



# pork industry handbook

COOPERATIVE EXTENSION SERVICE • MICHIGAN STATE UNIVERSITY

## Swine Farrowing Units

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A wide variety of choices is available in farrowing units—from the A-frame house in the field to the environmentally controlled central farrowing house with slotted floors. Although good management is the most important requirement for a successful farrowing operation, well-planned and properly constructed buildings and equipment make good management easier.

Perhaps a higher level of management is required with a central farrowing house than with a pasture operation; with central farrowing the labor required is reduced, and one person can handle more sows. When selecting a farrowing unit, each producer should consider available capital, amount and type of labor available, anticipated future size of operation, existing buildings available, and management ability available. While the sows and pigs need a certain environment for optimal performance, this environment can be provided in many ways and should be accomplished in the ways best suited to each producer's conditions.

### Critical Design Factors

**Comfort** The farrowing house must provide physical comfort for the young nursing pigs and for the sow. Each has different temperature requirements. Ideally, the newborn pig needs a clean, dry, draft-free environment with clean air and a temperature of about 85-90 F. the first three days of life. In contrast, the most comfortable temperature for the sow is approximately 60-65 F.

In central farrowing houses, these two temperature requirements are best handled by maintaining an overall farrowing house temperature of about 65-75 F. and

providing supplemental zone heat for the pigs. Solid floor houses using bedding can be maintained at a lower temperature than slotted floor houses. In a house that is open or not environmentally controlled, other provisions such as draft barriers, bedding and hovers may be needed.

Comfort considerations can also be judged by the operator observing the activity of the pig. Peak efficiency is best obtained from a building in which it is comfortable or pleasant for a person to work.

**Protection** Farrowing crates reduce the number of pigs crushed by the sow. Guardrails located about 6 in. out from the wall and 8 in. up from the floor will reduce the number of pigs crushed by the sow in open pen farrowing. Having a separate comfort zone for the baby pigs provides additional protection by attracting them away from the sow except when nursing.

**Sanitation** Properly designed farrowing units are easy to keep clean. Porous or rough surfaces should be avoided as they can harbor certain bacteria. Rough floor surfaces not only are abrasive to the feet and knees of nursing pigs but they also retain moisture and manure. Smooth surfaces drain better, dry more rapidly and are easier to clean and disinfect, but can be slick.

Solid floors should be sloped for proper drainage—about ½-in. per foot. Slotted floor surfaces should be flat and smooth. Slats made of materials that could be slick (aluminum, stainless steel, plastic) should have ribs down the center or punched slots to give better footing. A number of parallel ribs may trap moisture and manure, resulting in unsanitary conditions.

**Management** Proper management in central farrowing houses is much easier if farrowings are grouped.



Establish a schedule for breeding, and try to follow it. This makes it possible to completely empty the building and clean and disinfect between groups of sows.

At all times, the attendant must be able to recognize signs of environmental stress in the animals and to make appropriate adjustments. Pigs piled up or shivering are cold regardless of what the thermometer shows. Likewise, pigs lying everywhere but under the heat source indicate that their heat supply is set too warm or is too close to the floor. Operators must also be alert when any disease or other disorder occurs. They must detect what is wrong immediately and administer appropriate treatment. The good manager learns to anticipate problems and thereby avoids them.

### General Decisions

**Permanent or Portable Buildings** Portable houses should be considered by individuals who either are renting land, or choose not to make a major commitment to swine production. Some landowners may have no interest in providing permanent structures; hence, portable buildings become the only alternative. Portable buildings usually require more total land area and total labor per animal unit. Also proper management can be complicated by inclement weather. Today there are farrowing units that approach permanent buildings but still are portable. Smaller units are constructed as a complete unit, and larger units are composed of separate sections moved separately.

In contrast, permanent central farrowing houses involve a large financial investment. The only means of recovering this investment is by using the houses regularly for their intended purpose—farrowing. The complex nature of modern central farrowing facilities with pits and slotted floors permits no alternative use. Multiple or continuous farrowing that produces at least 6 or more litters per stall per year is required to justify the more specialized central farrowing house. Farrowing only 6 times per year would permit weaning in the stalls and using them a short while as a nursery. A producer makes a definite commitment to hog production when he invests in modern, permanent farrowing facilities.

**Site Location** Proper site location involves several basic considerations. The soil must be well drained. If it is necessary to do some land leveling for a foundation site, avoid construction on the excavated or transported soil or make sure the soil is well compacted. Settling under a part of the foundation could cause the building to crack.

The farrowing facilities should be part of a total arrangement of facilities—nursery, growing-finishing, gestation, feed processing, and waste disposal system. An organized arrangement of physical facilities is aimed at providing the most efficient means of moving animals, feed, and waste. This involves connecting lanes for moving animals from building to building and augers or similar devices for mechanically moving feed from the processing center to bulk tanks at each building.

While it is desirable to have the farrowing house convenient to the farm home, the swine buildings must not create undesirable living conditions for the home occupants. Odors are generally more pronounced in warm, humid weather. Therefore, place the buildings so the prevailing summer breezes do not carry the odors to the home. Be sure to check local and state environmental ordinances with respect to location next to property lines or neighboring residences.

**Crates or Pens** In choosing between farrowing crates and farrowing pens, the primary differences are the amount of exercise for the sow and the protection of the pigs from crushing. With crates, the sow is essentially completely

restrained. Also, the pigs are protected from overlaying. The majority of the farrowing facilities use crates today. Some tethering is done in Europe, but this practice is not common in the United States.

A sow in an open pen usually needs additional restraint if she requires any form of physical treatment. Provide guardrails for the pigs to reduce overlaying. Also, the operator is protected when handling pigs in a farrowing crate, whereas pigs in an open pen with a nervous or ill-tempered sow can be caught or handled only with special caution.

Most crate dimensions are 5 ft. wide by 7 ft. long. The width includes an 18-in. pig area on both sides of a 24-in. sow stall. Most commercial crates are adjustable to accommodate very large or very small females.

A typical pen arrangement is 4-5 ft. wide by 12-13 ft. long. The front 18-24 in. of the pen is the creep area and the rear 4-5 ft. of the pen is usually slatted. There is some advantage to restraining the pigs from the slotted floor area the first few days. Some producers have found that with the long narrow pen configuration, no significant advantage exists for guardrails. While most sows do a reasonably good job of depositing their wastes over the slotted area, individual sows are not prevented from creating filthy surroundings. Some producers use these pens as "free stalls." Sows have free access to come and go from the pens to a feeding floor for their feed and water, and the pigs are restrained in the pens.

### Solid or Slotted Floors

The use of slotted floors greatly reduces the amount of labor required to remove the manure. Also, by providing drainage for urine and spilled drinking water, slotted floors help to maintain much drier floor surfaces than is possible with solid floors.

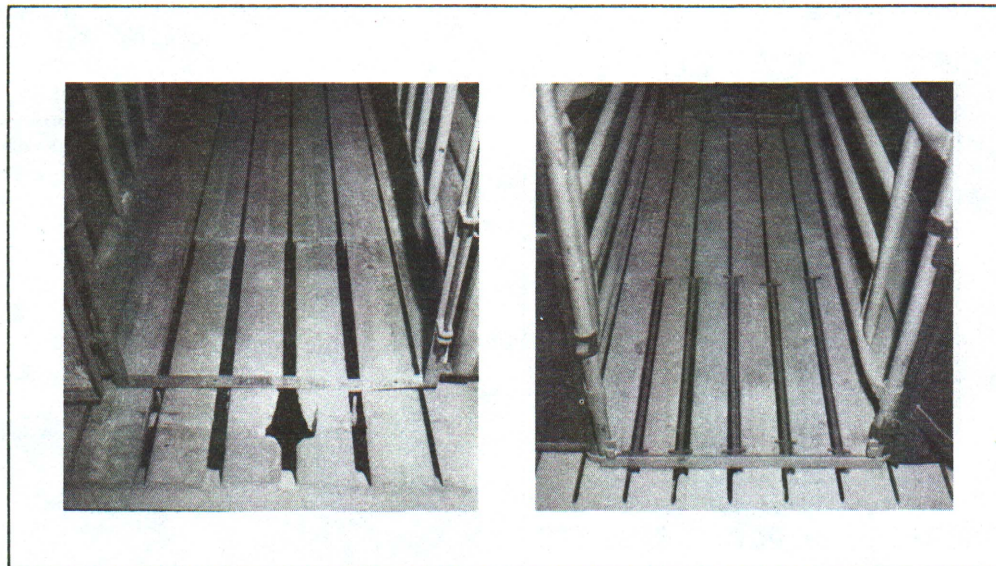
Initial cost of slotted floors is greater than for a solid floor. In time this greater cost is compensated for by reduced labor demands. Commercial slats are available in concrete, steel, stainless steel, aluminum, fiberglass and plastic. Also slats can be homemade from 2'x4's cut from oak or other hardwoods. Expanded metal used front and rear of a farrowing crate with a wood center section cleans extremely well. When improperly installed, however, it has caused some teat damage. The metal can deteriorate rapidly. Lay the material so the long openings are parallel to the sow and avoid expanded metal with sharp edges. Be sure to support adequately. Usually 3/4 inch, 9-11 gauge, flattened expanded metal is used. Criteria for evaluating slats are cost, life expectancy, uniformity, freedom from abrasive surfaces, and ease of cleaning.

The spacing between slats is very critical in a farrowing unit. It should be small enough so the pigs' feet can't go through (3/8 in.) or large enough so the leg will not get caught (1 in.). The spacing should be no more than 3/8 in. in the pig area. A smaller slat opening will cause a buildup of manure. A larger spacing increases the chance of small pigs getting their legs caught.

In the sow dunging area the slat spacing should be 1 in. This permits the sow's manure to work through more easily. Some producers extend this wider slot opening beyond the end of the crate. However, this area must be covered at farrowing and for the next two or three days with some form of grate (Fig. 1).

The slats should run parallel with the sow. This results in better footing for the sow when she gets up and for the pigs when nursing. The floor can be totally or partially slotted. Some producers prefer about 30 in. slotted to the rear, a center of oak boards or concrete, and about 12 in. slotted in front. This results in a warmer sleeping surface for the pigs. With center boards, space them slightly so liquids will drain





**Figure 1. Concrete slats with 1-in. spacing behind sow. Cover wide gaps during farrowing.**

through. A solid concrete center allows for floor heat in the pig area. The purpose of the small slotted area in front is to catch the wastage from the waterer and to take care of the dunging that occurs from the small pigs in the front corners after 3 weeks of age.

**Single Room or Separate Rooms** Another alternative with larger producers is to divide the farrowing unit into separate rooms of 10-12 crates. Each room might hold the number of crates for the farrowings in a week. The rooms and pits can be constructed completely independent so one room can be cleaned and disinfected without affecting the others. The room is much easier to clean when it can be completely emptied. Also, the separate rooms are an aid in management since moving the sows to and from the crates, weaning, and disinfecting all can be put on a definite schedule. This kind of arrangement is strongly recommended for producers on a continuous farrowing program.

**Manure Management** With solid floors, the manure must be cleaned daily from the farrowing pens or crates. A mechanical gutter cleaner could be used to save labor. The use of bedding, whether of straw, wood shavings, or other material, increases the amount of solid waste that must be removed. The bedding must be kept out of a liquid manure system because it will clog normal pumping equipment and will decompose very slowly in lagoons. Generally, such solid wastes are hauled directly to the field.

If no bedding is used, the manure can be handled more easily as a liquid. With solid floors, the manure can be washed to a holding tank or lagoon. With slotted floors, the liquid manure can be stored in the pit under the slats or it can be flushed periodically from the pit to a holding pit or lagoon. The size of the pit will determine how long you can store manure before emptying. Plan for about 4 gal. (about ½ cu. ft.) of liquid manure per day for each sow and litter. Keep waterers in good repair. Excessive water leakage is expensive and can soon equal the amount of liquid manure produced. Pits for storing manure are usually 4-6 ft. deep. A pit 1-2 ft. deep is adequate for flushing.

There is some objection to storing the manure under the slats because of the gases and odors produced by the liquid manure in the pits. A properly designed under-slat ventilation system will help minimize this problem.

With portable slotted floor farrowing houses, the building must be moved when the manure accumulates.

Accumulations have to be hauled away with a manure spreader.

### **Construction Decisions**

**Materials** The materials used for construction should be selected by their appearance, durability, ease of cleaning, and cost.

**Exterior sidewalls** can be of any suitable building material—poured concrete, concrete blocks, galvanized steel, painted steel, aluminum, exterior plywood, and conventional wood siding.

**Roofing** materials most frequently used are painted or galvanized steel, painted or non-painted aluminum roofing, and asphalt shingles.

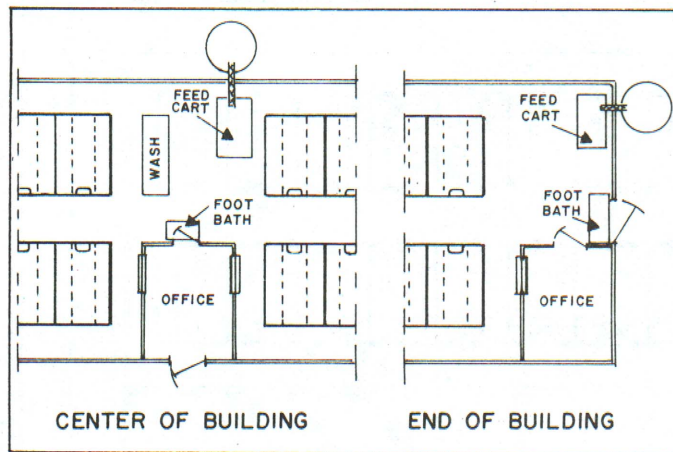
**Interior wall** linings should be durable, easy to clean, and able to withstand corrosion. Many interior wall linings being used today are easily damaged. Materials used are exterior plywood, metal covered with a protective coating, cement asbestos board, fiberglass sheets, and tempered hardboard.

**Insulation** for sidewalls constructed of concrete blocks can be supplied by filling the cores with vermiculite or other appropriate block fill. Insulation in the form of batts and blankets is commonly used with stud frame construction because it is convenient to use and cost is low. Some of the new plastic insulations, such as polystyrene and urethane, are also often used. Rigid insulation board is also used for perimeter insulation and to insulate under concrete floors, particularly in heated floors.

It is important to use fire-resistant types. Protect the sidewalls from pig access and other mechanical damage. All insulation must be protected from rodents. Plan for a minimum R value of 8-10 in the walls and 14-20 in the ceiling. More may be required in the colder regions. The southern regions will benefit from insulation during extremely hot weather as well as during cold weather.

**Vapor barriers** are needed under the inside wall lining to keep the water vapor inside the building from going into the wall and condensing. Polyethylene film (4 mil) is most commonly used. It is also used under solid concrete floors to keep moisture from moving up from the ground and resulting in damp floors.





**Figure 2. Locate the service area either at one end or in the center of long farrowing houses.**

**Service Area** When planning your permanent farrowing facility, allow space for a service area (Fig. 2). Include space for a sow wash area, equipment storage, record keeping, and for a refrigerator for keeping medication. If you hand-feed from a cart, allow space to store the feedcart.

### Environmental Control

**Ventilation** is needed to remove moisture and odors in winter and heat in summer. Adequate air exchange capacities and proper distribution are important. Minimizing drafts is also important for small pigs.

Both exhaust and pressure systems can meet the requirements if properly designed. The exhaust system has been more common for winter ventilation. When using manure pits with slotted floors, drawing a part or all of the ventilation air from the pit may reduce odors inside the house and help eliminate dangers from manure gases.

**Heating Units** Adequate heat is needed during cold weather in a farrowing house, particularly where slotted floors and no bedding are used. For buildings with slotted floors, use some form of space heater to maintain 72 F. in the room, and utilize supplemental heaters as needed to provide extra heat for the small pigs at birth. Supplemental heaters include heat lamps, gas or electric radiant heaters,

and hot water or electric floor heat and heating pads. Solar heating has generated much interest recently. Preliminary tests show that heating fuel costs can be saved by use of solar heat.

**Summer Cooling** Proper summer cooling requires considerably more air movement than for winter. During extremely hot weather, the ventilation system could be supplemented with a fan blowing over the sows. Evaporative cooling works well in the dryer climates. With the sows confined in farrowing crates, a zone cooling system works well with a central duct and individual tubes leading down to each sow's head. Refrigerated air in this system helps further to alleviate the sow's heat stress.

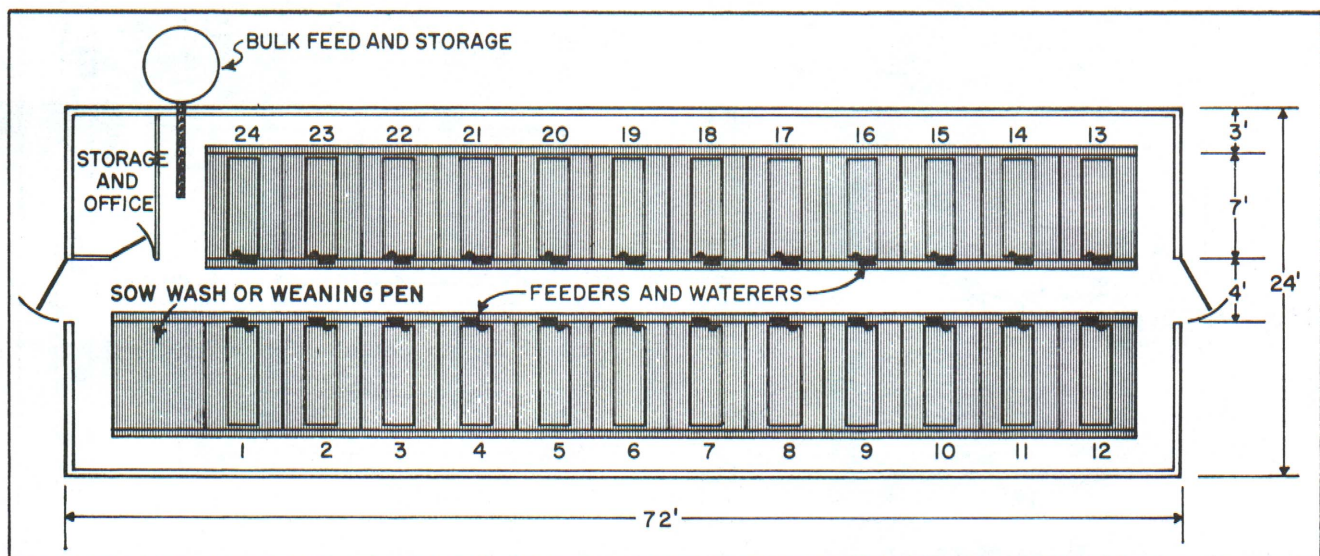
### Floor Arrangements

The normal floor arrangement for a farrowing house with a slotted floor is 2 rows of farrowing crates facing a central aisle (Fig. 3). The crates normally face the center aisle for ease of feeding. The sows will be hand fed from a feed cart or feeding stations located along the center aisle. Hand feeding provides the operator with an opportunity to observe each sow individually each day. If she doesn't eat or hasn't eaten her last feed, it is an indication that something is wrong.

There is some interest in getting the next group of sows to farrow into the farrowing house at least 2 weeks ahead of farrowing to build up an apparent immunity in the pigs against scours. Figure 4 shows an arrangement which includes sow holding pens for this purpose. The few nursery pens are used to wean the heaviest pigs from the litter early, giving the smaller ones a chance to catch up.

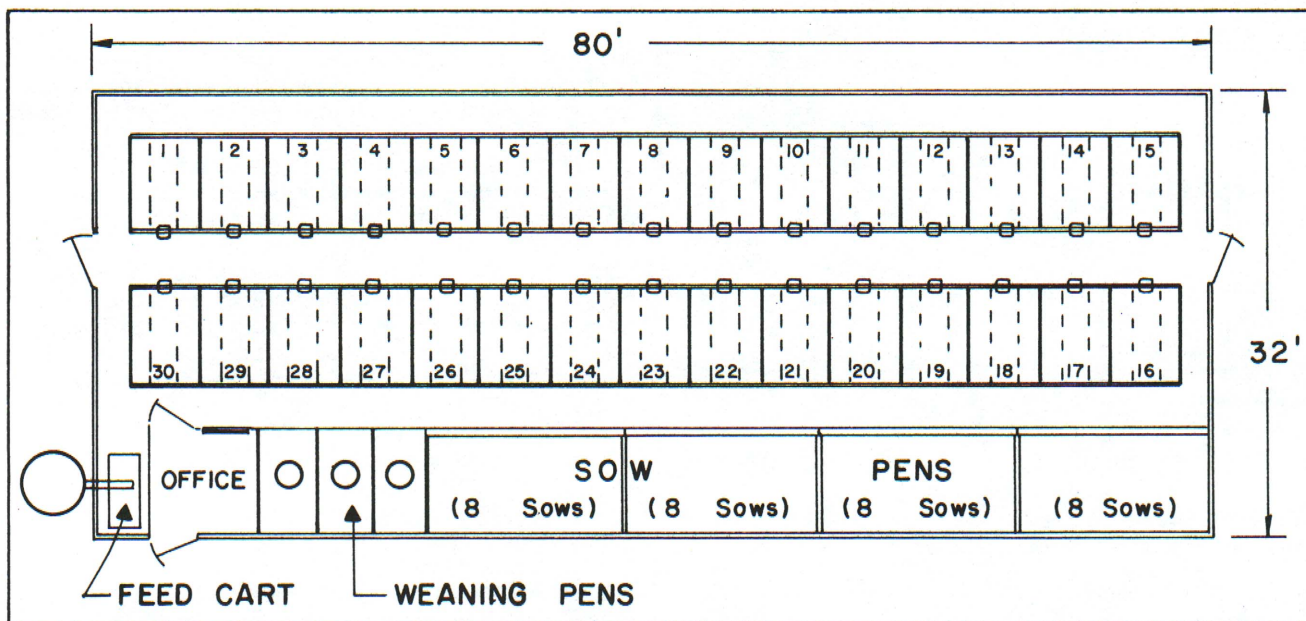
Four different farrowing crate floor arrangements being used are shown in Figure 5. Figure 5(a) shows a solid floor system with the floor sloping to the front and rear and usually containing floor heat. This system requires more labor than the systems using slats. Cleaning is minimized if the sows are turned out twice a day for all their feed and water. A mechanical gutter cleaner could be used with this arrangement.

Figure 5(b) shows a floor with a slotted section only at the rear of the sow. The front portion of the floor is sloped forward so that any water spillage will not drain through the entire crate. This arrangement works best where the pigs are weaned by the time they are 3 weeks old. Floor cleaning at the front of the crates becomes a problem if the pigs are kept for a longer period.



**Figure 3. Floor plan of slotted floor farrowing house.**



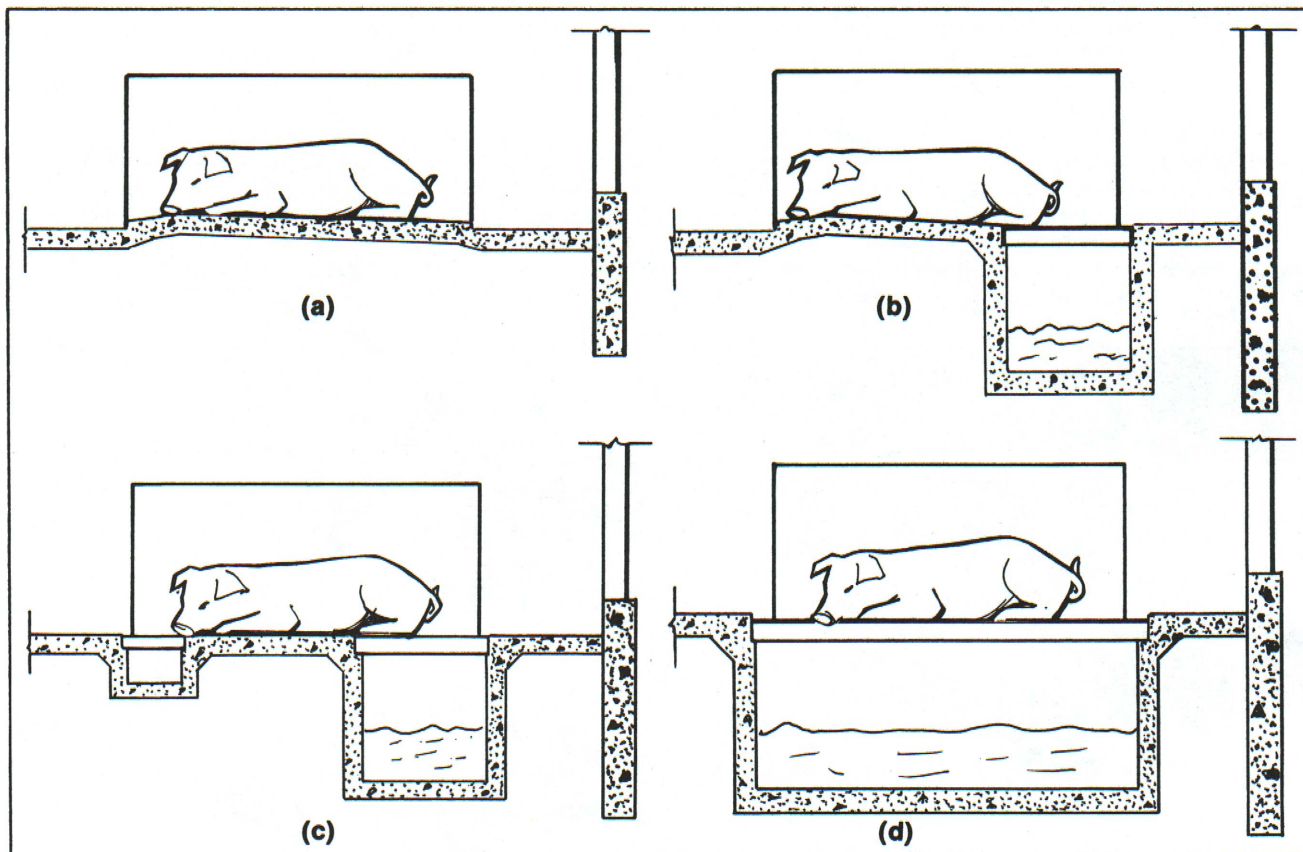


**Figure 4. Farrowing house plan with sow holding pens.**

Figure 5(c) shows a floor with about 12 in. slotted in front and 30 in. at the rear. The concrete center portion often contains heat in the floor of the creep area. These pits have a minimal liquid manure storage capacity. They may be shallow and flushed several times daily, washing the manure into a holding tank or lagoon.

Figure 5(d) indicates a pit completely under the stall area. This may be accomplished by locating a pit only under the crate area or by having a pit under the entire house. The floor may be totally slotted or partially slotted

(Fig. 6). With a totally slotted floor, 8-ft. slats are usually used which extend beyond the front and rear of the crate. Concrete slats should be 4-6 in. wide spaced 3/8 in. apart. Spacing the slats 1 in. apart for the 2 x 2 ft. section directly behind the sow allows the manure from the sow to work through the slotted floors easier. These wider openings must be covered with a grate the first few days of farrowing. Where the floor is partially slotted, run the slats at the rear of the sow parallel to the sow for better footing for the sow and pigs.



**Figure 5. Floor arrangement for farrowing: (a) solid floor, (b) rear pit, (c) pit front and rear, and (d) full pit.**



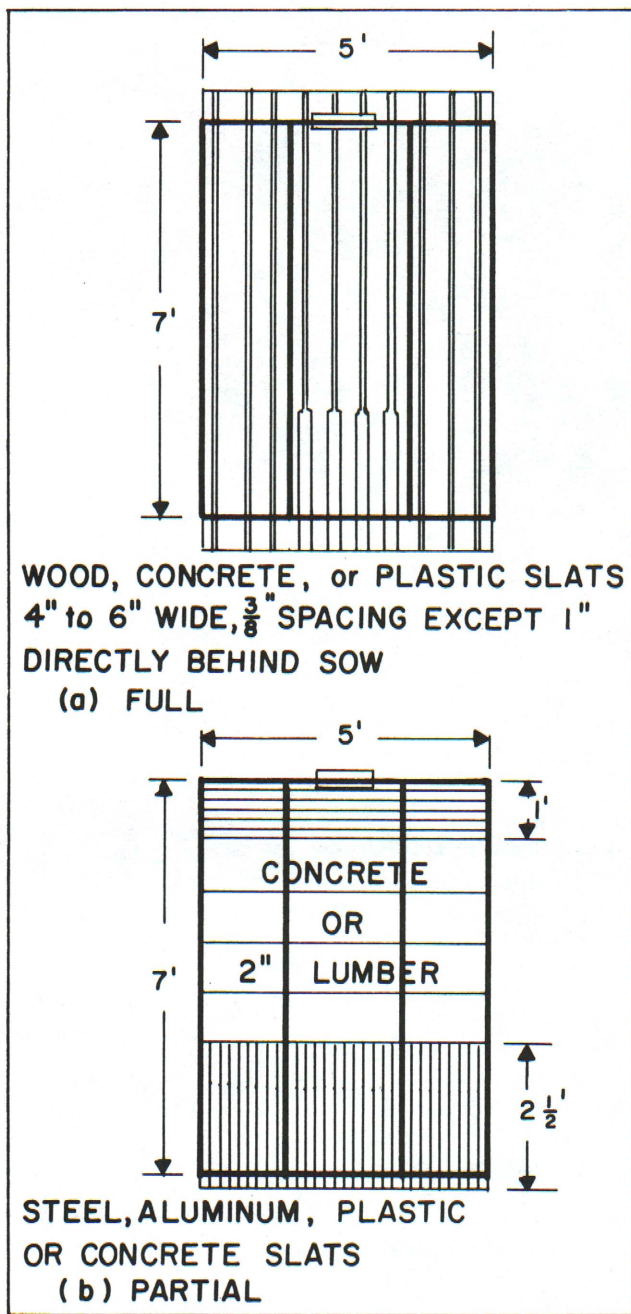


Figure 6. Full or partially slotted floor farrowing.

When remodeling an existing building, many producers have supported their slotted floor farrowing crates on concrete blocks. Two concrete blocks (16 in. high) with 2x8 supports 8 ft. long and 2 ft. apart located under the sow partitions adequately support the crates. Usually the existing floor is sloped so that liquids can be drained away and solids scraped out periodically. A storage pit can also be made on top of the existing floor with block walls. Detailed construction plans are available from your State Agricultural College. Contact your county Extension agent or state Extension specialist.

### Planning Information

Table 1 lists planning information for quick reference.

Table 1. Information for planning.

#### Suggested temperatures (winter)

Inside air

Solid floors—60-65 F.

Slotted floors—70-75 F.

Floor temperature, pigs—85-90 F. at farrowing

#### Heating and cooling

Supplemental heater—2,000-3,000 BTU/hr./sow and litter

Heat lamp—250 watts/litter

Floor heat

Electric—30-40 watts/sq. ft.

Hot water—50 BTU/hr./ft. of pipe

Gas infrared—2,500-4,000 BTU/hr./litter

Zone cooling—50-75 cfm/sow

Zone air conditioning—0.15 tons/crate

#### Ventilation

Winter

Continuous—20 cfm/sow and litter

Normal—80-100 cfm/sow and litter

Summer—200-450 cfm/sow and litter

#### Slotted floors

Slot width— $\frac{3}{8}$  in. except behind sow (1" in 2' x 2' area)

Slat width—4-6 in. (metal or plastic may be narrower)

#### Manure production

Sow and litter—4 gal./day (.54 cu. ft./day)