INSULATED SURFACE PUMP ENCLOSURE INSTALLATION

Arthur H. Schulz, Extension Agricultural Engineer

The location of an automatic pressure water system to obtain maximum sanitation and convenience has always been a problem under North Dakota's extreme winter weather. Well pit installations have been common where a heated building or a basement could not be used. Above ground pump installations in an insulated unheated house are common for municipal installations and on farms in southern areas. The purpose of this demonstration was to determine whether or not an unheated, insulated, above ground pump enclosure could be used in North Dakota.

If heat was required to keep water from freezing, information was also desired on the amount of electricity required to heat adequately an insulated pump enclosure. Information was also desired on the soil temperature in the area under the insulated pump enclosure and immediately adjacent to the well, the relation of the outside temperature to the temperature inside a concrete block pump house, and the relation of the temperature in the uninsulated well house to the temperature in the insulated pump enclosure. A method for getting the outlet pipe back down below frost level without subjecting the water in it to freezing was also desired.

The installation, made on the Paul Schulz farm in Cass Co., N. Dak., was as follows. (Fig. 1). A ¾" copper outlet pipe was installed alongside the well casing so the heat from the well could be used to keep the water in this pipe from freezing. The outlet pipe was then wrapped with electric heating tape to the 4½ foot depth to further protect it if necessary and as a means of thawing it in case it did freeze. A 12-inch by 48-inch concrete culvert was installed around the well casing and the outlet pipe. The bottom was sealed with concrete and the culvert filled with mineral wool insulation. Thermocouples were installed in the insulated concrete culvert section and the adjacent soil section as shown in Fig. 1. A concrete floor was then poured over this insulated section.

A ½ hp 2 pipe jet type pump with a standard 42 gallon pressure tank was installed. The remaining section of the 20 foot, 150 watt electric heating tape was wrapped around the outlet pipe and pump as shown in Fig. 1. A thermostat was installed on the heating tape to provide automatic operation at about 33° to 35° F.

The insulated enclosure for the pump and pressure tank assembly was a small house 36" wide, 44" long and 46" high, inside dimensions. The house had 2"x6" framing, a vapor seal and shiplap on the inside, shiplap on the outside and the space between the sheathings filled with mineral wool insulation. The unit was built in sections and assembled over the pump. The top was left loose to provide an entry.

Acknowledgement is given R. L. Witz, Associate Agricultural Engineer and Fred Grant, student assistant, for keeping records, and Paul Schulz, RR1, Fargo, for cooperating in keeping records and for the use of equipment and facilities.

A recording thermometer was installed in the pump enclosure. A common thermometer was installed in the concrete block pump house and temperature readings were made once daily. Outside temperatures were obtained from the Fargo weather bureau. A kilowatt hour meter was installed to record the electricity used by the electric heating tape.

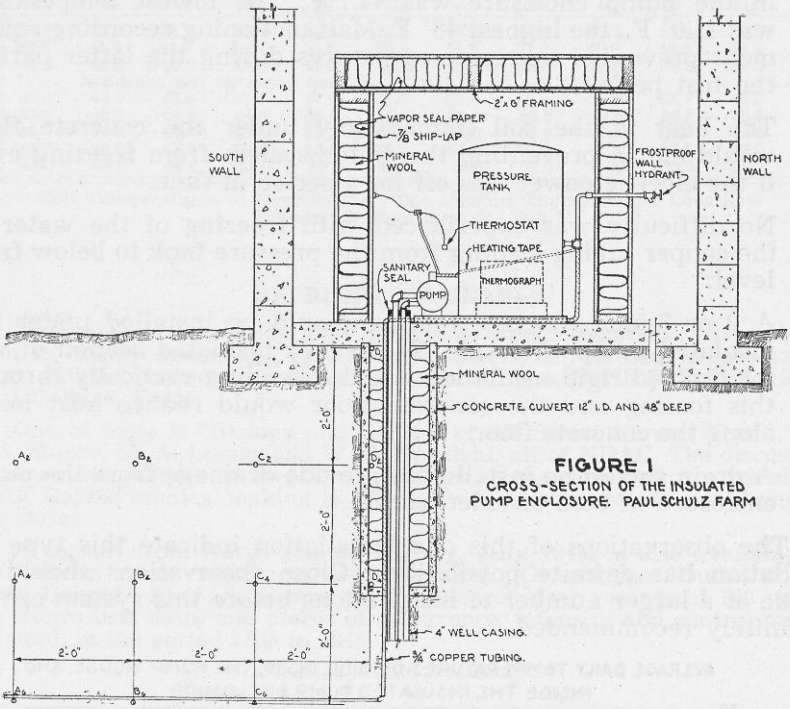


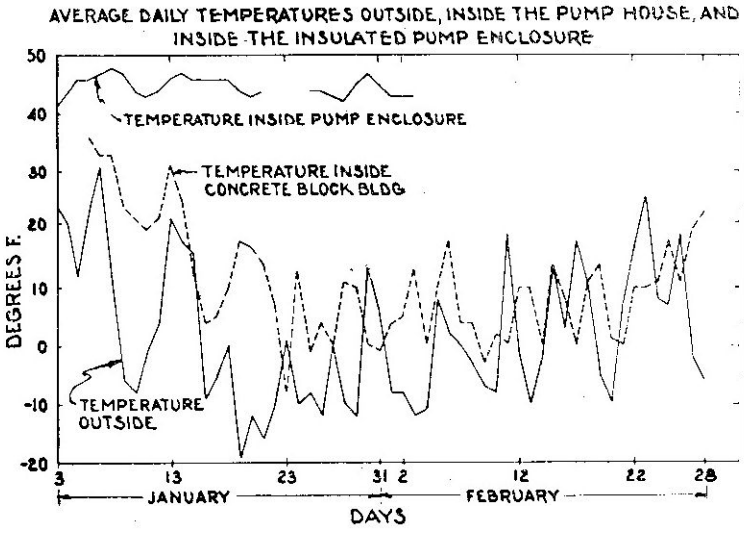
FIGURE 1
CROSS-SECTION OF THE INSULATED PUMP ENCLOSURE. PAUL SCHULZ FARM

Summary of One Year's Observations. The following observations are based upon one year's operation. It is recognized that further observations are necessary before any general recommendations can be made.

1. Only 3 kilowatt hours of electricity were used by the electric heating tape during the winter months to keep the insulated pump enclosure above freezing. Heat was used only immediately after the cover was removed for servicing the thermograph. No freezing would have occurred had no heat been available.
2. The soil temperatures at the various thermocouple locations are shown on chart 1. An 18-inch bank of snow covered this area about January 6. This aided in keeping the soil temperatures high during the rest of the winter. The same results could probably be obtained by spreading a 2-foot layer of straw over an area extending 8 to 10 feet around the house early in the fall. The high soil temperatures made the insulated concrete casing around the well casing and outlet pipe worthless.

3. The average temperature during the months of January and February inside the concrete block house was 11.0° F. The average temperature outside was 3.0° F. Completely covering an insulated pump enclosure located in the open with 2 or 3 feet of straw would probably make a greater temperature differential than did the concrete house. The average temperature in the pump enclosure was 44.7°F. The lowest temperature was 41.0° F., the highest 48° F. Malfunctioning recording equipment prevented taking temperatures during the latter part of the test period.
4. The heat in the soil immediately under the concrete floor would aid in preventing the water system from freezing even if the electric power was off for a period of time.
5. No difficulty was experienced with freezing of the water in the copper tubing leading from the pressure tank to below frost level.
6. A 2 or 3-inch concrete footing should be installed under the insulated pump enclosure. A 1½ inch insulated section of water proofed rigid insulation board extending vertically through this footing and the concrete floor would reduce heat losses along the concrete floor.
7. A drain should be installed to provide drainage from the pump enclosure in case of emergency.

The observations of this one installation indicate this type installation has definite possibilities. Close observations should be made of a larger number of installations before this system can be definitely recommended.



An installation of an insulated pump enclosure installed out in the open has been made on the college farm. Records will be obtained on its operation during the next winter.

CHART I

	Thermocouple Locations (See Figure 1)											
Date	A_2	B_2	C_2	A_4	B_4	C_4	A_6	B_6	C_6	D	D_4	D_2
1/3	36.5	36.5	38.0	37.0	37.5	37.5	46.0	47.5	47.5	38.5	39.2	44.0
1/10	42.0	41.5	41.5	50.0	50.0	50.0	51.0	51.0	49.0	40.5	43.0	46.0
1/17	47.5	46.5	45.0	49.0	48.0	48.0	49.5	49.5	50.5	39.0	43.5	46.7
1/26		Readings not obtained because of failure of equipment										
1/31	43.5	46.0	46.0	47.5	47.5	47.0	50.0	50.0	50.0	36.7	42.0	45.0
2/6	38.5	42.0	44.0	44.0	45.0	45.0	46.0	48.5	48.5	36.5	38.5	38.5
2/13	44.0	44.0	44.0	45.0	45.0	46.0	52.0	52.0	52.0	37.0	40.5	45.0
2/21	43.0	43.0	43.0	46.5	46.5	45.5	46.0	46.0	46.0	36.5	39.0	42.0
2/28	48.0	48.0	48.0	49.0	49.0	48.5	53.0	52.0	50.0	39.0	39.5	41.0

Soil Temperatures in Degrees F At The Various Thermocouple Locations
January 3—February 28, 1949

REPRINTS AVAILABLE

Two reprints of considerable interest to North Dakotans, especially to farmers, county agents and agriculture teachers, can be had (single copies only) without charge, by writing the bulletin room, North Dakota Agricultural College, Fargo.

One of these is "Biology and Control of the Sweet Clover Weevil," by J. A. Munro, M. A. Leraas and W. D. Nostdahl, all of NDAC. The discussion of occurrence, degree of invasion and effect on the clover all revolve about North Dakota studies, making it especially interesting to persons living in this state.

A reprint from North Dakota History, July 1949, is also available in the bulletin room, for single copy requests. "Grasshopper Outbreaks in North Dakota," by J. A. Munro covers research over records of 140 years. Dr. Munro lists dates and places of occurrence, intensity and control methods used, in the period 1808 to 1948.

ELECTRONIC LIVESTOCK SCALE

With a heavy volume of beef cattle and hog transactions and marketing, North Dakotans will find interest in a near-errorless and highly accurate electronic scale for weighing livestock at public markets. It was developed by an aircraft company working under contract with USDA. The livestock branch of PMA supervised the work, which was carried on under the Research and Marketing Act. The scale can register only the weight of the load actually on the platform, is accurate to within five pounds on loads up to 32,000 pounds, and shows weights on a dial readily readable 10 feet away. Read "Scale Magic Comes to Livestock Marketing," in NEWS FOR FARMER CO-OPERATIVES, August issue. You can get it from Farm Credit Administration. .

FOR HOG MANGE

Two new spray materials—benzene hexachloride and chlordane—have proved effective in control of mange on hogs, says Herbert M. Barnes, swine specialist at Ohio State University. Either of the compounds, now available commercially, may be used as a high pressure spray, as a knapsack sprayer or as a dip. He warns farmers, however, not to use more than the 25 per cent recommended spray concentration.