SECTION D - FACILITIES TO MAINTAIN PRODUCT TEMPERATURE

REFERENCES (Chapter 511-6-1)

.05 Equipment and Utensils:

(1) Materials (e) Galvanized Metal, Use Limitations (l) Temperature Measuring Devices, Ambient Air and Water (x) Temperature Measuring Devices
(2) Design and Construction (jj) Food Service Equipment, Acceptability
(3) Numbers and Capacities (a) Cooling, Heating and Holding Capacities

I. **Holding Facilities**: Hot-holding and cold-holding facilities must be designed, constructed and installed to comply with DPH Rule 511-6-1-.05 Equipment and Utensils. Food equipment that is designed and built according to standards set by ANSI accredited certification programs is acceptable in this rule.

II. **Refrigeration Sizing and Design:**

1. *Plan review must consider the need to provide adequate refrigeration facilities* for the proper storage, transportation, display, and service of TIME/TEMPERATURE CONTROL FOR SAFETY (TCS) food. Specific refrigeration needs are based on the menu, number of meals, frequency of deliveries, and food to be prepared in advance of service. All refrigerators must be capable of maintaining TIME/TEMPERATURE CONTROL FOR SAFETY (TCS) food at 41°F or below.

2. If TIME/TEMPERATURE CONTROL FOR SAFETY (TCS) foods are prepared a day or more in advance of service, a rapid cooling procedure capable of cooling TIME/TEMPERATURE CONTROL FOR SAFETY (TCS) foods from 135°F to 41°F within 6 hours (135°F to 70°F within the first 2 hrs.) must be provided. The capacity of the rapid cooling facilities must be sufficient to accommodate the volume of food required to be cooled to 41°F within the total cooling time limit of 6 hours. The location of the rapid cooling facilities (e.g., sinks for ice baths, freezer storage for ice wands, blast chillers) must be identified. Refrigerators and freezers at workstations for operations requiring preparation and handling of TIME/TEMPERATURE CONTROL FOR SAFETY (TCS) foods should be considered. For example, it may be necessary to locate a freezer near the fryer where frozen products will be deep-fried. Refrigeration units, unless designed for such use, must not be located directly adjacent to cooking equipment or other high heat producing equipment that may adversely impact the cooling system's operation.

III. **Calculating Refrigerated Storage Needs:** To plan refrigeration storage, the following items must be considered: *menu, type of food operation, number of meals per day, number of deliveries per week, and adequate ventilation in the areas where the refrigeration systems will be located:*

A. *Meals Served Per Day*: This formula is used first to establish the daily number of meals:

Total Meals Per Day Served:

Number of Meal Periods x Number of Dining Seats x Turnover of Seats per Meal Period + Other Sales per Day (takeout or catering)

B. *Walk-in Refrigeration Volume*: Then, the following formula is used to establish required walk-in refrigeration storage volume:

Total Interior Storage Volume Needed:

$$\frac{\text{Volume per Meal}^{1}\ (\text{ft.}^3) \times \text{number of meals between deliveries}}{.40^{2}}$$

For example, if a food service establishment serves 1,000 meals between deliveries, the following refrigerated walk-in storage capacity would be needed:

$$\frac{0.1\ \text{ft.}^3/\text{meal} \times 1000\ \text{meals}}{.40} = 250\ \text{cubic feet}$$

C. *Reach-in Refrigeration Volume*: This formula is used to establish the required reach-in refrigeration storage volume:

Total Interior Storage Volume Needed:

$$\frac{\text{Volume per meal}^{3}\ (\text{ft.}^3) \times \text{number of meals between deliveries}}{.75^{4}}$$

For example, if a food service establishment serves 1,000 meals between deliveries, the following reach-in refrigerated storage capacity would be needed:

$$\frac{0.1^3/\text{meal} \times 1000\ \text{meals}}{.75} = 133\ \text{cubic feet}$$

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[1]Volume per meal is estimated to be 0.1 cubic feet.
[2]Only 40% of any walk-in unit actually provides usable space.
[3]Volume per meal is estimated to be 0.1 cubic feet.
[4]Only 75% of any reach-in unit actually provides usable space.

Note: *See Tables D-1 and D-2 for listings of storage volumes for walk-in and reach-in units needed between deliveries.*

TABLE D-1

The following charts are based on the volume of the meals, number of meals served and frequency of delivery.
Note: To calculate the interior floor area (ft^2) required for walk-in refrigeration units using the following charts, divide the storage volume by the height of the unit.

COLD STORAGE CHART FOR WALK-IN UNITS
0.10 Cu.Ft.. per meal for all cold storage products

Number of meals served between deliveries	Storage volume of walk-in Cu.Ft.	Number of meals served between deliveries	Storage volume of walk-in Cu.Ft.	Number of meals served between deliveries	Storage volume of walk-in Cu.Ft.
200	50.00	1050	262.50	2050	512.50
250	62.50	1100	275.00	2100	525.00
300	75.00	1150	287.50	2150	537.50
350	87.50	1200	300.00	2200	550.00
400	100.00	1250	312.50	2250	562.50
450	112.50	1300	325.00	2300	575.00
500	125.00	1350	337.50	2350	587.50
550	137.50	1400	350.00	2400	600.00
600	150.00	1450	362.50	2450	612.50
650	162.50	1500	375.00	2500	625.00
700	175.00	1550	387.50	2550	637.50
750	187.50	1600	400.00	2600	650.00
800	200.00	1650	412.50	2650	662.50
850	212.50	1700	425.00	2700	675.00
900	225.00	1750	437.50	2750	687.50
950	237.50	1800	450.00	2800	700.00
1000	250.00	1850	462.50	2850	712.50
		1900	475.00	2900	725.00
		1950	487.50	2950	737.50
		2000	500.00	3000	750.00

TABLE D-2

STORAGE CHART FOR REACH-IN UNITS
0.10 Cu.Ft. per meal for all cold storage products

Number of meals served between deliveries	Storage volume of reach-in Cu. Ft.	Number of meals served between deliveries	Storage volume of reach –in Cu. Ft.	Number of meals served between deliveries	Storage volume of reach-in Cu. Ft.
200	26.67	1050	140.00	2050	273.33
250	33.33	1100	146.67	2100	280.00
300	40.00	1150	153.33	2150	286.67
350	46.67	1200	160.00	2200	293.33
400	53.33	1250	166.67	2250	300.00
450	60.00	1300	173.33	2300	306.67
500	66.67	1350	180.00	2350	313.33
550	73.33	1400	186.67	2400	320.00
600	80.00	1450	193.33	2450	326.67
650	86.67	1500	200.00	2500	333.33
700	93.33	1550	206.67	2550	340.00
750	100.00	1600	213.33	2600	346.67
800	106.67	1650	220.00	2650	353.33
850	113.33	1700	226.67	2700	360.00
900	120.00	1750	233.33	2750	366.67
950	126.67	1800	240.00	2800	373.33
1000	133.33	1850	246.67	2850	380.00
		1900	253.33	2900	386.67
		1950	260.00	2950	393.33
		2000	266.67	3000	400.00

IV. Additional Requirements and Recommendations for Refrigerated and Frozen Storage Facilities:

1. *All refrigeration units* must have numerically scaled indicating thermometers accurate to + 3°F. Temperature sensing devices must be located in the unit to measure air temperature in the warmest part of the refrigerator (usually near a door opening). Refrigerators and freezers shall be capable of maintaining required temperatures.

2. *Air circulation within refrigeration and freezer units* should not be obstructed and should allow for an even and consistent flow of cold air throughout the units.

3. *Interior and exterior floor/wall junctures of walk-in refrigerators and freezers* must have approved coved junctures.

4. The use of *galvanized metal* in refrigerated storage facilities is subject to rust that may lead to cleaning and durability issues; therefore, *these materials are not permissible for such use in there construction.*

5. *The materials of which food display containers are made of must be examined*. Metals are more readily conductive of heat than plastics. Therefore, stainless steel pans will heat foods more efficiently than those made of plastics.

6. *Gaps and openings around walk-in refrigerator and freezers must be properly sealed* to the walls or properly spaced to allow for cleaning behind and around the units. Reach-in refrigerators and freezers that are fixed in place shall be spaced to allow for cleaning along all sides of the unit or sealed to adjoining equipment or walls. Refer to Section H of this document.

7. Refrigeration and freezer units should not be installed with access from the exterior of the building *unless food can be protected when transported from the unit into the food establishment*.

8. *If the walk-in floors will be water-flushed for cleaning or receive the discharge of liquid waste or excessive melt water, the floors should be sloped to drain*. If the structure of the walk-in is integral with the building, properly installed floor drains may be installed inside the unit.

9. Each walk-in unit shall be equipped with lighting that provides *10 foot-candles of light* throughout the unit when it is full of product. Lights must be properly shielded or shatter resistant.

10. Establishments wishing to include within their menu food items in the ready-to-eat form TIME/TEMPERATURE CONTROL FOR SAFETY (TCS) foods consisting of *raw, raw-marinated, partially cooked, or marinated-partially cooked fish other than molluscan shellfish and wishing to treat these items on-site to destroy parasites* must provide adequate and properly sized freezer equipment capable of maintaining the ready-to-eat product to the following specifications:

    A. –4ºF (-20ºC) for a minimum of 168 hours (7 days); or
    B. –31ºF (-35ºC) or below until solid and stored at –31ºF (-35ºC) for a minimum of 15 hours; or
    C. –31ºF (-35ºC) or below until solid and stored at –4ºF (-20ºC) or below for a minimum of 24 hours.

11. *Lockable casters* are recommended for reach-in refrigerators and freezers.

12. Finally, cold holding food equipment such as *self-service displays or sandwich preparation coolers are not designed to be used to cool foods*. They are designed only for holding the temperature of food placed within or on them. Equipment presented for review as designed hold foods must be verified as being capable through its manufacturer's specification documentation.

V. <u>Rapid Chill Refrigeration Units</u>: Construction and installation of rapid chill refrigeration units (i.e., blast chillers) shall be similar to refrigerated and frozen storage facilities. Rapid chill refrigeration units *must be capable of cooling cooked TIME/TEMPERATURE CONTROL FOR SAFETY (TCS) food from 135°F to 41°F within a total of 6 hours with the capability of cooling from 135°F to 70°F within the first 2 hours of this 6 hour cooling process.*

VI. <u>Cooking Facilities</u>:

1. The types and location of *cooking facilities must be based upon the types and methods of food preparation.*

2. Cooking facilities must be capable of heating TIME/TEMPERATURE CONTROL FOR SAFETY (TCS) food to the minimum time/temperature requirements:

Beef roasts ……....	130ºF (112 min)
Cooked fruits and vegetables being hot held ……	135 ºF (15 sec)
Solid seafood pieces…….….	145ºF (15 sec)
Other TIME/TEMPERATURE CONTROL FOR SAFETY FOODS(TCS) food ……..	145ºF (15 sec)
Eggs:	
Immediate service …….	145ºF (15 sec)

Pooled* ……. 155ºF (15 sec)
(*pasteurized eggs must be served to a highly susceptible population)

VI. Cooking Facilities: (continued)

Pork…… 145ºF (15 sec)
Comminuted meats/fish ……. 155ºF (15 sec)
Poultry…… 165ºF (15 sec)
Reheated TIME/TEMPERATURE CONTROL FOR SAFETY FOODS(TCS) food ……. 165ºF (15 sec)
Stuffed fish, meat, pork ……. 165 ºF (15 sec)

3. Cooking equipment must be constructed and installed in accordance with *DPH Rule 511-6-1-.05 Equipment and Utensils*

4. Lockable casters with flexible utility lines are recommended to facilitate cleaning. Refer to Section H of this Manual.

5. If cooking equipment uses water or steam, *methods for filling and draining the units must be identified.*

VII. Hot Holding and Reheating Facilities[1]:

1. Hot holding facilities must be capable of *maintaining TIME/TEMPERATURE CONTROL FOR SAFETY (TCS) food at an internal temperature of 135°F or above during display, service and holding periods.*

2. Considerations:

   A. *Careful consideration must be given when reviewing the establishment menu* to determine if intended holding or display equipment will adequately hold TIME/TEMPERATURE CONTROL FOR SAFETY FOODS at safe temperatures. For an example, egg rolls containing shrimp placed out under heat lamp bulbs for self-service on a food-bar as per common practice without any form of liquid sauce. If customers are not actively consuming them, these egg rolls are subject to a quick cool down to a temperature below the required 135ºF minimum hot holding temperature for TIME/TEMPERATURE CONTROL FOR SAFETY (TCS) foods. This cooling process occurs because there is no liquid to efficiently conduct heat from the display pan to the food and the less efficient heat conduction of radiant heat from heat lamp bulbs. On the other hand, egg drop soup will have no problem to stay well above the require 135ºF minimum hot holding temperature due to the fact that the soup is mostly comprised of liquid, an excellent conductor of thermal energy. The liquid making up the soup is more efficient in conducting thermal

1 See Illustration D1 for examples of Hot Holding and Reheating Equipment.

energy than the air surrounding the egg roles heated by the radiant heat from the heat lamp. This is true due to the heat lamps being subjected to the influence of air crosscurrents of the establishment HVAC system along with currents created by people movement around the food bar. Another factor affecting the efficiency of the heat lamp bulbs is the distance from the lamp bulbs to displayed food on the food bar.

B. To solve the above cooling process dilemma, counter measures might take a combination of equipment modification and adjustment of timing from the cooking process to the point in time of displaying of food. In addition, the operator must consider the rate at which customers are egg rolls from the food bar, keeping just enough on display to meet consumer demand. Temperature of TIME/TEMPERATURE CONTROL FOR SAFETY (TCS) must be closely monitored by trained food employees as well.

C. The county EHS and the permit applicant/plans preparer would need to evaluate available equipment specification sheets and display equipment design in order to access the successful use of heat lamps to maintain TIME/TEMPERATURE CONTROL FOR SAFETY (TCS) food product temperatures required by the Chapter. Another factor that must be considered by both is the method of preparation of the menu item to be displayed for service.

3. *Reheating equipment must be capable of raising the internal temperature of TIME/TEMPERATURE CONTROL FOR SAFETY (TCS) food rapidly (within a maximum of 2 hours) to at least 165°F*. Generally, hot holding food equipment, such as a self-service display food bar or a steam/dry heat food staging table, are not designed to be used to reheat foods. They are designed only for holding the temperature of food placed within or on them. Equipment presented for review as designed to rapidly reheat and hot hold food must be verified as capable of doing so through its manufacturer's documentation, such as manufacturer's equipment specification sheets.

4. *Appropriate product thermometers* will be required to monitor the food temperature.

5. *The materials of which food display containers are made of must be examined*. Metals are more readily conductive of heat than plastics. Therefore, stainless steel pans will heat foods more efficiently than those made of plastics.

6. Hot holding and reheating facilities must be constructed and installed in *accordance with DPH Rule 511-6-1-.05*.

7. Lockable casters with flexible utility lines are recommended to facilitate cleaning. *Refer to Section H of this Manual*.

8. If hot holding units use water or steam, methods for filling and draining the units must be identified.

Illustration D-1

Examples of Cooking and Holding Equipment

"Carving Station"

"Steam Kettle"

"Gyro Cooker/Holding Unit"

"Holding Cabinet"

"Heat Lamp Holding Unit"

"Quartz Hot Holding Unit"

"Braising Pan"