

# Farm Structures FACTSHEET



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## PRINCIPLES OF FREEZER DESIGN

The basic principles of refrigeration, as outlined in [Factsheet #280.600-1 "Refrigeration Principles"](#), apply to freezer storage structures. Because of the low temperatures within freezer facilities, some special consideration must be taken into account.

### INSULATION

The temperature difference between the ambient, outside air and that inside the freezer is usually much greater for freezer storages and it is, therefore, necessary to increase the insulation values for freezers compared to cold storages. The range of R-values recommended results from variation in the cost of energy, insulation material and climatic conditions.

Type of Facility	Temperature Range (°F)	Floors R-Value	Walls and Suspended Ceilings R-Value	Roofs R-Value
Cooler	28 to 35	15 – 20	25 – 35	30 – 40
Holding Freezer	-10 to -20	30 – 35	33 - 50	40 – 50
Freezer (cold)	-40	35 – 40	50 – 60	50 - 60

### FLOORS

Assuming that the freezer buildings are usually constructed upon fill, the very low temperature within the building will eventually lower the sub-soil temperature to below freezing. When this occurs, moisture in the sub-soil freezes and causes a frost heaving condition. It is not unusual to see entire freezer floors buckle. To prevent under-floor icing, artificial heating must be induced through air vents, hot liquid lines or electrical heating cables. The most

widely accepted method of heating the sub-soil is with air ducts below the insulated freezer floor, relying on a gravity or blower system to circulate warm air. The use of four-inch diameter Big-O drainpipe, spaced at twenty inches on centre, has been found to be very acceptable. Heat given off from air-cooled condensers can be directed through these ducts without additional energy costs. Heat-trace cables, such as pyro-tenax, can be installed below the insulated concrete floor and it is recommended that a heat source intensity of three watts per square foot be used.

## DOORS

In-fitting doors are not recommended for rooms operating below freezing unless heated door seals are used. A heat-trace cable can be installed in a groove around the door frame mullions. The recommended heat intensity is three to six watts per linear foot.

## AIR VENTS

Air vents are a must in freezer storages, otherwise the room can collapse inward due to air density change as the air is chilled. It must be noted that the vent seals must be heated to keep them operational. Heat-trace cables can be used in the seals.

## TEMPERATURE PULL-DOWN CONSIDERATIONS

Because of the low temperatures within freezer facilities, contraction of structural members in the space will be substantially greater than any surrounding, ambient conditions. Therefore, expansion joints must be properly designed to prevent structural damage during facility pull-down.

Finishes are especially subject to damage when temperatures are lowered rapidly. Portland cement should be fully cured before the room is refrigerated. The temperature must be lowered gradually and held at 35°F until most moisture has been removed before lowering to the operating freezing temperature. Because concrete slabs will contract during pull-down, caulking of slab-wall joints and expansion joints should be done after the recommended 35°F hold period.

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### FOR FURTHER INFORMATION CONTACT

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