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Insulation of Farrowing Houses

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The ability to properly control environment within a farrowing house reduces labor requirements and results in more healthy pigs. Insulation is a necessary part of a good environmental control system.

A newborn pig needs an environment of about 90 degrees Fahrenheit which is free of drafts. This can be reduced by 2 degrees per day until 70 degrees is reached.

Insulation serves several functions in maintaining these temperatures and in improving other aspects of the farrowing house environment. First, and most important, insulation reduces the cost of supplemental heat. Fuel costs for an uninsulated farrowing house can run two to three times as high as costs for a properly insulated unit.

Insulation causes the interior surface temperatures of the building to be higher during cold weather. Warmer surface temperatures reduce the amount of condensation within the building and lower the amount of radiant heat loss from the animals.

Radiation is one of the three methods of heat transfer. It affects the comfort level even though temperatures within the building are correct. Animals lose heat by radiant heat transfer when they are surrounded by a surface which is much lower in temperature than their body temperature. Radiant heat loss is the reason you feel cool when sitting in front of a picture window on a cold winter day even though room temperature may be 75 degrees.

Insulation helps reduce the loss of animal heat which further cuts down on heating bills. This is more important in higher density buildings such as growing and finishing structures than in farrowing houses. However, 20 sows with litters will produce about 12,000 BTU's of heat per hour which can be used to warm the building and heat ventilating air.

Finally, insulation reduces the rate of heat gain during summer months. This improves comfort and will make air conditioning more effective in units where it is used.

Amount Required

The amount of insulation used in a building is an economic decision. The cost of insulation is balanced against savings in energy costs and the effect of improved environment on net income. In Missouri, farrowing house walls should be insulated to a minimum "R" value of 13, and ceilings should be insulated to a minimum "R" value of 24.

In addition to insulating walls and ceilings, perimeter or edge insulation should be placed around the outside edge of the concrete floor slab. Perimeter insulation keeps floors warmer and can reduce fuel costs almost 16 percent in buildings where floor heat is used for pigs.

Three methods of installing perimeter insulation are shown in Figure 1. Perimeter insulation should have a minimum "R" value of 8 and extend 24 inches below ground level or 24 inches in from the edge of the floor slab. Because it is in direct contact with the ground, a material which is not affected by moisture should be used for perimeter insulation. The most commonly used materials are the expanded plastic foam insulations such as polystyrene and urethane.

"R" Value

"R" stands for resistance and the term "R" value is used as a measure of a given material's ability to resist the flow of heat. The higher the "R" value, the better the insulating value.

"R" is an additive property. This means that two inches of a given material will have twice the "R" value of one inch and that the "R" values of different components of a wall or ceiling section can be added together to obtain a total "R" for the particular building component.

Several years ago, most insulation was either mineral wool or fiberglass. These materials have similar insulating

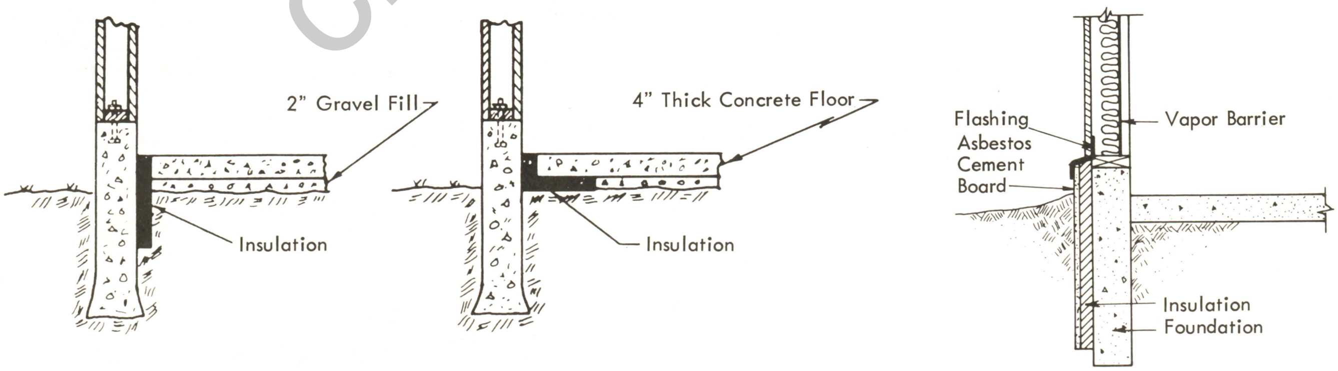

Figure 1. Three alternative methods of installing perimeter slab insulation.

Table 1 - Insulating values for several commonly used building materials and insulations.
"R" values are for thickness specified.

Materials	Thickness (Inches)	"R" Value
Fiberglass or Mineral Wool Batts	1	2.5-3.7*
Wood Fiber	1	4.0
Paper or Pulp Products	1	4.15
Expanded Polystyrene (Bead Board)	1	3.8
Extruded Polystyrene	1	4.0
Urethane Foam	1	6.25
Concrete	1	.08
Plywood	.375	.47
Insulating Sheathing	.78	2.06
Single Glass	.125	.89
Concrete Block	8.0	1.92
Light Weight Concrete Block	8.0	2.88
Fir or Pine Boards	.75	.98

*Exact value depends on fiber diameter and density. See manufacturing data for the product you select.

properties, and it became common practice to specify insulation requirements in terms of inches of thickness.

Today, there are many different insulations on the market, each with its own characteristics. The only fair way to compare their insulating ability is to compare "R" values. Table 1 contains a listing of the more common insulating and building materials along with their respective "R" values.

When You Buy Insulation

Some manufacturers of insulation quote "R" values for their product on an installed basis. This allows them to include additional "R" values for other assumed components of the wall, ceiling or floor section. If the insulation is advertised as having different "R" values for ceiling, wall and floor application, "R" value is being quoted on an installed basis. Recommendations in this guide sheet are for insulation only. When you shop, compare prices on "R" values for insulation only.

Vapor Barrier

All air contains moisture. The amount of moisture depends on the temperature of the air and the environmental conditions. Air in agricultural buildings normally contains large amounts of moisture because of animal respiration and evaporation from wet floors.

Moisture vapor contained in air behaves like heat; it flows from areas of high concentration to areas of lower concentration. If moisture vapor encounters a cold surface during its movement, free water will condense out. We see this happen most frequently on the outside of a glass of ice water. It also happens on the inside surface of poorly insulated farrowing houses during cold weather. It can also occur at some point inside a well insulated wall. When this happens, insulation becomes wet and loses its insulating value. Another common result is peeling paint and rotting of studs or siding materials.

The best method of combating moisture problems is to use a vapor barrier. Vapor barriers are installed directly over the insulating material on the side of the wall or ceiling section nearest the inside of the building.

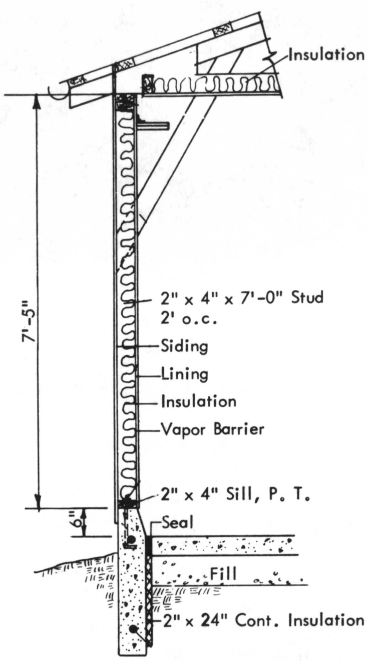

Figure 2. Partial section view of a farrowing house with ceiling, wall and perimeter insulation installed.

The vapor barrier prevents moisture vapor from reaching cold surfaces where it can condense out and cause problems. The best vapor barrier to use in farrowing houses is a 4 mil polyethylene film. This film can be stapled directly to the face of the studs or ceiling joists prior to installing the interior finish material.

Foam Plastic Insulation

During recent years, we have seen a rapid increase in the use of foam plastic insulation materials in farrowing houses. These are attractive to builders and farmers for several reasons. They are relatively impermeable to moisture and a vapor barrier is not required. They are higher in cost; however, lower labor requirement for installation and the fact that they provide a one step insulation and interior finish can offset the added cost. Several products have attractive, easily cleaned surfaces which add to the interior appearance of the building.

There are two major problems associated with using foam plastic insulations. They can't be used as interior surface materials in areas exposed to animals without some means of protecting them from mechanical damage. Some farmers have installed a 4-foot-high plywood covering over the bottom half of walls covered with foam plastic boards to keep animals and equipment from damaging the walls.

The second major problem with the foam plastics is their flammability. They have a tendency to burn very rapidly and to produce heavy toxic smoke during combustion. Some manufacturers have attempted to reduce the fire problem by adding fire retardant chemicals to their plastics. Others are placing protective covers on the surfaces of the insulating boards which are intended to keep fire away from the flammable plastic. Care must be used to protect the integrity of these surfaces during installation.

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