

Table 2 Condensing Unit Sizes for Medium Temperature Commercial Refrigerators

Refrigerator Size, cu ft	Condensing Unit, hp
20-30	3/4
30-50	3/4
50-75	3/4
75-95	3/4

It might be thought that the reach-in, because it is used for short time storage, has no critical requirements as far as relative humidity is concerned. Many products in both low- and medium-temperature refrigerators are extremely sensitive to humidity, particularly since, in pre-portioned sizes, they have a high ratio of exposed surface to total volume. While there is no humidity problem with tightly packaged items, or with items to be stored for only a few hours at most, humidity is important for the proper care of many unpackaged items that are to be stored overnight, or for similar periods. It is almost impossible to make recommendations concerning relative humidity, because recent research indicates that previous, generally accepted standards have failed to take two important factors into consideration: (1) quantity and rate of air movement, and (2) variations in humidity and temperature.

It is now known that ideal storage conditions are a combination of favorable temperature, favorable relative humidity, slow but constant air circulation and minimum fluctuations between maximum temperature and humidity. It can safely be said, however, that *high relative humidity* is almost always more desirable than otherwise.

Condensing Unit Sizes

Without offering it as an engineering yardstick, it can be generally assumed that in the medium-temperature field, the sizes of condensing units shown in Table 2 will allow for proper temperature and humidities in cabinets of the stated sizes, providing the condensing units are of full capacity for their horsepower rating, the cabinets are properly constructed, the expansion devices, evaporators, and fans are properly sized, and the parts are assembled correctly. In low-temperature cabinets of the same sizes, condensing unit requirements are roughly one size larger.

CONCEPTS OF CABINET DESIGN

Historically, the reach-in has been a refrigerated cabinet fitted with a few wire shelves. Sometimes other interior equipment, such as meat rails, drawers, slides for bakers, bun pans and other special arrangements are included but by and large,

Table 3 Pan Capacity for One 12X20X4 in. Pan

Item	Number of Units in Full Pan
Head Lettuce	8 Heads
Leaf Lettuce	9 Heads
Escarole	6 Heads
White Cabbage	7 Heads
Celery	8 Bunches
Loose Carrots	20 Pounds
Green Peppers	3/4 Bushel
Cucumbers	3/4 Bushel
Spinach	5 Pounds
Lemons	90 Each
Grapefruit	12 Each

Table 4 Pan Capacity for 1/2 Cup Portions

No. of Portions	Pan Size—Inches	Pan Centers in.
70	12X20X2 1/4	3
120	12X20X4	5
175	12X20X6	7
45	No. 165, 2 deep	3
75	No. 165, 4 deep	5
110	No. 165, 6 deep	7
170	Cheese Cake, 18X26X3	3-4
	Roast and Bake Pans	
50	19 1/4 X 21 1/4 X 1 1/4	2
105	19 1/4 X 21 1/4 X 2 1/4	3
175	19 1/4 X 21 1/4 X 3 1/4	4
320	21 1/4 X 20 1/4 X 6 1/4	7
50	10 1/2 X 19 1/4 X 2 1/4	3
85	10 1/2 X 19 1/4 X 3 1/4	4
160	11 1/2 X 20 X 6 1/4	7

an arrangement providing a maximum of 1 sq ft of shelf area for every cu ft of capacity, and sometimes even less. The historical change in the character of the items stored in the reach-in and the urgent necessity that the reach-in fit into the newer programs of kitchen operation have changed this concept. Modern kitchen theory requires that foods be handled as few times as possible, changed from container to container a minimum number of times, and handled in large rather than in small lots. Further, the theory of *portion control* calls for the uniform portioning of foods as far in advance of cooking or serving as is desirable for maximum operating efficiency. (See Tables 3, 4, and 5.)

Special Storage Needs

Portions are often fragile, and must always be handled with more care than when in bulk. Therefore, portions need special containers and many levels of storage. As an example of portion control items in the refrigerator, a head of lettuce is suitable. As such, it requires little space and no special consideration. But, if left to the last minute to be turned into a chef's salad, it contributes to mealtime turmoil, waste and poor accounting. If, on the other hand, it is converted to chef's salads during between-meal slack periods, the work can be done with care, without waste and under conditions that allow for accurate accounting. Then, if the refrigerator is properly equipped, the salads can be put on dishes, the dishes put on trays, and the trays put in the refrigerator, one just above the other, stored compactly, and not disturbed until needed for the table.

Another example has to do with the modular integration of cooking, service and storage equipment. Many items of cooking equipment are designed for the commonly used 12 X 20 in. pan. This pan also fits the standard openings in service counters, and warming tables. Quite obviously, food prepared and served in this pan should also be stored in it and the refrigerator must be properly prepared for this specialized function. These two examples are sufficient to show that the refrigerator can contribute to effectiveness in kitchen operation.

The possibilities for good refrigerator use depend on how well the food facility has been planned. Each refrigerator should be placed in the location that will best integrate it into the flow of labor and materials. It can then be decided whether the refrigerator will have doors on one side, or both sides, and which way the doors shall swing. As a matter of fact, they may not swing at all, but may be of the sliding door type, if the refrigerator is to be used chiefly for display. If the doors are hinged, as they should be if the refrigerator is to be used in the

Table 5 Portion Capacity Data

Item	Capacity of One		Inches between levels
	14X18 in. tray	18X26 in. pan	
PAPER CONTAINERS			
1/4 oz cup	90	190	1
3/4	90	190	2
1	65	150	2
2	45	90	2
2 1/4	35	75	2
4	25	55	2
6	12	28	2
8	12	28	3
10	12	24	3
1/4 pt milk carton	20	40	4
GLASSWARE			
5 oz juice glass	35	84	4
10 oz water glass	20	40	5
sherbet glass (empty)	20	40	4
DISHES (empty)			
6 1/2 in. round plate	5	11	
7 1/2 in. round plate	4	8	
4 1/2 in. fruit nappie	8	21	
5 in. oatmeal bowl	5	15	
3 1/2 in. bouillon cup	12	28	
5 1/2 in. salad bowl	5	11	
3 in. custard cup (Hall)	20	40	
FOOD PORTIONS			
No. 12 scoop on fruit nappie	8	21	3-4
No. 8 scoop on 7 1/2 in. plate	4	8	3
Gel. Salad on 6 1/2 in. plate	5	11	3
Custard in cup	20	40	3
Pie on 6 1/2 in. plate	5	11	2
Cake on 6 1/2 in. plate	5	11	3-4
1/4 Cantaloupe on 7 1/2 in. plate	4	8	3-4

kitchen, the doors will probably be solid, but may be triple-glazed in certain applications, as in salad pass-through cabinets for cafeteria use.

From this point on, the use to which the refrigerator is to be put will determine whether the standard complement of wire shelves will be satisfactory or whether other accessories are required. Modern refrigerators are available with assortments of shelves and accessories, all easily interchangeable, so that the refrigerator has flexibility of application and use. Meat rails, pull-out shelves, drawers, tray slides, racks for pans and large containers, that slide in and out of the refrigerator, handling many trays at a time are some of the variations available.

Another development of the reach-in cabinet is the *combination walk-in reach-in*, with access doors on one side for reach-in service and with one of the other sides equipped with a door for entering the walk-in section. This type of fixture has its place in many large restaurants. The reach-in cabinet may be classified as a freezer when designed for lower temperature operation. In addition to these stationary units, the planning may include mobile refrigerators, equipped with heavy extension cords and polarized plugs, with matching outlets at all points of use.

REFRIGERATED DISPLAY CASES

This group of refrigerators consists of wall, counter, island and sometimes even service cases borrowed from the retail food store group. Such cases are sometimes installed in the grill rooms or chop houses for the storage and display of steaks,

chops, sea foods, salads, desserts and many other food products that may be attractively decorated and presented, thus using the cases as merchandising tools. The service type of case is better adapted for the display of steak, chops and sea foods, whereas the counter refrigerator would be preferred for desserts, some salads, and other food products, except frozen products. This type of case usually has sliding doors on the front or back, depending upon its use and location. These cases usually range from 48 to 72 in. in length. They are also frequently used in conjunction with refrigerated wall cases.

SALAD PANS

Combination units, called wall salad cases, are available in lengths from 48 to 72 in. Restaurants and cafeterias requiring self-service or display of salads, sliced fruits, desserts or other similar articles of food need refrigerated salad pans to preserve the condition and appearance of the foods. A salad pan is simply an open pan-type receptacle of proper shape and size in which salads can be put. They are not usually made in any standard size or sold by fixture manufacturers, but are normally designed and built to specification by restaurant equipment suppliers. These pans are generally placed in an opening in the top of a refrigerated cavity so that the bottom of the pan is chilled by the cold air of the refrigerated cavity. Other designs consist of a refrigerated pan flooded with water, which is allowed to freeze. The resulting ice forms a pan upon which the salads and desserts are placed. With the increasing availability of ice on the premises, there is a growing tendency to use non-refrigerated salad pans, with ice furnishing both the refrigeration and display background.

An interesting variation has recently appeared on the market in the form of a small cart carrying iced pans, with plastic domed lids, to be used for at-the-table display and the personal selection of salads, etc. Other methods of display of salads and desserts include refrigerated plates made in various shapes and placed on a counter or table at a convenient place for customer observation. These plates are operated at low temperatures to produce a frost build-up. Salads and desserts are then placed with other decorations on the white frosted plates for attractive display.

COUNTER OR BACK-BAR REFRIGERATORS

The category of counter or back-bar refrigerators is a rather broad one, including both standard and specially-built equipment. These counter-height cabinets are usually specified where full-height cabinets cannot be used or are impractical and are used to provide short time storage at the point of use for such perishables as butter chips with high use factors.

Counter refrigerators are usually 30 to 36 in. high not including the legs and 24 to 30 in. deep. Lengths vary from about 2 ft to that required. Lengths of 4 to 10 ft are the most popular. Doors are provided, about one for every 2 ft of counter, and they are usually solid and hinged. Visible exterior surfaces are usually of stainless steel except that tops are sometimes made of plastics, hardwood or other materials. Refrigeration is usually of the forced-air type with cabinet temperatures held to about 40 F.

Counter refrigerators may be an integral part of, or placed beneath the surface counters; or they may be installed beneath working surfaces as in sandwich units; or used as bases for superstructures that display items such as salads and pastries.

DISPENSERS

Automatic and semi-automatic dispensers are prime examples of equipment specialization in the food service field be-