

# ELECTRIC MILK HOUSE HEATING<sup>1</sup>

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Heating of the milk house and milking parlor is often required to keep ice from forming on the floor, to keep water pipes and other equipment from freezing and for operator comfort. When a dairyman converts to bulk tank cooling, the requirement for supplemental heat becomes more urgent. Most compressor units are remotely located and therefore the heat removed from the milk is no longer available for space heating purposes. Of course, if permitted, it is possible to direct some of the heat developed by the condensing unit back into the milk house. The amount of heat gained by this method is limited and generally not sufficient to keep the milk house at the desired temperature.

Many types of electrical heating sources are available for heating the milk house or milking parlor. Heating cable can be placed in the floor areas, infrared heat (bulb and tube type) may be mounted over the work areas for operator comfort, radiant panels can be mounted on the walls, or a convection heater (resistance heating element with fan) can be placed at any desired location.

The type of heating equipment will depend on the task to be performed. A guide for the selection of the best type of electrical heating device to perform a given task is presented. In this guide reference is made to several Tables and Figures (Tables 1, 2, 3 and Figures 1, 2, 3).

Table 3 has been prepared for determining the size space heater required in a milk house. Its use will eliminate the necessity of computing the heat loss in order to determine the size heater required to maintain a desired temperature.

## INSULATION

To keep heat losses and cost of operation to a minimum, it is important that the milk house be insulated as well as possible and doors and windows be tight fitting. The heat requirements and cost of operation can be reduced by as much as 50% if the building is properly insulated. The ceiling area should contain a minimum of 3 inches of insulation either of the batt type or loose fill. Normally 30% of the heat loss will be through the ceiling. The walls in frame construction should have at least 3 inches of the batt type insulation. In concrete lock construction the heat loss through the block will be reduced by 50% if the cores are filled with a loose fill

<sup>1</sup>Presented at the Dairy Fieldmen's Conference at the Pennsylvania State University, University Park, July 12 and 13, 1961.

TABLE 1—TYPES OF HEATING CABLES—FOR UNDER-FLOOR HEATING

Type cable	Insulation	Standard lengths	Watts load	Voltage <sup>1</sup>	Approx. cost
Plastic	Plastic vinyl	20 ft	100 W <sup>2</sup>	110 V	\$ 5.00
		30	150	110	6.00
		40	200	110	7.50
		60	300	110	10.00
Plastic (Self-protecting)	Plastic vinyl	20 ft	140 W <sup>3</sup>	110 V	\$ 8.00
		30	210	110	10.00
		40	280	110	11.00
		60	420	110	15.00
		120	720	230	10.00
Rubber covered	Silicone rubber	50 ft <sup>4</sup>	500 W <sup>4</sup>	115 V	\$ 0.15 per ft
		100	1,000	230	\$ 0.15 per ft
Lead covered Flamenol jacket <sup>6</sup>	Varnished cambric	60 ft <sup>5</sup>	420 W <sup>5</sup>	115 V	\$ 0.20 per ft
		120	840	230	\$ 0.20 per ft

<sup>1</sup>OK for nominal voltages of 110 to 120 V.

<sup>2</sup>Rated 5 watts per ft of 2 conductor "tape" or "cable."

<sup>3</sup>Rated 7 watts per ft of "tape" or "cable" (Self-protecting).

<sup>4</sup>Rated 10 watts per ft of 1 conductor cable.

1 conductor cable forms loop of 1/2 length given

<sup>5</sup>Rated 7 watts per ft of 1 conductor cable — otherwise same as Note 4.

<sup>6</sup>If lead covered cable used without Flamenol Jacket, for burial in concrete, carefully coat entire lead surface with insulating barnish such as GE Co. "Clyptal."

## A GUIDE TO ELECTRIC HEATING EQUIPMENT FOR MILK HOUSES &amp; MILKING PARLORS

Type of heating equip.	Where installed	Task performed	Installed capacity	Operational features	Controls	Installation
Heating cable	Floors of milk houses	Keeps floor dry and ice free	30 watts/sq. ft. See Figure 2	Will add some comfort heating to the milk house, but it should be installed primarily to keep floor dry.	Time clock and manual - Operation should be from start of milking to one or two hours after.	Use cable with proper type covering for burial. Do not install cable under heavy equipment. Do not cross cable over itself. Do not shorten standard cable lengths. Keep cable 6 in from pipes and drains. (See Tables 1 and 2 and Figure 3)
	Milking parlor pits	Keeps floor dry and free of ice	Same as for milk house	Will add some comfort by keeping operators' feet warm.	Time clock and manual - One hour before milking until one or two hours after depending on time to dry floor.	Same as for milk house.
	Walk ways	Keeps walk ways, inside and out, free of ice	40 watts/sq. ft. See Figure 2	Used only as needed.	Manual	Same as for milk house.
	Water pipes	Keeps water flowing during cold weather	See Table 2 and Figure 3	Will supply 5 to 10 watts per foot depending on type of cable.	Thermostat	See Table 2 and Figure 3
Heat lamps 250 watts	Over work areas in milk house	Comfort of operator	4 lamps over each work area in milk house	Will only heat the operator and objects that will absorb infrared energy. Will not heat the air.	Manual	Mount lamps in swivel sockets located on the corners of a wooden frame attached to the ceiling and large enough to cover the work area.
	Over operator pit in milking parlor.	Comfort of operator	3 per stall in Herringbone Parlor 5 per stall in walk through stall	Will keep operator warm but will not heat air. Therefore cows are not subject to radical changes in temperature from inside to outside.	Manual	Install one row of lamps for each row of stalls. Mount lamps one foot out from stalls and 12 inches above tallest operator. Lamps should be mounted on strip or channel. Suspend channel from ceiling with chains so that the height can be easily adjusted - with 5 lamps per stall, connect No. 1, No. 3 & No. 5 in one circuit. No. 2 & No. 4 in a different circuit. Then you have a choice of 2, 3 or 5 per stall. In the Herringbone system connect 2 lamps of each stall in one circuit.
Tube type infrared (can be obtained in 750 to 4000 watt sizes).	Milking parlor	Operator comfort	15 watts per sq. ft. of floor area.	Similar to common heat lamp. Heating is confined to a local area and accomplished by direct infrared radiation.	Manual	Mounting height not to exceed 9 feet - Mounted perpendicular to the length of the milking pit.
Space heater with fan (Convector heater)	Milk house	Keeps temperature of milk house at desired level	See Table 3	Resistant-type heater. Fan will circulate and direct warm air.	Thermostat. Usually placed on the heater housing with selection dial. Can be remotely located.	Can be mounted permanently or can be used as a portable heater and moved as desired.
Glass panel	Milk house	Keeps temperature of milk house at desired level	See Table 3	Radiant-type heater. Radiant energy is absorbed by walls, equipment, etc. and reflected into room.	Thermostat - attached to heater or remotely located.	Install opposite blank wall - not opposite windows.

TABLE 2—ANTI-FREEZE CABLE FOR WATER PIPE

Description	TYPES OF CABLES	
	Watts per ft.	Standard lengths
Plastic (Vinyl-Glass Insulation)	5.0 & 7.0	12, 20, 30, 40 & 60 ft
Lead covered (Asbestos & VC insulation)	6.0 & 6.7	30, 60, 120 ft
Silicone rubber, copper braid	7.0 & 10.0	60, 120 ft
Flamenol jacket over lead <sup>1</sup>	10.0	50, 100 ft

CABLE WATTAGE REQUIRED

Pipe size	Min. temp.	Watts per ft of pipe required		
		Bare pipe no wind	Pipe in wind & covered <sup>2</sup>	1-in insul. on pipe
1/2 in	-10°F	8.0 w.	4.0 w.	2.5 w.
	+10°	4.5	2.5	1.25
3/4 in	-10°	10.0	5.0	3.0
	+10°	5.5	2.5	1.75
1 in	-10°	12.25	6.0	3.5
	+10°	6.75	3.5	2.0
1-1/4 in	-10°	15.5	8.0	4.75
	+10°	9.0	4.5	2.75

<sup>1</sup>Recommended if exposed to severe mechanical abuse. Can be obtained in other length on special order.

<sup>2</sup>Pipe and cable to be covered if outdoors; or indoor subject to wind or draft. Use this column if covering is less than equivalent to 1-in insulation.

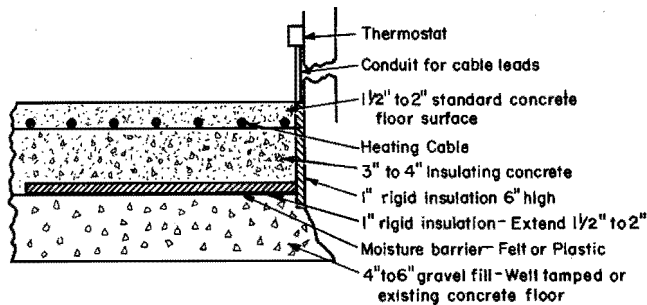


Figure 1. Construction details for heating cable in floor (side view).

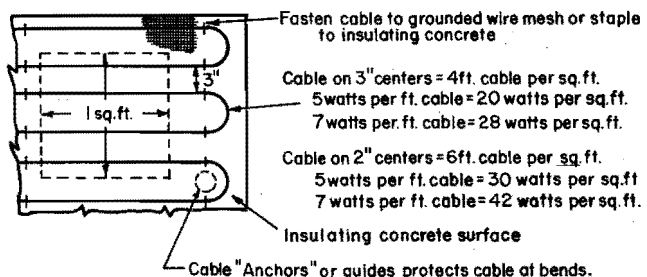


Figure 2. Construction details for heating cable in floor (top view).

Installation—Pipe Protection

For Cable Rated 5 watt per ft.:  
Required watts per ft. of pipe:

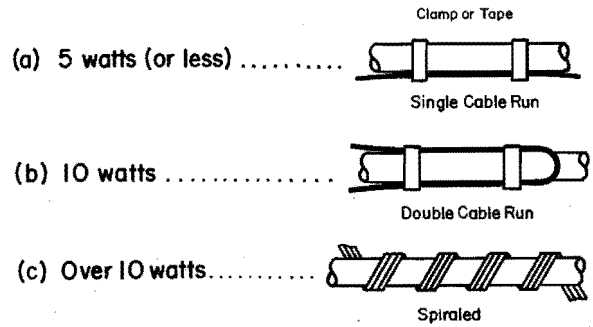


Figure 3. Number of spirals or turns (Cable rated at 5 watts per foot)

(Per Ft of Pipe)

15 watts per ft 3/4 in pipe 11.0 turns

1 in pipe 9.0 turns

1-1/4 in pipe 7.0 turns

For cables rated 6 to 10 w per ft: Reduce length of cable on pipe or number of spirals to 5/6, 5/7, 5/10, etc.

TABLE 3—HOW TO ESTIMATE SPACE HEATING REQUIREMENTS FOR MILKHOUSE-PROCESSING ROOM AND FARM SHOP

Resistance Type Space Heater (Radiant and/or Convection)

Advantages

1. Gives operator working comfort.
2. Low first costs - \$30 to \$100.
3. Low operating costs - 3c to 6c per hr.
4. Flameless and safe.

Calculation

Multiply the cubic footage of the room by the proper factor selected from the table below.

Expected outside lowest temperature	Inside temperature desired					
	Uninsulated buildings			Insulated buildings		
	(40°)	(50°)	(60°)	(40°)	(50°)	(60°)
+30°	0.5	1.0	1.5	0.3	0.6	0.9
+20°	1.0	1.5	2.0	0.6	0.9	1.2
+10°	1.5	2.0	2.5	0.9	1.2	1.5
0°	2.0	2.5	3.0	1.2	1.5	1.8
-10°	2.5	3.0	3.5	1.5	1.8	2.1
-20°	3.0	3.5	4.0	1.8	2.1	2.4

Example—To maintain a 40° temperature in an uninsulated milkhouse, 10 ft wide, 12 ft long and 8 ft high. Lowest outside temperature expected is -20°F.

Solution—Volume (Cu ft) of room = 10 x 12 x 8 = 960 cu ft. Multiplying factor (from table) for -20°F outside temperature, uninsulated building, and 40°F inside temperature = 3. Required wattage = 960 x 3 = 2880 watts (Use 3000 W. heater).

$$\text{Kilowatt Hour Usage} = \frac{\text{KW} \times \text{degree days} \times 18.5}{\text{Maximum design temperature}} \quad (40^\circ, 50^\circ \text{ or } 60^\circ)$$

type of insulation that is moisture-resistant. Storm sash and doors will also help reduce heat loss.

To prevent the insulation from becoming saturated with moisture, thus reducing its efficiency, a vapor barrier of polyethylene or similar material should be installed on the warm wall side of the insulation. In the case of loose fill in the cores of concrete block, no vapor barrier will be necessary if the material is impervious to moisture.

#### GABLE VENTILATION

Properly designed venting should be provided above the ceiling area.

When a vapor barrier is used allow one square foot of inlet area and one square foot of outlet area for each 600 square feet of ceiling area.

When no vapor barrier is used, allow one square foot of inlet area and one square foot of outlet area for each 300 square feet of ceiling area.



## 49th ANNUAL MEETING

OCTOBER 24, 25, 26, 27, 1962

Ben Franklin Hotel

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