 feet across street, filled with ⅞ inch creosoted pine boards.

Protected by ½ inch layer of sand kept wet for 3 days.

Cost: $1.17 per square yard.

J. R. Weatherford, Engineer.

Hillsboro Road, Greenville, Illinois

Built 1910

Thickness 8 inches; width 16 feet; length 3000 feet. No crown, straight slope of 1 inch.

Proportions: 1 part Portland cement, 2½ parts sand, 5 parts limestone.

Joints: ¾ inch wide, filled with pitch, every 25 feet across road.

Laid on soft, muddy bottom, without longitudinal grade. Drainage obtained by deepening side ditches. Concrete tamped until mortar flushed to surface. This road traverses low lands subject to frequent floods. The use of concrete as the roadway material saved the expense of raising the road, which would have meant a fill of 16,000 cubic yards.

Cost: 92 cents per square yard exclusive of grading. Stone cost 50 cents per cubic yard on the job.

H. N. Baumberger, City Engineer.

J. Q. Adams, Contractor.

FIG. 18.—HILLSBORO CONCRETE ROADWAY, GREENVILLE, ILL. Under normal conditions.

FIG. 19.—CHELSEA STREET, MEMPHIS, TENN.

FIG. 20.—HILLSBORO CONCRETE ROADWAY, GREENVILLE, ILL.
Flooded but serviceable.

TWO-COURSE PAVEMENT

Adams Avenue, Mason City, Iowa

Built 1910

Thickness: base 5 inches, wearing course 2 inches; width 30 feet; length 4000 feet.

Joints: ½ inch wide every 25 feet across the street, and 1 inch wide continuous along curbs.

F. P. Wilson, City Engineer.

Geo. Gabler, Contractor.

Upon the sub-soil cleaned of all deleterious matter, well rolled and wetted and shaped to the same curvature as the finished surface, a 5-inch concrete base was placed. The proportions in this mixture were 1 part by measure of Portland cement, 2 parts by measure of clean, sharp sand, and 5 parts by measure of limestone (graded from ½ to 1½ inches). The cement and sand were thoroughly mixed to a mortar in a batch mixer. The proper amount of stone, which had been previously drenched with water, was added. The batch was then mixed until all the stones were thoroughly coated with mortar.

The concrete was placed upon the road and tamped until mortar came to the top. The surface was made smooth and parallel with the finished pavement.

Within twenty minutes after laying the base, a wearing coat 2 inches thick was added. This was mixed in a batch mixer and consisted of 1 part by measure of Portland cement to 2 parts by measure of clean coarse sand. The finishing was done with a wooden float and the surface was roughened by the use of a stiff vegetable brush.

An expansion joint 1 inch wide and filled to the top with asphalt applied at a temperature of about 400° F. was made next to the curb on each side of the street. A similar joint was made ½ inch wide every 25 feet across the street. (Latest specifications place expansion joints every 37½ feet.)

The distance between the transverse expansion joints was divided by cuts into sections of 12½ feet. These cuts or contraction joints were made by using a steel plate ¼ inch thick and 7 inches wide, cut to the desired shape of the street. Steel forms were also used for making the expansion joints. All forms for making joints were removed before the concrete had hardened.

The edges of the contraction joints were rounded to a radius of ½

FIG. 21.—ADAMS AVE., MASON CITY, IOWA.

FIG. 22.—RAWLINS ST., MASON CITY, IOWA.

inch. In accordance with the new specifications the edges of the expansion joints are protected by soft steel plates similar to those used on Grand River Road in Wayne County, Michigan. (See page 15.) No filler is placed in the contraction joints.

Each day for one week after completion the surface was sprinkled with water. The street was closed to traffic for two weeks.

The cost of this work was $1.25 per square yard.

On some of the streets in Mason City, where concrete paving was laid, the subsoil was soft and swampy. In such cases a narrow ditch was dug 18 inches inside of each curb and 18 inches deep below the sub-grade. In each ditch a 4-inch drain tile was laid, and connected with the sewer. The dirt taken from the trench was not replaced, but the space was filled with good, clean, hard-burned cinders, thoroughly rammed, thus insuring drainage.

In Adams Street longitudinal cuts were made, 10 feet apart, entirely through both surface and base. The surface is corrugated transversely every 5 inches. In the 1912 specifications this practice has been abandoned.

OTHER EXAMPLES OF TWO-COURSE PAVEMENTS

County Road, Coshocton, Ohio

Built 1910

Thickness of base 5 inches, wearing surface 1 inch; width 18 feet; length 400 feet.

Proportions: *Base*, 1 part Portland cement, 2 parts sand, 4 parts river gravel. *Wearing course*, 1 part Portland cement, 1½ parts sand.

Joints: 1 inch wide, filled with asphalt, every 10 feet across the road.

This road runs through a valley which is flooded with water during every freshet. It was previously a macadam road and washed out with each flood. To make the road passable at all times of the year and to ensure a wearing surface which would not wash away, this roadway was built of concrete.

Cost: $1.05 per square yard.

David Markley, John Wagner, Allen Haines, Edward Norman, Road Commissioners.

Geo. J. Bock & Son, Contractors.

FIG. 23.—SAND BEACH AVE., BAD AXE, MICH. TWO-COURSE CONCRETE.

FIG. 24.—COUNTY ROAD, COSHOCTON, OHIO.

Barrancas Avenue, Pensacola, Florida

T. Earle Thornton, City Engineer. R. S. Blome Company, Contractors. Built in accordance with the R. S. Blome Company's specifications, a digest of which is given below.

THE BLOME COMPANY GRANOCRETE CONCRETE PAVEMENT

PATENTED, TRADE-MARK REGISTERED

DIGEST OF GENERAL SPECIFICATIONS

PREPARATION OF SUB-GRADE

The sub-grade shall be prepared in such a way as to provide a solid foundation, and shall conform to the lines and grades established by the engineer.

MATERIALS

The Portland cement shall conform to the standard specifications of the American Society for Testing Materials. All cement shall be carefully protected from the weather until used.

The sand shall be free from clay, loam, vegetable matter, and dust. The grains shall vary in size from one-eighth inch down to the finest and be so graded that the voids, as determined by saturation, shall not exceed 33 per cent. of the volume.

The coarse aggregate shall be of good quality of limestone, trap rock, or other hard stone, or of gravel graded in size from 2½ inches down, and in the event of stone being used, the same shall not measure under ¼ inch in diameter.

When delivered on the street, these materials shall be placed in such a manner as to be kept clean until used.

MANNER OF CONSTRUCTION OF GRANOCRETE

Base: The thickness of the pavement shall be determined by the engineer.

Upon the properly prepared sub-grade shall be deposited concrete composed of 1 part of Portland cement and 8 parts of an aggregate consisting of approximately 50 per cent. of broken stone or gravel with particles below ½ inch eliminated, 15 per cent. of ¼ inch stone or gravel, with the dust removed and 35 per cent. of clean torpedo sand.

This selection of the several sizes of aggregates is made in order to produce a mass which will have sufficient voids to receive enough of the material constituting the top wearing surface to secure a firm union between the two.

FIG. 25.—BARRANCAS AVE., PENSACOLA, FLA.

The concrete shall be mixed in a mechanical mixer, suitable for the purpose and approved by the engineer in charge. Each batch shall be turned at least five times before being removed from the mixer.

SURFACE

After the concrete base has been placed and tamped and before it has begun to set, there shall be immediately deposited thereon the surfacing which shall consist of 1 part Portland cement, 1 part coarse sharp sand, and 1 part of a mass composed of hard, broken stone, conglomerate or gravel of sizes as follows: 25 per cent. of $\frac{1}{4}$ inch size, 50 per cent. of $\frac{3}{8}$ inch size, 25 per cent. of $\frac{1}{2}$ inch size.

In all instances the finer particles shall be eliminated. The surfacing shall be 1 inch thick after compacting.

EXPANSION JOINTS

Expansion joints shall be provided where specified by the engineer.

They shall extend entirely through the pavement and shall be filled with Blome Company's composition.

Whitehall, Baltimore Co., Maryland

Built 1911

Thickness of base 4 inches, wearing surface 2 inches; width 12 feet; length 500 feet.

Proportions: *Base,* 1 part Portland cement, 3 parts sand, 5 parts gravel. *Wearing Course,* 1 part Portland cement, 1 part sand, 2 parts crushed rock.

Joints: Every 15 feet diagonally across road.

Cost: 97½ cents per square yard.

H. G. Shirley, Baltimore Co., Engineer.

Contractor: Force account.

Wisconsin Avenue, Sheboygan, Wisconsin

Built 1911

Thickness of base 4¾ inches at gutter; 6¾ inches at center; width 30 feet; length 6000 feet.

Proportions: *Base,* 1 part Portland cement, 3 parts sand, 5 parts limestone. *Wearing Course,* 40 per cent. Portland cement, 50 per cent. graded granite chips, 10 per cent. sand.

Batch mixer used.

Reinforcing: American Steel & Wire Company's No. 7 triangular woven wire mesh laid between the wearing surface and base.

Joints: ¾ inch wide, filled with asphalt, every 40 feet across street, and continuous along curbs.

Protected by wetting for 5 days. Traffic barred for 10 days.

Cost: $1.25 per square yard.

C. U. Bowley, City Engineer.

Franz Radloff, Contractor.

Fig. 26.—Concrete Road, Whitehall, Baltimore Co., Md.

Fig. 27.—Wisconsin Avenue, Sheboygan, Wis.

Cemetery Road, Washington, Iowa

Built 1911

Thickness of base 5 inches, wearing surface 2 inches; width 9 feet; length ½ mile; crown 1½ inches.

Proportions: *Base*, 1 part Portland cement, 2½ parts sand, 5 parts limestone (graded ¼ to 1½ inches). *Wearing course*, 1 part Portland cement, 1½ parts sand.

Continuous mixer used.

Joints: 1 inch wide, filled with tar, every 20 feet across road.

Concrete tamped, surface made sloppy wet. Finished with wooden float.

Protected by covering with sand, kept wet ten days. Traffic barred eighteen days.

Cost: $1.39 per square yard.

Carl M. Kech, Chairman, Street Committee.

Wallace Treichler, Rock Island, Illinois, Engineer.

J. J. McKeone, Contractor.

Concrete Pavement in front of C. R. I. & P. Freight Station, Mason City, Iowa

Built 1913

Thickness of base 5 inches, wearing surface 2 inches; width 30 and 40 feet.

Proportions: *Base*, 1 part Portland cement, 2 parts sand and 5 parts crushed rock. *Wearing course*, 1 part Portland cement, 2 parts sand.

Batch mixer used.

Joints: ¼ inch wide, filled with asphalt, every 37½ feet across street.

Protected by covering with sand kept wet for one week. Traffic barred for two weeks.

Cost: Including grading $1.35 per square yard.

F P. Wilson, City Engineer.

George Gabler, Contractor.

FIG. 28.—CEMETERY ROAD, WASHINGTON, IA.

FIG. 29.—CONCRETE PAVEMENT IN FRONT OF C. R. I. & P. RY. STATION, MASON CITY, IA.

South Front Street, Milford, Delaware

Built 1911

Thickness of base 6½ inches, wearing surface about ½ inch; width 28 feet; length 1500 feet; crown 7 inches.

Proportions: *Base*, 1 part Portland cement, 2½ parts screenings, 5 parts broken stone (graded ¾ to 3 inches). *Wearing course*, 1 part Portland cement, 1½ parts trap rock screenings.

Batch mixer used.

Joints: 1 inch wide, filled with asphalt and trap rock grits, every 100 feet across the street and along gutters.

As soon as base was laid a light coat of mortar was floated upon it. Board templet used to bring to grade, surface then smoothed with shovel.

Concrete protected by sprinkling every two hours for three days. Traffic barred for one week.

Cost: 95 cents per square yard.

Herbert W. Hatton, Wilmington, Delaware, Engineer.

Frank Hudson, Contractor.

Broadway, De Pere, Wisconsin

Built 1910

Thickness of base 6 inches, wearing surface 1¾ inches; width 28 to 56 feet; length 4700 feet.

Proportions: *Base*, 1 part Portland cement, 3 parts sand, 5 parts broken stone. *Wearing course*, 1 part Portland cement, 1½ parts crushed granite (graded from $\frac{1}{16}$ to ¼ inch, dust removed).

Continuous mixer used.

Joints: ¾ inch wide, filled with asphalt filler, every 50 feet across the street and continuous along curbs. Asphalt filler brought to within ½ inch of surface, filling finished with sand.

Surface tamped, finished with wooden float, and brushed at right angles to center line with steel broom. Planks used to keep laborers off concrete.

Protected by canvas until set. Travel barred for ten days.

Cost: $1.31 per square yard.

W. R. Matthews, City Clerk.

McGrath Construction Company, Contractor.

FIG. 30.—SOUTH FRONT ST., MILFORD, DEL.

FIG. 31.—BROADWAY, DE PERE, WIS.

Guilden Street, New Brunswick, New Jersey

Built 1908 under Blome Granitoid Patents

Thickness of base 5¼ inches, wearing surface 1¾ inches; width 36 feet; length 1800 feet.

Proportions: *Base,* 1 part Portland cement, 2 parts sand, 5 parts broken stone. *Wearing course,* 1 part Portland cement, 2 parts granite chips.

Batch mixer used.

Joints: ¾ inch wide, filled with Blome preparation, every 40 feet across street and continuous along curbs.

Surface floated. Marked in blocks 4½ x 9 inches.

Bridges, resting on curbs, used for finishers to work upon.

Concrete kept wet twenty-four hours. Traffic barred for ten days.

Cost: $2.11 per square yard.

Fred C. Schneider, City Engineer.

Conrad Seobolt, Contractor.

Baldwin Street, Harlan, Iowa

Built 1911

Thickness of base 4 inches, wearing surface 2 inches; width 30 feet; length ½ mile.

Proportions: *Base,* 1 part Portland cement, 2 parts sand, 5 parts broken stone. *Wearing course,* 1 part Portland cement, 2 parts sand.

Batch mixer used.

Joints: ½ inch wide, filled with asphalt, every 40 feet across street and along curbs.

Corrugated on 6 per cent. grade (in foreground of photograph) and smooth on flat grade. Finished with a wooden float.

Planks used to keep workmen off concrete.

Protected by light layer of sand, sprinkled twice daily. Travel barred for ten days.

Cost: $1.18 per square yard for plain; $1.28 per square yard for corrugated.

John P. Crick, Omaha, Neb., Engineer.

G. Mancini, Contractor.

Fig. 32.—Guilden St., New Brunswick, N. J.

Fig. 33.—Baldwin St., Harlan, Ia.

Le Mars, Iowa

Built 1904

Thickness of base 5 inches, wearing surface 1½ inches; width 30 feet; length 400 feet; crown 5 inches.

Proportions: *Base,* 1 part Portland cement, 6 parts coarse gravel. *Wearing course,* 1 part Portland cement, 2 parts coarse screened sand.

Surface grooved diamond shape by use of special tamper. Subjected to heaviest traffic in town.

Cost: $1.25 per square yard.

M. A. Moore & C. H. Kehrberg, Contractors.

Main Street, New Hampton, Iowa

Built 1911

Thickness of base 5 inches, wearing surface 2 inches; width 51 feet; length 1900 feet.

Proportions: *Base,* 1 part Portland cement, 2 parts sand, 5 parts stone. *Wearing course,* 1 part Portland cement, 2 parts sand.

Batch mixer used.

Joints: Expansion, ½ inch wide, every 33 feet across the street. Longitudinal joints, 1 inch wide along curbs and ½ inch wide 17 feet apart in street. All joints filled with asphalt. Contraction joints cut through pavement, half way between expansion joints across the street.

Concrete tamped and finished with a wooden float. Planks used to keep laborers off concrete.

Protected by keeping wet for seven days. Traffic barred for twenty-one days.

Cost: $1.29 per cubic yard.

A. F. Kemman, City Engineer.

W. R. Garland & Co., Contractors.

Fig. 34.—Le Mars, Ia.

Fig. 35.—Main St., New Hampton, Ia.

REINFORCED CONCRETE PAVEMENTS

Doty Street, Fond du Lac, Wisconsin

Built 1910

Thickness of base 5 inches, wearing surface 1½ inches; width 30 feet; length 4000 feet.

Joints placed every 50 feet across the street and along gutters. These were made ¾ inch wide, and filled with asphalt. A 3-inch crown was given to the pavement.

J. S. McCullough, City Engineer.

J. Rassmussen & Sons Company, Contractors.

The proportions of the concrete in the base were 1 part Portland cement, 2½ parts sand, and 5 parts clean crushed limestone.

Only the middle 18 feet of the 30-foot pavement was reinforced. Four inches of the concrete base was laid, and into it was immediately tamped the reinforcing. The reinforcement consisted of No. 7 triangular woven wire mesh, made by the American Steel & Wire Company, and was placed with the large wires across the pavement. The remaining inch of the base was then added.

The concrete for the base was mixed in a continuous mixer.

Within twenty minutes of the completion of the base was applied the wearing course of a mixture of 1 part Portland cement, 1 part clean sharp sand, and 1 part granite screenings, varying in size from $\frac{1}{16}$ to ¼ inch. First was spread a layer ½ inch thick. This was thoroughly rammed to insure proper bond. A second layer 1 inch thick was immediately added and thoroughly troweled and was made to conform to the established grade and cross-section of the street by the use of Roughen's Adjustable Street Gauge. Before the concrete had hardened the surface was roughened by drawing lightly across it an ordinary street broom. The mortar for the wearing surface was mixed in a batch mixer.

Along each curb and every 50 feet across the street, a ¾-inch expansion joint was made by the use of a board or metal form. The joints extended the full depth of the pavement, and care was exercised to insure a uniform width from top to bottom. After the concrete had hardened the forms were taken out, all dirt removed, and the joints filled with an asphalt preparation.

If rain came immediately after laying the pavement, the surface was covered with canvas. Otherwise no protecting cover was used. The surface was kept wet for one week after completion and the traffic was barred for two weeks.

FIG. 36.—DOTY ST., FOND DU LAC, WIS.

FIG. 37.—DOTY ST., FOND DU LAC, WIS.
Finishers working from Roughen's Adjustable Street Gauge

Plymouth, Wisconsin

Built 1910

Thickness of base 5 inches, wearing surface 1½ inches; width 42 feet; length 2275 feet.

Proportions: *Base*, 1 Portland cement, 3 parts sand, 5 parts broken stone. *Wearing course*, 1 part Portland cement, 1½ parts crushed granite (graded ¼ inch to dust).

Batch mixer used.

Reinforcement: American Steel & Wire Company's No. 7 triangular woven wire mesh, placed between base and wearing surface.

Joints: 1 inch wide, filled with pecky cypress boards, every 40 feet across street and along curbs. The upper edges of the transverse joints were faced with mortar, 2 inches wide and 1½ inches deep, proportioned 1 part Portland cement to 1 part granite screenings. The wire mesh was laid in strips running across the street and allowed to slightly overlap. Surface brought to grade by use of templet, then troweled smooth, and covered with granite chips, graded from ¼ to ¾ inch. These were rolled into surface by hand roller. Enough granite chips spread to cover the surface.

Planks used to keep workmen off concrete. After thirty-six hours, pavement sprinkled for six days. Traffic barred for ten days.

Cost: $1.23½ per square yard.

W. G. Kirchoffer, Madison, Wisconsin, Engineer.

Franz Radloff, Contractor.

North Sixth Street, Sheboygan, Wisconsin

Built 1911

Thickness of base 5 inches in center of street, 3 inches at curbs; wearing surface 1¾ inches; width 30 feet; length ½ mile.

Proportions: *Base*, 1 part Portland cement, 3 parts sand, 5 parts limestone. *Wearing course*, 40 per cent. Portland cement, 50 per cent. granite chips (graded 20 per cent. $\frac{1}{16}$ to ¼ inch, 30 per cent. ¼ to ¾ inch) and 10 per cent. torpedo sand.

Batch mixer used.

Reinforcing: American Steel & Wire Company's No. 7 triangular woven wire mesh, laid between wearing surface and base.

Joints: 1 inch wide, filled with asphalt, every 40 feet across street and continuous with curbs.

Base tamped. Top floated and broomed transversely. Roughen's Adjustable Street Gauge used as templet and as platform to keep laborers off concrete.

Concrete protected by wetting for seven days. Travel barred for ten days.

Cost: $1.20 per square yard.

C. U. Bowley, City Engineer.

Franz Radloff, Contractor.

FIG. 38.—PLYMOUTH, WIS.

FIG. 39.—NORTH SIXTH ST., SHEBOYGAN, WIS.

Grand Avenue, Highland Park, Michigan

Built 1911

Thickness of base 5 inches, wearing surface 2 inches; width 24 feet; length ½ mile; crown $\frac{1}{100}$ width of street.

Proportions: *Base*, 1 part Portland cement, 3 parts sand, 6 parts broken stone (graded 1½ to 2 inches). *Wearing course*, 1 part Portland cement, 1 part sand, 3 parts granite chips (graded 50 per cent. ¼ inch, 30 per cent. ⅛ inch, 20 per cent. $\frac{1}{16}$ inch).

Hand mixed.

Reinforcement: Thomas system; ⅜-inch round steel bars placed in both directions, 2-foot centers, and 1½ inches from top of surface. One-quarter inch round steel bars, placed in both directions, 4-foot centers, and 6 inches from top of surface. All bars securely fastened at intersections.

All reinforcing fabricated on job in sections 30 feet long by width of road, set in position prior to placing any concrete, and supported securely by small angle irons.

Joints: ½ inch wide, filled with asphalt, every 30 feet across road and along curbs. Edges protected by Baker Armored plates. (See page 47.)

Surface graded with iron-shod wooden templet.

Concrete covered with 2 inches of earth and kept moist for one week. Traffic barred for three weeks.

Cost: $1.57 per square yard.

George Jerome, Detroit, Michigan, Engineer.

R. D. Baker, Contractor.

JOINT PROTECTION PLATES

The edges of transverse joints must be protected. For this purpose soft steel plates are used. Very satisfactory results have been obtained with the Baker Armored Protecting Plates and the Truss-Con Armor Plates. These plates are 2½ inches in depth and about ¼ inch thick. From the center of the plates, at intervals of from 8 inches to 10 inches, tongues are cut ¾ inch wide and 6 inches long. These are bent back upon the plate to a right angle with it. Before the concrete is placed the plates are set in position by means of an installation device, which holds them firmly to line and grade. The protruding tongues provide rigid anchorage to the concrete.

Fig. 40.—Grand Ave., Highland Park, Mich.

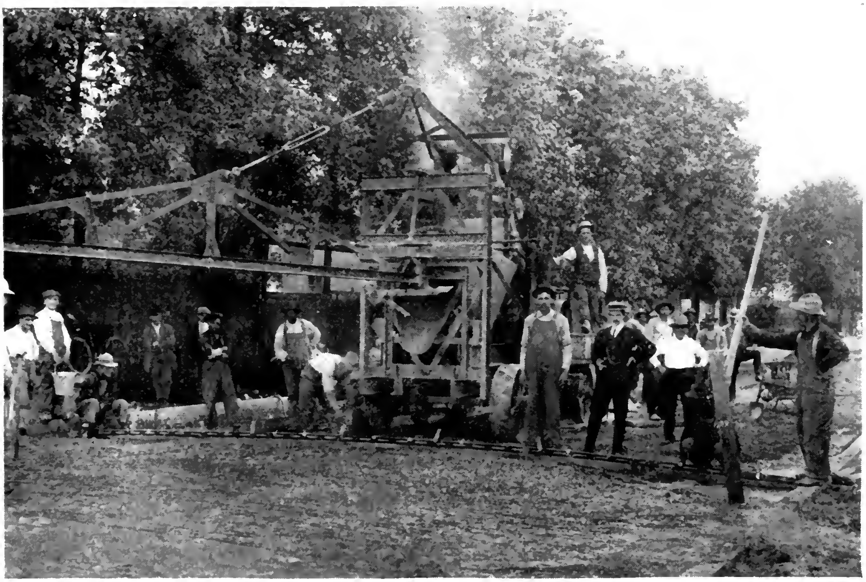

Fig. 41.—Reinforcement and Steel Armored Protecting Plates in Position, Hamtramck, Mich.

GROUTED PAVEMENTS—HASSAM TYPE

Blue Avenue, Independence, Missouri

Built 1910 under Hassam Patents

Thickness 6 inches; width 30 feet; length ½ mile.
Joints: ¾ inch wide, filled with asphalt, continuous along curbs.
H. H. Pendleton, City Engineer.
Rackliffe-Gibson Construction Co., St. Joseph, Mo., Contractors.

Method of Constructing Hassam Pavements

The Hassam pavement consists of a properly compacted sub-grade upon which is placed a layer of broken stone thoroughly rolled to a thickness of 6 inches and made to conform to the grade and contour of the street. After this stone has been firmly compacted by rolling and the voids reduced to a minimum, it is grouted with a Portland cement grout, made of 1 part cement and 2 parts sand. This grout is poured upon the stone until all the voids are filled and the grout flushes to the surface. The rolling is continuous throughout the process of grouting. Upon this surface is placed a very thin layer of pea stone, which is spread over the entire area of the roadway, grouted and rolled, the rolling continued until the grout flushes to the surface. Expansion joints are left along the curbs.

For four days after completion the street is kept wet and all traffic barred for ten days.

Spencer Road, Spencer, Massachusetts

Built 1906 under Hassam Patents

Thickness 6 inches; width 16 feet; length 1 mile. Crown 3 inches; no joints.
Cost: $1.75 per square yard.

This road was built similar to Blue Ave., Independence, Missouri, and after three years' service it was covered with Hassamite, a bituminous compound, spread in two layers, ¼ gallon per square yard per application. After the first coat is applied, at a temperature between 200° F. and 300° F., it is drifted with screened pea stone and lightly rolled; the second course is drifted with coarse sharp sand, thoroughly rolled, sufficient sand being added to absorb any surplus composition.

The only repair made has been a patch requiring the use of only ½ gallon of Hassamite.

Built by Massachusetts State Highway Commission.
Hassam Paving Co., Contractors.

Fig. 42.—Blue Ave., Independence, Mo.

Fig. 43.—Spencer Road, Spencer, Mass.

CONCLUSION

The many concrete roads and streets successfully built, a few of which have been described, establish beyond doubt the adaptability of this material to all conditions and requirements. Such successful examples, together with the low cost of construction and maintenance, prove concrete to be the most desirable of all road materials.

The best results in any road construction can only be obtained by the exercise of the greatest care in the selection of the materials and in the actual work of building. Concrete roads are no exception to this rule. Too many think that poor aggregates and bad workmanship may be overcome by the use of Portland cement. Such a practice is unfair to this material, wonderful as it is, and the results obtained are neither what the taxpayers have a right to expect, nor what those in direct charge of the work desire.

Careful attention to every detail will produce a concrete road, lasting for many, many years.

Bad materials and careless workmanship will produce failures.

The aggregates used should be the best the locality affords. If proper local sand and stone cannot be found, buy them elsewhere. It is false economy to put such poor materials in a road as to predestine it to failure.

If the stone is soft and not of a uniform quality, or the sand poor and its grains coated with dirt, weak places are embodied in the construction, which give an opportunity for the starting of a crack or the formation of a pit-hole. The same trouble will occur if retempered mortar is added or frozen aggregates are used.

The use of proper material in the sub-base, and careful compacting of the same, is often neglected. A concrete road widely distributes the load brought upon it, and while pockets in the sub-base may be bridged by the use of concrete, they may become of such size as to cause failure. Therefore, the sub-base must be prepared in such a way as to avoid the formation of pockets.

Many soils will not permit of quick flow of water through them unless artificial drainage is provided. After every rain the ground water is raised, and if this is not carried away rapidly to the proper channels, it will freeze and heave the surface, forming unsightly cracks.

The drainage problems must be solved by those having direct charge of the work and in such a way as to fit local conditions. To provide adequate drainage, consideration must be given not only to the water falling on the roadway, but also to the overflow from adjoining property. Side ditches should have sufficient fall to carry the water quickly to

Fig. 44.—Preparation of Sub-Base.

Fig. 45.—Wetting Sub-base Immediately Before Placing Concrete.

the adjacent streams and not allow it to stand in pools along the sides of the road.

One of the fundamental requirements of road construction is the exclusion of water from the road itself. Concrete can be made impervious to water by using the proper proportions of cement, sand, and stone. This gives not only a dense mixture, but also one of great strength.

The necessity of measuring with comparative exactness the stone or gravel and sand is therefore apparent. The most practical method is that of the bottomless box or of equally accurate devices. Measuring material by wheel-barrow loads or shovelfuls should never be permitted under any circumstances.

Care should be exercised in the amount of water used. If after placing a batch it is found that water flushes to the surface without tamping, too much is being used. On the other hand, if heavy and continuous tamping is required to bring mortar to the surface, too little water is being used. A few experimental batches, mixed with varying quantities of water, will determine the proper amount. Then be sure that the proper quantity is used by having the water measured for every batch. The methods, too often employed, of dashing a promiscuous number of bucketfuls over the mass, or of adding water with a hose connected to the water main, are a little easier, but are sure to result in concrete lacking in uniform density and strength.

See that the sub-base is wet before placing the concrete. The amount of water needed varies with the character of the soil. Unless the sub-base is wet, it may absorb enough water from the concrete to prevent its setting properly.

If, for any cause whatever, even at noontime, it is necessary to stop work, place a joint across the road, and complete the work to this joint. When this is not done, an irregular line of weakness is formed where batches join, and cracks are likely to develop.

Forms along the sides of the road are desirable not only to confine the concrete and to fix lines and grades, but are the most available tracks to support bridges from which the finishers may work. With this weight on them, it is necessary to make them substantial and to stake them securely. Curbs along the sides of a street serve the same purpose. By using a templet, cut to the proper curve of the crown and resting on the side forms, a wavy roadway, so objectionable to the automobilist, is avoided.

All laborers must be kept off the concrete after it is once in place. Although footprints can be worked out, dirt from shoes is likely to spoil

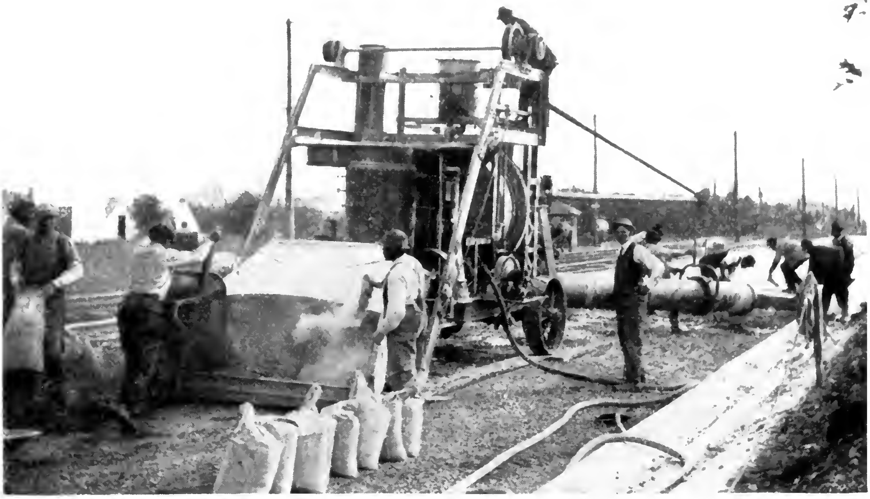

FIG. 46.—MEASURING THE MATERIALS.

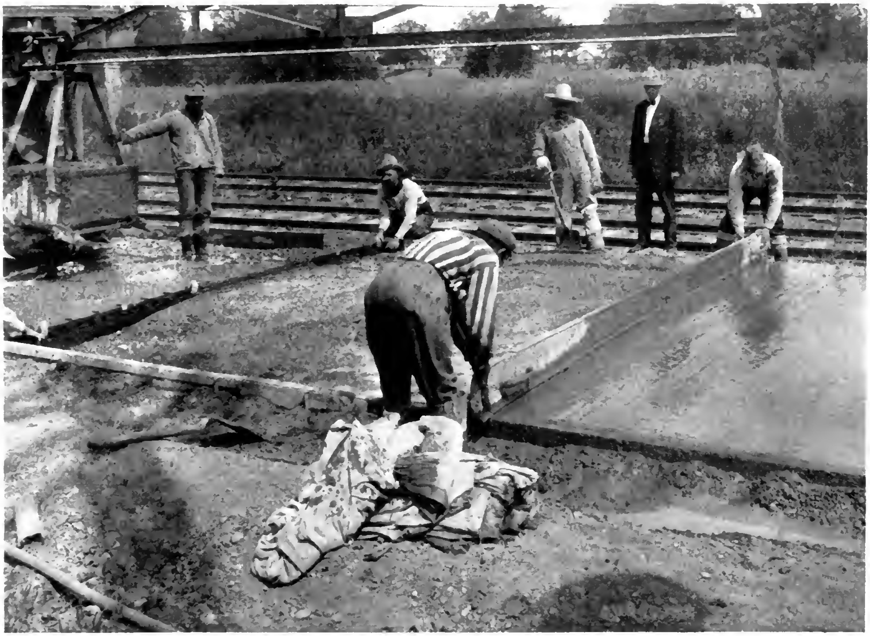

FIG. 47.—USING THE SIDE FORMS AS TRACKS FOR TEMPLET.
Steel Joint Protection Plate Shown at the Left.

the proper bond between the materials. By the use of a bridge all need of tracking on the concrete is avoided.

Expansion joints along the edges of the pavement prevent the displacement of the curb. Straight cuts across the street perpendicular to the center line, or at an angle of 60°, and located at proper intervals, prevent unsightly contraction cracks. These joints will not wear down if the edges are protected.

Concrete, in hardening, has a tendency to shrink, and such shrinkage is increased if the water is allowed to be drawn from the concrete before it has thoroughly hardened. Owing to the uncertainty of the sub-base,

FIG. 48.—CONCRETE ROAD DURING CONSTRUCTION.
Side forms in place. Strike-off board and steel joint protection plate.

if prepared in freezing weather, as well as the difficulty of properly handling the materials going to make up the concrete, most roads, where the winter months are cold, are laid between May 1 and November 1. During these hot dry months the sun will absorb water from the concrete if allowed to shine directly upon it. The surface must be protected. If the sun is particularly strong and the temperature high, canvas should be spread over the roadway for the first ten hours. Then dirt shoveled on the pavement, and kept thoroughly wet for seven days, affords an almost perfect protection. Do not use manure.

FIG. 49.—PROTECTION OF ROAD. WETTING AND COVERING WITH DIRT.

FIG. 50.—EASE OF TRACTION FOR HEAVY LOADS.

It is always difficult to exclude impatient traffic from a road; yet when one considers the many years of service given by a concrete road properly laid, the three or four weeks' time necessary to perfect it seems insignificant.

Concrete is probably the most adaptable material of construction ever known. Being a combination of composite parts, proper ingredients are everywhere available. Its ability to take any form desired fits it admirably to every local condition. By wood floating, slipperiness can be absolutely avoided, and by surface grooving, foothold for horses is given on the steepest grade. Resistance to traction is extremely low, owing to the monolithic character of a concrete pavement.

A concrete road is suited to every class of traffic. The objection often raised that it is hard on horses' feet has not been borne out by experience wherever these roads have been constructed. Farmers after using the road have noticed no ill effect on their horses' feet or shoulders, and are anxious for more concrete roads to be built. A horse stepping on an even surface is harmed less than by stepping on the loose stones pulled from a macadam road by the automobile. The low tractive resistance also allows the horse to pull a load with greater ease.

This discussion may lead some to feel that a successful concrete road is quite difficult to build. Such, however, is not the case. The details discussed are all little things, essential to success, it is true, but of a nature easily cared for if given the proper amount of thought. They do not increase the cost of the work, but they do increase the life of the road.

PROPOSED STANDARD SPECIFICATIONS FOR ONE-COURSE CONCRETE HIGHWAY*

GRADING

Defined.—The term "grading" shall include all cuts, fills, ditches, borrow pits, approaches and all earth moving for whatever purpose, where such work is an essential part of or necessary to the prosecution of the contract. When to bring the surface to grade, a fill of one (1) foot or less is required, the area shall be thoroughly grubbed. All soft, spongy or yielding spots and all vegetable or other objectionable matter shall be removed and the space refilled with suitable material.

Engineer's Stakes.—Stakes will be set by the engineer for center line, side of slopes, finished grade and other necessary points properly marked for the cut or fill.

Excess Material.—Excess material shall be disposed of as directed by the engineer, the free haul not to exceed .... feet.

Over-haul.—Materials hauled a greater distance than the free haul from the place of excavation shall be paid for at the rate of .... cents per cubic yard for each additional .... feet.

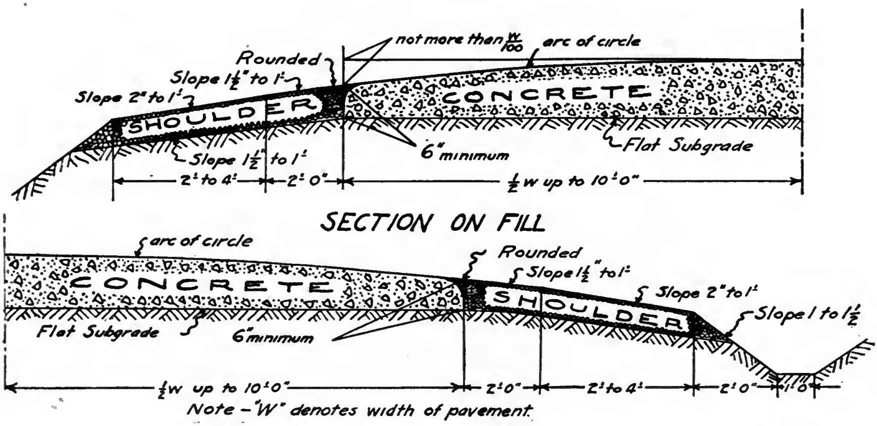

FIG. 51.—ONE-COURSE CONCRETE HIGHWAY. SECTIONS ON FILL AND CUT.

Fills.—Embankments shall be formed of earth or other approved materials and shall be constructed in successive layers, the first of which shall extend entirely across from the toe of the slope on one side to the toe of the slope on the other side, and successive layers shall extend entirely across the embankments from slope to slope. Each layer, which shall not exceed one (1) foot in depth, shall be thoroughly rolled with a roller weighing

* Presented to the American Concrete Institute, Tenth Annual Convention, February 16–20, 1914, Chicago, Ill.

not less than five (5) tons nor more than ten (10) tons before the succeeding layer is placed. The roller shall pass over the entire area of the fill at least twice.

The sides of the embankment shall be kept lower than the center during all stages of the work, and the surface maintained in condition for adequate drainage. The use of muck, quicksand, soft clay or spongy material which will not consolidate under the roller is prohibited.

When the material excavated from cuts is not sufficient to make the fills shown on the plans, the contractor shall furnish the necessary extra material to bring the fills to the proper width and grade. When the earth work is completed the cross-section of the road shall conform to the cross-sectional drawings and profile shown in Fig. 51.

Slopes.—All slopes must be properly dressed to lines given by the engineer.

Finished Grade.—When grade line is approached, the final grade stakes will be set, for which sufficient notice must be given to the engineer.

Note:—In excavating cuts it is considered advisable, when the line of the sub-grade is approached, to compact the remaining material by rolling. The depth of material left in the cut to be compressed to the finished grade by rolling will depend upon the character of the material.

DRAINAGE

Drainage.—The contractor shall construct such drainage ditches as will insure perfect sub and surface drainage during construction and such work shall be completed to the satisfaction of the engineer, prior to the preparation of the roadbed, as herein specified.

Tile drains shall be placed as shown in the drawings attached hereto. Tile to be laid in the trench at least................ (........) inches wide and.............. (........) feet deep below the established grade of the finished pavement, such trench shall be back filled with crushed stone or pit-run gravel, with sand removed, which after light tamping shall be................(........) inches in depth.

Open ditches must be constructed along the concrete road as shown in Fig. 51, the dimensions, side slopes and grade of said ditches being as shown on the cross-section and profile.

At the time of the acceptance of the road, the ditches must be in perfect condition, with clean slopes and bottom, containing no obstructions to the flow of water.

SUB-GRADE

Construction.—The bottom of the excavation or top of the fill, when completed, shall be known as the sub-grade, and shall be at all places true to the elevation as shown on the plans attached hereto.

The roadway shall be graded to the proper sub-grade to permit of the specified thickness of paving materials being laid to bring the finished surface of the pavement to the lines and grades as shown on the plans.

The sub-grade shall be brought to a firm, unyielding surface by rolling the entire area with a self-propelled roller weighing not less than ten (10) tons, and all portions of the surface of the sub-grade which are inaccessible to the roller shall be thoroughly tamped with a hand tamp weighing not less than fifty (50) pounds, the face of which shall not exceed 100 square inches in area. All soft, spongy, or yielding spots and all vegetable or other objectionable matter shall be entirely removed and the space refilled with suitable material.

Where considered necessary or of assistance in producing a compact, solid surface, the sub-grade before being rolled shall be well sprinkled with water.

When the concrete pavement is to be constructed over an old roadbed composed of gravel or macadam, and the concrete is to be wider than the old gravel or macadam road, the latter shall be entirely loosened and the material spread for the full width of the roadbed and rolled. All interstices shall be filled with fine material, and rolled to make a dense, tight surface of the roadbed.

Acceptance.—No concrete shall be deposited upon the sub-grade until it is checked and accepted by the engineer.

Completion.—Upon the sub-grade thus formed shall be laid the concrete pavement as shown in Fig. 51.

MATERIALS

Cement.—The cement shall meet the requirements of the Standard Specifications for Portland Cement, adopted by the American Society for Testing Materials, August 16, 1909, with all subsequent amendments and additions thereto adopted by said Society.

When the cement is not inspected at the place of manufacture it shall be stored a sufficient length of time to permit of inspecting and testing. The engineer shall be notified of the receipt of each shipment of cement.

Fine Aggregate.—Fine aggregate shall consist of sand or screenings from clean, hard, durable crushed rock or gravel consisting of quartzite grains or other equally hard material graded from fine to coarse, with the coarse particles predominating and passing, when dry, a screen having one-quarter (¼) inch openings. It shall be clean, hard, free from dust, loam, vegetable, or other deleterious matter. Not more than twenty (20) per cent. shall pass a sieve having fifty (50) meshes per linear inch, and not more than five (5) per cent. shall pass a sieve having one hundred (100) meshes per linear inch.

Fine aggregate containing more than three (3) per cent. of clay or loam shall be washed before using.

Fine aggregate shall be of such quality that the mortar composed of one part Portland cement and three (3) parts fine aggregate by weight, when made into briquettes, shall show a tensile strength at least equal to the strength of 1 to 3 mortar of the same consistency made with the same cement and Standard Ottawa sand.

In no case shall fine aggregate containing frost or lumps of frozen material be used.

Coarse Aggregate.—Coarse aggregate shall consist of clean, hard, durable crushed rock or gravel, graded in size, free from dust, loam, vegetable or other deleterious matter, and shall contain no soft, flat or elongated particles. The size of the coarse aggregate shall be such as to pass a one and one-half (1½) inch round opening and be retained on a screen having one-quarter (¼) inch openings.

In no case shall coarse aggregate containing frost or lumps of frozen material be used.

Natural Mixed Aggregate.—Natural mixed aggregate shall not be used as it comes from deposits, but shall be screened and used as specified.

Water.—Water shall be clean, free from oil, acid, alkali, or vegetable matter.

Reinforcement.—Concrete pavements twenty (20) feet or more in width shall be reinforced with metal fabric. All reinforcement shall be free from excessive rust, scale, paint, or coatings of any character which will tend to destroy the bond. All reinforcement shall develop an ultimate tensile strength of not less than 70,000 pounds per square inch and bend 180 deg. around one diameter and straighten without fracture.

FORMS

Materials.—The forms shall be free from warp, of sufficient strength to resist springing out of shape, and shall be equal in width to the thickness of the pavement at the edges. Wooden forms shall be of not less than two (2) inch stock, and shall be capped with two (2) inch angle iron.

Setting.—The forms shall be well staked or otherwise held to the established line and grades, and the upper edges shall conform to the established grade of the road.

Treatment.—All mortar and dirt shall be removed from the forms that have previously been used.

PAVEMENT SECTION

Width, Thickness of Concrete and Crown.—The concrete pavement shall be................. feet wide, ... (........) inches in depth at center, and .... (........) inches in depth at the sides. The finished surface shall conform to the arc of a circle, as shown on Fig. 51.

Note:—Crown shall be not more than one one-hundredth ($\frac{1}{100}$) of the width. The thickness of the concrete at the edges shall not be less than six (6) inches.

JOINTS

Width and Location.—Transverse joints shall be not less than one-quarter (¼) inch nor more than three-eighths (⅜) inch in width and shall be placed across the pavement perpendicular to the center line, not more than 35 feet apart. When a curb is specified or where pavement abuts a building a joint not less than one-quarter (¼) inch wide shall be placed between it and the pavement. All joints shall extend through the entire thickness of the pavement and shall be perpendicular to its surface.

Protection of Joints.—The concrete at transverse joints shall be protected with soft steel joint protection plates which shall be not less than two and one-half (2½) inches in depth and not less than one-eighth (⅛) or more than one-quarter (¼) inch average thickness. The plates shall be of such form as to provide for rigid anchorage to the concrete. The type and method of installation of joint protection plates shall be approved by the engineer. The surface edges of the metal plates shall conform to the finished surface of the concrete, as shown in Fig. 51.

All joint protection plates over one-quarter (¼) inch high or one-half (½) inch low shall be removed.

Joint Filler.—All joints shall be formed by inserting during construction and leaving in place the required thickness of prepared felt or similar material of approved quality, having a thickness of not less than one-eighth (⅛) inch nor more than one-quarter (¼) inch, which shall extend through the entire thickness of the pavement.

MEASURING MATERIALS AND MIXING CONCRETE

Measuring.—The method of measuring the materials for the concrete, including water, shall be one which will insure separate and uniform proportions of each of the materials at all times. A sack of Portland cement (94 lbs. net) shall be considered one (1) cubic foot.

Mixing.—The materials shall be mixed to the desired consistency in a batch mixer of approved type, and mixing shall continue for at least forty-five (45) seconds after all materials are in the drum. The drum shall be completely emptied before mixing successive batches. The drum of the mixer used shall revolve at a speed not less than the minimum nor more than the maximum number of revolutions shown in the following table:

Rated Capacity Cu. Ft. Unmixed Material	Capacity Bags of Cement in 1:2:3 Mix	Revolutions Per Minute of Drum Min.	Max.
7 to 11	1	15	21
12 to 17	2	12	20
18 to 23	3	12	20
24 to 29	4	11	17
30 to 33	5	10	15

Retempering.—Retempering of mortar or concrete which has partially hardened, that is, mixing with additional materials or water, shall not be permitted.

Proportions.—The concrete shall be mixed in the proportions of one (1) sack of Portland cement to not more than two (2) cubic feet of fine aggregate and not more than three (3) cubic feet of coarse aggregate, and in no case shall the volume of the fine aggregate be less than one-half (½) the volume of the coarse aggregate.

A cubic yard of concrete in place between neat lines shall contain not less than one and seven-tenths (1.7) barrels of cement.

The engineer shall compare the calculated amount of cement required according to these specifications and plans attached hereto with the amounts actually used in each section of concrete between successive transverse joints, as determined by actual count of the number of sacks of cement used in each section. If the amount of cement used in any three adjacent sections (between transverse joints) is less by two (2) per cent, or if the amount of cement used in any one section is less by five (5) per cent, than the amount hereinbefore specified, the contractor agrees to remove all such sections and to rebuild the same according to these specifications at his expense.

Consistency.—The materials shall be mixed with sufficient water to produce a concrete which when deposited will settle to a flattened mass, but shall not be so wet as to cause a separation of the mortar from the coarse aggregate in handling.

REINFORCING

Reinforcing.—Concrete pavements twenty (20) feet or more in width shall be reinforced. The cross-sectional area of the reinforcing metal running parallel to the center line of the pavement shall amount to at least 0.038 square inch per foot of pavement width and the cross-sectional area of reinforcing metal, which is perpendicular to the center line of the pavement, shall amount to at least 0.049 square inch per foot of pavement length.

Reinforcing metal shall be placed not less than two (2) inches from the finished surface of the pavement and otherwise shall be placed as shown on the drawings. The reinforcing metal shall extend to within two (2) inches of all joints, but shall not cross them. Adjacent widths of fabric shall be lapped not less than four (4) inches.

PLACING CONCRETE

Placing.—Immediately prior to placing the concrete, the sub-grade shall be brought to an even surface. The surface of the sub-grade shall be thoroughly wet when the concrete is placed.

After mixing, the concrete shall be deposited rapidly in successive batches upon the sub-grade prepared as hereinbefore specified. The concrete shall be deposited to the required depth and for the entire width of the pavement, in a continuous operation, between transverse joints without the use of intermediate forms or bulkheads.

In case of a breakdown concrete shall be mixed by hand to complete the section or an intermediate transverse joint placed as hereinbefore specified at the point of stopping

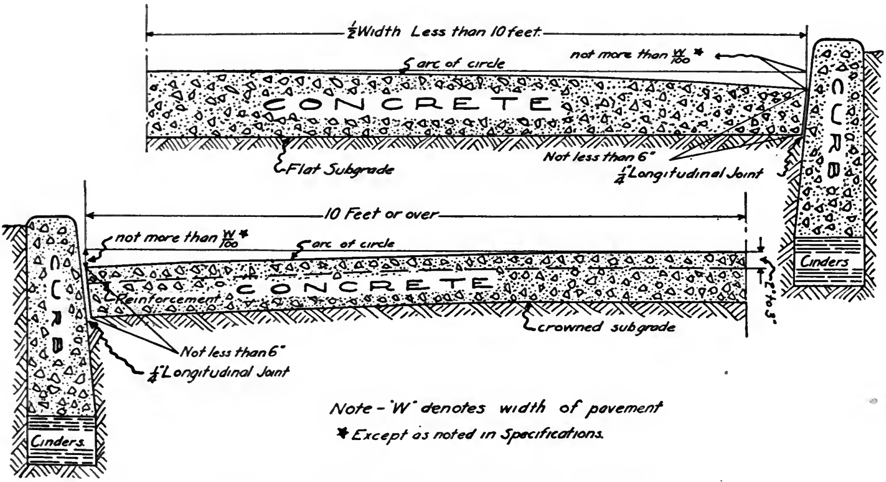

FIG. 52.—ONE-COURSE CONCRETE PAVEMENT.

work. Any concrete in excess of that needed to complete a section at the stopping of work shall not be used in the work.

Finishing.—The surface of the concrete shall be struck off by means of a templet or strike board which shall be moved with a combined longitudinal and cross-wise motion. When the strike board is within three (3) feet of a transverse joint it shall be lifted to the joint and the pavement struck by moving the strike board away from the joint; any excess concrete shall be removed. Concrete adjoining the metal protection plates at transverse joints shall be dense in character, and any holes left by removing any device used in installing the metal protection plates shall be immediately filled with concrete.

After being brought to the established grade with the templet or strike board, the concrete shall be finished from a suitable bridge, no part of which shall come in contact with the concrete. The concrete shall be finished with a wood float in a manner to thoroughly compact it and produce a surface free from depressions or inequalities of any kind. The finished surface of the pavement shall not vary more than one-quarter (¼) inch from the true shape.

The edges of the pavement shall be rounded as shown on the cross-sectional drawings in Fig. 51.

PROTECTION

Curing and Protection.—Excepting as hereinafter specified, the surface of the pavement shall be sprayed with water as soon as the concrete is sufficiently hardened to prevent pitting, and shall be kept wet until an earth covering is placed. As soon as it can be done without damaging the concrete, the surface of the pavement shall be covered with not less than two inches of earth or other material which will afford equally good protection, which cover shall be kept moist for at least ten (10) days. When deemed necessary or advisable by the engineer, freshly laid concrete shall be protected by a canvas covering until the earth covering can be placed.

If at the time the pavement is laid or during the period of curing the temperature during the daytime drops below 50 degrees Fahrenheit, sprinkling and covering of the pavement may be omitted at the direction of the engineer.

Under the most favorable conditions for hardening, in hot weather, the pavement shall be closed to traffic for at least fourteen (14) days, and in cool weather for an additional time, to be determined by the engineer.

The contractor shall erect and maintain suitable barriers to protect the concrete from traffic, and any part of the pavement damaged from traffic or other causes occurring prior to its official acceptance, shall be repaired or replaced by the contractor at his expense in a manner satisfactory to the engineer.

Before the pavement is thrown open to traffic the covering shall be removed and disposed of as directed by the engineer.

Temperature Below 35 Degrees Fahrenheit.—Concrete shall not be mixed or deposited when the temperature is below freezing.

If at any time during the progress of the work the temperature is, or in the opinion of the engineer will, within twenty-four (24) hours drop to 35 degrees Fahrenheit, the water and aggregates shall be heated and precautions taken to protect the work from freezing for at least ten (10) days. In no case shall concrete be deposited upon a frozen sub-grade.

SHOULDERS

Construction.—Where shoulders are required, they shall be built upon the properly prepared subgrade, as shown in Fig. 51. All materials shall meet with the approval of the engineer and the work shall be done to his entire satisfaction.

ADDITIONS TO THE SPECIFICATIONS FOR ONE-COURSE CONCRETE HIGHWAY WHICH APPLY TO TWO-COURSE ROADS AND CITY STREETS

DRAINAGE

Catch Basins.—All catch basins and manhole tops and all covers of openings of any kind shall be readjusted to the grade by the contractor at his expense.

MATERIALS

Aggregate for Wearing Course.—The aggregate for the wearing course shall consist of a mixture of two (2) parts of the materials specified under "Fine Aggregate," and three (3) parts of clean, hard, durable, crushed rock or gravel, free from dust, soft particles, loam, vegetable or other deleterious matter, and passing when dry a screen having one-half (½) inch openings and be retained on a screen having one-quarter (¼) inch openings.

In no case shall aggregate for wearing course containing frost or lumps of frozen material be used.

PAVEMENT SECTION

Width, Thickness of Concrete and Crown.—The concrete pavement shall be .... (......) feet wide from face to face of curb. The base of the concrete pavement shall be . . . . (. . . . . .) inches in depth at the center and . . . . (. . . . . .) inches in depth at the sides. The wearing course shall be of . . . . (. . . . . .) inches uniform thickness. The finished surface shall conform to the arc of a circle as shown in Fig. 53.

Note: The minimum thickness of the concrete base shall be not less than five (5) inches and the minimum thickness of the wearing course shall be not less than two (2) inches. When pavements twenty (20) feet or less in width are to be built on approximately level ground and a flat sub-grade is to be used, sufficient fall for drainage at the sides of the pavement along the curb shall be provided by giving the roadbed the same grade as that proposed for the gutter. The crown of all pavements shall be not more than one one-hundredth ($\frac{1}{100}$) of the width except, when deemed advisable by the engineer, the crown of a pavement built on a crowned sub-grade may be increased to one-fiftieth ($\frac{1}{50}$) of the width to provide sufficient fall for drainage along the sides of the pavement at the curb.

MEASURING MATERIALS AND MIXING AND PLACING CONCRETE

Cement Required.—A cubic yard of concrete base in place shall contain at least 1.4 barrels of cement and a cubic yard of wearing course in place shall contain at least 2.97 barrels of cement.

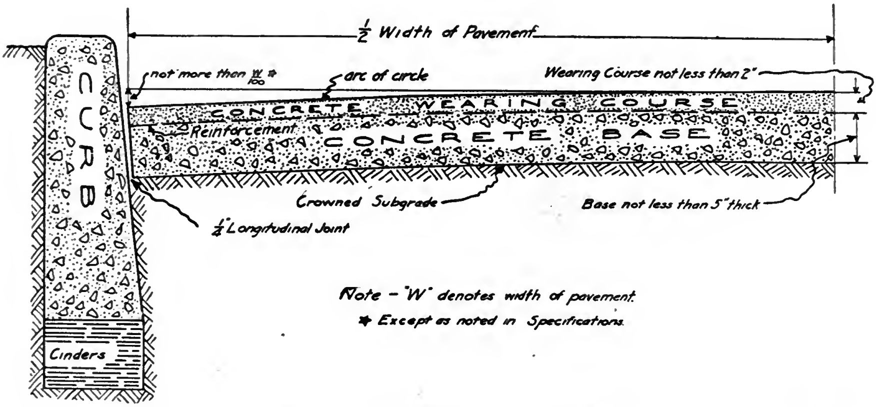

FIG. 53.—TWO-COURSE CONCRETE PAVEMENT FOR PAVEMENT OVER 20 FEET WIDE.

CONCRETE FOR BASE

Proportions.—The concrete shall be mixed in the proportions of one (1) sack of Portland cement to not more than two and a half (2½) cubic feet of fine aggregate, and not more than four (4) cubic feet of coarse aggregate, and in no case shall the volume of the fine aggregate be less than one-half (½) the volume of the coarse aggregate.

The concrete shall be brought to a comparatively even surface, the thickness of the wearing course below the finished grade of the pavement. Workmen shall not be allowed to walk on the freshly laid concrete, and if sand or dust collects on the base, it shall be removed before the wearing course is applied. The reinforcing metal shall be placed upon and slightly pressed into the concrete base immediately after it is placed.

CONCRETE FOR WEARING COURSE

Proportions.—The mortar for the wearing course shall be mixed in the manner hereinbefore specified in the proportion of one (1) sack of Portland cement and not more than two (2) cubic feet of "Aggregate for Wearing Course" hereinbefore specified.

Placing.—The wearing course shall be placed immediately after mixing and in no case shall more than forty-five (45) minutes elapse between the time that the concrete for the base has been mixed and the time the wearing course is placed.

Finishing.—The wearing course shall be struck off by means of a templet or strike board, which shall be moved longitudinally or crosswise of the pavement. Concrete adjoining the metal protection plates at transverse joints shall be dense in character and any holes left by removing any device used in installing the metal protection plates shall be immediately filled with a mortar composed of one (1) part Portland cement to not more than two (2) parts of fine aggregate.

After being brought to an established grade with the templet or strike board, the concrete shall be finished from a suitable bridge, no part of which shall come in contact wiih the concrete. The concrete shall be finished with a wood float in a manner to

FIG. 54.—JANESVILLE ROAD, MILWAUKEE CO., WIS.
Method of constructing one-course concrete pavement.

thoroughly compact it, and produce a surface free from depressions or inequalities of any kind. The finished surface of the pavement shall not vary more than one-quarter (¼) inch from the true shape.

REINFORCING

Reinforcing metal shall be placed between base and wearing course and shall be not less than two (2) inches from the finished surface of the pavement and otherwise shall be placed as shown on the drawings. The reinforcing metal shall extend to within two (2) inches of all joints, but shall not cross them. Adjacent widths of fabrics shall be lapped not less than four (4) inches.

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS

For the benefit of those who may wish to investigate the subject further, below is given a tabular digest of concrete pavements, of which records are at hand. These are arranged alphabetically according to states.

Location	Year Built	Type	Square Yards	Thickness	Proportions	Cost per Square Yard	Remarks	Engineer
Alabama—								
Birmingham	1910	Two-course	13,000	$5\frac{1}{4}'' + 1\frac{3}{4}''$	1:3:4 1:1½	$1.90	Includes grading	B. B. Merriweather
Birmingham	1910 1913	Two-course	2,500	3″ + 14″ under ties	1:3:6 1:2:4	—	Along and between car tracks and under ties	Thomas R. H. Daniels
Birmingham	1911	Two-course	13,000	$5\frac{1}{4}'' + 1\frac{3}{4}''$	1:3:4 1:1½	$1.99	Includes grading	M. Nicholson
Birmingham	1913	Two-course	16,000	4″ + 2″	—	$1.20	—	M. Nicholson
Mobile.....	1912	Bit.-top	12,800	—	—	—	—	—
Opelika	1913	Bit.-top	4,800	5″	1:2:4	$1.35	5 year guarantee	G. N. Mitcham
Opelika	1913	Hassam	4,000	6″	—	$1.75	—	G. N. Mitcham
Selma	1912	Hassam	29,000	6″	—	$1.55	—	J. Smith
Selma......	1913	Bit.-top	19,000	5″	—	$1.25	—	J. Smith
Selma	1913	Hassam	3,000	6″	—	$1.55	—	J. Smith
Arizona—								
Phoenix	1913	Bit.-top	6,800	4″	1:2:4	$1.18	—	O. C. Thompson
Arkansas—								
Fort Smith..	1912	One-course	3,000	6″	1:2:4	$1.30	Includes grading	Geo. Myers
Fort Smith..	1912	One-course	60,000	6″	1:2:4	$0.69	—	Geo. Myers
Fort Smith..	1913	One-course	40,000	6″	1:2:4	$0.69	Includes grading	Geo. Myers
Fort Smith..	1913	One-course	51,300	6″	1:2:4	$0.72	Includes grading	M. H. Reed
Hot Springs.	1908	Two-course	15,000	$5\frac{1}{4}'' + 1\frac{3}{4}''$	1:3:4 1:1½	—	—	Cleveland Smith
Little Rock .	1912	Two-course	15,000	6″	1:3:5 1:2:4	$0.90	—	H. Levinson
Little Rock .	1913	Bit.-top	28,000	6″	1:3:5 1:2:4	$1.18	—	H. Levinson
Pine Bluff ..	1913	—	4,500	—	—	—	—	Commissioner

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(Continued)

Location	Year Built	Type	Square Yards	Thickness	Proportions	Cost per Square Yard	Remarks	Engineer
***California—**								
Burlingame to South San Francisco.....	1912	Bit.-top	76,000	4″	1:3:6	$0.67½	—	A. B. Fletcher
Near Covina	1913	Bit.-top	16,000	5″	1:2:4	—	—	F. W. Joiner
Lodi.......	1912–3	—	132,000	—	1:2:6	$1.66	—	J. W. McAfee
Riverbank..	1912	One-course	5,000	4″ and 6″	Vary	—	Reinf.	Haviland, Dozier and Tibbitts
Colorado—								
Boulder	1912	One-course	500	7″	1:3:5	$1.06	—	H. E. Phelps
Colorado Springs...	1912	One-course	500	5″	1:2:5	$1.44	—	—
Grand Junction......	1912	Two-course	10,000	5″ + 2″	1:3:6 1:1½	$2.00	Includes grading	E. R. Romberg
Connecticut—								
Branford ...	1913	One-course	12,700	6″	1:2:4	$1.66	—	C. J. Bennett
Bridgeport..	1913	Two-course	1,600	4″ + 1½″	1:2:4 1:1½	$2.20	Includes grading	A. H. Terry
Derby......	1906	Hassam	3,000	6″	—	—	—	V. B. Clark
Greenwich..	1912	Bit.-top	6,300	6″	1:2:4	$1.32	Includes grading	Mr. Peck
Greenwich..	1913	Bit.-top	6,500	6″	1:2:4	—	Includes grading	N. A. Knapp
Hartford ...	1913	One-course	2,100	6″	1:2:4	—	—	L. F. Peck
Meriden....	1913	One-course	11,100	6″	1:2:4	$0.89	Includes grading	C. J. Bennett
Middletown.	1913	One-course	11,100	6″	1:2:4	$1.43	—	C. J. Bennett
New Haven	1908	Two-course	49,700	5½″ + 1¾″	1:3:4 1:1½	$2.20	Includes grading	F. L. Ford
New Haven.	1910	Two-course	—	—	1:3:4 1:1½	$2.40	Includes grading	F. L. Ford
New London	1907	Hassam	1,000	6″	—	$1.74	Includes grading	Geo. K. Crandall

*The 1913 work done by the California State Highway Department we understand amounted to 1,750,000 square yards.

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Connecticut (*Continued*)—								
Plymouth ..	1913	One-course	5,600	5″ at sides 7″ at center	1:2:4	$1.31	—	C. J. Bennett
Ridgefield ..	1913	One-course	9,000	5″ at sides 7″ at center	1:2:4	$1.38¾	—	C. J. Bennett
South Norwalk.....	1912	Bit.-top	11,000	6″	1:2½:4½	$1.27	Includes grading	G. A. Sherron
Stamford ...	1913	Hassam	7,000	—	—	—	—	—
Wallingford.	1913	Hassam	24,500	6″	—	$1.50	Bit.-top	C. J. Bennett
West Hartford......	1913	One-course	10,100	6″	1:2:4	$1.58	Includes grading	C. J. Bennett
Windsor....	1913	One-course	23,000	5″ at sides 7¼″ at center	1:2:4	$1.33	—	C. J. Bennett
Delaware—								
Delaware City	1913	Two-course	12,000	5″ + 2″	1:2½:5 1:2	$1.20	—	—
Georgetown.	1913	One-course	2,000	6″	1:2:3½	$1.16	—	Herbert W. Hatton
Milford	1911	One-course	4,700	6½″	1:2½:5	$0.95	—	Herbert W. Hatton
Milford	1912	One-course	2,300	6″	1:2½:5	$1.10	—	Herbert W. Hatton
Wilmington.	1907–9	Hassam	43,000	6″	—	—	—	—
Wilmington.	1912	—	200	—	—	—	—	—
District of Columbia—	Before 1912	—	900	—	—	—	—	—
	1912	Bit.-top	2,100	6″	1:2:5	$0.84	—	—
	1913	—	6,300	—	—	—	—	Capt. Judson
Florida—								
Clearwater..	1913	Bit.-top	23,600	6″	1:3:5	$1.40	—	R. L. Davis
Duval Co...	1908	Two-course	16,000	4½″ + 1½″	1:3:5 1:2	$0.83	—	—
Duval Co...	1910	Two-course	40,000	4½″ + 1½″	1:3:5 1:2	—	—	—

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Florida (*Continued*)—								
Pensacola...	1912	Two-course	30,000	5″ + 2″	1:3:4 1:1½	$1.36	—	G. Rommel
Pensacola...	1913	Two-course	25,000	4½″ + 1½″	1:3:4 11:½	$1.24	—	G. Rommel
Tampa	1910	Two-course	400	5¼″ + 1¾″	1:3:4 1:1½	—	—	—
Georgia—								
Athens.....	1913	Bit.-top	4,200	5″ + 2″	1:3:5 1:2	$1.05	—	J. W. Barnett
Atlanta	1913	Bit.-top	17,000	5″	1:2:4	$1.25	—	R. M. Clayton
Augusta....	1912	—	1,000	—	—	—	—	—
Macon.....	1912	One-course	7,143	6″ to 8″	1:2:4	$1.25	Includes grading	J. J. Gaillard
Macon.....	1913	One-course	1,800	6″ to 8″	1:2:4	$1.18	Includes grading	J. J. Gaillard
Macon	1913	One-course	16,400	8″	1:2:3	$1.40	Includes grading	J. J. Gaillard
Idaho—								
Ada County.	1912	Two-course	21,400	4½″ + 1½″	1:3½:7 1:1½:3	$0.99	—	Arthur E. Fox
Ada County.	1912	Two-course	20,500	4½″ + 1½″	1:3½:7 1:1½:3	$1.00	—	Arthur E. Fox
Ada County.	1913	Two-course	80,000	4½″ + 1½″	1:3:7 1:1½:3	$1.00	—	Arthur E. Fox
Boise	1910	One-course	20,000	8″	1:3:7	$1.15½	—	Ern G. Eagleson
Boise......	1910	One-course	7,000	6″	1:3:7	$1.10	—	Ern G. Eagleson
Boise	1910	One-course	27,000	6″	1:3:7	$1.09	—	Ern G. Eagleson
Boise	1910	One-course	28,000	6″	1:3:7	$1.15	—	Ern G. Eagleson
Boise	1911	One-course	4,000	6″	1:3:5	$1.04	—	Ern G. Eagleson
Boise	1912	One-course	4,600	6″	1:3:5	$1.10	—	C. C. Stevenson
Moscow	1913	Bit.-top	69,000	5″	1:2½:5	$1.29	—	H. J. Smith
Illinois—								
Aledo......	1913	Bit.-top	86,000	6″	1:2:4	$1.06	—	N. H. Tunnicliff
Belleville ...	1913	Two-course	5,600	6″ at sides 8″ at center	1:2½:4 1:2:2	$1.44	Reinf.	W. C. Wolf
Bloomfield..	1913	One-course	9,070	6″ at sides 8″ at center	1:2:3	$1.45	Includes grading	C. C. Parker

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Illinois (*Continued*)								
Braeside....	1912	One-course	3,100	5″	1:2½:3½	$1.10	—	—
Carlinville ..	1912	One-course	7,100	6½″	1:2:3½	$0.82	—	A. N. Johnson
Carlinville ..	1912	Two-course	4,000	5″+2″	1:3:5 1:1:1	$1.20	—	W. D. P. Warren
Chandlerville Twp.	1912	One-course	1,500	6″	1:2:3½	$0.96	—	A. N. Johnson
Chicago	1903 1904 1905 1906 1907	Two-course	80,000	5¼″ + 1¾″	1:3:4 1:1½	—	—	J. B. Hittel
Chicago	1912	—	13,000	—	—	—	—	J. B. Hittel
Chicago	1913	Two-course	1,050	5″+2″	1:2:4	$2.13	—	C. Hadsall
Chicago	1913	One-course	3,300	7″	1:2:3	$1.65	—	C. Hadsall
Chicago	1913	Two-course	1,500	—	1:2:4 1:1:1½	—	—	C. Hadsall
Chicago Heights ..	1912	Bit.-top	3,300	5″ at side 7″ at center	1:2:4	$0.82	—	—
Decatur	1912	One-course	4,100	5″ at side 7″ at center	1:1½:3	$1.12½	Includes grading	—
Deerfield ...	1912	One-course	6,400	5″ at side 7″ at center	1:2½:3½	$1.10	—	J. C. Shields
De Kalb Twp	1912	One-course	7,300	6½″	1:2:3½	$0.82	Reinf.	A. N. Johnson
Edwardsville	1913	One-course	31,900	6″	1:2:3½	$1.02	—	A. N. Johnson
Edwardsville	1913	Bit.-top	1,200	6″	1:3:5	$1.42	Includes grading	—
Effingham ..	1912	Two-course	60,000	4″ + 2½″	—	$1.66	—	—
Evanston ...	1912	Bit.-top	13,600	—	1:3:5	$0.95	—	J. H. Moore
Evanston ...	1913	One-course	7,500	6″ at sides 8″ at center	1:2:3	$0.59	Includes grading	—
Freeport....	1913	One-course	900	7″	1:2:3	$1.00	—	C. S. Hepner
Geneseo	1913	One-course	6,300	6″ at sides 7″ at center	1:1¾:3	$1.30	—	Clark G. Anderson
Grandville ..	1909	One-course	15,000	6″	1:3:5	—	—	—
Greenville ..	1910	Two-course	7,000	5″ + 1½″	1:6 1:2	—	—	H. N. Baumberger

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Illinois (*Continued*)—								
Greenville . .	1910	One-course	5,000	6″	1:2½:5	$0.92	—	H. N. Baumberger
Greenville . .	1911	One-course	4,000	6″	1:4	$0.75	—	H. N. Baumberger
Harvard. . . .	1913	One-course	8,600	6″	1:2:4	—	—	H. N. Price
Highland . . .	1910	One-course	840	6″	—	—	—	—
Highland . . .	1913	One-course	6,680	6″	1:2:3½	$1.40	—	A. N. Johnson
Highland Park.	1912	One-course	2,400	5″ at side 7″ at center	1:2:3½	$1.01	—	J. C. Shields
Highland Park.	1913	One-course	2,700	—	1:2:3	—	Reinf.	Jos. Anderson
Jacksonville.	1913	One-course	2,150	6″	1:4	—	—	A. N. Johnson
Joliet	1913	Two-course	200	5″ + 2″	1:3½:4 1:1:1½	—	Reinf.	D. A. With
Kewanee . . .	1904	Two-course	1,000	4″ + 2″	—	$1.54	—	—
La Salle	1913	One-course	10,660	6½″	1:2:3½	$1.06	—	A. N. Johnson
Lawrenceville	1912	One-course	400	6″	1:4	$0.72	—	—
Le Roy. . . .	1913	One-course	5,100	6″	1:2:3½	$1.29	—	A. N. Johnson
Lewiston . . .	1913	Bit.-top	16,000	—	—	—	—	—
Lincoln.	1912	One-course	2,000	6″	—	$0.78	—	—
Mattoon . . .	1912	One-course	10,000	6″	1:1½:4	$1.03	—	C. L. James
McLean. . . .	1912	One-course	5,000	6″	1:2:3½	$0.79	—	A. N. Johnson
Moline.	1910	Two-course	3,600	6″ + 1″	1:3:5 1:1	$1.60	—	C. G. Anderson
Moline.	1913	One-course	1,000	7″	1:1½:3	—	—	C. G. Anderson
Morgan Park	1913	One-course	2,000	¾″	1:2:3	$1.38	—	V. B. Roberts
Newton	1912	One-course	8,400	7″	1:2:3	$1.05	—	—
Newton	1913	Bit-top	6,200	7″	1:2:2	$1.15	—	—
Princeton. . .	1913	—	3,000	—	—	—	—	—
Quincy.	1912	Bit.-top	18,800	6″	1:2:4	$1.06	—	F. T. Hancock

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Illinois (*Continued*)—								
Quincy.....	1913	One-course	1,500	6″	1:1½:3	$1.40	Includes grading	F. T. Hancock
Ravinia	1913	One-course	4,800	5½″ at sides 7½″ at center	1:2:3	$1.10	—	Jas. Anderson
Riverside...	1913	Two-course	560	5″ + 2″	1:2:4 1:2	—	Reinf.	Mr. Hancock
Shirley.....	1913	One-course	6,730	6″	1:2:3½	$1.29	—	A. N. Johnson
Seymour ...	1910	Two-course	3,000	7″	—	—	—	—
Springfield..	1912	One-course	5,600	6″ at sides 8″ at center	1:2:3½	$1.04	—	A. N. Johnson
Springfield..	1913	One-course	8,560	6″	1:2:3½	—	—	A. N. Johnson
Springfield..	1913	Bit.-top	8,600	6″	1:2:4	—	—	W. D. Seeley
Waukegan..	1909	Two-course	700	6″ + 2″	1:3:6 1:1½	$1.65	Includes shoulder	—
Western Springs...	1913	One-course	1,000	6″	1:2:3	$1.75	—	C. B. Williams
Indiana—								
Anderson...	1912	One-course	400	6″	1:4	$1.35	Includes grading	G. A. Lamphear
Anderson...	1913	Bit.-top	1,800	—	—	—	—	G. A. Lamphear
Bloomfield..	1913	One-course	9,200	6″ at sides 8″ at center	1:2:3	$1.45	Includes grading	C. C. Parker
Connersville	1890	—	500	—	—	—	—	—
Connersville	1912	Two-course	65,000	6″ + 1½″	1:4 1:1½	$1.02	Includes grading	W. F. Redpath
Connersville	1913	Two-course	47,000	6″ + 1½″	1:4 1:1½	$1.22	—	W. F. Redpath
Frankfort...	1913	—	1,600	6¾″	1:2½:5	$1.20	Includes grading	—
Gary.......	1906–7	Two-course	22,000	5″ + 2″	1:3:5 1:1½	$1.65	—	Indiana Steel Company
Gary.......	1908	Two-course	32,000	5″ + 2″	1:3:5 1:1½	$1.90	—	Indiana Steel Company
Huntington .	1913	Bit.-top.	21,500	5″	1:4	$1.09	Includes grading	H. H. Wagoner
Kendalville .	1912	Bit.-top.	56,000	6″	1:2:4	$1.35	Includes grading	—
Richmond ..	1896	Two-course	140	5″ + 1½″	1:2:5 1:2	$2.51	—	F. R. Charles
Richmond ..	1901 to 1905	Two-course	3,100	5″ + 1½″	1:2:5 1:2	$1.18 to $1.46	—	F. R. Charles

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Indiana (*Continued*)—								
Richmond . .	1906 to 1911	Two-course	15,000	6″ + 1″	1:2:5 1:2	$1.03 to $1.39	—	F. R. Charles
Richmond . .	1912	Two-course	3,400	6″ + 1½″	1:2:5 1:2	$1.33	—	F. R. Charles
Richmond . .	1913	Two-course	7,600	6″ + 1½″	1:2:5 1:2	—	—	F. R. Charles
Riverside Park.	1913	One-course	600	6″ at sides 7″ at center	1:2:3	—	Reinf.	—
Rockville. . .	1912	One-course	5,000	5″	1:4½	$1.10	Reinf.	H. L. Davies
Seymour . . .	1913	Two-course	35,000	5¾″ + 1¼″	1:2:4	$1.00	Reinf.	E. B. Douglas
South Bend .	1913	One-course	9,700	7″	1:1½:3	$1.23	—	W. S. Moore
Warsaw. . . .	1912	Two-course	1,800	—	—	$1.14	Includes grading	G. W. McCarter
Iowa—								
Ames	1912	One-course	7,600	6″ at sides 7½″ at center	1:2:4	$0.95	—	J. S. Dodds
Ames	1913	One-course	10,500	6″ at sides 7½″ at center	1:1½:3	$1.06	—	J. S. Dodds
Atlantic	1912–13	One-course	26,000	6″ and 7″	1:2:2	$1.12 –6″ $1.24–7″	—	J. H. Mayne
Bettendorf. .	1911	One-course	29,000	6″	1:2½:4	$0.85	—	A. M. Compton
Bloomfield. .	1913	One-course	2,400	7″	1:2½:4	$1.29		Iowa Engineering Company
Burlington. .	1910	Two-course	4,200	6″ + 2″	1:2:5 1:1:1	$1.48	—	H. G. Vollmer
Burlington. .	1911	Two-course	5,000	5″ + 1½″	1:2:5 1:2	$1.34	—	H. G. Vollmer
Burlington. .	1912	One-course	8,600	6″	1:2:3	$0.96½	—	H. G. Vollmer
Burlington. .	1913	One-course	34,400	6″	1:2:3	$1.17	—	H. G. Vollmer
Burlington. .	1913	Bit.-top	8,400	6″	1:2:3	$1.45	—	H. G. Vollmer
Cedar Falls .	1912	Two-course	28,000	5″ + 2″	1:5 1:2	$0.92 to $1.16	—	—
Cedar Rapids	1912	Two-course	28,600	5″ + 2″	1:3:5 1:2	$1.15	—	F. A. Green
Cedar Rapids	1913	Two-course	27,100	5″ + 2″	1:3:5 1:2	$1.20	—	F. A. Green
Centerville. .	1912	One-course	3,800	6″	1:2:4	$1.41	Includes grading	T. S. DeLay Iowa Engineering Co.

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Iowa (*Continued*)—								
Cerro Gordo County... Near Mason City	1913	One-course	9,400	6″ at side 7½″ at center	1:1½:3	$1.02	—	J. S. Dodds
Clarence....	1913	Bit.-top	7,500	6″	1:2:4	$1.53	—	Iowa Engineering Company
Clarinda....	1910	Two-course	10,000	4″ + 2″	1:3:5 1:1	$1.23	—	A. S. Van Sandt
Clarinda....	1911	Two-course	12,000	4″ + 2″	1:3:5 1:1	$1.23	—	A. S. Van Sandt
Clarinda....	1912	One-course	12,100	6″	1:2:4	$1.09	Includes grading	Theo. S. DeLay
Clarinda....	1913	One-course	15,300	6″	1:2:4	—	—	Theo. S. DeLay
Clear Lake..	1913	Two-course	35,000	5″ + 2″	1:3:5 1:2	$1.26 to $1.43	Includes grading	H. D. Keerl
Clinton.....	1912	Two-course	4,700	5″ + 2″	1:6 1:2	$1.00	Includes grading	J. G. Thorne
Clinton.....	1913	Bit.-top	27,800	6″	1:6	$1.18	Includes grading	J. G. Thorne
Council Bluffs....	1913	Two-course	650	6″	1:3:4 1:2	$1.50	Includes grading	—
Cresco.....	1911	Two-course	11,800	7″	1:2:5 1:2	$1.36	—	—
Creston....	1912	One-course	2,100	6″	1:2:4	$1.10	Includes grading	Theo. S. DeLay
Davenport..	1909	Two-course	3,300	5″ + 2″	1:3:5 1:2	$1.25	—	J. A. Ryan
Davenport..	1910	Two-course	9,700	5″ + 2″	1:3:5 1:2	$1.35	—	J. A. Ryan
Davenport..	1911	Two-course	9,200	5″ + 2″	1:3:5 1:2	$1.25	—	J. A. Ryan
Davenport..	1911	One-course	5,300	6″	1:3:5	$0.93	Reinf.	J. A. Ryan
Davenport..	1912	Two-course	49,800	5″ + 2″	1:3:5 1:1:1	$1.17	—	J. A. Ryan
Davenport..	1913	Bit. top	11,500	6″	1:3:5	$1.37	—	J. A. Ryan
Davenport..	1913	One-course	22,200	6″	1:2:3	$1.23	—	J. A. Ryan
Des Moines.	1909	Two-course	5,000	6½″ + 1½″	1:2:5 1:1:1	$1.62	—	J. W. Budd
Des Moines.	1912	One-course	45,600	6″ and 8″	1:2½:4	$1.27	—	J. W. Budd
Des Moines.	1913	Two-course	50,800	6½″ + 1½″	1:2:5 1:1:1	$1.20	—	C. Green
Dubuque...	1909	One-course	370	5″	1:3:5	$0.80	—	—
Dubuque...	1912	Two-course	500	5¼″ + ¾″	1:7 1:1	$1.12	—	—

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Iowa (*Continued*)—								
Dubuque . . .	1913	One-course	260	6″	1:1½:3	$1.29	—	—
Dubuque . . .	1913	Two-course	3,900	5¼″ + ¾″	1:3:5 1:2	$1.57	—	—
Dubuque . . .	1913	Two-course	2,000	4½″ + 1½″	1:2:3 1:2	$1.44	—	—
Eddyville . . .	1907	Two-course	7,800	5″ + 2″	1:5 1:2	$0.86	—	—
Eddyville . . .	1909	—	3,100	—	—	—	—	—
Eddyville . . .	1911	One-course	26,100	7″	1:2½:2½	$1.02	—	J. W. Budd
Eldora	1910	Two-course	10,000	5″ + 2″	1:2½:5 1:2	$1.36	—	S. B. Gardner
Eldora	1911	Two-course	30,000	5″ + 2″	1:2½:5 1:2	$1.35	—	S. B. Gardner
Eldora	1912	Two-course	40,000	5″ + 2″	1:2½:5 1:2	$1.23	—	S. B. Gardner
Ft. Dodge . .	1910	Two-course	28,900	5″ + 2″	1:2:5 1:1:1	$1.59	Includes grading and curbs	C. H. Reynolds
Ft. Dodge . .	1911	Two-course	8,600	5″ + 2″	1:2:5 1:1:1	$1.60	Includes grading and curbs	C. H. Reynolds
Greenfield . .	1911	Two-course	10,500	4″ + 2″	1:2½:5 1:1:1	$1.34	—	Iowa Engineering Co.
Greenfield . .	1912 1913	Two-course	29,000	4″ + 2″	1:2½:5 1:1:1	$1.27	—	Iowa Engineering Co.
Hampton . . .	1913	Two-course	50,000	5″ + 2″	1:2½:5 1:2	$1.20½	Includes grading	Baker & Gardner
Harlan	1911	Two-course	18,000	4″ + 2″	1:2:5 1:2	$1.18	—	John P. Crick
Iowa City . .	1912	One-course	5,200	7″	1:1½:3	$0.99	—	J. C. Watkins
Iowa Falls . .	1913	Two-course	20,100	5″ + 2″	1:2:5 1:2	$1.17½	—	—
Keokuk	1912	One-course	7,500	6″	—	—	—	—
Knoxville . . .	1910	Two-course	10,000	4″ + 2″	1:2½:5 1:2	$1.53	—	Hall & Adams
Knoxville . . .	1911	Two-course	9,000	4″ + 2″	1:2½:5 1:2	$1.51	—	Hall & Adams
Knoxville . . .	1913	—	20,000	—	—	—	—	—
Le Mars	1904	Two-course	900	5″ + 1½″	1:6 1:2	$1.25	—	Moore & Kehrberg
Manchester	1911	Two-course	700	5″ + 2″	1:3:5 1:2	$1.25	—	—
Manchester	1912	Two-course	3,200	5″ + 2″	1:4 1:2	$1.24	—	—
Marshalltown	1910	Two-course	800	5″ + 2″	1:3:5 1:3	$1.40	—	W. H. Steiner

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Iowa (*Continued*)—								
Marshalltown	1911	Two-course	6,800	3″ + 2″	1:3:5 1:2	$0.89	—	W. H. Steiner
Marshalltown	1911	Two-course	7,000	5″ + 2″	1:3:5 1:2	$1.18	—	W. H. Steiner
Marshalltown	1912	Two-course	64,000	5″ + 2″	1:2:5 1:2	$1.08	—	W. H. Steiner
Marshalltown	1913	One-course	6,500	—	—	$1.08	—	W. H. Steiner
Mason City .	1909	Two-course	8,000	5″ + 2″	1:2:5 1:2	$1.35	—	F. P. Wilson
Mason City .	1910	Two-course	17,000	5″ + 2″	1:2:5 1:2	$1.25	—	F. P. Wilson
Mason City .	1911	Two-course	42,000	5″ + 2″	1:2:5 1:2	$1.38	—	F. P. Wilson
Mason City .	1912	Two-course	49,800	5″ + 2″	1:2:5 1:2	$1.23	—	F. P. Wilson
Mason City .	1912	Two-course	4,000	11″ + 2″	1:2:5 1:2	$1.75	Under and between car tracks	F. P. Wilson
Mason City .	1913	Two-course	25,000	5″ + 2″	1:2:5 1:2	$1.35	—	F. P. Wilson
Near Mason City	1913	One-course	9,500	6″ at sides 8″ at center	1:2:4	$1.03	—	B. H. Lampert
Mt. Vernon .	1913	One-course	9,400	—	—	—	—	Iowa Eng. Co.
Muscatine ..	1912	One-course	2,700	6″	1:4½	$0.93	—	C. H. Young
Muscatine ..	1913	One-course	8,700	6″	1:4½	$1.00	—	C. H. Young
Muscatine ..	1913	Two-course	33,000	5″ + 2″	1:7 1:2	$1.35	—	C. H. Young
New Hampton	1911	Two-course	10,700	5″ + 2″	1:2:5 1:2	$1.29	Includes grading	A. F. Kemman
New Hampton	1912	Two-course	9,000	5″ + 2″	1:2:5 1:2	$1.14½	—	A. F. Kemman
Newton	1913	Two-course	43,200	5″ + 1″	1:2:5 1:2	$1.18	—	W. F. Beyers
Osage......	1910	One-course	40,000	5″ + 2″	1:2½:5 1:2	$1.39	—	S. B. Gardner
Perry	1912	One-course	12,000	6″	1:2:2	$0.94	—	J. A. Burris
Near Perry .	1913	One-course	4,000	6″	1:4	$0.84	—	F. Nadden Co.

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Iowa (*Continued*)—								
Red Oak....	1911	One-course	3,000	6″	1:2:4	$1.27	—	Richard Roberts
Red Oak....	1913	One-course	5,500	6″	1:2:4	$1.29	Includes grading	Richard Roberts
Remsen	1911	One-course	9,000	6″	1:4	$0.89	—	Smith & Finley
Rock Rapids	1913	One-course	1,000	6″	1:2:4	—	—	—
Sac City....	1913	One-course	2,000	6″	1:2:4	—	—	—
Shenandoah.	1910	Two-course	1,000	5″ + 2″	1:2:5 1:2	$1.25	—	Fred Cain
Sioux City ..	1911	One-course	80,100	5″	1:3:4½	$1.22	—	K. C. Gaynor
Sioux City ..	1912	One-course	173,600	6″	1:2:3	$1.04 to $1.29	Includes grading	Fred C. Smith
Sioux City ..	1913	One-course	58,600	6″	1:2:3	$1.04 to $1.19	—	Fred C. Smith
Toledo	1910	Two-course	1,000	5″ + 2″	1:3:6 1:2½	$1.44	—	Hugh A. Chambers
Toledo	1911	Two-course	19,000	5″ + 2″	1:3:6 1:2½	$1.44	—	Hugh A. Chambers
Vernon Heights ..	1912	Two-course	2,800	—	1:3:5 1:2	$1.16	—	—
Vinton	1912	Two-course	10,600	5″ + 2″	1:3:5 1:2	$1.07	—	Percy P. Smith
Vinton	1913	Two-course	16,500	5″ + 2″	1:3:5 1:2	$1.27	Reinf.	J. K. Hohm
Near Vinton	1912	Two-course	47,000	6″ + 2″	1:5 1:1½	$1.03	—	Percy P. Smith
Near Vinton	1913	One-course	30,000	8″	1:2:4	$1.37	Reinf.	Percy P. Smith
Washington.	1911	Two-course	3,100	5″ + 2″	1:2½:5 1:1½	$1.39	—	Wallace Treichler
Washington.	1911	Two-course	1,000	4″ + 1″	1:2½:5 1:1½	$0.97½	—	Wallace Treichler
Washington.	1913	Bit.-top	12,000	6″	1:2½:4	$1.35	—	Iowa Engineering Co
Waterloo ...	1912	Two-course	1,300	4″ + 2″	1:5 1:2	$1.25	—	—
Waterloo ...	1912	Two-course	1,000	4″ + 1½″	1:5 1:2	$1.12	—	—
Waterloo ...	1912	One-course	1,300	7″	—	$0.99	—	—
Kansas—								
Atchison ...	1912	Two-course	10,300	5″ + 1″	1:2½:5 1:2:4	$1.02	—	S. K. McCrary

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Kansas (*Continued*)—								
Atchison . . .	1913	Two-course	6,200	5″ + 1″	1:2½:5 1:1½:3	$1.12	—	S. K. McCrary F. S. Altman
Fredonia . . .	1912	Two-course	12,000	4½″+1½″	1:2:5 1:1½	$1.05	—	—
Hiawatha. . .	1913	Bit.-top	2,200	6″	1:2:4	$1.22	—	O. C. Chapin
Iola.	1913	One-course	3,550	6″	1:2½:5	$1.14	—	V. D. Frye
Iola.	1913	One-course	4,205	6″	1:2½:5	$1.14	—	V. D. Frye
Junction City	1911	Hassam	2,300	6″	—	$1.12	—	W. V. Buck
Junction City	1912	Bit.-top	41,900	6″	1:2¼:4½	$1.17	—	W. V. Buck
Junction City	1913	One-course	6,700	7″	1:2¼:4½	$1.15	—	W. V. Buck
Kansas City	1910	Hassam	4,000	6″	—	$1.70	—	Wm. Barclay
Kansas City	1911	Hassam	40,000	6″	—	$1.68	—	Wm. Barclay
Kansas City	1911	One-course	3,000	6″	1:3:5	$1.09	—	Wm. Barclay
Kansas City	1912	One-course	16,400	6″	1:2:4	$1.00	—	Wm. Barclay
Manhattan .	1912	Bit.-top	2,700	5″ + 1″	1:5 1:2	$1.14	—	O. E. Noble
Manhattan .	1913	Two-course	3,100	5″ + 1″	1:5 1:2	$1.10	—	O. E. Noble
Newton	1912	Two-course	2,000	6″ + 2″	1:3:6 1:2:4	$0.90	—	—
Newton	1913	One-course	5,000	7″	1:2:4	$1.00	—	—
Olathe	1912	One-course	900	7″	1:2:4	$1.50	—	—
Pittsburg. .	1912	One-course	4,400	6″	1:1½:4	$0.98	Joplin Chats	L. E. Curfman
Pittsburg. . .	1913	One-course	6,000	6″	1:1½:4	$1.08	Joplin Chats	L. E. Curfman
Wichita	1911	Hassam	85,000	6″	—	$1.69½	—	Bert. C. Wells
Wichita	1912	One-course	24,600	5″ and 6″	1:2:4	$0.75–5″ $0.90–6″	Flush coat of cement and chats	Bert. C. Wells
Wichita	1912	Hassam	14,500	5″	—	$1.67	Flush coat of cement and chats	Bert. C. Wells
Wichita	1913	One-course	6,500	5″	1:2:4	$1.00	—	Bert. C. Wells

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

Location	Year Built	Type	Square Yards	Thickness	Proportions	Cost per Square Yard	Remarks	Engineer
Louisiana—								
New Orleans	1908 to 1912	Two-course	154,700	6″ + 2″	1:3:4 1:1½	$2.37 to $2.95	—	W. J. Hardee
Shreveport . .	1911 1912	Two-course	14,000	5½″ + 1½″	1:3:5 1:2	$1.61	Includes grading	Geo. A. Wilson
Maine—								
Biddeford . .	1912	Bit.-top	2,000	6″	1:2:4	$1.31	—	W. T. Allen
Cape Neddick	1912 1913	Bit.-top	26,600	6″	1:2:4	$1.00	—	Paul D. Sargent
Gardiner . . .	1912	Bit.-top	4,500	5″	1:2:4	$1.33	Includes grading and drain	L. M. Barnard
Kennebunkport	1912	Bit.-top	4,300	6″	1:2:4	$1.37	—	—
Kennebunkport	1913	Bit.-top	3,700	6″	1:2:4	$1.37	—	—
Portland . . .	1907 to 1911	Hassam	18,700	—	—	$1.65 to $2.06	—	—
Portland . . .	1911	One-course	14,800	6″	1:2:4	$1.29 to $1.75	—	—
Portland . . .	1912	Bit.-top	7,600	6″	1:2:4	$1.35	Includes grading	Bion Bradbury, Jr.
Portland . . .	1913	Bit.-top	20,000	5″ at sides 6″ at center	1:2:4	—	—	Bion Bradbury, Jr.
South Portland	1912	Bit.-top	1,000	6″	1:2:4	$1.32½	Includes grading	A. E. Skillin
Wells	1913	Bit.-top	31,700	6″	1:2:6	$1.26	—	—
Westbrook . .	1912	Hassam	18,000	6″	—	$1.65	Includes grading	D. R. Duran
Maryland—								
Allegany Co. near Kreigbaum	1913	Bit.-top	9,000	5″ at sides 7″ at center	1:2:4	—	—	D. P. LaFevro
Anne Arundel Co., near Annapolis	1913	Hassam	14,100	5″ at sides 7″ at center	—		—	H. G. Shirley
Brooklyn . . .	1912	Hassam	9,400	6″	—	$1.52	—	H. G. Shirley
Forest Park	1912	One-course	1,400	6″ at sides 7″ at center	1:2:4	$1.01	—	Wm. G. Sucro
Guilford	1913	Bit.-top	26,000	5″	1:3:6	—	—	J. C. Little
Near Halethorpe . . .	1913	One-course	16,500	5″ at sides 7″ at center	1:2:4	$1.18	—	H. G. Shirley

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Maryland *(Continued)*								
Near Highlandtown	1913	Bit.-top	500	6″	1:2:4	—	—	—
Roland Park	1910	Bit.-top	8,000	6″	1:2½:5	$1.05	—	Mr. Chubb
Roland Park	1913	Bit.-top	40,200	6″	1:3:6	—	—	J. C. Little
Near Roslyn Sta.	1913	One-course	1,000	5″	1:2:4	—	—	Wm. G. Sucro
Towson	1913	Bit.-top	1,600	6″	1:2:4	$1.29	Includes grading	Wm. G. Sucro
Whitehall	1911	Two-course	700	4½″ + 2½″	1:3:5	$0.97½	—	H. G. Shirley
Calvert Co. Huntingtown	1910	Two-course	—	6″ + 1″	1:2:4 1:2	$1.30	—	—
Caroline Co. Near Winchester	1913	One-course	12,500	5″ at sides	1:2:4	$1.49	—	H. G. Shirley
Carroll Co. Near Taneytown	1913	Bit.-top	16,400	5″ at sides 7″ at center	1:2:4	$1.13	—	H. G. Shirley
Cecil Co. Near Bacon Hill Sta.	1913	One-course	18,800	5″ at sides 7″ at center	1:2:4	$1.20	—	H. G. Shirley
Near Elkton	1912	One-course	1,600	6″	1:2:4	$1.25	—	H. G. Shirley
Near Northeast	1912	One-course	4,000	6″	1:2:4	$1.25	—	H. G. Shirley
Charles Co. Near Rock Point	1912	One-course	3,300	6″	1:2:4	$1.10	—	H. G. Shirley
Near Rock Point	1913	One-course	33,700	5″ at sides 7″ at center	1:2:4	$1.33½	—	H. G. Shirley
Dorchester Co. Near East New Market	1913	Bit.-top	24,800	5″ at sides 7″ at center	1:2:4	$1.25	—	H. G. Shirley
Near Mt. Holly	1913	One-course	16,500	5″ at sides 7″ at center	1:2:4	$1.25	—	H. G. Shirley

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Maryland (*Continued*)								
Frederick Co.								
Near Ridgeville	1913	One-course	10,000	5″ at sides 7″ at center	1:2:4	$1.25	—	H. G. Shirley
Howard Co.								
Elk Ridge ..	1913	One-course	8,200	5″ at sides 7″ at center	1:2:4	—	—	G. H. Sykes
Montgomery Co.								
Bethesda ...	1912	One-course	17,600	6″	1:2½:5	$0.83	—	Mr. Sharkey
Chevy Chase	1912	Oil concrete	3,000	6″	1:1¾:3½	$0.95	—	L. W. Page
Chevy Chase	1912	Bit.-top	2,800	6″	1:1¾:3½	$0.95	—	L. W. Page
Chevy Chase	1912	One-course	1,400	6″	1:1¾:3½	$0.95	—	L. W. Page
Chevy Chase	1913	One-course	1,600	6″	1:1¾:3½	$0.99	—	L. W. Page
Near Damascus	1913	One-course	16,500	5″ at sides 7″ at center	1:2:4	$1.28	—	H. G. Shirley
Near Rockville	1913	One-course	16,000	5″ at sides 7″ at center	1:2:4	—	—	H. G. Shirley
Prince George Co.								
Near Bladensburg ..	1912	Bit.-top	7,100	6″	1:2:4	$1.25	—	H. G. Shirley
Near College Park.....	1912	Bit.-top	4,700	6″	1:2:4	$1.35	—	H. G. Shirley
Near College Park.....	1912	One-course	1,400	6″	1:2:4	$1.35	—	H. G. Shirley
Near Hyattsville	1912	Bit.-top	3,600	6″	1:2:4	$1.25	—	H. G. Shirley
Near Hyattsville	1913	One-course	10,000	5″ at sides 7″ at center	1:2:4	$1.25	—	H. G. Shirley
Near Laurel.	1912	Hassam	7,600	6″	—	$1.52	5 yr. guarantee	H. G. Shirley
Near T. B...	1913	Bit.-top	38,000	5″ at sides 7″ at center	1:2:4	$1.09	—	H. G. Shirley
Upper Marlboro	1913	Bit.-top	65,300	5″ at sides 7″ at center	1:2:4	$1.08	—	H. G. Shirley

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Maryland *(Continued)*								
Near Washington (D. C.)...	1913	Bit.-top	8,300	5″ at sides 7″ at center	1:2:4	$1.47	—	H. G. Shirley
St. Marys Co. Near Mechanicsville	1913	One-course	45,100	5″ at sides 7″ at center	1:2:4	$1.15	—	H. G. Shirley
Somerset Co. Near Crisfield	1913	One-course	22,300	5″ at sides 7″ at center	1:2:4	$1.08	—	H. G. Shirley
Near Princess Anne	1913	Hassam	16,400	5″ at sides 7″ at center	—	$1.45	—	H. G. Shirley
Talbot Co. Near Easton	1913	One-course	33,000	5″ at sides 7″ at center	1:2:4	$1.35	—	H. G. Shirley
Wicomico Co. Near Salisbury	1913	One-course	36,800	5″ at sides 7″ at center	1:2:4	—	—	H. G. Shirley
Worcester Co. Berlin......	1912	One-course	10,300	6″	1:2:4½	$1.34½	Includes grading	Herbert W. Hatton
Near Berlin .	1913	Bit.-top	33,000	5″ at sides 7″ at center	1:2:4	$1.47	—	H. G. Shirley
Pocomoke ..	1911	One-course	25,000	6″	1:2:3½	$1.25	Includes grading	Herbert W. Hatton
Massachusetts								
Boston.....	1912	Hassam Bit.-top One-course	13,400	6″	1:2:4	—	—	—
Haverhill...	1909	Hassam	8,000	6″	—	$1.75	—	Geo. E. Hutchins
Haverhill...	1910	Hassam	2,000	6″	—	$1.75	—	Geo. E. Hutchins
Haverhill...	1911	Hassam	8,000	6″	—	$1.75	—	Geo. E. Hutchins
Long Meadow..	1912	One-course	6,000	4″	1:2:4	—	—	A. W. Dean
Long Meadow..	1913	One-course	4,000	5″ at sides 7″ at center	1:2:4	—	—	A. W. Dean
Lowell	1908	Hassam	6,400	6″	—	$1.35	—	Wm. A. Favor

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Massachusetts (*Continued*)—								
Lynn	1906 to 1911	Hassam	65,100	6″	—	—	—	Geo. I. Leland
Lynn	1911	One-course	8,000	6″	1:2:4	$1.70	—	Geo. I. Leland
Lynn	1911	Two-course	6,000	$5\frac{3}{4}″ + \frac{1}{4}″$	1:3:5 1:1:1	$1.65	—	Geo. I. Leland
Lynn	1912	One-course	14,800	6″	1:2:4	$1.30	—	Wm. L. Vennard
Lynn	1913	One-course	42,650	6″	1:2:4	$1.00	—	Wm. L. Vennard
Newton	1907	One-course	10,000	$2\frac{1}{2}″$	1:3:5	0.17\frac{3}{4}$	—	Chas. W. Ross
North Adams	1912	Bit.-top	775	6″	1:2:4	$1.15	—	H. E. Blake
North Andover	1913	One-course	22,000	5″ at sides 7″ at center	1:2:4 1:1$\frac{1}{2}$:3	—	—	A. W. Dean
Somerville	1907 to 1912	Hassam	36,800	6″	—	$1.65	—	E. W. Bailey
Spencer	1906	Hassam	5,700	5″	—	—	—	J. A. Johnson
Spencer	1907	Hassamite	—	6″	—	$1.75	—	A. W. Dean
Taunton	1912	Hassam	6,000	—	—	—	—	—
Worcester	1906 to 1911	Hassam	26,500	6″	—	—	—	—
Worcester	1912	Hassam	7,200	6″	—	$1.75	—	—
Michigan—								
Allegan	1906	Two-course	1,110	—	—	—	—	Fred Mackey
Allegan	1909	Two-course	830	—	—	—	—	—
Alma	1912	Two-course	200	5″ + 2″	1:7 1:2	—	—	Riggs and Sherman
Alma	1913	Two-course	1,000	5″ + 2″	1:2$\frac{1}{2}$:5 1:2	—	—	W. J. Sherman & Co.
Alma	1913	One-course	3,000	6″	1:2:3	—	—	W. J. Sherman & Co.
Alpena	1909	Two-course	11,500	6″ + 2″	1:6 1.1$\frac{1}{2}$	$1.15	Includes curbing	J. W. McNeil
Alpena	1910	Two-course	13,200	6″ + 2″	1:2:6	$1.32	Includes grading	J. W. McNeil
Alpena	1912	Two-course	6,500	6″ + 2″	1:3:3 1:1$\frac{1}{2}$	$0.85	—	J. W. McNeil
Ann Arbor	1909	Bit.-top	2,000	$4\frac{1}{2}″ + 1\frac{1}{2}″$	1:8 1:2	$0.80	—	E. W. Groves

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Michigan (*Continued*)								
Ann Arbor . .	1910	Bit.-top	20,000	$4\frac{1}{2}'' + 1\frac{1}{2}''$	1:8 1:2	$0.80	—	E. W. Groves
Ann Arbor . .	1911	Bit.-top	64,000	$4\frac{1}{2}'' + 1\frac{1}{2}''$	1:8 1:2	$0.80	—	E. W. Groves
Ann Arbor . .	{1912 1913	Bit.-top	70,000	$5'' + 2''$	1:8 1:2	$0.90	—	Manley Osgood
Bad Axe	1909	Two-course	13,000	$5'' + 1''$	1:6 1:2	$0.80	—	John Bloomshield
Bangor	1912	One-course	900	$5\frac{1}{2}''$ at side $8''$ at center	1:2:3	$1.20	—	—
Bay City . . .	1908	Two-course	500	—	—	—	—	G. C. Turner
Bay City . . .	1912	Two-course	6,600	$5''+2''$	1:5 1:2	—	—	H. C. Thompson
Bay City . . .	1913	Two-course	5,000	$5''+2''$	1:5 1:2	$1.77	—	H. C. Thompson
Bay City . . .	1913	Two-course	5,300	$5''+2''$	1:5 1:2	$1.15	—	H. C. Thompson
Berrian Co. .	1912	One-course	3,115	$6'' + 2''$	1:2:4	$1.20	Includes grading	—
Buchanan . .	1912	One-course	3,100	$6''$	1:2:4	$1.20	Includes grading	—
Cadillac	1913	—	8,000	—	—	—	—	—
Caro	1913	Two-course	12,000	$6''$	1:2:3 1:2	$0.97	—	R. W. Roberts
Charlevoix . .	1911	Two-course	2,000	$5'' + 2''$	1:6 1:2	—	—	Geo. A. Pierson
Charlevoix . .	1912	Bit.-top	22,500	$5\frac{1}{4}'' + 1\frac{3}{4}''$	1:6 1:2	—	—	Geo. A. Pierson
Charlotte . . .	1912	Two-course	12,000	$5\frac{1}{2}'' + 1\frac{1}{2}''$	$1:2\frac{1}{2}:5$ 1:2	$1.07	—	Jas. R. McCamman
Clear Water .	1906	Two-course	5,000	$6'' + 1''$	1:7 1:2	$0.93	—	—
Constantine .	1913	Two-course	4,300	$4\frac{1}{2}''+1\frac{1}{2}''$	$1:4\frac{1}{2}$ 1:2	$1.27	—	W. C. Bailey
Dearborn . .	1912	One-course	11,700	$7''$	$1:1\frac{1}{2}:3$	$1.60	—	—
Detroit	1909	Two-course	1,000	$5'' + 2''$	1:3:6 $1:1\frac{1}{2}$	—	—	R. H. McCormick
Detroit	1910	Two-course	1,000	$5'' + 2''$	1:3:6 $1:1\frac{1}{2}$	—	—	R. H. McCormick
Detroit	1910	One-course	12,000	$6''$	1:2:4	—	—	R. H. McCormick
Detroit	1911	Two-course	61,000	$5'' + 2''$	1:3:6 1:1:3	$1.12	—	R. H. McCormick
Detroit	1912	Two-course	4,200	$5''+2''$	1:3:6 1:1:3	—	—	R. H. McCormick
Detroit	1913	—	16,600	—	—	—	—	—
Dowagiac . . .	1912	Bit.-top	3,300	$4'' + 2''$	1:7 1:2	$0.95	—	—
East Jordan .	1912	Two-course	10,000	$5'' + 2''$	1:6 1:2	$1.06	—	—

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Michigan (*Continued*)								
Escanaba...	1911	Two-course	11,000	4″ + 2″	1:2:4 1:1:2	$0.87	—	Mr. McKillican
Escanaba...	1912	Two-course	29,000	4″ + 2″	1:3:6 1:1½	$1.00	—	D. A. Brotherton
Flushing....	1911	—	700	—	—	—	—	—
Frankenmuth	1913	One-course	7,000	7″	1:2:3 1:2	—	—	R. W. Roberts
Grand Haven	1910	Bit.-top	2,000	—	1:6 1:2	$0.97	—	Riggs Sherman Co.
Grand Haven	1911	Bit.-top	7,000	6″ + 1½″	1:7 1:3	—	—	Riggs Sherman Co.
Grand Haven	1913	One-course	10,000	6″	1:4	$0.95	Includes grading	W. J. Sherman & Co.
Grand Haven	1913	One-course	13,300	7″	1:4	$1.05	Includes grading	W. J. Sherman & Co.
Grand Rapids.......	1901–2	Two-course	1,000	6″ + 1″	1:3:5 1:2	$1.25	—	L. W. Anderson
Grand Rapids.......	1903–8	Two-course	15,000	6″ + 1½″	1:3:6 1:2	$1.10	—	L. W. Anderson
Grand Rapids.......	1911	Two-course	1,200	5½″ + 1″	1:2½:5 1:1½	$1.02	—	L. D. Cutcheon
Grand Rapids.......	1913	Two-course	18,800	5½″ + 1″	1:5 1:2	—	—	L. D. Cutcheon
Grosse Point	1913	Two-course	1,000	5″ + 2″	1:2:4 1:2	—	—	M. L. Brown
Hamtramck.	1911	Two-course	25,000	5″ + 2″	1:3:6 1:1:3	$1.57	Reinf.	Geo. Jerome
Hamtramck.	1912	Two-course	10,000	5″ + 2″	1:3:6 1:1:3	—	Reinf.	Geo. Jerome
Hamtramck.	1913	Two. course	3,000	5″ + 2″	1:3:6 1:1:3	—	Reinf.	Geo. Jerome
Hancock ...	1907	Two-course	8,000	5¼″ + 1¾	1:3:4 1:1½	$2.29½	—	C. B. M. Craig
Hastings ...	1913	One-course	18,400	7″	1:2:3	$0.87	—	F. L. Roberts
Highland Park.....	1910	Two-course	7,000	5″ + 2″	1:3:6 1:1:3	$1.57	Reinf.	Geo. Jerome
Highland Park.....	1911	Two-course	22,000	5″ + 2″	1:3:6 1:1:3	$1.57	Reinf.	Geo. Jerome
Highland Park.....	1912	Two-course	12,600	5″ + 2″	1:3:5 1:2½	$1.35	Reinf.	L. D. Beckley
Highland Park.....	1913	Two-course	10,000	5″ + 2″	1:3:5 1:2½	$1.35	Reinf.	Geo. Jerome

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Michigan (*Continued*)								
Howell.....	1912	Two-course	6,280	4½″ + 1½″	1:6 1:3	—	—	R. E. Long
Hudson	1912	One-course	24,000	6″	1:2:4	$1.76	—	—
Huron Co. ..	1912	One-course	—	—	1:2:4	—	—	—
Jackson	1907	Two-course	25,000	6″ + 4″	1:7 1:3	—	—	H. D. Conway
Jackson	1911	Bit.-top	11,000	4″ + 2″	1:8 1:2	$1.20	—	A. W. D. Hall
Jackson	1912	Two-course	11,000	4″ + 2″	1:6 1:2	$1.20	—	A. W. D. Hall
Kalamazoo .	1896	Two-course	1,200	4½″ + 1½″	1:6 1:2	$1.44	—	—
Kalamazoo .	1907	Two-course	5,700	4½″ + 2½″	1:5 1:1½	$1.74	—	H. A. Johnston
Kalamazoo .	1910	One-course	2,000	—	1:2:3	—	Reinf.	H. A. Johnston
Kalamazoo .	1912	Two-course	300	5″ + 1½″	1:5 1:2	$1.20	—	A. Lenderink
Kalamazoo .	1913	One-course	2,000	7″	1:2:3	—	—	Fleming
Kawkawlin .	1911	One-course	890	7″	1:5	—	—	—
Kawkawlin .	1912	Two-course	850	5″+2″	1:7 1:2	$1.00	—	J. H. Blonshield
Lansing	1911	Bit.-top	13,400	5″ + 2″	1:2½:5 1:2:4	$1.29	—	H. A. Sparks
East Lansing	1913	One-course	10,700	7″	1:1½:3	—	—	—
Marquette..	—	Two-course	12,900	4½″+2½″	—	—	—	—
Marshall ...	—	One- and Two-course	25,000	—	—	—	—	—
Menominee .	1911	Two-course	2,000	6″ + 2″	1:3:5 1:1	$1.22½	—	Albert Hass
Menominee .	1912	Two-course	800	6″ + 2″	1:3:5 1:1	$0.85	—	Albert Hass
Monroe	1911	One-course	13,500	6″	1:2:4	$1.30	—	—
Monroe	1912	One-course	3,800	6″	1:3:5	$0.80	—	—
Monroe	1912	Two-course	23,000	4½″ + 1½″	1:3:5 1:2	$1.30	—	—
Monroe	1913	Two-course	12,600	4½″ + 1½″	1:3:5 1:2	$2.28	Includes grading	—
Mt. Clemens	1912	Bit.-top	400	8″	—	$1.35	—	—
Mt. Pleasant	1911	Two-course	7,700	5″ + 2″	1:5 1:2	—	—	A. C. Sekell

Location	Year Built	Type	Square Yards	Thickness	Proportions	Cost per Square Yard	Remarks	Engineer
Michigan (*Continued*)—								
Mt. Pleasant	1913	Two-course	5,000	5″ + 2″	1:2:5 1:2	\$0.81	—	R. W. Roberts
Mt. Pleasant	1913	Two-course	5,200	6″ + 2″	1:2:5 1:2	\$0.94½	—	R. W. Roberts
Niles.......	1912	One-course	1,800	6″ at side 8″ at center	1:2:4	\$1.20	—	—
Otsego	1911	Two-course	200	6″ + 2″	—	—	—	L. A. Simpson
Port Huron .	1912	Two-course	11,000	5½″ + 1½″	1:5 1:1½:1½	\$1.22	Reinf.	Earl R. Whitmore
Saginaw....	1908	Hassam	9,000	6″	—	\$1.40	—	R. W. Roberts
Saginaw....	1912	One-course	800	6″	1:2:4	\$1.00	—	H. H. Eymer
Saginaw Co.	1910	Two-course	10,000	3″ + 3″	1:2:5 1:2:4	—	—	—
St. Johns ...	1911	Bit.-top	1,000	5″ + 2″	1:5 1:2:3	\$1.10½	—	E. G. Hulse
St. Johns ...	1912	Two-course	14,700	5″ + 2″	1:5 1:2½	\$1.33	—	E. G. Hulse
St. Johns ...	1913	Two-course	5,000	5″ + 2″	1:5 1:2½	\$1.33	—	E. G. Hulse
St. Joseph ..	1908	One-course	160	8″	—	—	—	W. J. Chay
Scottsville ..	1910	Two-course	8,000	5″ + 2″	1:6 1:2	—	—	—
Sebewaing ..	1912	One-course	2,700	6½″	1:2:3	\$1.34	—	—
South Haven	1913	Two-course	11,000	4″ + 2″	1:4 1:2	\$1.00	—	J. S. Lozier
Wayne Co...	1909	Two-course	10,000	4″ + 2½″	1:2½:5 1:2:3			
Wayne Co...	1909	One-course	10,000	6″	1:2:4		Cost includes	Wm. F. Butler
Wayne Co...	1910	One-course	50,000	6″	1:2:4	\$1.04 to	4-ft. wide gravel	John S. Hagerty Edward N.
Wayne Co...	1911	One-course	200,000	7″	1:1½:3	\$1.71	shoulders, grading	Hines Commissioners
Wayne Co...	1912	One-course	300,000	7″ at sides 9″ at crown	1:1½:3		and drainage	
Wayne Co...	1913	One-course	300,000	7″ at sides 9″ at crown	1:1½:3			
Ypsilanti ...	1913	Two-course	5,000	4½″+1½″	1:6 1:2	\$1.05	—	—
Minnesota—								
Bemidji	1910	Two-course	2,000	5″ + 1½″	1:5 1:2	\$1.20	—	M. D. Stoner
Bemidji	1912	One-course	19,800	5″	1:3½	\$1.05	—	M. D. Stoner
Brainerd ...	1910	One-course	6,000	5″	1:5	\$0.84½	Surface corrugated	R. K. Whitley

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(Continued)

Location	Year Built	Type	Square Yards	Thickness	Proportions	Cost per Square Yard	Remarks	Engineer
Minnesota (*Continued*)—								
Brainerd . . .	1911	One-course	10,500	5″	1:5	$0.84½	—	F. A. Glass
Brainerd . . .	1913	One-course	17,600	5″	1:5	$0.95 to $1.05	—	C. D. Peacock
Davenport . .	1912	Two-course	2,900	6″ + 1½″	1:3:5 1:1:1	$1.05	—	—
Duluth	1909	Two-course	14,000	5¼″ + 1¾″	1:3:4 2:3	$1.95	—	—
Duluth	1912	One-course	7,700	5″	1:2:5	$1.30	—	John Wilson
Duluth	1912 } 1913 }	One-course	7,500	5″	1:2:5	$1.30	—	John Wilson
Duluth	1913	Two-course	5,800	5″ + 1½″	1:3:5 1:1:1	$1.20	—	John Wilson
Hennepin Co.	1912	One-course	8,200	7″	1:2:3	—	—	—
Mankato . . .	1912	Two-course	200	5″ + 2″	1:5 1:1½	$1.32	—	—
Minneapolis	1912	One-course	9,900	7″	1:2:4	$1.18	Includes grading	E. R. Dutton
Minneapolis	1913	One-course	28,970	7″	1:2:4	$1.30	—	F. W. Capplan
Okatoma . . .	1913	—	1,000	6″	1:4	—	—	—
Owantonna .	1912	One-course	1,000	6″	1:4	$1.73	—	H. S. Dartt
Red Wing . .	1912	One-course	800	6″	1:4	$0.86	Surface corrugated	Wm. Geisheker
St. Paul	1912	One-course	4,500	5″	1:2:3	$0.92	—	—
Stillwater . . .	1912	Two-course	2,700	5″ + 1½″	1:3:5 1:2	$1.25	—	L. W. Clarke
Stillwater . . .	1913	One-course	5,000	7″	1:2:4	$1.03	—	L. W. Clarke
Wayzota . . .	1913	One-course	8,200	7″	1:2:3	—	—	F. Haycock
Winona Co.	1912	One-course	19,700	6″	1:2:4	$1.00	—	O. B. Leland
Winona Co.	1913	One-course	18,800	6″	1:2:4	$1.00	—	H. B. Childs
Mississippi—								
Brook Haven	1912	Two-course	1,400	5″ + 1″	1:2:5 1:2	$0.90	—	—
Jackson	1913	Bit.-top	8,500	5″	1:2:4	—	—	M. L. Tulley
Meridian . . .	1910	Two-course	8,000	5¼″ + 1¾″	1:3:4 1:1½	$1.97	Includes grading	W. G. Wetmore
Meridian . . .	1913	Bit.-top	30,000	—	—	—	—	—

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Mississippi (*Continued*)— Vicksburg ..	1908	Two-course	7,000	$5\frac{1}{4}'' + 1\frac{3}{4}''$	1:3:4 1:1½	$2.07	—	C. R. Twiss
Missouri— Cape Girardeau ...	1911	One-course	16,000	6″ and 7″	1:1½:3	$0.96	—	C. E. Stiver
Cape Girardeau ...	1912	One-course	3,000	6″	1:1½:3	$0.96	—	C. E. Stiver
Cape Girardeau ...	1913	One-course	7,000	5″ at side 6″ at center	1:2:4	$0.96	—	C. E. Stiver
Cape Girardeau ...	1913	One-course	24,000	5″ at side 6″ at center	1:1½:3	$0.93 to $0.98½	—	C. E. Stiver
Cape Girardeau ...	1913	Bit.-top	7,000	5″ at side 6″ at center	1:3:5	$0.92	—	C. E. Stiver
Chillicothe..	1913	Hassam	7,000	5″	—	$1.50	—	J. Broaddus
Clinton.....	1912	One-course	5,000	7″	1:1½:3	$1.30	—	H. C. Allen
Clinton.....	1913	One-course	6,700	7″	1:1½:3	$1.29	—	H. C. Allen
Columbia...	1913	Bit.-top	1,000	7″	1:2:4	$1.30	—	J. Paul Price
Columbia...	1913	One-course	10,840	6″	1:2½:4½	$0.89	—	J. Paul Price
Eldorado Springs...	1912	One-course	15,000	6″	1:5	$0.86	—	D. L. Haggard
Fulton	1913	—	3,600	—	—	—	—	—
Hannibal ...	1913	Hassam	75,000	—	—	$1.68	—	B. F. Smiley
Hannibal ...	1913	One-course	15,000	6″	1:2:4	$1.00	—	B. F. Smiley
Independence	1909	Hassam	2,000	6″	—	$1.65	—	H. H. Pendleton
Independence	1910	Hassam	32,000	6″	—	$1.60	—	H. H. Pendleton
Independence	1910	One-course	1,000	5″	1:3:5	$1.30	—	H. H. Pendleton
Independence	1911	Hassam	14,000	6″	—	$1.55	—	H. H. Pendleton
Independence	1911	One-course	4,000	5″	1:3:5	$1.22	—	H. H. Pendleton
Kansas City	1910	One-course	5,000	8″	1:2½:4½	$1.29	—	L. R. Ash
Kansas City	1911	One-course	52,000	6″	1:2½:4½	$1.02 to $1.35	—	L. R. Ash
Kansas City	1911	Two-course	3,000	$5'' + 1\frac{1}{2}''$	1:3:5 1:2	$1.43	—	L. R. Ash

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Missouri (*Continued*)—								
Kansas City	1912	One-course	266,500	6″	1:2½:4½	$1.04	—	L. R. Ash
Kansas City	1913	One-course	260,800	8″ and 6″	1:2½:4½	$1.03 to $1.24½	—	Curtis Hill
Kansas City	1913	One-course	17,900	6″	1:2½:4½	$1.03	—	Curtis Hill
Kirksville...	1913	Two-course	18,500	5½″ + 1½″	1:2:4½ 1:½:1½	$1.45	—	S. M. Foley
Liberty.....	1911	Two-course	17,000	5″ + 1″	1:2½:5 1:2	$1.18	—	E. H. Collins
Liberty.....	1912	Two-course	38,900	5″ + 1½″	1:2½:5 1:2	$1.15	—	E. H. Collins
Liberty.....	1913	Two-course	11,100	5″ + 1″	1:2½:5 1:1:1	$1.19 $1.32	—	E. K. Carter
Maplewood .	1913	Bit.-top	2,400	6″	1:2½:5	$1.72	—	S. W. Shinkle
Maplewood .	1913	One-course	4,000	6″	1:2:4	$1.56	Includes grading and curbs	S. W. Shinkle
Marshall ...	1913	Bit.-top	13,000	—	—	—	—	—
Mexico.....	1912	One-course	6,500	6″	1:3:5	$1.12¼	—	—
Nevada	1912 1913	Bit.-top	29,000	6″	1:1:4	$1.20	—	J. M. Clack
St. Joseph ..	1907 1908	Hassam	190,000	6″	—	$1.35 to $1.39	—	D. L. Lawler
St. Joseph ..	1910	Two-course	2,000	4″ + 1″	1:2:4 1:½:1	$1.32	—	D. L. Lawler
St. Joseph ..	1911	Two-course	13,000	4″ + 1″	1:2:4 1:½:1	$1.15	—	D. L. Lawler
St. Joseph ..	1912	Two-course	10,800	4″ and 5″ + 1″	1:2:4 1:½:1	$1.20 to $1.35	—	Chas. W. Campbell
St. Louis....	1890	—	700	—	—	—	—	—
Sedalia.....	1912	Two-course	2,000	5″ + 1″	1:3:6 1:2	$1.00	Includes grading	F. T. Leaming
Sedalia.....	1913	Bit.-top	7,000	—	—	—	—	—
Springfield..	1913	—	100,000	—	—	$1.23 to $1.36¼	—	C. Phillips
Trenton	1911	One-course	700	6″	1:2½:5	$1.44	—	—
Webster Groves ...	1913	Bit.-top	30,000	6″	1:2½:4	$1.25	—	W. A. Fuller
Montana—								
Billings.....	1912	One-course	400	7″	1:2:4	$2.25	—	C. E. Durland

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Montana (*Continued*)—								
Bozeman ...	1908	Two-course	25,000	$5\frac{1}{2}'' + 1\frac{1}{2}''$	1:2:4 1:1:1	$1.95	—	C. M. Thope
Great Falls	1912	One-course	3,100	6″	1:6	$1.40	—	—
Nebraska—								
Benson.....	1910	One-course	18,000	6″	1:2:4	$1.04	—	Roy Towle
Douglas Co..	1910	One-course	28,000	5″	1:3:5	$1.27 to $1.62	—	Geo. McBride
Grand Island	1912	Bit.-top	7,000	5″	1:5	$1.45	—	H. W. Kibbey
Lincoln.....	1912	Two-course	1,100	$4\frac{1}{2}'' + 1\frac{1}{2}''$	—	$1.45	—	Adna Dobson
Omaha.....	1908	One-course	1,000	8″	1:2:4	$1.55	Includes curbs	Geo. W. Craig
Omaha.....	1909	One-course	3,000	8″	1:2:4	$1.70	Includes curbs	Geo. W. Craig
Omaha.....	1909	One-course	1,000	6″	1:2:4	$1.45	—	Geo. W. Craig
Omaha.....	1910	One-course	9,000	8″	1:2:4	$1.62	Includes curbs	Geo. W. Craig
Omaha.....	1910	One-course	1,000	6″	1:2:4	$1.20	—	Geo. W. Craig
Omaha.....	1911	One-course	3,000	8″	1:2:4	$1.62	Includes curbs	Geo. W. Craig
Omaha.....	1911	One-course	1,000	6″	1:2:4	$1.25	—	Geo. W. Craig
Omaha.....	1912	One-course	2,100	6″	1:2:4	$1.65	—	—
Omaha.....	1913	—	35,000	—	—	—	—	—
South Omaha	1907	One-course	1,000	6″	$1:2\frac{1}{2}:5$	$1.19	—	E. M. Rohrbough
South Omaha	1911	One-course	13,000	8″	$1:2\frac{1}{2}:5$	$1.23	—	Geo. W. Roberts
New Hampshire—								
Nashua.....	1907	Hassam	5,000	6″	—	$1.35	—	—
Nashua.....	1909	One-course	2,000	7″	1:3:5	$1.16	—	Osgood Construction Co.
Nashua.....	1909	Two-course	800	6″+1″	1:3:5 1:3	$1.16	—	Osgood Construction Co.
Nashua.....	1911	One-course	1,400	6″	1:3:5	$1.09	—	Osgood Construction Co.
New Jersey—								
Audubon ...	1912–3	One-course	2,400	6″	1:2:4	$0.98	—	J. J. Albertson
Bridgeton ..	1913	Two-course	1,400	5″ + 2″	1:3:5 1:2	$1.40	—	N. M. Sharp
Glen Ridge .	1913	One-course	1,500	6″	$1:1\frac{1}{2}:3$	$1.28	Reinf.	F. E. Crane

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
New Jersey (*Continued*)—								
Linden	1913	One-course	4,500	6″ at sides 8″ at center	1:2½:4	—	—	Jacob L. Bauer
New Brunswick	1908	Two-course	5,000	5¼″ + 1¾″	1:2:5 1:1½	$2.11	—	Fred. C. Schneider
New Brunswick	1911	Two-course	7,200	5¼″ + 1¾″	1:2:5 1:1½	$2.15	—	Fred. C. Schneider
New Brunswick	1912	Bit.-top	15,000	6″	1:2:4	—	—	—
New Brunswick	1913	One-course	19,000	6″	1:2:4	—	—	—
New Village	1912	One-course	9,000	6″	1:2:4	$1.40	—	F. Salmon
Oaklyn	1913	One-course	2,500	6″	1:2:4	—	—	—
Ocean City	1912–3	Bit.-top	21,000	5¾″	1:2:4	$1.00	—	Ralph L. Goff
Paterson	1913	Bit.-top	1,800	6″	1:2:4	—	—	—
Roselle Park	1913	Bit.-top	16,000	6″	1:2:4	$1.34⅔	—	J. Wallace Higgins
Trenton	1912	One-course	1,300	6″	1:2½:5	$1.44	—	Abram Swan, Jr.
Trenton	1913	One-course	4,300	6″	1:2:4	$1.07–$1.11	—	Abram Swan, Jr.
Washington	1912	Bit.-top	1,500	6″	1:2:4	$1.34	—	Borough Engr.
Westfield	1913	Bit-top	7,200	6″	1:1½:3	$1.37	—	A. W. Vars
New York—								
Albany Co.								
Albany	1912	Bit.-top	4,500	6″	1:2¼:4	$1.00	—	A. M. Worthington
Albany	1912	Bit.-top	1,300	6″	1:2¼:4	$1.65	—	Frank R. Lanagan
Albany	1913	One-course	5,500	5″ at sides 7″ at center	1:1½:3	$1.89	Includes grading	Frank R. Lanagan
Albany	1913	Two-course	4,100	5″ + 2″	1:3:5 1:2	$1.20	—	Frank R. Lanagan
Slingerlands	1912	One-course	39,500	6″	1:2½:5	$0.87	—	C. Gordon Reel
Watervliet,—Shakers	1912	One-course	60,000	5″	1:3:5 2:3:6	$0.85	—	C. Gordon Reel
Allegany Co.								
Friendship,—Belmont	1913	One-course	65,800	5″	1:6	$0.70	—	John N. Carlisle

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
New York (*Continued*)—								
Friendship,—Bolivar...	1913	One-course	50,000	5″	1:2½:5	$0.85	—	John N. Carlisle
Obi—Cuba .	1913	One-course	72,000	5″	1:5	$0.87	—	John N. Carlisle
Broome Co.								
Binghamton	1912	Bit.-top	1,600	6″ + 2″	1:2:5 1:2	$1.16	—	J. A. Giles
Binghamton	1913	Two-course	800	6″ + 2″	1:3:6 1:2	$1.45	Includes grading	J. A. Giles
Cattaraugus Co.								
Allegany, Vandalia .	1913	One-course	44,100	5″	1:6	$0.93	—	John W. Carlisle
Otto—Cattaraugus ...	1912	One-course	8,500	6″	1:5	$0.80	—	C. Gordon Reel
Otto, East ..	1913	One-course	18,600	5″	1:5	$0.80	—	John N. Carlisle
Chautauqua Co.								
Dunkirk....	1912	One-course	30,200	6″	1:1½:3	$1.12	Reinf.	J. W. Hackett
Dunkirk....	1913	One-course	3,900	6″	1:1½:3	$1.12 to $1.35	Reinf.	J. W. Hackett
Poland Center—Waterboro ...	1912	One-course	46,900	6″	1:5	—	—	C. Gordon Reel
Chenango Co.								
Nineveh—Afton	1912–3	Hassam	52,700	4½″ at sides 5¾″ at center	—	$1.62	—	C. Gordon Reel
Clinton Co.								
Battleman Rd.......	1912	One-course	10,500	6″	1:2½:5	—	—	C. Gordon Reel
Cortland Co.								
Cortland ...	1913	—	—	—	—	—	—	—
Erie Co.								
Tonawanda .	1912–3	One-course	43,500	6″	1:6	—	—	C. Gordon Reel
Essex Co.								
Schroon Lake to North Hudson ..	1912	One-course	55,600	6″	1:6	$0.81	—	C. Gordon Reel

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
New York (*Continued*)— Village of Upper Jay to Village of Keen . .	1912	One-course	56,900	6″	1:2½:5	$0.57½	—	C. Gordon Reel
Franklin Co. North Bangor—South Bangor . . .	1912	One-course	19,400	6″	1:2½:5	$0.82⅔	—	C. Gordon Reel
Fulton Co. Gloversville	1913	Bit.-top	32,000	6″	1:2½:5	$1.50	—	—
Genesee Co. Batavia	1913	—	6,300	—	—	—	—	Robert L. Fox
Jefferson Co. Watertown .	1912	Hassam	4,500	6″	—	$1.33	Bit.-top	E. W. Sayles
Watertown .	1912–3	Bit.-top	7,800	6″	1:4	$1.28	—	E. W. Sayles
Livingston Co. Avon Village	1912	Bit.-top	16,900	6″	1:5	—	—	C. Gordon Reel
Avon Lima .	1912	One-course	60,400	6″	1:2½:5	—	—	C. Gordon Reel
Geneseo-Pifford . . .	1912	One-course	17,400	6″	1:2½:5	—	—	C. Gordon Reel
Madison Co. Bridgeport-Lakeport .	1912	One-course	41,800	6″	1:2½:5	—	—	C. Gordon Reel
Sherrill-Kenwood	1913	One-course	2,100	6″	1:2:4	—	—	—
Monroe Co. Fairpoint-Nine Mile Pt.	1912	One-course	107,100	5″	1:2½:5	—	—	C. Gordon Reel
Sea Breeze-Nine Mile Pt.	1912	One-course	34,700	5″	1:5½	—	—	C. Gordon Reel
Nassau Co. Locust Valley	1913	Bit.-top	9,000	—	—	—	—	—
New Hyde Park, N. Y.	1912	Hassam	13,200	5″	—	—	—	—
Staten Island	1912	Bit.-top	1,200	6″	1:2¼:4	$1.12	—	—

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
New York (*Continued*)— Niagara Co.								
Gosport-Hartland	1912	Bit.-top	26,200	6″	1:2½:5	—	—	C. Gordon Reel
La Salle	1913	Bit.-top	6,400	5″	1:6	$1.18	—	A. P. Smith
Niagara Falls	1907	Hassam	15,000	6″	—	$2.17	Includes curbs	F. S. Parkhurst, Jr.
Niagara Falls	1908	Hassam	28,000	6″	—	$2.21	Includes curbs	F. S. Parkhurst, Jr.
Niagara Falls	1909	Hassam	13,000	6″	—	$2.30	Includes curbs	F. S. Parkhurst, Jr.
Niagara Falls	1910	Hassam	19,000	6″	—	$2.20	Includes curbs	F. S. Parkhurst, Jr.
Niagara Falls	1911	Hassam	12,000	6″	—	$2.00	—	F. S. Parkhurst, Jr.
Niagara Falls	1911	Hassam	6,000	7″	—	$1.95	—	F. S. Parkhurst, Jr.
Niagara Falls	1912	Hassam	32,300	7″	—	$2.00	—	F. S. Parkhurst, Jr.
Niagara Falls	1913	Hassam	30,000	7″	—	—	—	F. S. Parkhurst, Jr.
Wrights Corners, Hartland	1913	Bit.-top	63,800	6″	1:2½:5	$0.70	—	John N. Carlisle
Onondaga Co.								
Baldwinsville-Cicero	1912	One course	91,300	6″	1:6	—	—	C. Gordon Reel
Cicero-Brewerton	1912	Bit.-top	45,400	6″	1:6	—	—	C. Gordon Reel
Fabrius Village	1913	Bit.-top	13,400	5″	1:2½:5	—	—	John N. Carlisle
Marietta-Marcellus	1912	One-course	63,400	5″	1:6	—	—	C. Gordon Reel
Phoenix-Syracuse	1912	One-course	36,900	6″	1:2½:5	—	—	C. Gordon Reel
Syracuse-Bridgeport	1912–3	One-course	62,300	6″	1:2½:5	—	—	John N. Carlisle
Ontario Co.								
Geneva-Lyons	1912–3	One-course	60,500	6½″	1:5	—	—	John N. Carlisle

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
New York (*Continued*)—								
Orleans Co. West Barre to Barre Center . . .	1912	Bit.-top	38,400	6″	1:2:5	—	—	C. Gordon Reel
Oswego Co. Fulton	1912	One-course	2,300	6″	1:2½:5	—	—	C. Gordon Reel
Fulton	1912	Bit.-top	25,300	6″	1:2½:5	$1.60	—	G. C. Hill
Fulton	1913	One-course	355	6″	1:3:5	$1.30	—	G. C. Hill
Fulton-Three Rivers . . .	1912–3	Hassam	48,400	6″	—	—	—	John N. Carlisle
Fulton-Three Rivers . . .	1912–3	One-course	38,900	6″	1:6	—	—	John N. Carlisle
Sterling-Oswego . . .	1913	Bit.-top	23,300	6″	1:2½:5	—	—	John N. Carlisle
Renssalaer Co. DeFreestville	1912	One-course	6,300	5″	1:6	—	—	C. Gordon Reel
Defreest-ville-Couse	1912	One-course	29,500	5″	1:6	—	—	C. Gordon Reel
Troy	1912	Hassam	3,000	5″	—	$1.20	—	—
Troy	1912	Hassam-ite	7,000	5″	—	$2.35	—	—
Troy	1913	—	60,000	—	—	—	—	—
West Sand Lake to Averill Park	1912	One-course	34,400	6″	1:6	—	—	C. Gordon Reel
Rockland Co. Spring Valley-Mt. Ivy . .	1912	One-course	36,700	6″	1:2½:5	—	—	C. Gordon Reel
Saratoga Co. Schuylers-ville Village	1912	One-course	14,300	6″	1:6	—	—	C. Gordon Reel
Seneca Co. Ovid-Romulus	1912	Bit.-top	60,800	6″	1:2½:5	$0.81	—	C. Gordon Reel

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
New York (*Continued*)—								
St. Lawrence Co.								
Ogdensburg-Morristown.....	1913	One-course	38,300	6″	—	—	—	John N. Carlisle
Sullivan Co.								
Liberty-County Line Part 1....	1912	Hassam	80,200	6″	—	$1.22	—	C. Gordon Reel
Ulster Co.								
Kingston ...	1913	One and two-course	3,900	6″ and 4″ + 2″	1:1½:3 and 1:3:6 1:1	$1.13	—	John F. Hallinan
Kingsville-Ellenville Part 4....	1912	One-course	15,700	6″	1:2½:5	—	—	C. Gordon Reel
Warren Co.								
Lake George-Warrensburg	1912	Bit.-top	43,000	6″	1:2½:5	—	—	C. Gordon Reel
Wayne Co.								
William Sta. to Poultneyville ..	1912	Bit.-top	28,400	6″	1:2½:5	—	—	C. Gordon Reel
Westchester Co.								
Bedford-Golden...	1912	One-course	28,200	6″	1:3:6	—	—	C. Gordon Reel
New Rochelle	1913	One-course	13,150	6″	1:2:4	—	—	J. R. Wilkes
New Rochelle	1910	Hassam	4,500	6″	—	—	—	J. R. Wilkes
New Rochelle	1913	Bit.-top	14,000	—	—	—	—	J. R. Wilkes
Waverly....	1913	—	5,000	—	1:2½:5	—	—	E. D. Sebring
Wyoming Co.								
Java Village-Wales....	1912	Bit.-top	34,100	5″	1:2½:5	—	—	C. Gordon Reel

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(Continued)

Location	Year Built	Type	Square Yards	Thickness	Proportions	Cost per Square Yard	Remarks	Engineer
North Carolina—								
Charlotte...	1907	Two-course	2,800	4″ + 2″	1:3:6 1:1½	$1.25	—	Jos. Firth
Charlotte...	1912–3	Two-course	59,000	″ + 2″	1:3:6 1:1½	$1.50	—	Jos. Firth
Greensboro .	1912	Bit.-top	14,800	5″	1:2:4	$1.25	—	M. M. Boyles
Greensboro .	1913	Bit.-top	35.000	5″	1:2:4	$1.25	—	M. M. Boyles
Raleigh	1912	Bit.-top	12,800	6″	1:2:4	$1.24	—	—
Raleigh	1913	Bit.-top	12,000	6″	1:2:4	$1.24	—	W. L. Wiggs
Wilmington	1913	Bit.-top	12,000	6″	1:2:4	$1.24	—	—
North Dakota								
Grand Forks	1910	Two-course	23,000	5¼″ + 1¾″	1:7 1:1½	$2.20	8″ strip woven wire in crown	H. G. Lykken
Grand Forks	1911	Two-course	35,500	5¼″ + 1¾″	1:7 1:1½	$2.25	Stone cost $4.50 per cu.yd.	H. G. Lykken
Grand Forks	1911	One-course	2,000	7″	1:5	$1.26	—	H. G. Lykken
Minot......	1913	—	19,200	—	—	—	—	—
Ohio—								
Adams Co.								
Near Winchester ...	1913	One-course	5,800	6½″	1:2:3	$1.28	—	—
Ashland Co.								
Near Ashland	1912	Bit.-top	18,300	6″	1:1½:3½	$1.00	Reinf.	J. R. Marker
Ashtabula Co.								
Near Andover	1912	Bit.-top	15,000	7″	1:1½:3½	$0.95	—	J. R. Marker
Near Geneva	1913	Bit.-top	9,400	6″ at sides 7″ at center	1:1½:3½	$0.95	—	J. R. Marker
Jefferson ...	1912	One-course	1,300	6″	1:2:3	$1.06	—	B. F. Hewitt
Jefferson ...	1912	Bit.-top	58,500	6″	1:2:4	$1.06	—	B. F. Hewitt
Champaign Co.								
Near Urbana	1913	Bit.-top	1,100	6½″	1:1½:3	$1.20	—	J. R. Marker

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Ohio (*Continued*)—								
Coshocton Co.	1909	Two-course	2,000	5″ + 1″	1:2:4 1:1½	$1.05	—	Commissioners
Coshocton Co.	1912	Bit.-top	7,200	6″	1:2:5½	$0.95	—	John A. Hanlon
Near Cambridge....	1912	Bit.-top	3,000	6″	1:2½:5	—	—	John A. Hanlon
Crawford Co. Bucyrus....	1910	Two-course	3,000	4½″ + ½″	1:2½:4½ 1:2:2	$0.94	—	H. L. Webber and George Schillinger
Cuyahoga Co. Cleveland ..	1912	Bit.-top	15,900	4½″ + 1½″	1:2½:5 1:2	$1.03	—	Robert Hoffman
Lakewood ..	1913	One-course	4,300	7″	1:4	—	—	Chas. W. Root
Near Warrensville ..	1911–3	One-course	28,000	6″	1:4	$1.13	Includes grading	Harry Bunning
Delaware Co. Delaware...	1913	Two-course	1,350	4″ + 2″	1:2:5 1:2	$1.85	Includes grading	H. O. Core
Erie Co. Cedar Point	1913	Bit.-top	72,800	6″	1:3:5	—	—	C. M. King
Florence Twp.	1913	Bit.-top	5,800	6″	1:1½:3½	$1.10	—	J. R. Marker
Sandusky...	1913	One-course	20,500	6″	1:1½:3½	$1.12	—	J. R. Marker
Vermillion ..	1913	Bit.-top	7,000	6″	1:1½:3½	$0.90	—	J. R. Marker
Fayette Co. Washington Ct. House	1912	One-course	16,400	6″	1:1½:3½	—	—	J. R. Marker
Franklin Co. Near Columbus	1910	One-course	1,400	6″	1:3:6	$0.83	—	Jos. C. Wondus
Near Columbus	1912–3	Bit.-top	1,600	6″	1:1½:3 and 1:2:4	—	—	J. R. Marker
Near Columbus	1912–3	One-course	800	6″	1:1½:3 and 1:2:4	—	—	J. R. Marker
Near Columbus	1912–3	Hassam	800	6″	—	—	—	J. R. Marker

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

Location	Year Built	Type	Square Yards	Thickness	Proportions	Cost per Square Yard	Remarks	Engineer
Ohio (*Continued*)—								
Near Columbus	1913	Bit.-top	5,800	6″ at sides 7″ at center	1:3:8	—	—	R. N. Waid
Madison Twp.	1913	Bit.-top	17,600	6″ at sides 7″ at center	1:1½:3½	$1.20	—	J. R. Marker
Geauga Co.								
Burton	1913	One-course	9,300	6″	1:2:4	$1.45	—	E. A. Fiedler
Middlefield .	1913	Bit.-top	19,100	6″	1:2:4	$1.09	—	B. F. Hewitt
Scotland Sta.	1913	Bit.-top	10,100	6″	1:1½:3½	$0.90	—	J. R. Marker
Scotland Sta.	1913	Bit.-top	9,000	6″	1:1½:3	$1.50	—	E. A. Fiedler
Hamilton Co.								
Norwood ...	1912	One-course	5,000	6″	1:2½:5	$1.10	—	J. A. Stewart
Norwood ...	1913	One-course	6,500	6″	1:2½:5 and 1:2:4	$1.14	—	J. A. Stewart
Harrison Co.								
Piedmont ..	1911	One-course	9,200	6″	1:2½:5	$0.90	Reinf.	M. Kelley
Near Scio ...	1913	Bit.-top	15,100	7″	1:1½:3½	$1.28	—	J. R. Marker
Scio	1913	Bit.-top	2,300	7″	1:1½:3½	$1.31	—	Wm. Hibbs
Holmes Co.								
Near Millersburg	1912	Bit.-top	3,200	6″ at sides 7″ at center	1:1½:3½	$1.31	—	J. R. Marker
Huron Co.								
Bellevue	1913	One-course	1,200	6″	1:2:4	$1.00	—	John Laylin
Bellevue	1913	Bit.-top	2,700	6″	1:2:4	$1.05	—	John Laylin
Near Norwalk	1912	Bit.-top	13,000	6″	1:2:4	$0.95 to $1.15	—	L. C. Herrick
Near Norwalk	1913	One-course	131,700	6″	1:2:3	$0.94 to $1.56	—	L. C. Herrick
Near Norwalk	1913	One-course	26,000	6″	1:1½:3 and 1:2:3	$1.17 to $1.21	—	John Laylin
Norwalk	1912	Bit.-top	2,400	6″	1:2:4	$0.88	—	John Laylin
Norwalk	1912	One-course	1,700	6″	1:2:4	$1.18	—	John Laylin

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Ohio (*Continued*)—								
Knox Co.								
Milford Twp.	1913	One-course	2,600	6½″	1:1½:3½	—	—	J. R. Marker
Lake Co.								
Madison Twp......	1912	Bit.-top	10,000	6″	1:1½:3½	$1.00	—	J. R. Marker
Near Painesville	1913	One-course	33,200	6″	1:1½:3½	$1.33	—	J. R. Marker
Weeds Corners......	1913	Bit.-top	15,600	4″ + 2″	1:2½:5 1:1½:3	$1.45	—	H. P. Cummings
Licking Co.								
Granville ...	1912–3	Bit.-top	37,000	5″ at sides 7″ at center	1:1½:3½	$1.03	—	J. R. Marker
Logan Co.								
Bellefontaine	1892–3	Two-course	4,400	4″ + 2″	1:4 1:2	$2.15	—	C. A. Inskeep
Lorain Co.								
Near Elyria.	1913	Bit.-top	8,400	5″	1:2:4½	$0.95	Slag	T. L. Gibson
Grafton	1912	Bit.-top	4,800	6½″	1:2:4	$0.81	—	—
Lucas Co.								
Adams Twp.	1912–3	Bit.-top	19,200	6″	1:1½:3½	$1.20	Slag	J. R. Marker
Near Toledo	1913	One-course	19,300	6½″	1:1½:3½	$1.65	—	J. R. Marker
Toledo	1912	One-course	20,000	6″	1:2:4	$1.41 to $1.79	—	Geo. W. Tonson
Toledo	1913	One-course	26,500	6″	1:2:4	$1.02 to $2.56	—	Geo. W. Tonson
Madison Co.								
Near Darby.	1913	One-course	8,200	6″	1:1½:3½	$1.17	—	J. R. Marker
Mahoning Co.								
Near Akron.	1912	One-course	8,700	6″ at sides 7″ at center	1:1½:3	$1.26	Slag	G. M. Montgomery
Near Akron	1913	One-course	2,500	6″ at sides 7″ at center	1:1½:3	$1.26	Slag	G. M. Montgomery
McGuffey Road	1913	Bit.-top	8,200	6″	1:1½:3	$1.40	—	G. M. Montgomery
Near Youngstown	1912	Bit.-top	12,200	6″	1:1½:3½	$1.23	—	J. R. Marker
Marion Co.								
Marion.....	1913	One-course	3,500	6″	1:1½:3½	—	—	—

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Ohio (*Continued*)—								
Meigs Co.								
Rutland	1913	Bit.-top	3,300	6″ at sides 7″ at center	1:1½:3½	$0.95	—	J. R. Marker
Mercer Co.								
Jefferson Twp	1912	One-course	13,100	6″ at sides 7″ at center	1:1½:3½	$0.94	—	J. R. Marker
Miami Co.								
Near Piqua .	1912	Bit.-top	38,900	6″ at sides 7″ at center	1:1½:3½	$0.90	—	J. R. Marker
Near Piqua .	1912	Bit.-top	17,400	6″ at sides 7″ at center	1:1½:3½	$1.03	—	J. R. Marker
Near Tippecanoe	1913	Bit-top	13,000	6″ at sides 7½″ at center	1:2:3	$1.15	—	L. P. Knoop
Troy	1913	One-course	2,200	6″	1:2:3	$1.25	—	A. W. Scott
Montgomery Co.								
Dayton	1906	Two-course	3,000	4″ + 2″	1:6 1:2	$1.15	—	—
Dayton	1907	Two-course	8,000	4″ + 2″	1:6 1:2	$1.00 to $1.35	—	—
Dayton	1908	Two-course	13,000	4″ + 2″	1:6 1:2	$1.08 to $1.30	—	—
Dayton	1909	Two-course	2,300	4″ + 2″	1:6 1:2	$1.08 to $1.30	—	—
Dayton	1910	Two-course	9,000	4″ + 2″	1:4 1:2	$1.04 to $1.35	—	—
Dayton	1911	Two-course	3,000	4″ + 2″	1:4 1:2	$1.24 to $1.27	—	—
Dayton	1912	Two-course	6,000	4″ + 2″	1:4 1:2	$1.17 to $1.35	—	—
Dayton	1913	One-course	1,200	6″	1:1½:3	—	—	Public Service Dept.
Dayton	1913	Two-course	5,500	4″ + 2″	1:4 1:2	$1.26 to $2.38	—	Public Service Dept.
Muskingum Co.								
Near Dresden......	1912	Bit.-top	10,000	6″	1:2:4	$0.77	—	Ray Tanner
Near Ellis Corners ..	1913	One-course	19,600	6″	1:1½:3½	$0.92	Slag	J. R. Marker

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Ohio (*Continued*)—								
Noble Co.								
Near Athens	1913	One-course	15,000	6″	1:2:4	$1.86	Includes grading	J. R. Marker
Pickaway Co.								
Near Circleville	1913	Bit.-top	8,200	7″	1:1½:3½	$1.12	—	J. R. Marker
Near Circleville	1913	Bit.-top	10,000	7″	1:1½:3	$1.25	—	J. R. Marker
Near Circleville	1913	One-course	1,200	6″	1:2:3	—	—	J. R. Marker
Wayne Twp.	1912	Bit.-top	11,400	7″	1:1½:3½	$0.93	—	J. R. Marker
Pike Co.								
Near Waverly......	1911 } 1912 }	Bit.-top	3,500	6″	1:2:4	$0.95	—	J. R. Marker
Waverly ...	1910	One-course	1,700	6″	—	—	—	J. R. Marker
Putnam Co.								
Near Lima..	1913	One-course	4,500	6″ at sides 7″ at center	1:1½:3	$1.06	—	J. R. Marker
Sugar Creek Twp......	1912	Bit.-top	1,500	6″ at sides 7″ at center	1:1½:3½	$0.90	—	J. R. Marker
Vaughnsville.	1913	One-course	7,000	6½″	1:2:3	$1.10	—	A. E. Miller
Richland Co.								
Belleville ...	1911	One-course	1,500	6″	—	$1.01	—	—
Near Mansfield	1911	Bit.-top	1,000	6″	1:3:5	$1.25	Includes grading	Chas. Bushey
Plymouth ..	1913	One-course	6,700	6″	1:1½:3	$2.39	Includes grading	John Laylin
Ross Co.								
North Chillicothe	1913	One-course	9,400	6½″	1:2:3	$1.03	—	—
Scioto Twp.	1912	Bit.-top	22,000	5″ at sides 7″ at center	1:1½:3½	$0.95	—	J. R. Marker
Sandusky Co.								
Clyde......	1913	Bit.-top	9,600	6″	1:2:4	$1.08	—	Wm. Schepflin
Rice Twp...	1912 } 1913 }	Bit.-top	3,100	6″	1:1½:3½	$1.05	—	J. R. Marker
Seneca Co.								
Green Springs...	1912	Bit.-top	5,300	6″	1:2:4	$0.94	—	H. P. Puffenberger

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Ohio (*Continued*)—								
Tiffin	1912	Bit.-top	15,700	6″	1:2:4	$1.00	—	H. P. Puffenberger
Shelby Co. Sidney	1913	One-course	9,800	6″	1:6	$0.93 to $1.56⅓	—	Smith & Boulay
Stark Co. Canton.....	1913	One-course	4,800	6″ at sides 8″ at center	1:1½:3	$1.30	—	J. A. Starrett
Summit Co. Near Copley	1913	Bit.-top	19,500	6″	1:1½:3½	$0.76	Slag	J. R. Marker
Trumbull Co. Near Hartford......	1912	Bit.-top	19,000	6″	1:1½:3½	$0.82	Slag	J. R. Marker
Tuscarawas Co. New Philadelphia...	1912	One-course	1,200	7″	1:1½:3	$1.05	—	J. R. Marker
Vinton Co. Near McArthur ...	1913	One-course	2,700	6″	1:1½:3	$1.10	—	J. R. Marker
Washington Co. Near New Matamoras.	1912	Bit.-top	9,400	6″ at sides 7″ at center	1:1½:3½	$1.20	—	J. R. Marker
Oklahoma—								
Haileyville..	1912	One-course	1,700	4″	1:2:4	$1.00	—	—
Muskogee ..	1912	One-course	3,700	6″	1:2:4	$1.05	—	Chas. Schultz
Okmulgee ..	1912	Two-course	8,000	4″ + 2″	1:3:6 1:2	$1.60	—	Jas. G. Lyons
Oregon—								
Astoria.....	1911	One-course	4,000	6″	1:3:5	$1.60	Reinf.	L. C. Rogers
Coquille...	1913	—	4,000	—	—	—	—	—
Hood River	1912 1913	Hassam	19,000	5″	—	$1.35	—	P. M. Morse
Portland ...	1908	Hassam	8,000	6″	—	—	—	J. W. Morris
Portland ...	1909	Hassam	63,000	6″	—	—	—	J. W. Morris
Portland ...	1910	Hassam	217,000	6″	—	—	—	J. W. Morris
Portland ...	1911	Hassam	500,000	6″	—	—	—	J. W. Morris
Portland ...	1912	Two-course	120,700	3½″ + 2½″	1:3:5 1:2:4	$1.25	—	T. M. Hurlburt
Portland ...	1913	Two-course	185,450	3½″ + 2½″	1:3:5 1:2:4	$1.25	—	J. R. Hanson

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Oregon (*Continued*)—								
Salem	1912	One-course	60,000	6″	1:2:4	$0.97 to $1.35	—	W. Skelton
St. Johns	1912	One-course	7,400	6″	1:3:4	$0.98	—	J. R. Hanson
Pennsylvania								
Allentown	1908	Two-course	1,000	5″ + 1″	1:7 1:2	$1.40	—	W. Erdell
Ardmore	1913	One-course	2,750	5″ at sides 7″ at center	1:2:4	$1.30	—	J. S. G. Dunne
Athens	1904	Two-course	100	6″ + 2″	1:3:5 1:2	$1.12	—	Mathew J. Walker
Bellwood	1912	One-course	900	4″	—	$1.36	—	—
Near Bethayres	1913	Bit.-top	25,500	6″	1:2:4	$1.10	—	S. D. Foster
Bradford	1912	One-course	300	7″	1:3:5	$1.25	Includes grading	—
Chalkhill FayetteCo.	1912	One-course	2,080	6″	1:2½:5	$1.75	Country road	S. D. Foster
Carnegie	1912	Bit.-top	2,000	6″	1:2½:5	$1.18	—	O. B. Higley
Clarion	1913	Bit.-top	850	5″ + 1″	1:2:4 1:2	$1.62	—	J. Keck
Clairton	1913	Bit.-top	12,000	6″	1:2:4	$1.65	—	C. O. Supplee
Coraopolis	1911	Hassam	9,000	6″	—	—	—	S. D. Foster
Cynwyd	1913	One-course	3,750	5″ at sides 7″ at center	1:2:4	$1.30	—	J. S. G. Dunne
Donora	1913	Bit.-top	4,260	6″	1:2:4	$1.65	—	E. J. Iiams
Easton	1912	Bit.-top	3,400	6″	1:3:5	$1.70	—	C. V. Stevens
Easton	1912	Bit.-top	6,500	6″	1:2:4	$1.61½	—	C. A. Reeves
East Pittsburgh	1913	One-course	1,850	7″	1:1½:3	$1.70	—	Harrop-Hopkins & Taylor
Erie	1912	Two-course	1,600	4½″ + 1½″	1:2:5 1:1½	$1.39	—	—
Franklin Co.	1909	One-course	1,300	6″	1:3:5	—	—	J. W. Hunter
Gap	1911 1912	One-course	2,800	4″	1:3:5	—	—	S. D. Foster
Gettysburg	1913	One-course	7,500	4″	1:6	$1.08	—	J. B. Hamilton
Glen Rock	1911	One-course	2,000	6″	1:3:5	$0.93	—	J. W. Hunter

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Pennsylvania (*Continued*)								
Hanover....	1912	Bit.-top	550	6″	1:3:6	$1.10	—	A. Kohr
Harrisburg..	1910	—	1 800	—	—	—	—	J. W. Hunter
Haverford ..	1913	One-course	2,900	5″ at sides 7″ at center	1:2:3	$1.05	Without cost of cement	J. S. G. Dunne
Kennett Square ...	1913	Two-course	1,500	4″ + 2″	1:2:3 1:2	$0.83	—	Joseph Pyle, Jr.
Knoxville...	1913	Bit.-top	1,200	6″	1:2:4	$1.28	—	W. M. Donnelly
McKees Rocks....	1913	Bit.-top	820	—	—	—	—	—
McSherrystown.....	1909	One-course	2,750	5″	1:3:5	$0.83	—	J. W. Hunter
Mt. Pleasant	1913	Bit.-top	6,500	—	—	—	—	—
Merion.....	1913	One-course	1,850	6″ at sides 8″ at center	1:2:3	$2.00	Reinf.	E. J. Heddon
Natrona....	1913	Bit.-top	5,900	6″	1:1½:4	$1.38	—	Mr. Malloy
Nazareth ...	1908	Two-course	2,900	5″ + 1″	1:3:6 1:2	$0.82	—	P. Kressly
Nazareth ...	1913	One-course	2,700	5″ at sides 7½″ at center	1:2:3	$1.51	Includes grading	S. D. Foster
New Castle .	1906	Two-course	650	6″ + 1″	1:2:4 1:2	$1.15	—	—
Newport ...	1913	Bit.-top	2,800	6″	1:2½:5	$1.10	—	S. D. Foster
Oil City	1912	Two-course	150	5″ + 1″	1:2:4 1:1⅔	$1.53	—	G. F. Roess
Oil City	1913	Two-course	150	6″ + 1″	1:6 1:1½	$1.49	—	Mr. Weber
Overbrook ..	1913	Bit.-top	3,520	—	1:2:4	—	—	R. H. Johnson Co.
Perkasie....	1910	—	2,400	—	—	—	—	—
Philadelphia	1911	Hassam	4,000	5½″	—	—	—	Geo. F. Webster
Punxsutawney...	1912	Two-course	200	4½″ + 1½″	1:6 1:1½	$1.57	—	R. S. Van Renssalaer
Rochester ..	1913	Bit.-top	3,000	—	—	—	—	—
Selins Grove	1911	One-course	3,800	6″	1:3:5	—	—	J. W. Hunter
S. Bethlehem	1906	One-course	530	4″	1:2½:5	$0.90	—	R. E. Neumeyer
S. Bethlehem	1909	One-course	1,000	4″	1:2½:5	$0.90	—	R. E. Neumeyer

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Pennsylvania (*Continued*)—								
S. Bethlehem	1912	One-course	3,500	5″	1:3:5	$1.10	—	R. E. Neumeyer
Tunkhannock	1913	One-course	10,400	5″ at sides 7″ at center	1:1½:3	$1.42	—	Ed. Stone
Brownsfield Wks. So. Union Twp.	1913	One-course	940	7″	1:3:5	—	—	Twp. Comms.
Warren.....	1913	Bit.-top	830	6″	1:2:4	$1.51	—	—
Warrior Run	1913	Bit.-top	5,160	—	—	—	—	—
Warwick Twp......	1913	One-course	2,000	6″	1:2½:5	—	—	S. D. Foster
West Earl Twp......	1912	Bit.-top	733	6″	1:2½:5	—	—	S. D. Foster
Westmont Boro.....	1907 } 1908 }	Two-course	25,800	4″ + 2″	1:10 1:2:4	—	—	Mr. Corning
Wilkinsburg	1913	One-course	400	7″	1:1¾:3½	$1.60	—	Frease & Sperling
South Dakota								
Mitchell....	1912	Two-course	26,800	5½″ + 1½″	1:3:5 1:¾:¾	$1.51	Reinf.	S. H. Smith
Pierre......	—	Two-course	7,000	5″ + 1″	—	—	—	T. H. Lea
Sioux Falls..	1912	One-course	5,200	5″	1:1½:3	$1.03 to $1.36	—	S. B. Howe
Sioux Falls..	1912	Two-course	700	5″ + 1½″	1:3:6 1:1:1	$1.08	—	S. B. Howe
Sioux Falls..	1913	One-course	700	7″	1:1½:3	$1.48½	—	S. B. Howe
Watertown .	1913	One-course	12,300	8″	1:4¾	$1.52	Reinf.	F.W. Schreiber
Tennessee—								
Chattanooga	1910 } 1911 }	Two-course	3,300	5″ + 2″	1:3:6 1:1½	$1.08	—	R. A. Hooker
Chattanooga	1912	One-course	20,000	6″	1:2:4	$1.23	—	E. E. Betts
Knoxville...	1908	Two-course	12,800	5¼″ + 1¾″	1:3:4 1:1½	$1.88	—	S. D. Newton
Knoxville...	1909	Two-course	29,600	5¼″ + 1¾″	1:3:4 1:1½	$1.88	—	S. D. Newton
Knoxville...	1911 } 1912 }	—	2,400	5¼″+1¾″	1:3:4 1:1½	$1.88	—	J. E. Thompsen
Memphis ...	1909	One-course	4,300	6″	1:2¼:4½	$1.20	—	J. H. Weatherford
Memphis ...	1910	One-course	17,700	6″	1:2¼:4½	$1.17	—	J. H. Weatherford

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Tennessee (*Continued*)—								
Memphis . . .	1911	One-course	30,460	6″	1:2¼:4½	\$1.12 to \$1.20	—	J. H. Weatherford
Memphis . . .	1912	One-course	13,500	6″	1:2¼:4½	\$1.00 to \$1.12	—	J. H. Weatherford
Memphis . . .	1912	Bit.-top	13,100	5″	1:2¼:4½	\$1.33	—	J. H. Weatherford
Memphis . . .	1913	Bit.-top	21,000	6″	1:2¼:4½	\$1.33	—	J. H. Weatherford
Texas—								
Dallas.	1910	One-course	3,000	5″	1:2:5½	\$1.25	1″ of rock vibrated into surface	J. M. Preston
Dennison. . .	1913	—	16,000	—	—	—	—	—
Ft. Worth . .	1912	Two-course	22,630	5½″ + 1½″	1:9 1:1½	\$2.06	—	F. J. Von Zuben
Ft. Worth . .	1912	One-course	9,400	6″	1:5	\$1.85	1″ of rock vibrated into surface	F. J. Von Zuben
Ft. Worth . .	1913	—	1,600	—	—	—	—	—
Galveston . .	1913	Two-course	46,040	4″ + 2″	1:3:5 1:1½:2	\$1.46	Colored red	A. T. Dickey
Greenville . .	1912	Bit.-top	10,000	6″	1:2:5½	\$1.85	—	R. C. Stubbs
Hillsboro . . .	1911 1912	Hassam	35,400	5″	—	\$1.85	—	E. L. Dalton
Houston. . . .	1912 1913	Hassam	1,000	6″	—	\$1.90	—	—
Marshall . . .	1912 1913	Bit.-top	12,000	6″	1:2:4	—	—	—
San Antonio	1913	Two-course	8,100	4″ + 2″	1:3:6 1:2:4	\$1.33	—	A. C. Pancoast
Waco	1912	Bit.-top	3,500	4″	1:2:4	\$1.40	—	—
Waco	1913	Bit.-top	3,000	4″	1:2:4	\$1.40	—	—
Waxahachie	1913	Hassam	6,000	6″	—	—	—	—
Wichita Falls	1911	Two-course	1,000	4″ + 2″	1:2:4 1:2	\$1.35	—	L. C. Hinckley
Utah—								
Ogden.	1912	Two-course	2,000	6″ + 2″	1:2:5 1:2	\$1.84	—	H. S. Craven
Salt Lake City	1913	Two-course	4,000	5″ + 2″	1:3:5 1:1:1	\$1.10	—	S. Q. Cannon
Virginia—								
Farmville. . .	1913	One-course	7,300	6″	1:2:4	\$1.25	—	P. St. J. Wilson

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Virginia (*Continued*)—								
Norfolk	1911	One-course	3,500	6″	1:2:4	$0.87	—	U. S. Govt.
Phoebus	1906	Hassam	25,600	6″	—	$1.50	—	G. Chambers
Portsmith ..	1912	Bit.-top	10,000	6″	1:2:4	—	—	—
Washington—								
Aberdeen ...	1912	Two-course	2,000	2″ + 4″	1:3:6 3:2:4	$1.49	—	C. W. Ewart
Aberdeen ...	1913	Two-course	12,800	5″ + 2″	1:2¼:4½ 1:2	$1.15	—	L. D. Kelsey
Aberdeen ...	1913	Two-course	9,000	6″ + 2″	1:2¼:7½ 1:2	$1.26	—	L. D. Kelsey
Bellingham .	1913	One-course	10,800	6″	1:2:4	$1.30	—	W. H. North
Bellingham .	1913	One-course	780	7″	1:2:4	$1.45	—	W. H. North
Burlington ..	1913	Bit.-top	15,260	6″	1:2:4	—	—	—
Centralia ...	1912	Bit.-top	14,000	5″	1:3:5	$1.15	—	Stanley Macomber
Centralia ...	1913	One-course	17,500	6″	1:3:4	$0.99	—	Stanley Macomber
Centralia ...	1913	One-course	10,000	5″	1:3:4	$0.81	—	Stanley Macomber
Ellensburg ..	1913	Bit.-top	1,000	6″	1:3:5	$1.25	—	F. M. Carter
Franklin Co.	1912	Bit.-top	8,050	5″	1:2:4	$1.08	—	County Commissioners
Kent	1912	Bit.-top	10,850	6″	1:2½:4	$1.28	—	B. Bouldron
Lewis Co. ...	1912	Two-course	30,500	1½″ + 4½″	1:2½:5 1:1:1	$1.22	—	J. S. Ward
Lewis Co. ...	1913	Two-course	14,080	1½″ + 4½″	1:3:6 1:1:2	$1.14	—	J. S. Ward
Lincoln	1912	Two-course	4,700	1½″ + 4″	1:3½:7 1:1½:3	$0.90	—	County Commissioners
Monroe	1913	Bit.-top	13,500	6″	1:2:4	$1.22	—	—
Montesano ..	1911	Two-course	7,400	4″ + 2″	1:3:6 1:2	$1.32	—	Geo. W. Gauntlet
Montesano ..	1912	Two course	3,800	4″ + 2″	1:3:6 1:1:1	$1.00	—	—
North Yakima	1911	One-course	2,100	6″	1:2:4	$1.35	—	—
Pierce Co. ..	1912	Two-course	30,000	4½″ + 1½″	1:3:6 1:1½	$1.40	—	M. R. Thompson
Pierce Co. ..	1913	Two-course	75,100	4½″ + 1½″	1:3:6 1:1½	$1.40	—	M. R. Thompson
Pierce Co. ..	1913	One-course	122,000	5″	1:2:4	$0.83	—	M. R. Thompson

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Washington (*Continued*)—								
Seattle	1913	Two-course	750	$4\frac{1}{2}'' + 1\frac{1}{2}''$	1:3:5 1:2	$1.26	—	A. H. Dimock
Spokane	1911 } 1913 }	Two-course	126,000	$5'' + 1\frac{3}{4}''$	1:3:5 $1:1\frac{3}{4}$	$2.40	—	M. Macartney
Spokane	1911	Hassam	23,800	6″	—	$2.39 to $2.70	—	M. Macartney
Spokane	1913	Two-course	550	$4\frac{1}{2}'' + 1\frac{1}{2}''$	$1:2\frac{1}{2}:5$ 1:1:1	$2.00	—	M. Macartney
Spokane	1913	Hassam	34,000	—	—	$1.90	—	M. Macartney
South Bend .	1913	One-course	14,400	6″	1:2:4	$1.25	—	G. G. Hall
Tacoma	1912	Two-course	5,300	$4\frac{1}{2}''+1\frac{1}{2}''$	1:3:6 $1:1\frac{1}{2}$	$1.20	—	G. D. Ball and M. R. Thompson
Tacoma	1913	Two-course	82,700	$4\frac{1}{2}'' + 1\frac{1}{2}''$	1:3:6 $1:1\frac{1}{2}$	$1.20	—	G. D. Ball and M. R. Thompson
Uniontown . .	1913	Bit.-top	13,300	6″	1:3:6	$1.22	—	—
Vancouver . .	1911	One-course	15,500	5″	—	$1.15	—	B. L. Dorman
Vancouver . .	1913	Bit.-top	900	6″	1:3:5	$1.25	—	B. L. Dorman
Near Vancouver . . .	1913	Two-course	4,700	$1\frac{1}{2}''$ top + $3\frac{1}{2}''$ at sides $5\frac{1}{2}''$ at center	1:3:6 1:1:2	$1.42	—	W. A. Schwarz
Sedro Woolley	1913	Bit.-top	6,000	—	—	—	—	—
Walla Walla	1912	Two-course	7,500	$5'' + 1''$	1:3:5 1:2	$1.24	—	W. R. Rehorn
Walla Walla	1913	Bit.-top	27,600	5″	1:3:5	$1.30	—	W. R. Rehorn
Whatcom Co.	1913	One-course	32,000	6″	$1:2:3\frac{1}{2}$	$1.33 to $1.50	—	C. M. Adams
West Virginia—								
Charleston . .	1912	One-course	3,300	7″	1:2:4	$1.29	—	G. S. Brown
Charleston . .	1913	Two-course	900	$5'' + 2''$	1:2:4 1:2	$1.40	—	G. S. Brown
Charleston . .	1913	Two-course	500	$5'' + 2''$	1:2:4 $1:1\frac{1}{2}$	—	—	G. S. Brown
Charleston . .	1913	Bit.-top	7,700	7″	1:2:4	$1.20	—	G. S. Brown
Huntington	1910	Two-course	900	6″	1:2:4 1:2	$1.30	—	—

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Wisconsin—								
Appleton . . .	1909	Two-course	12,300	$5'' + 1\frac{3}{4}''$	1:3:6 1:1½	$1.32	Includes grading	C. H. Vinal
Appleton . . .	1909	One-course	5,300	7″	1:2:4	$1.02	Includes grading	C. H. Vinal
Appleton . . .	1911	Two-course	2,000	$5'' + 1\frac{3}{4}''$	1:3:6 1:1¾	$1.22	Includes grading	C. H. Vinal
Appleton . . .	1912	Bit.-top	5,000	$5'' + 1\frac{3}{4}''$	1:3:6 1:1½	$1.30	Includes grading	C. H. Vinal
Appleton . . .	1912	Bit.-top	2,300	7″	1:2:4	$1.15	Includes grading	C. H. Vinal
Appleton . . .	1913	One-course	32,000	—	—	—	—	—
Ashland	1911	Two-course	3,400	—	—	—	—	Jerod Day
Burlington . .	1911	Two-course	12,200	$5'' + 1\frac{1}{2}''$	1:2:4 1:2	$1.06	—	P. J. Hurtgen
Chippewa Falls	1912	Two-course	700	$6'' + 1\frac{1}{2}''$	1:6 1:1½	$1.28	—	L. G. Arnold
De Pere	1910	Two-course	21,000	$6'' + 1\frac{3}{4}''$	1:3:5 1:1½	$1.31	Includes grading	Geo. P. Hawley
De Pere	1911	Two-course	5,000	$6'' + 1\frac{3}{4}''$	1:3:5 1:1½	$1.39	Includes grading	Geo. P. Hawley
East Milwaukee . . .	1913	Two-course	2,000	2″ top 4″ at sides 6″ at center	1:2½:4 1:2	$1.59	—	F. W. Ullius
Fond du Lac	1908	Two-course	18,000	$5'' + 1\frac{1}{2}''$	1:2½:5 1:1:1	$1.31	—	J. S. McCullough
Fond du Lac	1909	Two-course	69,200	$5'' + 1\frac{1}{2}''$	1:2½:5 1:1:1	$1.25	—	J. S. McCullough
Fond du Lac	1910	Two-course	23,700	$5'' + 1\frac{1}{2}''$	1:2½:5 1:1:1	$1.09 to $1.27	Reinf.	J. S. McCullough
Fond du Lac	1910	Two-course	20,600	$5'' + 1\frac{1}{2}''$	1:2½:5 1:1:1	$1.09	—	J. S. McCullough
Fond du Lac	1911	Two-course	11,000	$5'' + 1\frac{1}{2}''$	1:1½:5 1:1:1	$1.25	Reinf.	J. S. McCullough
Fond du Lac	1912	Two-course	2,800	$5'' + 1''$	1:2½:5 1:1:1	$1.36	Reinf.	J. S. McCullough
Fond du Lac	1913	Two-course	3,870	$5'' + 1\frac{1}{4}''$	1:2½:5 1:1:1	$1.36	Reinf.	J. S. McCullough
Near Fond du Lac . . .	1913	One course	22,000	6″	1:2:4	—	—	—
Green Bay . .	1910	Two-course	6,200	$6'' + 1\frac{3}{4}''$	1:3:5 1:1½	$1.35	Includes grading	W. W. Reed
Green Bay . .	1911	Two-course	2,000	$6'' + 1\frac{3}{4}''$	1:3:5 1:1½	$1.30	Includes grading	W. W. Reed
Green Bay . .	1912	Two-course	26,000	$6'' + 1\frac{3}{4}''$	1:3:5 1:1½	$1.25	—	August Brown
Green Bay . .	1913	One-course	1,300	6″	1:2:3	$1.30	Reinf.	—

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Wisconsin (*Continued*)—								
Kenosha Co.	1913	One-course	6,300	5″ at sides 7″ at center	1:2:3½	$0.67	—	M. G. McGinn
Kenosha Co.	1913	One-course	15,700	6″ at sides 8″ at center	1:2:3½	$0.79 to $1.12	—	M. G. McGinn
Kenosha Co.	1913	One-course	5,280	5½″ at sides 7½″ at center	1:2:3½	$0.96	—	M. G. McGinn
Menasha . . .	1909	Two-course	12,000	4″ + 1½″	1:2:4 1:1½	$0.95	Reinf.	A. McMahon
Menasha . . .	1910	Two-course	18,900	6″ + 2″	1:2:4 1:1½	$1.22½	Reinf.	A. McMahon
Menasha . . .	1911	Two-course	2,100	6″ + 2″	1:2:4 1:1½	$1.22½	—	A. McMahon
Menominee .	1912	One-course	7,300	6½″	1:4	$1.15	Includes grading	—
Milwaukee Co.	1912	One-course	44,600	6″	1:2:6	$1.05	—	H. J. Kuelling
Milwaukee Co.	1913	One-course	210,800	6″ at sides 8″ at center	1:2:3½	$1.50	—	H. J. Kuelling
Monroe	1913	One-course	860	6″	1:2:3½	$1.60	Reinf.	County Commissioners
Montello . . .	1909	Two-course	4,400	4½″ + 1½″	1:2:5 1:1:1	$0.97	—	—
Neenah	1909	Two-course	1,500	6″ + 1½″	1:3:5 1:1:1	$1.25	—	John Le Tourneux
Neenah	1910	Two-course	4,000	6″ + 1½″	1:3:5 1:1:1	$1.09	—	John Le Tourneux
Oshkosh	1909	Two-course	5,000	5¼″ + 1¾″	1:3:4 1:1½	$1.57	—	Geo. H. Randall
Oshkosh	1912	Two-course	5,100	5¼″ + 1¾″	1:3:4 1:1½	$1.72	Includes grading	Geo. H. Randall
Oshkosh	1913	Bit.-top	30,000	7″	1:2:4	$1.48	Reinf. includes grading	Geo. H. Randall
Oshkosh	1913	Bit.-top	12,900	—	1:2:5	$1.37	Reinf. includes grading	Geo. H. Randall
Platteville . .	1911	Two-course	8,880	5″ + 1½″	1:3:5 1:1½	$1.39	Reinf.	W. G. Kirchoffer
Plymouth . .	1910	Two-course	11,000	5″ + 1½″	1:3:5 1:1½	$1.23½	Reinf.	W. G. Kirchoffer
Plymouth . .	1913	Two-course	4,500	5″ + 1½″	1:3:5 1:1½	$1.25	Reinf.	W. G. Kirchoffer
Port Washington	1913	Two-course	15,000	5″ + 1½″	1:2½:5 1:1½	—	Reinf.	—
Sheboygan . .	1911	Two-course	20,000	4¾″ at sides 6¾″ at center + 1¾″ top	1:3:5 1:1½	$1.20 to $1.33	Reinf.	C. U. Boley

TABULAR DIGEST OF SOME CONCRETE PAVEMENTS.—(CONTINUED)

LOCATION	YEAR BUILT	TYPE	SQUARE YARDS	THICKNESS	PROPORTIONS	COST PER SQUARE YARD	REMARKS	ENGINEER
Wisconsin (*Continued*)—								
Sheboygan . .	1912	Two-course	24,600	$4\frac{3}{4}''$ at sides $6\frac{3}{4}''$ at center + $1\frac{3}{4}''$ top	1:3:5 1:1½	$1.25	Reinf.	C. U. Boley
Sheboygan . .	1913	Two-course	19,900	$4\frac{3}{4}''$ at sides $6\frac{3}{4}''$ at center + $1\frac{3}{4}''$ top	1:3:5 1:1½	$1.25	Reinf.	C. U. Boley
So. Milwaukee	1912	One-course	12,000	6″	1:2:4	$1.35	--	H. J. Kuelling
Superior	1912	Two-course	14,400	6″ + 1½″	1:6 1:1:1	$1.29	Reinf. includes grading	E. B. Banks
Superior	1913	Two-course	50,000	6″ + 1½″	1:2½:4½ 1:1:1	$1.28	Reinf. includes grading	E. B. Banks
Watertown .	1913	One-course	27,000	6½″	1:1½:2½	$1.35	Reinf.	Arnold Kraeft
Wyoming—								
Sheridan . . .	1913	Bit.-top	21,850	6″	1:2½:5	—	—	—