Slotted Floors for Swine – Pork Industry Handbook
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pork industry handbook

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Slotted Floors for Swine

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The development of slotted floors has been the dominant factor in making confinement swine production practical. Slotted or partially slotted floors make pens self-cleaning, leaving them clean and dry. The reduction of labor associated with clean, dry pens accounts largely for the feasibility of confinement production.

The question as to what type of floor to install in a confinement building depends somewhat upon how management intends to handle the waste. For example, if wastes are to be handled as a solid or semi-solid product, the floor will usually be solid. But if wastes are to be handled as a liquid, the floor will usually be at least partially slotted. Since slotted floors materially reduce the labor associated with most non-slotted floors, many existing confinement buildings, and perhaps most of the buildings of the future, will have slotted floors.

How Much Slotted Floor

Studies have generally shown no difference in performance when comparing partial versus total slats during summer. During winter, Nebraska studies showed an increase in feed requirement per unit gain with increasing amounts of slotted floor. For this reason, and because the initial floor cost increases slightly as the amount of slotted area increases, many floors for growing-finishing (G-F) pigs are from one-third to one-half slotted. This amount of slotted floor works well where the pen length is 24-26 ft., with about 10 ft. of this being slotted. Pen widths, in this case, are usually 8-10 ft. Wider or squarer buildings, with a center or off-center alley and pens on both sides with partially slotted floors, require pinpoint management to train pigs to dung on the slotted area. Buildings with a single row of pens, with the alley along the front or back with partially slotted floors, generally result in good dunging patterns. Thus, building dimension or arrangement may be a factor in deciding how much of the floor should be slotted.

Injuries to the claws have been shown to be greater on total slats as compared to partial slats. However, the effect of claw injuries on growth rate appears to be slight. Claw injuries to breeding swine, however, often lead to more significant problems. Studies have shown that wider slats (8 in.) reduce claw injuries and clean as well as narrower slats.

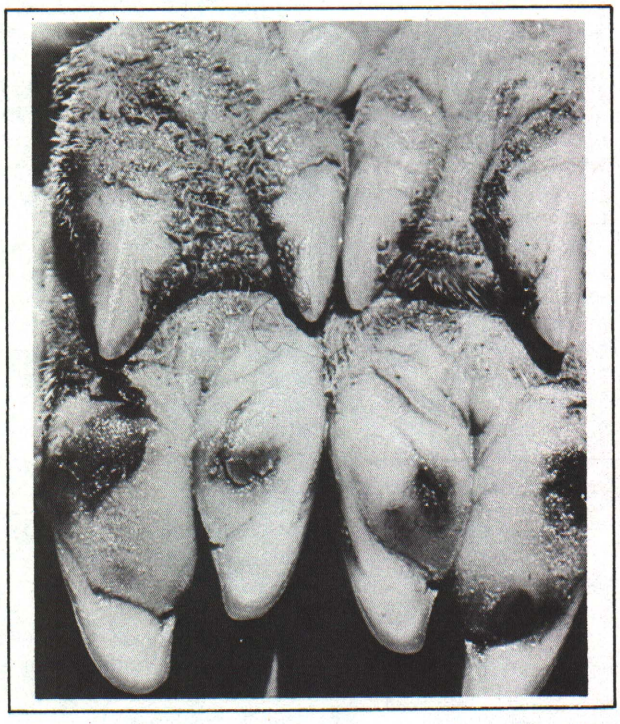

Figure 1. Claw lesions of this type can be reduced by using wider slats (6-8 in.) that have a smooth flat surface and a slight pencil-round edge.

Since partially slotted floors are also partially solid floors, it is important for labor reduction and pig performance that pigs develop a desirable dunging pattern. As stated earlier, a long and narrow pen 8 or 10 ft. wide and 22 or 24 ft. long is preferred when floors are partially slotted. Pen shape is not important to dunging patterns on fully slotted floors. Assuming a long, narrow pen, there are

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construction and management factors that are important in toilet training pigs. Perhaps no single item is fundamental, but rather several factors combined appear to have an additive effect of training the pig. For details, see PIH 11, Swine Confinement Growing-Finishing Units.

The floor configuration in farrowing houses varies among builders. Research results provide scant guidance in selecting farrowing house floor design. Houses with total, partial or no slats can be managed successfully. The present trend appears to favor 24-30 in. of slats at the rear of the crate, and 12-18 in. of slats at the front, with the middle section being solid.

Slat Width and Spacing

The most desirable dimension for slats depends upon material and class of pigs. Slotted floors should be designed to minimize pig injury while maximizing cleanliness. In general, the larger the pig the wider the slats that may be used without sacrificing performance and cleaning characteristics. Concrete slats may be made or are available in various widths. Concrete slats used for farrowing generally are 4-5 in. wide, nursery slats 4-6 in. wide and G-F slats 5-8 in. wide. Some of the metal and fiberglass slats for small pigs are as narrow as 1 in.

Factors such as amount of surface area slotted may influence the decision on what width slat to choose. Generally, a narrow spacing is required of narrow slats and a wider spacing, up to 1 in., is required of wider slats. Slat widths of 7-8 in. have been used very successfully for gestation and G-F pigs. Slats of this width definitely require a full inch spacing.

For slotted floored nurseries, the slat spacing should be either narrow enough so the pigs cannot get their legs caught at all, or wide enough (1 in.) so they can easily get their legs free should they step in the slot. When the wider spacing is used in the farrowing crate, a grate covering should be used at farrowing to cover the openings. The use of a grate is particularly necessary at the rear of the sow where wider slat openings are used. If the slat openings at the rear of the farrowing crate are not covered immediately prior to farrowing, and for several days following, the manager has no way of knowing if the sow has voided the placental tissue as it would go directly into the pit. Since a retained placenta may result in certain health problems for the sow and litter, the manager must know if and when the placenta was passed. Using a grate to overlay the wider slots at the rear of the farrowing crate until the pigs are a few days old also allows the baby pigs to adapt to slotted floors in stages.

Table 1. Suggested slat spacings.

Farrowing crate	⅜ in., except at rear of sow where ¾-1 in. opening may be used.
Nursery (20-40 lb. pig)	½-1 in., depending on width of slat; wider slat/wider opening.
G-F (40-220 lb.)	¾-1 in., narrower slats of material other than concrete may use narrower openings. Wider slats, 5-8 in. need 1 in. opening.
Gestation or Boars	1-1⅛ in.

Slat Direction

In most phases of confinement production, slats that are placed parallel to the long dimension of the pen appear to favor pig comfort and mobility. Nursery, G-F and gestating pigs appear more mobile and comfortable when walking on slats that are parallel to the long dimension of the pen as opposed to slats that are placed at a right angle.

The foregoing assumes a rectangular shaped pen. Slat direction in total slotted floored buildings will be influenced by other factors such as construction costs and the like. However, placing the slats parallel to natural traffic flow, so that the pigs will walk down a slat rather than across it, is worthy of consideration. The foregoing is true for farrowing and gestation crates or stalls, even though the animal is not allowed free movement.

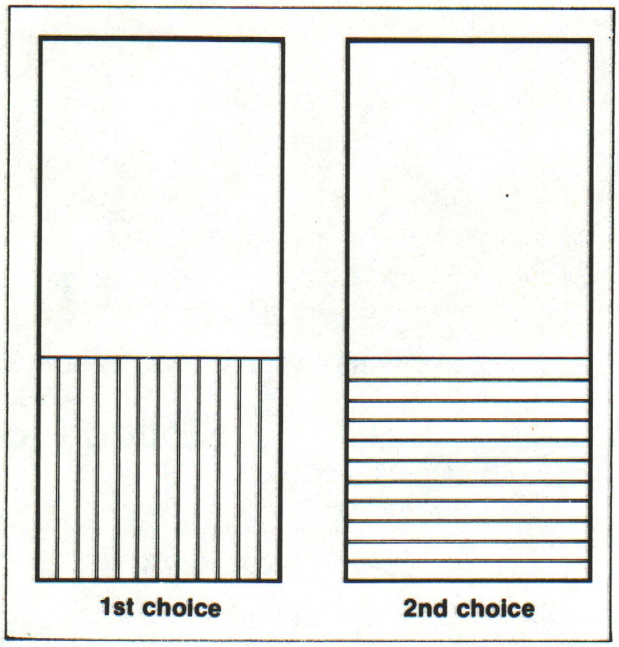


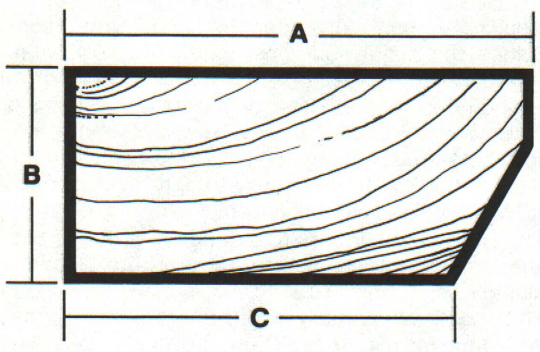
Figure 2. The recommended or preferred slat direction is shown on the left.

Slotted Floor Materials

Wood, concrete, metal and plastic have all been used effectively for slotted floors.

WOOD slats have the lowest first cost and also the shortest life. Oak is best, but other hardwoods such as hickory and maple can be used. Pig performance may be reduced by variable spacing resulting from warping (particularly likely to happen with slats less than 3 in. wide), wear, careless installation, insecure fastening and uneven heights. Wood slats can become quite slick. Their maximum life expectancy is between 2 and 4 yr., and even less in areas of intensive use, such as around feeders and waterers.

The recommended dimensions for wood slats are:



	A	B	C
2-ft. SPAN	3½-6 in.	2 in.	2¾-5 in.
4-ft. SPAN	3½-6 in.	2½ in.	2¾-5 in.
6-ft. SPAN	3½-6 in.	3 in.	2¾-5 in.
8-ft. SPAN	3½-6 in.	3½ in.	2¾-5 in.
10-ft. SPAN	3½-6 in.	4 in.	2¾-5 in.

The "A" dimension must be greater than the "C" dimension so the spacing will not become clogged. The slats are usually formed by ripping a rectangular timber on the diagonal, resulting in a vertical edge and an inclined edge. A second vertical cut should be made cutting off the sharp edge made by the diagonal cut.

CONCRETE slats are the most durable and have worked well especially for all hogs over 40 lb., including gestating sows. While they work well for smaller pigs and during lactation, slats made of other material work equally well here. Concrete slats can be precast by a concrete products plant, or commercial forms are available for casting the slats in place. Precast slats have the advantage of quality control during proportioning the mix, casting the slat and curing. Some concrete products plants are forming gang slats (two or more slats connected into one section) and complete 5 ft. wide and 8-12 ft. long farrowing sections.

Recommended dimensions for concrete slats are 5-8 in. tops with 4-5 in. depths (5 in. depth required for 8 and 10 ft. lengths).

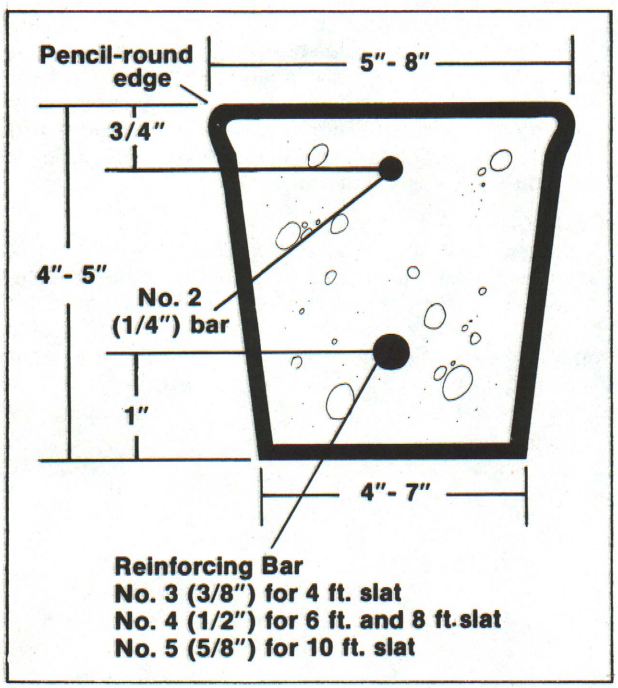


Figure 3. Example of concrete slat.

The ¼ in. bar in the top of the slat can be omitted when slats are cast in place and not moved. Use at least a 7½ bag mix of air-entrained cement with a 2-3 in. slump, a maximum-sized aggregate of ½ in. A slight pencil-round edge can be provided by edging the slats with a ¼ inch sidewalk edger. This will prevent chipping and further reduce foot injuries. Give the slats a smooth, steel-trowel finish to reduce leg and knee abrasions. This is particularly necessary for farrowing and nursery floor slats. For proper curing, protect the slats from drying out for 5 days by covering with plastic, by spraying on a curing compound or by covering with a wetted layer of straw.

METAL of various designs has been used. Flattened expanded metal (¾ in., 9-11 gauge) has proved to work well for pigs under 40 lb., but does not last as long as concrete when subjected to concentrated traffic of heavier animals. In farrowing crates, lay expanded metal so the long openings are parallel to the sow. Expanded metal with sharp edges should be avoided. Many of the early metal slats did not prove satisfactory because corrosion attacked the steel from the underside and caused failure after 2-4 yr. Treating the underside of metal slats with epoxy paint or similar material extends its life. Steel grate 1-1½ in. wide and ¼-⅜ in. thick has worked well when spaced ⅝-¾ in. apart for farrowing and ½ in. apart for nursery units.

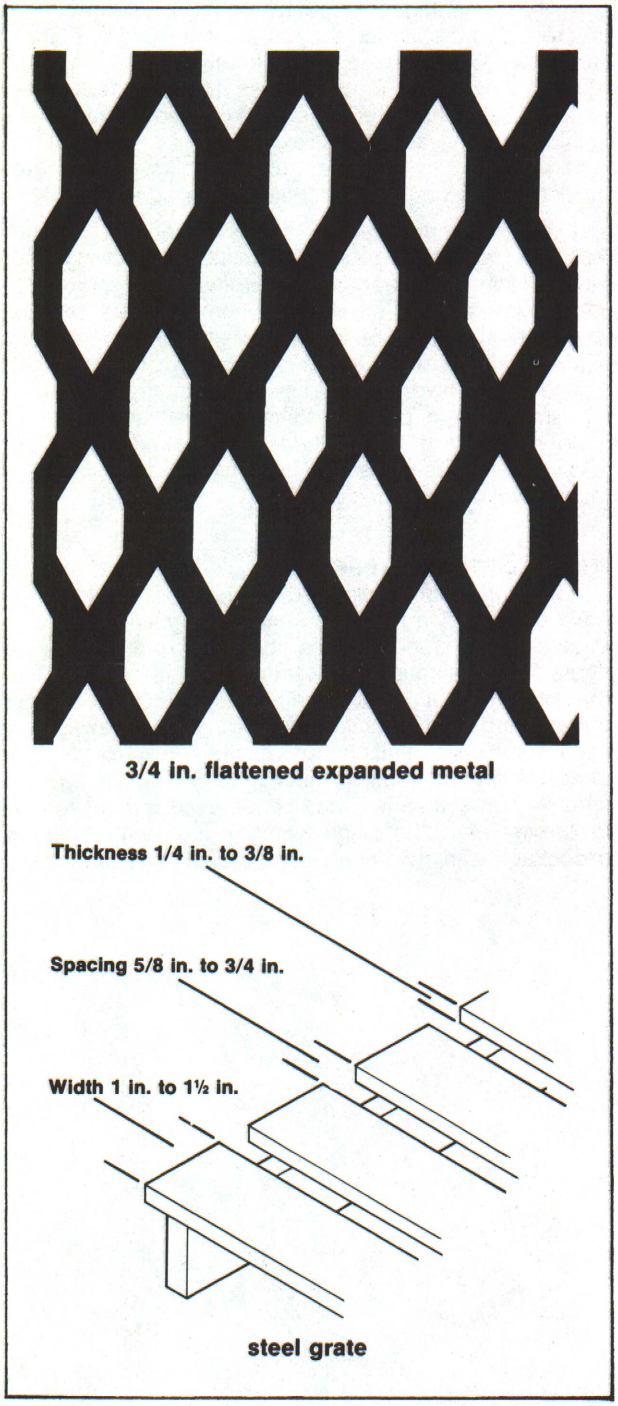


Figure 4. Examples of metal slotted floorings.

STAINLESS STEEL has become popular in farrowing and nursery units. The stainless flooring comes in 8½ in. or 12 in. wide planks. Some planks are welded together into a grate, and others are bolted together. Most of the stainless steel sections will span from 4-10 ft., depending on the depth of the side flange. A longer life is expected with stainless steel flooring than from plain steel. Porcelainized steel slats are also available.

ALUMINUM slotted flooring is available in several shapes from narrow "T" section to 8 in. wide punched sections. Aluminum cleans very readily, but some can be

slick for sows and heavier hogs. Aluminum must be insulated from other materials, particularly steel, to avoid corrosion.

PLASTIC slotted flooring of various shapes has become available during recent years. The plastic floors have the advantage of being somewhat warmer than concrete and metal, and they also clean readily. Plastic slats have been reported to be somewhat slick for sows and hogs over 100 lb. Some slat manufacturers have reported that a characteristic of PVC (plastic) is that it may develop a fatigue factor that is expressed as broken slats or a permanent sag. Because of this, plastic slats are currently somewhat heavier than those sold initially.

There has been recent interest in a 1⅝ in. wide fiberglass reinforced plastic "T" slat for farrowing and nursery. The fiber strands in fiberglass are reported to interrupt the fatigue factor found in some plastics, thereby making them more durable. Fiberglass may also be slick, making it difficult for heavier pigs to walk. The most popular application for fiberglass and some types of plastic slats appears to be in partially slotted farrowing floors and nurseries. Most of the slotted floor materials used in farrowing and nursery pens could be used in flat-decks and double deck nursery units.

Floor Smoothness

Concrete floors (solid and/or slotted) that are rough have been shown to result in more injury, lameness and infection than smooth, clean floors. Therefore, concrete floors or slats should have a smoothness about equal to a machine trowel finish. Concrete slats that have a smooth surface and slight pencil-round edge result in fewer claw injuries and edges that chip less easily. The risk of getting a concrete floor too rough is much greater than getting it too smooth. However, a floor can become too smooth as well. Problems with floors too smooth are nearly always associated with solid non-slotted areas. In general, if the floor is kept dry, and the slope does not exceed ½-¾ in. per foot, it is rare for problems related to slickness to occur.

Other Floor Related Problems

Knee and hock lesions among baby pigs in farrowing houses have been a problem to some producers, particularly in new buildings. Bedding usually reduces or eliminates the problem. Since most types of bedding cannot be used in a house with liquid manure disposal, other techniques are necessary. Wood shavings and sawdust have sometimes been used successfully in sparing amounts on the solid portion of a partially slotted farrowing pen, but extreme caution is advised. Secondary surfaces in the farrowing crate in the nursing-creep area have been used with some success. Rubber mats and outdoor carpet are examples. Important considerations here are durability and ease of sanitation.

Some paints or plastic-like materials painted on the floor in the nursing area of the farrowing crate may aid in reducing knee and hock abrasions to the pig. A latex based cement may be obtained in most paint or hardware stores that may be applied over existing floor areas that are too rough or smooth. Only material that is non-toxic to the pig should be used. It is also wise to try these types of materials in a limited number of crates before committing the entire building. Some products of this type may result in a floor that is excessively slick. A liquid adhesive painted to the pigs' knees shortly after farrowing has been reported to have some effectiveness in protecting tissue in this area for a period of one week to ten days.

Summary

Decisions on what type of slat material to use should be based upon: cost, durability, freedom from maintenance, walking ease for the pig, self-cleaning and sanitation characteristics. It is generally conceded that good quality concrete slats are the most durable and the least expensive. Concrete slats also function extremely well for most phases of the life cycle.