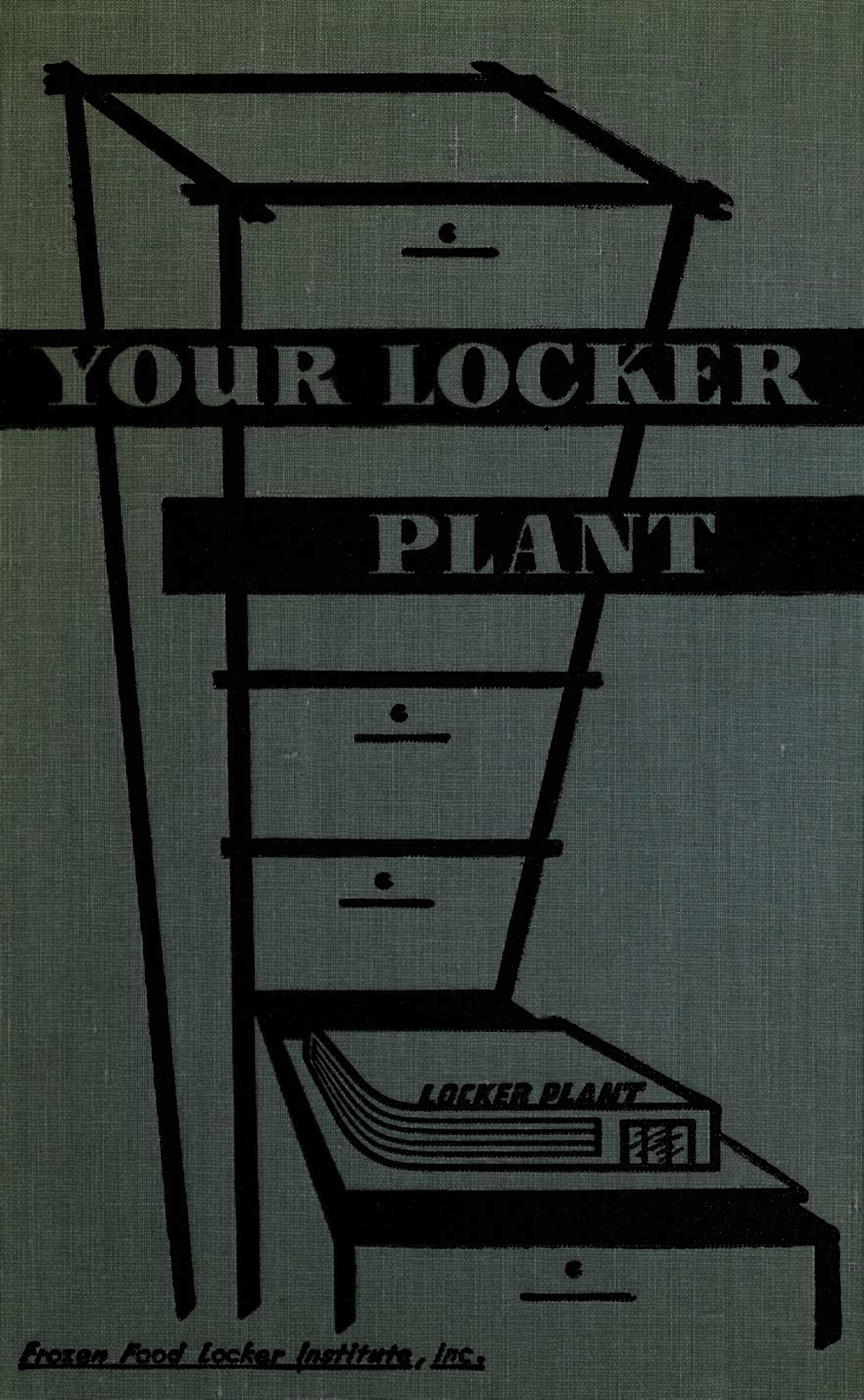
YOUR LOCKER PLANT



Frozen Food Locker Institute, Inc.

YOUR LOCKER PLANT

A Guidebook
FOR THE PROSPECTIVE
LOCKER OWNER

Published by
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FOREWORD

This book, "YOUR LOCKER PLANT," is the work of many men.

It was launched by the Frozen Food Locker Institute to fill a long-felt need for a set of standards—a compilation of technical knowledge to be used as a guide in the engineering and construction of new locker plants, and toward the more efficient operation of established locker plants.

A committee of experts was appointed to study all available data. More than a year was spent in this work alone. After the various groups submitted their recommendations, these were studied at great length by the full committee, and the final thinking was assembled into this one volume.

It was also found that a real need existed for a single source of authoritative information for the prospective locker manager, and accordingly this subject was also dealt with fully in this volume.

Credit for this book must go to the hundreds of locker managers, contractors, manufacturers, and suppliers who gave freely of their time to share their invaluable experience in the industry. To them—one and all—a heartfelt "Thanks!"

Special credit is also due the following who spent hundreds of laborious hours without a thought of credit or compensation:

R. A. BAXTER, R. A. Baxter & Son, Covington, Tennessee, who prepared most of the data on locker plant design and construction.

ROGER SPRAGUE, Baker Ice Machine Co., Inc., Omaha, Nebraska, who prepared the data on refrigeration.

MARVIN L. FERGESTAD, Insulation Engineers, Inc., Minneapolis, Minnesota, who prepared the data on insulation.

J. WILBERT WITTE, Biro Manufacturing Co., Marblehead, Ohio,

who prepared the sections of this book dealing with the meat processing rooms.

DELBERT R. CARD, Insured Locker Service, Minneapolis, Minn., who prepared the chapter on insurance.

JOHN L. HOPPE, Publisher of MEAT MERCHANDISING and LOCKER MANAGEMENT magazines, who prepared the balance of the book, and supervised its editing and production.

CLYDE DILLON, Koch Butchers' Supply Company, North Kansas City, Missouri, who contributed most of the material dealing with slaughtering and rendering.

A bow also to the magazines "Food Freezing," "Locker Management," "Locker Operator," "Meat Merchandising" and Quick Frozen Foods"—from whose pages much of the material appearing in this book originated.

—L. O. WARNER, President (1947)
Frozen Food Locker Institute, Inc.
Chairman, Standards Committee

YOUR LOCKER PLANT

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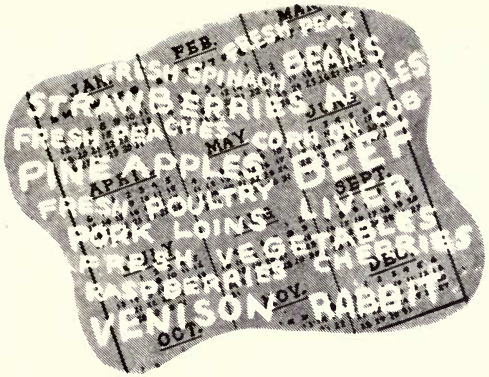


CHAPTER ONE

YOUR LOCKER PLANT

A BUSINESS OPPORTUNITY

FEW industries have expanded so rapidly as has the frozen food locker business. This is because lockers bring better living within the reach of a greater number of people at less cost.

Among the primary reasons why the locker plant industry has expanded so rapidly in recent years are:

(1) More widespread knowledge of freezing technique and the effects of freezing foods;

(2) The substantial savings which families can make in their food costs;

(3) The possibility of having a variety of delicious fresh-flavored foods the year around;

(4) Improvement in the number and quality of services rendered by locker plants to customers;

(5) The ease and convenience with which women can preserve foods for future use, and

(6) Maximum utilization of homegrown foodstuffs.

Thus through the modern miracle of the frozen food locker plant, farmers and city folks of all income groups can enjoy spring chicken in January, strawberries in February, peas and asparagus in March, and roasting ears of corn-on-cob in the middle of December. Thanks to the modern locker plant, fresh-like foods are available the entire year with all of their original nutrition, color, flavor and taste.

To the farmer, the locker plant has become an integral part of his life and living. It permits him to eat his own meats, poultry, vegetables, and fruits the year round. The well-equipped locker plant, with facilities for slaughtering, curing, and processing, offers him an efficient, money-saving way of enjoying the fruits of his labors. The average farmer locker-renter enjoys a better way of life through the nearby locker plant. He feeds his family a better, more nutritious diet—and in so doing, saves an average of $216.00 per year.

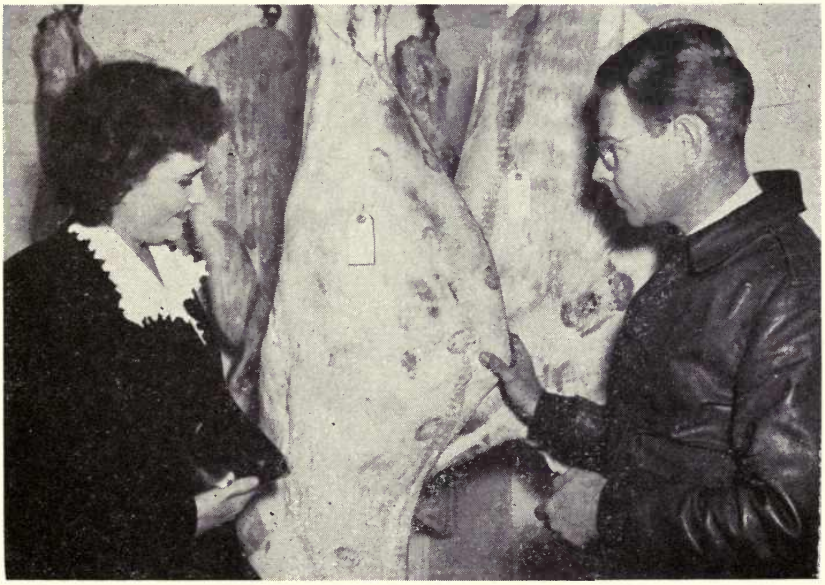
To the farmer's wife, the locker plant has been a godsend. It has taken many days of time-consuming drudgery out of her life—days that would otherwise be spent in canning fruits and vegetables by the hundreds of quarts and pints, and in canning and curing meats. It has offered her a way of bringing to her table fresh foods out of season—foods that are as tasty as the day they were picked from the tree or the vine—foods that are more nutritious. She sees in the locker plant not only something that saves her time and money, but something which offers her the opportunity of feeding her family a year-round balanced diet of foods with greater nutritional and vitamin content. The farmer's wife sees the locker plant as a means to a healthier, happier family.

The producer of the nation's foods has found the locker plant invaluable in stabilizing the market for his products. Before the advent of the many thousands of locker plants which now cover the nation, the grower of any perishable product had only one of two alternatives: (a) to sell at the prevailing price, or (b) let it rot in the fields and on the trees. Now he can freeze a major share of the fruits, vegetables, poultry, and other foods he produces, and hold them until the market is firm and stabilized.

Lockers Grow Through Service

Locker plants were not born and created by war conditions—4,600 plants were going business establishments prior to food

The American housewife finds in her locker plant another useful implement for bringing tastier and more healthful foods to members of her family.



Meat, the backbone of any meal, can be bought economically in advance for storage in the family locker. After being selected, cut, wrapped and frozen, a quarter or side offers nutrition and great variety for the table.

rationing. Demands for locker services mounted, however, in keeping with attention to food. Capacity business was the usual experience of owners, with new customers on the waiting list. Hundreds of plants added rooms and facilities to accommodate the ever-increasing requests from old customers as well as new. This trend was quite a natural one for a new industry, and prior to the war it had been on an ascending scale in all parts of the nation. A review of figures substantiates the claim that the growth of the locker industry has been gradual, though quite rapid:

Year	States Having Locker Plants	Number of Plants	Average No. of Lockers
1938	33	1,269	260
1939	38	1,861	275
1940	44	2,970	290
1941	45	3,723	320
1942	46	4,443	350
1943	47	4,859	370
1944	48	5,682	390
1945	48	6,464	453
1946	48	8,025	500
1947	48	9,900	585

According to recent surveys, 75 to 85 percent of families using lockers in the United States are farmers. Thus, one-fifth of all farmer families of the nation use lockers; 71 percent of all locker plants are located in towns with a population of less than 5,000. Only 6 percent of all plants are in cities of over 25,000; 90 to 95 percent of all locker patrons either live on farms or in small towns.

These data demonstrate that the industry is, at present, distinctly a service to rural families. These conditions existed prior to the war and prior to food rationing. Any tendency to move into larger cities is principally coincident with private initiative and enterprise in such development.

The United States Department of Agriculture, Colleges of Agriculture, and the Agricultural Extension Service groups, have recognized the contributions of locker plants to the rural food program. Patrons, likewise, have recognized this contribution over a period of years by their continued patronage of locker plants upon the basis of food savings. It is agreed by all

A Comparison of Costs of 100 Pounds of Beef at Retail and Processing at the Locker Plant

RETAIL		
Farm value (100 lbs. dressed)	$40.00	
Marketing, processing and distribution cost	25.00	
10-year average retail value 100 lbs. beef		$65.00
LOCKER METHOD		
Farm value of beef (100 lbs.)	40.00	
Slaughtering (based on $2.50 per head)	.80	
Cutting, chilling, wrapping, and freezing (@ 3c per lb.)	3.00	
Grinding (15 lbs. @ 1½c per lb.)	.23	
Locker rent (500 lbs. at $15.00 or 3c per lb.)	3.00	
Total cost per 100 lbs. beef (processed by locker method)		$47.03
Difference or saving		$17.97

students of the development that the frozen food locker plants of the nation have been of material aid to food conservation in a number of ways:

(1) Modern processing of food, freezing, and storage by refrigeration have eliminated much waste and spoilage, compared with slaughtering, processing and inadequate preservation methods in farm homes. It is estimated that 25 to 30 percent of the pork derived from the four million hogs slaughtered in the eight southeastern states, alone, is lost annually through lack of adequate facilities for preservation on the farm.

(2) Farmers have been enabled to spread consumption of meats, fruits and vegetables throughout the year, from season to season.

(3) As producers of their own meats, fruits and vegetables, farm people have become self-sufficient in providing these

products of their own labor and toil by use of locker plant services. This is almost as true of city residents who became ardent victory gardeners, and had the opportunity to use lockers.

While the greatest growth in the locker plant field has naturally been in rural areas, where locker plants served the greatest need, locker plants have also been found to fill a long-felt need in cities of all kinds—even in the hearts of the greatest metropolises of the nation. Here they serve the "gentleman farmer" who produces his own food on his weekend farm, and who can now enjoy the fruits of his efforts. The city locker plant, too, serves the sportsman who can now have his catch or kill quick-frozen, and enjoy his fish or game out of season for the limited periods provided by law in the various States.

Probably the greatest service which the city locker plant is destined to fill will be in serving the thousands of home freezers which are now becoming available. The city locker operator can perform a needed and profitable service by brokering meats, cutting, wrapping, labelling, and freezing. Since few, if any, of the home freezers are designed to freeze foods; since most home freezers are nothing more or less than boxes which will "hold" frozen foods, there will obviously be a great need for this kind of service. In the dozens of large cities in the United States where locker plants have been installed, these operators have found that this operation alone will more than justify the cost of a plant.

The city family, too, is savings and quality minded. The city locker renter has an advantage of being able to purchase a quality or grade of meat, especially beef, more suitable to the tastes or pocketbook of the family. In addition, he can make important savings in the cost of his meat. One authority estimates that the savings in beef run about 9c per pound and that the savings in pork run about 4½c per pound, and offers as proof of this the charts reproduced herewith. The authority also makes a point of the fact that locker renters like the convenience of the locker plant, which is usually open at odd hours, including Sundays, and is, therefore, more convenient than the butcher shop which operates the regular opening and closing hours.

All locker renters—whether rural or metropolitan—enjoy two basic advantages: First, more nutritious foods; second, a real

A Comparison of Costs of 100 Pounds of Pork at Retail and Processing at the Locker Plant

RETAIL		
Farm value (100 lbs. pork dressed)	$36.00	
Marketing, processing, distribution cost	16.20	
Total retail cost of 100 lbs. pork		$52.20
LOCKER METHOD		
Farm value of 100 lbs. pork	36.00	
Slaughtering cost per 100 lbs. ($1.50 per head)	.90	
Cutting, chilling, wrapping, and freezing (@ 3½c per lb.)	3.50	
Grinding lard and sausage (25 lbs. at 1½c)	.38	
Rendering (16 lbs. lard at 3c)	.48	
Curing and smoking hams and bacon (24 lbs. at 3c)	.72	
Locker rental (3c per lb. on fresh pork)	1.80	
Total cost 100 lbs. pork (locker method)		$43.78
Saving over retail cost		$ 8.42

economy. The modern locker is truly a safety deposit box for vitamins. In the words of a noted dietitian: "Frozen foods are valuable to homemakers furnishing meals, supplying all vitamins needed to maintain weight and supply energy."

As food savers, freezer locker plants are fully justified from the standpoint of economy alone. They prevent losses from home-butchering and home-curing, which are estimated as high as 25 percent in some states, and eliminate the feeding of stock from the time it is ready to be slaughtered until "the weather is right."

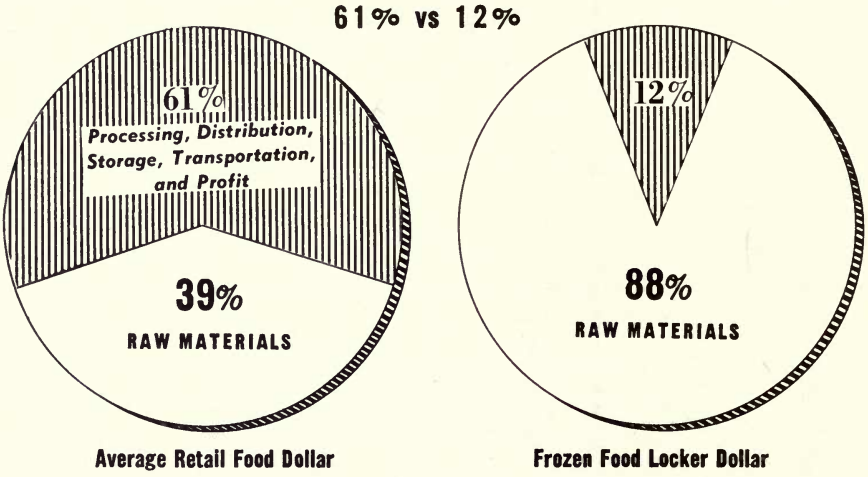
A man with a freezer-locker does not have an ordeal and orgy at "hog killing time". Instead, his hog is slaughtered at the right time, regardless of the weather. After proper aging, the meat is cut into table size portions by experts, properly wrapped and then stored in his private locker, to be eaten when he wants

it. Experts cure the hams and bacon, render the lard and grind the sausage. Nothing is wasted.

The same economies apply, of course, to beeves and lamb. Chickens are processed at their prime for consumption in the months to come.

Most fruits and vegetables are suitable for freezing and lose very little of their food value in the processing or locker storage. Locker processing involves far less work than canning and puts garden-fresh products on the table months later. Therefore, surplus fruits and vegetables need not be sold (usually in glutted markets).

Let's take a look at the consumer's food dollar, as shown in the following charts which appear in "Food is Power," a booklet published by the National Frozen Food Locker Association:



Of every dollar spent for food at retail prices, over half goes to cover transportation, profits for the producer, middle-man and seller, hidden taxes and processing.

The average farm family can enjoy the food they produce (and store in a locker) at the farm cost of production plus nominal locker charges.

No farm family raises all the foods it eats and many farmers specialize in crops of which little, if any, reaches his table. With a freezer locker plant which has good processing facilities, at a reasonably convenient distance, every farmer will be encouraged

to raise at least enough meat, poultry, and vegetables for his family's year-round needs.

What Is a Locker Plant?

Before going any further, let us define a locker plant and agree on what it is, what it does, and how it operates.

The modern locker plant of today with its sub-zero freezing compartment, sanitary steel lockers, and complete processing services, is a far cry from the early locker plants. These consisted of nothing more than a few wire or wooden shelves in cold storage plants. The locker plant industry has been quick to adopt new developments and scientific inventions and as a result the vast majority of locker plants today are modern, sanitary and efficient food processing and storing establishments.

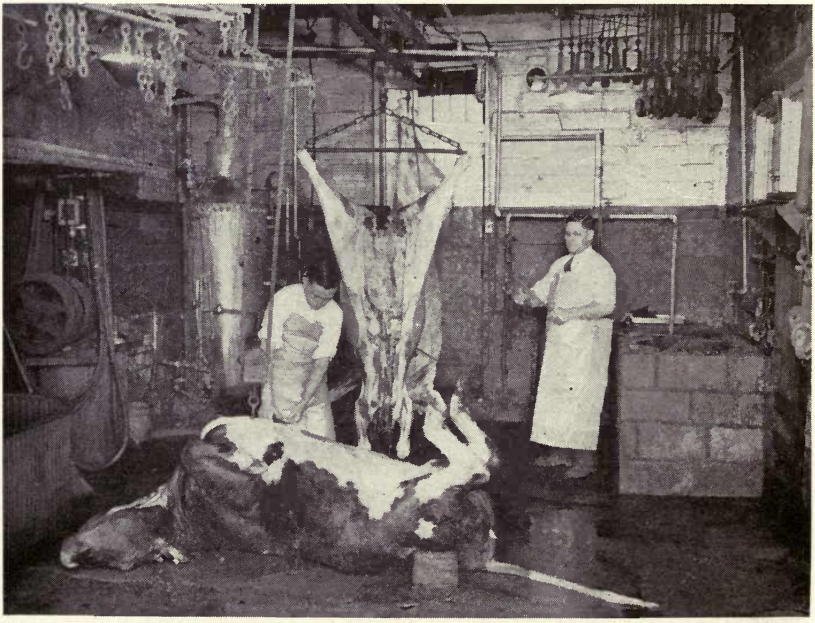
What is a locker plant? It is a place where freezer storage is provided for individual families, whether urban, suburban or farm dwellers, to store their own meat, poultry, fish, game, vegetables, fruits, eggs, butter and other foods for use against the day when prices are higher or such items cannot be obtained. These products are frozen and stored in compartments or units, arranged similar to safety deposit boxes in banks. Thus families can store the foods they grow or buy from friends or farmer relatives. City women can take advantage of bargain sales in stores or periods when there is an abundance of any item. Farmers can either butcher their own meats and have them stored or they can buy meats from the locker operator. City patrons can purchase wholesale cuts of meat from the locker plant operator for storage in their locker.

How does a locker plant operate? The customer rents a locker; then he either brings his meat to the plant in wholesale quantities for processing, or has the management do the slaughtering, either on the farm or at the plant. If the meat is purchased by the patron, the management, in some cases, acts as a buying and servicing agent, taking care of everything from purchasing to placing the processed product in the lockers. Using a rented locker for frozen food is as simple an operation as removing suitcases from a parcel locker in a railroad station. Each customer has a key to his locker and the plant manager has a master key to all lockers so that he may place the packages of food in the locker after they are frozen.

Not only have locker plants themselves increased at a phenomenal rate during the past two years but the facilities and services offered customers have been greatly expanded. Curing, smoking, rendering of lard, sausage making, slaughtering and blanching of vegetables are becoming such integral parts of locker plant operations, that every person thinking of constructing a locker plant should endeavor to offer these services, or at least make provisions in constructing the building so that these facilities can be added at a later date without too much difficulty or expense.

The Trend Towards Completeness

Locker plants started with cold storage businesses as renting drawers or compartments to individuals who wanted to store a surplus quantity of perishables. The idea "caught on" almost immediately, but soon locker renters began to ask: "Who will slaughter my beef, or hog, or calf, or lamb?" "Who will render the lard and cure my hams and bacon?" "Where can I get a



Completeness of service is becoming more and more the rule among locker plants. Such service starts with the slaughtering of the animal, and includes the handling of by-products as well as processing and storage for the locker user. Produce preparation is also growing as a function of the locker plant.

blancher to do a wholesale job of blanching my vegetables?" "What will I do with the by-products of these slaughtering and processing operations?"

Locker operators were quick to provide the answer. Killing pens and equipment were installed; curing coolers and smoke rooms were added to thousands of locker plants; blanching rooms—complete with all the needed equipment—soon made their appearance.

Today, the man who is thinking about installing a locker plant should give serious thought and consideration to making his plant truly complete, with all of the facilities for slaughtering, processing, curing, and smoking that he feels his community needs and will use.

Returns From a Locker Plant

Individual locker box rentals vary from $12 to about $25 per year, dependent upon the size of locker, location, type and design. In some sections of the nation, lockers are called "food cupboards," with capacity from 16 cubic feet up to 30 cubic feet. The customary steel constructed lockers range from 4½ cubic feet to 7 cubic feet.

Service charges for chilling, cutting, wrapping and freezing are customarily in the bracket from 3c to 5c per pound for meats. Fruits and vegetables are often packed by the patron, in cartons provided by the locker plant. Cartons are sold at a profit, and the charge for freezing is usually low. It is pointed out that variation in types and class of services offered effect rates in corresponding ratio.

Locker Rentals and Service Charges

The annual charge for locker rentals varies on the average from $12.00 to $25.00 per year. In some cities, locker rentals were as high as $25.00 per locker during the war years, but, on the average $20.00 was the tops for a standard size locker (width 24 inches, heighth 16 inches, length 30 inches, capacity 200 pounds. The lower drawers usually rent for more than the upper lockers of the "reach in" type. Some locker plants have recently installed both large and small lockers to take care of families of various sizes.

Rental charges for lockers on a monthly basis vary from $1.00 to $2.00, with $1.50 as the usual charge. Most operators keep

their monthly rental sufficiently high when compared to the annual rental to encourage the operator to rent on an annual basis, and many offer to apply monthly rentals on a yearly contract.

Extra lockers (for locker renters) are usually $1.00 to $1.50 per month. Where there is no charge or too low a charge, patrons leave packages in the extra lockers until they have room for them in their original lockers, and this cuts down the potential patron capacity of the locker rooms.

Slaughtering charges for locker customers vary greatly. Where there is no slaughter room, usually the locker butcher goes to the farm with his own or the plant truck, butchers the animal on the farm, and makes a flat charge of $2.00 to $3.00 for hogs up to 300 pounds (liveweight), and $3.00 to $4.00 for heavier ones; $2.50 to $3.00 for beef cattle up to 800 pounds, and from $3.50 to $5.00 for heavier weights; and $1.50 to $3.00 for

Most combination food stores and locker plants do processing for their retail meat departments and lockers with the same equipment in the same area. Systematic tagging and record keeping is necessary to keep each carcass and meat cut where it belongs. Separate coolers usually are provided.

veal and sheep. Many plants also make a mileage charge. Most plants without slaughtering facilities, will, however, let the farmer slaughter and deliver the carcass to the plant if he wishes.

Where the operator has a slaughter plant, live animals are usually picked up on a mileage charge basis, or the farmer has the option of delivering the live animals to the plant.

Charges for cutting, wrapping and freezing also vary, usually from 3c per pound to 5c per pound, with the present average around 4c. In many plants, the charge for this service is too low, owing to the lack of information and cost experience in locker plant operation by the originators of this industry. The sound plan is to keep charges high enough to justify a profit using the most competent help you can get, with due allowance for depreciating the cost of your equipment.

To guide the prospective operator, we submit herewith (Chart C), a table showing the usual rental and service charges.

Chart "C"

SERVICE	RANGE	AVERAGE
Rent (varies with size and convenience)—		
Annual	$12.00 to $20.00	$16.00
Monthly	1.00 to 2.00	1.50
(Per month) extra lockers	1.00 to 1.50	1.35
Slaughtering per head (varies with weight)—		
Hogs (to 300 lbs.)	2.00 to 3.00	2.50
Beef (to 800 lbs.)	2.50 to 4.00	3.25
Veal	1.50 to 3.00	2.25
Sheep	1.50 to 3.00	2.25
Mileage	.05 to .10	.075
Chill, cut, wrap, freeze (per lb.)	.03 to .08	.04
Brokerage	.02 to .04	.03
Grinding (per 100 lbs.)	1.25 to 2.00	1.50
Curing (per 100 lbs.)	3.00 to 5.00	4.00
Smoking (per 100 lbs.)	2.00 to 3.00	2.50
Sausage Making (per lb.)	.02 to .05	.035
Rendering lard (per lb.)	.03 to .05	.04
Dressing, drawing, and wrapping chicks (per head)	.15 to .25	.20

Service	Range	Average
Dressing, drawing, and wrapping ducks (per head)	.25 to .50	.35
Dressing, drawing, and wrapping geese (per head)	.25 to .50	.40
Dressing, drawing, and wrapping turkeys (per head)	.25 to .50	.40
Freezing fruits and vegetables (per lb.)	.02 to .07	.04

Should I Build a Locker Plant?

There are two factors to be considered in the building of a locker plant. The first is this: "Will the locker plant that I propose to build fill a definite community need?" There is no hard-and-fast rule that can be used to find the answer to this question. Obviously, the prospective locker operator must survey his community. In the case of a rural community, the logical way to start is to map out the county in which he proposes to build a locker plant, and adjacent counties as well. Spot the roads and make a dot for each rural household. It has been proven time and time again, that all other things being equal, the farmer will gravitate to the closest locker plant offering him satisfactory service. You can thus easily determine the natural trading radius of your locker plant, and estimate its chance for survival and success.

In thinking about establishing a locker plant to compete with a nearby plant, it is well to consider the other fellow's facilities and service. If he is a sloppy or indifferent operator, if he fails to provide such needed services as curing hams and bacon, slaughtering, rendering lard, etc., or if his basic services such as chilling the meat properly, cutting and grinding the meats to the patron's order, wrapping the meats properly and safely and identifying them properly are not up to par, you may reasonably expect a share of the business from his natural trading radius.

Most prospective rural locker operators need not look far for an ideal spot. One authority estimates that as of January, 1947, there were 9,600 communities and cross-roads areas which needed locker plants.

To insure the success of your plant, you should have 250 or more rural families in your natural trading radius. In many

Existing food stores, particularly in the smaller communities, have found the addition of frozen food lockers a business-building "plus" and an appreciated service for the housewife. Families having a part of their food needs already stored in the locker plant are logical customers for the retail meat and groceries departments operated in the same building.

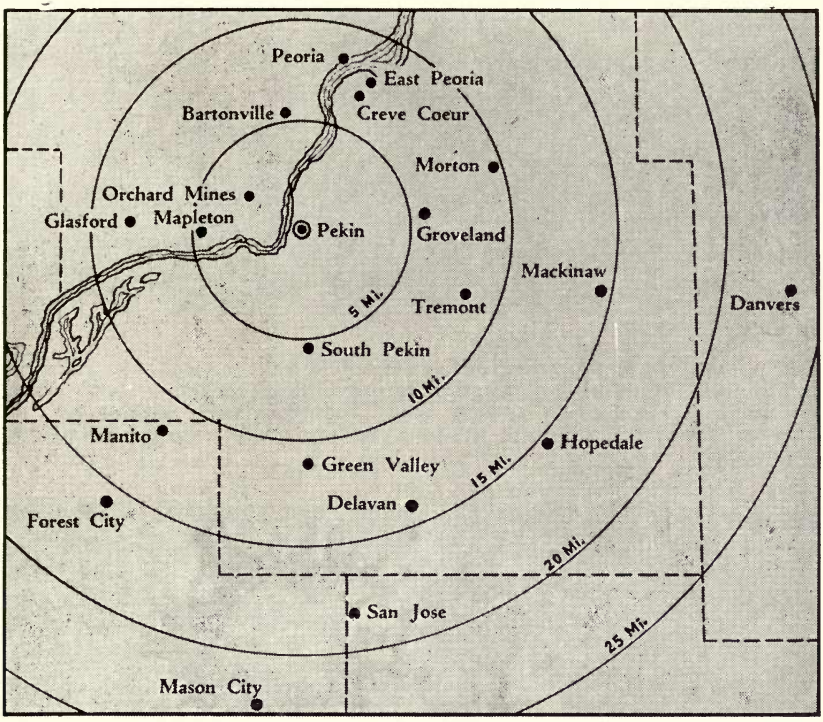
cases, however, this rule can be set aside if your plans also contemplate the establishment of a branch plant. Many locker operators have found it sound business to install a major locker plant complete with all facilities in a central point, and to build smaller branch plants, offering cold storage facilities only, at nearby points. The meats are processed, wrapped, and sharp frozen at the central plant, and then transported to the branch plants.

In the case of the city plant, the best advice that we can offer is this: Make haste slowly. Locate your plant on the fringe of the town where you get the advantage of the farm trade, where the large estates and homes are located, and where your chances of success are best.

In building a plant, the chief factor to consider is this: "What type of plant is most likely to stand the acid test of competition now and in the future?" In general, it is likely to be the one which combines the following features:

1. Convenient location for the locker patrons.
2. Efficient arrangement within the plant.
3. Adequate insulation properly installed.
4. Proper engineering of refrigerating equipment.
5. A flexible arrangement which will permit expansion and shifts in services rendered.
6. Adequate volume for efficient use of competent personnel and modern equipment.
7. Honesty in dealing with patrons.
8. A sanitary plant.
9. Reasonable rates.

In order to attain these goals in locker plant operation, it is necessary for the prospective operator to analyze carefully the needs and demands of the community and the surrounding area. One of the more difficult problems is that of determining how many or what proportion of the families in a given trade territory will use lockers and how many of these would want to use curing, smoking, slaughtering, lard rendering and other miscellaneous processing services. The latter is not ordinarily measurable in advance; however, it would seem worth while to take sufficient time for educational work and preconstruction solicitation so that the plant has 40 to 60 percent of its locker capacity



A study of the addresses of the patrons of one locker plant showed that some came as far as 25 miles for the service; the majority, however, lived within a 10-mile radius. As the number of plants increases, the trading area for any one plant will decrease; but the increased use of locker services by the population generally will make up for the distant business lost.

rented in advance. The smaller the plant the larger this percentage should be. These advance rentals will enable the plant to operate without the extremely heavy deficit which often occurs during the first year or two when plants are opened without advance rentals. Further, it provides a basis for planning the size of the locker plant.

Who Should Build a Locker Plant?

Serious study and attention are recommended prior to entering the frozen food locker plant business. To begin with, the primary food which is stored in the lockers as a general rule is meat, and the operator should have a full, rounded knowledge about meats and their proper care. The more he knows about slaughtering, processing, curing, smoking, and handling meats—

The locker plant is dependent upon automobile transportation for much of its business. Here are two plants well provided for in this respect. One has ample curb space for ordinary needs; the other has a parking area of its own. As is the case with the food market, convenience for women is important.

the easier his lot will be. The operations involving the care and handling of fruits and vegetables can be easily assimilated but the meat training does not come readily or easily.

The prospective locker operator should be well financed. Costs for the average complete plant at the present time range from $45.00 to $60.00 per locker, not including the building or grounds. Thus, a plant of 300 lockers will involve an investment of $14,000 to $18,000. In some communities, these costs will run less. However, the operator who starts out on a "shoe-string" without being prepared to make a capital investment of his own is greatly handicapped, and his chances for success are dimmed accordingly. The third factor needed is the quality of being content with operating a service business—because the locker business

is essentially that. It offers a rich and permanent future for those who fit into it, but it is not essentially a "get-rich-quick" business.

Operating Expenses of a Typical Locker Plant

I. Locker Plant Operated With Appliance Store:

SALES:			
Sales—Appliances		$20,871.88	
Containers		176.62	
Frozen Food—Retail		2,508.09	
Frozen Food—Wholesale		8,521.90	
Meat—Wholesale		880.34	
Total Sales			$32,958.83
COST OF SALES:			
Opening Inventory		$ 1,701.85	
Purchases—Appliances	$13,246.09		
Containers	137.25		
Frozen Foods	9,155.87		
Meat	1,229.04	23,768.25	
Freight and Express		558.45	
Total		26,046.55	
Less: Closing Inventory		1,821.95	
Cost of Sales			$24,224.60
Gross Profit on Sales			$ 8,734.23
OTHER INCOME:			
Discounts Earned		26.29	
Insurance—Locker		85.96	
Interest Income		14.76	
Locker Rentals		2,937.89	
Processing Income		3,967.93	
Service Income		490.66	
Total Other Income			7,523.49
Gross Income			$16,257.72

Operating Expenses:	
Accounting and Legal	$ 321.50
Advertising	334.04
Commissions	108.59
Depreciation	1,003.63
Donations	22.00
Dues and Subscriptions	118.02
Fuel	82.32
Installation Expense	105.65
Insurance	400.07
Interest Expense	232.32
Miscellaneous Expense	11.98
Office Supplies	206.58
Old Age Benefits	34.20
Plant Supplies	641.97
Power	776.56
Processing Supplies	325.83
Rent	640.00
Repairs	425.76
Salaries	2,917.16
Sales Tax	47.13
Taxes and License	80.60
Telephone and Telegraph	156.07
Traveling Expense	202.43
Truck Expense	241.47
Water	95.34
Total Operating Expense	$ 9,531.22
Net Profit For Year 1946	$ 6,726.50

Breakdown of Locker Revenue

Average per month:

Locker rental	**$237.19**	**Sale of frozen foods**	**233.45**
Processing receipts	**330.31**	**Miscellaneous revenue**	**51.65**

Operating Expenses of a Typical Locker Plant

II. Statement of Main Plant with 500 Lockers and Branch Plant with 285 Lockers

			Percent to Total Sales
RECEIPTS:			
Store Sales Frozen Foods and Meats	$56,502.92		71.51%
Processing Sales	9,535.42		12.07%
Locker Rentals	12,980.66		16.42%
Total Receipts		$79,019.00	100.00%
COST OF GOODS SOLD:			
Inventory at Start	$ 4,580.24		
Purchases	50,623.44		
Total Available	$55,203.68		
Less: Inventory End	7,115.31		
Cost of Goods Sold		$48,088.37	60.86%
Gross Profit		30,930.63	39.14%
EXPENSES:			
Salaries	$12,851.18		16.27%
Power, Light, Water	1,889.36		2.39%
Telephone	176.05		.22%
Truck Expenses	82.53		.10%
Repairs	1,965.69		2.49%
Supplies	1,509.32		1.91%
Heat	621.25		.79%
Travel Expense	159.00		.20%
Dues, Subscriptions	122.98		.16%
Advertising	809.21		1.02%
Interest	884.86		1.12%
Insurance	907.97		1.15%
Depreciation on Building	303.00		.38%
Depreciation of Equipment	2,435.90		3.08%
Rents	906.65		1.15%
Taxes	120.25		.15%
Total Expenses		$25,745.20	32.58%
Net Profits 6½% on sales		5,185.43	6.56%

Breakdown of Locker Revenue—Average Per Month

Sale of frozen foods	$4,708.57
Processing sales	794.62
Locker rentals	1,081.72

Operating Expenses of a Typical Locker Plant

III: Statement of Plant With 768 Lockers

			Percent to Total Sales
INCOME FROM OPERATIONS:			
Locker Rents	$ 7,076.24		42.00%
Processing	4,914.68		29.17%
Fruits and Vegetables	126.32		.75%
Curing	3,676.60		21.82%
Lard Rendering	486.00		2.88%
Storage	51.64		.31%
Supplies	220.12		1.31%
Miscellaneous	297.04		1.76%
Total Income from Operations		$16,848.64	100.00%
OPERATING EXPENSES:			
Payroll	$ 3,178.00		18.86%
Payroll Taxes	127.12		.75%
Lights and Power	2,335.68		13.86%
Supplies Used	1,213.04		7.20%
Fuel Used	530.60		3.15%
Repairs	232.00		1.38%
Rent	300.00		1.78%
Freight and Hauling	59.56		.35%
Insurance	365.76		2.17%
Office Expense	26.84		.16%
Advertising	128.80		.76%
License	8.00		.05%
Cash Over and Short	13.48		.07%
Depreciation	400.00		2.38%
Total Operating Expenses		$ 8,918.88	52.78%
Net Profit from Operations		$ 7,929.76	47.22%

Breakdown of Locker Revenue

	Average per month
Locker rental	$589.68
Processing	409.55
Curing	306.38
Lard rendering	40.50

Independent Operators

Most of the plants in the country today are being operated by men who come from various walks of life. Many of today's plants stem from ice plants, creameries, co-operatives, and the like. Some of the most successful plants are being operated by men who are entirely foreign to the world of food and food preservation. Most of these plants, however, are big plants —so large that the operator can hire skilled help to take care of the various types of operation which are necessary.

Some authorities feel that, because the locker renter will gravitate to the closest plant which offers him satisfactory service, the trend of the future is to the smaller plants. This is the chief reason why today, about 45 percent of the locker plants of the nation are operated in conjunction with food stores retailing meats.

This trend is only natural, for locker plants definitely belong in food stores. It is more logical for a meat man to add a locker plant to his market than it is for any other individual to start a plant. To begin with, meat men know how to cut meat, how to corn beef, how to render lard, how to cure and smoke hams and bacon, how to make sausage, how to wrap meat, and how to judge meat. After all is said and done the locker business is primarily a business of cutting and storing meat and who should understand this method of operation better than the retail meat merchant?

Secondly, the meat man has the time. The retail meat business is a rush business with over 50 percent of the weekly volume being done in 20 percent of the hours of the week. There are many, many hours in the morning and early afternoon and there are certain days of the week when meat cutters are not pressed for time and these periods can be devoted very profitably to

cutting up meat for locker renters. Studies have shown that the average meat man with one helper can handle his regular retail business and in addition take care of the slaughering and processing for a 250- to 300-locker plant. When the locker plant increases in size, the meat man can profitably add another Saturday man and still handle 300 lockers and over. If the plant grows beyond this size, he can hire another regular meat cutter, dividing his salary between locker operations and the retail meat counter.

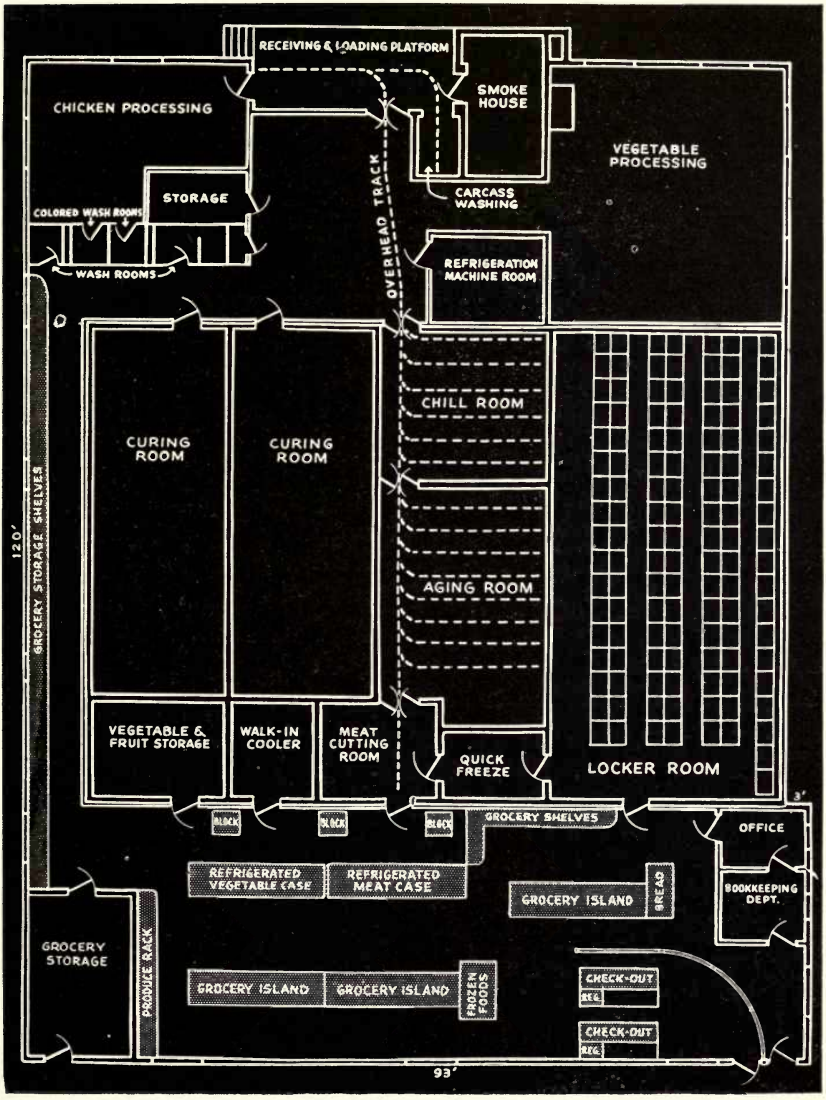
A third reason for the big trend of locker plants in food markets is because the retailer already has the necessary tools, including electric meat cutters, meat choppers, tenderizing machines, scales, cutlery, cooler, and the bookkeeping system. All the retailer needs to start operation is the sharp freezer and locker room equipment. Figures show that it costs the meat man only about 80 percent as much to go into the locker business as it would cost someone else.

Fourthly, most food markets have the space—or can in most cases easily provide it. One of the greatest economic wastes in the retail meat business is the back room. By rearranging it by putting up or knocking down a wall, most meat men have space enough to accommodate 200 to 300 lockers, or even more, in the back part of their markets.

Alert rural retail meat dealers should be on the ground floor as they are the logical ones to open plants in their communities. If they let the opportunity slip by, competitors will get the jump and open locker plants. Those who miss the boat will find that they will be forced out of the meat business or that the competitor with the locker plant will have such an advantage over them that they cannot overcome it. Locker plants are no longer an experiment; they have become an integral part of rural life and living and in the method of food distribution. They offer the retail meat dealer a once-in-a-generation opportunity if he is located in an area where a locker plant should be operating. Even meat markets in large cities should be fully awake to the possibilities of opening a plant as indications are that many plants will be opened in bigger cities in the near future.

Some retailers may be hesitant about adding a locker plant to their food store because they feel that in the future home freezer cabinets may eventually force locker plants out of busi-

ness. There is no basis for this belief and no retailer should be discouraged from building a locker plant because of such a remote possibility. Individual freezing cabinets undoubtedly will



Here's the floor plan of a successful combination frozen food locker plant and super market. This building was planned as a combination operation; many grocers and meat men have found space for lockers in existing buildings.

become popular among a certain percentage of farm and city people, but they will not injure locker plants. In fact, just the opposite will occur; people with home freezers will be dependent on locker plants for proper processing, wrapping and freezing. It is not likely that home cabinets will be large enough to store all the foods a family needs. As a result it will be necessary to rent a locker at a plant. The home freezer will probably become a temporary storage space and will be used chiefly to keep the frozen foods the housewife needs from day to day, while the locker at the plant will be used for storing foods for a greater length of time with the home freezer being replenished with foods from the locker.

Because no farmer or city person can cut up a quarter of beef into individual cuts and wrap them as quickly or as economically as an experienced meat man, persons with home freezers will turn to the locker plant for these services. Another factor which favors the locker plant over the home freezing unit is the low power rates which locker plants have because of the large amount of electricity they consume. Actual figures show that power costs on some plants run $1.00 per year per locker, or a cost of 8⅓ cents per month. It is impossible for any home freezer to be operated at such an economical cost; in fact the power bill for a home unit will probably run $1.50 a month and more.

It can be definitely stated that an efficiently operated locker plant which gives the best possible service at reasonable rates will play an important part in food preservation for a long time to come, and locker plants and home freezers will supplement rather than supplant each other.

Locating Your Locker Plant

We have already stressed the point that the locker plant should be located in a natural trading center. This may be in a rural community, even at a cross-roads, in a city, a village, a moderate sized town, or even in a big city, preferably on the outskirts of same.

The places where people from farms come to do business, buying, banking, and trading, are the most natural sites for locker plants. Farmers and their families are thrifty and food conscious, and can easily be shown the values in refrigerated storage designed for their convenience and economy.

Just where to locate your plant poses a problem: The cost of land in a study of 18 cold-storage locker plants was found to vary from $2.00 per locker to 50c per locker. You must make your own choice, but the factors to be considered are as follows:

(a) Select the most convenient, most centrally located site. A few hundred extra dollars spent for land that offers a better location is money well spent.

(b) Make sure you have enough space, not only for today, but for tomorrow as well. If your plans include the addition of a slaughtering plant in the future, you will need at least 800 additional square feet for it, and additional space for holding pens. You will also need additional space to provide truck space and ready loading and unloading space.

(c) You will do well to consider a location where electric power, gas, plumbing, and good hard-surface roads are available.

(d) Select a location that offers not only ready accessibility

Before making the heavy investment necessary to put up this beautiful locker plant building, surveys were made to assure the prospective owner that there was potential business to support such a plant. The plant is situated on the road most used by farmers in its trading area.

for your patrons, but good parking facilities for cars and trucks as well.

(e) If you contemplate a slaughtering and processing plant, make sure it will not be a nuisance to present or future neighbors. Check local and state laws governing the establishment of a business of this kind.

(f) If you have a choice of locations, look to a long range appreciation in the value of your land. If your locker plant draws farmers to your place of business regularly, it is a good location for firms selling machinery, feeds, fertilizers, and supplies to farmers. It's smart to get an option on adjacent land if you don't have the cash to buy it outright.

(g) If you are locating in an incorporated area, don't take anybody's word for it before you install slaughtering facilities. Request that an ordinance be passed, or secure written approval from the proper authorities covering the erection of your plant.

Analysis of Location of Customers

How much territory can a locker plant expect to serve? How many miles will customers travel to patronize a locker plant? These questions not only puzzle the person who is planning to build a plant, but also many operators who already have plants.

In order to show the location of locker plant customers, here is the analysis of a typical locker plant—Vogel's Super Market and Locker Plant, Pekin, Ill. This plant, located in a town with a population of 19,000, has 794 lockers which are rented by 642 persons.

Vogel's locker customers are broken down into two groups, (1) city people, and (2) farmers who live on rural routes. The analysis reveals that 422 of the lockers are rented by city people, while 372 are used by farmers.

The vast majority of the city locker renters live in Pekin, these account for 333 of the lockers. Peoria comes second with 47 lockers taken by Peoria people. The rest of the towns on the map only have a few locker renters each.

Most of the farmers live on rural routes out of Pekin, Manito, Tremont, Green Valley, and Peoria. Majority of customers live within 10 miles of the plant.

Persons who are contemplating installing frozen food locker plants will be interested in the following figures showing the number of lockers various plants have. As can be seen the vast majority of locker plants reported in this survey have between 150 and 600 lockers. This survey also revealed that most plants in food stores have around 300 lockers. The trend in the past few years has been towards plants of this size, as a locker establishment with about 300 lockers can be installed in most food stores.

States	1,000 Lockers and Over	800	600	300 to 600	150 to 300
Ohio	8	3	17	44	48
Michigan	3	2	9	33	25
Indiana	2	3	5	22	14
Illinois	9	6	13	71	52
Iowa	2	7	12	110	135
Nebraska	1	2	1	23	50
Missouri	3	1	5	20	16
Totals	28	24	62	323	340—777

What Type of Building to Use?

No hard-and-fast rule can be laid down. Locker plants have been installed in all kinds of existing buildings. The best advice we can offer is to secure the advice of a contractor member of the Frozen Food Locker Institute as to the suitability of an existing building, or the erection of a new building. Later in this book we will deal with specific standards covering construction, from the roof to the basement, and we recommend that you read these paragraphs diligently. However, in considering whether to use an existing building or to build a new structure, you require "on-the-ground' advice from a man who knows something about local structural costs, the availability of materials, and the like. We recommend that you secure this advice from a trusted contractor member of the Institute.

Public Utilities Must Be Considered

It is recognized that two public or private facilities are necessary for plant operations. These are **power** and **water.** Without

Here's an exterior of one thoroughly modern supermarket, in which a large frozen food locker plant is an important department. The locker owner who can start from scratch and plan his operation before building, is fortunate, for he will operate more efficiently than his competitor.

Here's a modest but completely modern building that has much to recommend it as a home for a frozen food locker plant. In many small communities, the new locker plant is by far the finest building in town, and owners of such plants have prestige and important positions in civic affairs.

these two services being available at all times, complete shutdown of operations may result. Therefore, **dependability** of power and water services is of primary importance, their **cost** secondary. Careful consideration should be given to obtain the type of services that are within economical reach.

1 — Water Service

(a) Where public water services are available, the problem of an adequate water supply is readily solved.

(b) Plants located where public water services are not available, the problem of water supply is one of providing facilities in the form of power driven well supply, free from contamination and approved by the governing health board authority or through the use of cisterns and cooling towers or evaporative condensers.

(c) Dependability of service is of importance, as a failure of the water supply system, without an adequate reservoir supply, is apt to cause serious damage.

(d) Where it is permissible to provide independent well-water supply, on approval of the local health authorities, the temperature of the well water is important from an economical standpoint.

(e) Where private wells are permitted for industrial use, but not for human consumption or food processing, the temperature of the well water is the governing factor as to its use for water-cooled refrigerating equipment, and other industrial purposes.

(f) Whatever type of service is chosen, an abundance of water should be made available for proper functional and sanitary operations.

(g) Water temperatures of public and private sources vary among sections of the country and have a direct bearing on economy of plant operations. In locations where the water supply is 80° F. or over, it may be found necessary to pre-cool the water used directly in the food preparation and meat manufacturing.

(h) Water of 185° F. or above is required for sterilization and sanitation. Therefore, an abundant supply of hot water under pressure must be available for daily plant operations.

(i) To keep any plant clean and sanitary, use plenty of hot water and cleaning soap, and scrub vigorously and thoroughly.

2 — *Electric Service*

(a) Electric power is required for operation of power-driven equipment. However, in some sections other types of power are sometimes used in manually controlled plants.

(b) The selection of type of power to be used for operating power-driven equipment depends largely on electric rates and service charges. In general, electric power of public or private service should be selected so that the refrigerating equipment and auxiliaries may be fully automatic in control.

(c) In general, alternating current is readily available in all but remote locations. Therefore, it is advisable to provide for power services of 2- or 3-phase current, and take off this service all single-phase services required. Seldom, if ever, will it be necessary to provide for any power factor correction. The use of synchronous type motors should not be necessary.

(d) If a choice of more than one power service is available, then choose the power service which has a proven record for the least power line interruptions, as power failure of lengthy duration may cause serious loss to products stored under refrigeration. Whatever type of power is chosen, do not install a power service less than 50 percent greater than the maximum total calculated, or anticipated connected power load.

3 — *Power-Water Costs*

The balance between power and water costs to determine the type of condenser to be selected for the refrigerating equipment varies with the water inlet temperature to condenser; the temperature rise of condenser water leaving condenser; the ambient air temperatures, both dry and wet bulb; cost of power or water per unit basis.

A thorough study of all factors should be made before final selection is given. The higher the rise of water temperature leaving the condenser the less amount of water is required, but

the greater the electric power input per ton of refrigeration, with resultant greater overall cost of both power and water.

The final selection of type of condenser should not be made until all factors, including the use of water cooling towers or evaporative type condensers, have been compared, to determine which type of condensing equipment offers the greatest economy and dependability of service.

Many sections of the country offer climatic conditions in favor of evaporative type condensers for both freon-12 and ammonia refrigerants.

4 — Temperatures

The selection of temperatures to be maintained in the refrigerated spaces is mandatory in many states where existing laws governing locker plants are enforced. In general the locker room should be held at zero (0°) degrees or below, and the freezer at minus fifteen (—15° F.) degrees, with the chill and aging coolers at 34° F. Curing rooms are held at 40° F. However, these are optimum temperatures and are slightly variable. The important factor is to maintain an even or level degree of room temperatures within a maximum of two-degree (2°) variation.

While it is perhaps desirable to air-condition public or work spaces beyond the refrigerated rooms, this is not absolutely necessary.

The type of refrigerant to be used in the refrigerating system, and the mechanics of applying the refrigerating effect is optional and of personal choice, and is based on the dependability of service, economy of operation, and lowest cost of maintenance.

Designing Your Locker Plant

Probably the best way to design a locker plant is to plan from the back, and to follow a piece of meat through your locker plant. Since about 75 percent of the products stored in lockers are meats, this is a fundamentally sound approach to a basically good plan of operation. So let's follow a beef animal from the time it comes into your plant until it goes out the front door in the form of consumer packages.

First of all, let's settle the question of slaughter: if your plans include on-the-premise slaughter, either now or in the future, provide space for it by allowing space for the loading and unloading of the animal from the truck, a holding pen, and a slaughtering room, which for greatest efficiency and most profitable usage of the hides, fancy meats, and biologicals, shall be at least 1000 square feet.

Planning Your Slaughter House Receiving Room

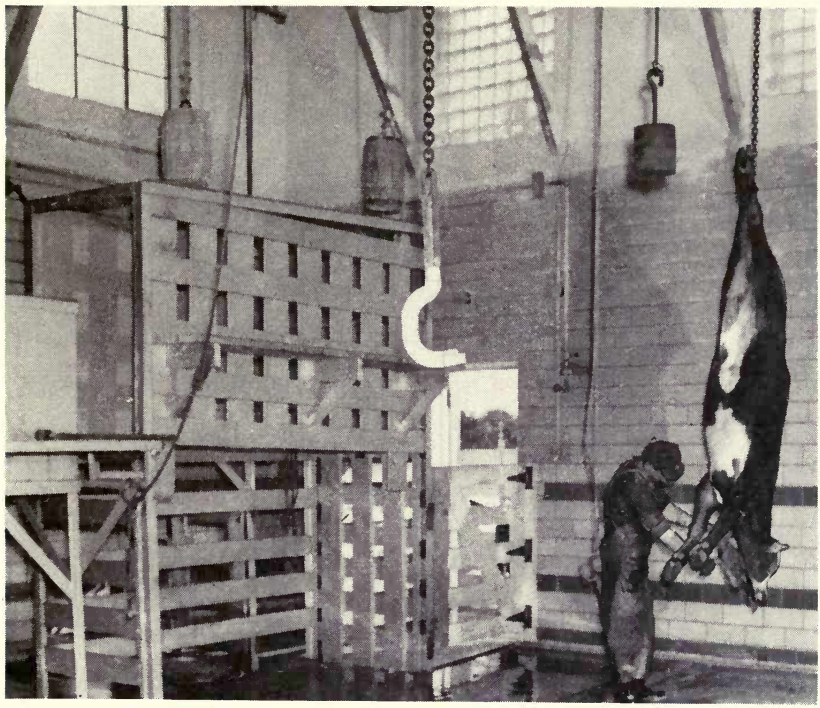
There is one great difference between a packer and a locker plant that renders the services outlined. That difference is of great importance to the locker plant operator because it favorably affects his profits. The packer buys the animals outright; he slaughters and processes and sells the finished product to make his product. The packer has a big investment in raw products. The finished products are subject to market fluctuation in price. Pork products such as hams and bacon have to be "cured" and are held for weeks. Market changes affect them, many times adversely.

On the other hand, the locker operator does not buy any raw products. He is not interested in the "market". His raw products are not his, but his customers. His only financial interest is in the service charges for converting cattle and hogs into food for his patrons.

So far we have talked about the general advantages of slaughtering and processing. Now let's get down to dollars in revenue. These figures are offered as a guide and are as near an average throughout the country as anyone can arrive at. They are not given to establish the charges proposed.

For beef slaughter only, the charges run from $2.50 to $4.00, depending on the size of the animal. This, of course, means the actual slaughter, removal of hide, eviscerating, washing and chilling out in the chill room. As a result of slaughter the operator gets the **raw offal,** which are the intestines, feet, head, etc.

The hide, of course, is the property of the owner of the beef, but there is nothing to prevent the operator from taking the hide for the slaughter; or he can buy it at a price so as to make a good profit.

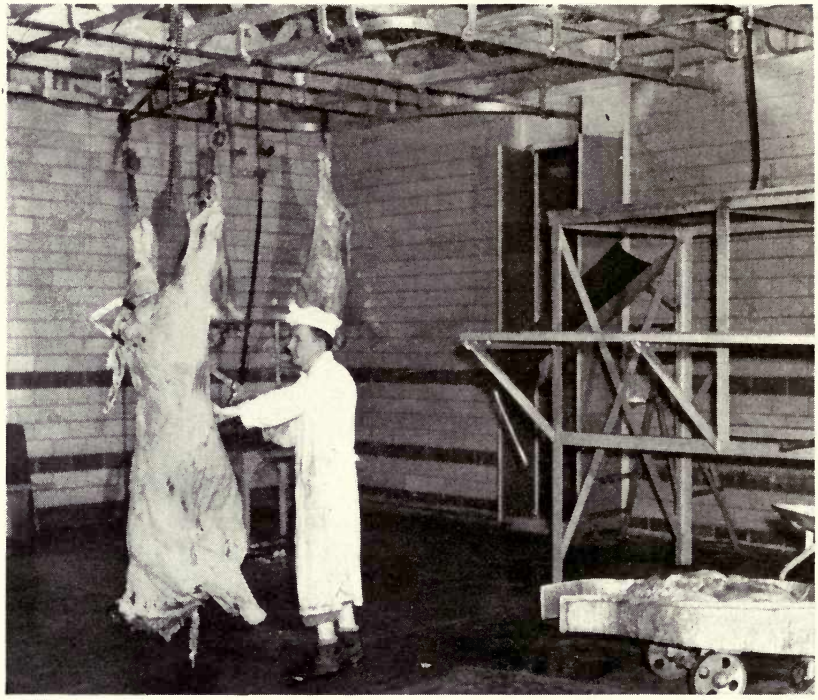


A slaughtering department that meets all minimum specifications of the Bureau of Animal Industry is a valued addition to any locker plant. This one has two beds for killing cattle, and one hog line, fully equipped. Three electric hoists make it easy to move cattle for bleeding, for skinning, and to the overhead track. The bleeding rail is 16 feet from the floor.

Usually the owner of the beef does not want to bother with the hide. The average beef hide will weigh about 50 pounds (green), and at 12 cents per pound, that means a value of $6.

The head produces edible lean trimmings. Usually this is more profit for the operator. A good-sized beef head will produce eight to 10 pounds of such trimmings. The inedible return in grease and meat scraps (animal food) from the average heavy cow or steer will run approximately $3. To sum it up, the service charges on the slaughter of a beef will run not less than $8 and can amount to as much as $12. In addition there is a charge for cutting, wrapping and freezing.

The average slaughtering charge for a hog is $1.50 to $3 depending on the size. You get head trimmings of from three to

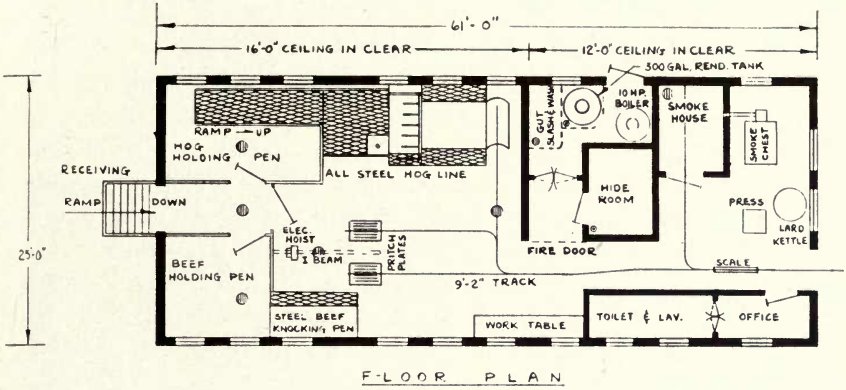


Hoists for holding carcasses while they are being split are requirements in some states. After splitting the carcass, this butcher will use the hoist to lift the sides to the roller on the overhead track. The vehicle at lower right is a paunch truck into which viscera from the slaughtered animal are dropped. The small pan on the top is for holding liver.

five pounds amounting to at least $1 at wholesale prices. Inedible rendering produces $1 from each hog. Lard rendering will run $1.50 to $2 per animal and curing and smoking $3 to $4 each.

Just as in the case of beef, there is a further charge for cutting, wrapping, and freezing of that portion of the hog carcass that is not rendered, cured and smoked. To sum up, the service charge on a single hog can yield from $12 to $14. As already stated, these are approximate returns, but taking the country as a whole, you will find them not far from average.

Now let's see what investment is necessary to obtain these financial benefits and the even greater results that accrue from being able to offer this complete service.



F-LOOR PLAN

A slaughter house with combined processing rooms may be used as an addition to a plant or as a separate building unit. The processing rooms shown can be left in, if this is the wish of the plant owner. The beef line is on one side of the room, the hog slaughter line at the other. Beef and pork are not ordinarily killed at the same time but separate lines are advisable

Some plants are so arranged and located that additions cannot be built. Then it is necessary to build a building in a suitable location where electricity, water, sewage disposal and good roads are available. Where the slaughtering and processing can be added to the present plant, some expense can be saved and the advantage of constant supervision of this important service obtained.

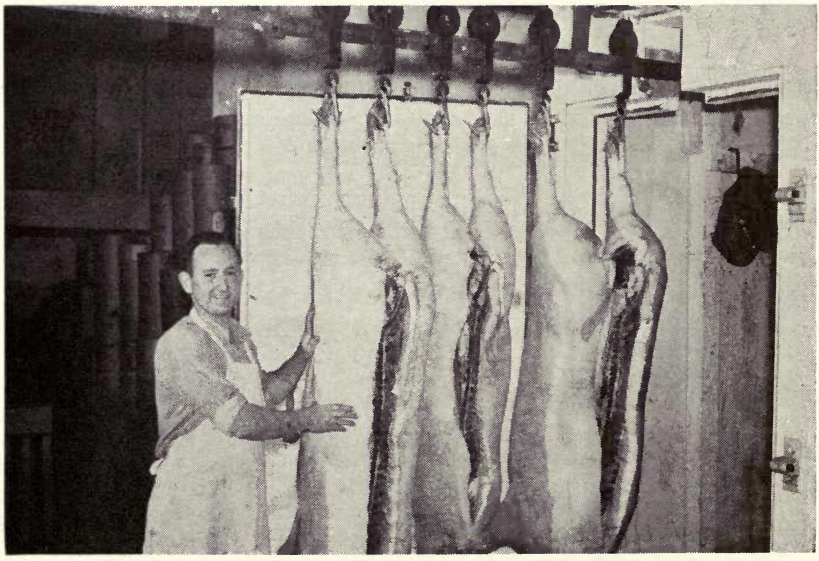
A building of 40 by 25 feet, or approximately this size, is usually large enough for slaughtering, lard rendering and smoking. If desired, the holding pens can be placed outside the building, giving more room for other uses. Usually there is no stock plan that will fit the operator's particular needs. Each plant should be specially designed to meet the requirements of location and capacity. In many states the health laws require that the inedible department be separated from the slaughter room.

The cost of a slaughtering and processing plant such as described and shown would depend on the material used and the cost of labor which varies in different parts of the country. The equipment, however, does not vary much. Complete equipment to handle eight to 12 head of beef and 15 to 20 hogs per day, including inedible equipment, curing, smoking, rendering equip-

ment and a small sausage room, will total from $5000 to $7000. This is, of course, exclusive of coolers and refrigeration machinery (if any) and does not include the cost of the building.

The present trend in locker plants is toward the rendering of greater service both to locker renters and to those clients who are owners of home freezing units. One service which, according to a recent survey, was rendered by only one-third of the plants answering the questionnaire, is slaughtering. But interest in slaughtering is growing, since the addition of this service enables the plant to benefit, not only from the service offered, but also from such by-products of slaughtering as the disposal of waste and offal, both profitable sidelines.

All the recommendations offered here are subject to approval of state and local authorities, and any locker manager contemplating the erection of a slaughter house should consult these authorities before embarking on the erection of the plant. If the preparation of meat for interstate or foreign commerce is contemplated, Federal meat inspection is required. Information regarding this



After slaughter, the split carcasses are guided into the chill room by way of the overhead track. Some states require that the chill room be on same premises as the slaughterhouse. This is to prevent too great a time lag between the actual death and dressing of the animal and the cooling period.

A well organized chill room. This room should be separated from the aging room and should provide .6 square ft. of floor space for every locker in the plant. See text for table of recommended chilling period for various animals.

may be obtained by writing to the Chief, Meat Inspection Division, Bureau of Animal Industry, Washington, D. C.

In selecting the site for a slaughter house it is important to be assured of a constant and ample supply of good water. The source of the water should be free from any possibility of pollution. It is also important to be assured of suitable drainage and sewage disposal. The best solution to both these problems is, of course, a municipal water supply and sewage system. A boiler system for the production of water at 180°F. is essential for the maintenance of good sanitation and it is recommended that a 5-horsepower or larger boiler be installed for this purpose.

For good sanitation it is important that the floor and side walls be of some impervious material, such as concrete, to the height of at least 5 feet. Other materials which may be used for this purpose are vitrified packing house brick for the floors and glazed brick or tile for the walls. The floors should be pitched approximately one-quarter inch per foot to allow for good drainage and should be covered with wooden floats to afford a safe footing.

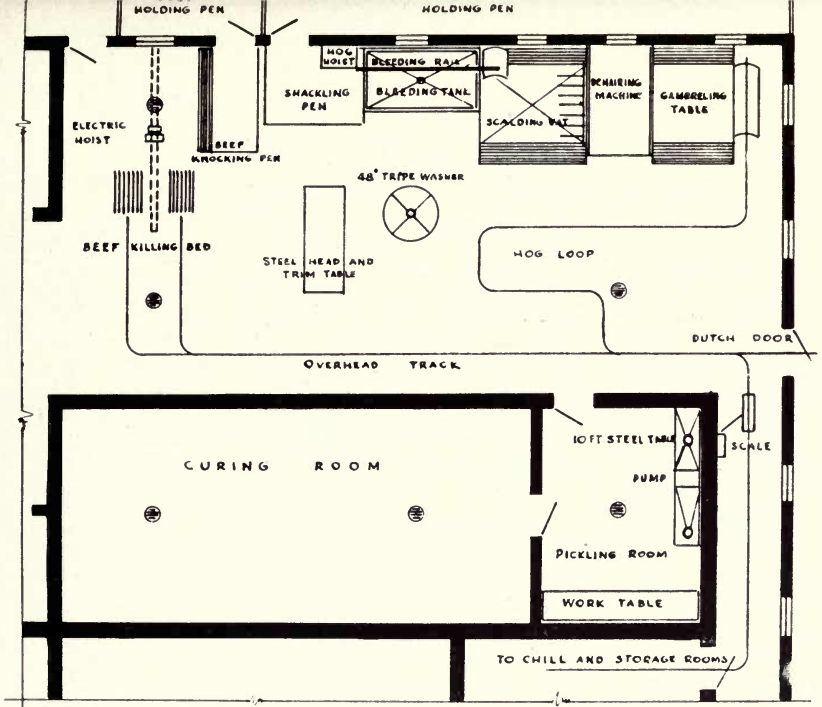
The drains in the floors should be equipped with deep-seal traps (P-S or U-shape) and the drainage lines should be properly vented to the outside air. If a grease catch basin is installed, the drainings from lavatories should not be discharged into it, but should be disposed of separately. The junctions of walls and floors should be suitably covered and the building should be of rat-proof construction. Above the concrete or tile, the walls may be of any smooth-surfaced material. The walls of the cooler should be insulated and the inside should be surfaced with smooth emulsified asphalt or portland cement plaster. The ceilings should be surfaced with smooth material.

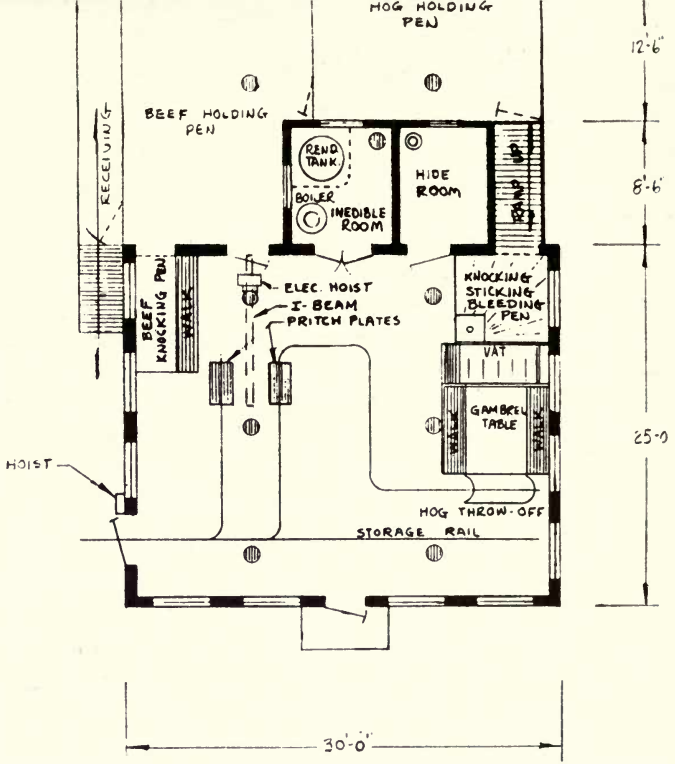
It is not essential to construct a cooler within the slaughter house if the cooler is available elsewhere, but a cooler is essential to avoid meat spoilage. Locker plants which have available coolers should construct slaughter houses within as short a distance of the plant as is practicable, so as to avoid the necessity of transporting the meat over long distances.

Animals are driven into the knocking pen and, after stunning, cattle and calves are ejected into the area in front of the pen. The stunned animals are shackled and hoisted for bleeding on an overhead track. Hogs and sheep are hoisted for bleeding without stunning. It is recommended that all animals be hoisted for bleeding as this results in better bleeding and greater sanitation.

After bleeding, heads are skinned and removed and the carcass is transferred on the overhead track to a place reserved for the removal of the hides, eviscerating and splitting. The carcass should be washed while suspended from the overhead rail. In the case of hog slaughtering, the carcass is transferred to the scalding vat. After scalding, the hair and scurf are removed with a ball scraper. The carcass is then eviscerated and is ready for butchering. Only one carcass should be dressed at a time and a second animal should not be ejected from the knocking pen until the floor has been entirely cleaned of all blood and other material.

It is desirable that all animals be inspected before and after slaughter by a properly authorized state official. The minimum equipment required for this are a cattle and calf head flushing and washing booth, head inspection rack and a suitable metal truck for the inspection of viscera. There should be suitable means for cleaning and disinfecting this equipment.





PLAN

TYPICAL PLANS FOR SMALL SLAUGHTERING AND PROCESSING PLANTS.

These plans are provided principally for the purpose of explanation, not as suggested plans for your plant. In most instances the layout of slaughtering and processing rooms depends on the space available, location of sewers, holding-pen space, and whether or not you are adding to a present building, remodeling an old building, erecting a completely new plant, or building a new slaughterhouse. It is best to design the building for your specific needs, but the arrangement of the equipment as shown here is standard.

The by-products of slaughtering form a profitable adjunct to locker plant operation and include lard rendering, the handling of hides and the rendering of inedible products, such as the blood, etc. A lard-rendering kettle should be part of the equipment. If inedible rendering is also to be handled, a separate kettle must be supplied for this purpose in a separate room. All waste not used must be sealed in watertight containers and removed from the plant daily. A small room, surfaced on the inside with impervious material, should be constructed for the storage of hides. This may be a separate small building close to the slaughter house.

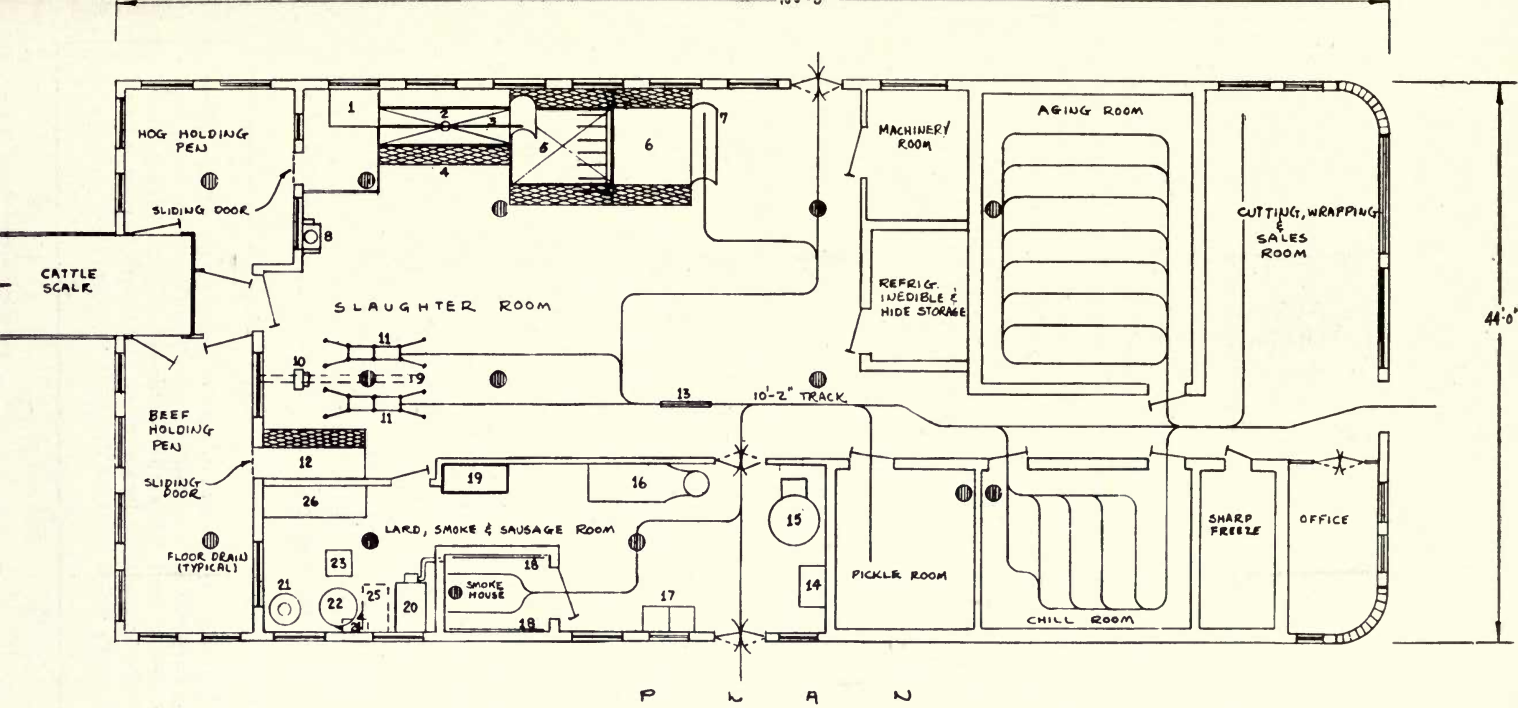
The slaughter houses illustrated on these pages range in total cost from $2500 to $6300, depending on the type of material used in construction, the size of the plant and the amount of equipment installed. Locker plants will not find it necessary to install a separate chill room, since this equipment is already part of the locker plant.

Various types of drainage are used, depending on local conditions. The locker manager planning to install a slaughter house should study his clientele carefully, take into consideration the number of lockers in his plant and construct the type of slaughter house which will service his purpose best with no waste space or overcrowding.

For efficient operation of a locker plant, everything possible should be done to eliminate carrying and moving of the products by hand. In addition to overtrack and carts, electric hoists can be used to good advantage in several different places in the plant as follows:

1. At the unloading dock. It is a difficult and even dangerous job to lift a side of a beef or a whole hog from a farmer's truck up to the overhead track. An electric hoist mounted above the track which extends over the platform makes it simple for any employe to pull the switch and lift the carcass directly on the overhead track.

2. In the slaughter room. An electric hoist is needed to lift the stunned animal for sticking and then to lower the bled animal to the pritch plates. Some locker plants use another hoist to raise and lower the door of the knocking pen.



PLAN

LEGEND

1 HOG HOIST
2 HOG BLEEDING PAN
3 HOG BLEEDING RAIL
4 STICKING & UNSHACKLING PLATFORM
5 SCALDING VAT
6 GAMBRELING TABLE
7 HOG THROW-OFF CHUTE
8 STERILIZING LAVATORY
9 I-BEAM HOIST SUPPORT
10 ELEC. BEEF HOIST
11 BEEF CRADLES
12 BEEF KNOCKING PEN
13 TRACK SCALE
14 GRINDER
15 SILENT CUTTER
16 STUFFER & STUFFING TABLE
17 COOKING CABINETS
18 STEAM COIL BANKS
19 HAM SOAKING VAT
20 SMOKE CHEST
21 STEAM BOILER
22 LARD KETTLE
23 LARD PRESS
24 LARD PUMP
25 LARD SETTLING TANK
26 TRIMMING & CUTTING TABLE

Plan and Elevations of a Small Slaughter and Processing Plant in Wisconsin. This plan shows the holding pens within the main building. They are entered through a wagon or cattle scale to secure the live weight. All facilities are included. This is primarily a wholesale establishment, but the area shown as the sales room could be used also for a retail market. A list of the equipment spotted in is shown in connection with the plan.

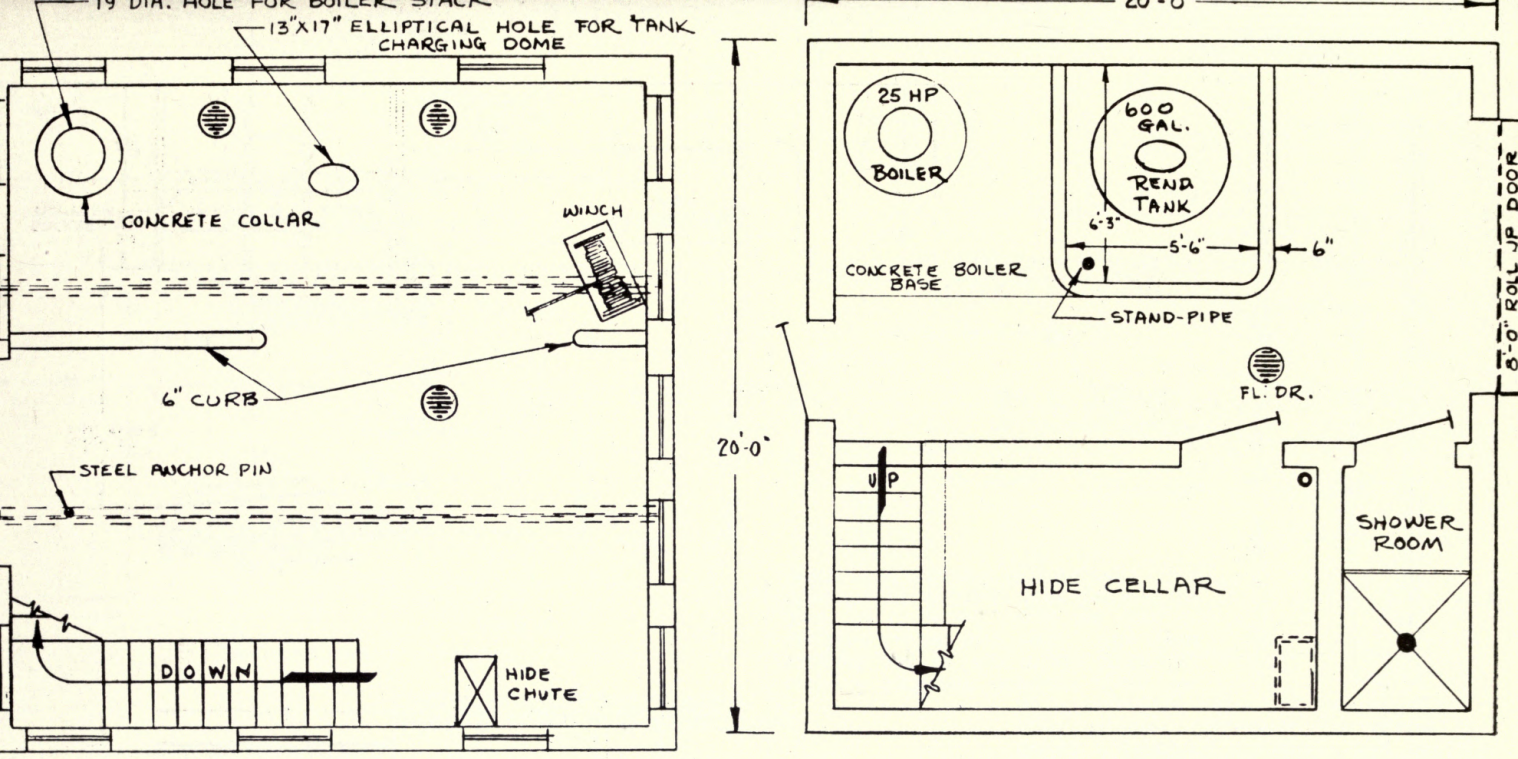
3. Quite a few locker plants with basements or a second floor use an electric hoist to lift an elevator between the two floors. These elevators are usually constructed on the job by local workmen and power is furnished by the electric hoist.

If you do not contemplate or permit on-the-premise slaughter, the next problem to consider will be the receiving room where the quarters, sides, or whole beeves will be brought into the locker plant proper. This receiving room should have an outside door at the rear or side of the building opening onto an unloading platform, over which you should, if at all possible, run a portion of overhead track or rail system. The installation of this equipment will save you many a hard lift and maybe an occasional sprain, and does not cost much if it is fitted into your original plans.

If you have a track or rail system, track scales should be placed conveniently near to the outside door for the purpose of weighing all meat as it arrives.

If yours is a smaller plant, or if you have a space problem, you can get along without a regular receiving room. All that is necessary, then, is to have a suspended beam scale where the meat can be weighed and tagged before it is taken into the chill room. The ordinary wall-type scale which most meat markets have is entirely satisfactory for weighing meats to go into the locker plant. However, if an overhead rail is used it is very desirable to have a track scale as this will save much time and effort. It is highly important that the carcass be tagged as soon as it is weighed so that there will be no mistake later as to ownership of the carcass. Some locker managers prefer to attach a tag containing only the name of the owner and the order number. Then on a separate sheet with the same order number list the cutting instructions. Others prefer to use a larger tag which contains all the necessary information, such as the name of the owner, locker number and the complete cutting instructions.

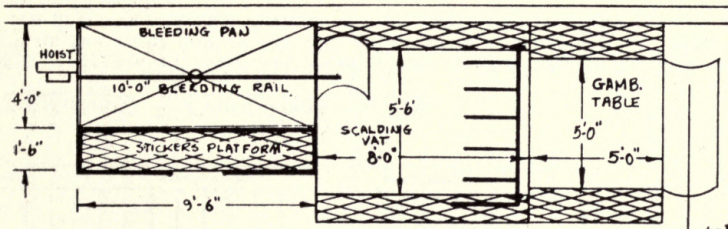
On the following pages are plans and elevations of successful slaughtering as shown in C. E. Dillon's famous book, "Meat Slaughtering and Processing," which is available through "Locker Management" Magazine. The prospective locker plant owner will find useful patterns among them which he can adapt to his own needs.



SKINNING & CHARGING FLOOR

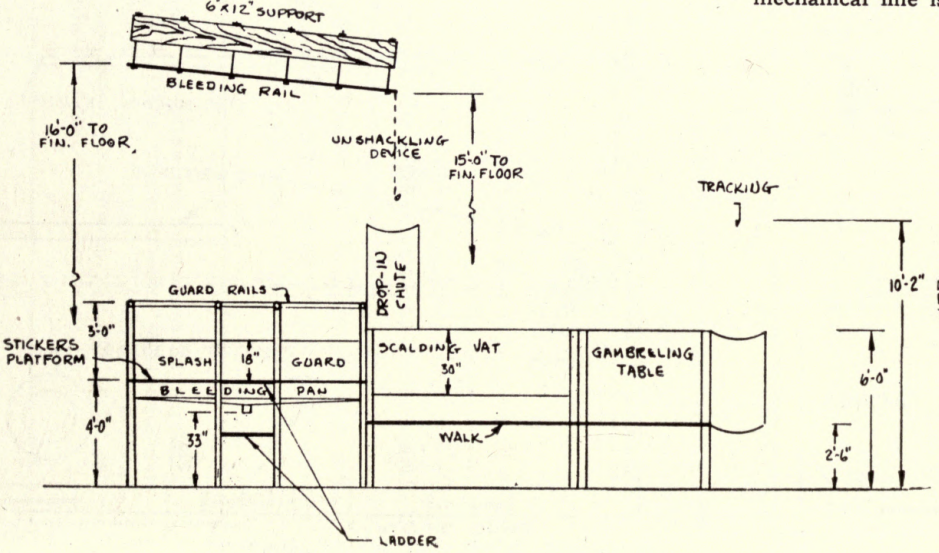
FIRST FLOOR PLAN

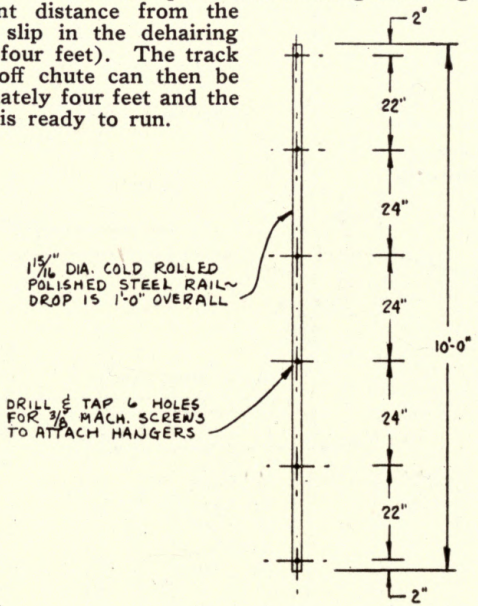
Complete Wet Inedible plant for Dead Animals. This complete plant is housed in a two story building 20 ft. x 20 ft. By removing the curb on the right side of the 600 gallon tank another similar tank can be installed. The 25 h.p. boiler will take care of both tanks. No dryer is installed because the operator will feed the meat scraps wet to his own hogs. It is located separate and apart from his packing plant.



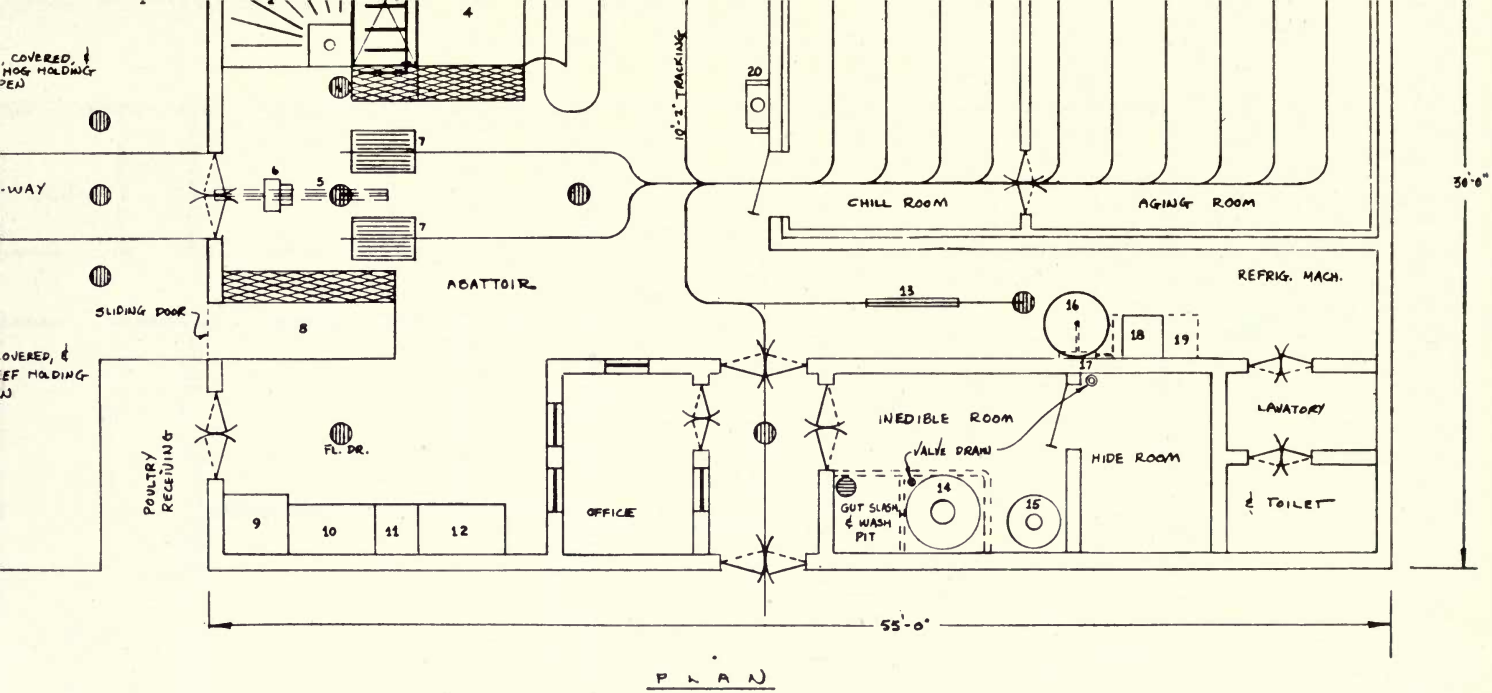
PLAN

Typical hog line suitable for both hand killing and future mechanical hog slaughter. This line is entirely constructed from steel—each unit separate but fastened rigidly together. As shown it is used for hand slaughter but at any time a slaughterer's business grows to the point where he wants to install a dehairing machine it can be done without disturbing the equipment except to move the gambreling table a sufficient distance from the scalding vat to slip in the dehairing machine (about four feet). The track over the throw-off chute can then be moved approximately four feet and the mechanical line is ready to run.





BLEEDING RAIL DETAIL



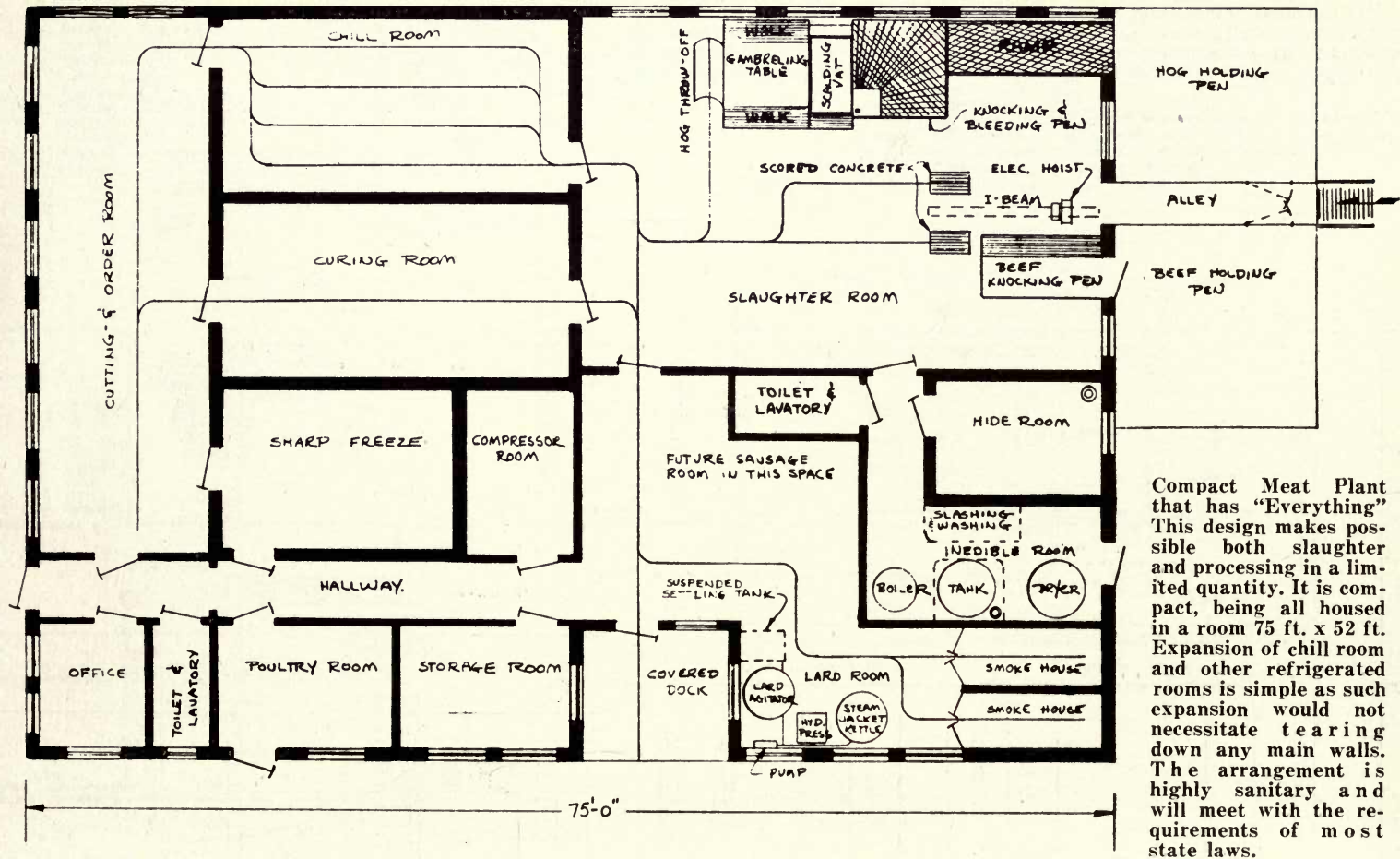
PLAN

LEGEND

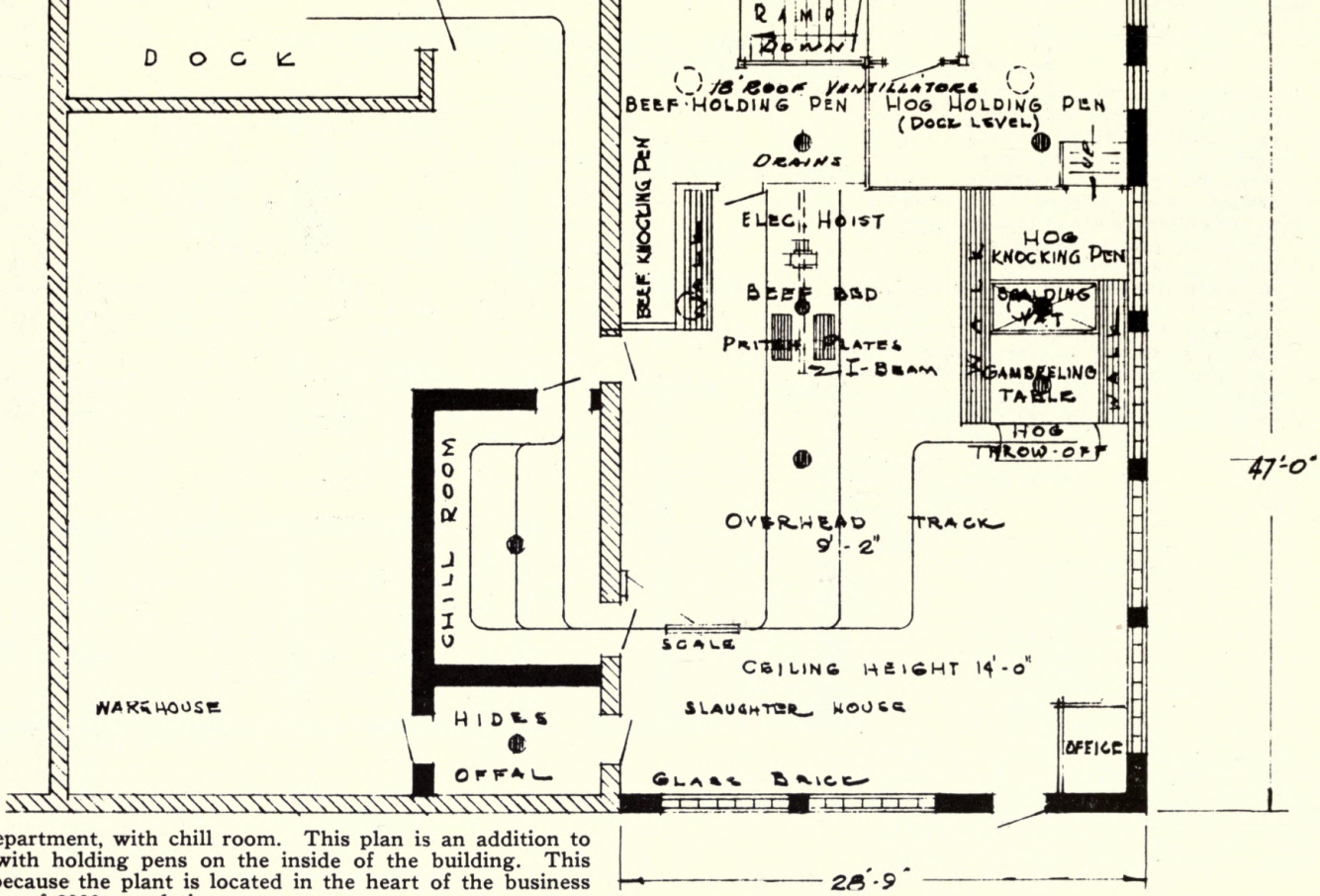
1 HOG RAMP
2 KNOCKING, STICKING, & BLEEDING PEN.
3 SCALDING VAT
4 GAMBRELING TABLE
5 I-BEAM HOIST SUPPORT
6 ELEC. HOIST & TROLLEY
7 PRITCH PLATES
8 BEEF KNOCKING PEN
9 POULTRY STICKING BOOTH
10 PICKER & SCALDER
11 PLUMPING TANK
12 CHILLING VAT
13 TRACK SCALE
14 INEDIBLE TANK (500 GAL)
15 BOILER (10 H.P.)
16 LARD KETTLE (100 GAL)
17 LARD PUMP
18 PRESS
19 SETTLING TANK
20 STERILIZING LAV.

NOTE!
1. FLOORS PITCH ⅛"/FT. TO DRAINS CONNECTED TO 8" DRAIN LINES & RUN THRU GREASE TRAP AHEAD OF SEWER.
2. TOILETS CONNECT DIRECT TO SEWER THRU SEPERATE SOIL PIPE.
3. WINDOWS (NOT SHOWN) TO BE EQUIV. TO APPROX. 25% OF FLOOR SPACE.
4. SKYLIGHT OR ROOF VENTS TO BE INSTALLED OVER INED. ROOM, HIDE ROOM & ABATTOIR

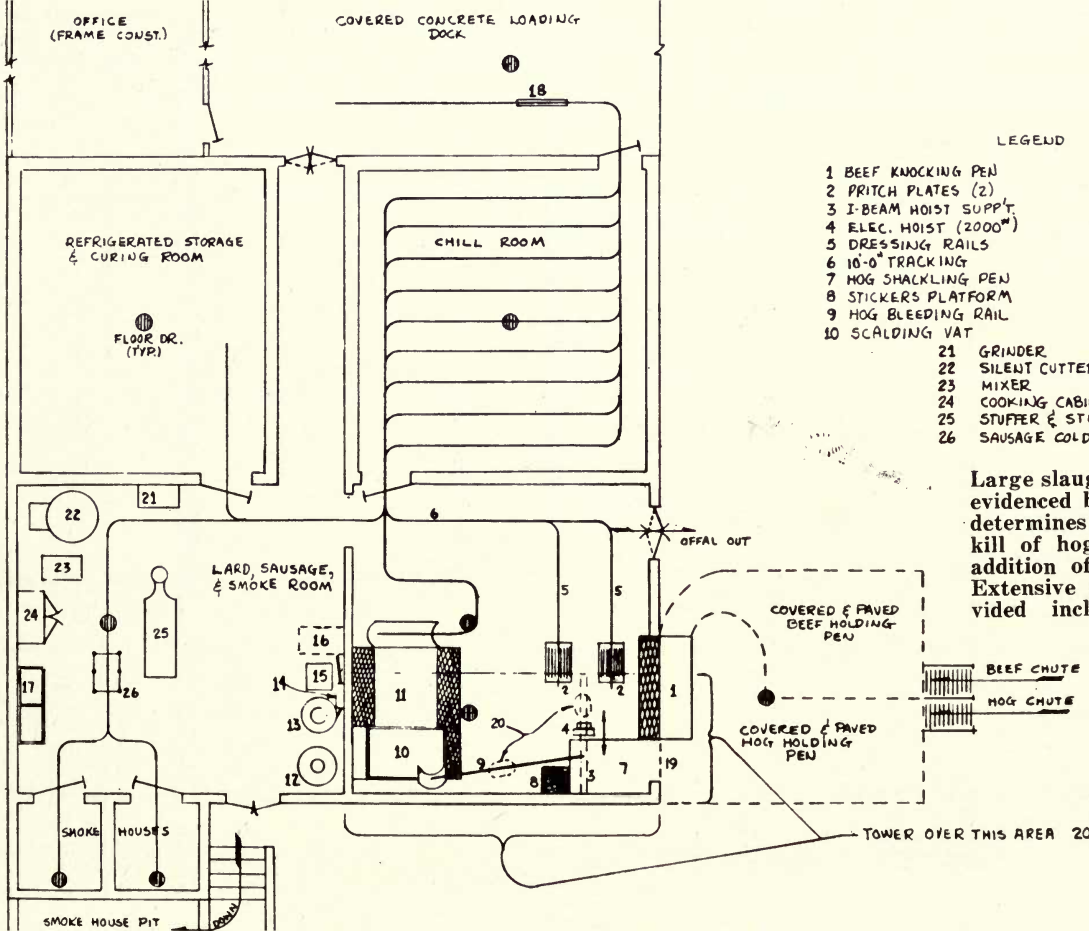
Small Slaughter Plant or Department including Poultry Slaughter and Inedible. Well arranged and typical layout for the purpose. Inedible and toilet separated by passageways. If state laws require poultry department to be separated it is easy to run partition from back wall to office. Some states require this.



Compact Meat Plant that has "Everything" This design makes possible both slaughter and processing in a limited quantity. It is compact, being all housed in a room 75 ft. x 52 ft. Expansion of chill room and other refrigerated rooms is simple as such expansion would not necessitate tearing down any main walls. The arrangement is highly sanitary and will meet with the requirements of most state laws.



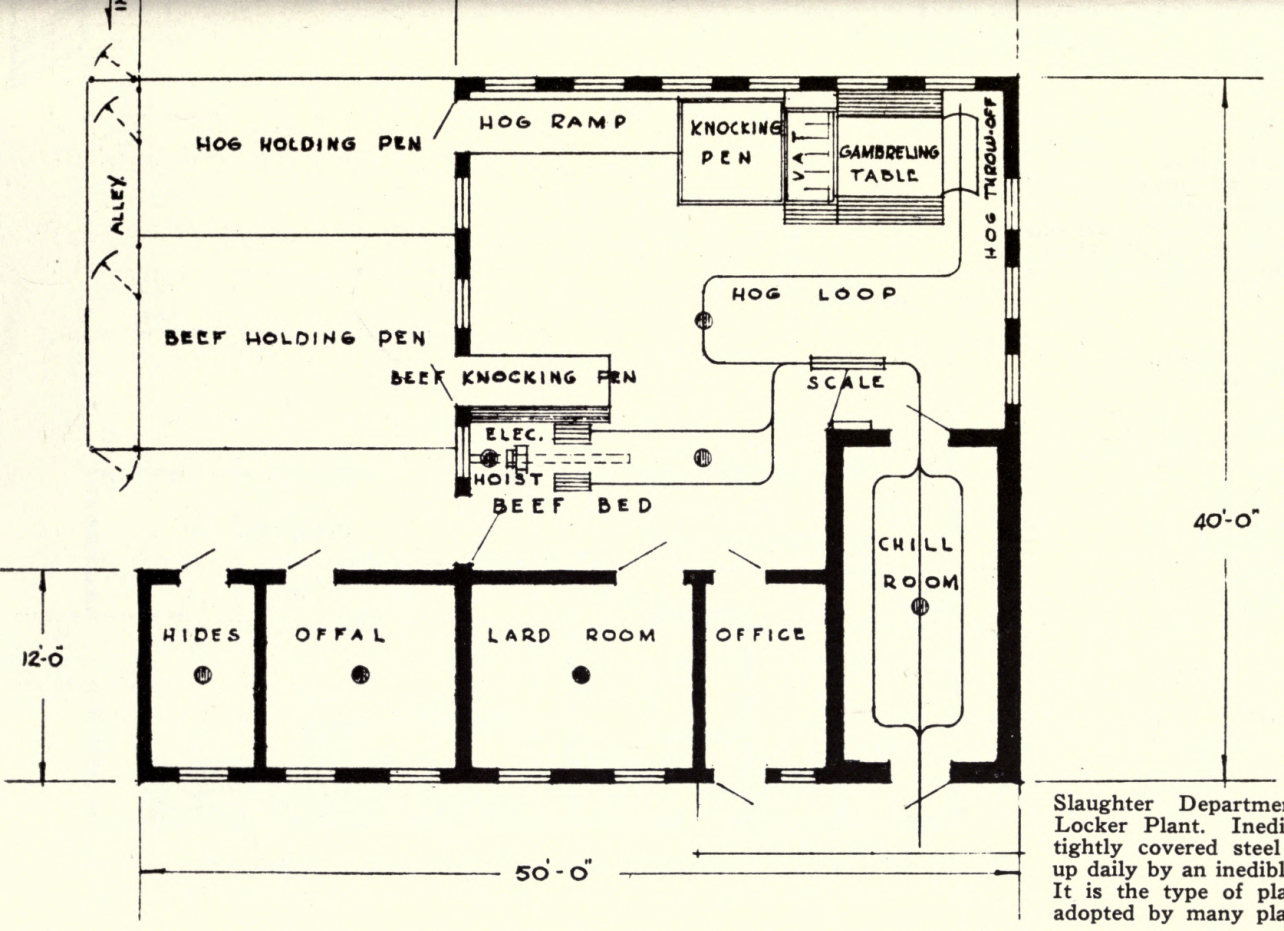
Slaughtering Department, with chill room. This plan is an addition to a locker plant with holding pens on the inside of the building. This was necessary because the plant is located in the heart of the business section of a town of 2000 population.



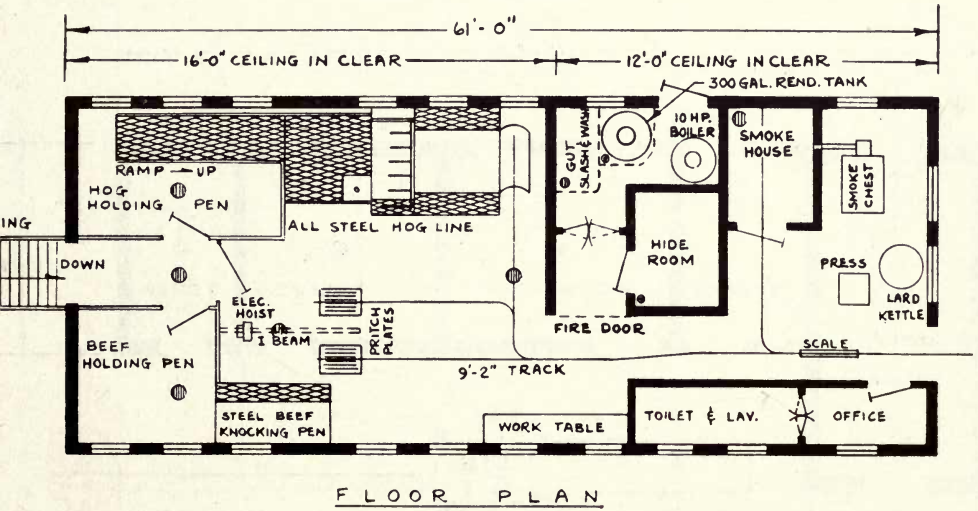
LEGEND

1 BEEF KNOCKING PEN
2 PRITCH PLATES (2)
3 I-BEAM HOIST SUPP'T.
4 ELEC. HOIST (2000#)
5 DRESSING RAILS
6 10'-0" TRACKING
7 HOG SHACKLING PEN
8 STICKERS PLATFORM
9 HOG BLEEDING RAIL
10 SCALDING VAT
11 GAMBRELING TABLE
12 STEAM. BOILER
13 STEAM JACKET LARD KETTLE
14 LARD PUMP
15 HYD. PRESS
16 LARD SETTLING TANK
17 HAM SOAKING VATS
18 TRACK SCALE
19 SLIDING DOOR
20 BLOOD & WATER DRAINS
21 GRINDER
22 SILENT CUTTER
23 MIXER
24 COOKING CABINET
25 STUFFER & STUFFING TABLE
26 SAUSAGE COLD SHOWER

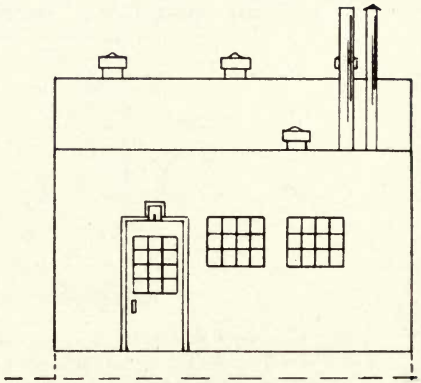
Large slaughter facilities are provided as evidenced by the large chill room which determines the rate of hog slaughter. The kill of hogs could be increased by the addition of a mechanical hog dehairer. Extensive processing facilities are provided including the manufacture of smoked sausage. Holding pen space was limited hence the special chute arrangement of beef holding pen. Smoke houses fired by a pit excavated below the two smoke houses. The slaughtering building is built in a coupalo to give necessary height.



Slaughter Department Attached to a Locker Plant. Inedible offal is held in tightly covered steel barrels and picked up daily by an inedible rendering concern. It is the type of plan that needs to be adopted by many plants in small towns.

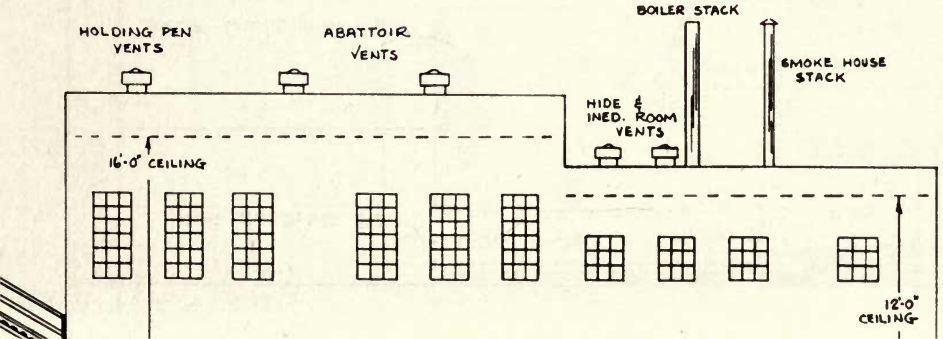


FLOOR PLAN



FRONT ELEVATION

LOADING DOCK AT TRUCK LEVEL SHOULD BE PROVIDED AT FRONT



Plan and Elevations of small slaughtering plant including Inedible Department, also lard rendering and smoking. No refrigeration is provided, for coolers are located at the Locker Plant. This plant was located outside of the city limits of the city in which the locker plant is located.

Range of Temperature and Humidity Conditions

It is recognized that established practices of individual plants may vary from those shown in table. However, the data given approximate those in use by the meat packing industry.

Department and Product Processed	Room temperature °F, DB	Frequency of air recirculation per hour (forced draft)	Relative humidity %	*Symbols for type of refrigerating system
Beef chill cooler	30-31	60-100	85-90	A or B
Beef carcass holding	33-34	12- 15	85-90	A or B
Beef curing (pickle)	36-38	.. ..	.. ..	A or C or D
Beef cutting and boning	36-38	15- 20	50-55	A or C or D
Bacon molding	12-15	20- 30	.. ..	C
Bacon slicing and packing	50-55	10- 15	45-50	A
Bacon storage	28-32	10- 15	65-75	A or C
Calf cooler	32-34	10- 15	85-90	A or B
Cooked meats—fresh	32-38	15- 20	80-85	A or B or C
Canned ham—storage	26-30	15- 20	60-65	A or C
Canned meats cooler	36-38	15- 20	60-65	A or C or D
Dried beef cooler	48-50	10- 15	60	A or C or D
Dry sausage meat curing	36-38	10- 15	80-90	A or C or D
Dry sausage holding	36-38	10- 15	50-60	A or C or D
Dry salt curing	34-38	15- 20	80-90	A or C or D
Hog chilling	28-30	60-100	85-90	A or B
Hog cutting	45-50	15- 20	45	A or C
Lard (off rolls)	65-70	.. ..	.. ..	
Lard storage	45	10- 15	.. ..	A or C or D
Leaf lard cooler	28-30	15- 25	75-80	A or C
Offal cooler (fancy meats)	32-34	15- 20	90	A or B
Pigs feet curing	36-38	10- 15	80-90	A or C or D
Pork sausage chilling	24-26	25- 40	75-80	A or C
Pork cuts—fresh	26-28	10- 15	75-80	C
Sausage cutting and grinding	36-38	15- 20	70-90	A or C or D
Sausage trimming	34-35	10- 15	80-85	A or C or D
Sausage storage—package	45-50	10- 15	88-90	A or C
Freezer	10-15	.. ..	80-90	C
Sheep—lamb chill	30-34	.. ..	88-90	A or B
Storage freezer	0- 5	.. ..	80-90	C
Smoked meats storage	28-32	10- 15	65-70	C
Smoked meats hanging	45-50	10- 15	65-75	A or C
S. P. curing	36-38	10- 15	80-90	A or C or D
S. P. retard cure	26-28	10- 15	80-90	C
Salted hides	50-55	10- 15	85-90	C or D

* A—Forced draft unit cooler either open brine spray or closed ammonia coil with brine defrosting.
B—Overhead deck with open brine spray or ammonia coils with brine defrosting.
C—Ammonia coils—prime surface or fin type or evaporator plates—not under forced draft.
D—Brine coils—not under forced draft.

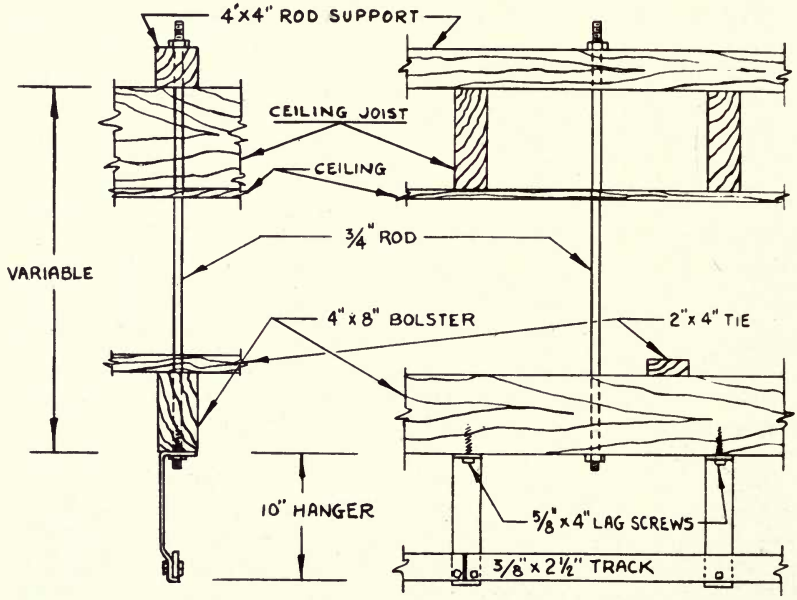
Chill Room and Aging Room

After the quarter of beef has been weighed and tagged it should be taken immediately into the chill room. Freshly slaughtered meat should be permitted to hang in the chill room until all body heat is removed; usually from 12 to 18 hours is sufficient for this purpose. When the body heat has been removed from pork, veal and lamb, and the carcasses are thoroughly chilled, the meat is then ready to be processed into individual cuts. However, high quality beef carcasses can be allowed to remain in the chill room or moved to an aging room and kept for several days to several weeks in order to ripen the meat tissues.

Here are some good rules to follow in planning your chill room:

(a) Space should be provided to the extent of approximately 6/10 square feet per locker for chilling and holding or aging meat prior to cutting and freezing.

(b) This space should be refrigerated to a temperature of 34° to 36° F.



DETAILS OF TYPICAL TRACK SUSPENSION

Where the cooler ceiling is higher than the track, this type suspension may be used. If the ceiling is lower, the rod suspension may be eliminated.

(c) The total space should be divided by a simple, movable, non-insulated partition into space about one-quarter of the whole for chilling, and the remainder to be used for aging and holding after the chilling process. It is suggested that the partition be made movable in order that the space allotted to chilling may later be altered if found insufficient or excessive.

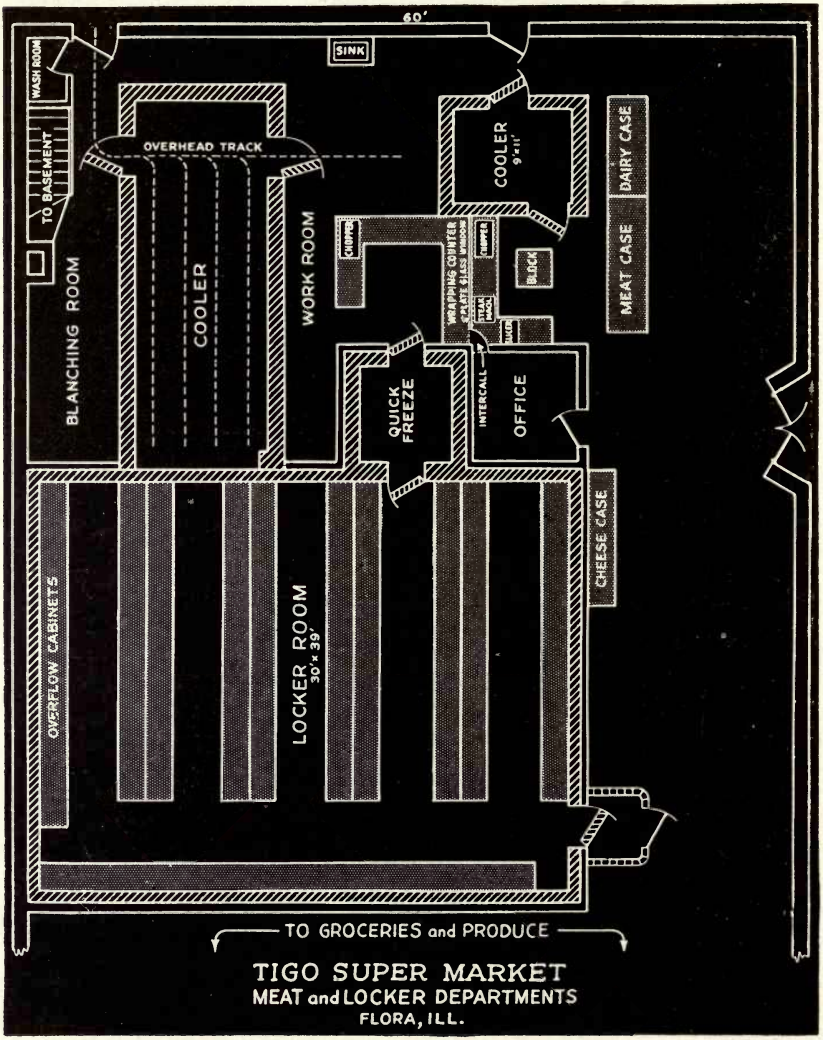
The room should be equipped with tracks or rails placed at a height above the floor of at least 7.2 feet where quarters only are handled; where full carcasses are handled, tracking rails should be 11′-0″ high and arranged in such a manner as to permit the bringing of fresh meat that requires chilling into the chill section first, and then, with a minimum of trouble the moving of the chilled meat into the larger space.

While most plants usually combine their chill and aging rooms into one, where possible a separate aging room is helpful, for when warm carcasses are loaded into the chill room the temperature may be elevated, thus retarding aging. Sliming also is apt to develop. Where the aging period is 15 days, the aging room should allow about 13 feet of meat hanging rail space per 100 lockers.

Many locker plants enclose their cutting and processing rooms in glass. In fact, several states require that this be done.

The locker plant operated in connection with a retail store usually does all its processing in the retail meat department. This eliminates the expense of installing duplicate processing equipment and also enables the retail meat man to cut up locker meats during slack periods in the retail trade. One of the objections raised to the processing of locker meat in the retail department is that some customers might suspect that a dishonest meat man might slice off a roast or steak from the locker customer's carcass he is cutting and put it in the retail display case and sell it as his own.

This objection is easily answered with the statement that any locker operator has just as much chance to steal a steak or roast if the meat is cut in the processing room in the rear and in addition he has a master key to all lockers and has every opportunity for a theft. But not one locker operator in a thousand would think of appropriating any meat that belonged to a customer for he well knows that he would soon be suspected and caught and as a result



This plant has separate cutting rooms and sets of power equipment for the two departments. A glass partition separates the two cutting rooms; patrons of both the meat department and locker plant can witness cutting for both.

the plant would receive such an undesirable reputation that he would be forced out of business within a short while.

However, it is a good idea to cut all locker meat on a separate block so that there will not be any confusion in the mind of the retail meat cutter. A good solution to this problem has been

Received of: Joe Green

Job No. 4103

Date 6/15 Locker No. 317 Our Their Container(s)

Product: 1 Whole Hog Weight 320 lbs.

1st Charges for	Description		Rate	Taxable Sales	Total
House purchase		@	per		
		@			
Sloughtering		@	per hd.		
Processing	320 lbs	@	.02 per		6.40
		@			
		@			

Remarks Cure - 2 hams, 2 sides, 2 jowls, 2 shoulders. Deliver lard to customer.

Total 1st Charges 6.40

Cash Charge

VOGEL'S SUPER MARKET & LOCKER PLANT

(office copy) by L. J.

Hours in Sharp Freezer 11 In: hr. 11 A.M. day 6/16 Out: hr. 10AM day 6/17

To locker No. B702 Date 3/17 By W.W. Job No. 4103

Product Pork Weight No. of Part Job Cards 1

No. pkgs.	Description	Service	Statement		
	Roasts		Grinding		
	Steaks				
	Hamburger		Smoking		
12	Chops Pork				
	Bacon		Curing 112 # @ 3¢	3	36
	Hams				
12	Sausage		Stuffing Sausage		
	Lard				
	Stew		Rendering Lard		
	Leg				
	Tenderloin				
	Patties				
	Soup Bone				
	Chickens		1st chg. unpd.	6	40
	Geese—Ducks		Total	9	76
	Turkey		Credit:		
	Game		Hide		
4	Spareribs				
3	Back Bones				
			Net due	9	76

Receipted by L. J. Date 6/25/ Amount Paid $ 9.76

VOGEL'S SUPER MARKET & LOCKER PLANT

Form FA30a

This filled-out processing form shows the charges that are made by the locker plant for the work done on a whole hog.

devised by a locker operator in Omaha, Neb., who has a separate cutting table for locker meats surrounded with a board one foot high on all three sides so that there is no possibility of any locker meat and retail store meat becoming mixed.

Our quarter of beef is now cut up into steaks, chops, roasts, just about the same as the retailer would cut up a quarter for selling over his counter. The processing tickets contain instructions as to the cuts the family prefers and also the number of people in the family, so he will know about how many steaks or chops to wrap up in each package. The cuts are then placed on a wrapping table ready to be wrapped and stamped with the number of the locker, the items of meat and the particular cuts. The wrapping table should be a sturdily constructed table or bench with a wooden or linoleum surface where the meats can be wrapped with speed and ease. After the meat is wrapped, each package should be marked with the customer's locker number, contents and date of freezing, as now required by law in many states.

The Freezer

Up to now the quarter of beef we have been following through the locker plant has been handled in a manner similar to which meat is handled and processed in a retail meat market. But here

Frozen corn and frozen strawberries—two of the more popular items that may be prepared in the preparation room of the well equipped locker plant.

The basic revolution brought about by the frozen food locker plant started right here—in the freezer. Not until it was discovered that foods would retain their nutrient values and flavors when frozen at low temperatures did the food locker industry become a possibility. Thousands of Americans now prefer foods that have been frozen to those not frozen, regardless of season.

the similarity ends. The package of meat must now be subjected to sub-zero temperatures so that all of the flavor, color, taste and nutritive value of the original product will be perfectly preserved. The foods to be frozen are placed in a cabinet or room at a temperature of zero to minus 20 degrees (depending on the type of freezer used) and usually left there overnight to insure a perfect freeze.

The freezer is really the heart of the entire locker plant operation and the quality of foods stored in the locker plant is largely dependent on the perfection with which the foods are frozen in the sharp freezer.

It is highly important that every piece of food to be stored in a locker be frozen. In most states having any considerable number of locker plants, this is now required by law. There should be no deviation from this rule, for serious trouble is bound to result if the freezing process is side-stepped. In the past some of the early plants constructed on the West Coast and some

smaller and ill-equipped plants put foods directly into the lockers and let them freeze at locker room temperature. This is a bad practice and if this procedure is still followed anywhere in the country today it is to be strongly condemned. When foods are frozen slowly at locker room temperature, they not only lose their original fresh properties, but if a large quantity of warm merchandise is put into lockers at one time it will seriously raise the temperature of the room to the extent that other products may be partially thawed. The phenomenon of freezing is based on the scientific fact that the various chemicals (salt, sugar, water and acids) freeze at the temperature at which the complete solution solidifies instead of disintegrating the solution by freezing the various component parts at their individual freezing temperatures, as is experienced in the slow freeze process. Truly, freezing is the key to the success of the refrigerated locker plant.

Air Purification and Odor Control

The maintenance of air purity in refrigerated food storage spaces is of the utmost importance. It insures protection of the quality and freshness of the perishable products stored, prevents contamination and inhibits flavor transference. It contributes to customer good will by assuring a pleasant, odorless atmosphere in the locker and service areas.

It is well known that the admission of outdoor air to refrigerated food storage spaces must be kept down to a minimum in order to:

(1) Reduce the refrigerating load;

(2) Exclude outside air-borne microorganisms; and

(3) Retard ripening and decay caused by excess oxidation.

This limitation of outdoor air dilution, however, allows undesirable odors, putrescent gases, flavor esters and the like to accumulate within these spaces and which must be controlled.

Eliminate Odor Economically

Fortunately, there is a practical and economical way to eliminate the odors and extraneous air-entrained gaseous and vaporous impurities which would otherwise become concentrated in chill, freezing, aging and locker rooms. The medium available for this purpose is gas absorbent activated carbon which will extract from the air and retain all of these air-borne contaminants.

The type or quality of activated carbon having the requisite characteristics for air purification is specially processed and impregnated, crushed and screened to precise and uniform granules and should conform to the following minimum standards:

Weight (dry)	32 lbs. per cu. ft.
Apparent density	0.45 to 0.52
Activity (for carbon tetrachloride)	65%
Retentivity	32.5%
Ash content	2% by weight
Hardness (ball abrasion method)	85%
Washed and dried to moisture content not exceeding	1% by weight

Such carbon is hard, abrasion resistant and free of dust and can be repeatedly reactivated (re-energized when exhausted) without loss or deterioration. Activated carbon merely removes impurities from the air. It neither adds anything to nor alters the chemical composition or thermal state of the air coming in contact with it.

The carbon-containing equipment must be designed to provide an adequate quantity of carbon to last a reasonable period of time before it is saturated and requires reactivation (usually one year or longer) and to insure that all air to be decontaminated will flow uniformly through the carbon beds.

Activated carbon air purification equipment is available both in self-contained air recirculating units or separately for attachment to existing cold diffusers, room coolers or conditioners.

For those plants employing direct-expansion cooling equipment without mechanical air circulation, a self-contained air circulating type of air purification unit is recommended, similar to that illustrated. It consists of a cylindrical cage of closely spaced, perforated, carbon-filled tubes surrounding a built-in, quiet-operating, circulating fan and motor so arranged that, while operating, the room air is repeatedly drawn through the unit and re-discharged to the room. The design is such that approximately one-third of the total air circulated is constantly being purified and de-odorized.

Five Air Changes An Hour

For average good results the unit should recirculate a volume of air per minute equivalent to one-fourth of the volume of the

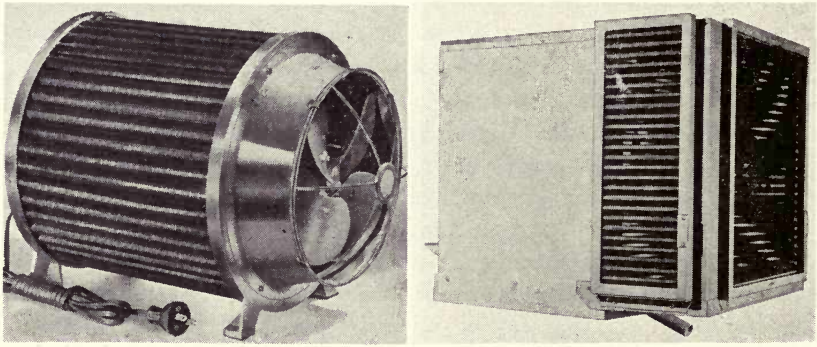
room it serves. By decontaminating one-third of this volume continuously, a ventilation effect equivalent to five air changes per hour is obtained.

In areas of above average odor generation, such as pre-chill rooms, a slightly larger unit providing a more rapid ventilation rate may be desirable. It is mounted portably, may be moved from room to room and operated intermittently as required. It is placed so as not to discharge the air directly at the carcasses.

In large rooms it is preferable to use several units properly distributed rather than one central unit. The forced air circulation created by these unitary air purification units will also contribute to the efficiency of the cooling coils and the maintenance of more uniform temperature conditions throughout the room.

For those plants equipped with cold diffusers or central refrigeration systems which already provide mechanical air circulation, panels containing one or more rows of perforated carbon-filled tubes are available for insertion in air ducts or attachment to the cooling or conditioning apparatus.

Multiple panels of large face area are built around the air intake side of the diffuser so that all the air will pass through them at low velocity and without creating excessive resistance to air flow.



Various sizes of circulators and de-contaminators for air in the locker room are available. Such devices (left) keep the air in continuous motion while purifying one-third of the air circulated. Right, how air purification panels are applied to a typical cold diffuser. Panels are made in various sizes to fit cooling units and air circulating systems. Air freshness is assured because the impurities are extracted when the room air circulates through the panels.

It is recommended that the locker operator consult with the manufacturer of carbon air purification equipment to insure that equipment of proper design, adequate to the requirements and consistent with the greatest economy will be applied.

Ultra Violet in the Aging Room

Another highly desirable feature for locker plant chill rooms is the installation of electronic lamps giving off ultra-violet rays. These germ-killing rays will kill bacteria in the air and on the meat and at the same time permit the chill room to be held at a higher temperature, thus permitting faster tenderizing of meat as well as saving power costs. In addition, ultra-violet ray lamps are very advantageous in that they keep the air clean and give the cooler a sweet-smelling fragrance. It is especially desirable that the locker plant chill room have a pleasant odor since some locker customers go into the chill room. Lethal ultra-violet lamps eliminate this unpleasant odor by destroying bacteria brought into the cooler on freshly-killed carcasses. Temperatures in a chill room equipped with lethal ultra-violet can be kept at 40 degrees.

A portable electronic unit permits maximum use of the unit throughout the chill room. For instance as soon as a farmer brings in a freshly killed carcass the meat can be purified by swabbing the entire carcass by holding the electronic unit close to the meat for a few seconds. In this manner, all of the meat brought into the plant, no matter under what conditions it was slaughtered, will be freed from bacteria.

Naturally it is to the advantage of the locker operator to do everything possible to improve the quality of meat for his locker patrons. Virtually all of the meat brought into a locker plant is slaughtered by the farmer only a few hours before. The aging process can be greatly speeded up with the installation of electronic ray units in the chill room for these units permit the box to be held at a higher temperature and thus the meat ages much quicker.

Cutting and Processing Room

Now that the beef we are following through the locker plant has been properly chilled and aged it is ready to be taken into the

cutting or processing room. This should be a room of generous proportions (see table for suggested floor space to allow).

Table of Areas for Meat Cutting Room

Size of Plant	Minimum	Recommended Space	Considered Desirable by Some
Up to 167 Lockers.....	140 sq. ft.	175 sq. ft.	276 sq. ft.
Up to 333 Lockers.....	170 sq. ft.	212 sq. ft.	393 sq. ft.
Up to 500 Lockers.....	200 sq. ft.	250 sq. ft.	450 sq. ft.
Up to 667 Lockers.....	300 sq. ft.	375 sq. ft.	500 sq. ft.
Up to 833 Lockers.....	330 sq. ft.	450 sq. ft.	540 sq. ft.
Up to 1,000 Lockers.....	360 sq. ft.	500 sq. ft.	590 sq. ft.
Up to 1,200 Lockers.....	390 sq. ft.	550 sq. ft.	650 sq. ft.

The cutting and wrapping room should be in full view of patrons, lobby, and office. Power saws, power grinders, stuffers, etc., are good advertising. Action has customer appeal. Clear

This is a well equipped meat cutting and wrapping room. Women do a good job on the wrapping table where their manual dexterity stands them in good stead. Generally speaking, the equipment needed for a cutting room is the same as that needed in a retail meat shop, plus locker wrapping papers.

vision for the public trends to force operators toward clean lines of operation. Power equipment emphasizes the efficiency of the locker plant processing.

The cutting and wrapping room should be arranged so that all products for processing move through without crossing lines of operation. Thus, equipment should be arranged so that operations move from the chill room to breaking block and table, thence to trimming table or block. Pork products should move three ways—for curing, to the curing room; trimmings and fat to the grinder; items to be sliced and wrapped to the power saw and wrapping table. After wrapping and stamping items, they should be placed in baskets and moved directly to sharp freezing room, as customers' meats should be handled as separate items and moved into the freezer without delay.

The use of baskets saves time in moving products into and out of the sharp freezer, and to a large extent, eliminates the possibility of mixing patrons packages in performing this operation. The use of shelved trucks or dollies of proper design for moving baskets may also save time in larger plants.

Sink equipped with running hot and cold water should be in, or available to, the cutting room for washing utensils and other equipment. Good drainage should be provided so that processing room can be scrubbed and cleaned every day. For trimming chilled hogs, a pail of hot water in which to keep knives will be found to speed pork trimming and will do a neater job.

Equipment

Choppers. Considerable study has convinced leaders in the locker plant field that chopper capacity should meet the following minimum standards:

Up to 250 lockers, the choppers should be 700-pound capacity, equipped with lard plates and plates for chopping, as follows: ⅛-inch holes (fine); ¼-inch holes (medium, and ⅜-inch holes (coarse).

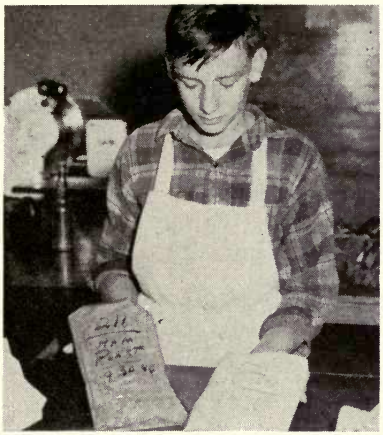
For 250 to 1,000 lockers, there should be two choppers, each of 700-pound capacity, one to be equipped for lard and coarse grinding. For better hamburger, all meats should be first ground through the coarse lard plate and mixed thoroughly before fine grinding.

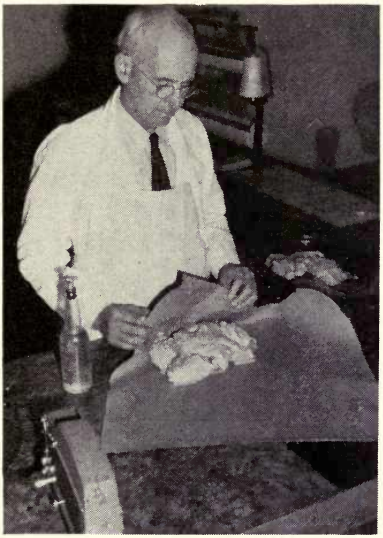
This is a cutting and wrapping room in a large-volume locker plant. In many smaller plants, or in combination food stores and locker plants, the meat cutters have time to do the wrapping as well as the cutting. The invasion of the power saw into the retail meat market is not yet complete, but practically every locker owner considers it as essential as his compressor.

Power Saws. A plant of 250 to 300 lockers should have a good one horsepower saw. A larger plant of from 300 to 1,000 lockers should have a 1½ horsepower saw. Plants even larger should have one of each. If the cutting room is not adjacent to the locker room, office and lobby, an additional three-quarter horsepower saw will help give quick service to the customer who wants a few chops, a few slices of ham, or a quick roast.

Cutting blocks. Plants up to 250 lockers should have two blocks, one break block 30x36 inches, and one for trimming, 24x30 inches. For plants from 250 to 1,000 lockers, we recommend two blocks of the 30x40 inch size. Larger locker plants should have blocks in accordance with the number of choppers and saws in operation. We do, however, recommend one break block, 30x60 inches, and additional blocks to meet requirements. We further recommend a cutting board, either 12x18 inches, or 18x24 inches in size.

Cutting tables. We recommend one cutting table, 10 feet x 30 inches, to be placed alongside the power saw, and one sorting table 10 feet x 30 inches, to be used in preparing meats for wrapping. Wrapping benches and tables should be figured 8 feet per person, with a minimum of 14 feet.





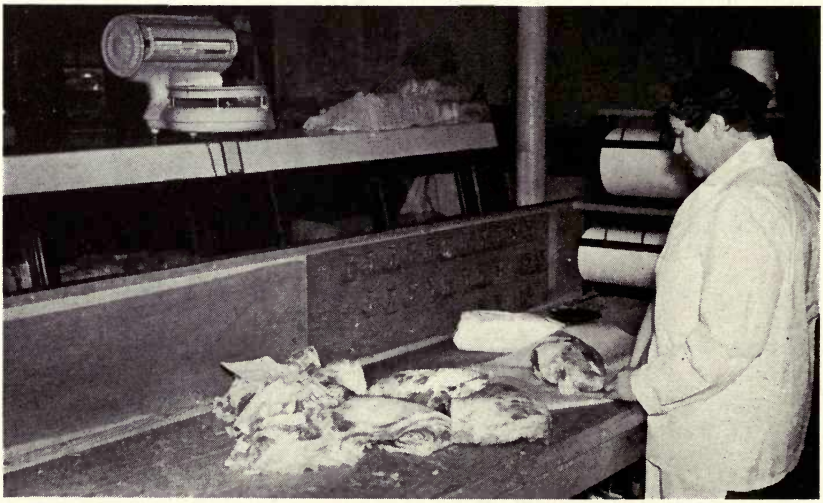
Here are some operational ideas that involve equipment. Top: left, pork and beef items are wrapped in papers of different shade to make it easy for the customer to find what she is after. Right, half-size, or twin, lockers make up the top tiers in many plants. Their use for small-sized families or as overflow space from other lockers is quite general. Left, below: poultry is sprinkled in some locker plants before wrapping on the theory that a thin coating of ice will help preserve the meat. Right, a freezing basket taped to an ordinary super market pushcart makes a good improvised locker plant truck.

We further recommend a good **tenderizing machine,** so individual steaks can be cut and tenderized to customer requirements. We also recommend a 24-inch **dial or cylinder type scale.**

Stuffers. For small operations in plants up to 250 lockers, we recommend a cylinder bench-type machine, not smaller than 18-pound capacity. However, a 38-pound capacity is more desirable. For larger plants we recommend a floor-type upright, hand or combination air stuffer, of 54 to 60-pound capacity.

Rendering kettles. When using an open-type kettle for gas, coal or wood, the average locker plant should have a kettle of 60-gallon capacity, with a No. 3 cylinder lard press and a 75-gallon double-jacketed lard cooler, with double-action agitator. For larger plants where steam is available, we recommend not less than 100-pound capacity, steam jacketed kettle, with a No. 2 hydraulic lard press, and a 100-pound double jacketed lard cooler with double-action agitator.

Portable smoke houses. For inside smoking where a portable smoke house for gas or wood is desirable and can be used in plants up to 250 lockers, we recommend a 250-pound capacity. For larger plants where facilities will permit inside smoking and



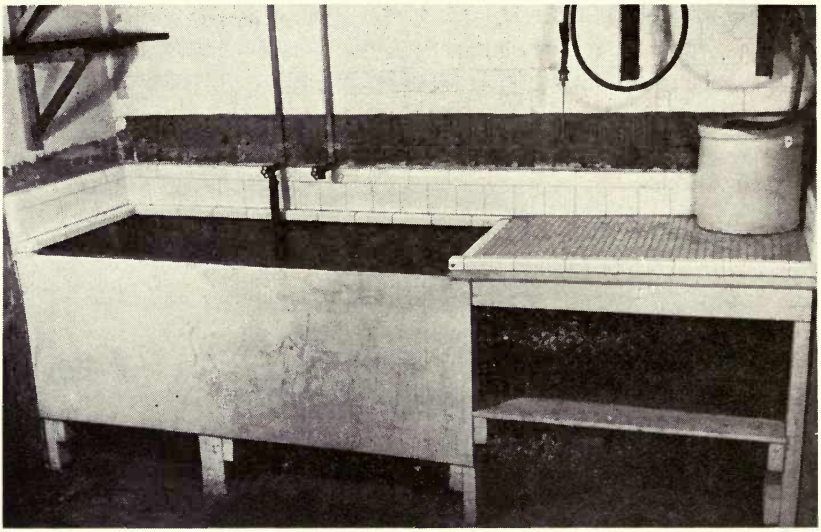
To avoid any danger of confusing locker meat with retail meat in markets handling both, a separate wrapping table, like the one shown here, is helpful.

the use of a portable smoke house for gas or wood, we recommend a 500-pound capacity. These can be added to when necessary. For heavy duty smoking, it is best to adhere to the outside constructed smoke house.

Miscellaneous. Items used in the modern up-to-date processing room:

Magnetic steels
Market cleavers
Steak knives, 10 and 12-inch
Skinning knives, 5 and 6-inch.
Boning knives, 5 and 6-inch
Flexible boning knives
Hand saws
Lard ladle
Block scrapers
Block brushes
Electric block scraper
Roast beef tiers
Wooden skewers
Oil stone for sharpening
All types of locker plant stamps
Freezer baskets
Slicing machines
Tenderizing machines
Platform scale
Freezer trucks
Market frocks
Woolen frocks for freezer
Butcher aprons
Floor mats where necessary
Floor brooms, mops and soap powder
Galvanized pails
Sanitary metal, bone and suet cans
Lard stirrers
Lard dipper
Lard skimmer
Waterproof aprons
Marking tags and fasteners
Wrapping paper
Cellophane paper
Twine and tape
Tape machine
Square hooks, long and short
Thermometers
Tying string of the roast type
Hand or power driven sand stone for sharpening purposes
Smoke sticks
Block surfacer or scraper
Sausage and hamburg mixing tubs
Paper cutters to meet requirements
Skull or overseas caps
Bacon hangers
Floor scrapers
Lard pails and containers
Rubber scrapers
Hand trucks

The freezing cabinet or room should have a capacity both in size and refrigeration equipment for freezing at least five pounds of food per locker per day, based on all lockers being rented. Standard wire or sheet metal trays of 17 by 28 inches



Cleanliness, which is vital in all meat processing, is enhanced with good equipment. Here's a model pumping table and ham soaking vat. The tile drainboard and the tile-lined vat are easy to clean and keep sanitary.

Freezing baskets are usually made of wire and are four inches deep. Each will store around 40 pounds of meat and are placed in the freezer with the load. The baskets are then used as carriers for the frozen items when they are being taken to their proper lockers for storage. Some locker men tag each basket with the locker number of the owner of the foods. This helps keep all items straight and makes storing a simple job.

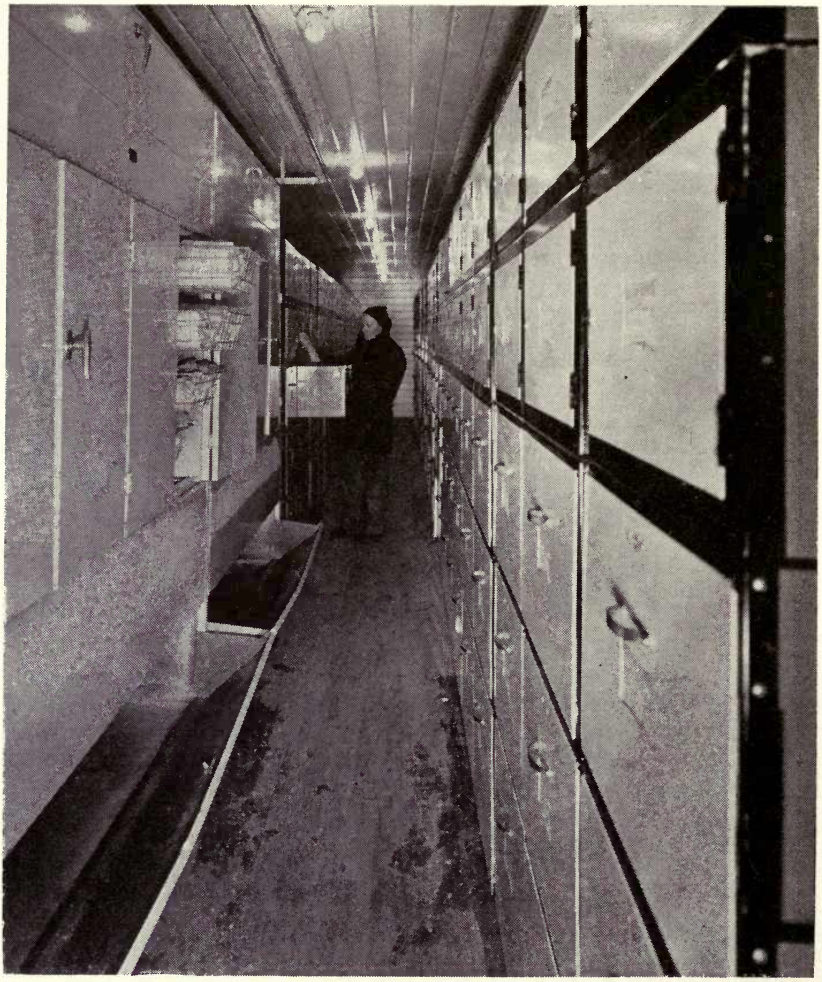
usually hold about 40 pounds as a maximum. This means that about 13 to 14 feet of freezer shelf space 17 to 28 inches wide should be furnished per 100 lockers. The freezer cabinet should be equipped with a lock so that the merchandise in the cabinet can be protected from the possibility of customers opening the cabinet and stealing some of the merchandise.

A desirable feature, in all cases, is a reach-in entrance from the cutting room to make loading of the freezer more convenient. This can be an insulated pass-door measuring about two feet square which will permit the operator to stand in the cutting room and push merchandise directly into the sharp freeze cabinet. If such an outside door is used, it must be heavily insulated because of the temperature difference. When the merchandise is frozen the operator goes inside the locker room and opens the inside door to the sharp freezer, takes the merchandise out and puts it directly into the customer's locker. Further details will be given in our later chapter on "Refrigeration".

Locker Room

Now that our quarter of beef has been cut up, wrapped and frozen, it is ready to be put in the locker and left there until the consumer is ready to take it home and serve it. In many respects the locker room is the main part of the plant, for it is here that the foods are kept in perfect condition until the customer is ready to use them. Even the name "locker plant" has been acquired from the locker room and has become so popular that now the entire industry is known as the locker plant industry, or frozen food locker industry. The locker room should be kept at zero degrees and never be permitted to go above 5 degrees.

In designing a locker plant, the first thing to take into consideration is the locker room, and the number of lockers it is to contain; for the equipment, size and location of the remainder of the plant is based on the locker room. The locker room is a well-insulated room built to hold the number of lockers desired and also in most cases, the sharp freeze cabinet. In judging the size, a good estimate is to allow nine cubic feet for each locker. Thus a plant with 250 lockers should have 2250 cubic feet, and a plant with 300 lockers should contain 2700 cubic feet. The layout should be planned so that both lockers and sharp freeze cabinet will be arranged in the most compact manner to fit the space



One grocer found he had space in the basement of his supermarket building for 2500 lockers. Here's his locker room, with the freezing cabinet at left.

available for the locker room. All aisles should be at least 36 inches wide so that customers can walk about with ease and so that drawer-type lockers can be fully extended.

Caution should be taken in planning the location of the overhead coils or plates if they are used, for it is important that they hang only over the aisles and do not extend over the tops of any of the lockers. The reason for this is in defrosting or scraping

the frost from the coils or plates the frost will drop into the aisle where it can be swept up and will not fall on top of the lockers where it is difficult to remove. It is also essential to ascertain just how far down from the ceiling of the locker room the plates or coils will extend and then make the ceiling high enough so the plates or coils are at least one inch higher than the top of the lockers. Otherwise, the doors of the top row of lockers may hit the coils or plates and thus the doors cannot be fully opened and the top row of lockers may become totally useless. As in the case of the sharp freezer, refrigeration can be provided by means of coils, plates or a blast freezer.

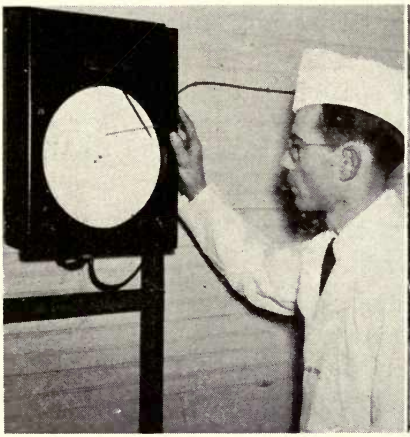
Where a locker plant is installed in a food store, the door to the locker room whenever possible should open directly into the food market, preferably along one side of the meat display case. The entrance should not be directly in back of the meat case as it is not advisable to have people walking among the meat blocks, electric power saw, and thus getting in the way of the meat cutter. Whenever possible, the floor of the locker room should be on the

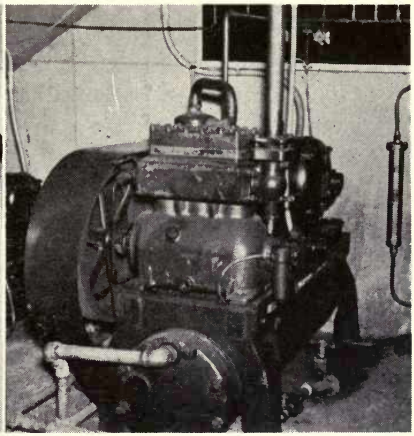
Locker rooms generally present a good appearance because they are white and easy to clean. Coils or vacuum plates are placed over the aisleways so that when defrosted, the deposit will fall on the floor, where it may be easily swept up, rather than on the tops of the lockers where it would accumulate.

same level with the floor in the market, in order to eliminate a step. Of course, this cannot always be done when the locker room is built on the floor of the store, but whenever a special building is erected to house the plant, provision should be made to have the locker room floor flush with the outside floor.

As the locker room is the one part of the plant that customers come in contact with the most, everything should be done to make it attractive and convenient. The hinges on the heavy insulated door should be oiled so the door will swing as easily as possible and the latch should be adjusted so that it will operate with the minimum of effort. The room should be well illuminated so customers can see the packages even in the back of the locker. Ladders used by customers to reach upper rows of lockers should be substantial, yet light enough so they can be moved from one locker to another. No ice or frost on which a customer might slip should ever be permitted to remain on the floor. Likewise no containers, boxes, or cartons should be allowed to be on the floor anywhere in the locker room.

Exchange of air between the zero locker room and the warmer outside rooms is necessary. Here are two ways this has been managed by locker plant owners. Left, a double swinging door arrangement; and right, a heavy canvas curtain.





Automatic thermometers, publicly displayed and registering the temperature inside the zero locker room, are required in laws covering locker operations in some states. Right, a 10-horsepower compressor for 600 lockers and freezer.

Minimum space for aisles is 34 inches. This permits drawers on opposite tiers of lockers to open fully. A better width is 36 inches.

Here is a summary of the essentials to be considered in designing your locker room:

1. The locker room should have space for steel lockers placed in convenient rows with 36-inch aisles between rows. Floor space required per tier is usually 8 square feet. Some additional floor space should be provided for entrances.

2. It is recommended that tiers of lockers five or six high be used, having three or four drawer units in each tier.

3. Temperature should be maintained at 0 degrees F. or lower at all times and a recording thermometer should be provided in a conspicuous location to keep a continuous record of temperature. Most states require the thermometer to be outside the locker room, in public view.

4. Walls should have a smooth, washable finish and be of some material that will not absorb odors or give off odors.

5. The patron door into the lobby should be of the cold storage door type, not less than 2 feet 6 inches x 6 feet 6 inches, with a door closer and with a fastener easy to operate that will hold the door in a position to prevent warping.

6. One or more windows should be provided in the wall or door of the locker room adjacent to the lobby or similar space. These should consist of several layers of glass each with air spaces between and provisions against frosting.

7. Each aisle should be provided with a stepladder of suitable design for this purpose, preferably on wheels and non-tippable and having a platform at the top for holding baskets, either for patron or operator use.

8. A suitable alarm bell or buzzer should be provided with a button placed just inside the patron locker room door in a conspicuous place. Some have telephone or intercommunication systems.

9. Slight illumination should be provided in the locker room at all times during operating hours through a switch available only to the operator.

10. Main locker room illumination should be controlled through a switch placed conveniently for the patrons, and a signal light should be provided to indicate to the operator when this illumination is on.

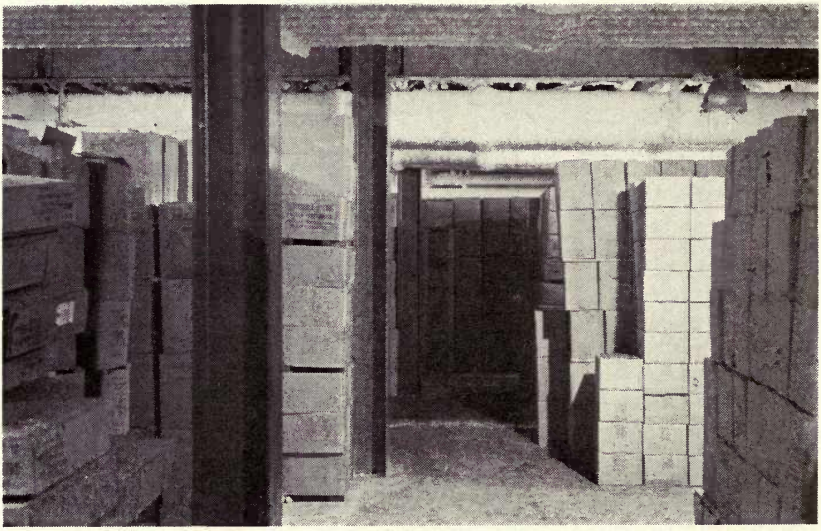
11. It is suggested that the locker room be built in combination with the bulk storage room in such a manner that some of the lockers may be removed to permit increased bulk storage or vice versa, as may prove necessary or desirable under future operating conditions.

Steel lockers have come to be accepted as standard throughout the industry because they are sturdy, easy to install, attractive in appearance, offer protection against fire and theft, and are sanitary.

The average locker will hold from 200 to 250 pounds of food, depending on how fully the space inside the locker is utilized by the customer and the type of containers used. Each locker is equipped with two keys which fit only that particular locker. The plant operator has a master key to permit placing the customers' goods in the lockers. Steel lockers can be purchased in any quantity desired and because of this few locker plants begin business with the maximum number of lockers which the plant can contain. A plant can start operation with only one-half or

This arrangement makes the freezing cabinet easily accessible. Note that the lowest two tiers provide more space than top three tiers; they also bring more.

In many a farm community, a large bulk storage room is more profitable than the same space devoted to individual lockers. Strawberries, apples, peaches, poultry or other products may be stored until the peak of the volume has passed, then sell at a better price than they would bring if left at the mercy of the market. Space thus set aside in the zero room may be utilized as locker space later if the demand justifies it.



two-thirds of the full number of lockers and install additional lockers of the same size and design as business necessitates. In this way the initial investment can be reduced and extra lockers can be bought when the plant is in a better financial state.

Half-sized lockers, known as twin lockers and "2-in-1" convertible lockers, are manufactured to fill the need for a smaller-sized locker. This locker offers an opportunity for additional rentals and an added service which will be appreciated by many present locker renters. Some prospective customers who are not completely sold on the advantages of a locker can be induced to rent half-sized lockers until they realize the benefits of locker storage and then they can be sold a full-sized locker. Such a locker is also handy for the person who requires an extra amount of space for a short while to store some surplus foods. Hunters and fishermen often desire to rent a small-sized locker for a few months. Twin lockers help to eliminate the nuisance of having customers with full lockers ask the operator to store some extra foods for a few weeks on top of the lockers or in a bulk storage space. With several of these lockers on hand, the operator can tactfully say that he has no space for surplus foods, but will be glad to rent one of the half-sized lockers for a short period of time.

Bulk Storage Space

Many locker plants have found it advantageous and profitable to install a bulk storage room kept at 0° F. for use by large consumers, such as restaurants, fraternities, schools, hospitals, and intitutions, and for the overflow from patron lockers, and possibly to be used later for room expansion. It is suggested that the space be constructed as a part of the locker room, and be partitioned off from the locker space by a simple, non-insulated wall, so that, at a later date, if it becomes necessary, the partition can be moved to change the proportions of the locker space and the bulk storage. The volume of bulk storage space to be provided will have to be determined on the basis of local conditions.

Fruit and Vegetable Processing Room

It is considered desirable to provide a room for the final preparation of fruits and vegetables (i.e., mixing with sugar or syrup in the case of fruits, and blanching in the case of vegetables) and the packaging of same.

If possible, this room should be placed adjacent to the meat cutting room, and should be accessible without the necessity of persons passing through the meat room.

Equipment should include, besides suitable table space, at least a blanching kettle with special gas burner or stove for rapid heating, two sinks with cold running water, and bench scales.

It is obvious that the present system of home preparation, home blanching, and home packaging is cumbersome, laborious and highly inefficient. Sooner or later an improved system will be forced upon us whether we like it or not. Under the present system, the housewife must first go to the locker plant and buy containers for an unknown or guessed-at amount of produce and take them to her kitchen.

The housewife is seldom equipped to do the blanching and packaging. She does not have the necessary kettle or the necessary amount of boiling water for blanching nor ice water for immediate cooling. She cannot streamline the operation. She has no hot water thermometer; she is uncertain of her timing and in some cases dreads the operation. She would be greatly relieved if provisions could be made to do the blanching and packaging under supervision at the locker.

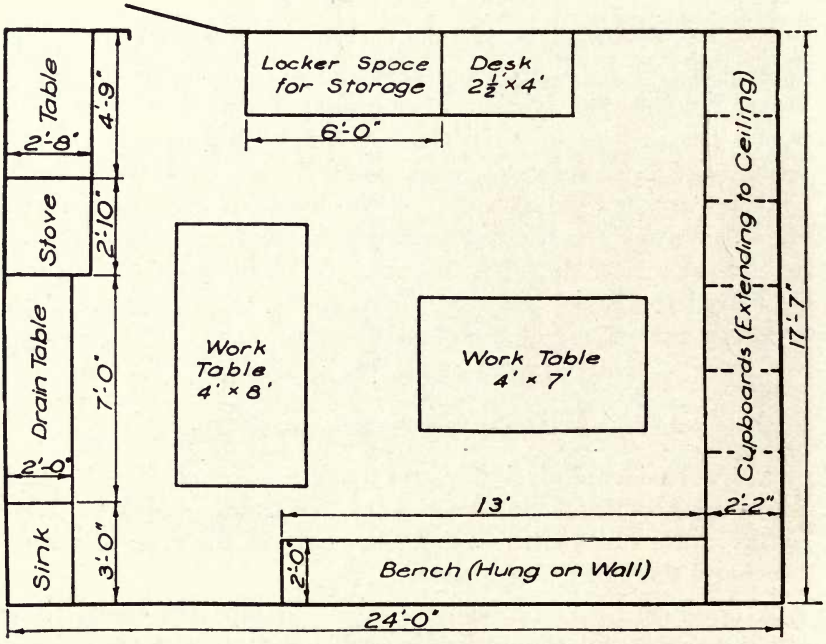
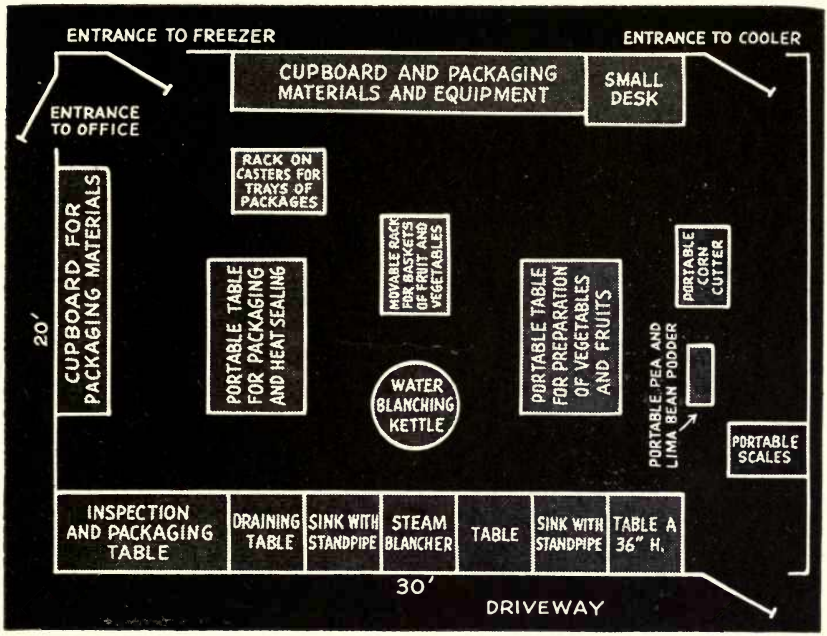
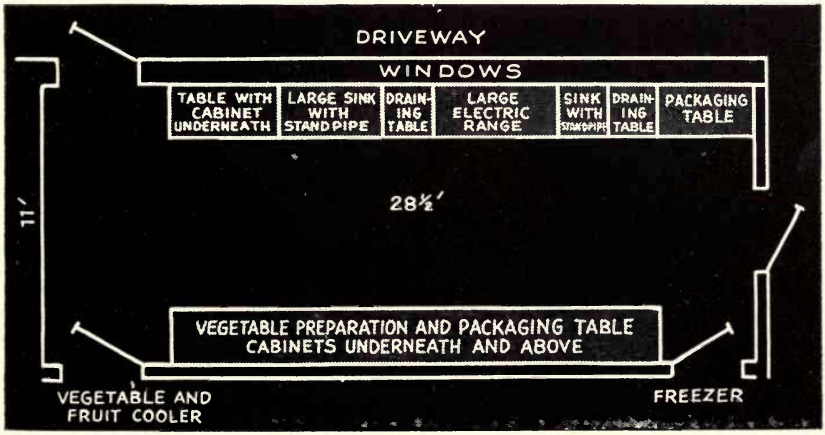


Fig. 1

Floor plan for a fruit and vegetable preparation room.



A well equipped fruit and vegetable preparation room. To make the operation of this room profitable, a large volume of foods must be run through it; and for large volume, this more completely equipped room is recommended. Much of the equipment is movable, as experience has shown that many steps may be saved through re-arrangement, depending on the foods being processed.



A small fruit and vegetable preparation room. This is a suggested arrangement for equipment in a preparation room suited to use by locker plant employees, or to the locker patrons themselves. Accessibility to driveway, cooler and freezer all are desirable though this may not be possible in all cases. Use of a larger room, if available, is recommended.

Since locker plants are necessarily unlike in architecture and arrangement, only the most general suggestions can be made. Streamline the operations in so far as possible. Have the ready-prepared fruits and vegetables delivered at a side door or back door and move them in orderly succession through the blanching tank, through the cooling tank, over the packaging table, to the sharp freezing room. If the patron is to assist in the operation there will need to be a dressing room. Heat for the blanching tank may come from the regular boiler or from a special gas or electric heater. Have the wire baskets made to fit easily in the blanching tank. Have timing clock and blanching schedule at hand and in easy sight of both the patron and the operator. Move the baskets directly from the blanching tank to the cooling tank which may be iced to hasten cooling.

From the cooling tank the blanched and cooled vegetables should move forward to the packaging table. Here is where the patron may assist in the operation to the greatest advantage. The containers may be on shelves over the packaging table within reach of the workers. Ladles and dippers of varying sizes may be used for the different products. The containers should flow naturally from filler to sealer, to the freezing room.

In fruits the final preparation as well as the packaging may be done at the locker plant. Strawberries and raspberries may be stemmed and receive their final washing. Cherries may be pitted in a machine and washed. Peaches may be steam-peeled and pitted at the locker plant. Dry sugar may flow from an overhead hopper and syrups of varying density may be made and cooled in advance. These should move from the preparation table to the filling table, to the freezing room.

Not only should the locker plant service relieve the patron of the labor and the unpleasantness of blanching and packaging her vegetables and of preparing and packaging her fruits and vegetables, but it should also result in better quality frozen products because of the greater speed and greater accuracy of the operations. This, in turn, should lead to an even higher degree of satisfaction for the already well-satisfied patrons.

Curing Room

A room should be provided for the curing of hams and bacon. For a 350 locker plant, a room about 20x30 feet will do, but it is best to allow space for expansion. The size of this room will vary in different parts of the country. At the present time over 40 percent of all the locker plants in the country offer curing services to their customers. This figure is based on a survey made by the U. S. Department of Agriculture.

As to the cost of curing meats, definite figures are not available

Familiar scenes in the modern locker plant. Left, an aging room, with complete track facilities and ultra-violet equipment. Right, a section of a curing room, with tags in each bin to show ownership and status of curing.

The shelves pictured here slope toward the front so that the curing solution may be drained readily. Drippings are carried to pail in trough.

because curing operations vary, but a check of some typical curing plants reveals that costs for curing averages about ½-cent to 1¼ cents per pound. Many locker plants charge from 3 cents to 5 cents per pound for curing. There is no doubt that a curing and smoking department is not only a profit maker, but it will bring many new customers into the establishment.

There is nothing complicated or difficult about building and operating a curing department. Complete details are given in the blueprints which appear on the following pages. This curing room measures 19 by 31 feet and has space for 150 bins in addition to room for preparing the meat. The bins consist of 30 single sections and 10 double sections, the bins being three tiers high. The lumber needed is as follows:

75—1″ x 3″ x 16′	188—1″ x 4″ x 16′
63—2″ x 4″ x 14′	153—1″ x 4″ x 10′

Lumber necessary for the curing room table is as follows:

1—1″ x 10″ x 5′	1—2″ x 6″ x 16′
1—4″ x 4″ x 12′	3—1″ x 4″ x 12′
1—2″ x 4″ x 10′	1—1″ x 2″ x 10′

The above specifications apply to the layout as shown on the following pages and will provide the exact amount of lumber needed. However, the lumber necessary for a curing room of any size can be determined from the following figures which are based on units of four sections each. Single sections would be the ones next to the walls and the double sections the ones in the center of the room.

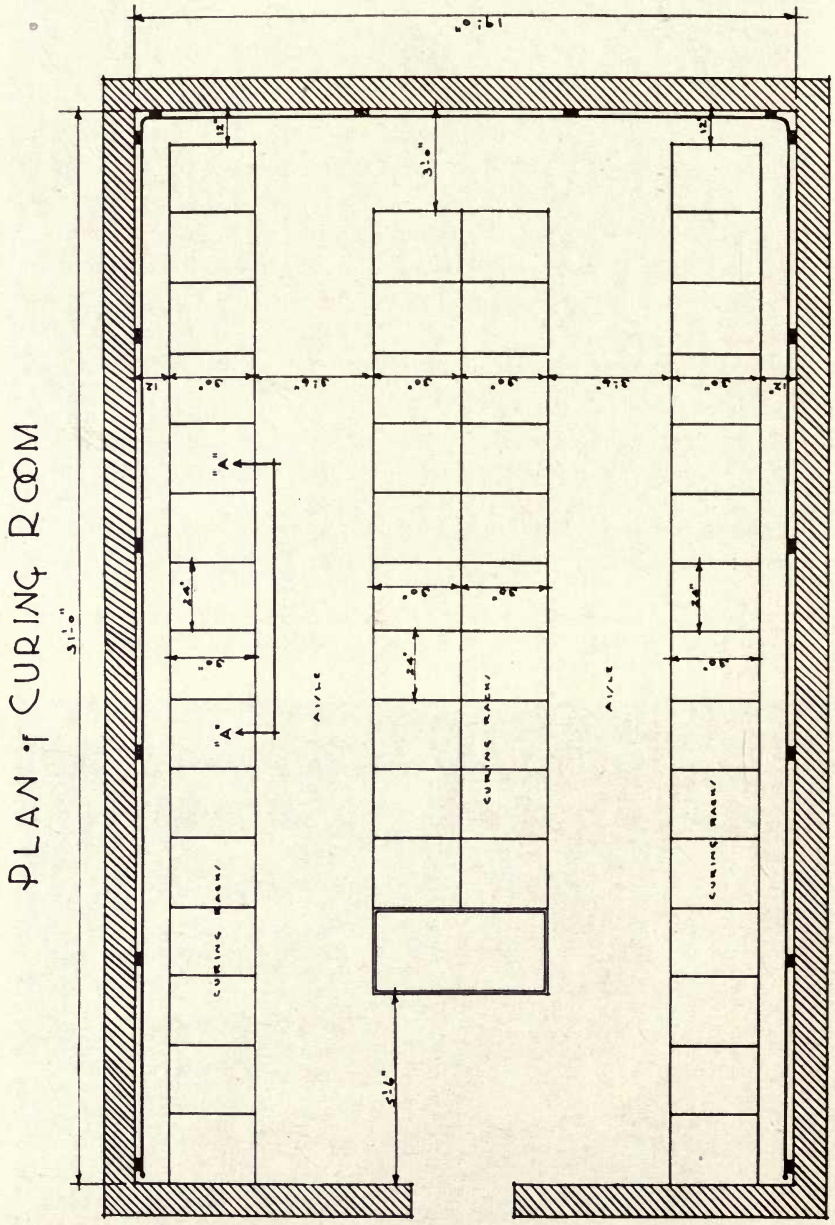
Lumber for four single sections, three bins high, total of 12 bins is:

6—1″ x 3″ x 16′	15—1″ x 4″ x 16′
5—2″ x 4″ x 14′	14—1″ x 4″ x 10′

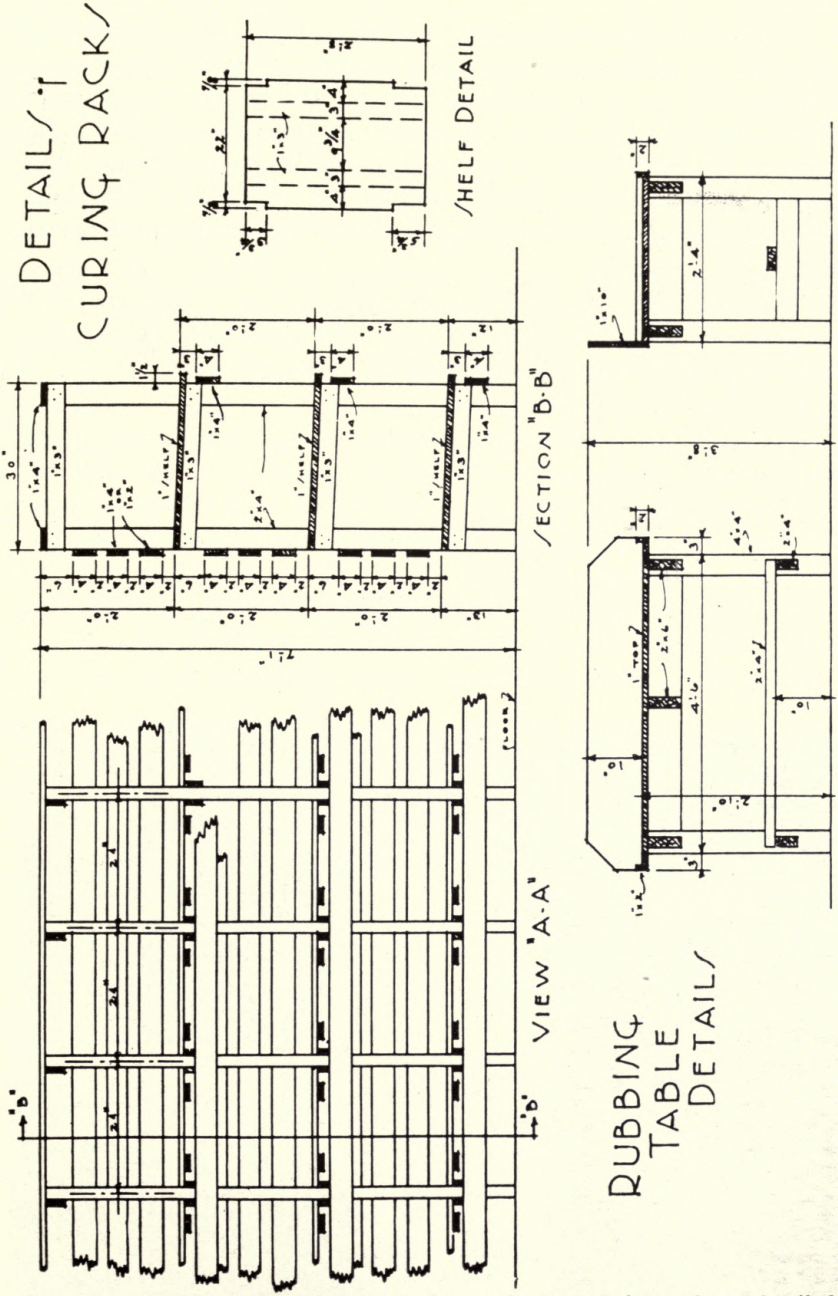
Lumber for four double sections, three bins high, total of 24 bins is:

12—1″ x 3″ x 16′	30—1″ x 4″ x 16′
10—2″ x 4″ x 14′	19—1″ x 4″ x 10′

Shelves of this type may be lifted out for easy cleaning, and in summer, the bins can be taken down and stacked away for use in the fall season.



A floor plan for a curing room holding 150 bins. This room measures 19 by 31 ft. By making the bins four high instead of three, 150 bins may be added.



Any carpenter can make racks for the cutting room from these detailed blue-prints. Plans are also given for the rubbing table. The lumber should be cypress, redwood, or a good non-odorous hardwood, for best results.

It is best to construct the racks with removable shelves so that they can be thoroughly cleaned at regular intervals and also so that the bins can be taken down and stacked away. The shelves should slope to the front and troughs or gutters should be fastened to the shelves to catch the drippings from the curing compounds. Drain pipes should carry the drippings from the troughs to a pail on the floor or better still direct to a drain in the floor.

The preferred wood to use in making the curing racks is cypress; next best choice is redwood. If neither of these woods is available use any good hardwood of a non-odorous type which is free of knots.

It is highly important that the entire curing room be kept clean and sanitary at all times. All of the equipment in the room including bins, tables, floors, and walls should be scrubbed at regular intervals with hot soapy water or a good cleaning powder. After the equipment has been cleaned it is a wise procedure to disinfect and deodorize it with a solution of sodium hypochlorite. This powder can be obtained from wholesale drug firms.

Use a 0.4 percent solution of sodium hypochlorite for cleaning

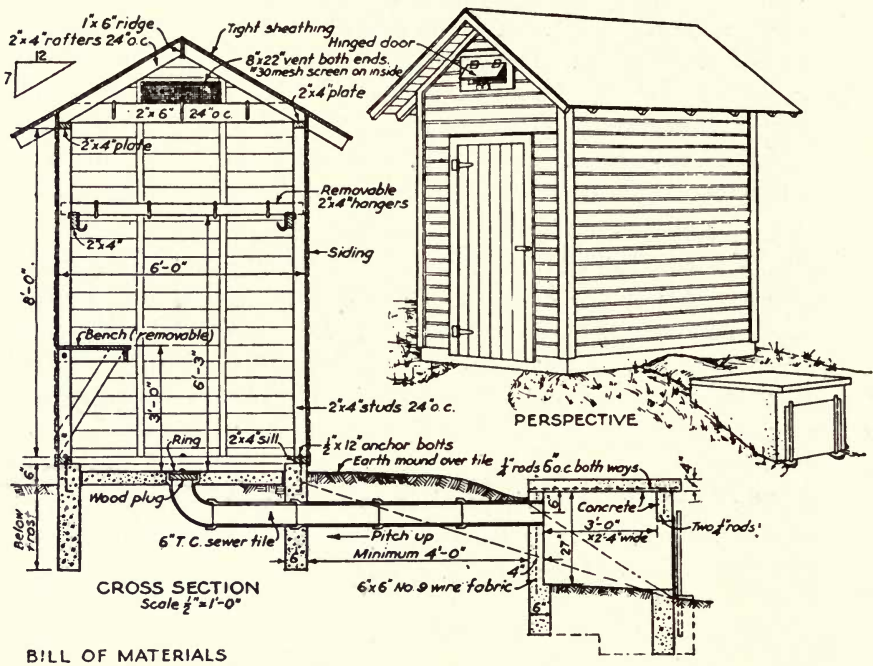
How bacon hangers should be inserted before hanging to be smoked.

floors, walls and other equipment which does not come in direct contact with the meat. It is unnecessary to rinse the solution from this equipment. The solution should be diluted for cleaning tables, tools, shelves and should be thoroughly rinsed off with water about ten minutes after it is applied. It is recommended that the meat be removed from the room or at least covered while sodium hypochlorite is being used in the curing room.

This room should be refrigerated to a temperature of 38° to 40°F. The room should be equipped with sloping wooden shelves where the dry or sugar cure is to be used for hams, having gutters at the lower edges so arranged that all shelves will drain into a common drain. There should also be provided wooden vats or curing barrels for curing bacons, and where the brine method is to be used for hams, other wooden tanks or barrels for curing hams.

While freezing makes it possible to preserve meats almost indefinitely, when it comes to pork, patrons prefer smoke-fragrant hams and bacon, as well as a host of other cured meats. The meat processing and preserving cycle is not really complete in any plant unless cured products are also made available to the patron.

Wagon-racks are available which save much handling during the smoking process.



BILL OF MATERIALS

SMOKEHOUSE

CONCRETE 1:3:5 mix
10 bags cement, 1 cu. yd. sand, 1½ cu. yds gravel.

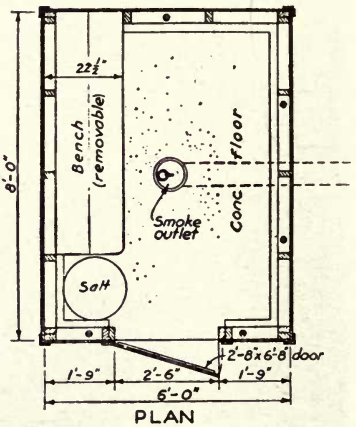
LUMBER
3 pieces 2"x 6"x 6'-0" cross ties.
3 " 2"x 4"x 12-0" header, bench and hangers.
12 " 2"x 4"x 10'-0" sills, studs, and rafters
23 " 2"x 4"x 8'-0" " " plates, and hangers
2 " 1"x 10"x 8'-0" bench and vent doors.
2 " 1"x 6"x 10'-0" ridge and trim.
2 " 1"x 6"x 7'-0" door battens.
6 " 1"x 4"x 10'-0" corner boards and trim.
6 " 1"x 4"x 8'-0" trim
6 " 1"x 6"x 7'-0" T. & G. boards for door
275 ft. B.M. 6" drop siding.
120 ft. B.M. roof sheathing.
Roofing or asphalt shingles to cover 100 sq. ft. roof area

MISCELLANEOUS
7-½"x 12" anchor bolts, with nuts and washers.
1 pair 8" Tee hinges, 1 safety hasp.
2-pair 2"x 2" hinges, for vent doors
1-piece metal flashing-6"x 40"
4 lin. ft. #30-mesh wire screen-10" wide.
4 lengths 6" T.C sewer pipe, 1-6" 90° T.C. elbow
Nails, hanging hooks, and paint not included

FIREBOX

CONCRETE 1:2:3 mix
6 bags cement, ½ cu. yd. sand, ½ cu. yd. broken hard brick, gravel or stone (brick more heat resistant)

MISCELLANEOUS
10 lin. ft. 6"x 6" No. 9 wire fabric 30" wide.
6 pieces ½" steel rods 42" long.
10 " " " 32" "
2 " 1½" pipe 36" long
1-piece 24"x 32" metal, sliding door



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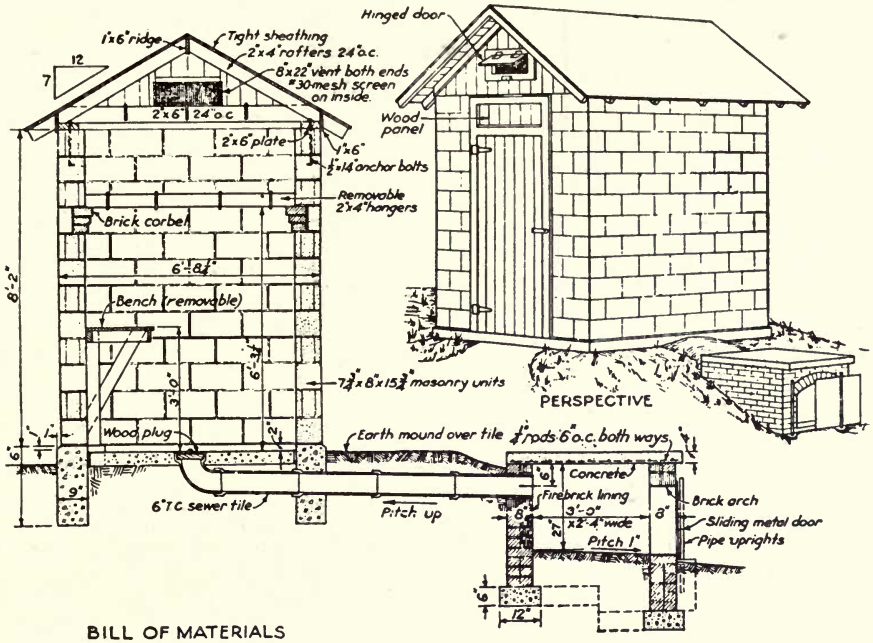


BILL OF MATERIALS
SMOKEHOUSE

CONCRETE AND MORTAR.

Concrete 1:3:5 mix. Mortar 1:3 + 10% lime
14 bags cement, ½ cu yds sand, 2 cu yds gravel
65 lbs. hydrated lime.

142	8"x8"x16"	smooth face	masonry	units
12	8"x4"x16"	"	"	"
2	8"x4"x8"	"	"	"
14	8"x8"x8"	"	half	"
32	8"x8"x16"	"	corner	"
12	8"x8"x16"	"	jamb	"
12	8"x8"x8"	"	half	"

100 common brick

LUMBER

4 pieces	2"x6"x8'-0"	plates and door jambs
6 "	2"x6"x7'-0"	" cross ties
9 "	2"x4"x10'-0"	rafters, gable end studs,
7 "	2"x4"x6'-0"	bench and removable hangers
3 "	2"x3"x8'-0"	door casing.
5 "	1"x6"x10'-0"	battens, ridge, trim
9 "	1"x4"x10'-0"	trim
1 "	1"x12"x6'-0"	bench.
1 "	1"x10"x10'-0"	and vent doors

120 ft B.M. roof sheathing 56 ft B.M. 1"x6" T&G door, gables
Roofing or asphalt shingles to cover 100 sq ft. roof area

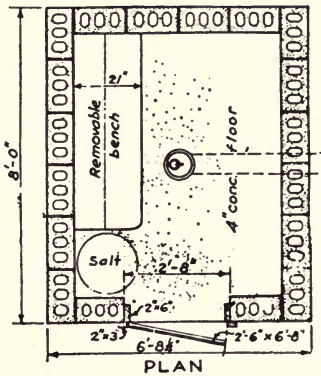
MISCELLANEOUS

8-½"x14 anchor bolts. 1 pr. 8" tee hinges. 1 pr. 2"x2" hinges
6"x38" metal flashing. 4 lin. ft. #30 mesh screen 10" wide.
Nails, hanging hooks, and paint not included

FIREBOX

7 bags cement, ½ cu yd sand, ½ cu yd gravel
450 common brick. 90 firebrick.
9-½" steel rods 40" long. 6-½" steel rods 48" long
2 pieces ½" pipe 36" long.
1 metal sliding door 24"x32"

CROSS SECTION
Scale ½"=1'-0"



PLAN

B

Here are drawings showing the smoke house described in the text, with bills of materials. This is a relatively large smoke house and will handle large quantities of meats. (A) shows the construction and details for a frame building; (B) shows materials and drawings for cement block construction.

Since all plants chill, cut, freeze and store, the curing operation is but a simple further step along the road of good service.

New equipment need not be expensive. It can consist largely of a meat pump, locally built wooden racks and curing boxes, vats, if brine or sweet pickle curing is desired, and a temperature controlled smokehouse. As a matter of fact a curing box can be easily constructed at home. As to help anyone experienced in handling meat can quickly master the basic principle of meat curing. There is no mystery about it and a number of good firms supplying curing materials designed to help the locker operator can be called upon for help.

With these prepared cures the operator can satisfy the preferences of his trade—give them mild, ready-to-eat hams, medium cured, or long keeping country style hams, fancy mild breakfast bacon, or full flavored, well cured type and even Canadian style bacon. Other specialties, such as smoked turkey, corned beef, fresh and cured sausages, etc., will also add to an operator's profits.

It is not necessary—in fact it is against good practice—to keep smoked and cured meats in the lockers. These products take up valuable space and should not be placed adjacent to metallic substances such as locker drawers. Fresh meats only should be frozen; there is no need for freezing the smoked products.

Smoke House

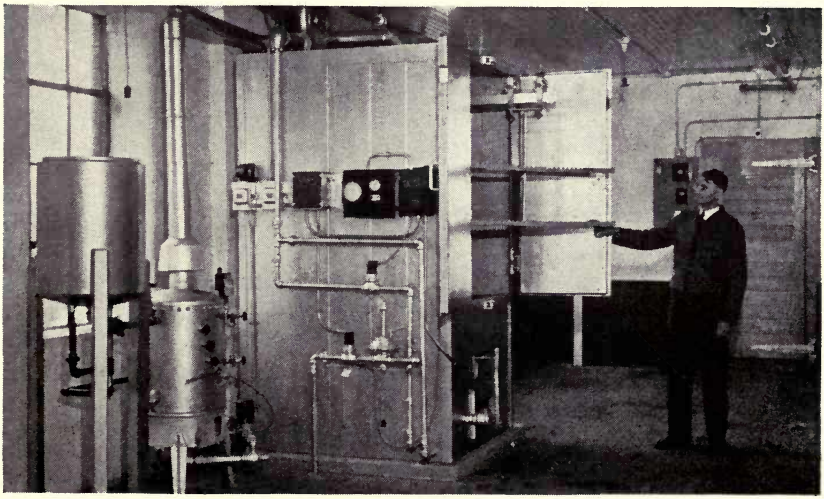
A smoke house should be provided at or near the rear of the building, with provision for heating by gas or steam for the tenderizing of hams, in addition to the provision for smoking. Steel smoke house units are recommended because steel units are easily installed, occupy a minimum of space, can be installed one at a time as the demand grows, and because such units are complete and self-contained, with all parts necessary for controlling temperature and smoke.

The smoke houses (A) and (B) illustrated on these pages are large enough for the average locker plant, and easily constructed. The outside fire pit makes the temperature easy to control and reduces the fire hazard. Tight construction and well fitted ventilators provide effective regulation of the air flow past the meat. Movable two-by-fours across the house for hanging the meat

enable the operator to adjust the hangers to the size of the hams or bacons to be smoked. Two or more tiers of meat can be hung. A taller house, holding four or more tiers of meat, can be served by the same fire pit.

Local stone can be used at low cost and logs are satisfactory if well fitted and chinked. This type of smokehouse should not be located nearer than 50 feet to any other building. A solid frost-proof foundation is essential and a concrete floor is desirable as it can be made fly-and-rat-proof and is more easily cleaned than wood.

Meat can be crowded into a smokehouse, the only rule being that no piece touch another or the wall. The space required for each piece varies with the weight of the cut, but a general rule is 12 inches in width both ways and two feet in height for each piece. Movable rails and staggered hooks will make possible the smoking of a larger quantity at one time. Smoke houses are satisfactory storing places for meat if each piece is properly wrapped, bagged and hung separately.

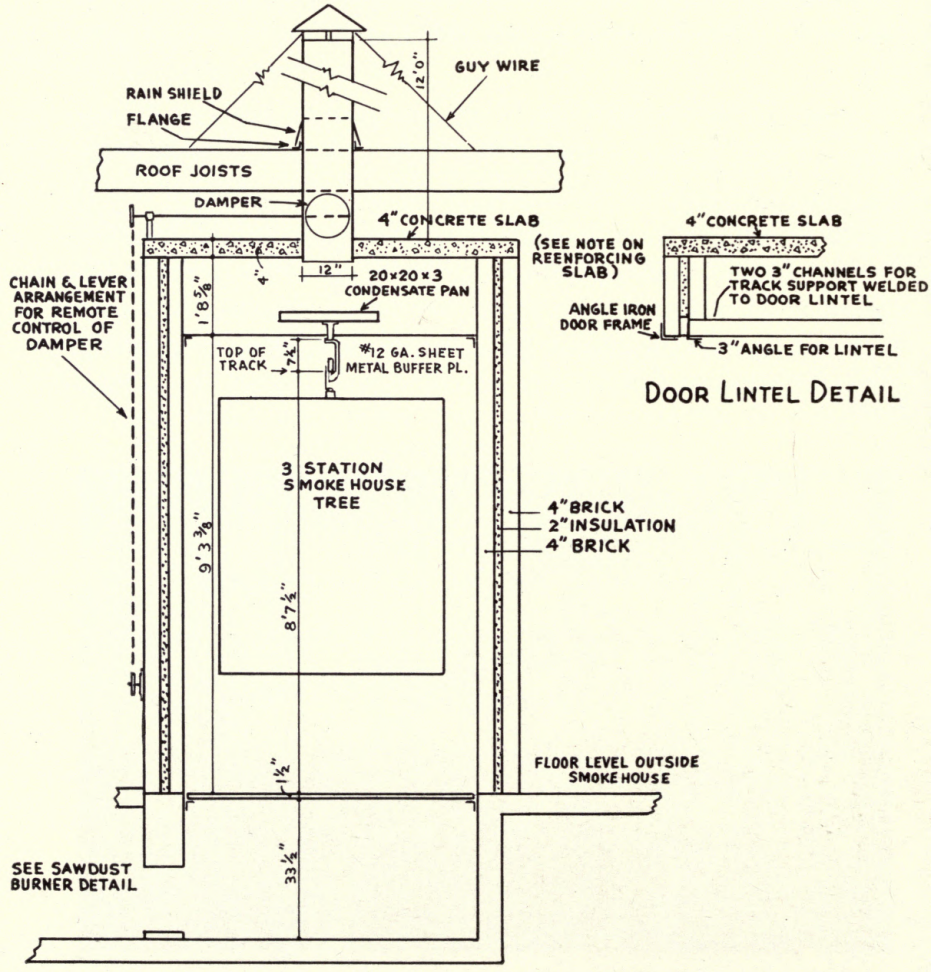


This modern steel smoke house is gas-fired. The lard kettle (left) has a capacity of 25 gallons and is heated with an automatic gas boiler.

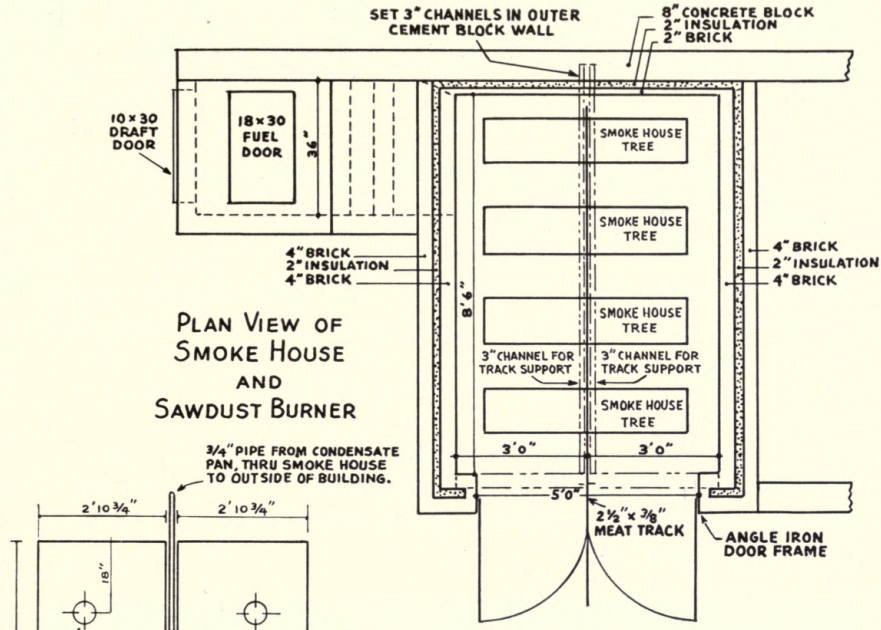
Plan for Smokehouse

Notes: Masonry opening for flush-sill type smokehouse doors will be 5′-10″ in width and 9′-3″ in height. The top of the track from the top of the opening is 7½″. Angle iron door frame will be set in concrete at floor to provide flush sill.

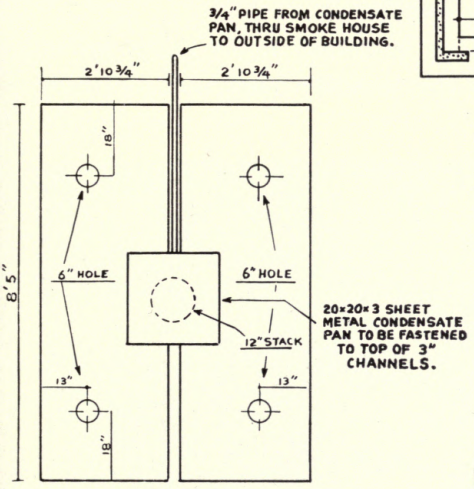
Space 3″ track supporting channel 5/8″ apart. Reinforce 4″ concrete slab every 12″ in both directions with 3/8″ rod. Be sure to turn back the ends.



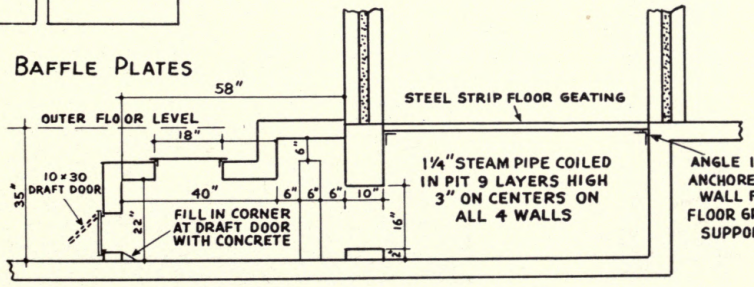
FRONT CROSS SECTION



PLAN VIEW OF SMOKE HOUSE AND SAWDUST BURNER



DETAIL OF BAFFLE PLATES



SIDE ELEVATION OF SAWDUST BURNER

Storage Room for Smoked Products

If possible, it is recommended that separate space be provided for smoked products. This space should be refrigerated to 45° to 50°F.

Lard Rendering and Steam Cooking Facilities

Lard rendering facilities should be included in the plant, but should be located toward the rear of the building well away from the meat cutting room and lobby. The rendering kettle may advantageously be used for steam cooking, as in making soup stock from bones, etc.

Inedible Rendering

Where slaughtering is done on the premises, the future locker operator should by no means overlook the profits to be made

This is a steam-jacketed lard rendering kettle in use. Operator stirs lard almost constantly, breaking the lumps, until it is melted and starting to cook.

from inedible rendering. The addition of proper equipment can not only be a money-maker, but it will also prevent the accumulation of raw inedible matter around a slaughtering plant which creates many real problems—all bad. In fact, a great many states have already passed legislation governing the disposal of inedible products.

In brief, many parts of the animals which are unfit for human consumption can be rendereed into commercial grease which brings a good price. The contents of the body cavity including the intestines (except for fancy meats such as the heart and liver), the head, hide (of the beef and sheep), the feet, and blood—in fact any portion of the animal that is not edible—all can be turned into profit.

With the proper rendering and condensing equipment, which is available at a most moderate cost, it is easy to convert otherwise unusable meat scraps into dried and pulverized chicken feed, for which there is a ready market.

The great profit potential, however, lies in the recovery of grease. For this purpose, most locker operators and small slaughterers use what is known as the "wet process".

After the cooked lard is scooped from the kettle and strained through muslin into the lard press, cracklings are squeezed through the press.

Large meat packers and commercial renderers use a method known as the "dry rendering process." Both methods are basically the same. Both extract the grease by the application of heat and pressure but the wet process is much simpler to operate and much less expensive to install. For the benefit of small operators there is illustrated a wet rendering plant, consisting of two principal pieces of equipment, a boiler and a tank with fittings. The boiler is an ordinary steam boiler with sufficient capacity to operate the tank. In most cases, a boiler selected by the operator is of a larger capacity than is required for the operation of the tank alone.

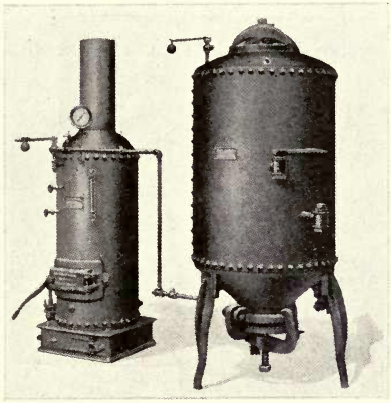
All slaughtering plants should have an abundance of live steam for washing up and sterilizing purposes in the slaughtering plant and in the holding pens. A boiler is also useful for cooking purposes, heating the building, and for the hog scalding vat. No locker plant should be without a steam boiler if slaughtering or processing is done. A boiler is absolutely essential to the maintenance of a sanitary establishment.

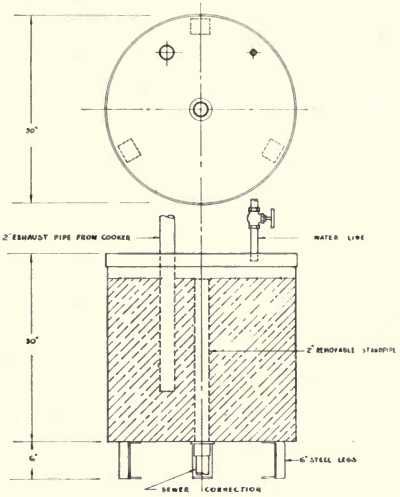
The whole cooking operation is a very simple one but a little preparation is necessary before the raw product is placed in the tank. The entrails and other parts of the viscera should be slashed on a curbed-in space in the tank room. This space should have an ample drain. They should then be flushed with water under pressure so that all fiber is washed away. (The price of grease is determined by grade.)

When the tank is charged it is desirable to put all of the bones, heads, etc., into the bottom of the tank and then all of the raw product on top of them. The steam is turned on to the tank (it enters at the bottom) and it is allowed to cook under pressure until done. This steam pressure is usually 50 pounds. It takes six to eight hours to finish a tank. When done the grease will float and is drawn off into steel barrels through the grease draw-off cocks on the side of the tank. If the charge is a small one and the grease doesn't reach up to the draw-off cocks, it can be floated by turning more water into the tank.

The actual returns from the saving and processing inedible products will give you some idea of how important this processing can be. The estimates shown in the chart accompanying this article are based on slaughtered animals being in a fair,

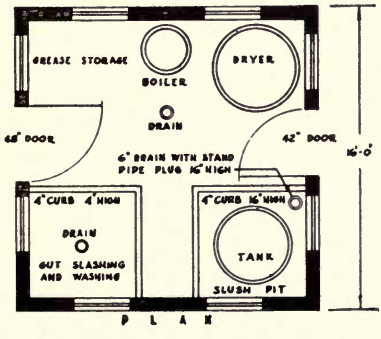
average condition. All weights and values are approximate and may vary depending on the condition of the animal and the care with which the inedible offal is rendered.

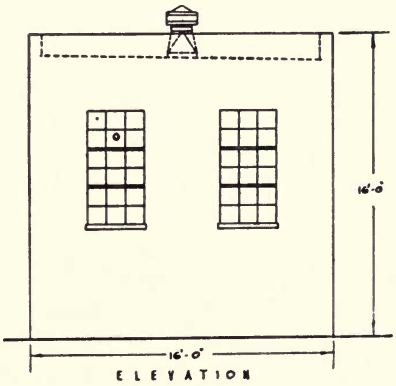




(Left). In this wet tanking outfit, the horsepower of the vertical boiler is determined by the size of the cooking tank (right of boiler). All fittings, except the stack to the roof, usually are included with this type unit.

(Right. An odor-condensing unit. It is connected to the cooking tank exhaust. Cooking odors are condensed and carried through the standpipe directly into the sewer. Such a unit will prevent much of the odor of "wet" rendering, especially if cooking is done while offal is fresh.





Layout (left) shows a floor plan for the inedible rendering department. In some states, health laws require that the inedible rendering building be separate from the slaughter house. Right, elevation drawing of the building.

In addition to these returns, if the wet blood is saved it will produce more tonnage in meat scraps. Blood of the average beef weighs 50 pounds, and an average hog 10 pounds. To use this blood in meat scraps from the wet rendering process, it is necessary to first coagulate the blood by placing it in an open steel barrel and running a steam line into it. This will cook the blood evaporating much of the moisture out of it so that it will be of about the consistency of uncooked liver. Further cooking will be necessary and it can be put back into the tank after the grease is drawn off and cooked until done. The addition of the blood to the meat scraps not only adds to the weight of this product but improves its value, as animal food as well, as the protein content of the meat scraps is thereby greatly improved.

In addition to the inedible from slaughter in locker plants, a large revenue will be obtained from shop scraps from the work rooms. These scraps usually return a large percentage of grease.

Machine Room

A room of ample size shall be provided, preferably on the main floor, for refrigerating machinery such as compressors, motors, controls, etc.

Poultry Picking and Cleaning Room

If a plant is to be located in an area where there is likely to be considerable demand for the processing of poultry, including picking and eviscerating, it is considered highly desirable that facilities be provided entirely separate and at some distance from the meat and fruit and vegetable processing rooms. The ideal thing is to provide a separate room which can be closed off from the rest of the plant and which is constructed with washable walls and floor and is equipped with hose connections for hot and cold water and with adequate drainage facilities.

The equipment needed for a model poultry picking and cleaning room consists of a mechanical poultry picker, a scalder, and a dressing table. These can be bought separately, or they can now be obtained in one complete unit at a moderate cost. The space

required for a complete installation is small—usually 8 by 10 feet is ample—and the returns from this investment, especially in heavy poultry consuming areas, is great.

In killing, picking, and dressing poultry, the following points should be observed:

Dry-pick or "slack scald" (125° to 130°F.—bird immersed 20 to 60 seconds) the birds to remove the feathers. Remove pin feathers and singe to remove hair-like feathers (fili plumes). Care should be exercised in removing feathers so that skin remains intact.

Cool, if possible, overnight at 32° to 34°F. If chill room is not available, draw immediately and rinse in water at room temperature to remove blood, and wash in ice water. Dry-picked birds should be boxed and iced.

Under most conditions of storage for home use the halving of the bird, or cutting up in pieces for frying or fricassee, is more desirable since less space is required for storage. This simplifies the drawing procedure.

Remove the head and neck, oil sac and shanks. Cut from the neck to the rear along the backbone. Remove entrails. The backbone may be removed by cutting along each side if desired. Broilers may be halved by cutting along the keel. Chicken for frying or for fricassee should be disjointed after final washing.

The giblets (gizzard, liver, heart, and neck) and pieces may be packed in a carton or wrapped in moisture-vapor-proof paper and then placed in a carton if desirable. When packing halves of chicken, one-half is placed skin-down on the table. Two pieces of waterproof paper are placed on the half and the other half placed on top. The paper aids in separting the frozen halves. Wrap in moisture-vapor-proof paper before freezing.

Labeling and dating are important. Freezing should be started as soon as packaging is finished. Freezing should be done in similar manner as for other packaged meats. Storage at constant temperature (0°F.) is desirable.

Lobby

Lobby space should be provided connecting the main entrance with the patron entrance to the locker room with suitable space for some furniture and for hanging locker coats and gloves.

The lobby should be located, preferably, adjacent to the meat cutting room in order to afford the patrons an opportunity to watch the meat cutting operations.

The lobby should be separated from the meat cutting room by means of an attractive counter with glass partition above. The counter may also be used by patrons delivering articles to be frozen and placed in their lockers.

Office

An office should be provided with ample space for the operator's use in dealing with patrons, etc.

The office should be located adjacent to the lobby and should be partitioned off from it by means of a clear glass partition in order that the comings and going of patrons and the activity of employees may be under observation.

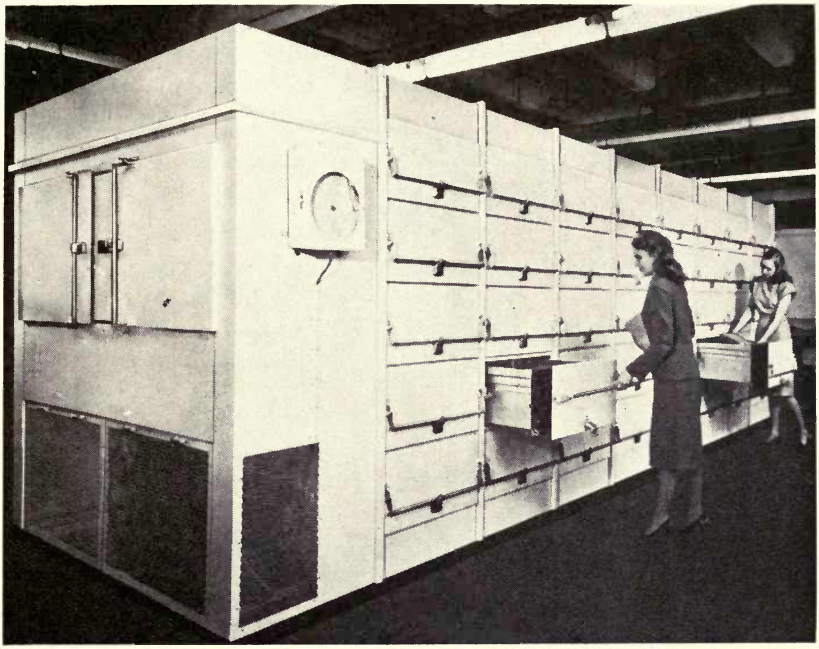
Frozen Foods Cabinet

Many locker plants conduct a profitable side-line in selling processed frozen fruits and vegetables to locker renters. When prices are good, they tip off their customers to put in a supply, and many also have built up good "take-home" volumes in frozen fruits and vegetables by placing a freezer cabinet near the entrance, where they will be seen as the customer leaves as reminders to buy a package or two for immediate consumption.

Complete Factory-Built Units

In recent years, a new type of locker plant unit has been developed. This is a system that requires no refrigerated room. Below-zero temperatures are maintained in all drawers—yet surrounding area remains at room temperature.

This new type of two-temperature refrigeration unit is illustrated on the next page. It comes in factory-built, self-contained, fully-insulated sections, ready for quick and simple installation. The building in which this type of unit is installed needs no insulation as the zero temperature is inside the cabinet, the room itself remaining at normal temperature. Any building will do, so long as it has a level floor, water and electricity available, and no engineering plans are required. According to the manufacturers, zero temperature inside the storage drawers is maintained by a cold curtain of refrigerated air. This flow of air wipes the drawers free of frost, and insures perfect holding of stored foods. Defrosting can be accomplished in approximately 15 minutes time without increasing the holding temperatures or moving any of the stored foods. An alarm bell warns if temperature inside the unit rises to plus 3 degrees F.



View of self-contained locker system. Unit comes complete—ready to install—equipped with recording thermometer.

These self-contained units are available in eight different models ranging from 10 to 80 drawers, and are especially popular with food stores who want to put a limited number of lockers in their back rooms and basements, and with locker operators who want to add lockers to existing plants.

Automatic Type Locker Plants

Two types of "automatic locker plants" are available, the most popular of which is known as the "wheel" type locker plant. This type of installation is entirely automatic. The lockers are in a zero room on tracking which is electrically controlled. The customer never enters the locker room. Instead, she presses a button, and the bank of lockers containing her locker comes to where she is standing and stops. She then opens a door, and there is her locker ready for use. The makers of this type of unit stress these points: this type of unit is preferred by customers

because they can use the lockers in comfort without entering the refrigerated space. They also state that these units are economical to operate in that they exclude heat from lights or bodies.

The other type of automatic locker plant is a "floor" type, wherein the lockers are recessed into the floor of the plant, and lifted by means of a pulley.

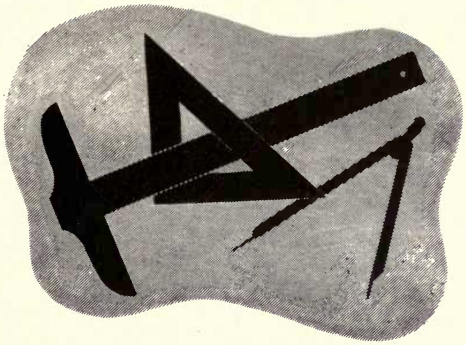
RESUME OF STATE LOCKER LAWS.

State Administering Agency and address	Date Statute Enacted	Annual License Fee	°F. Temp. Required-Tolerances Thermometer Specified: (D)-Direct Reading (R)-Recording Chill Room	Freezer Still Air	Freezer Forced Air	Freezer Locker Room	Special Requirements: Locker Room Alarm; Gas Masks; Health Certificates	Inspection Frequency	Notes
ALABAMA State Bd. of Health Montgomery		No Specific Statutes—Regulations Est. 1945 Under Bd. of Health	34°	—10°	0°	(R)0°		Regular Intervals	1
ARIZONA State Bd. of Health Phoenix		No Specific Statutes— Under Consideration							
ARKANSAS State Bd. of Health Little Rock		No Specific Statutes—Regulations Est. 1944 Under Bd. of Health	35°* ±2°	—15°* Max.	0°* Max.	(R)0° +5°	Health Certificates		1, 2, 5
CALIFORNIA Dept. Public Health San Francisco		Under 10M cu. ft.—$15; 10M to 50M—$30; 50M to 100M—$40; Over 100M—$50	No Specific Statutes—Rules of Cold Storage, Pure Food, and Food Sanitation Acts Apply					Any Reasonable Time	
COLORADO Refr. Locker Bd., Div. of Agric. Denver	1947	Established by Board $15 Minimum $25 Maximum	(D)37°* ±2°	(D)—10°* Max.	0°* Max.	(R)0° +5°	Alarm Gas Mask	Semi-Annual	1, 2
CONNECTICUT Dairy & Food Comm. Hartford	1945	$5 for 200 Lockers or less; $1 ea. add. 100 or fraction	37° ±5°	—20° Plate Temp.	.....	(R)0° to 5°	Alarm	Any Reasonable Time	
DELAWARE		No Specific Statutes							
FLORIDA		No Specific Statutes							
GEORGIA		No Specific Statutes							
IDAHO Dept. Public Health Boise		No Specific Statutes—	Cold Storage Food Product Factory Laws Apply						
ILLINOIS Dept. Agric., Div. Foods & Dairies 39 S. La Salle, Chgo.	1941	$15 for 200 lockers or less; $2 ea. add. 100 or fraction. $25 Max.	(D)34°* ±2°	(D)—10°* Max.	0°* Max.	(R)0° +5°	Gas Mask Health Certificates	Semi-Annual	1, 2, 3, 4. 5
INDIANA State Bd. of Health Indianapolis	1943	$15 for 200 Lockers or less; $2 ea. add. 100 or fraction. $25 Max.	34°* ±2°	—10°* Max.	0°* Max.	(R)0° +5°	Gas Mask Health Certificates	Semi-Annual	1, 2, 3, 4. 5
IOWA Dept. of Agric. Des Moines	1939	$10 for 200 Lockers or less; $2 ea. add. 100 or fraction	.....	0° Max.	0° Max.	10° Max.	.....	.....	4, 5(a)
KANSAS State Bd. of Health, Dept. Food & Drugs Topeka		No Specific Statutes—Regulations Under Bd. of Health	.....	.....	.....	.....	.....	.....	1, 2, 5(a)
KENTUCKY Dept. of Agric. Frankfort	1946	$10	35°* ±2°	—10°* Max.	0°* Max.	0° +12°	Health Certificates	Periodic	1, 4, 5
LOUISIANA		No Specific Statutes							
MAINE Dept. of Agric. Augusta		$5	No Specific Statutes—Slaughterhouse Laws and Regulations Apply						
MARYLAND State Dept. Health Baltimore		$25	No Specific Statutes—Cold Storage Plant Laws and Regulations Apply						
MASSACHUSETTS Dept. Public Health Boston		$10	No Specific Statutes—1945 Modification of Cold Storage Laws and Regulations Apply					When Deemed Necessary	
MICHIGAN Dept. of Agric. Bur. of Mktg. & Enf. Lansing	1942	2¢ per Locker $5 Minimum	(D)35°* ±2°	(D)—10°* Max.	0°* Max.	(D)0° +5°	Health Certificates Recommended	At Any Time	1, 2, 5
MINNESOTA Dept. of Agric., Dairy and Food St. Paul	1943	$3 for 100 lockers or less; $1 ea. add. 100 or fraction	.....	0° Max.	0° Max.	10° Max.		Not Specified	1, 4, 5
MISSISSIPPI State Bd. of Health Jackson	1946	$15 Plant $5 Branch Plant	(D)34°* ±2°	(D)—10°† Max.	0°† Max.	(D&R) 0° +3°	Gas Mask	Any Reasonable Time	1, 2, 4, 5
MISSOURI Dept. of Agric. Jefferson City	1946	$15 for 200 Lockers or less; 4¢ ea. add. Locker. $50 Max.	(D)37°* ±2°	(D)—10°* Max.	0°* Max.	(D&R) 0° +5°	Alarm Gas Mask Health Certificates	Semi-Annual	1, 2, 3, 4
MONTANA State Bd. of Health Food & Drugs Div. Helena	Pending	$10	35°* ±2°	—10°* Max.	0°* Max.	0° +12°		Periodic	4
NEBRASKA Dept. of Agric. & Inspection Lincoln	1943	$5 for 200 Lockers or less; $2 ea. add. 100 or fraction	(D)33° to 38° 35° Rec.	(D)—9°	0°	(D&R) —5° to 10° 0° ±5°	Health Certificates	Semi-Annual	1, 2, 3, 4, 5(a)

RESUME OF STATE LOCKER LAWS.

State Administering Agency and Address	Date Statute Enacted	Annual License Fee	°F. Temp. Required-Tolerances Specified: (D)-Direct Reading (R)-Recording Thermometer — Chill Room	Freezer — Still Air	Freezer — Forced Air	Freezer — Locker Room	Special Requirements: Locker Room Alarm; Gas Masks; Health Certificates	Inspection Frequency	Notes
NEVADA State Dept. Health Div. of Pub. Health Engrg., Reno		No Specific Statutes Yet Enacted. Food Establishment Sanitation Act Applies	.....	.....	.....	.....	.....	Annually & as Designated	.....
NEW HAMPSHIRE		No Specific Statutes							
NEW JERSEY State Dept. Health Trenton		No Specific Statutes—Regulations Est. 1945 by Bd. of Health Under Cold Stge. Act $10	(D) under 40°	(D)0° Max.	0° Max.	(D)0° +5° Rec.		When Necessary	1, 2
NEW MEXICO State Bd. Public Health, Santa Fe	1947	$25 for 500 Lockers or less; $5 ea. add. 100 or fraction. $50 Max.	(D)34°† ±2°	(D)—10°† Max.	0°† Max.	0° +3°	Gas Mask	Any Reasonable Time	1, 2, 4
NEW YORK Dept. of Agric. & Mkts., Albany	1942	$25 Plant $5 Branch Plant	.....	.....	.....	.....	.....	.....	1, 2, 3, 4
NORTH CAROLINA		No Specific Statutes—	State Bd. of Health Now in Process of Formulating Regulations for Adoption						
NORTH DAKOTA Dept. of Agric. Bismarck	1943	$15 for 200 Lockers or less; 4¢ ea. add. Locker. $50 Max.	(D)37°° ±5°	(D)—10°* Max.	0°* Max.	(R)0° +5° Max.	Alarm Gas Mask Health Certificates	Semi-Annual	1, 2, 3, 4
OHIO Dept. of Agric. Div. Foods & Dairies Columbus	1943	$15 for 200 lockers or less; $2 ea. add. 100 or fraction. $25 Max.	(R)38°* ±2°	(R)—10°* Max.	0°* Max.	(R)5° +5°	Health Certificates	Semi-Annual	1, 2, 3, 5
OKLAHOMA State Dept. Health Oklahoma City	1945	$15 Plant $2.50 Branch Plant	(D)34°† ±2°	(D)—10°† Max.	0°† Max.	(R)0° +3°	Alarm Gas Mask	Any Reasonable Time	4, 5
OREGON Dept. of Agric. Salem	1947	$10—100 Lockers or less $15—100 to 500 $20—500 to 1500 $25—1500 over	(D)36°* ±4°	.....	.....	(R)5° +12° on plants in use	Alarm Health Certificates	Periodic	1, 2
PENNSYLVANIA Dept. of Agric. Bur. Foods & Chem. Harrisburg		No Specific Statutes—	Cold Storage Laws Modified to Cover in 1946						
RHODE ISLAND		No Specific Statutes							
SOUTH CAROLINA		No Specific Statutes							
SOUTH DAKOTA Dept. of Agric. Pierre	1945	$3 for 100 Lockers or less; $1 ea. add. 100	(D)36°* ±2°	(D)—10°* Max.	(D)0°* Max.	(D)0° +5°		Not Specified	1, 2, 4
TENNESSEE Dept. of Agric. Nashville	1947	$25 New Plant $10 for 200 Lockers or less; $2 ea. add. 100	(R)36°* Max.	—10°† Max.	0°† Max.	(R)0° +5°	Alarm Gas Mask	Any Reasonable Time	1, 2, 4
TEXAS State Health Dept. Austin		No Specific Statutes—Health Dept. Advisory Stds. Established 1946	(D)34°*	(D)—10°* Max.	(D)0°* Max.	(R)0° +5°	Gas Mask Health Certificates	Not Specified	1, 2, 3
UTAH Dept. of Agric. Salt Lake City		Modifications of Cold Storage Laws Apply—$5 for 400 Lockers or less; $10 over 400	33° to 37°	0°	0°	(R)10°		Periodic	
VERMONT Dept. Public Health Div. Sanitary Engrg. Burlington		No Specific Statutes—Food Establishment Laws Apply	.....	.....	.....	.....	.....	Any Reasonable Time	1 (Implied)
VIRGINIA Dept. Agric. & Immigr. Div. Dairy Foods Richmond	1946	$10 for 200 Lockers or less; $2 ea. add. 100. $25 Max.	.....	.....	.....	(R)10° Max.	Health Certificates	Periodic	4, 5
WASHINGTON Dept. of Agric. Olympia	1943	$10	35°* ±2°	—10°* Max.	0°* Max.	0° +12°	Health Certificates	Periodic	4
WEST VIRGINIA		No Specific Statutes							
WISCONSIN Dept. of Agric. Madison	1940	$5 to $40. Based on Size of Community	(D)35°* ±2°	(D)10°* Max.	(D)0°* Max.	(R)0° +5°	Health Certificates Rec.	At Any Time	1, 2, 3, 5
WYOMING		No Specific Statutes							

°10° Tolerance specified for short periods after loading of fresh foods.
†5° Tolerance specified for short periods after loading of fresh foods.
1. Foods must be inspected by operator before storage.
2. Foods must be wrapped and/or dated and/or marked before placing in lockers.
3. Records must be given to patrons on request showing detailed disposition of food processing plant.
4. Operators protected with lien upon customers' property for charges due.
5. Separate room specified for storage of products unfit for human consumption.
5a. Storage of products unfit for human consumption barred.



CHAPTER TWO

YOUR LOCKER PLANT

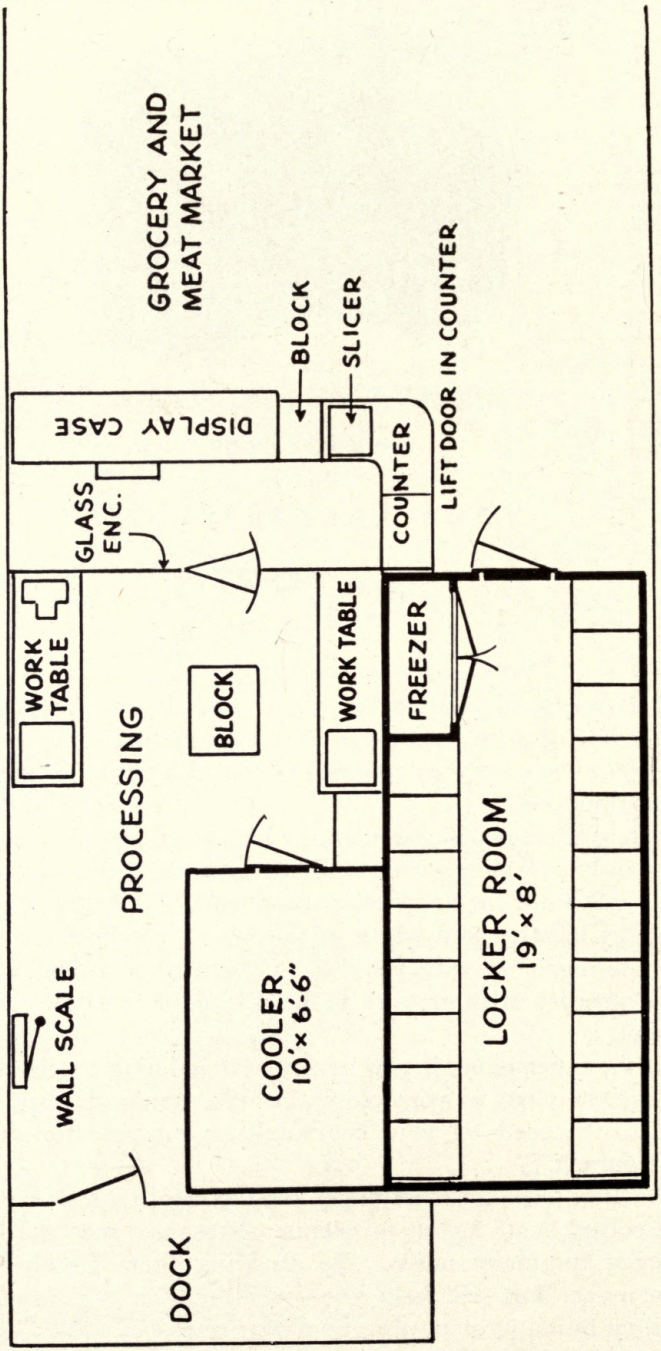
LAYOUT

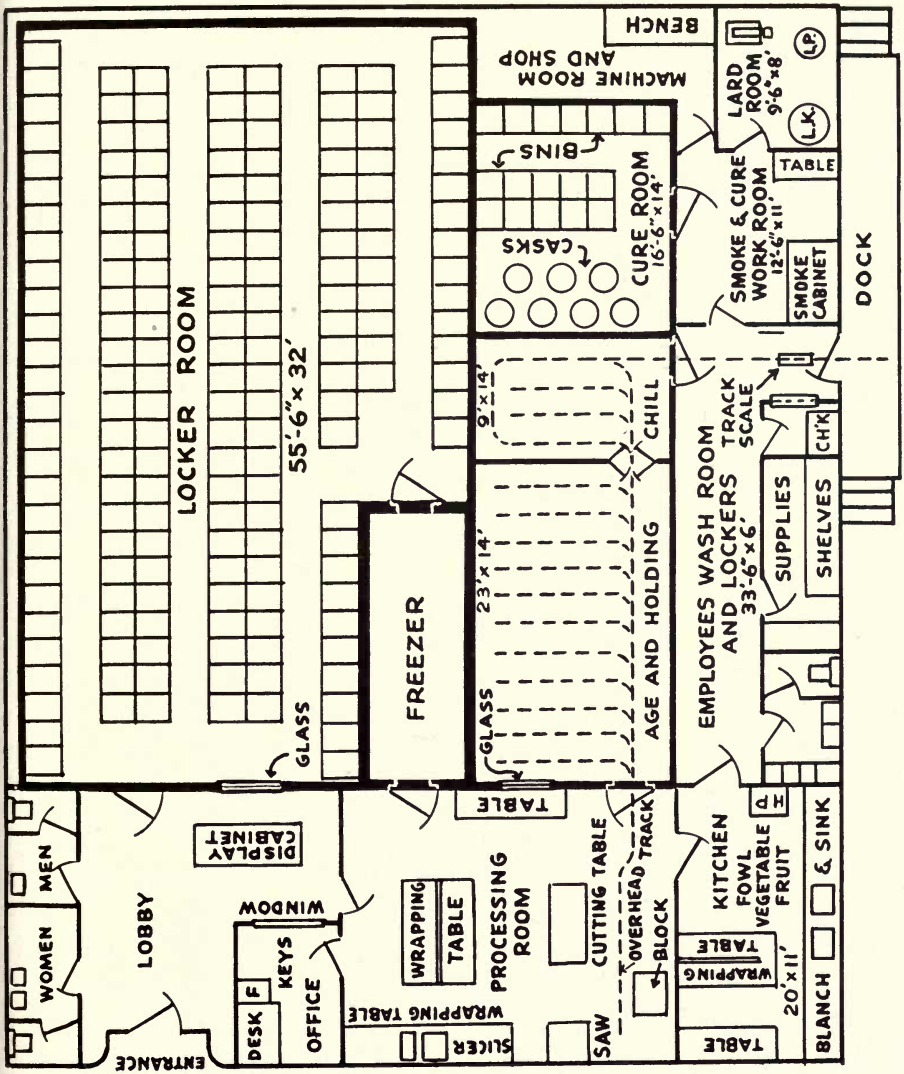
THE layout of your locker plant depends on so many factors —some of them peculiar to your own and no other situation— that you must give the problem considerable attention before you do anything else.

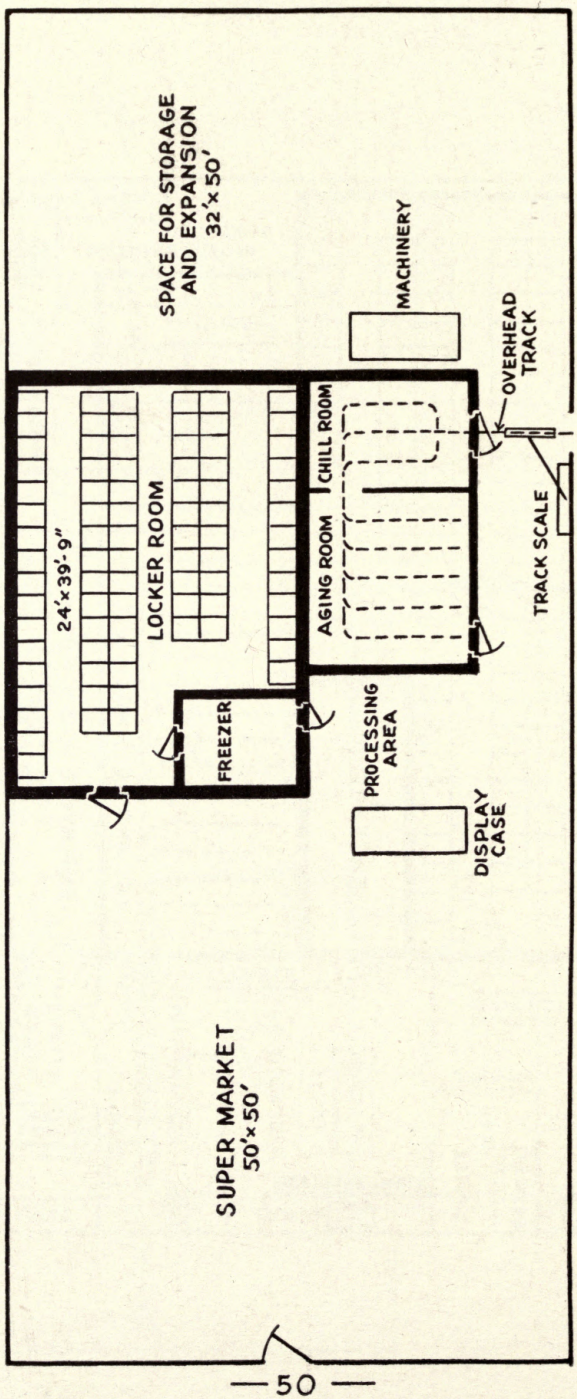
If you are establishing a plant in a building already constructed, you will be working within limitations imposed by that building, which was built for some other purpose. The height of the ceilings; the location and width of the doors, the direction in which the building faces with relation to the sun; and the position of traffic arteries with respect to it—all these must be taken into account.

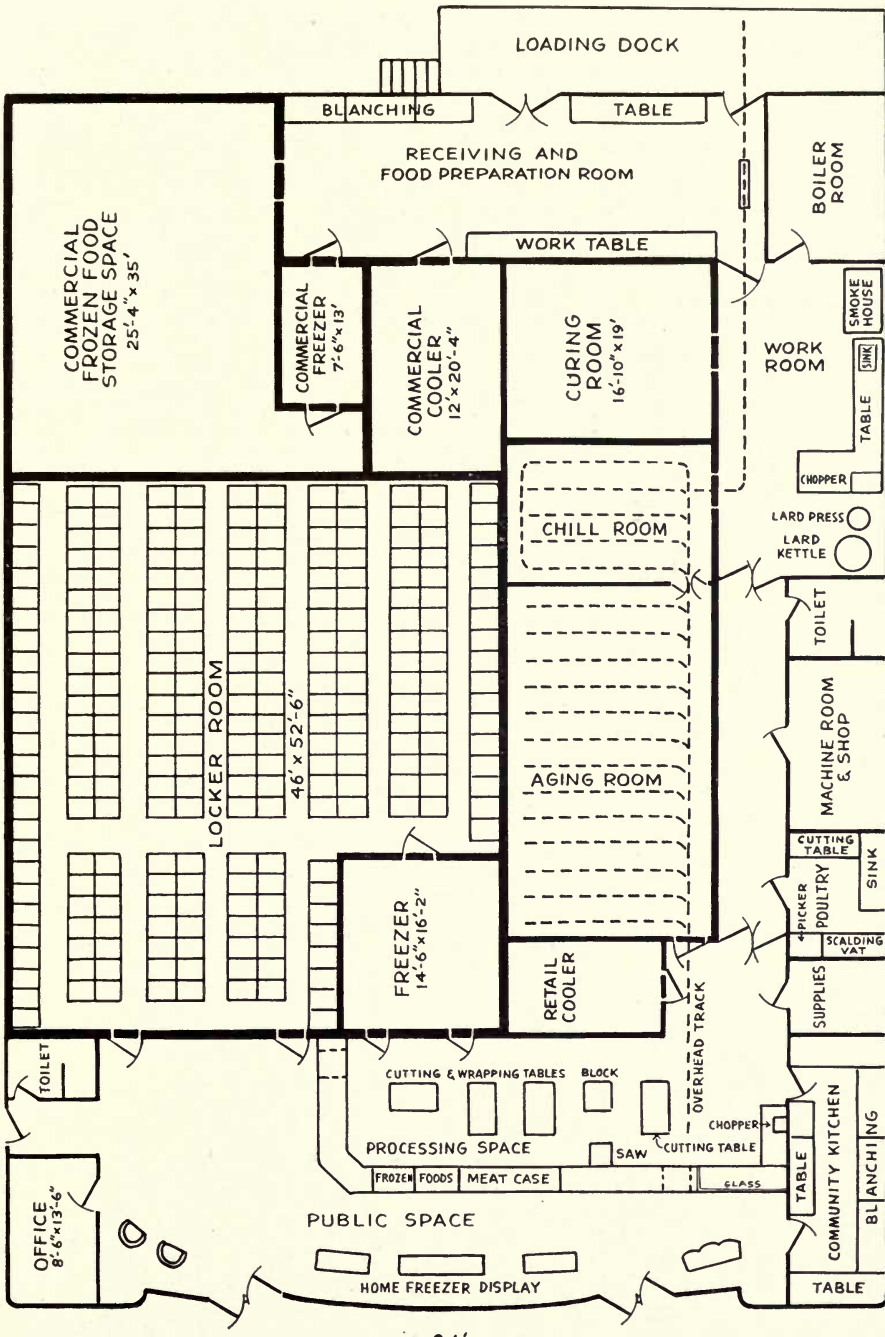
On the other hand, if you have a new building to plan, you can arrange the parts of your plant the way you want them, to conform to the needs of your community, your potential customers and yourself.

The floor plans on these pages show how other locker managers have solved some layout problems. These are successful layouts designed for many needs. By studying them closely you can learn much that will help you—whether you are remodeling a standing building or putting up a new one.

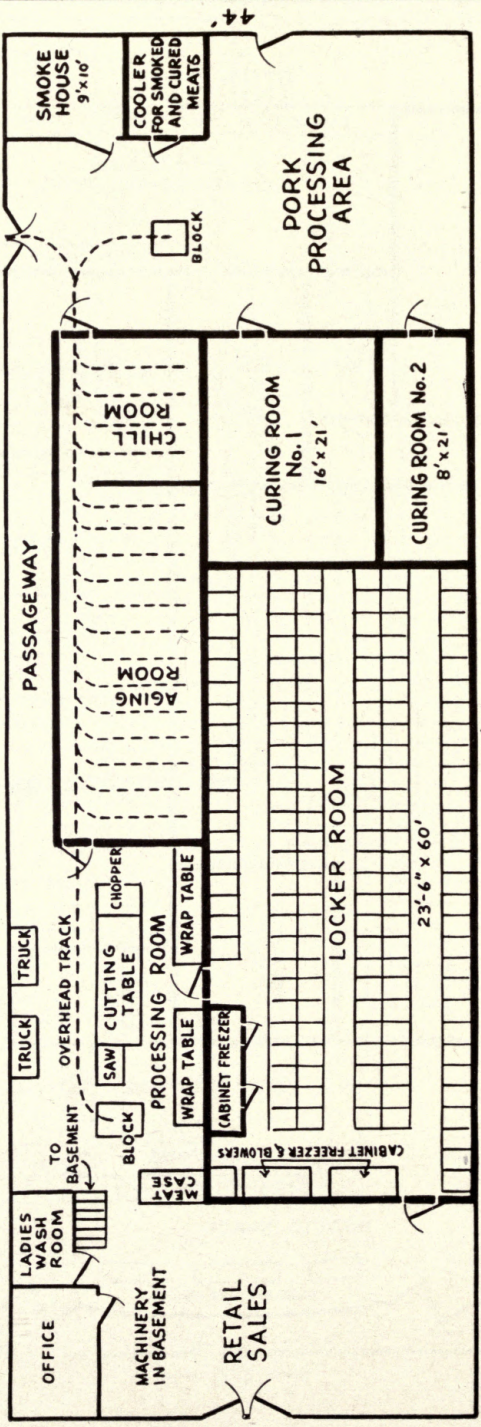

GROCERY AND MEAT MARKET
BLOCK
SLICER
DISPLAY CASE
GLASS ENC.
COUNTER
LIFT DOOR IN COUNTER
WORK TABLE
PROCESSING
BLOCK
WORK TABLE
FREEZER
WALL SCALE
COOLER 10'×6'-6"
LOCKER ROOM 19'×8'
DOCK

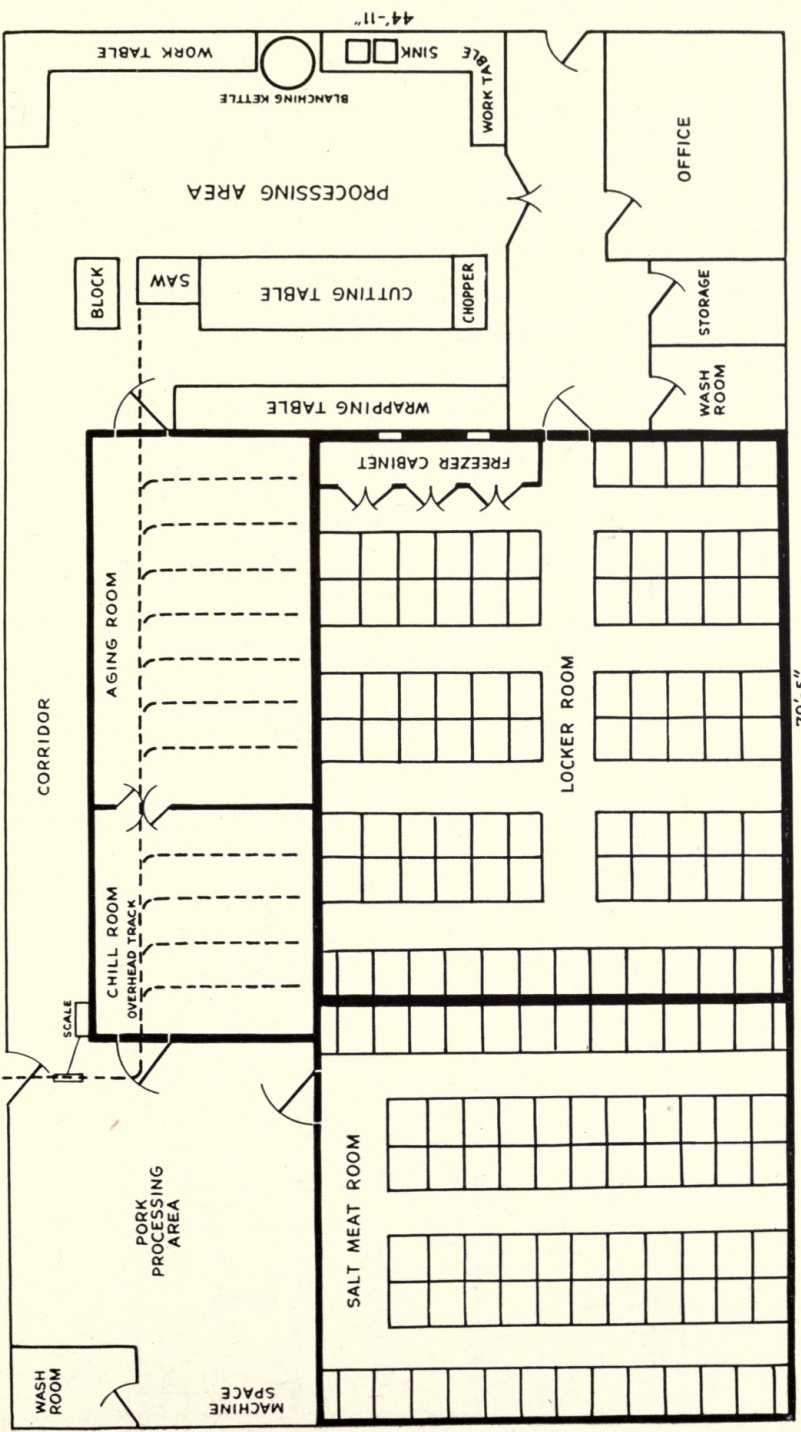

LOCKER ROOM
55'-6"× 32'
GLASS
FREEZER
GLASS
23'×14'
AGE AND HOLDING
9'×14'
CHILL
TABLE
BINS
CASKS
CURE ROOM
16'-6"×14'
MACHINE ROOM AND SHOP
BENCH
LARD ROOM 9'-6"×8'
LP
LK
TABLE
SMOKE & CURE WORK ROOM 12'-6"×11'
SMOKE CABINET
DOCK
TRACK SCALE
CH'K
EMPLOYEES WASH ROOM AND LOCKERS 33'-6"×6'
SUPPLIES
SHELVES
MEN
WOMEN
LOBBY
DISPLAY CABINET
WINDOW
KEYS
DESK
F
OFFICE
ENTRANCE
WRAPPING TABLE
SLICER
WRAPPING TABLE
PROCESSING ROOM
CUTTING TABLE
OVERHEAD TRACK
BLOCK
SAW
KITCHEN FOWL VEGETABLE FRUIT
TABLE
WRAPPING TABLE
20'×11'
TABLE
BLANCH
& SINK

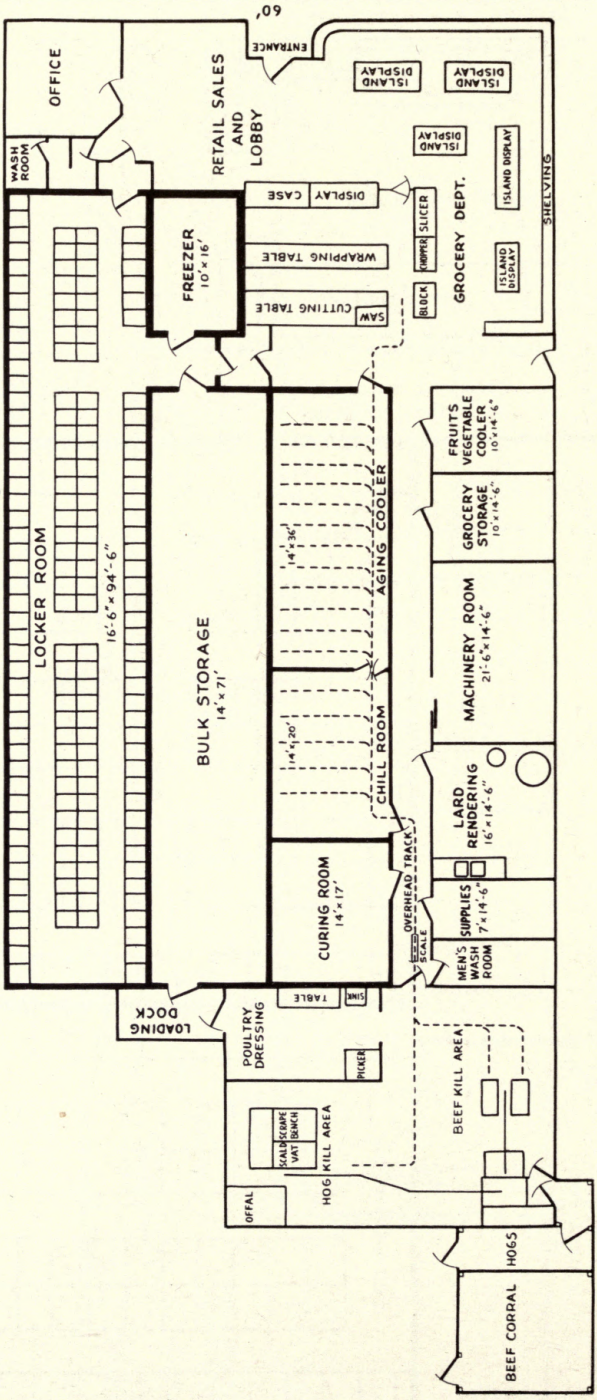

SUPER MARKET
50'×50'
SPACE FOR STORAGE
AND EXPANSION
32'×50'
MACHINERY
OVERHEAD
TRACK
24'×39'-9"
LOCKER ROOM
CHILL ROOM
AGING ROOM
FREEZER
PROCESSING
AREA
DISPLAY
CASE
TRACK SCALE
120'
50

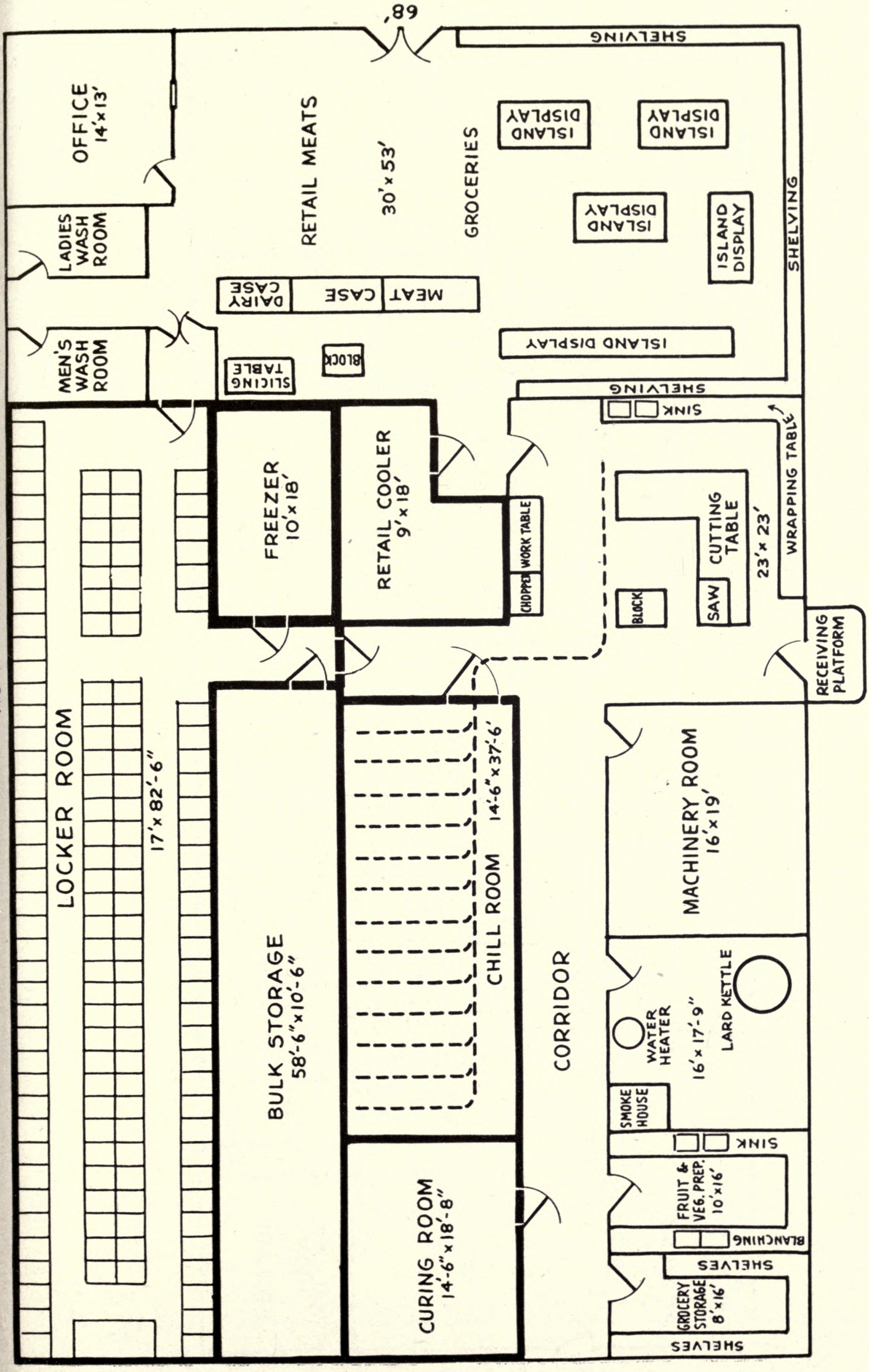

LOADING DOCK
BLANCHING
TABLE
RECEIVING AND
FOOD PREPARATION ROOM
BOILER ROOM
WORK TABLE
COMMERCIAL FROZEN FOOD STORAGE SPACE 25'-4" × 35'
COMMERCIAL FREEZER 7'-6" × 13'
COMMERCIAL COOLER 12' × 20'-4"
CURING ROOM 16'-10" × 19'
WORK ROOM
SMOKE HOUSE
SINK
TABLE
CHOPPER
LARD PRESS
LARD KETTLE
CHILL ROOM
TOILET
LOCKER ROOM
46' × 52'-6"
AGING ROOM
MACHINE ROOM & SHOP
CUTTING TABLE
SINK
PICKER
POULTRY
SCALDING VAT
SUPPLIES
FREEZER 14'-6" × 16'-2"
RETAIL COOLER
OVERHEAD TRACK
TOILET
CUTTING & WRAPPING TABLES
BLOCK
CHOPPER
PROCESSING SPACE
SAW
CUTTING TABLE
FROZEN FOODS
MEAT CASE
GLASS
TABLE
COMMUNITY KITCHEN
BLANCHING
OFFICE 8'-6" × 13'-6"
PUBLIC SPACE
HOME FREEZER DISPLAY
TABLE

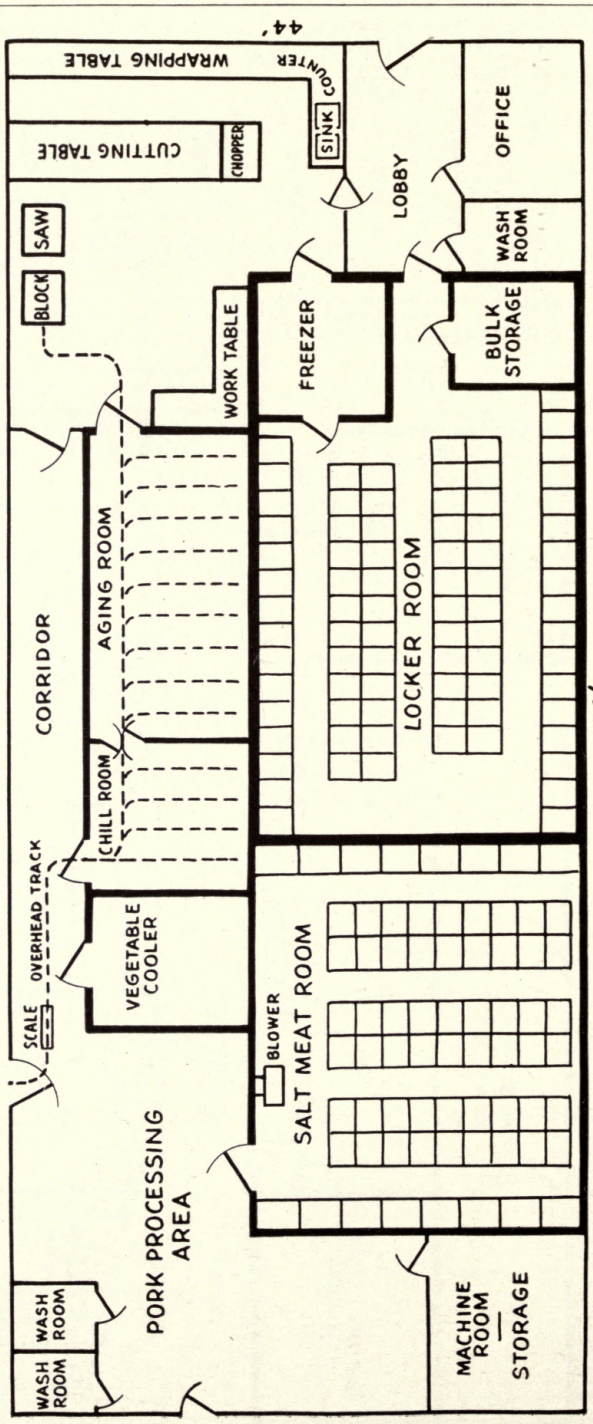
— 84' —

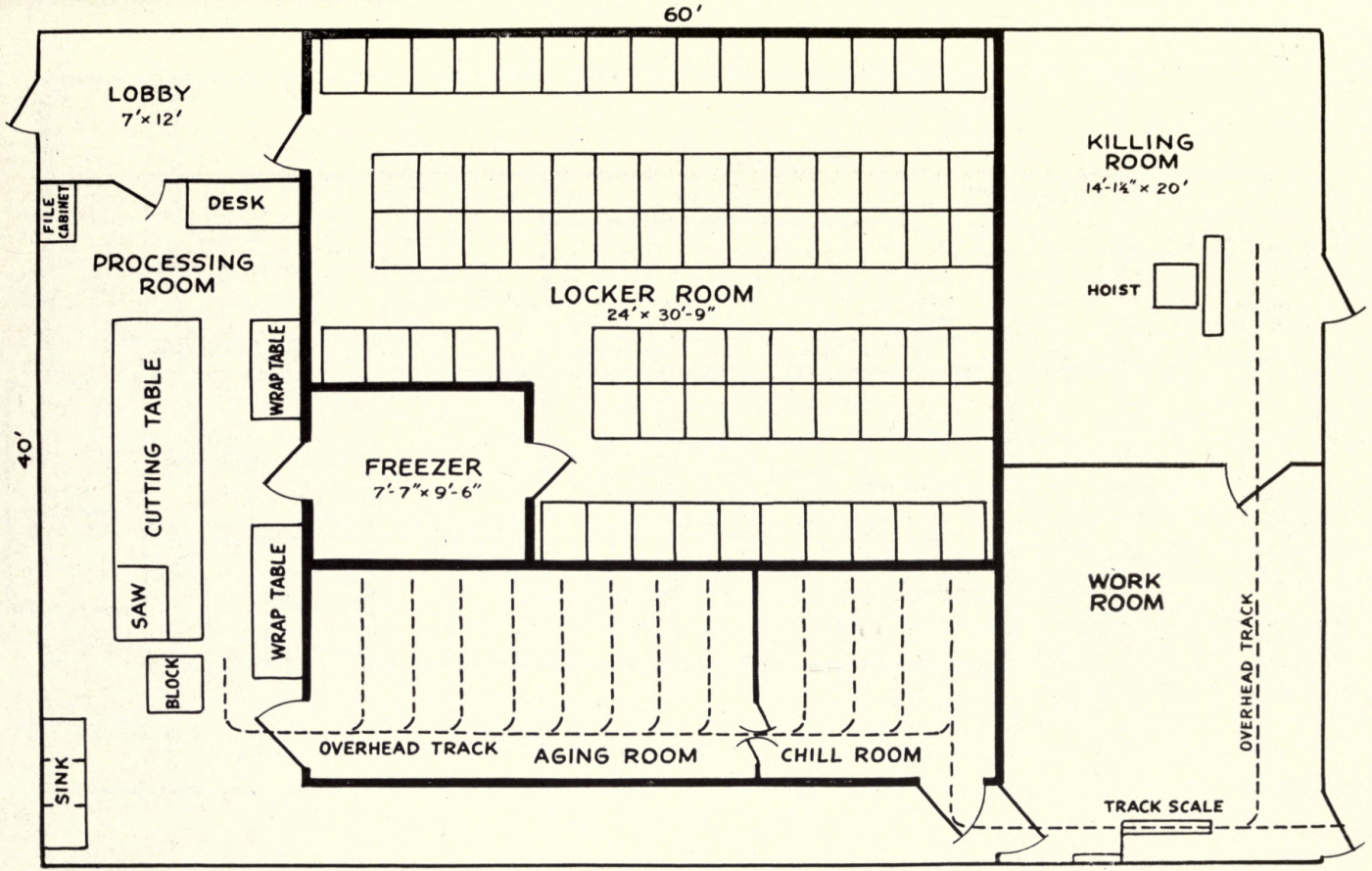

44'
SMOKE HOUSE 9'x10'
COOLER FOR SMOKED AND CURED MEATS
BLOCK
PORK PROCESSING AREA
CHILL ROOM
AGING ROOM
PASSAGEWAY
CURING ROOM No. 1 16'x21'
CURING ROOM No. 2 8'x21'
OVERHEAD TRACK
TRUCK
TRUCK
SAW
CUTTING TABLE
CHOPPER
WRAP TABLE
PROCESSING ROOM
WRAP TABLE
CABINET FREEZER
LOCKER ROOM
23'-6" x 60'
CABINET FREEZER & BLOWERS
130'-6"
MEAT CASE
TO BASEMENT
BLOCK
LADIES WASH ROOM
OFFICE
MACHINERY IN BASEMENT
RETAIL SALES

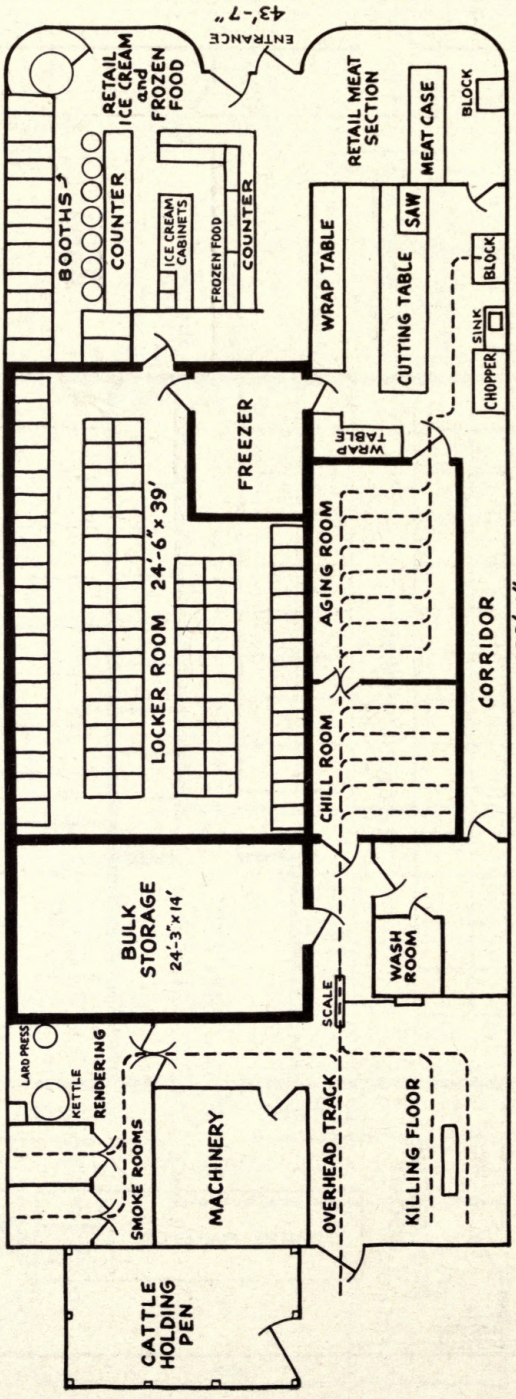

44'-11"
WORK TABLE
SINK
WORK TABLE
BLANCHING KETTLE
PROCESSING AREA
OFFICE
BLOCK
SAW
CUTTING TABLE
CHOPPER
STORAGE
WASH ROOM
WRAPPING TABLE
FREEZER CABINET
AGING ROOM
CORRIDOR
LOCKER ROOM
79'-5"
CHILL ROOM
OVERHEAD TRACK
SCALE
PORK PROCESSING AREA
SALT MEAT ROOM
WASH ROOM
MACHINE SPACE

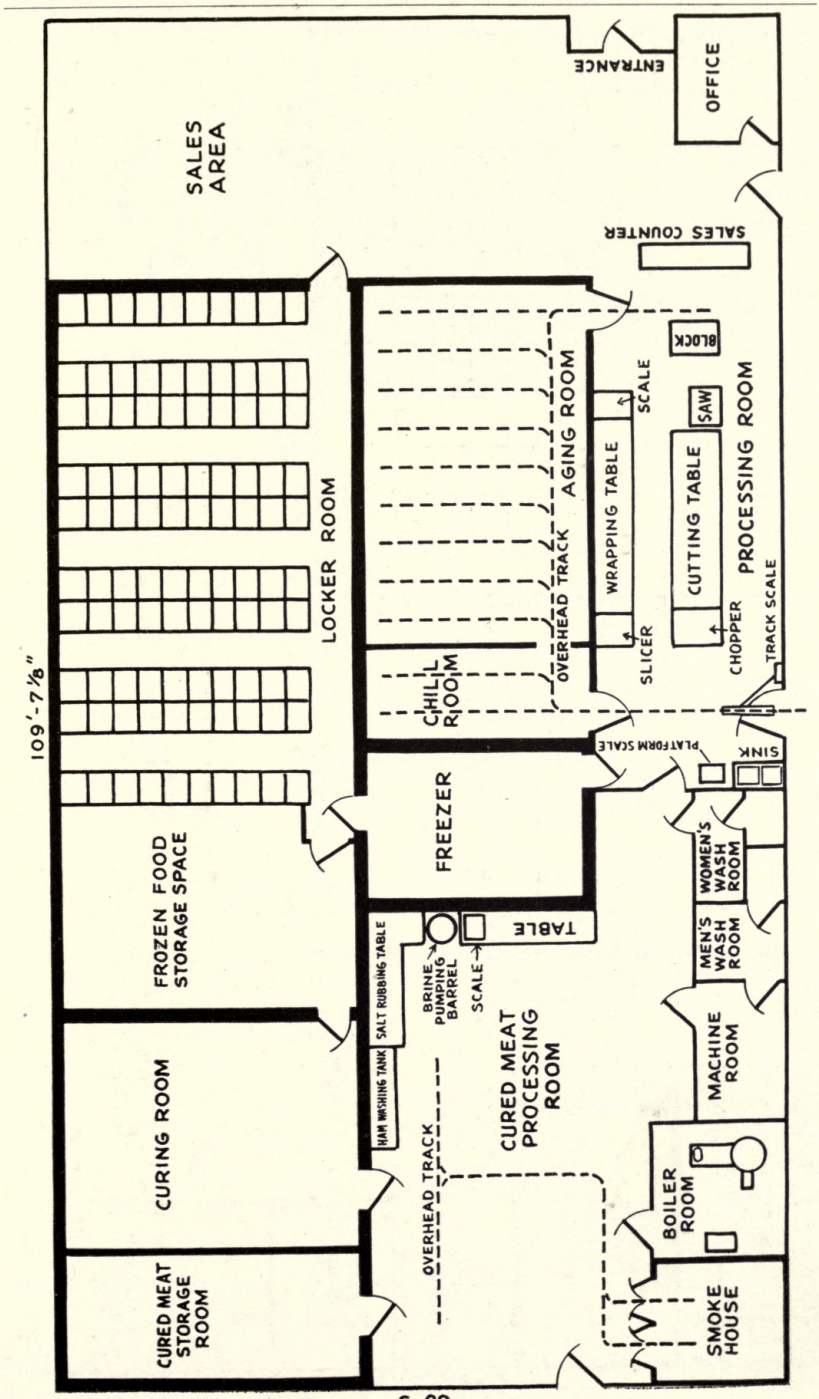

60'
ENTRANCE
OFFICE
WASH ROOM
RETAIL SALES AND LOBBY
ISLAND DISPLAY
ISLAND DISPLAY
ISLAND DISPLAY
ISLAND DISPLAY
DISPLAY CASE
SLICER
CHOPPER
BLOCK
GROCERY DEPT.
SHELVING
FREEZER 10'×16'
WRAPPING TABLE
CUTTING TABLE
SAW
118'
LOCKER ROOM
16'-6"×94'-6"
BULK STORAGE 14'×71'
14'×36'
AGING COOLER
14'×20'
CHILL ROOM
FRUITS VEGETABLE COOLER 10'×14'-6"
GROCERY STORAGE 10'×14'-6"
MACHINERY ROOM 21'-6"×14'-6"
LARD RENDERING 16'×14'-6"
OVERHEAD TRACK
SCALE
CURING ROOM 14'×17'
SUPPLIES 7'×14'-6"
MEN'S WASH ROOM
LOADING DOCK
TABLE
SINK
POULTRY DRESSING
PICKER
BEEF KILL AREA
SCALD VAT
SCRAPE BENCH
HOG KILL AREA
OFFAL
HOGS
BEEF CORRAL

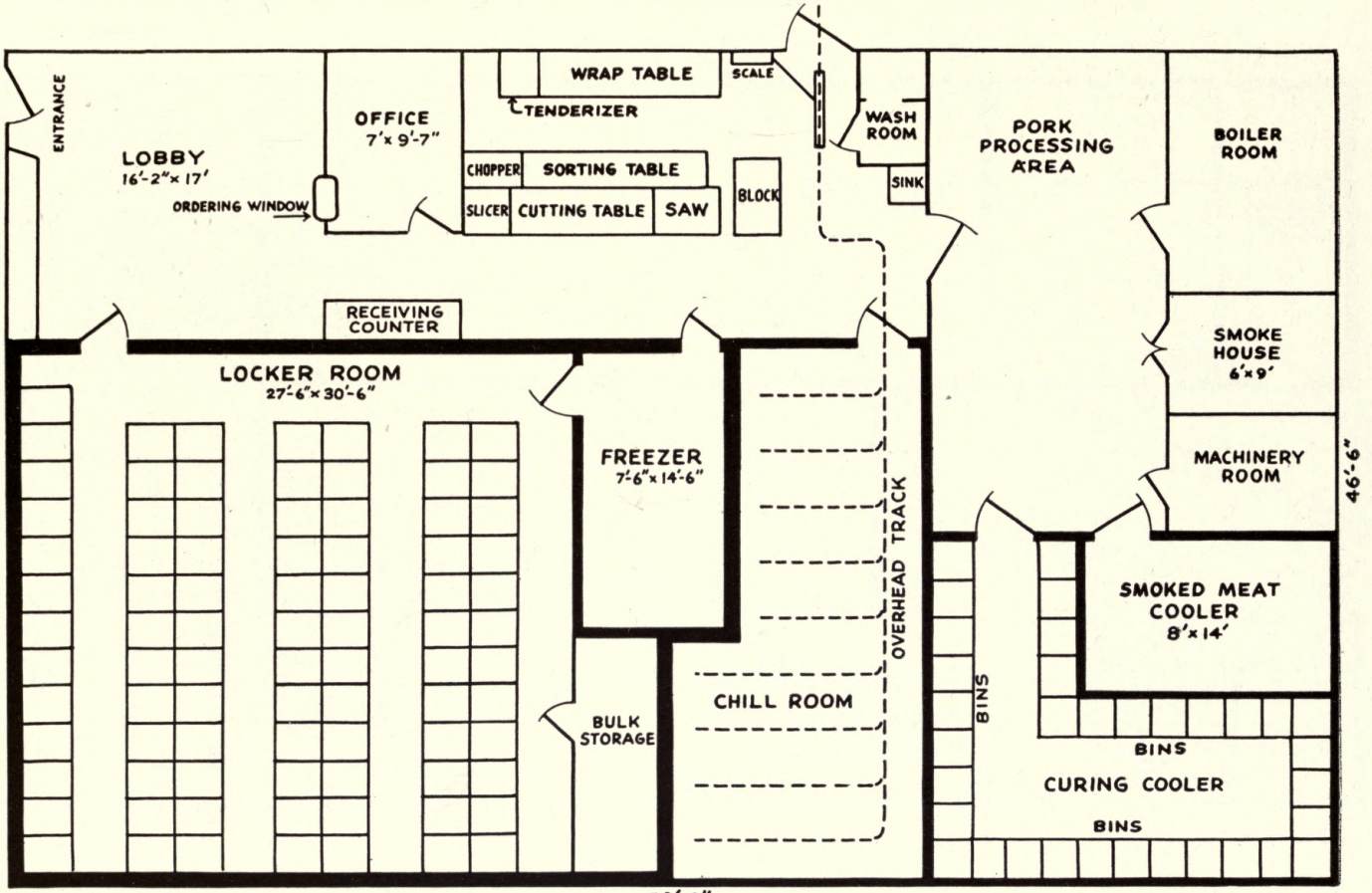

68'
OFFICE
14'×13'
LADIES
WASH
ROOM
MEN'S
WASH
ROOM
RETAIL MEATS
30'×53'
GROCERIES
SHELVING
ISLAND
DISPLAY
ISLAND
DISPLAY
ISLAND
DISPLAY
ISLAND
DISPLAY
SHELVING
DAIRY
CASE
MEAT CASE
ISLAND DISPLAY
SLICING
TABLE
BLOCK
SHELVING
SINK
WRAPPING TABLE
FREEZER
10'×18'
RETAIL COOLER
9'×18'
WORK TABLE
CHOPPER
CUTTING
TABLE
23'×23'
BLOCK
SAW
RECEIVING
PLATFORM
LOCKER ROOM
17'×82'-6"
BULK STORAGE
58'-6"×10'-6"
CHILL ROOM
14'-6"×37'-6'
CORRIDOR
MACHINERY ROOM
16'×19'
WATER
HEATER
16'×17'-9"
LARD KETTLE
SMOKE
HOUSE
SINK
CURING ROOM
14'-6"×18'-8"
FRUIT &
VEG. PREP.
10'×16'
BLANCHING
SHELVES
GROCERY
STORAGE
8'×16'
SHELVES

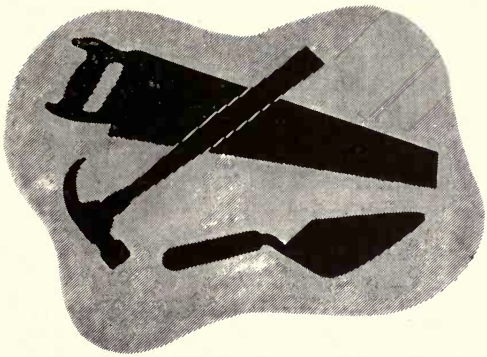

44'
WRAPPING TABLE
COUNTER
SINK
CUTTING TABLE
CHOPPER
SAW
BLOCK
OFFICE
LOBBY
WASH ROOM
WORK TABLE
FREEZER
BULK STORAGE
CORRIDOR
AGING ROOM
LOCKER ROOM
CHILL ROOM
OVERHEAD TRACK
SCALE
VEGETABLE COOLER
BLOWER
SALT MEAT ROOM
PORK PROCESSING AREA
WASH ROOM
WASH ROOM
MACHINE ROOM
STORAGE
106'


60'
40'
LOBBY
7'×12'
FILE CABINET
DESK
PROCESSING ROOM
CUTTING TABLE
SAW
BLOCK
SINK
WRAP TABLE
WRAP TABLE
LOCKER ROOM
24'× 30'-9"
FREEZER
7'-7"× 9'-6"
KILLING ROOM
14'-1½"× 20'
HOIST
WORK ROOM
OVERHEAD TRACK
OVERHEAD TRACK
AGING ROOM
CHILL ROOM
TRACK SCALE


CATTLE HOLDING PEN
SMOKE ROOMS
LARD PRESS
KETTLE
RENDERING
MACHINERY
BULK STORAGE 24'-3" x 14'
OVERHEAD TRACK
SCALE
WASH ROOM
KILLING FLOOR
CHILL ROOM
AGING ROOM
CORRIDOR 102'-6"
LOCKER ROOM 24'-6" x 39'
FREEZER
WRAP TABLE
CUTTING TABLE
SAW
CHOPPER
SINK
BLOCK
RETAIL MEAT SECTION
MEAT CASE
BLOCK
BOOTHS
COUNTER
ICE CREAM CABINETS
FROZEN FOOD
COUNTER
RETAIL ICE CREAM and FROZEN FOOD
ENTRANCE
43'-7"


SALES AREA
ENTRANCE
OFFICE
SALES COUNTER
LOCKER ROOM
CHILL ROOM
OVERHEAD TRACK
AGING ROOM
WRAPPING TABLE
SCALE
BLOCK
SAW
CUTTING TABLE
PROCESSING ROOM
SLICER
CHOPPER
TRACK SCALE
109'-7⅛"
FROZEN FOOD STORAGE SPACE
FREEZER
PLATFORM SCALE
SINK
TABLE
SALT RUBBING TABLE
BRINE PUMPING BARREL
SCALE
WOMEN'S WASH ROOM
MEN'S WASH ROOM
CURING ROOM
HAM WASHING TANK
CURED MEAT PROCESSING ROOM
MACHINE ROOM
OVERHEAD TRACK
CURED MEAT STORAGE ROOM
BOILER ROOM
SMOKE HOUSE
60'-9"


ENTRANCE
LOBBY
16'-2" x 17'
ORDERING WINDOW
OFFICE
7' x 9'-7"
WRAP TABLE
TENDERIZER
SCALE
CHOPPER
SORTING TABLE
SLICER
CUTTING TABLE
SAW
BLOCK
WASH ROOM
SINK
PORK PROCESSING AREA
BOILER ROOM
SMOKE HOUSE
6' x 9'
MACHINERY ROOM
RECEIVING COUNTER
LOCKER ROOM
27'-6" x 30'-6"
FREEZER
7'-6" x 14'-6"
OVERHEAD TRACK
BULK STORAGE
CHILL ROOM
BINS
SMOKED MEAT COOLER
8' x 14'
BINS
CURING COOLER
BINS
46'-6"
73'-3"



CHAPTER THREE

YOUR LOCKER PLANT

CONSTRUCTION

Where a building is to be built to house a frozen food locker plant the following considerations are very important.

Foundation and Footings

Foundations and footings will vary in various sections of the country, because of differences in frost levels and the types of earth on which the buildings are to be erected. The footing for a foundation should always be on solid dirt, and well below frost levels. This will vary from section to section. The width and thickness of the footing on which the foundation is to be placed will run from 24 inches wide to 12 inches deep, and in territories where the earth is sandy or loose, it is necessary to have the footing of sufficient width to properly support the foundation. It is often necessary to place in the footing from two to four steel reinforcing rods (⅝"), since it is very important that the walls of a building in which a low temperature room is built do not settle.

Where the footing is a considerable depth in the ground, it is very important to place a firm support from the footing to the under side of the concrete floor, as shown in the accompanying blueprint. You will notice that expansion material one-half inch thick should be placed between concrete floor and wall of building. The type and thickness of the wall which is placed on the foundation and footing will vary according to height of the building. A nine-inch brick wall for a single story building would be of proper carrying capacity; and where a concrete block wall is used, it is very important to use a concrete belting around the entire walls of the building, window-top height. This is done by building a box form around the top of the wall to approximately 14 inches high, and reinforce this belting with five steel rods (⅝") properly placed for reinforcing purposes.

Concrete floors in the building should be not less than four inches thick and have a carrying capacity of from 300 to 350 pounds per square foot. Concrete reinforcing mesh should be used in all floors, especially under refrigerated rooms.

We also advise footings under walls to the refrigerated rooms, as shown on the blueprint of foundations. The sizes and types of setting for these foundations will vary as to type of soil and type of refrigeration wall construction. This is especially true where refrigerated rooms are backed up with concrete blocks. The type of construction of a locker room wall can not be too rigid, due to the fact that the doors to these rooms are used quite often, and by people who slam them with quite a bit of force.

Where there is an occasion to support the roof of a building on the walls of the refrigerated rooms, as was the case as shown on above mentioned blueprint, it is very important to use either an eight-inch concrete block wall, or brick. All blocks and bricks should be laid in a good rich mixture of mortar mix. If this type of wall is not used, steel posts can be used in walls, and insulation placed around them.

Where a locker plant is to be constructed in an existing building, the location, type, and kind of building should be very carefully considered before starting construction of refrigeration rooms to be used for a food locker plant. The floors should be not less than four-inch concrete in good condition. The ceiling height of the building should be high enough to receive the plant

without spreading beyond a point where the construction cost would be out of proportion. The concrete floor in the building should be not less than 12 inches above outside ground level, to prevent floor heaving. In other words, the size, type, and condition of a building in which you are to build a food locker plant should be such that you could construct a plant that would be of sound quality, convenient, and economical to operate.

Drainage Under Floors and Around Walls

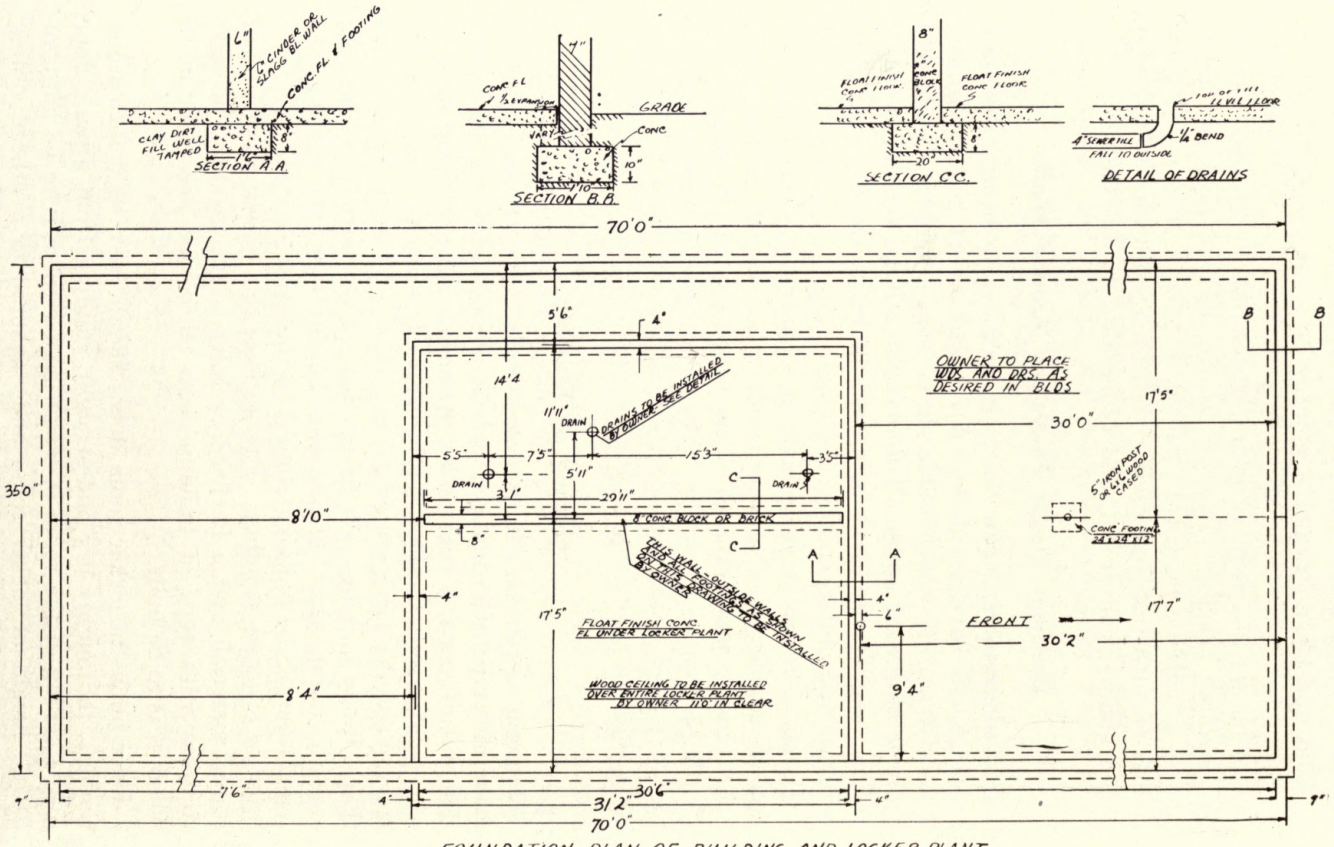
If at all possible, a new building designed for locker plant purposes should have a sub-floor level well above outside ground level. If this is not possible, it is very important to have a bedding of gravel under all floors and around outside walls to proper height with drain tile leading from same, to care for moisture accumulation.

Should a locker plant be built in a basement, every consideration should be given to ventilation under all refrigerated room floors, and outside walls to 12 inches above ground level. This ventilation can be accomplished by using four-inch hollow square tile of proper load-bearing qualities, placing same under concrete sub-floors, and up outside basement walls.

Method of Framing

Framing for loose fill insulated walls will vary according to make and type of insulation, and we advise following the insulation manufacturer's cuts and recommendations, making sure to use sound material. This applies to the framing necessary for the erection of the refrigerated rooms only. While it is not often that a frame building will be erected for the purpose of housing a refrigeration plant, should this be the case, the footing and foundation of the building should be the same as that used for a brick or concrete building. The walls of this building must be of sound material, and a licensed architect's specifications usually conform with type of building best suited for the location in which it is to be built.

Door bucks to locker room doors should be 6 by 6 inch wood timbers, thoroughly dry and straight, running from ground floor to the ceiling of the room in which locker room is to be built, or to full height of locker room and anchored to overhead ceiling



FOUNDATION PLAN OF BUILDING AND LOCKER PLANT

joist supporting insulation of the locker room ceiling. It is also necessary to anchor the door buck firmly to ground floor. The header buck should be of same size and mortised, or dapped into upright bucks, and securely nailed. See attached sketch on blue print.

Since there is quite a bit of traffic through this door you will experience cracking of vapor seal, and plaster, if door bucks are not properly installed, and well anchored.

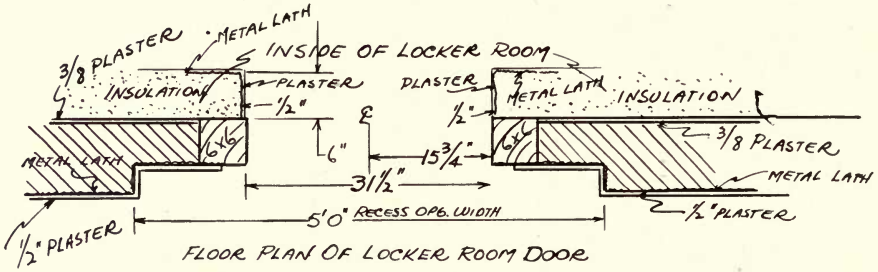
Door bucks for chill and other high temperature room doors should be installed in the same manner but 4 by 6 inch dry timbers can be used, since the problem of vapor seal is not as serious in these rooms, and the traffic is not as heavy as in the locker room.

Electrical Installation

All electric wiring inside of refrigerated rooms should be in galvanized rigid iron conduit, using vapor-proof fittings for all light outlets. The lighting circuit should enter refrigerated rooms at the pilot light switch. Make sure to seal the wiring where the conduit goes from the switch box to the inside of refrigerated rooms with an approval sealing compound, filling the conduit from the warm to the cold side of insulated wall thoroughly, after all wires have been run.

All electric wiring for refrigeration compressors, meat saws, grinders, and lighting service in the office and processing rooms should be done by a licensed electrician and according to city, and National Underwriter's rules and regulations prevailing in the territory in which the plant is built. Where refrigeration walls are being constructed there should be provisions made for refrigeration lines going through same. This can be done by using a short piece of transite pipe of sufficient size for refrigeration lines and long enough to reach from the warm to the cold side of refrigeration wall. If this is not used, a satisfactory opening can be left by using a metal pipe in two sections by placing it in the wall, leaving at least one inch of space between the two pieces of pipe in center of insulated wall.

There should be located in every locker room one light which will burn continuously, and not controlled by entrance pilot light switch. There should also be located inside in a conspicu-



FLOOR PLAN OF LOCKER ROOM DOOR

ous place an emergency bell button, and so marked, controlling a bell of proper size located in the front part of the store building at a point where same could be heard any place in the building, or on the street in front of the building. This is not a very expensive piece of equipment, and it may be very valuable in case of emergency. Another emergency precaution, and probably the best, is the placing of a telephone inside the locker room, connected to the telephone line in the place of business. The telephone company will install this extension for a very small rental per month.

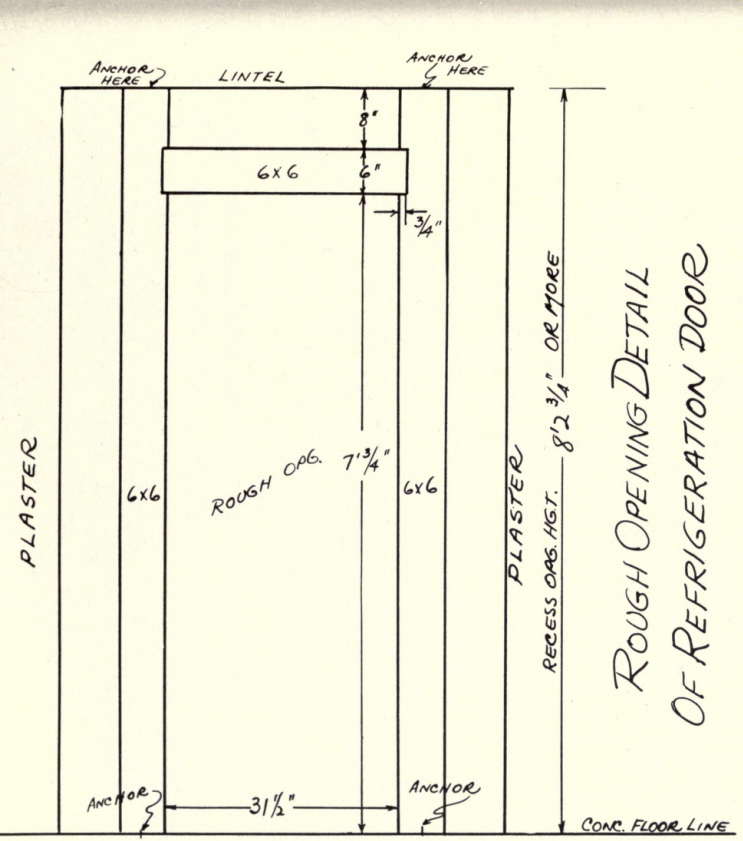
Plumbing Installation

Drainage: Each high-temperature room should have floor drains not less than four inches in diameter, properly trapped with heavy iron grating. The drains should be carried to the outside of the refrigerated rooms, and connected to disposal drainage system, not sanitary sewerage.

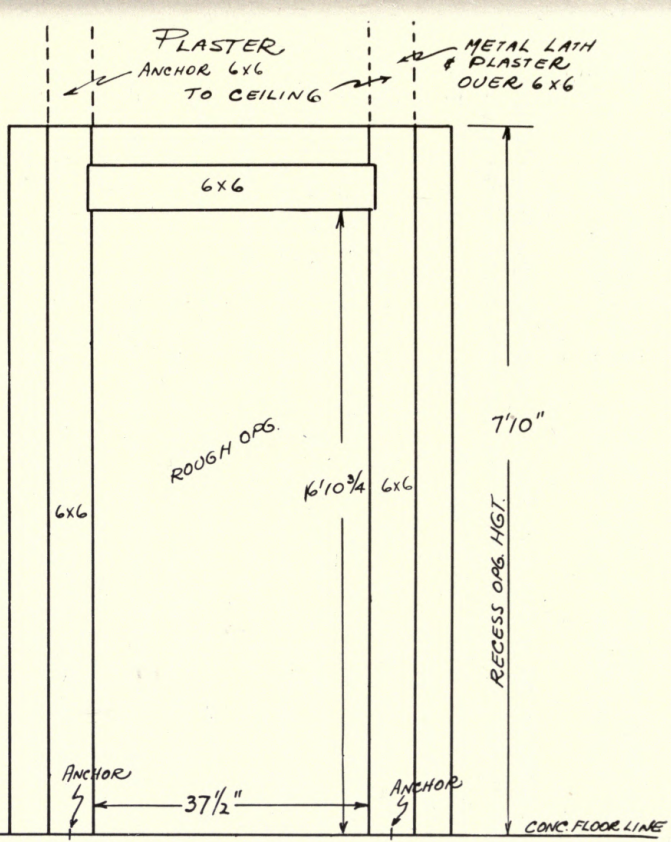
It is advisable to build a grease trap just outside of refrigerated rooms or outside of the building for all drains coming from meat curing rooms, chill, and aging rooms. Drains for high temperature blower coils in the above-mentioned rooms should be provided in the floor under the coil, and as close to the insulated wall as possible. These drains can be connected into the drain from center of floor.

We advise that all drains for high temperature refrigerated rooms and low temperature blower coils be laid in the concrete sub-floor, as shown in sketch. These drains can be trapped just outside of the refrigerated rooms where it is preferred.

Sanitation: Sanitation is very important, and every precaution must be taken to provide plenty of hot and cold water at various



ROUGH OPENING DETAIL OF REFRIGERATION DOOR



FRONT ELEVATION OF LOCKER ROOM DOOR 2'x6'
ROUGH OPG. FOR DOOR 31 1/2" x 7' 3/4"

FRONT ELEVATION OF CURING ROOM DOOR 2'6 x 6'
ROUGH OPENING 37 1/2" x 6'10 3/4"

places throughout the processing room, and available for washing floors in meat curing rooms, age and chill rooms at certain intervals.

A good many states now have laws governing this particular subject, and we advise checking carefully any special requirements which might be enforced by the various city and state health departments.

The locker plant should have an ample water supply, conveniently accessible to all operations and approved by the local health authorities. Running hot and cold water under pressure should be available in each room in which food is prepared or in which utensils are washed, with provisions for hose connections.

In the processing room all surfaces in which food comes in contact should be smooth, and not readily corrodible material.

Processing rooms, and rooms where utensils used in the processing of food are kept, should be well lighted, with ventilation equipment supplementary to windows and doors—such as adequate exhaust fans or hoods—provided if necessary. This ventilation requirement would not apply to the locker room, chill, aging, or freezing room. Ample light promotes cleanliness; proper ventilation reduces the bacterial concentration in the air, odors, and condensation upon interior surfaces which may drop into food or utensils, smudging of walls, and ceilings, excessive heat, and concentration of toxic gases produced as a by-product of combustion or otherwise, moisture produces mold development.

All doors opening to the outside, windows, transoms, or other openings, should be screened with not less than 16-mesh wire or plastic cloth, and all screen doors should be self-closing. Screens for outside doors or openings which are frequently used for carrying products in or out of the building, should be supplemented by fans of sufficient power to prevent the entrance of flies when doors are used, and measures should be taken to prevent the entrance of flies the year round.

Sewerage: It is very necessary that adequate toilet facilities conveniently located and complying with the minimum requirements of the state board of health, and with the local city plumbing code, are provided for each frozen food locker plant. In plants where both sexes are employed, toilet facilities must be provided

for each, and there should be an intervening room or vestibule between the toilet rooms and any room in which food is prepared, processed, chilled, frozen or stored, or in which utensils are washed or stored. This intervening room or vestibule should be equipped with tight fitting self-closing doors and should be of such dimensions as to prevent both doors from being opened simultaneously by the same person. It is suggested that the intervening room, or vestibule be made large enough to contain lockers for employees' clothing, and hand-washing facilities.

Toilet room doors should be provided with springs or self-closing devices, all vestibules and toilet rooms should be well lighted, and toilet rooms should be vented to the outside air.

In the event that city sewage disposal system is not available, then a septic tank should be constructed and operated in accordance with the standards of the state board of health.

Floor Drains: A floor drain in chill and aging rooms should be provided for each 180 to 200 square feet of floor space, sloping the floor to the drain so that there will be no pools of standing water after flushing.

Floor drains in processing rooms should have not less than one four-inch trapped drain to each 400 square feet of floor surface, sloping the concrete floor to the drain so that there will be no pools of standing water after flushing.

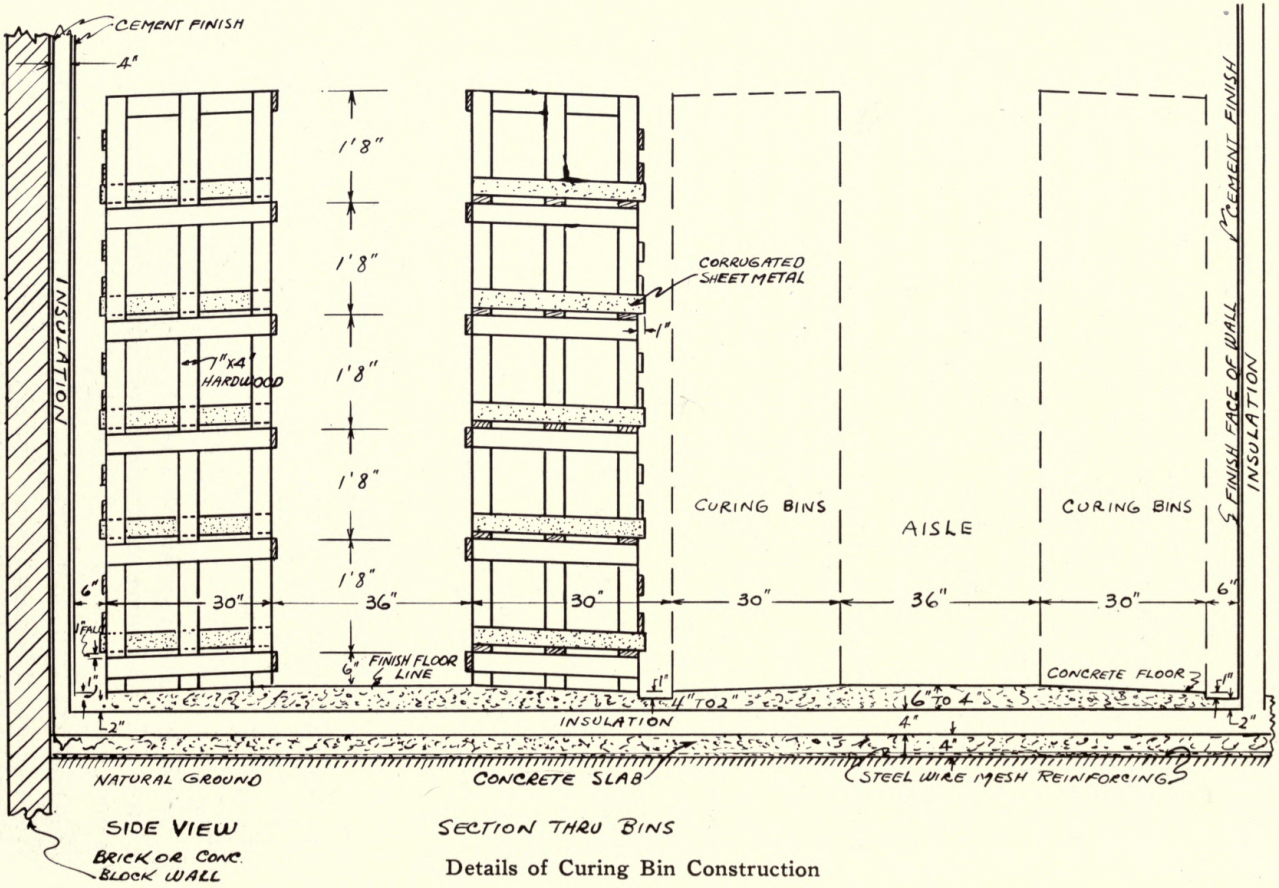
As previously stated, these drains should be properly trapped, and carried to a grease trap, then emptied into the storm sewerage.

Finish Wall Treatment in Rooms

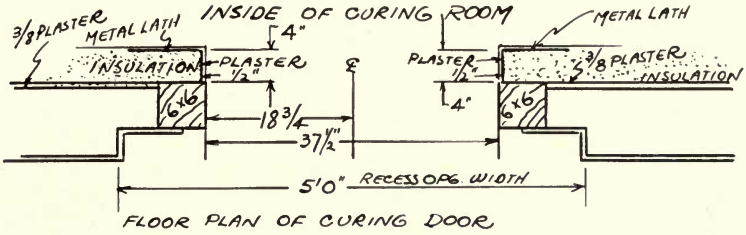
Processing: Walls and ceiling in processing room should be of a smooth washable construction, tight and impervious to moisture, and of a material that can be painted as often as necessary.

The most durable finish is finish troweled smooth, and if paint is used it is very important that an approved cold storage paint be procured, since some paints throw off odors that are absorbed by food.

Curing: The walls and ceiling in meat curing rooms should be given a portland cement plaster finish, applied in two coats to an approximate thickness of one-half inch, by first tacking to the



Details of Curing Bin Construction



insulation a one-inch mesh poultry wire where rigid insulation is used, or if the structure is for loose-fill insulation, use metal lath as a background to which the plaster is applied, both coats to be apportioned, one part hydrated lime, two parts portland cement, and three parts clean sharp sand. The first coat should be applied as a rough, or scratch coat, the second coat for the interior of all refrigerated rooms should be brought to a smooth trowelled surface, and scored in blocks approximately four feet square to reduce cracking to a minimum.

It is a very good idea to treat the finish plastered wall in this room with an approved hardening material. This treatment makes the wall easily washed, without absorption of moisture.

Where the inside walls of refrigerated rooms are painted it is very necessary to use an approved cold storage paint.

Office: The finish of walls and ceiling in the office can be any of several materials. Here again we would recommend a smooth plaster finish, which can be painted or decorated according to the owner's wishes.

Coolers: The wall finish in all refrigerated rooms should be of a material that will throw off no odors of any kind. Our preference would be a cement or hard-plaster finish trowelled to a smooth surface. If the rooms are insulated with rigid insulation, we advise the use of a plastered wall reinforced with one-inch poultry netting. If the rooms are insulated with loose-fill insulation, a very good finish wall can be had by the use of metal lath, and plastered with the above-mentioned material. There are also transite and asbestos boards that make a very satisfactory finish.

Where the walls are finished with plaster and trowelled to a

smooth finish it is advisable to score them four feet in both directions, reducing cracking to a minimum.

The ceilings of refrigerated rooms can be finished with a mastic plastered to the rigid insulation, or can be plastered with the cement plaster using the poultry wire tacked to the ceiling insulation for reinforcing purposes.

Flooring

Processing: The floors in food processing rooms should be of concrete, and not less than four inches in thickness, reinforced with concrete reinforcing mesh, and trowelled to a smooth finish. The finish coating of the concrete floor should have an added abrasive material, or should have an effective non-slip surface, and treated with an approved hardening material to prevent absorption.

Coolers: The floors in cooling and aging rooms should be of concrete not less than three inches in thickness, and reinforced with metal reinforcing mesh and trowelled to a smooth surface, and treated with an approved hardening material to prevent absorption of waste matter. Floors thus treated are easily washed.

Floors in the locker room should be of same type construction as in chill rooms and treated with a hardening material.

Floors in meat curing rooms should be designed so as to take all drainage from shelves to a trough in back of the bins. It is very important, especially in this room, to treat the finished floor with a surface hardener. It prevents the floor from absorbing the greasy substance which drains from the meat being cured. In the accompanying blueprint showing details of the interior of a meat curing room, you will notice that the drain troughs run parallel with the meat curing shelves, and in each of these troughs should be placed four-inch floor drains not more than 14 feet apart. Sloping all curing room floors from center of aisles to troughs back of shelves prevents the undesirable accumulation of the drainage in the aisles of the room.

All meat-curing shelves should be equipped with metal sloping to the back, which will empty the drainage into the above-mentioned trough. Corrugated aluminum roofing is very satisfac-

tory for this purpose. The blueprint referred to will show arrangement of shelves and method of placing metal in racks.

Roof Construction or Ceiling in Coolers

The roof or ceiling construction in refrigerated rooms should be well constructed making sure that there is no chance of the timbers, or trusses supporting the ceiling, sagging, or settling. This is especially true in the pre-cool and aging room where meat tracks and rails are used.

The ceiling of these rooms should be of very heavy timbers, or steel trusses and should be supported at each timber bearing point on either side of the room with steel posts built into the insulated wall, which would prevent sagging of the ceiling.

In some cases it is advisable to support meat tracks and rails on separate posts placed inside of the refrigerated room, making sure to place them close enough together to prevent the rails supporting the track from sagging when the maximum amount of load is placed on the track.

It is very important that the roof or ceiling structure of all refrigerated rooms be so constructed that there will be no settling or sagging, which would cause the breaking of the vapor seal.

Exterior Walls

Exterior walls to refrigerated rooms can be finished with plaster, asbestos cement board, or in the case of a loose fill plant, metal lath and plaster. Our preference would be a hard-plaster finish, trowelled to a smooth surface so that it could be painted with an approved cold storage paint for sanitary purposes.

The exterior walls to a building housing refrigerated rooms should always be thoroughly waterproofed.

The type of structure for exterior walls in a single story building should be not less than nine-inch brick, or concrete block construction.

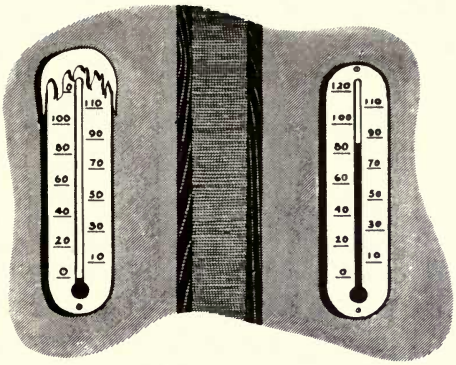
Roof Construction

The roof construction will depend on the size of the building, the number of supports that can be had in the building, and the type of roof construction.

Where steel trusses are used it is very important that steel posts or wood posts be placed in refrigerated walls to support the roof structure at certain intervals. This support must be had regardless of type of trusses used. Should it be necessary to place posts inside of refrigerated rooms to support the ceiling, it is very necessary to properly vapor seal, or insulate the posts, preventing moisture seepage into the refrigerated room.

Ventilation in the attic of a building housing the refrigerated rooms, or ventilation over refrigerated rooms, is very important, and should be constructed so that ventilating fans can be installed for the purposes of moving ceiling, and attic heat from the building. This will mean quite a saving in operation cost.

The architect's plans and specifications usually provide for proper roof carrying capacities. However, it is very necessary that the above additional precautions be taken. In other words, where possible it is advisable to design the locker plant, and have the building built around it.



CHAPTER FOUR

YOUR LOCKER PLANT

INSULATION

General Considerations

CONSTANT temperature of the various rooms in the locker plant must be maintained to avoid chemical changes and shrinkage of the stored products. Economical considerations in the selection of insulation are also important to the success of the plant. Initial costs determine investment, depreciation, and interest charges. However, reducing insulation costs too much will add to the operating cost. The more insulation used—the lower the cost of:

1. The power required throughout the life of the plant.
2. Initial cost and depreciation of the refrigeration equipment.
3. Maintenance and care of insulation and refrigeration equipment.

The savings stated are more important in smaller buildings because the heat losses to be avoided by insulation are relatively greater. This may be illustrated by a simple comparison:

In a low temperature room 100 ft. x 100 ft. x 15 ft., there are 26,000 square feet of floor, wall, and ceiling area and 150,000

cubic feet of space. This amounts to 0.17 square feet per cubic foot. In a room such as we might have in a locker plant of 25 ft. x 50 ft. x 10 ft., there are 4,000 square feet of floor, wall, and ceiling area and 12,500 cubic feet of space. This amounts to 0.32 square feet per cubic foot. Thus the importance of the heat-absorbing surfaces is almost double for the smaller building. The locker room should then be well insulated with a high grade material, developed for that purpose in ample thickness. The economical thickness of low temperature insulation depends on the following:

1. Design conditions, i.e., climatic conditions, type of construction, temperatures to be maintained.
2. Applied cost of insulation per inch of thickness.
3. Installed cost of refrigeration per inch of thickness.
4. Cost of power.
5. Expected life of the plant, in order to figure depreciation and interest charges.
6. Cost of space occupied by insulation.

From the above, it is possible to calculate an economical thickness for each individual job. There are, however, too many variables to make thickness recommendations which would apply for all plants. The Cork Insulation Manufacturers Association recommend the following:

ROOM TEMPERATURE	RECOMMENDED CORKBOARD THICKNESS
45° and above	2-inch
35° to 45°	3-inch
20° to 35°	4-inch
5° to 20°	5-inch
— 5° to +5°	6-inch
—20° to —5°	8-inch

It should be pointed out that these recommendations are only a guide; and the size of the plant, climatic conditions, sun exposure, ground exposure, and other factors previously mentioned must be considered.

With sheet steel reflective type insulation, the recommended thicknesses are as follows:

Room Temperature	No. of Layers	Thickness of Insulation
40° F	3	1½ inch
30° F	4	2 inch
20° F	5	2½ inch
0° F	6	3 inch
-10° F	7	3½ inch
-20° F	8	4 inch

It is noted that the thickness with this type of insulation is much less than either corkboard or loose-fill types. The over-all cost per total thickness of insulation is comparable with other insulations.

With loose-fill insulation, the recommended thickness would be somewhat greater. This is due to a much lower cost per inch of thickness. The following thickness of insulating materials for this type of insulation follows:

CHILL ROOM—34°

Walls 6-inch
Partitions adjoining freezer or locker room 10-inch
Floor 6-inch
Ceiling—space over ventilated 6-inch
Ceiling—space over not ventilated 8-inch

LOCKER ROOM—0°

Walls—sun effect considered 14-inch
Walls—no sun effect 12-inch
Floor—on ground—18-inch gravel fill well drained 10-inch
Floor—space under ventilated 12-inch
Ceiling—space over ventilated 12-inch
Ceiling—space over not ventilated 14-inch

FREEZE ROOM—MINUS 20°

Walls—sun effect considered 16-inch
Walls—no sun effect 14-inch
Floor—on ground—18-inch gravel fill well drained 12-inch
Floor—space under ventilated 14-inch
Partitions adjoining cooler room 12-inch
Partitions adjoining locker room 6-inch
Ceiling—space over ventilated 14-inch
Ceiling—space over not ventilated 16-inch

Conductivity of Proprietary Materials

K—B.T.U. per inch, per sq. ft., per hour per 1° FTD.

Trade name	Density, lb./ft.³	Mean temp. of test sample, °F.	k	Reference
Alfol, flat	3.0	105	0.25	10
	4.1	107	0.223	10
Alfol, crumpled	.24	75	0.284	11
Armorak	26.3	45	0.29	12
		47	0.278	4
Balsam Wool	3.6	70	0.246	1
	2.2	90	0.270	2
	3.8	90	0.250	2
Cabot's Quilt	3.4	90	0.25	2
	4.6	90	0.26	2
Calorox	4.0	86	0.22	2
	11.4	70	0.28	1
Celotex	13.2	70	0.31	1
	14.8	90	0.34	2
Celotex Low Temp. Insulation	13.8	70	0.30	7
Dry-Zero	1.0	90	0.24	2
	2.0	90	0.25	5
Corkboard, Armstrong Cork Co.	8.32	60	0.283	10
Cork Insulation Co.	8.32	60	0.283	10
Crown Cork and Seal Co.	8.32	60	0.283	10
Mitchel and Smith Co.	8.32	60	0.283	10
Mundet Cork Corp.	8.32	60	0.283	10
United Cork Cos.	8.32	60	0.283	10
Ferro Therm	.25	45	0.217	13
Fibrofelt	13.6	90	0.32	7
Flaxlinum	13.0	90	0.31	2
Hairinsul	6.2	90	0.27	2
Insulex	18.0	---	0.60	---
Insulite Lowtemp	8.0	75.0	0.29	---
Insulite Ins-Light	10.4	74.8	0.295	---
Insulite Sealdslab	14.4	75.0	0.32	---
Linofelt	4.9	90	0.28	2
Keystone Hairfelt	18.7	86	0.27	2
Lo K. (Cotton Insulating Bats)	.875	72	0.24	7
Maftex	17.6	98	0.34	2
Masonite	15.0	75	0.33	7
Nu Wood	15.0	72	0.32	7
Onazote (rubber)	4.5	45	0.203	9
Palco (Redwood) Wool	5.0	75	0.255	7
Paper	2.0	---	0.27	8
Redwood Fibre	6.72	75.5	0.258	7
Rock Cork	15.6	86	0.33	2
	16.7	90	0.37	2
Rubatex	4.39	74	0.21	14
Silvercote Fabric	---	70	0.33	7
Silvercote Coreboard	23.4	70	0.265	7
Temlock	15.0	70	0.33	7
Thermofelt	7.8	90	0.28	2
Thermofill	26.0	90	0.52	2
Torfoleum	10.2	92	0.29	2
U. S. Mineral Wool	12.0	80	0.26	2
Zerocell	4.49	60.5	0.239	14

1: Gebhard—2: Bureau of Standards—3: McMillan—4: Allcut, Univ. of Toronto—5: Miller, Univ. of Minn.—6: Rowley—7: Peebles, Armour Inst.—8: Knight, Refrig. Eng., Aug. 31—9: British Nat. Phys. Lab. Refrig. Eng., Dec. '33—10:

Hechler and Queer, Refrig. Eng., March '38—11: Adams—12: Heilman: Legrand, Ref. Eng. Feb. '34—13: Pittsburgh Testing Lab.—14.

Many tests are made on all products. Consequently it is possible to select a good test of one product and a poor one of another and in this way make an unfair, unfavorable comparison. To avoid this we reproduce above a page taken from the REFRIGERATING DATA BOOK, the "Bible" of refrigeration engineers. This impartial group has selected insulation values which they suggest for use by the industry. The lower the "K", the better the insulation.

The final and important consideration in selecting an insulant is the fact that it is in constant use. The locker room must maintain design temperatures continuously and cannot be shut down for repairs. Thus, failure of the insulation would be very difficult to remedy. The greatest care should be taken to select an approved material and then apply it strictly in accordance with the manufacturer's specifications.

Essentials

Properties of a low temperature insulant to be considered are:

1. **Efficiency—low thermal conductivity.**
   This is the primary purpose of the insulant—to slow down the rate of heat flow; the lower the "K" factor, the better the insulation. An accompanying table is a reproduced table taken from the "Refrigerating Data Book" published by the American Society of Refrigerating Engineers.

2. **Moisture Resistance.**
   The insulant should take up a minimum amount of moisture from the air and should not support capillarity action.

3. **Durability.**
   The material should be chemically and physically inert to moisture and not decompose with moisture or age. It should be stable and remain in place without settlement. In the case of loose-fill types, the material should be resilient in order to retain manufacturer's recommended density. Usually, application of this material is in frame buildings where there is a certain amount of movement due to structural change, settlement, and changes in moisture content of the wood. The insulation should be flexible and resilient enough to conform with the structure.

4. **Fire Resistant.**
   The commercial insulants for low temperature work must be naturally fire-resistant or be treated for fire in the manufacturing process.

5. **Sanitary and Odorless.**
   The material should be clean and free from foreign matter. It should not harbor vermin or support bacteria growth. One of the most important properties is that it should be odorless in itself and not absorb odors.
6. **Light in Weight.**
   This might be a factor in the design of a locker plant as heavy materials would add to the construction cost. Heavy fill or semi-rigid type insulation may have tendency to compact and settle down.
7. **Easy to Install.**
   Application of the insulation should be simple enough so that specially trained workmen would not be required. It should be easy to handle and install. However, skilled and careful workmanship is necessary as the **efficiency** of the insulation is no better than the way it is applied.
8. **Economical.**
   As previously mentioned, the first cost to be considered is tied in with other factors. Ample thickness should be used, however, as we have yet to find a plant owner who regretted the fact that his insulation was put in too thick.

Types

The following insulations are commercially manufactured and offered for use in locker plants under various trade names:

1. Mass or Loose-fill
   a. Asphalt treated wood fibre.
   b. Redwood bark.
   b. Ceiba fibre.
   d. Regranulated cork.
   e. Expanded micaceous rock.
2. Semi-rigid
   a. Mineral wool bat .
   b. Felted cattle hair.
   c. Treated cotton bat.
3. Board Form
   a. Cork board.
   b. Treated hog hair.
   c. Mineral wool board.
   d. Wood fibre board.

e. Sugarcane fibre board.
f. Cellular glass block.
g. Balsa wood blocks.
h. Synthetic rubber blocks.
i. Fiberglass.

4. Reflective
   a. Aluminum foil.
   b. Aluminum one-side paper
   c. Aluminum two-side paper.
   d. Steel sheets—treated.

Application

There are so many types of buildings housing locker plants and consequently so many types of construction that it seems impractical here to cover all of these details for the different forms of insulation. Specifications and details of application can be secured from manufacturers of low-temperature insulation.

Vapor Barriers

Unlike heat transfer, moisture vapor transfer cannot as yet be fully analyzed and computed quantitatively. The quantity of heat flow through the component parts of buildings is definitely known and can be computed by means of the various coefficients of heat transfer of the materials making up the sections. The theory relating to the transfer of vapor through materials has not as yet been fully developed. It is definitely known, however, that the different vapor pressures between two parts of a structure is the motive force which causes the flow of moisture vapor. The amount of vapor transmitted is directly proportional to the difference in vapor pressure and inversely proportional to the vapor resistance of the materials in the wall. It is thus apparent that to prevent the flow of moisture vapor from one side of a wall with higher vapor pressures to the other side with lower vapor pressures that a vapor barrier with high vapor resistance must be applied.

If the flow of moisture vapor into insulated walls is not stopped, it will condense, at its dew point temperature, someplace within the wall. The insulation material will then take up this moisture and the thermal conductivity of the entire wall is increased. This condition may continue until the insulation material is completely saturated. In locker rooms, this means

ice or frost accumulation in the insulation. The thermal conductivity of water is about 14 times that of a good insulation—ice is 50 times. This shows how important it is to keep moisture out of the insulation.

At the saturation point of air, vapor pressures will increase with increased temperatures as shown in the following table:

Temperature °F.	Water Vapor Pressure at Saturation Lbs. Per Sq. Ft.
— 30	0.496
— 20	0.892
— 10	1.562
0	2.67
10	4.45
20	7.26
30	11.62
40	17.50
50	25.61
60	36.9
70	52.3
80	73.0
90	100.7
100	136.7

To show the importance of vapor transmission, consider the locker room with zero degrees temperature and 90 per cent relative humidity and an adjoining room at 90° temperature and 50 percent relative humidity. From the above table, the vapor pressure difference would then be 48 pounds per square foot, against which the insulation must be protected.

The flow of moisture vapor is also independent of the air movement. Air also carries moisture which must be prevented from getting into the insulation. All authorities agree that a most effective vaporseal must be applied on the warm side of the insulation. All do not agree on its use on the cold side. If the seal were perfect on the warm side, it would not make much difference about the cold side. Practically, it is almost impossible to get a perfect vapor barrier on the warm side, so the cold side is left vapor permeable. In this way, any moisture which may get in the wall or be present in the lumber or insulation

will seek the lowest vapor pressure areas and finally be picked up by the refrigeration equipment.

Oftentimes, in cold climates, the winter air temperature may fall below the temperature of locker and chill rooms. This might prevail for some length of time, and the travel of moisture vapor would then be reversed. However, the absolute quantity of water vapor in the cold air is small. For instance, if the locker room temperature were zero, there would only be around five grains per pound of air. Also, the vapor pressure differential is only a little over two pounds per square foot if the outside temperature is minus 30 degrees F. This is a small motive force compared to the summer condition. In the case cited of a locker room at 0° and 90 percent relative humidity, the vapor pressure amounts to 48 pounds per square foot. The outside air contains around 109 grains of water vapor per pound of dry air. This is 22 times the amount of water vapor over the winter condition.

In the case of chill rooms adjoining outside walls which are subjected to winter conditions, the reversal of vapor pressure takes on greater importance. Thirty-five degree air in the chill room would contain around 27 grains of water vapor per pound of dry air. Also, the vapor pressure differential would be around 12 pounds per square foot.

The problem in these cases is to select a vapor-resistant material for the inside of the insulation which will just prevent this reversed action in the winter. It should have a low vapor resistance only effective enough for the winter or lower vapor differential pressure periods and permeable enough to satisfy the summer or high vapor pressure differential periods. Of course, the latter period is of longest duration and is much more important. In practice, the inside of the insulation could be protected by materials such as asphalt felt or surface coatings of enamel or varnish—which would be around 10 to 20 times more vapor permeable than a good vapor barrier.

Materials

There are many types of membranes and coatings which make good vapor barriers and are manufactured specially for this purpose. Some of the good barriers are metal coated (copper or aluminum) paper and continuous sheets of asphalt incorporated into one or more layers of paper. The coated membranes must

be continuous without cracks or breaks. An asphalt saturated building paper does not make a good barrier, as the asphalt is not in a continuous sheet. If, however, this paper is finished on the surface with a smooth continuous coat of asphalt, or if the asphalt is placed between two or more layers of kraft paper in such a manner as to have a continuous unbroken layer of asphalt, it should be effective. Data on the diffusion of water vapor through various materials will be found in accompanying tables.

PERMEABILITY OF VARIOUS MATERIALS TO WATER VAPOR

Material	Thickness	Permeability to moisture (P)	Vapor resistance (1/P)
BABBITT (1)			
		Grains sq. ft. hr.	sq. ft. hr. (lb./sq. in.)
	Inches	(lb./sq. in.)	Grains
Fiberboard	0.492	60.6	0.0168
Fiberboard, 1 surface asphalt, rolled	.492	8.0	.125
Fiberboard, 1 surface asphalt, dipped	.63	17.3	.0578
Fiberboard, laminated, 2 samples cemented together with asphalt	.985	2.74	.365
Fiberboard, laminated, 6 layers with 5 layers of asphalt	.527	0.23	4.35
Fiberboard	1.06	37.0	0.0270
Fiberboard, same reduced in thickness	0.803	43.4	.0230
Do	.599	56.4	.0177
Do	.405	74.5	.0134
Do	.201	133.3	.0075
Wood, spruce	.563	3.48	.287
Do	.480	4.03	.248
Do	.405	3.94	.254
Do	.323	4.93	.203
Do	.232	7.24	.138
Do	.161	10.35	.097
Wood, pine	.80	1.88	.532
Do	.645	2.52	.397
Do	.496	3.45	.290
Do	.315	5.55	.180
Do	.169	9.65	.104
Wood (pine) A	.508	6.47	.155
Wood (pine) A, 1 coat of A1 paint		3.42	.292
Wood (pine) A, 2 coats of A1 paint		0.92	1.09
Wood (pine) A, 3 coats of A1 paint		.71	1.41
Wood (pine) B	.508	6.68	0.150
Wood (pine) B, 1 coat of A1 paint		3.85	.260
Wood (pine) B, 2 coats of A1 paint		1.95	.512
Wood (pine) B, 3 coats of A1 paint		1.53	.654
Kraft paper, 1 sheet	.00394	168.	.00595
Kraft paper, 2 sheets		107.	.00935
Kraft paper, 3 sheets		80.	.0125
Kraft paper, 4 sheets		63.6	.0157

Kraft paper, 5 sheets		53.5	.0187
Kraft paper, 5 sheets		65.3	.0153
Kraft paper, 5 sheets		61.6	.0162
Kraft paper, 7 sheets		45.5	.0220
Kraft paper, 7 sheets		38.3	.0261
Kraft paper, 8 sheets		38.3	.0261
Kraft paper, 8 sheets		33.1	.0302
Black vulcanized rubber, hardness 40	.0791	0.185	5.4
Plasticized rubber hydrochloride	.00158	.382	2.62
30-30-30 paper A	.0071	1.83	0.546
30-30-30 paper B	.0071	1.79	.558
Duplex Scutan 6-6 asphalt between 2 sheets of kraft	.0071	0.946	1.06
Scutan 0-14 (kraft infused with asphalt on 1 surface) A	.0071	8.6	0.116
Scutan 0-14 B	.0071	15.97	.0626
Scutan 14 (kraft infused with asphalt on surfaces) A	.0071	13.9	.0719
Scutan 14 B	.0071	15.8	.0633
Black building paper, black shiny paper infused with asphalt	.0173	0.376	2.66
Asphalt felt, 15-lb. felt building paper with soft dull appearance	.0319	13.5	0.0741
Pressed corkboard A	.905	4.75	.211
Pressed corkboard B	.985	5.42	.184
Plaster	1.34	27.1	.0369
Plasterboard, plaster between sheets of heavy paper	0.37	70.2	.0142
Masonite Presdwood, tempered	.13	9.76	.102
Masonite Presdwood	.13	21.7	.0461
Masonite Presdwood, 5 thicknesses		6.25	.16
Masonite Presdwood, 7 thicknesses		4.9	.204

TEASDALE (2)

	Inches	Grains sq. ft. hr. (lb./sq. in.)	sq. ft. hr. (lb./sq. in.) Grains
Foil-surfaced reflective insulation double-faced		0.172 to 0.263	5.82 to 3.8
Roll roofing—smooth, 40 to 65 lb. roll/108 sq. ft.		.263 to .348	3.8 to 2.87
Asphalt impregnated and surface-coated sheathing paper, glossy, 50 lb. and 35 lb./500 sq. ft.		.433 to 1.57 .348 to 4.19	2.31 to 0.637 2.87 to .239
Duplex or laminated papers, 30-30-30		2.80 to 5.24	0.357 to .191
Duplex or laminated papers, 30-60-30		1.05 to 1.75	.952 to .572
Duplex papers, reinforced		1.396 to 4.19	.716 to .239
Duplex paper, coated with metal oxides		1.05 to 2.63	.952 to .381
Insulation backup paper, treated		1.75 to 6.97	.572 to .144
Gypsum lath with A1-foil backing		0.173 to 0.785	5.78 to 1.27
Plaster, wood lath		22.4	0.0446
Plaster, 3 coats of lead and oil		7.5 to 7.84	0.133 to .127
Plaster, 3 coats of flat wall paint		8.72	.115
Plaster, 2 coats of A1 paint		2.35	.425

Plaster, fiberboard or gypsum lath	40.2 to 41.9	.0249 to .0239
Slater's felt	10.5 to 52.4	.0952 to .0191
Plywood, ¼-in., Douglas fir, soy bean glue, plain	8.72 to 13.1	.115 to .0764
Plywood, 2 coats of asphalt paint	0.87	1.15
Plywood, 2 coats of A1 paint	2.63	0.38
Plywood, ½-in., 5-ply Douglas fir	5.43 to 5.59	.184 to .179
Plywood, ¼-in., 3-ply Douglas fir, artificial resin glue	8.72 to 13.1	.115 to .0761
Plywood, ½-in., 5-ply Douglas fir, artificial resin glue	5.59 to 6.85	.179 to .146
Insulating lath and sheathing, board type	52.3 to 69.8	.0191 to .0143
Insulating sheathing, surface-coated	6.17 to 8.88	
Compressed fiber board, $\frac{3}{16}$ in.	10.3	.097
Insulating cork blocks, 1 in.	12.6	.0794
Blanket insulation between coated papers, ½ and 1 in.	3.90 to 4.07	.256 to .246
Mineral wool, unprotected, 4 in.	59.2	.0169

FOREST PRODUCTS LABORATORY

	Inches	Grains sq. ft. hr. (lb./sq. in.)	sq. ft. hr. (lb./sq. in.) Grains
Kraft paper		112.	0.00893
Plastered wall, no paint, plasterboard lath		41.7	.024
Plastered wall, no paint, wood lath		22.2	.045
Slater's felt, best type		10.1	.099
Duplex paper		2.78	.36
Plastered wall, 2 coats of A1 paint, wood lath		2.43	.411
Asphalt-coated paper, 35 lb./500 sq. ft. roll		2.08	.481
Asphalt-coated paper, 50 lb./500 sq. ft. roll		1.04	.962
Metal-coated paper		0.174	5.75

INTERNATIONAL CRITICAL TABLES

Still air, 3⅝ in.	70.9	0.0141
Still air, 1 in.	257.	.00389

WRAY (3)

1 coat of A1 paint on wood, Bakelite resin varnish	1.22	0.82
1 coat of A1 paint on wood, glycerol phthalate varnish	1.22	.82
2 coats of ordinary paint, linseed oil	3.48	.287
1 coat of A1 paint on wood, ester gum varnish	2.26	.445

HERRMANN (4)

	Inches	Grains sq. ft. hr. (lb./sq. in.)	sq. ft. hr. (lb./sq. in.) Grains
Hydrocarbon wax	†1	0.000052	1.9 ×10
Thiokol	†1	.00014	7.1 ×10
Gutta percha	†1	.00035	2.86×10
Hard rubber	†1	.00035	2.86×10
Para gutta	†1	.00042	2.38×10
Polystyrene	†1	.00087	1.15×10
Asphalt sealing compound	†1	.00087	1.15×10
Phenol fiber	†1	.00148	676
Soft vulcanized rubber	†1	.00157	637
Benzyl cellulose	†1	.00226	442
Bakelite	†1	.0035	286
Waterproof cellulose film	†1	.062	16.1
Cellulose acetate	†1	.12	8.3

MILLER (5)

	Inches	Grains sq. ft. hr. (lb./sq. in.)	sq. ft. hr. (lb./sq. in.) Grains
Plaster base and plaster, ¾ in.		30	0.033
Vapor barrier (Kimberly Clark Corp. data)		1.65	.61
Fir sheathing, ¾ in.		6	.167
Waterproof paper		100	.01
Pine lap siding		10	.1
Paint film		7	.14
Celotex, ¾ in.		25.5	.0392
Brick masonry, 4 in.		2.2	.454

MARTLEY (6)

Wood, Scot pine, per inch		21.4	0.0467

WRAY (3)

Wood, western yellow pine, ¼ in.		1.8	0.556

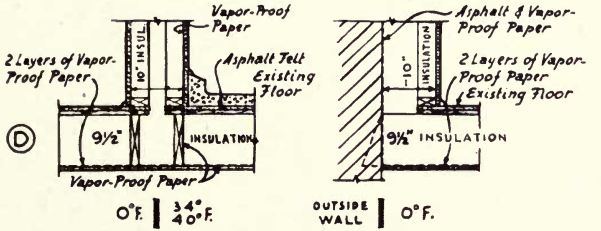
*Figures in brackets indicate the literature references at the end of this chapter.

†Data recalculated on basis of 1-inch thickness.

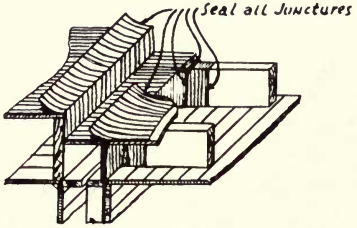
Various investigators use different units to express vapor permeability. In this table, they are converted to common units of moisture in grains per hour passing through one square foot of actual thickness specified when the vapor pressures at the two surfaces differ by one pound per square inch. The reciprocal of this permeability is the vapor resistance.

The highest resistance in any class of membranes is found in the metal-coated papers. Heavy roll roofing, asphalt impregnated surface-coated sheathing paper, and laminated papers of

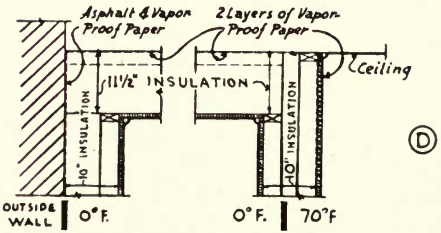
·INSULATION·DETAILS·
for
FROZEN FOOD LOCKER PLANTS



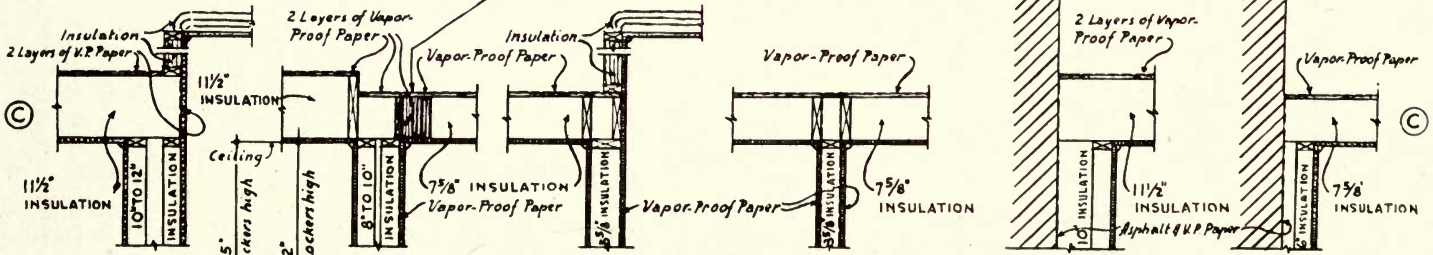
ALTERNATE FLOOR INSULATION DETAILS



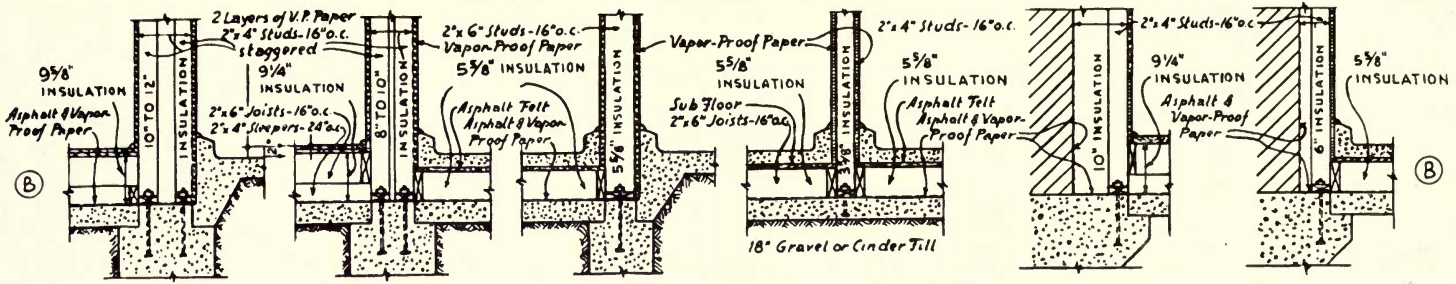
DETAIL OF V.P. PAPER LAP



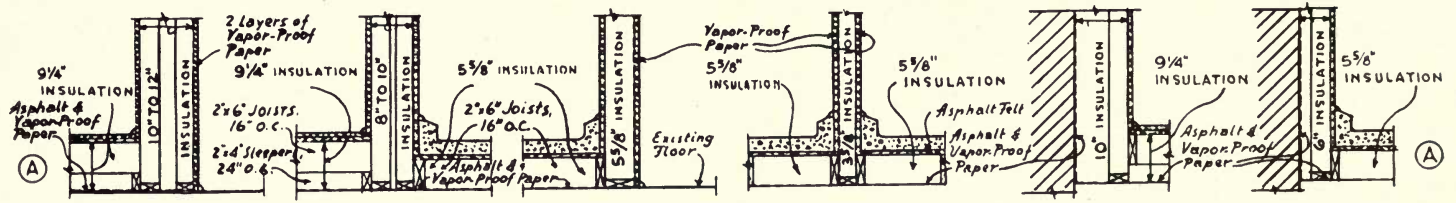
ALTERNATE CEILING INSULATION DETAILS



·TYPICAL·CEILING·CONSTRUCTION·



FLOOR·CONSTRUCTION·IN·NEW·BUILDINGS·



·FLOOR·CONSTRUCTION·IN EXISTING·BUILDINGS·

MINUS 20° 0°F. | 70°F.	MINUS 20° 0°F. | 34° 40°F.	34° 40°F. | 70°F.	34°F. | 40°F.	OUTSIDE WALL | 0°F.	OUTSIDE WALL | 34° 40°F.
①	②	③	④	⑤	⑥

two or three layers have all been found to be desirable for locker plant work. Other practical considerations are involved when selecting a membrane such as the handling of the paper on the job. It should be strong and not tear readily and should not become brittle in cold weather. It should be stable and not shrink or tear when subjected to moisture; and should resist vermin and fungus.

Some papers are creped, which allows them to stretch without rupture to absorb structural, moisture, and temperature strains. The material should also be capable of being readily sealed at the joints with asphalt.

Asphalts in various forms are very commonly used as vapor barriers in themselves or in conjunction with membranes. There are, in general, three common forms of industrial asphalts; and there are many compounds derived from them:

1. **Hot Asphalt—Natural or Primary Form.**
   This is a common material for water-proofing and for the erection of board form of insulation. Care must be taken to apply it at the correct temperature; because if it is overheated, its properties may be impaired. If underheated, it may lack adhesion. It must be applied only to a dry surface which has been primed with an asphalt wall primer. The erection asphalt should be carefully refined, odorless, and have a melting point of 180° F. to 190° F. It should not be confused with roofers' asphalt, pitch, or tar. Therefore, it should be obtained from recommended suppliers of low temperature insulation and sundries.

2. **Asphalt Emulsions—Dispersions.**
   A stable emulsifying agent of mineral colloid is added to minute particles of asphalt and dispersed with water to form this material. These are usually called clay type emulsions. They are commonly used for priming surfaces, for sealing joints of vaporproof membranes, insulation erection, and for making asphalt mastic finishes. The material may be brushed, troweled, or sprayed and usually is furnished in a heavy paint consistency. Water may be used to thin out the material to fit requirements. Naturally, with a water vehicle, it must be used above freez-

ing temperatures; and, in fact, if the material is frozen in the container, it is worthless. The material is odorless and easily handled and applied without heating.

3. **Cut-back Asphalts—Solutions.**

This is furnished in liquid form by means of solvents which have a pronounced odor, and for this reason, it must be applied properly if it is to be used. After any surface has been primed with an asphalt cut-back primer, it is necessary to wait until the primer has dried sufficiently so that the surface is what is known as "hand dry"—that is, so that you can touch it with your hand and none of the primer will be tacky enough to adhere or stick. If this procedure is followed, all odors will have been dissipated before the application of the hot asphalt.

Application

The method of vapor barrier application depends on the type of insulation and the construction.

With the board form, hot asphalt is used both for structural purposes to hold the board in place and for a vapor barrier. Masonry surfaces should first be primed with asphalt wall primer. The units are then dipped or mopped with hot asphalt so that vapor barriers are formed with each successive layer of insulation. This vapor-barrier then exists throughout the insulation on the cold side where the insulation should be vapor permeable. It is also common practice to finish the board type on the cold side with asphalt mastic, which forms another vapor seal. Erection of insulation in this manner has developed largely because of ease of construction due to the adhesive qualities of the hot asphalt. However, the question of proper vaporproofing seems to be ignored. One way of overcoming this difficulty would be to apply a good vapor barrier on the warm side only and erect the blocks in Portland cement and leave the cold side unfinished or plastered with Portland cement. Perhaps some other adhesive for erecting the blocks could be used which would be vapor permeable.

With the other types of insulation, the vapor barriers may be one or more membranes in combination with asphalt, which may be applied on the warm side only. Mass type insulations are

vapor permeable in themselves so that any moisture passing the barrier will go through the insulation to an area of lower vapor pressure. Masonry surfaces should be primed and air proofed with asphalt emulsion. The membrane should then be tacked on loosely in vertical strips. Two layers should be used to protect insulation for zero storage. The second layer could be laid in a troweled coat of asphalt emulsion or mopped in with hot asphalt with all joints broken over the first layer. For chill and age rooms, one membrane with joints lapped and sealed with asphalt is generally used. In new structures, it is best not to lay the first membrane in asphalt as it would then tend to move with the building. Cracks and openings in the masonry, due to settlement and shrinkage, would then not cause moisture infiltration as the barrier would remain intact.

The Vapor Barrier With Sheet Steel Reflective Insulation

The vapor barrier with this type of insulation is achieved by the caulking of all of the joints of the warmside layer. These joints are then pressed tightly together between two wooden separator strips, forming what is essentially a steel shell around the entire structure. The series of air spaces within the wall are vapor-permeable and allow any vapor therein to pass through to the area of low vapor pressure.

Summarizing, it must be remembered that the insulation is no better than its protection from moisture. Care must be taken to make a complete and thorough vaporseal, and care must also be taken to seal openings for conduits or piping which have been cut through the insulation.

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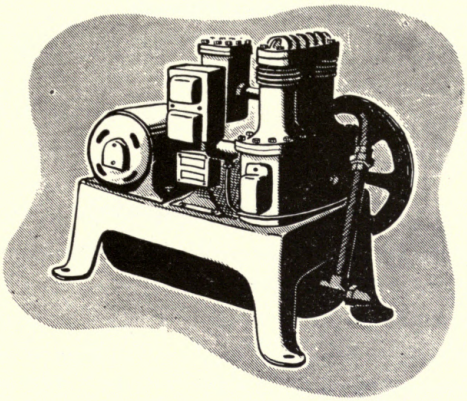


CHAPTER FIVE

YOUR LOCKER PLANT

REFRIGERATION

Type of Refrigerant

THIS book holds no brief for any one type of refrigerant. However, freon-12 and ammonia are most generally used. This fact does not indicate that other types of refrigerant gas are not acceptable or used in locker plants. The summary as shown herein gives the main characteristics and behavior of four selected gases.

Ammonia (Anhydrous)

Chemical formula	NH_3
Boiling point at atmospheric pressure	—28.1 °F.
Color	Clear and white
Odor and detection	Irritating odor, detected by smell; leaks detected by burning sulphur
Flammable limits (by volume)	16% to 25%
Toxicity—Group 2, Underwriter's classification	Quite toxic

Design Pressures

The basic design for standards of construction and for maximum working pressures should be:

High side (condensing)..... 250 P.S.I.
Low side (evaporator)..... 150 P.S.I.

Condensing Equipment

(a) Water-cooled condensers of the shell-tube type, or atmospheric, or double pipe type, designed for condensed liquid temperature of 96° F. (184.2 P.S.I.) or under.

(b) Evaporative type condensers designed for condensed liquid temperatures of 100° F. (197.2 P.S.I.) or under.

(c) Air cooled condensers should not be used.

General

Ammonia refrigerant is adaptable to commercial installations, and well suited for cold storage and locker plant facilities, where medium and sub-zero temperatures are required.

Compressor oil is not miscible with ammonia. Therefore ample means should be provided to remove any oil carried over into the condenser or evaporator system.

Water is miscible with ammonia. Care should be taken to prevent water from entering into the ammonia system. Steel is not attacked by ammonia, therefore low side equipment and mains are generally of steel. In general ammonia systems require smaller mains or pipe sizes than other refrigerants listed herein.

Freon-12 (Dichlorodifluoromenthane)

Chemical formula	CCl_2F_2
Boiling point at atmospheric pressure	—21.6° F.
Color	Clear and water-white
Odor and detection	Etheral odor—not detectable by smell — detection — use Halide leak detector
Flammable limits	Nonflammable
Toxicity	Group 6, Underwriter's classification: not toxic under general refrigeration use

Design Pressures

The basic design for standards of construction and for maximum working pressures should be

High side (condensing)..... 225 P.S.I.
Low side (evaporator)..... 150 P.S.I.

Condensing Equipment

(a) Water-cooled condensers of the shell-tube type or shell-coil type designed for condensed liquid temperature of 105° F. (125 P.S.I.) or under.
(b) Evaporative type condensers designed for condensed liquid temperature of 110° F. (136 P.S.I.) or under.
(c) Air cooled (fin and tube) type designed for condensed liquid temperature of 130° F. (180 P.S.I.) or under.

General

"Freon-12" refrigerant is adaptable to commercial installations of medium and sub-zero temperatures, not lower than —21.6° F. For installations of lower temperatures, compressors should be designed for vacuum or two stage operation.

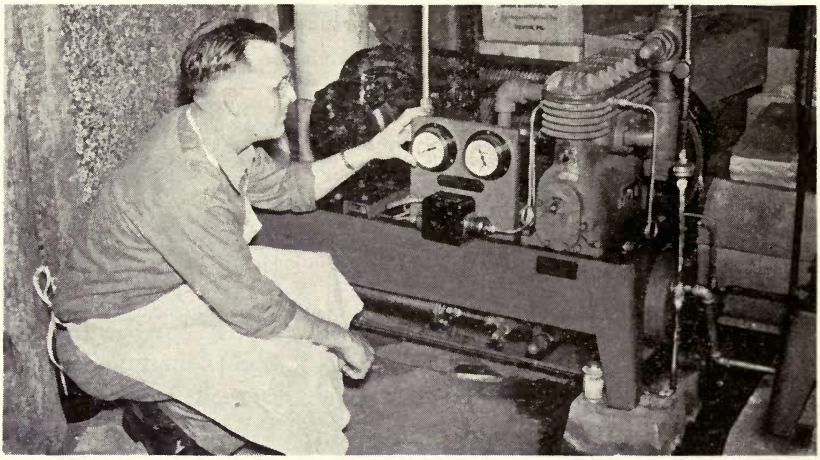
Compressor oil is miscible with Freon-12. Automatic oil return separators should be used for all low temperature work. All standard metals, ferrous and non-ferrous, may be used with Freon-12.

Moisture and air in a Freon-12 system will cause hydrolysis, thereby attacking steel parts and copper plating of seals and pistons. All moisture should be extracted by means of ample size dehydrators.

Line sizes for Freon-12 are required to be considerably larger than that used for ammonia.

Freon-22 (Monochlorodifluoromethane)

Chemical formula	$CHClF_2$
Boiling point at atmospheric pressure	—41.44° F.
Color	Clear and water-white
Odor and detection	Etheral odor—not detectable by smell. Detection: use Halide leak detector
Toxicity	Group 5, Underwriter's classification: Not toxic under general refrigeration use.



A typical Freon-12, 5-horsepower water-cooled locker plant compressor.

Design Pressures

The basic design for standard construction and for maximum working pressures should be:

High side (condensing) ..... 300 P.S.I.
Low side (evaporator) ..... 225 P.S.I.

Condensing Equipment

(a) Water cooled condensers of the shell-tube type designed for condenser liquid temperature of 100° F. (197.9 P.S.I.) or under.

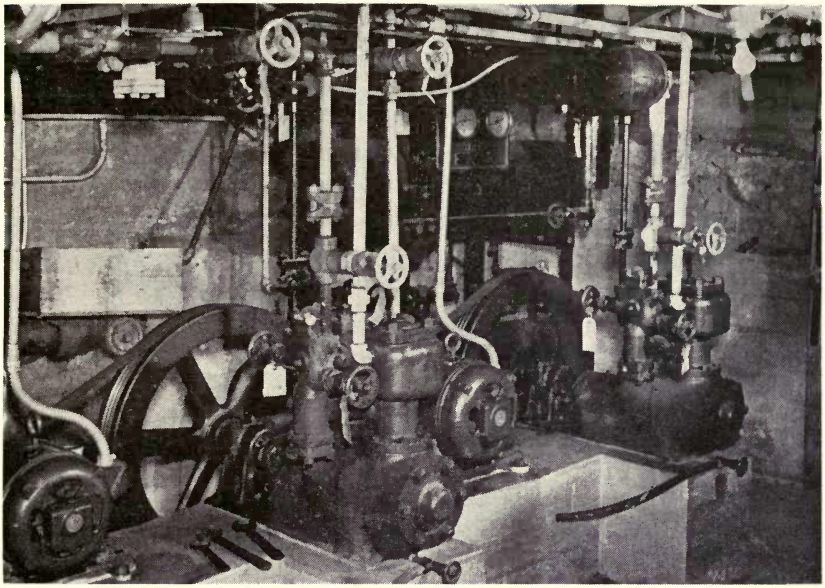
(b) Evaporative type condensers for condensed liquid temperature of 100° F. (197.9 P.S.I.) or under. For each 1° F. rise above 100° F. increases the condensing pressure by approximately 6 P.S.I., as for example at 110° F. liquid temperature the corresponding condensing pressure is 228.7 P.S.I.

(c) The use of air cooled condensers are not generally recommended.

General

"Freon-22" is adaptable to commercial installations of low and sub-zero temperatures. However, as operating pressures are higher than "Freon-12" plants using "Freon-22" should be designed for above indicated pressures.

Compressor oil is miscible with "Freon-22". Automatic oil return separators should be used for commercial applications.



This is one of several makes of compressors available to those who select ammonia as the refrigerant in their frozen food locker plants.

Moisture and air in a "Freon-22" system will cause hydrolysis, as outlined for "Freon-12".

Line size for "Freon-22" may be smaller than that required for "Freon-12" but larger than that required for methyl chloride. Do NOT mix "Freon-22" with "Freon-12".

Methyl Chloride

Chemical formula	CH_3Cl
Boiling point at atmospheric temperature	—10.6° F.
Color	Clear and water-white
Odor and detection	Faintly sweet odor. Detection, Halide leak detector
Flammable limits (by volume)	8.1% to 17.2%
Toxicity	Group 4, Underwriter's classification: Moderately toxic

Design Pressures

The basic design for standard construction and for maximum working pressures should be:

High side (condensing)..... 215 P.S.I.
Low side (evaporator)..... 125 P.S.I.

Condensing Equipment

(a) Water-cooled condensers of the shell-tube type, or shell-coil type designed for condensed liquid temperature of 96° F. (95.37 P.S.I.) or under.

(b) Evaporative type condensers for condensed liquid temperatures of 102° F. (105.4 P.S.I.) or under.

(c) Air-cooled (fin and tube) type condensers designed for condensed liquid temperatures of 110° F. (119.8 P.S.I.) or under.

General

Methyl chloride refrigerant is adapted to commercial installations of medium to zero degree temperatures. For installations of sub-zero temperatures, compressors should be designed for vacuum or two-stage operation. Compressor oil is miscible with methyl chloride. Automatic oil return separators should be used for all low temperature work. Moisture and air in a methyl chloride system will cause hydrolysis, thereby attacking steel parts and copper plating of seals and pistons. All moisture should be extracted by means of ample size dehydrators. Line size for methyl chloride may be one size smaller than that used for "Freon-12" of equivalent capacity.

Sulphur Dioxide

This refrigerant is not generally used for locker plant application, due to higher boiling point temperature at atmospheric pressure.

Load Calculations

The method of calculating the heat gains and product load of a locker plant, and the method of their determination is peculiar to each designer or engineer and no attempt is made to establish a fixed formula. Many states have existing regulations governing the temperatures to be maintained in locker plant refrigerated spaces. Therefore, where mandatory temperatures are stated, it is imperative that such temperatures should be the basis of design.

In general the suggested design conditions should be as shown herein:

Design Conditions

(a) Chill Room:

For plants having slaughtering facilities as part of plant operations the chill room (hot drip room) should be designed for an optimum temperature of 31 to 32° F. For plants not having slaughtering facilities, which receive meat carcasses pre-cooled (not directly from slaughtering house) should be designed for an optimum temperature of 32 to 33° F.

Sufficient refrigeration facilities should be provided to prevent the room teperature from rising beyond 38 to 40° F., during the period of loading in hot meat carcasses, and then the air temperature should be reduced and brought back to 31 to 32° F. as soon as possible after loading and held there. At no time should the temperature of 38 to 40° F. be allowed to remain longer than a six-hour period.

The internal temperatures, average weights, specific heat and final bone temperature for freshly slaughtered carcass are considered to be as shown herein for temperatures above 32° F.

Carcasses	Average Weight	Entering Temp.	Final Temp.
Beef	500	106	35
Calves	140	104	35
Lambs	41	101	33
Hogs	180	106	35
Hogs, light	80	100	33

The chilling period to reach final temperatures must not exceed 18 hours at 85% to 90% relative humidity.

(b) Holding or Aging Room:

As the majority of locker plants do not provide separate holding or aging rooms for different classes of meat products, the aging room should be held at 32 to 34° F. and at 85% to 90% relative humidity. There usually is some additional cooling carried on in the aging room. Therefore, the product load of the aging room should be taken as 20% of the chill room product load when calculating the sensible heat load.

(c) Curing Room:

The curing process carried on in a locker plant consists mainly

of dry salt and sweet pickle curing. However, other types of meat curing are no doubt used in some plants. For the purpose of this book the curing room temperature is stated as 40 to 42° F. and at 80% to 90% relative humidity.

(d) Freezer:

Many locker plants of medium capacity are equipped with "freezer cabinets" placed in the locker room, while locker plants of larger capacity are equipped with a separate freezer room.

Then too, some plants use plate coils, while others use pipe coils and blast cooling units. Therefore, no attempt is made to differentiate between the various methods used. Nevertheless for the sake of uniformity the freezer's temperature should be from minus ten degrees (—10° F.) to minus fifteen degrees (—15° F.), or its equivalent freezing effect.

(e) Locker Room:

The tendency to lower locker room temperatures has had a pronounced trend during the past five years or more, and zero degrees (0° F.) having been widely accepted, it is stated for the purpose of these standards that the locker room temperature be from 0° F. to 5° F. and at 80% to 90% relative humidity.

(f) Product Load:

The amount of products received or processed per day by the locker plant is so variable that no set amount will cover the operations of all plants. Therefore, for the purpose of these standards the amount of meat products is stated as:

Chill room	7 pounds per locker
Holding or aging room	2 pounds per locker
Freezer	4 pounds per locker
Curing room	2½ pounds per locker
Locker room	Heat gains plus 25%

In plants processing fruits and vegetables during times that meat products, in amounts shown above, are processed, the actual amount of fruits and vegetables to be handled daily must be added to the meat product load, and thus additional fruit and vegetable load should be considered in the over-all plant requirement.

(g) Ambient Temperatures:

The location of the locker plant determines the ambient tem-

perature to be considered. Hence for the purpose of these standards the stated design outside average summer temperatures are:

Walls; outside exposure ..... 95° F.
Floors; ground; no basement under ..... 75° F.
Ceiling; outside exposure ..... 100° F.
Roof; sun exposure ..... 130° F.

Note: For installations where corkboard is applied directly on roof, or where a false ceiling is constructed under roof, and having at least 18 inches of air space above top of insulation material and this space is ventilated, the sun effect may be neglected.

(h) Specific Heats:

The formula to calculate the amount of heat removed to cool and freeze a product to a desired temperature is:

Above 32° F. BTU=product in pounds x specific heat of product above freezing x temperature reduction.

Below 32° F. BTU=product in pounds x specific heat of product below freezing x temperature reduction.

Freezing BTU=product in pounds x latent heat of fusion.

The following table shows specific and latent heats of some products generally handled by locker service plants (average values):

Product Processed	Sp. Ht. above freezing	Sp. heat below freezing	Latent heat of fusion
Fresh Meats (1)			
Beef	.77	.41	102
Bacon	.52	.32	56
Veal (Calves)	.72	.28	101
Dry Salt Curing	.52	.32	51
Lard (Average)	.645	.468	22.5
Offal (Fancy Meats)	.72	.40	100
Pork (Fresh)	.60	.34	86
Sheep (Lamb)	.67	.38	84
S.P. Curing	.82	.43	86
Salted Hides	.40	.....	.....

Product Processed	Sp. Ht. above freezing	Sp. heat below freezing	Latent heat of fusion
Poultry and Fish (2)			
Poultry (Dry Picked)	.720	.395	93.5
Poultry (Scalded)	.800	.425	108
Game (Average)	.680	.380	86.5
Fish (Fresh)	.760	.410	101
Oysters (Hucked)	.896	.461	125
Fresh Fruits (3)			
Apples	.976	.456	121
Apricots	.880	.428	122
Blackberries	.880	.428	122
Blueberries	.882	.430	123
Cherries	.864	.444	119
Cranberries	.896	.456	125
Currants	.872	.452	121
Grapes	.856	.446	118
Peaches (Whole)	.788	.420	106
Plums	.845	.438	123
Raspberries	.892	.46	124.5
Rhubarb	.912	.462	128
Strawberries	.920	.470	120
Vegetables (4)			
Asparagus	.944	.479	134
Beans (Snap)	.897	.457	127
Brocoli	.920	.470	139
Brussels Sprouts	.936	.476	132
Carrots	.904	.464	126
Corn (Sweet)	.792	.422	106
Cauliflower	.952	.482	135
Egg Plant	.955	.487	131.5
Horseradish (root)	.921	.476	129
Kohlrabi	.955	.487	135
Mushrooms	.928	.468	131
Parsnips	.866	.453	119
Peas (Green)	.792	.422	107
Peppers (Sweet)	.936	.476	132
Potatoes (French Fried)	.816	.426	112
Pumpkin (Meat)	.920	.470	130

Product Processed	Sp. Ht. above freezing	Sp. heat below freezing	Latent heat of fusion
Squash (Winter)	.874	.456	121
Tomatoes (Whole)	.952	.482	135
Rutabagas (Diced)	.951	.486	133.5
Miscellaneous (5)			
Butter	.564	.500	18.4
Eggs (Meat)	.760	.410	100
Honey	.344	.754	25.9

Conductivity of Material

For the purpose of this book the heat gains through conductivity of insulating materials is said to be: (BTU per inch per sq. ft. per hour per 1° F. T.D.)

Material	Density lb. per sq. ft.	Conductivity "K" factor
Asphalt roofing (felt)	55.00	0.70
Balsa	7.36	0.35
Corkboard (typical)	8.3	0.27
Cork, regranulated coarse	8.1	0.31
Cork, regranulated fine	6.5	0.27
Glass wool, commercial grade	2.49	0.26
Insulation boards, fibre, various	15–21	0.32 to 0.38
Kapok, loosely packed	.87	0.24
Planer shavings	8.7	0.40
Rock wool	10.0	0.27
Rubber, expanded	4.85	0.21
Sawdust	12.0	0.41
Brick, low density	.....	5.0
Concrete—typical	.....	12.0
Cinders	60.	1.23
Redwood, dry	22	0.74
Fir	26	0.76
Maple	40	1.15
Pine, yellow leaf	26	0.84

Infiltration

The average air change per cubic foot of refrigerated space in a locker service plant will vary in proportion to size of plant. For

the purpose of this book the air change per 24 hours is considered to be:

Cu. Ft.	Air change per 24 hr.	Cu. Ft.	Air change per 24 hr.
500	20.0	6000	5.0
1000	13.5	8000	4.3
1500	11.0	10000	3.8
2000	9.3	20000	2.6
4000	6.3	30000	2.1

Air Heat Gain

The heat gain due to infiltration of outside air due to door openings varies in relation to the temperature of the inlet air and its relative humidity and room temperature. For the purpose of this book the optimum heat gain is stated as:

Storage Room Temp. °F.	Entering air Temp. °F.	R.H. % entering air	Heat gain per BTU per cu. ft.
45	95	50%	2.12
40	95	50%	2.31
35	95	50%	2.49
30	95	50%	2.26
20	95	50%	2.62
10	95	50%	2.93
5	95	50%	3.12
0	95	50%	3.28
— 5	95	50%	3.41
—10	95	50%	3.56
—15	95	50%	3.67
—20	95	50%	3.88
—25	95	50%	4.00

Miscellaneous Heat Gains

The heat gains from various sources reflect in the total heat load:

Electric lights, per watt ..... 3.42 BTU/Hr.
Motors (average), per H.P ..... 3000 BTU/Hr.
People (average) ..... 750 BTU/Hr.
Cooling of air (dry) ..... .24 BTU/Hr.
Cooling of vapors (water) ..... .46 BTU/Hr.
Cooling and freezing vapors (water) ..... 1200 BTU/Hr.

Note: The heat of respiration and evolution of fruits, etc., are to be neglected, since their stay in a locker service plant before freezing does not impose a heavy continuous load on plant refrigeration system.

Safety Factor

In calculation of the total heat load, including wall losses, product load, air changes and miscellaneous heat gains, there is to be added a safety factor of 15 percent to the total load to be dissipated and then the compressor selection to be based on 16-hour total operation per any one 24-hour period.

Type of Coils and Arrangement

The choice of lowside evaporators or coiling arrangement for all refrigerated spaces lies with the designer to select, and no brief is held for pipe or plate coils over fin type or unit coolers. However, it is desired here to set out minimum temperature differences between refrigerant temperatures and final room temperatures as:

(a) Forced Air:

Unit coolers, whether of the suspended or floor type, are rated by most manufacturers in BTU per hour per 1° F. temperature difference. The fan capacity, whether of the converted propeller, or blade type, or of the squirrel cage type, are based on C.F.M. at nominal or zero static pressure. Fin type coils or plain pipe coils are based on face velocity, with the total effective cooling surface selected for the "K" factor used by the manufacturer. Regardless of the method of determining the unit cooler capacity, it is stated for purpose of these standards the following design conditions:

Room	Mtd. (Max.)	Face velocity coil Max.	Pres. drop through coil Per sq. in.	Fins per inch (Max.)
Chill	6.5	600	0.5	4
Ageing	8.0	500	0.5	4
Holding	8.0	500	0.5	4
Locker	9.0	550	0.5	3
Freezer	9.0	600	0.5	2

(b) Heat Exchangers:

Unit coolers designed for Freon-12 are to be equipped with manufacturer's standard heat exchangers or dry coil. No heat exchangers are required with unit coolers using ammonia refrigerant.

(c) Defrosting:

The method of coil defrosting arrangement must be of the manufacturer's recommended design. However, an effective defrosting arrangement is required for each type of unit cooler used in locker plant application. It may be electric, water, warm air, or hot gas.

(d) Controls:

The method of refrigerant feed to unit cooler coil is to be automatically controlled through the use of the thermal expansion valve or float control. Suction pressure regulators are to be used on all systems where single compressor suction pressure application is used for rooms of medium or low temperatures. The use of liquid and suction magnetic stop valves are considered necessary where more than one room is connected to a single compressor. All rooms to be fully automatic through thermostat control where plants are connected to electric power service.

Pipe Coils

The choice of bare pipe coil arrangement for all refrigerated spaces lies with the designer to select. However, coil piping is to be not less than full card weight. For the purpose of these standards, the following is stated:

Room	Mtd. (Max.)	"K" factor	Pipe spacing center to center (Min.)	Circuits Min. No.
Chill	12	2.5	4½ inches	2
Ageing	15	2.5	4½ inches	2
Holding	15	2.5	4½ inches	2
Locker	15	2.0	4½ inches	3
Freezer	15	2.0	4½ inches	2

(a) Accumulators:

The use of surge drums or accumulators are required with all header type coils for systems under flooded control. However,

for systems under thermal expansion coil the use of surge drums or accumulators or over size suction headers acting as accumulators is recommended in the interest of good engineering practice.

(b) Defrosting:

The design of defrosting arrangement is necessarily governed by coil layout arrangement. However, the warm liquid or hot gas defrosting method is to be provided for each room, so arranged that one-half of the room cooling may be operated during defrosting operations.

(c) Circuits:

The total length of linear feet of pipe in each coil circuit for each thermal expansion valve used must be in accordance to standard published data of the expansion valve manufacturer.

(d) Hangers and Supports:

All suspended type coils are to be securely supported from ceiling hanger rods or self-supported floor stands. In no case shall the hanger rods or bolts extend through an insulated space so as to be exposed in an non-insulated space. Preferably, ceiling type coils in locker rooms are located over aisleway spaces. The use of drip pans in all rooms over 32° F. are optional, though desirable.

(e) Controls:

All rooms should be fully automatic under thermostatic control. Where one compressor is used for more than one room of different temperatures, there should be provided a liquid and suction magnetic stop valve and pressure regulator. All systems under full automatic control to be provided with a liquid trap in main suction line to each compressor installed.

Plate Coils

The choice of plate type coil arrangement for all refrigerated spaces lies with the designer to select. However, the total number of effective square feet of evaporator surface for plate type coils shall be not less than that calculated to be of equal amount as would be used for bare pipe coils for same design conditions. For the purpose of this book, the following is stated:

Room	Mtd. (Max.)	"K" factor	Circuits Min. No.
Chill	12	2.5	2
Aging	15	2.5	2
Holding	15	2.5	2
Locker	15	2.0	3
Freezer	15	2.0	2

(a) Accumulators:

The use of surge drums or accumulators is not required, except for those systems under full-flooded control. However, the use of over-size suction headers acting as accumulators is recommended in the interest of good engineering practice for all systems under thermal expansion control.

(b) Circuits

For the reason that plate-type coils are limited in length by manufacturers standards, multiple circuits are required, and shall be of manufacturer's recommended design.

(c) Defrosting:

It is recognized that plate-type coils, because of their flat face surfaces, are more easily defrosted by the scraping method than bare pipe coils. Nevertheless the preferable method of defrosting is by the hot gas or hot liquid methods and these are recommended.

(d) Hangers and Supports:

All suspended type plate coils to be securely supported from ceiling hanger rods or brackets. In no case shall the hanger rods or bolts extend through an insulated space so as to be exposed in a non-insulated space. Preferably, ceiling type plate coils in locker rooms are to be located over aisleway spaces. The use of drip pans under plate coils in all rooms over 32° F. are optional, though not necessary.

(e) Controls:

All rooms are to be fully automatic under thermostatic control. Where one compressor is used for more than one room of different temperatures, there should be provided a liquid and suction magnetic stop valve and pressure regulator.

Fin Coils

The choice of fin type coil arrangement for all refrigerated spaces lies with the designer. However, the total amount of

effective square feet of evaporator surface for fin type coils shall be based on the minimum standards as:

Room	Mtd. (Max.)	Pressure drop Per sq. in.	Fin spacing
Chill	10	0.8	½ inch
Aging	13	.08	½ inch
Holding	13	0.8	½ inch
Locker	15	0.8	¾ inch
Freezer	12	.08	¾ inch

(a) Accumulators:

The use of surge drums or accumulators is not required, except for those systems under full-flooded control. However, the use of oversize suction headers acting as accumulators is recommended in the interest of good engineering practice for all systems under thermal expansion control.

(b) Circuits:

For the reason that fin type coils are limited in length to manufacturer's standards, multiple circuits are required, and shall be of manufacturer's recommended design.

(c) Defrosting:

Hot gas or hot liquid defrosting arrangement is required for fin type coil installations, and arranged so that one-half of the room coiling may be kept in operation during defrosting cycle.

(d) Hangers and Supports:

All suspended type fin coils to be securely supported from ceiling hangers, rods and brackets. In no case shall the hanger rods or bolts extend through an insulated space so as to be exposed in an non-insulated space. Preferably, ceiling type fin coils in locker rooms should be located over aisleway spaces. The use of drip pans under fin type coils in all rooms over 32° F. are optional, though preferable.

(e) Controls:

All rooms to be fully automatic under thermostatic control. Where one compressor is used for more than one room of different temperatures, there should be provided a liquid and suction magnetic stop valve and pressure regulator.

Shelve and Truck Areas

There are three principal types of freezers in general use. These are:

(1) Cabinet type freezers located within the locker room proper;

(2) Walk-in type freezers, with shelf type coils or plates with additional coils or plates, ceiling suspended;

(3) Walk-in type freezers equipped with air blast units.

Preference of the locker plant owner or designer determines the freezer method to be used. However, for general purposes, the following is stated:

(a) Forced air:

In general, air blast type freezers are designed for trucks rather than for shelving. The average load of each truck should approximate 280 pounds and not exceeded 300 pounds, using as many trucks per freeze as is required to take care of the plant's processing capacity. Therefore, the allotted floor space to be occupied by each truck, and allowing for ample spacing between trucks, is stated as 8 square feet. For plants that are designed for forced air unit coolers of the suspended type, and freezing shelving of metal or wood construction, not directly refrigerated, these should be designed to hold a maximum of 7 pounds per square foot of shelf area.

(b) Pipe Coils:

In general, bare pipe shelf type coils are designed for walk-in type freezer only, and use ammonia as the refrigerant. Usually the product to be frozen is placed in standard wire baskets 17"x28"x4", holding approximately 40 pounds of product. The total lineal feet of shelving should be not less than 12 feet, nor need not be more than 14 feet for each 100 lockers installed. If product is placed directly on pipe coils, allow 7 pounds per square foot of shelf area per installed locker.

(c) Plate Coils:

Freezer type plates are limited in width and length to manufacturer's standard sizes. In general the product to be frozen is placed in standard wire baskets 17"x28"x4", holding approximately 40 pounds of products. The total lineal feet of 22" shelving should be not less than 16 feet, nor need not be more than 18 feet for each

100 lockers installed. If product is placed directly on the plate coils, allow 7 pounds per square foot of shelf area per installed locker.

(d) Cabinet Type Freezers:

Cabinet type freezers, located in the locker room proper, are generally of three types:

(1) Using plate coils in shelf arrangement;
(2) Of the induced air type without cooling or evaporator as part of the cabinet proper; and
(3) Of the direct air type with coiling or evaporator as part of the cabinet proper.

These types are of standard manufacture, and their total capacity should be based on 7 pounds per square foot of shelf area per installed locker.

Compressor Selection

In the early development of locker plants the practice of selecting the refrigeration compressor or condensing unit was largely determined on competition, rather than on sound engineering practice. Many plants were installed having a single condensing unit for widely varying room temperatures, reflecting in the power operating costs, and in many cases serious loss due to total shut down during service repairs. As the industry grew this evil was largely corrected; however, in some instances, this practice still exists. The selection of the number of compressors or condensing units to be installed is stated to be:

(a) In plants 350 to 550 installed lockers, there should be provided one compressor on all medium temperature rooms, and another compressor for the locker and freezer.

(b) In plants having installed 600 lockers and over, there should be provided one compressor for all medium temperature rooms; one compressor for the locker room or bulk storage room of zero temperature; and one compressor for the freezer alone.

(c) In all cases where two or more compressors are installed they should be inter-connected to each separate load division.

Compressor Oils

The importance of adequate lubrication applied to any type or make of compressor, motor or other friction wearing part, is

built into the machinery in accordance to the manufacturer's standards or design. Thus to insure the full useful life of the equipment, it is necessary that the manufacturer's specifications on lubrication should be adhered to at all times.

(a) Ammonia:

Compressor as recommended by the manufacturer should be used. Oils recommended by one manufacturer should not be used in another's make, without specific knowledge that the oil specifications are suitable for such changeability. Keep the oil level in the compressor within the height limits set by the maker and at least two (2) recharges of compressor oil should be provided with every installed compressor.

(b) Freon:

Compressor oil is miscible with Freon, therefore, compressor oil level gauge should be checked during and after test run of plant under designed operating conditions. In all low temperature applications, an automatic oil return separator should be provided and connected to the compressor. Here again use only that oil as recommended by the compressor manufacturer.

(c) Motors:

Sleeve bearing type motors require a good grade of light machinery oil.

All motor bearings should be checked before starting up plant and upon completion of test run prior to acceptance of plant by owner.

Ball bearing type motors are usually packed at the maker's factory and need little or no attention during plant construction and preliminary operations.

In case of ammonia systems, the compressor manufacturer provides suitable means to draw-off "spent" oil from the high pressure separator and this should be drained and checked before turning the plant over to the plant owner operator.

Refrigerant Mains

The size of suction, liquid and hot gas mains play an important part in the refrigerating plant's over-all operating efficiency. It is false economy to under-size any refrigerant main or pipe line,

just as it is willful waste to oversize the mains or pipe lines. These considerations are important:

(a) Ammonia:

The following table shows the maximum tons of refrigeration normally allowed for the listed size of pipe, per 100 feet equivalent length.

MAXIMUM TONS REFRIGERATION FOR AMMONIA MAINS

Pipe Size	Suction Line Suction Pressure Lbs./Sq. In. Ga. 5	20	45	Discharge Line	Liquid Line Condenser to Receiver	Receiver to System
⅜	.....	.....	.....	.....	2.5	12.0
½	0.6	1.1	2.0	3.1	6.0	20.0
¾	1.2	2.2	4.1	6.0	14.0	75.0
1	2.2	4.0	7.5	11.4	24.0	137.
1¼	4.4	8.0	15.0	22.4	50.0	.....
1½	6.4	11.8	21.6	30.9	77.0	.....
2	12.1	22.2	42.0	62.0	140.	.....
2½	19.1	35.5	65.0	97.5	.....	.....
3	31.5	59.0	.....	160.0	.....	.....
3½	46.6	87.5	.....	.....	.....	.....
4	64.0	.....	.....	.....	.....	.....
5	117.0	.....	.....	.....	.....	.....

EQUIVALENT FEET OF PIPE FOR VALVES AND FITTINGS

Pipe size	⅜"	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	3"	4"	5"
Per valve	1	1	1½	2	4	4	7	10	13	16	20	28
Per elbow	1	1	1½	2	3	3	5	7	9	11	13	17
Per tee	1	1	1½	2	3	3	5	7	9	11	13	19

(b) Freon:

The following table shows the maximum tons of refrigeration normally allowed for the listed sizes of pipe or tubing, per 100 feet equivalent length:

SUCTION LINES, TONS CAPACITY PER 100 FEET EQUIVALENT LENGTH

Evaporator Saturated Temperture, °F.

Line Size	0				10				20			
	Pressure Drop Per 100 Ft. Equivalent Length, Lbs., Per Sq. In.											
Inches	1	2	3	4	1	2	3	4	1	2	3	4
½*	0.14	0.20	0.25	0.29	0.11	0.16	0.22	0.32	0.17	0.24	0.30	0.35
⅜†	0.18	0.25	0.32	0.36	0.19	0.27	0.33	0.39	0.21	0.29	0.37	0.42
⅝*	0.26	0.37	0.46	0.53	0.28	0.40	0.49	0.58	0.31	0.43	0.55	0.62
½†	0.34	0.48	0.60	0.69	0.37	0.52	0.65	0.74	0.39	0.56	0.69	0.81
⅞*	0.57	0.80	1.00	1.28	0.62	0.87	1.09	1.25	0.66	0.94	1.16	1.36
¾†	0.71	1.01	1.25	1.41	0.77	1.08	1.35	1.51	0.82	1.16	1.44	1.66
1⅛*	1.33	1.89	2.34	2.70	1.45	2.04	2.55	2.94	1.56	2.21	2.74	3.16

1 †	1.50	2.14	2.64	3.05	1.64	2.30	2.88	3.30	1.77	2.48	3.12	3.60
1⅜*	2.29	3.26	4.03	4.67	2.49	3.52	4.38	5.06	2.69	3.82	4.70	5.44
1¼†	2.82	3.92	4.97	5.67	3.05	4.25	5.37	6.12	3.27	4.62	5.76	6.60
1⅝*	3.53	4.98	6.22	7.16	3.83	5.40	6.73	7.72	4.11	5.84	7.23	8.37
1½†	4.25	6.01	7.48	8.61	4.60	6.48	8.10	9.33	4.95	7.02	8.72	9.96
2⅛*	6.42	8.95	11.3	12.7	6.92	9.71	12.2	13.8	7.45	10.5	13.1	15.0
2 †	8.14	11.5	14.3	16.2	8.80	12.4	15.5	17 7	9.37	13.3	16.5	19.0
2⅝*	12.7	17.9	22.4	25.3	13.7	19.1	24.1	27.6	14.6	20.9	25.7	29.8
2½†	12.7	17.9	22.4	25.3	13.7	19.1	24.1	27.6	14.6	20.9	25.7	29.8

*OD. †IPS.

EQUIVALENT FEET OF PIPE FOR VALVES AND FITTINGS

Line size, IPS	⅜"	½"	¾"	1"	1¼"	1½"	2"	2½"
Per valve	1	1	1½	2	4	4	7	10
Per elbow	1	1	1½	2	3	3	5	7
Per tee	1	1	1½	2	3	3	5	7

DISCHARGE LINES MAXIMUM TONS OF COMPRESSOR CAPACITY FOR VARIOUS SIZES

Condensing Temp. °F.	115	90	Condensing Temp. °F.	115	90
⅜" OD	1.43	1.15	1¼" IPS	9.16	7.35
½" IPS	1.87	1.50	1⅝" OD	10.9	8.75
⅞" OD	2.97	2.38	1½" IPS	12.5	10.0
¾" IPS	3.26	2.62	2⅛" OD	19.2	15.3
1⅛" OD	5.05	4.05	2 " IPS	20.6	16.5
1 " IPS	5.29	4.25	2⅝" OD	32.2	25.9
1⅜" OD	7.72	6.19	2½" IPS	32.2	25.9

LIQUID LINES, TONS CAPACITY PER 100 FEET EQUIVALENT LENGTH

Line Size	Pressure Drop Per 100 Ft. Equiv. Length, Lbs. Per Sq. In. 3	5	10	20	Line Size	Pressure Drop Per 100 Ft. Equiv. Length, Lbs. Per Sq. In. 3	5	10	20
⅜" OD	0.88	1.14	1.80	2.58	1 " IPS	21.4	28.2	41.3	60.8
½" OD	2.89	3.64	5.56	8.50	1⅛" OD	21.4	28.2	41.3	60.8
½" IPS	4.86	6.81	10.2	15.8	1¼" OD	36.9	48.1	-----	-----
⅝" OD	4.86	6.81	10.2	15.8	1⅜" OD	36.9	48.1	-----	-----
¾" IPS	9.73	12.6	18.5	27.0	1½" IPS	62.0	-----	-----	-----
⅞" OD	10.5	14.1	21.8	33.0					

Water Mains

The service water mains to the plant must be sufficient to supply the full demand without pressure drop when more than one service is in use. Therefore, the size of the main service pipe line to the plant if not predetermined should be checked with the public utility supplying the service.

(a) Compressor Use:

In case of water cooled equipment, the water service to the compressor or condenser should be not less than that recommended by the equipment manufacturer and should be under automatic feed control with free unobstructed drain to sewer or waste system. In no case is any water line (or steam line) to be encased within or run directly over an insulated space. All water and drain lines should be installed of such size or design as may be approved by local inspecting authority, and in all cases to be not less than the standards as set forth by the American Water Works Association.

(b) Water Defrosting:

The use of water in defrosting coils of unit coolers is patented, and many unit cooler manufacturers operate under a license arrangement for the water defrosting feature built into the unit. Therefore, for our purposes, no water defrosting arrangement should be used, except that supplied by a licensed manufacturer, and then the arrangement to be as specified by the manufacturer for his particular piece of equipment. However, all water defrosting installations require an over-size quick draining main from the unit cooler to the waste line, and free from obstructions. This waste line should be installed by a licensed plumber qualified to carry out such work.

(c) Building Mains:

Because much depends on an adequate and well proportioned water system within the main plant, all such work should be contracted for directly by the owner to a licensed plumber. However, where a contractor undertakes this work, care should be exercised to meet all local requirements, and be well within any existing building code. Where no code exists, then the design, size and installation should follow that of the nearest municipality where such a code does exist.

Power Service

The installation of electric or gas services to the main plant should be contracted for directly by the owner. However, where these services are included in the general contract, the size and type of service shall be only those that are within the local build-

ing safety code, and where no code exists, to be equal to that of the nearest municipality where a building safety code does exist.

Evaporative Condensers

The use of evaporative type condensers for ammonia and Freon condensing equipment is employed wherever their use is dictated for economical reasons. Therefore, no safe rule may be safely set down to govern the selection of the type of condenser.

Water cooling towers in many localities, when used with closed type condensers, compare very favorably to evaporative type condensers. Here again no set rule may be safely set down to govern their selection or use.

Artesian wells producing water 20 or more degrees lower in temperature than the local water services are often selected for supplying the water to condensers and other uses. Here too the cost of pumping and well maintenance is the governing factor in addition to the temperature of the water, and no set rule applies as to their use or any other type of water supplied for condenser or plant service.

The choice of condenser design and application is left to the designer, but in no case are the discharge pressures to exceed those heretofore shown under the heading of refrigerants.

Piping Design

The design and piping layout for any type plant is peculiar to the designer, and of course, certain established rules are followed, which for the purpose of these standards are said to be not less than those required by the American Society of Mechanical Engineers.

The use of weld-type joints wherever practical is recommended. All screwed type joints should be made up with litharge and glycerine in a prescribed manner. Extra strong pipe must be used on all liquid ammonia piping and not less than full card weight pipe on discharge and suction mains. All piping must be so designed that objectionable traps or pockets are avoided. The use of steel welding type flanges is preferred wherever their use is practical, with four bolt type flange unions or connections on pipe

sizes one inch to and including four inches. For pipe size, five inches and above, round flanges of bolted type to be used.

The use of steel or copper may be used as preferred for freon. However, in case of steel pipe, the entire inner surface of the steel pipe must be sand blasted and thoroughly cleaned of all scale or foreign substance. In case of copper pipe of ¼" to ⅝" in size, flare type fittings may be used in the prescribed manner.

For copper mains ¾" diameter and over, solder type joints should be used, or fused welded. All soldered joints to be made up with silver solder in the prescribed manner.

Irrespective of the design, size or type of refrigerant, all pipe lines are to be carefully tested and checked for leaks, and left leak proof, sound and suitable to withstand working pressures specified under heading of refrigerants.

All fittings should be of structural strength to match their adjoining fitting or pipe, and withstand full test conditions as herein prescribed.

All valves used for ammonia are to be of the back seating pattern, and of standard manufacture. All valves used for Freon to be of the packless type, or larger sizes of the capped stem type and of standard manufacture.

Heat Exchangers

The use of heat exchangers on ammonia systems is not considered necessary or of any appreciable value to plant's operation or efficiency. However, for Freon-12, the use of capacity boosters or heat exchangers is of definite aid, and should be used on suction mains from all rooms of medium or low temperatures. In case of plants using compressors of the two-stage effect, discharge gas intercoolers are considered necessary in most cases, and liquid coolers or flash tanks are necessary in all cases.

Coil Suspension

The manner of suspending evaporators or coils from ceiling of room should follow the prescribed manner and style as designed by the coil or evaporator manufacturer. In no case should coils or evaporators be suspended except by rigid supporting rods or

hangers, or by self-supporting structural steel stands. Wire, cables, or other flexible hangers should not be used. In any case, no exposed parts of metal supporting members are extended through room insulation and left exposed. Adjustable rods or hangers are recommended to provide ease of installation and leveling.

Refrigerant Control

The choice of refrigerant feed control to evaporators is left to the designer. In general on all Freon-12 evaporators, thermal expansion valve control is most generally used, and the design whether single or multiport type is to be as recommended by the thermal expansion valve manufacturer after he is in possession of full design data of the size and type of evaporator selected for each room or installation. Installations using ammonia may use thermal expansion valve control for all rooms or a combination of thermal expansion and float control or float control for all rooms as selected by the designer. No restrictions are imposed for type of refrigerant feed control selected, providing ample reserve capacity is allowed to handle any momentary or anticipated excess load requirement.

The use of float controls is within good engineering practice, and of course, desirable for plants designed for flooded type control, for freezer, locker room or for medium temperature rooms. No specific preference of type of refrigerant feed control is stated herein.

Condenser Selection

The determination of the type of condenser required or to be installed lies with the designer, as heretofore mentioned. However, for our purposes ample effective condensing is to be provided, so that the designed condensing or "high side" pressure or condensed liquid temperature should not exceed that shown in the chapter under heading of "Refrigerants" regardless of the type or construction of the condensing apparatus. In no case shall an "air cooled" condenser be provided for use on an ammonia system. The evaporative type condenser is not classed as an "air cooled" condenser.

Freezer Types

The terms "slow," "sharp" and "quick" freezing are misnomers. We have deliberately avoided their use in this book. For general information of the locker manager, however, the following information is furnished:

(a) Slow Freezing:

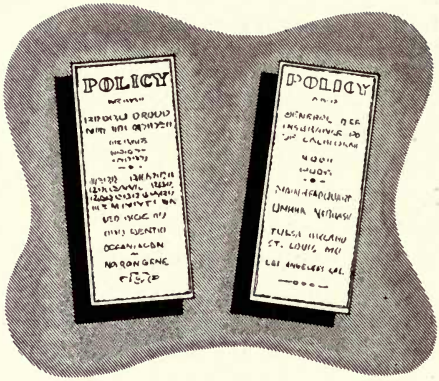
As the term implies, slow freezing is that process where the formation of ice crystals extends over a delayed period. Thus products frozen at zero (0° F.) degrees, are considered as slow freezing, when exposed to air temperature not under forced draft. Products frozen at zero degrees (0° F.) in cabinet freezers under propelled air movement, will hasten the freezing time. Nevertheless freezing done at zero degrees (0° F.) is considered slow frozen.

(b) Sharp Freezing:

As the term implies, sharp freezing is that process where the formation of ice crystals is accomplished at temperatures lower than zero degrees (0° F.) and where the time element is greatly reduced. Therefore, freezing done at minus ten degrees (–10° F.) to minus twenty degrees (–20° F.) is considered sharp freezing. Temperatures above minus ten degrees (–10° F.) shall be considered slow freezing temperatures.

(c) Quick Freezing:

As the term implies, quick freezing is that process where the formation of ice crystals is accomplished more rapidly than that generally accredited to sharp freezing, and where freezing temperatures are usually held at minus twenty-five degrees (–25° F.) and below. Quick freezing apparatus is universally designated for two stage compressor application, incorporating a primary compressor, gas intercooler, liquid precooler (flash tank) and secondary compressor. Quick freezing, therefore, is stated to incorporate the above mentioned equipment, otherwise sub-zero installations shall not be termed "quick freezing."



CHAPTER VI

YOUR LOCKER PLANT

INSURANCE

ANY successful business is operated for profit and insurance premiums necessarily form a part of overhead. That old adage "An ounce of prevention is worth a pound of cure" applies to the locker plant operator if he is to realize a maximum profit. Therefore, insurance costs should be carefully analyzed. These costs must be considered even before the site is selected and during the time the plant is in the blueprint stage. Remember, insurance costs are entirely within the property owner's control. Few business men give any thought to this very important item of overhead. The three most important items to consider are (1) location; (2) public fire protection, and (3) type of building construction. It is interesting to review briefly the procedure followed in fire insurance rating.

After a survey and grading of fire defenses are made by the engineering department of the rating organization having jurisdiction, the classification is determined which establishes the basis table to be used for your property. Therefore, before selecting a site for your plant a check should be made of the available fire hydrants, water supply and distance to the fire department.

Once the classification is established an inspector visits the property and makes a complete inspection to compile data regarding physical hazards. The survey includes complete information on construction, occupancy, private protection, and exposure. The rating schedule is then applied to obtain the final rate which you will have to pay for each $100 of insurance. This schedule considers every detail that has a bearing on (a) the probability of fire occurring; (b) the probability of such fire spreading; (c) the probability of its being extinguished; and (d) the probability of damage by fire, smoke, and water.

The schedule does not set out various rates for various buildings. There is no one rate for brick buildings, another rate for frame buildings, or another for fire-resistive buildings. The rating schedule is simply a system by means of which the parts of hazard in a building may be analyzed and it is meaningless until applied to some actual building. The rate for any building is largely determined by the property owner himself who may, subject to building ordinances, put a wood roof or an incombustible roof on his building, or protect or not protect floor openings, or use flammable liquids or introduce any one of a thousand hazards.

It is important that you consult with your local rating authorities before starting construction. Plans should be submitted and often the rating experts can make simple suggestions which, if followed, can reduce your fire insurance rate by as much as 50 percent. That saving over a period of years can climb to a sizable figure. In case you are one of many who has already constructed a building and the rate is high you need not be discouraged. A rating survey for all property is on file with your rating organization and copies are available to the interested property owner that he may acquaint himself with the hazards which can be corrected and with improvements which may lead to rate reductions.

Each rating bureau has a special service department and its function is to safeguard life and property by inspection of automatic sprinkler equipments, air conditioning installations and to make practical recommendations for the elimination of hazards in all classes of property. Suggestions coming from the rating bureau will be as follows:

1. Do not build nearer than 60 feet from a frame structure or nearer than 40 feet from a masonry structure. If you are to

lease a building investigate the fire rate. Perhaps the building across the street will serve your purpose as well and the rate will be much lower. Since parking space is necessary, let that space come between your building and an adjoining structure.

2. Unless walls are constructed of solid brick, they should be faced with four inches of solid brick. This statement applies particularly to new construction as you would have no opportunity to make the walls standard in the case of leased property.

3. If the floor is of concrete construction, consider a steel deck roof rather than one of wood joist.

4. Cut off slaughtering, rendering, smokehouse and heating plant. (Investigate standard smoke chests which are approved for inside use.)

5. Fire walls with openings properly protected by standard fire doors will reduce area subject to one fire.

6. Use incombustible insulation wherever needed.

7. Consider installation of automatic sprinklers, watchman service, and inside fire protection such as chemical extinguishers and standpipe and hose.

8. If it is necessary to place a wood floor over concrete, the nailing strips should be embedded in the concrete.

9. Consult the "Safety Code for Mechanical Refrigeration," published by the American Society of Refrigeration Engineers, 37 West 39th Street, New York.

10. Construct standard chimneys and provide proper clearance for metal pipes, heat devices and their firing doors. Properly protect the wood floor under any heat device.

11. Standards regarding installation of gas heated devices can be obtained from your rating organization.

12. Electric wiring should be installed according to the National Electrical Code.

As an illustration of insurance savings, let us examine the properties of Bill Jones and Joe Smith. Insofar as floor plans are concerned both are identical. The two buildings are constructed in adjoining towns having the same fire protection classification. Both buildings have concrete floors, are one story in height, have hollow concrete block walls faced with four inches of brick. Both are occupied as locker plants having identical processes. The rate on Bill Jones' plant is 52 cents. The rate on Joe Smith's plant is $1.03.

The natural assumption would be that the rating authorities had made a mistake, but that is not the case. Bill Jones consulted with his rating bureau and learned that by placing a steel deck roof on this building instead of a wood joisted roof, his plant would class as fire-resistive. He, therefore, had his plans changed to include this improvement at a small overall cost and as a consequence he is paying less than half the rate which Joe Smith pays because Joe's building has a wood roof. It pays to learn the facts before starting construction.

Despite our knowledge of fire prevention methods, fire each year destroys thousands of lives and hundreds of millions of dollars' worth of property in the United States. What can you do about this peril or any other to which your property might be subjected?

First you can survey the risks to which you are exposed. Is there a chance of a loss from fire, windstorm, explosion, hail, public liability, or business interruption? This survey should determine every chance of a major loss. Your risks surveyed and appraised, you can reduce or eliminate the obvious causes of loss. Even after this has been done there remains an irreducible minimum of risk over which you have no control. Thus, since the chance of loss due to fire, for example, can never be eliminated completely, another step in dealing with perils to property becomes necessary. You can transfer the remaining chance of loss to a professional risk-bearer — an insurance organization — by purchasing an insurance policy.

Now that we know something of the hazards involved in any structure and how to guard against them it is pertinent that a few definitions of insurance terms and coverages be given. While the definitions submitted may leave something to be desired from a legal standpoint, they are adequate to introduce the reader to a general understanding of property insurance.

APPRAISAL. An estimate of the value of property, made by impartial experts. Appraisals are frequently used in determining the insurable value of property and are important if the policy contains a coinsurance clause.

COINSURANCE. A policy provision specifying that the property owner will carry insurance amounting to at least a stated percentage of the value of the property in consideration of a reduced rate.

EXTENDED COVERAGE ENDORSEMENT. An endorsement extending the fire policy, usually to cover loss caused by windstorm, cyclone, tornado, hail, explosion, riot, civil commotion, smoke, falling aircraft and motor vehicles.

BUSINESS INTERRUPTION. This type of insurance is designed to protect the property owner against loss of earnings resulting from the interruption of business as a consequence of perils insured against.

CUSTOMER'S GOODS INSURANCE. This is a form of coverage that pays for losses on all lawful goods and articles belonging to persons other than yourself, and left by them in your place of business.

OWNER'S LIABILITY INSURANCE. Protects you against the hazards incidental to ownership and maintenance of premises. This form of coverage covers the liability imposed by law for damages because of bodily injury, sickness or death sustained by any person caused by accident in your plant.

To avoid being a disappointed Joe Smith, in case you are planning to construct a new building, keep the aforementioned 12 rules of construction and occupancy well in mind. Give serious thought to the location, public fire protection and type of building construction. Submit your plans to the rating authorities for counsel and guidance. Their services are free. Place your problems before your insurance agent or company. They have ways and means of obtaining the correct answers.

After every possible means of making your building safe have been exhausted you must then (with the help of your insurance agent) lay out a program of insurance protection. Don't think your insurance agent is trying to sell you a bill of goods when he suggests you carry business interruption insurance. You may thank him for that suggestion at a later date. If your building was destroyed by explosion or any other peril it would be consoling to have your actual earnings paid to you for each day the plant was inoperative. If your agent suggests owner's liability insurance listen to his story. It would be comforting to have your insurance company make payments to one of your customers who sustained severe bodily injury due to an accident in your plant. Should you follow your agent's tip and carry customers' goods insurance, your customers will be protected against loss of any goods left in your keeping.

This chapter has been written for the sole purpose of making you conscious of overhead from an insurance standpoint and to caution you to provide ample protection for continuing in business should a catastrophe occur. Space does not permit us to cover all the ramifications of construction, occupancy, and protection of locker plants; the field is too large and too varied, but if you will seek out the sources of information on the subjects touched upon you will be well repaid.

SOME FACTS ABOUT THE

FROZEN FOOD LOCKER INSTITUTE, INC.

THE Frozen Food Locker Institute was organized in May, 1943, to advance the Frozen Food Locker Industry, and to assist, during wartime, those who desired to build new locker plants or expand existing installations.

Today its membership of over 200 outstanding firms includes virtually every manufacturer and supplier of capital and operating equipment used by the industry, and a majority of the nation's leading locker plant builders.

The officers and directors who have guided the Institute's policies have been men of broad experience in the locker field, and representative of every branch of the industry. By serving as a clearing house for the exchange of ideas and information, the Institute has aided in setting new standards of design, construction, equipment and operation of locker plants throughout the United States and several foreign countries.

The Institute booklet, "Before You Build Your New Locker Plant," has been sent on request to thousands of interested prospects throughout the world, to servicemen overseas, to colleges, cooperative groups and others. It has served as a guide in the building of countless locker plants. The booklet is kept constantly up to date—to keep step with every new industry development. It is free for the asking.

The Institute has sponsored special training schools at several universities for the education of trained personnel for the industry. These schools have been attended by hundreds of men from the

United States, Canada, and several foreign nations. Members of the Institute have given generously of their time in speaking to the classes in these schools, to give students the benefit of their years of practical experience.

Institute members have assisted hundreds of veterans in the establishment of new plants which have provided locker service in their respective communities and livelihood for the veterans and their families.

Through its trade journal advertising the Institute has placed hundreds of prospective plant owners in touch with the experienced and dependable contractor members of the Institute, whose advice and counsel have made possible the construction of better locker plants and the avoidance of costly mistakes.

The Institute, and the industry generally, have long been conscious of the need for standards which would serve as an authoritative, impartial and reliable guide on the many problems confronting new and existing plants. In presenting "Your Locker Plant," the Institute believes it has rendered a distinct service to the entire Frozen Food Locker Industry.

These standards of plant design, insulation, construction, equipment and operation will, if carefully studied and adhered to, inevitably result in more efficient and attractive frozen food locker plants, which will render the greatest possible service to their patrons, and increased profits to their owners.

—Ray R. Farquhar
Executive Director.

Frozen Food Locker Institute, Inc.

YOUR LOCKER PLANT

SUPPLIERS

On the following pages you will find authoritative information about equipment and supplies by the leading manufacturers in the field, all of whom we can recommend highly to you.

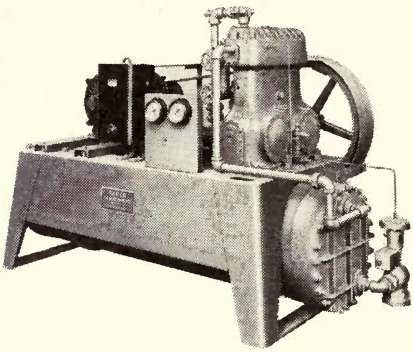
FROZEN FOOD LOCKER INSTITUTE.

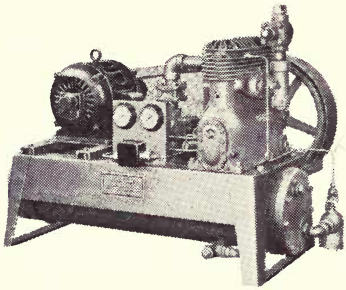
FOR HIGH PROFIT OPERATION BAKER'S THE BETTER BUY!

Profit-minded locker operators know that Baker refrigeration assures low-cost, dependable operation. That's why so many locker plant owners throughout America depend on Baker units. Ask any Baker owner.

BAKER SELF-CONTAINED AMMONIA CONDENSING UNITS

Built in sizes from 2 to 15 h. p. Particularly adapted to low temperature work due to their high efficiency and low operating costs. Include shell and tube condensers with pressure-operated water control valve. Ammonia compressors up to 100 h. p. also available.





FOR THOSE WHO PREFER FREON 1½ — 60 H. P. UNITS

Baker offers one of the widest lines of fully-automatic condensing units for Freon-12 in both two- and four-cylinder models. Air-cooled units range from 1½ to 3 h.p. Water-cooled types from 1½ to 60 h.p. Shell and tube type condensers supplied on all water-cooled models.

CHECK THESE OUTSTANDING FEATURES OF BAKER COMPRESSOR SUPERIORITY

1. Positive, full-pressure lubrication throughout.
2. Three-bearing drop-forged crankshaft.
3. Double trunk pistons — Full-length piston pins.
4. Honed cylinders — Piston rings of special formula.
5. Timken Tapered Roller Bearings.
6. Materials of highest quality — Precision built.

Sales and Service in Principal Cities

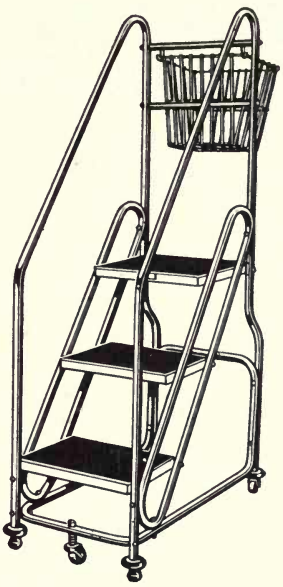
BAKER FOR OVER 40 YEARS A GREAT NAME IN REFRIGERATION

BAKER ICE MACHINE CO., INC.

FACTORIES: OMAHA, NEB. AND SOUTH WINDHAM, ME. • HEADQUARTERS: SOUTH WINDHAM, ME.

NEW LOW PRICES:

Improved manufacturing facilities permit reduction in prices. Improved construction—easier handling—all aluminum—rubber bumpers.



CARD

Sturdi-Lite

SAFETY LOCKER ROOM LADDER

Has one-piece aluminum steps with non-skid RUBBER TREADS. Ball-bearing casters and many other important and safety features.

3–Step Ladder

Height over-all 63", length over-all 36", width inside 15", width outside 17". Top step 27" from floor, two bottom steps 10" x 14¾", top step 14¾" x 14¾". Steps 8" apart. ONLY $45.00 complete with basket, F.O.B. Clearwater, Fla.

4–Step Ladder

Height over-all 74", length over-all 40", width outside 17", width inside 15". Top step 42" from floor. Steps 10½" apart. Steps are same as 3-step ladder. ONLY $49.50 complete with basket, F.O.B. Clearwater, Fla.

5–Step Ladder

Top step 52½" from floor—steps 10½" apart. Four bottom steps 10" x 14¾"—top step 14¾" x 14¾". ONLY $55.00 complete with basket, F.O.B. Clearwater, Fla.

TWO NEW 2-Step Utility Ladders — Low prices — write for details.

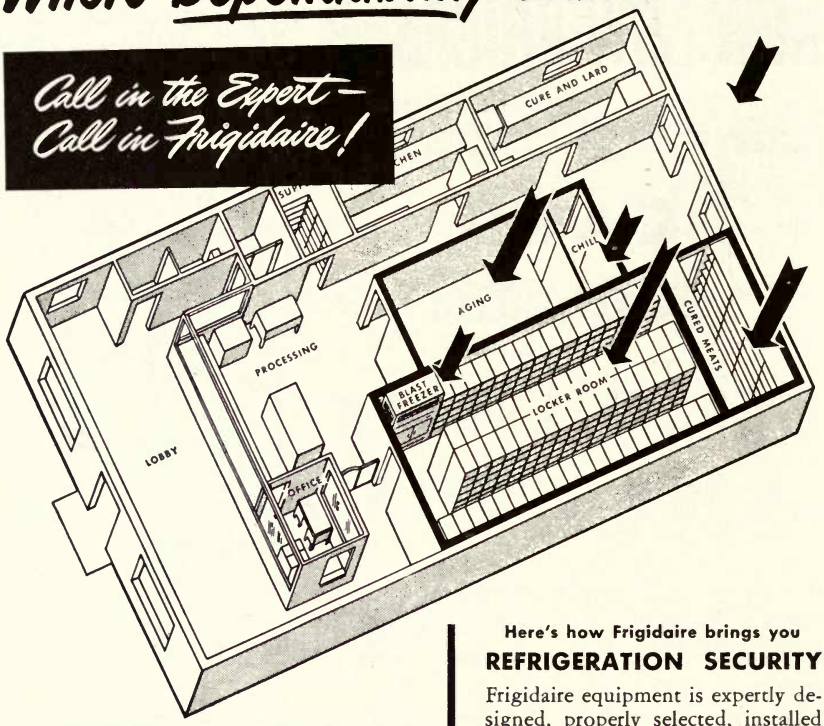
For profitable locker operation — the best is none too good.

Order Today — Immediate shipment. Details sent upon request.

D. R. CARD COMPANY

824 Merchandise Building
Minneapolis 2, Minnesota

Where Dependability counts most



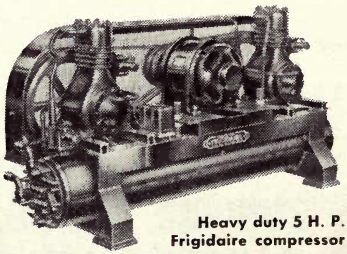
• Experienced operators know dependable refrigeration equipment is essential to profitable operation. Reduced shutdowns, less maintenance, lower operating costs result in savings that add up to profits. That's why it pays to call in the expert, to call in Frigidaire. For Frigidaire, a pioneer in locker plant development, has equipped thousands of plants with dependable, economical refrigerating equipment.

So, if you are enlarging your plant, building a new one or replacing equipment, consult your Frigidaire commercial refrigeration dealer—a specialist whose counsel is yours for the asking, whose organization is trained to engineer, install and service every installation properly. Find his name in Classified Telephone Directory under "Refrigeration Equipment." Or write Frigidaire, Dayton 1, Ohio. Leaside 12, Ontario.

Here's how Frigidaire brings you

REFRIGERATION SECURITY

Frigidaire equipment is expertly designed, properly selected, installed and serviced to bring you *Refrigeration Security.* Frigidaire compressors from 1/5 to 25 H.P. Other Frigidaire products: forced air and gravity cooling units, controls, display cases, home freezers, ice cream cabinets, water coolers, beverage coolers, milk coolers, reach-in refrigerators, air conditioners.

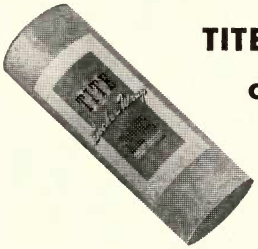


Heavy duty 5 H. P. Frigidaire compressor

You're twice as sure with two great names

Frigidaire *made only by* **General Motors**

Better Locker Packaging Builds Customer Satisfaction



TITE For Better Protection of Frozen Meats . . .

Available in 1000′ rolls for convenient locker plant use. Four widths—15″, 18″, 20″ and 24″ to meet every packaging need.

TITE, the original glassine laminated locker wrap, provides "Triple Protection" against oxidation and dehydration. Preserves the original flavor, texture and bloom of meat.

FREEZTEX Packages For Frozen Fruits and Vegetables

Ideal package for wet packed fruits and vegetables. Sturdy duo-waxed rectangular carton protects inner Marapak bag. Easy to set up, fill, and seal. Leak-proof gusset style bag is heat sealing, moisture-vapor-proof, and has superior wet strength.

Available in bulk quantities for locker plant use or in handy resale kits containing bags, cartons and filling funnel. Three sizes: Pint, Quart, and Two Quart.

Resale Locker Wrap rolls

TITE	100′ length	18″ width
FREEZTEX*	75′ length	24″ width
FREEZTEX*	100′ length	18″ width

**Cellophane laminated locker wrap.*

MARATHON PROTECTED BY MARATHON

Contact your local paper jobber or write Marathon Corporation, Menasha, Wis. for full information.

...From Detailed Designs and Data Contained in this New Manual...

Before you start planning to build a new frozen food locker plant or to enlarge existing low temperature facilities, be sure you obtain your copy of the new PALCO WOOL Insulation "Frozen Food Locker Plant *Plan and Construction* Manual." This informative guide contains seven plans and layouts for existing buildings in addition to complete designs, material lists, and construction details and procedure. With the aid of this valuable data you can plan your plant for maximum efficiency and most economical operation, using the best methods of PALCO WOOL application. In more than 10,000 frozen food locker plant and cold storage installations, PALCO WOOL Insulation has filled the most exacting requirements and specifications—proof of its superior insulating qualities. Get full details by sending for your copy of this new manual today!

FLAME PROOF
SAFERIZED
PROCESS
PALCO
INSULATION
WOOL

THE PACIFIC LUMBER COMPANY
100 BUSH STREET, SAN FRANCISCO 4
35 E. WACKER DRIVE, CHICAGO 1
122 E. 42nd STREET, NEW YORK 17

Member of
FROZEN FOOD
LOCKER
INSTITUTE

make 2 way profit with Revco CHILL CHEST

1 profit on Chill Chest sales

2 profit on sale of frozen food plus processing profit from Chill Chest owners

Urge your customers to use your locker plant as a processing and bulk storage plant with a Chill Chest at home for convenient storage of small amounts for immediate use. This plan offers you a substantial profit on the sale of the Chill Chest plus additional profits on the sale of frozen foods, supplies and processing and bulk storage services. It will actually increase your regular locker business.

For your customer this plan means that a whole year's supply of expertly processed food of superior flavor and quality can be stored without investing in a large, costly home freezer that takes up a lot of room and is seldom filled to anywhere near capacity. Yet a complete assortment of foods for immediate use is always in the house. Customers who buy frozen foods this easier, more convenient, more economical way will become frozen food enthusiasts and will always buy more of the goods and services that you sell.

Write today for complete details on the Chill Chest Plan for Locker Operators.

CHILL CHEST FEATURES

- *Moveable separators divide cabinet.*
- *Food is easy to reach; shallow compartment.*
- *Illuminated Interior.*
- *Safety Signal shows temperature rise or current failure.*
- *Dependable Refrigeration Unit built by the country's largest independent maker.*
- *Compartment has freezing coils on all sides.*
- *Fits with modern furnishings. Counter high.*

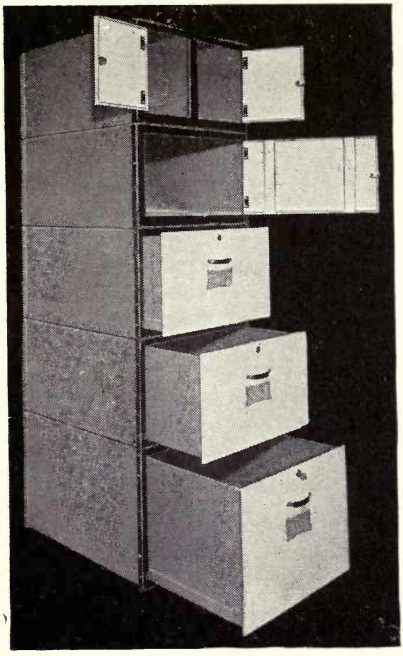
Revco INC. • DEERFIELD, MICHIGAN

The Right Locker Is Important

Since 1935

When you install MASTER you get the benefit of years of continuous experience and development that has enabled us to set new standards in locker construction.

MASTER has abandoned many designs in the past because they were impractical for profitable locker plant operation. It costs no more to get the best—demand



MASTER FOOD CONSERVATORS

—the modern locker units for economical locker plant operation. Drawers will be shipped assembled or knock-down according to your order. Also, locks will either be snap or barrel type—you specify which.

Write for Particulars

Find out why plant owners save money by installing MASTER. Equip for the future as well as the present. Safeguard your investment with MASTER. The "Choice of the Industry."

Endorsed by and sold through distributors of refrigeration and insulation.

MASTER MANUFACTURING CORP.

142 Main St. **Sioux City 4, Iowa**

Member of Frozen Food Locker Institute, organized for your protection.

Over 1,000,000 Master Food Conservators in Use

A★C★M (A PFIZER PRODUCT)

HOLDS FLAVOR and COLOR in Frozen Fruit

BUILDS BUSINESS For Locker Operators

. . . by improving your volume of business when you promote its sales

. . . by improving the value of your service when you use it yourself

● There's a service advantage and a profit advantage for locker operators who use and handle ACM, the ascorbic acid mixture that prevents the browning of cut fruit, and preserves its natural flavor. This product of Chas. Pfizer & Co., is conveniently packaged in a 4½ oz. bottle sufficient for 50 lbs. of fruit. It assures a high quality finish pack; protecting peaches, pears, apricots, cherries and other frozen and fresh fruit prepared with sugar or with syrup. It is easy to use as well as economical. One teaspoonful protects a pound of fruit, and complete instructions are included with each bottle.

Locker operators can be assured that ACM with its trade usefulness and its consumer appeal is a product that fully measures up to the standards of Pfizer Quality maintained for a near-century. Prices of ACM and full details are yours for the asking. Chas. Pfizer & Co., Inc., 81 Maiden Lane, New York 7, N. Y.; 444 West Grand Avenue, Chicago 10, Illinois; 605 Third Street, San Francisco 7, Calif.

PFIZER

PFIZER QUALITY

5239

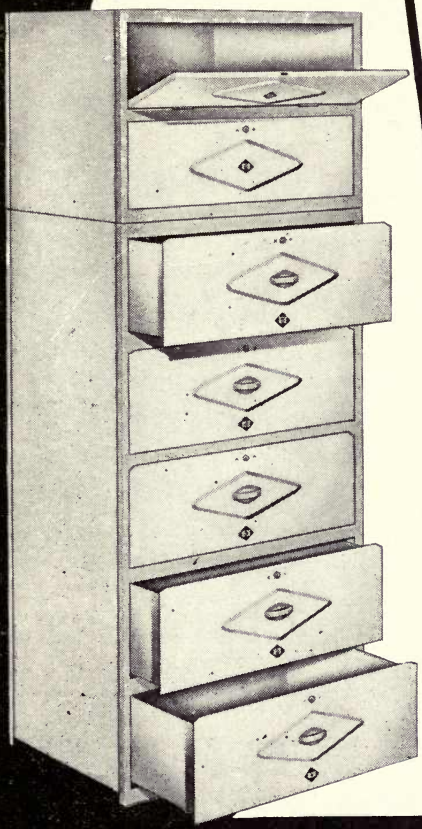
Manufacturing Chemists Since 1849

SAFE-WAY LOCKERS

BROADVIEW *and* ARISTOCRAT

(ILLUSTRATED)

GIVE YOU MORE FOR YOUR MONEY THAN EVER!



HIGH QUALITY
LOW PRICE
NO INSTALLATION COSTS

QUALITY—Not just skin deep, BUT through and through. All Safe-Way Lockers are made of the heaviest gauge steel *ever* used in locker construction. Our special "Bonderizing" (rust-proof) process before enameling also assures greater durability—longer life.

PRICES—Nowhere else can you find lockers that offer so much value at such substantial savings. Large production capacity and exclusive locker manufacturing is the answer.

NO INSTALLATION COSTS!—Broadview and Aristocrat lockers come to you *completely* assembled . . . no labor costs for assembly on the job. The complete unit, including both doors and drawers, is pre-assembled at factory.

The Perfect Locker
Built to Last Forever

Endorsed and Recommended by Distributors of Refrigeration and Insulation

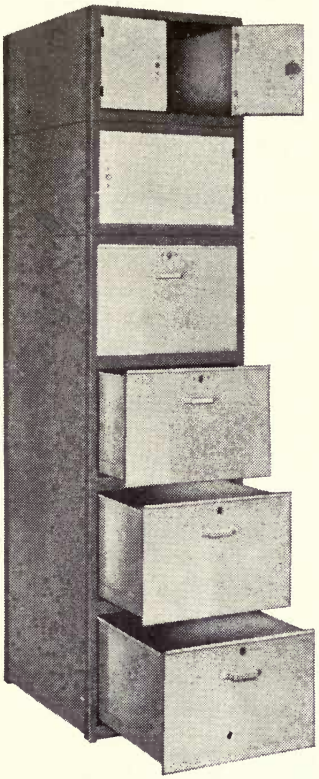
See your nearest Safe-Way Dealer, or write us direct for latest prices and specifications.

MEMBER FROZEN FOOD LOCKER INSTITUTE

SAFE-WAY FOOD LOCKER COMPANY

175 W. JACKSON BLVD. SAFE-WAY CHICAGO 4, ILLINOIS

ASE Froz-n-Food UNIT Lockers



FOR

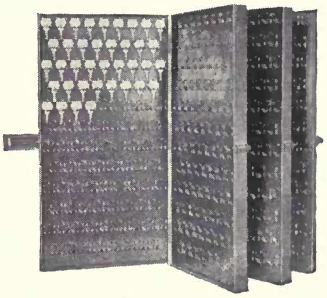
- MINIMUM UPKEEP
- CUSTOMER SATISFACTION
- MORE PROFIT

ASE Froz-n Food Lockers in their harmonizing green and ivory or black and white permanent finish, are not only attractive and easy to keep clean BUT their heavy, rigid steel construction guarantees you years of trouble-free service.

No assembly on Drawer Lockers—quickest assembly on Door Lockers. ALL ASE Units are Safe Stacking Device equipped. Remember, 36 years of experience in the craftsmanship of precision steel products is behind every ASE Locker.

Write today for your FREE copy of the big ASE Froz-n Food Locker catalogue.

There's an ASE Locker to Meet Your Every Requirement!

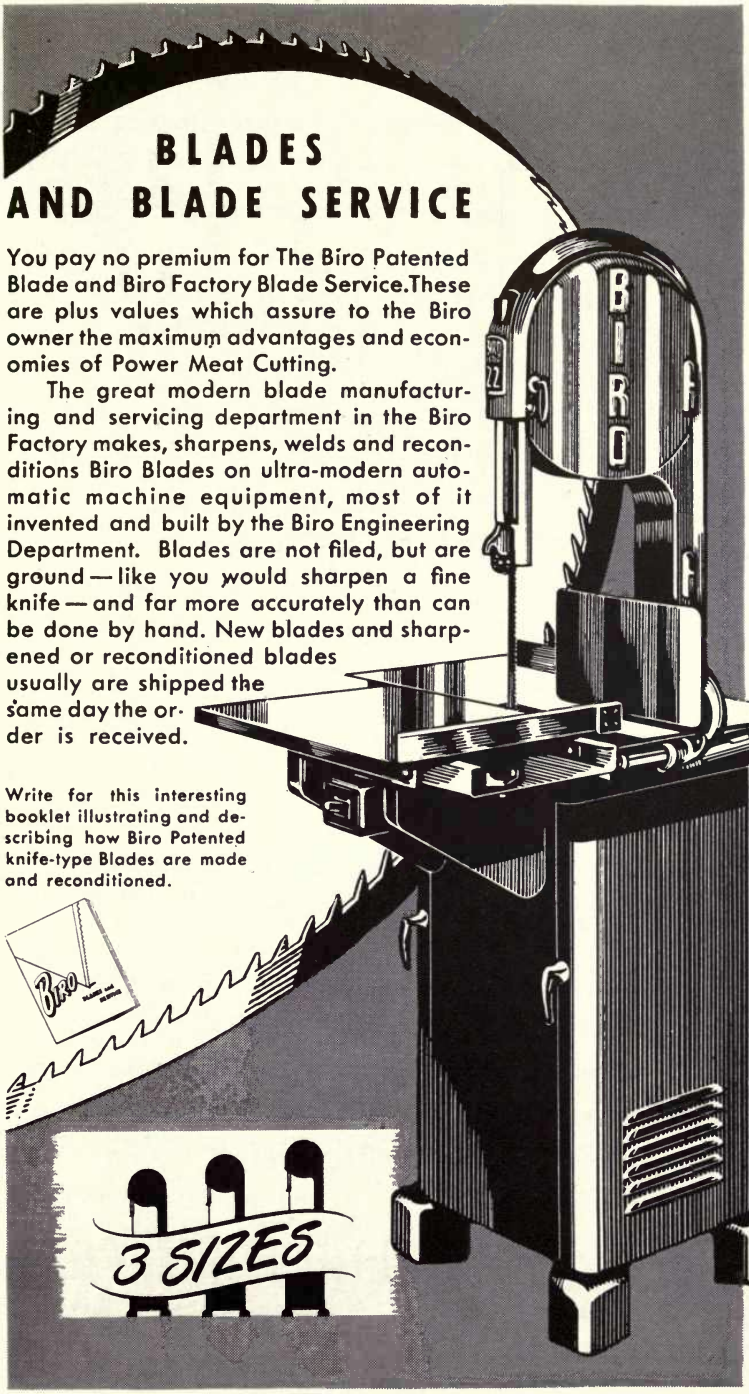


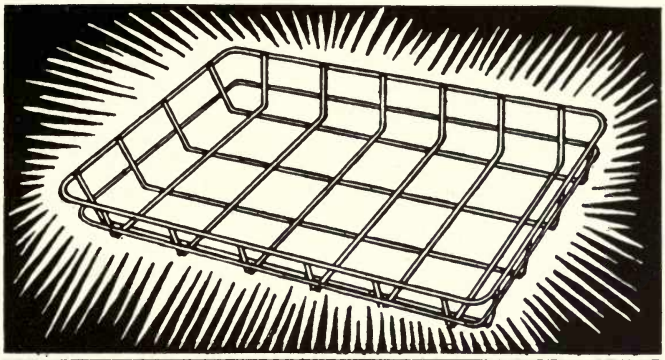
ASE KEY CABINET

No more lost, stolen, misplaced locker keys with an ASE steel Key Cabinet. 102 to 612 key capacity. Number card holder for each key. Strong hasp and staple for padlock — padlock furnished. For sizes and price write for key cabinet circular.

ALL-STEEL EQUIPMENT INC.

44 Highland Avenue **Aurora, Illinois**


BLADES
AND BLADE SERVICE
You pay no premium for The Biro Patented Blade and Biro Factory Blade Service.These are plus values which assure to the Biro owner the maximum advantages and economies of Power Meat Cutting.
The great modern blade manufacturing and servicing department in the Biro Factory makes, sharpens, welds and reconditions Biro Blades on ultra-modern automatic machine equipment, most of it invented and built by the Biro Engineering Department. Blades are not filed, but are ground — like you would sharpen a fine knife — and far more accurately than can be done by hand. New blades and sharpened or reconditioned blades usually are shipped the same day the order is received.
Write for this interesting booklet illustrating and describing how Biro Patented knife-type Blades are made and reconditioned.
BIRO
3 SIZES



Midwest FREEZER TRAYS

No. 1228 All-Purpose Tray (illustrated) is Locker Industry's biggest seller. 17x28x4". All joints welded. Electro-tinned. Dozen $20.00, 25 or more, each **$1.50**

No. 1425 Heavy-Duty Tray, 1" deeper, closer mesh, otherwise same as No. 1228. Dozen $24.00, 25 or more, each **$1.85**

No. 1324 Plate Tray, Special flatwire bottom for freezer plates 14½x21½x3½". Dozen $18.00, 25 or more, each..... **$1.35**

Midwest FREEZER TRUCKS

PUT PROCESSING ON WHEELS

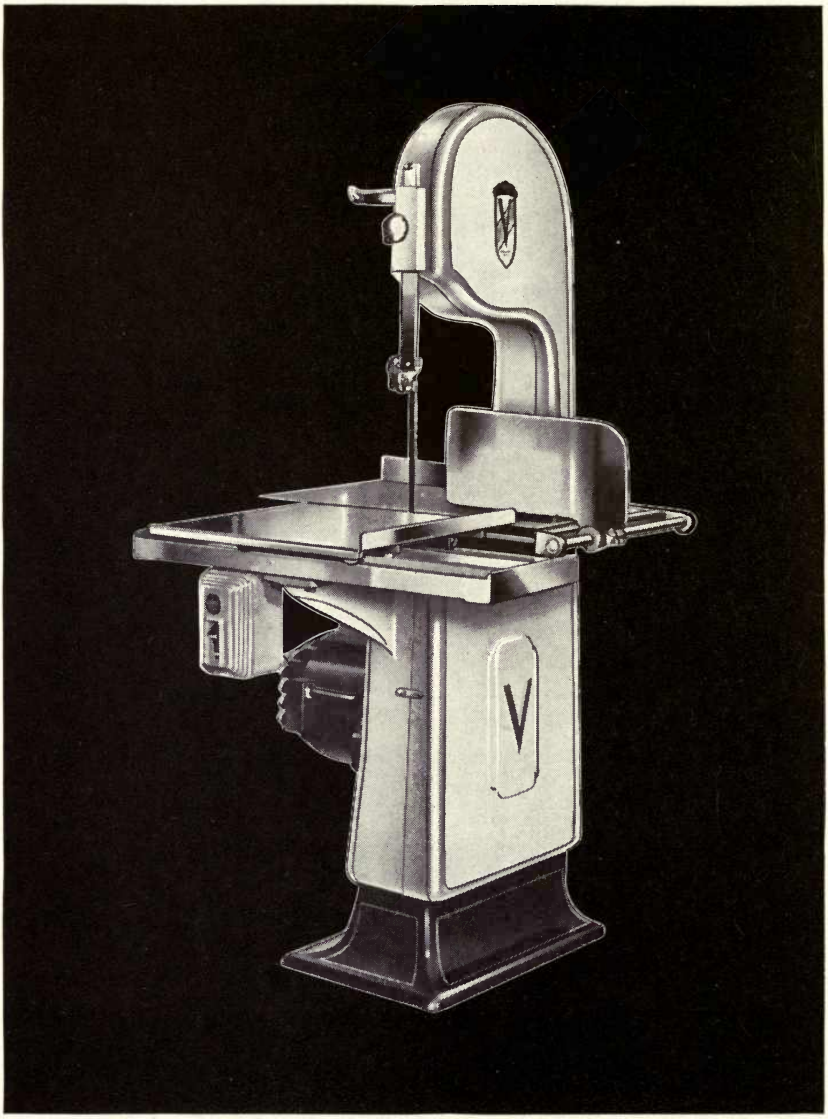
Style 1375-DE has large 4" DeLuxe replaceable rubber composition wheels—handles easier and quieter. Holds 6 standard No. 1228 17"x28" freezer trays plus 1 on top. Ample cross ventilation both ways. Trays removed either end. Welded steel throughout. Fixed casters in front; swivel type in rear. Over-all width 19½", length 29", height 54", shelf spacing 7⅞". Top raises to 80" for packing top lockers. Zinc plated finish. Price, tray not included..... **$39.95**

(Terms C. O. D.)

Without extension top.....$36.75

For No. 1324 Plate Tray 25c less

Midwest METAL STAMPING COMPANY KELLOGG, IOWA.



There Is Nothing Better

Jim Vaughan—The Electric Meat Cutter

JIM VAUGHAN COMPANY

736-740 N. Franklin St.
CHICAGO 10, ILLINOIS

Keep these helpers at your finger-tips

Five master books that every locker man should read and own.

1 "How to Build and Operate a Locker Plant"

Tells how to plan your plant and how to operate it efficiently and profitably by **proved** methods; how to process, how to wrap, what to charge, etc. By the editor of LOCKER MANAGEMENT. 320 pages, 215 illustrations, revised 2nd Edition. $2.00.

2 "Meat Slaughtering and Processing"

Gives complete information for planning your slaughtering, dressing, lard rendering, smoking, curing, sausage making, profits from by-products—all with practical guides to safety and efficiency. 307 pages, illustrated. $7.50.

3 "Power Meat Cutting For Profit"

Shows step by step how to cut up Beef, Pork, Lamb, Veal and Poultry—better and more profitably—with a power meat cutter by the famed Witte System. 152 photographs, 8 colorful cutting charts. $5.00.

4 "Your Self-Service Store"

Helps you establish a retail operation in your locker plant the modern and profitable self-service way with special emphasis on refrigerated meats, produce and frozen foods. 224 pages, 245 illustrations. $3.00.

5 "Finger-Tip Pricer"

The most widely used meat pricer. Gives correct selling price instantly on beef carcasses, loins, rounds and chucks, whole veal and whole lamb at mark-up you choose. All at today's costs! $2.00.

Order any—or all—of these valuable books under our guarantee of your money back if you fail to find them worth more than their price to you!

You'll Want This FREE Magazine!

If you own a locker plant . . .

If you're planning a locker plant . . .

Be sure to receive every issue of LOCKER MANAGEMENT, The Magazine of Ideas for Locker Men—sent free each month to the nation's locker plants. Fill in this coupon and mail now!

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105 S. Ninth St., St. Louis 2, Mo.

Enter my FREE subscription to LOCKER MANAGEMENT:

Name of Locker Plant.....

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City..... State.....

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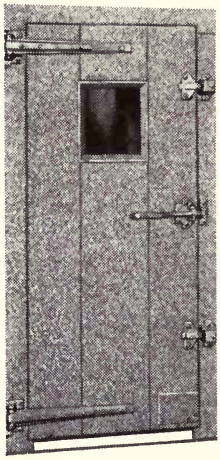
By..... .... MANAGER

JAMISON COLD STORAGE DOOR CO.

Oldest and Largest Builders of Cold Storage Doors in the World

Hagerstown, Maryland

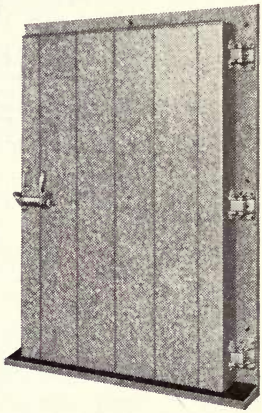
SALES BRANCHES AND DISTRIBUTORS IN PRINCIPAL CITIES



◀ JAMISON LO-TEMP DOOR

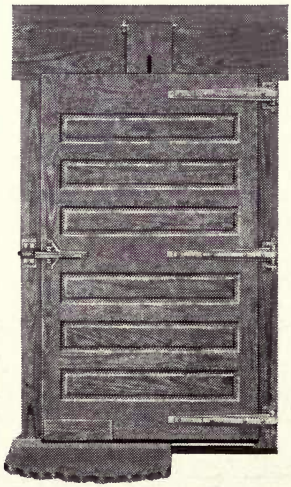
Tested under rigorous industrial use for several years. This door was developed for sub-freezing and sharp freezing operations where an infitting door is desired. Furnished with Lo-Temp gasket (sponge-rubber core with a water impervious skin), an exceptionally efficient seal is achieved. This gasket not only assures a uniform seal against the frame casing but plug seals the space between door and frame. Equipped with Jamison E-Z Open Two Point Fasteners and Adjusto-flex Hinges, a combination that produces uniformly distributed gasket pressure when the door is closed. Door is insulated with 6" or more of cork board or semi-rigid board form insulation, as specified. Cork board laid in hot asphalt; semi-rigid board form encased in water-proof paper. The front and edges of the door, as well as the frame casing, are metal clad. This feature provides protection from the deteriorating effects of moisture precipitation and helps maintain sanitary conditions.

JAMISON-BUILT STEVENSON SUPER-FREEZER DOOR ▶



It has been standard practice for many years to use this door (Over-lap Type) in sub-freezing and sharp freezing operations and rooms in which frozen food products are stored. Jamison "Zero-seal" gasket forms a soft, resilient, moisture impervious, insulating seal between door and frame. Door is insulated with 6" or more of cork board or semi-rigid board form insulation as specified. Cork board laid in hot asphalt, semi-rigid board form encased in water-proof paper.

Door is furnished with frame casing, without jambs. Jamison Adjustable Spring Hinges and Super-Freezer Door Fastener act together to compress the gasket to a uniformly tight seal. Door is protected with 20 gauge galvanized steel on the warm side, front or back, to retard moisture infiltration. Bulletin 126-B.



◀ JAMISON-BUILT TRACK DOOR

Used in packing plants, abattoirs, markets, banana-rooms, or wherever products are moved in or out of refrigerated rooms on a track or trolley rail. Standard Track Doors are equipped with track port automatically operated by Jamison's new "Adjustoflex Track Port Operator With *COMPENSATOR*". This provides utmost flexibility—positive, coordinated operation of entrance door and track port with no strain on operating mechanism. All Jamison-Built Doors, including Vestibule and Super-Freezer Doors, can be furnished with track port. Bulletin 124-C.

Other Jamison-Built Doors to meet your requirements

Cooler, Freezer and Sharp Freezer Doors . . . Standard Doors . . . Vestibule Doors . . . Dutch Doors . . . Auto-Close Doors . . . Can Passing Vestibules . . . Horizontal and Vertical Sliding Doors . . . Loading Dock Doors . . . Ice Passing Chutes . . . Cold Storage Windows . . . Refrigerator Fronts.