ELECTRICITY FOR HEATING SWEET POTATO CURING & STORAGE HOUSE

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COOPERATIVE EXTENSION WORK IN AGRICULTURE
AND HOME ECONOMICS
State of Virginia, Va. A. & M. College & Poly. Inst. &
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IN
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EXTENSION SERVICE

ELECTRICITY FOR HEATING SWEET POTATO CURING AND STORAGE HOUSES

The sweet potato has been produced by man for centuries and has been used as a basic food in many sections of the world. Some method of satisfactorily storing sweet potatoes is necessary if they are to be available for food throughout the winter. For hundreds of years the only method that was known or practiced in storing sweet potatoes was that of a dirt hill in one corner of the garden. This method is still being used for storing and preserving sweet potatoes for family use, but it is often very satisfactory.

In recent years sweet potatoes have gained in popularity as a food and production therefore has increased; they are now a cash crop for many farmers. This increased production naturally reduced the price. The potatoes were perishable, the old dirt hill method of storing was not practical for commercial purposes, and therefore the market soon became flooded at digging time.

Since sweet potatoes contain about 68% water and are very susceptible to sudden temperature changes, they are quite subject to rot. To counteract this condition and provide a means of holding the crop off the market temporarily, a process has been devised for curing the potatoes as soon as they are dug and storing them until a better price can be obtained, thereby making them available over a longer period of time.

The essentials of good storage are: 1. Fully matured potatoes; 2. Careful handling; 3. Thorough curing; 4. Uniform storage temperature.

The insulated sweet potato curing house with proper ventilation facilities was designed to obtain these objectives. It has been found that by maintaining a temperature of approximately 85 degrees Fahrenheit with proper air circulation in the house for ten to eighteen days, about 10 to 15% of the water can be removed from the sweet potatoes. After this curing process the potatoes can be kept in good condition in the curing house for months by maintaining a room temperature of approximately 55 degrees. Many growers obtain bigger profits from their sweet potatoes by curing and storing them until the green potatoes are off the market.

The greatest difficulty in the operation of curing houses has been that of maintaining the proper uniform room temperatures for curing and storing the potatoes. Using a central heating unit, such as a stove, with cold air entering the building through floor ventilators, makes it very difficult to avoid a temperature difference of from 10° F. to 12° F. between the lower and upper areas of the room. This condition can be improved with experience in manipulating the ventilators. It is obvious that this temperature variation makes it impossible to cure the potatoes throughout the house uniformly; the lower areas will be more susceptible to chilling on cold nights, and the potatoes in the upper areas which are naturally warmer, will be more thoroughly cured.

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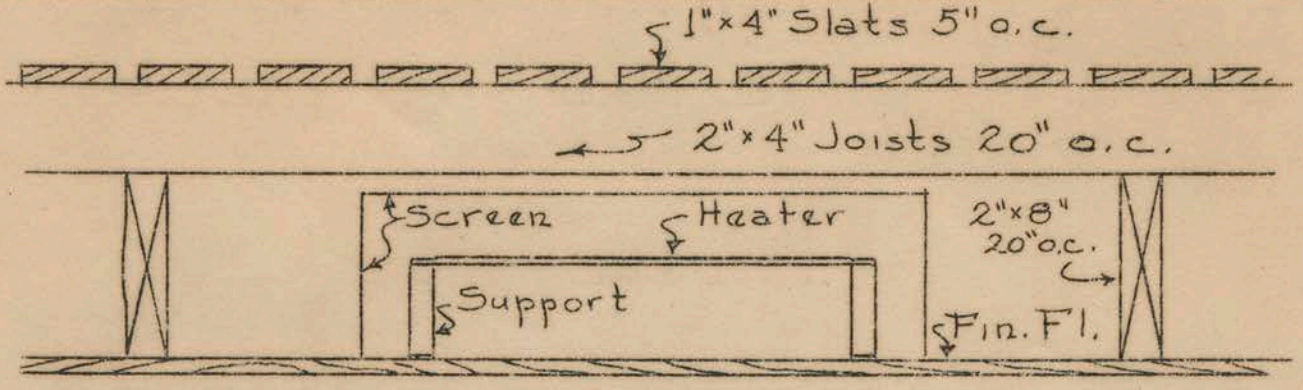
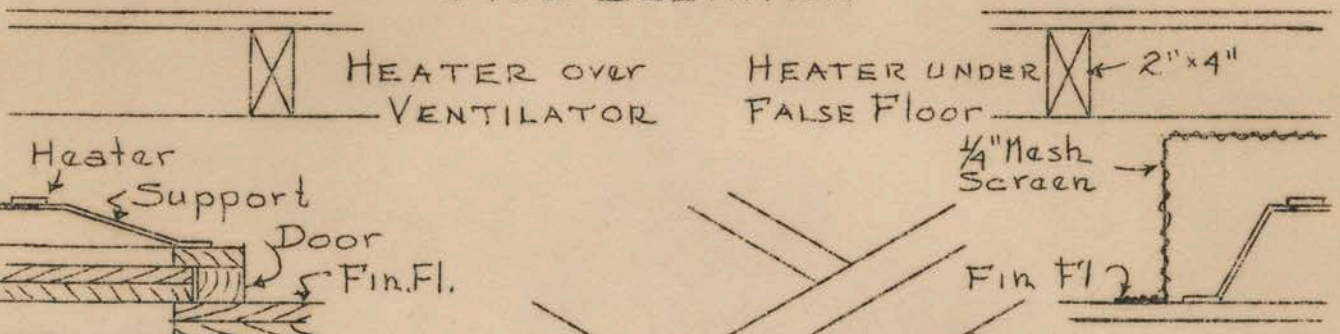
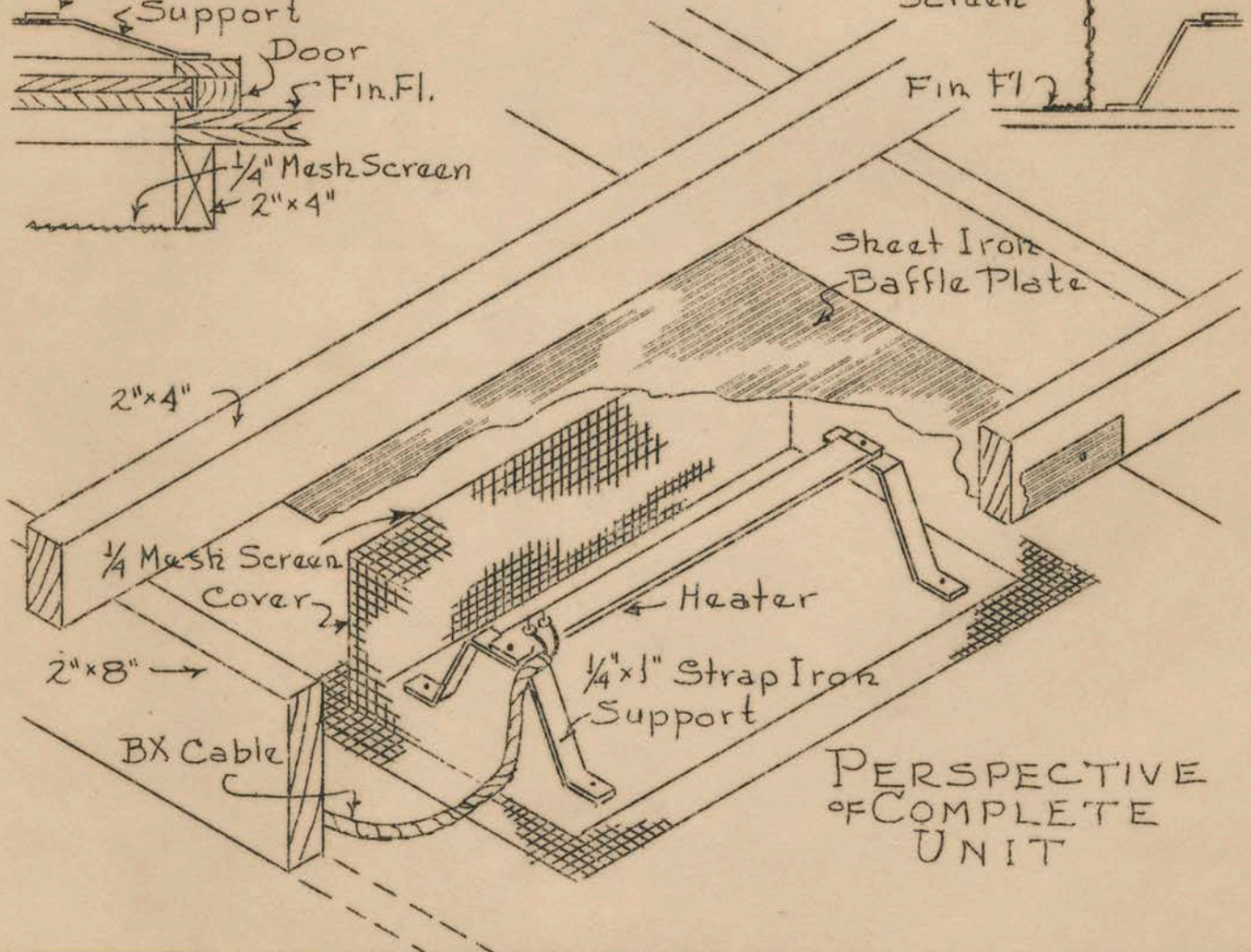


SIDE ELEVATION





PERSPECTIVE OF COMPLETE UNIT

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Drawn by - F. G. Payne Jr - Sept '35

The use of small electric heating units located between the floor and false floor of the curing house is one method of obtaining an automatically controlled uniform temperature for the curing and storage of sweet potatoes. The purpose of this circular is to discuss the use of electricity as a means of heating sweet potato houses. This information is based on results obtained in several curing houses in Tidewater Virginia in which electrical heating is being used with unusual success.

THE BUILDING:

Sweet potato curing and storage houses have been constructed of both wood and cinder blocks, the wood construction being the one most commonly used. Houses that now use a central heating unit such as a wood or coal stove can usually be converted into an electric curing house with few if any changes. The main change will be in the spacing between the main and false floors. The electric heating units are located between these two floors, as shown in drawing No. 1, the false floor being at least 12" above the main floor. This allows sufficient air circulation to distribute the heat and prevent overheating the potatoes immediately above the heating units.

The building should be tightly constructed and floors, side walls and ceiling well insulated for conserving heat. If the building is on a continuous foundation, the floor ventilators should be arranged so that there will be a free circulation of air under the building to supply the floor ventilators. The attached cross section drawing illustrates the proper construction to insure adequate insulation for a frame building. This drawing also shows the location of the electric strip heaters between the main and false floors.

ELECTRICAL EQUIPMENT:

The most satisfactory electric heating units tested to date are strip heaters of 500 watts capacity each. These heaters are cheap to buy and install and are available for operation on either 110 or 220 volts. A thermostat is connected in the circuit and mounted at a convenient location in the building where it will be at about the average temperature of the house. The number of heaters required will depend somewhat on the type of construction of the building and the thermostat must have an adequate current carrying capacity to operate with the heaters on the circuit which it controls. It has been found that from 1/3 to 1/2 kilowatt capacity of heaters is required per 100 bushels of storage capacity of the curing house. In other words, a 1,000 bushel storing house will usually require approximately 10 electric heaters of 500 watts each to heat the curing house satisfactorily.

It is very important that the heaters be uniformly distributed over the floor of the building. At least one and sometimes two heaters are located over each of the floor ventilators to preheat the air as it enters the building. The remainder of the heaters are located as illustrated in drawing No. 2.

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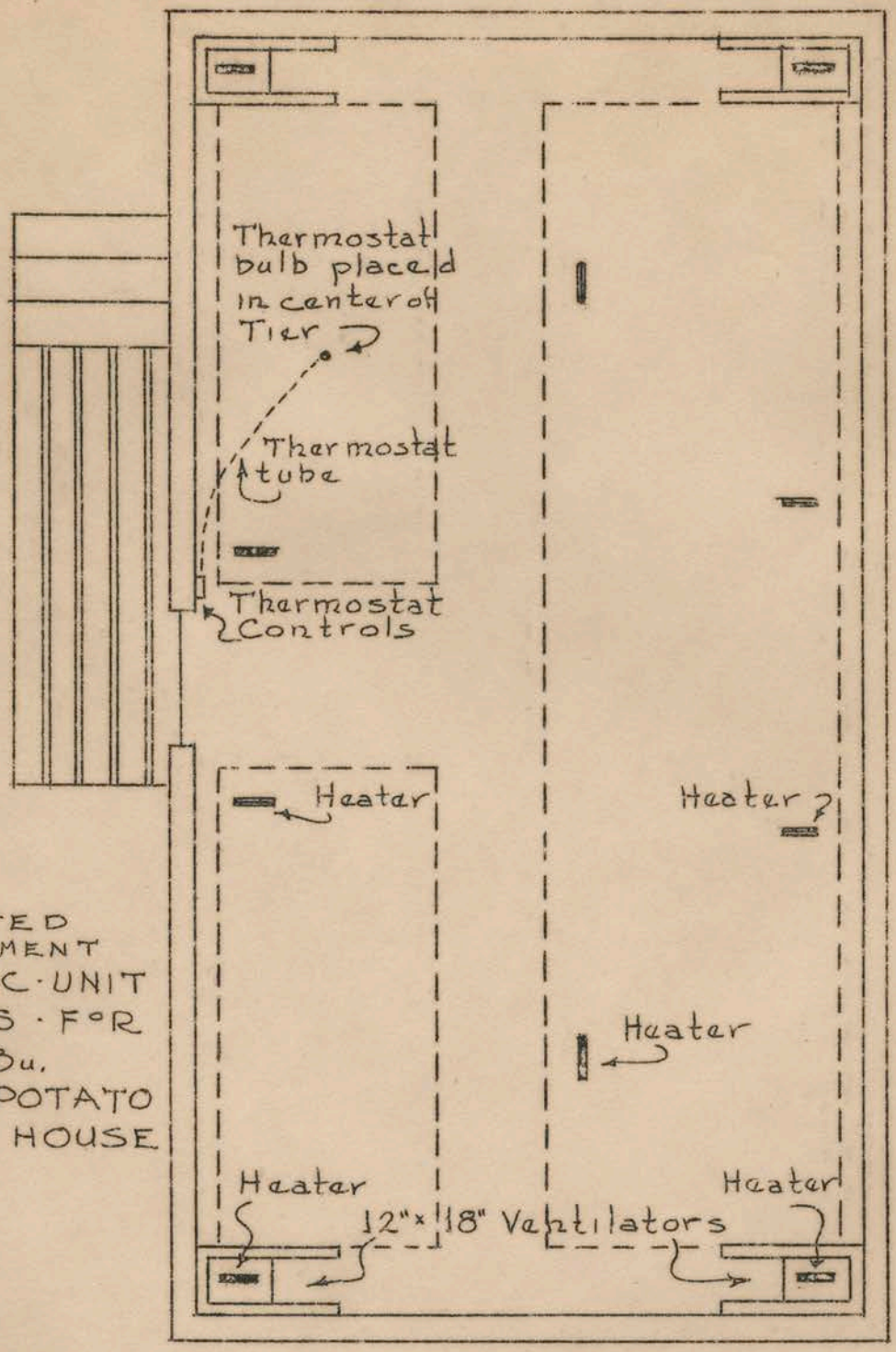

SUGGESTED ARRANGEMENT
ELECTRIC · UNIT
HEATERS · FOR
1000 Bu.
SWEET · POTATO
STORAGE · HOUSE

FLOOR PLAN
scale 1/4" = 1'-0"

PREPARED BY
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Various methods of mounting and connecting the heaters in place have been used. Probably one of the simplest and best practices is to mount them on pieces of strap iron, allowing at least four inches clearance on all sides. This assures good air circulation around the heater and avoids overheating or hot spot areas. A piece of sheet asbestos should be placed under the heater to prevent heat loss through the lower or main floor. In order to obtain the 12" spacing between the main and false floors, the usual practice is to use 2" x 8" risers with 2" x 4" pieces crossing them on which the slatted floor is supported. A piece of tin roofing or some similar metal at least 24" wide should be placed over the heaters and between the 2" x 8" risers and the 2" x 4" false floor supports. This metal serves as a baffle and further aids in distributing the heat and avoiding hot spot areas over the heaters. It is good practice to make a cage of 1/2" mesh hardware cloth over each heater to prevent rubbish or any other material from coming in contact with the heater and causing scorching or smoking.

Either open knob and tube or BX cable can be used in wiring the building. BX cable is preferable. Convenience outlets should be used so that each heater can be plugged into the circuit and then, as the potatoes are removed or when the house is cleaned, the heaters can easily be disconnected and removed to prevent being damaged. The electric service to the potato house should contain a fuse and switch box so that the entire circuit may be cut out if desired.

DIGGING AND HOUSING THE POTATOES:

The handling of the sweet potatoes is a very important factor in preventing rot due to bruises. The potatoes should be fully matured when dug and they should be dug when the ground is dry and the weather is clear. Sweet potatoes should be handled almost as carefully as eggs to prevent bruising. Marketable potatoes should be gathered first and, to avoid further handling, directly into the crates in which they are to be stored. The seed stock should then be picked up; and lastly, the cuts and others. If the potatoes are to be stored in bins, they should be graded in the field as stated above and then carefully placed in the bins.

THE CURING PERIOD:

The curing house should be filled as quickly as possible after the first potatoes are placed in the house. It is impossible to bring the house to the proper temperature while it is being filled but some heat should be provided as soon as storing is begun; as soon as the house is filled the temperature should then be increased to 85° F. and held there. The thermostat should be regulated to turn off the electric current at 85°, and turn it on again when the temperature drops down to 80°. The air in the building expands as it is heated and takes on moisture from the potatoes; therefore, floor and ceiling ventilators must be kept open all day to allow the moisture laden air to pass out and fresh air to enter the building. At night when the outside air is damp, or on rainy days, the floor ventilators are partly closed; but they should never be completely closed during the curing period.

The curing period is usually from ten to 18 days, depending mostly on outside weather conditions, when the proper inside temperature range of 80° to 85° is maintained. When the potatoes are cured, a few short sprouts will be visable and the potato skins will have a velvet-like feeling and will not rub off easily.

THE STORAGE PERIOD:

When the potatoes are cured the room temperature is then gradually reduced to 55° F., the floor ventilators are closed and the ceiling ventilators partly closed. The thermostat is then set to turn on the current when the room temperature drops to 50° and turn it off again when the temperature builds up to 55°.

This arrangement is the ideal one for the storage of the potatoes throughout the winter months. On warm sunny days, the floor ventilators can be opened to allow a good change of air in the building, but only for a short period of time.

ESTIMATING COST OF ELECTRICAL INSTALLATION:

The electric strip heaters will cost approximately $1.75 each and the price of suitable thermostats varies from $10 to $20. The cost of installing the equipment will naturally vary with the prices charged by different contractors or electricians. For rough estimates, the cost of completely equipping a sweet potato house for electric curing can be based on from $3 to $5 per 100 bushels of house capacity. This price does not include the cost of the service wires to the curing house because this will vary depending on the location of the curing house in relation to the other farm buildings or the source of electric power. More accurate cost estimates can be furnished by local power company agricultural engineers or through the agricultural engineering department of the Virginia agricultural extension division. It is advisable to consult with one of these agencies in planning the use of electricity for curing sweet potatoes.

OPERATING COSTS:

The cost of operating an electric sweet potato house is naturally dependent on a number of factors: weather conditions, proper design and operation of the curing house and the cost of the electricity. Records kept on several curing houses in Tidewater Virginia for three seasons show that from 1 to 1½ kwh of electricity per bushel is used for curing sweet potatoes and from 1¼ kwh to 2 kwh per bushel is consumed in curing and holding the potatoes in storage for six months. Most power companies have farm rates such that most of the current consumed in the potato curing house is billed on the lower step of the rate, which is usually 1½ or 2 cents per kwh.

Assume that the house to be operated holds 1000 bushels and that 1800 kwh of electricity is consumed in operating the house during the curing period and storage period. If the electricity for the storage house is available at 2 cents per kwh, then the total operating costs would be .02 x 1800 or $36.00.

ADVANTAGES OF ELECTRICITY FOR HEAT:

The following are the main advantages of electricity over other fuels for heating sweet potato curing and storage houses.

1. The heat source is distributed over the bottom of the house, which is normally the most difficult part to heat.

2. The electric method provides an even distribution of heat over the entire building, assuring a uniform cure.

3. The danger of fire is much reduced.

4. Any desired room temperature is definitely and automatically maintained.

5. A minimum of attention is required.

6. Space ordinarily occupied by the heating unit is made available for additional storage of potatoes, thus increasing the capacity of the building.

7. Operating costs are comparable to other methods where electricity is available at 1½ to 2 cents per kwh, as in the lower step of rates prevalent in Virginia.

The advantages outlined above are certainly worthy of consideration in planning a sweet potato curing house if electricity is available. The increased capacity of the house by eliminating the central heating unit should be worth the additional cost of the installation.