



pork industry handbook

COOPERATIVE EXTENSION SERVICE • MICHIGAN STATE UNIVERSITY

Decking for Nursery Pigs

Authors

E. T. Kornegay, Virginia Polytechnic
Institute and State University
Art Muehling, University of Illinois
Don Orr, Texas Tech University
Rick Wilson, Ohio State University

Reviewers

J. W. Branch, Louisiana State University
W. W. Irish, Cornell University
Sam Kennedy III, Clear Lake, Iowa

As pigs continue to be weaned at an earlier age to increase sow productivity, practical rearing systems and nutritional programs are needed. Poor postweaning performance is an increasing problem as pigs are weaned earlier. Most conventional nurseries are designed and built to meet the environmental needs of pigs weaned at six weeks of age. Decking has been developed for earlier weaning programs.

Decking refers to housing of weaned pigs in small cages or pens in either single, double or triple decks (tiers). Single decks, better known as flat or raised decks or nursery cages, are usually 12-30 in. above the floor as is the bottom deck of the double- or triple-decked systems, except where decks are used in existing nurseries.

Decking offers economic and management advantages over conventional systems, but is not a substitute for good management. The apparent success of decking is due in large part to an improved environment which minimizes postweaning stress and to increased attention by the operator.

This fact sheet describes various decking systems and management practices that should result in improved performance of weaned pigs.

Advantages of Decking

1. Decking can increase the stocking density of new nurseries, thus reducing building costs per pig. Double decking also enables the producer to increase the capacity of existing conventional nurseries at much less than the cost of providing additional space at floor level.

2. Decking appears to make it easier to provide the environmental needs (temperature, ventilation, feeder and waterer space, and floors) of the weaned pig. Thus, stress on the young pig is reduced, and performance is improved.

3. Pens in decking systems are smaller, thus reducing the number of pigs per pen, allowing the pigs within each pen to be grouped more uniformly, resulting in less pig stress.

4. Operating costs of decked nurseries are less because of better use of heat. The top decks occupy space which is heated but not otherwise used. The top decks are usually warmer because of temperature stratification within the room and can be used for smaller pigs which require a higher temperature environment.

5. Slotted floors which are generally used in decks stay cleaner and drier than solid floors, thus providing improved conditions for small pigs.

6. Decking systems are conducive to an early weaning program which can increase sow productivity.

Disadvantages of Decking

1. Difficulty in removal of the pigs from the top pens in a double- or triple-deck system is the biggest drawback, especially as the pigs become larger. As more experience with decks is gained, and as buildings are designed or redesigned to facilitate decks, this problem will probably be solved or at least diminished. The pigs do not have to be moved until they are taken out of the decks. Also, they should not be allowed to get over 50 lb. in double- or triple-decked nurseries. Using pens limited to a depth of 3 ft. and removable front gates eases the manual handling of the pigs in a multiple-level pen system.

2. Observing pigs in the lower deck is difficult if the bottom tier of cages is located at floor level. Also, observing pigs at all levels is difficult when using large feeders that cover most of the cage front.

3. Design and management of ventilation and heating systems in multi-decked nurseries are more critical than in conventional nurseries since adequate ventilation and uniformly distributed heat is needed at all levels.

4. Decking requires better planning, and smaller nursery rooms are needed where all-in, all-out management is used.

5. Maintenance of feeders, waterers and water supply lines may be difficult depending upon the arrangement of

pens in the nursery. Proper planning before installation will minimize this potential problem.

6. Pigs are not as clean on the bottom decks of multi-decked nurseries, but performance has not been shown to be affected.

Decked Nursery Systems

Decking can be used in a variety of ways in old and new nurseries. In old nurseries with conventional pens, a second deck can be added over a part of existing pen partitions or on self-supporting legs (Figures 1 and 2).

In new nurseries or in completely remodeled nurseries, greater opportunities exist for increasing density by using multi-decked arrangements of cages (Figures 3 and 4). Even in single-tier, flat-deck nurseries, pig density may be increased if cages are arranged properly.

Research has shown no difference in performance of pigs raised on the bottom or top deck of a double-deck system. Also, there were no differences in performance of pigs housed on the top, middle or bottom decks of triple-deck systems. In these studies, dropboards were not used between decks of cages; thus urine and feces dropped through the lower deck to the floor or into a pit. Pigs on the bottom decks were sometimes dirtier than the pigs on the top decks, but performance was not affected. If a producer desires, dropboards or metal trays can be used to deflect the urine and feces to keep it from entering the decks below. This option, however, would increase costs for installing and labor for cleaning.

In general, open bar partitions are used in commercially available cages. Many of the homemade upper decks, par-

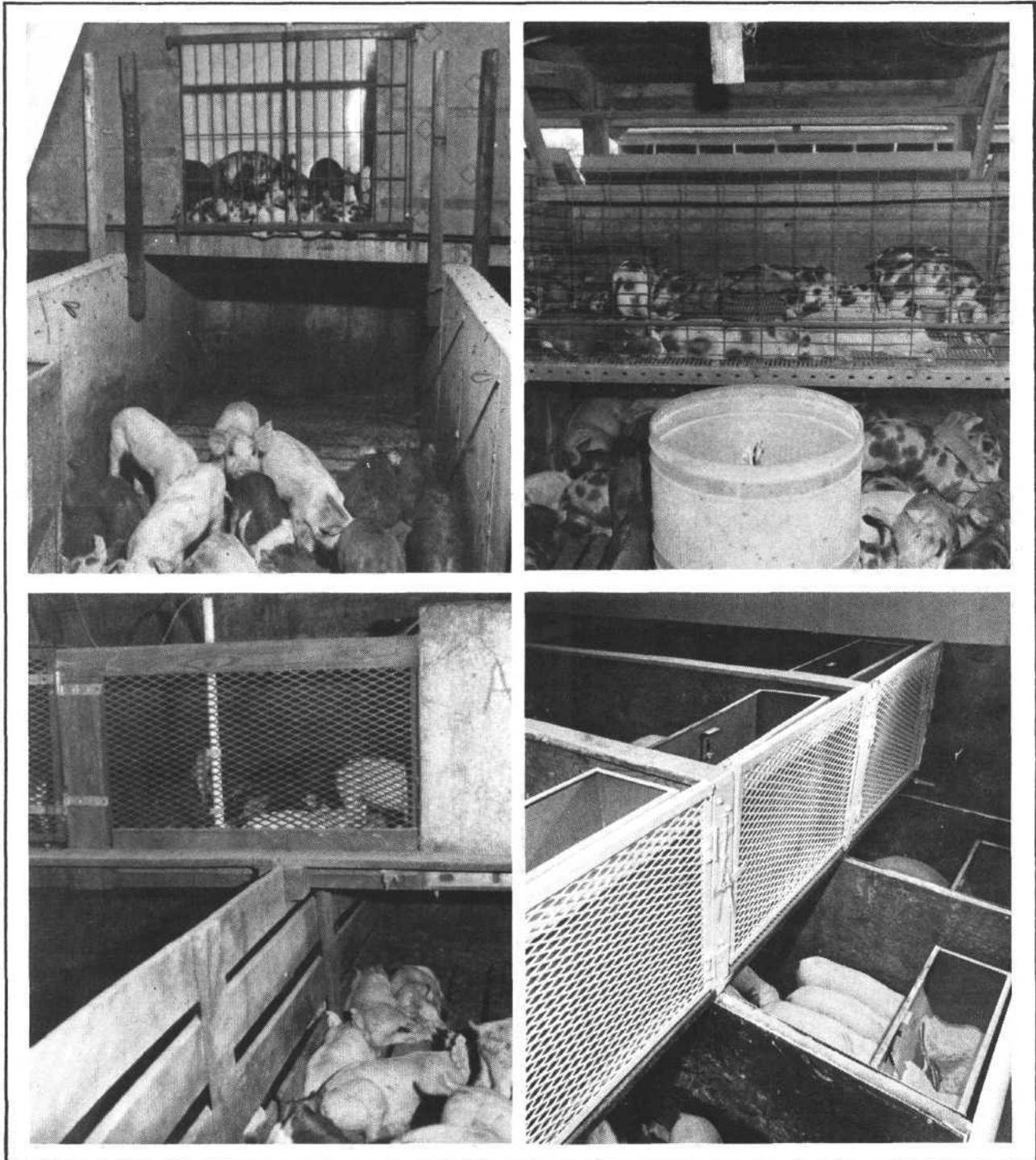


Figure 1. Decked nurseries that have been added over existing nursery pens.

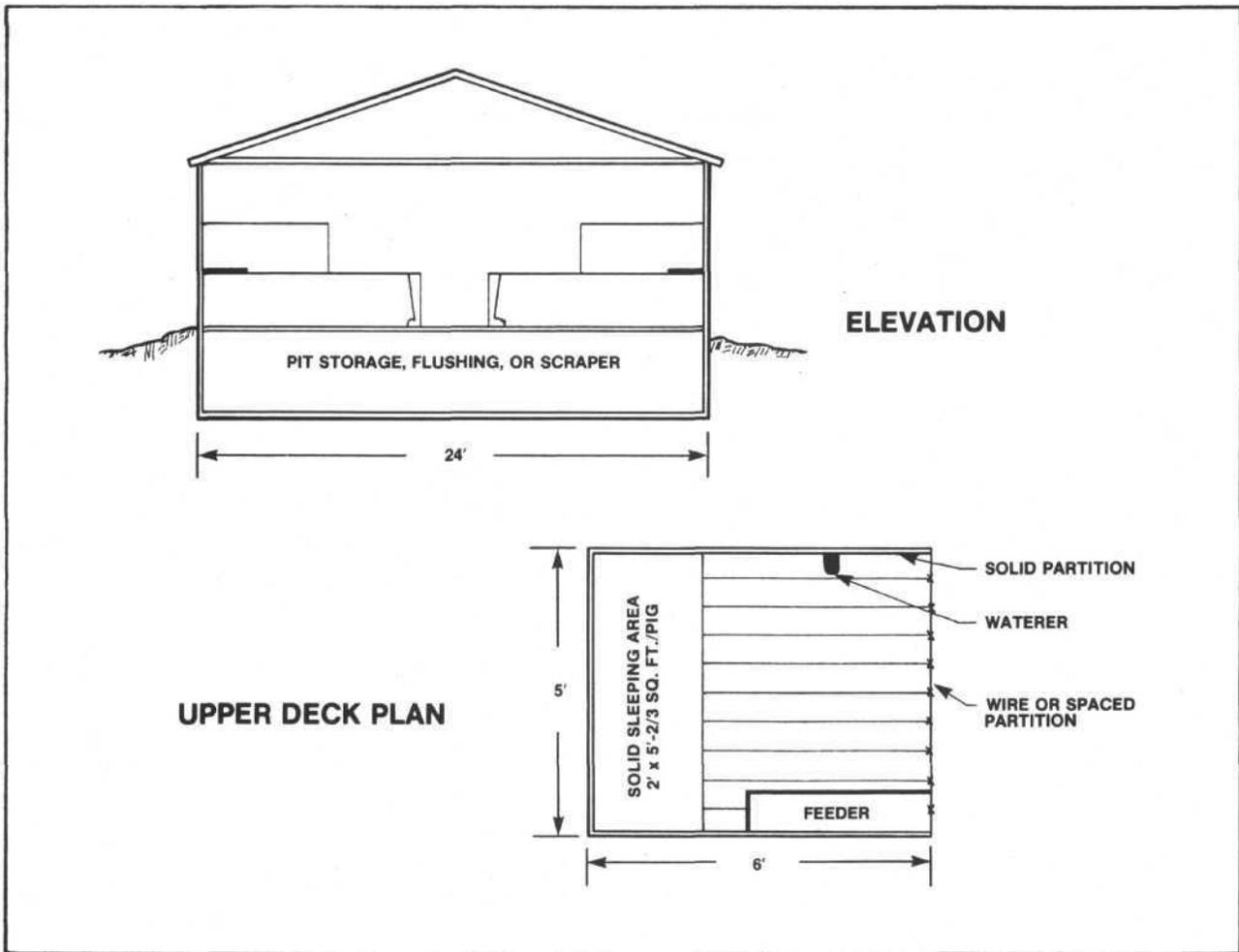


Figure 2. Views of decked nurseries which were added over existing nursery pens. An alternate arrangement for the top pens would be to locate the sleeping area and feeder in the front near the aisle and the waterer in the rear of the pen over the slotted floor.

ticularly those built over existing facilities, have either two or three solid sides.

Once the decision has been made to deck, there are numerous questions concerning floors, feeders, partitions, waterers, size of pens or cages, arrangement of cages in the nursery, heat, ventilation and waste removal systems, which must be answered.

Management and Environmental Needs

Types of floors. A slotted floor (65-100% slotted) with a solid floor section or an overlay, which can be located in the center of the cage or pen or near the front adjacent to the feeder, gives the best performance. Waterers should be located in the rear of the cage. A floor overlay or section of solid floor provides a solid surface for the pigs to lie on, thus reducing the amount of body surface area exposed. An overlay is not necessary after pigs are 6 weeks old or when using floors having a higher solid to open ratio of approximately 60% solid to 40% open. The location of the overlay adjacent to the feeder and in the middle of the cage encourages pigs to dung in the rear of the pen. A small amount of feed can be placed on the solid surface of the overlay as an additional enticement to the pigs to start eating soon after being placed in the pen. Feed wastage is readily detected on the solid surface, so feeders can be properly adjusted.

Research has shown that flat rolled, expanded-metal (9 gauge, $3/4 \times 1\frac{1}{2}$ in. galvanized) and woven wire (5 gauge, $3/8 \times 1\frac{1}{2}$ in. galvanized) were equally effective and caused

only a few feet abrasions. Although more expensive than the woven wire, plastic-coated expanded metal ($1/2 \times 1$ in. openings) worked well, and pigs had still fewer abrasions. Daily gain, feed intake and feed efficiency were not different between pigs housed on either of the above floors.

Likewise, there was no significant difference in pig performance when aluminum slats (3 in. wide, $1/2$ in. opening), concrete slats (4 in. wide, $3/4$ in. opening), plastic-coated steel mesh ($3/8 \times 1$ in. opening), woven wire (5 gauge, $3/8 \times 2\frac{1}{2}$ in. galvanized) and oak slats (4 in. wide, $1/2$ in. opening) were compared. However, feed efficiency was 7% poorer for pigs housed on aluminum slats compared to pigs housed on the other flooring materials.

Other reports suggest that 3-in. aluminum slats spaced $3/8$ in. apart lacked the cleaning properties of other flooring materials. Fiberglass t-bar slats ($1\frac{1}{8}$ in. slats with $3/8$ in. spacing) have good cleaning properties, but not as good as plastic-coated or bare expanded metal, woven wire and welded wire mesh. Perforated metal slats (12 gauge, $7\frac{3}{4}$ in. slats with $3/8 \times 7/8$ in. recessed opening) have excellent cleaning properties. It is important that metal slats be separated with spacers to allow better cleaning, which will extend their life.

Proper support spacing and the use of galvanized coating extend the life of expanded metal, woven wire and welded wire mesh. Also, thorough cleaning of these floors immediately after removal of pigs will extend the life. Lightweight (24 gauge) expanded metal and oil-tempered wire cloth (12 gauge, $1/2 \times 1/2$ in.) are less desirable although less expensive.

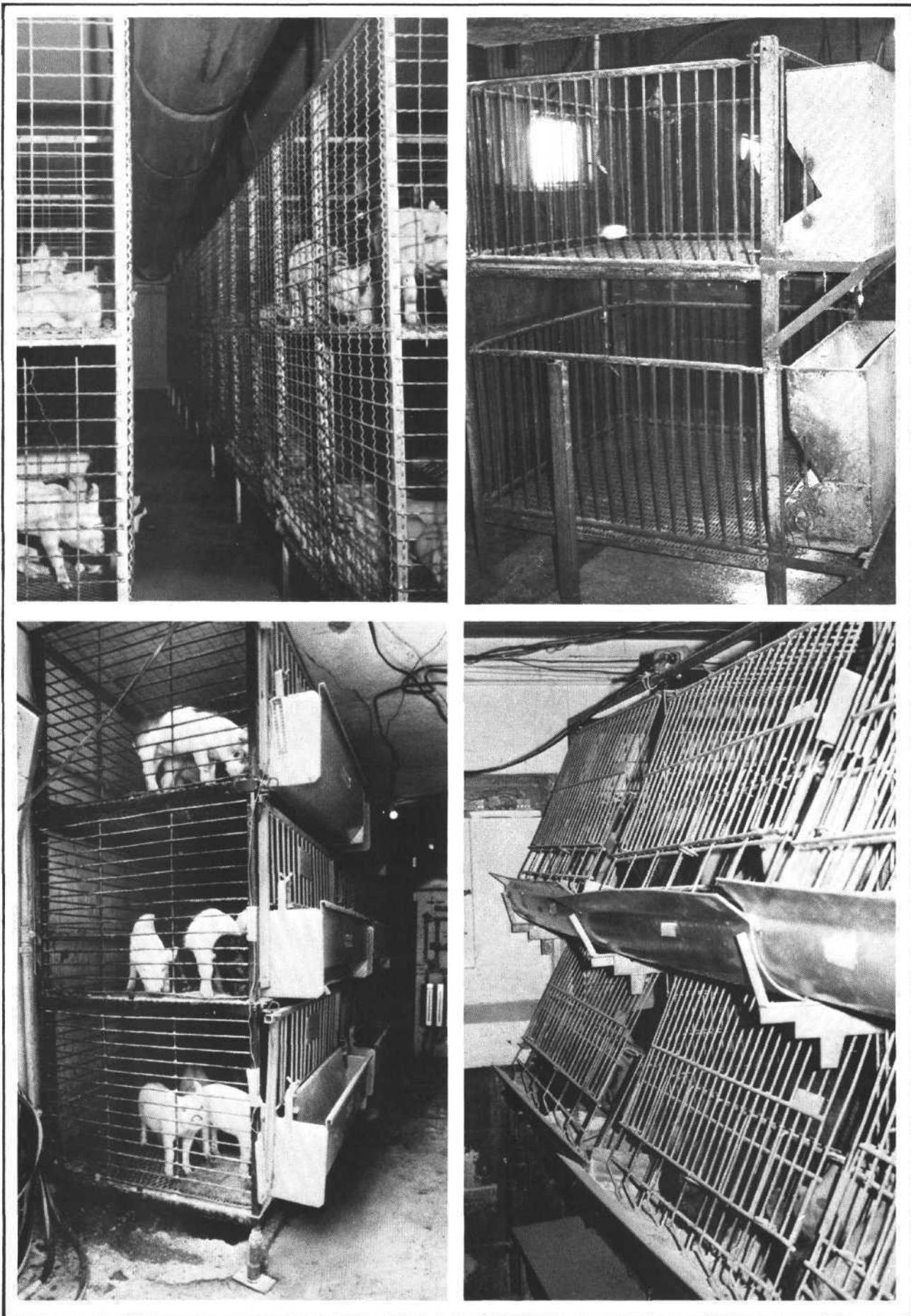


Figure 3. Multi-decked nurseries.



Figure 3. Multi-decked nurseries (continued).

Several flooring materials are shown in Figures 5 and 6. **Floor space recommendations and number of pigs per pen.** The ideal stocking density (floor space per pig) is not clearly known, but the following guidelines are suggested: 1.6 sq. ft. per pig up to 30 lbs.; 2.0 sq. ft. up to 40 lbs.; and 2.7 sq. ft. up to 50 lbs. Use the final weight at which pigs leave the pens when calculating the floor space required.

Research clearly shows that daily gain and feed efficiency declined and tail biting increased as the number of pigs per pen increases above 8.

Feeders and waterers. Either an open trough or self-feeder can be selected. If the feeder is located outside the front cage partition, all floor space can be used for pigs. The open trough offers the following advantages: It spans the entire front of the pen providing maximum feeder space per pig; it has a very low profile providing good observation of pigs; it is located at the front of the pen making it easy to add feed, to clean, and to observe the condition of the feed; and it lends itself well to restricted feeding during the first 2 wks. (Restricted feeding will be discussed in more detail later.) There are some disadvantages of open trough feeding. As the pigs get larger, it is more difficult to remove pigs from the pen; and it becomes necessary to fill the trough twice and perhaps three times per day. Feed wastage is more of a problem when the pigs are larger and the trough is filled to capacity. A lip or some other device may be needed to prevent feed wastage.

The self-feeder provides free choice feeding with a minimum of labor, and if properly designed and operated, can minimize feed wastage. A wide, low profile self-feeder is recommended which allows a producer to check the feed as well as the pigs in the pen. The self-feeder works especially well with larger pigs. Avoid tall, narrow self-feeders that do not provide adequate feeder space per pig and make it difficult to observe pigs. Observation may be improved by placing the feeder in the fenceline; however, adding feed is more difficult, and this system would only work for single or flat decks.

The accumulation of manure and urine in the lower deck feeders or troughs has not been a problem when they are located outside the front of the pen and the pigs are trained to dung in the rear. As pointed out earlier, an overlay located adjacent to the feeder is helpful in training the pigs. As the pigs grow and become crowded in the pen, the op-

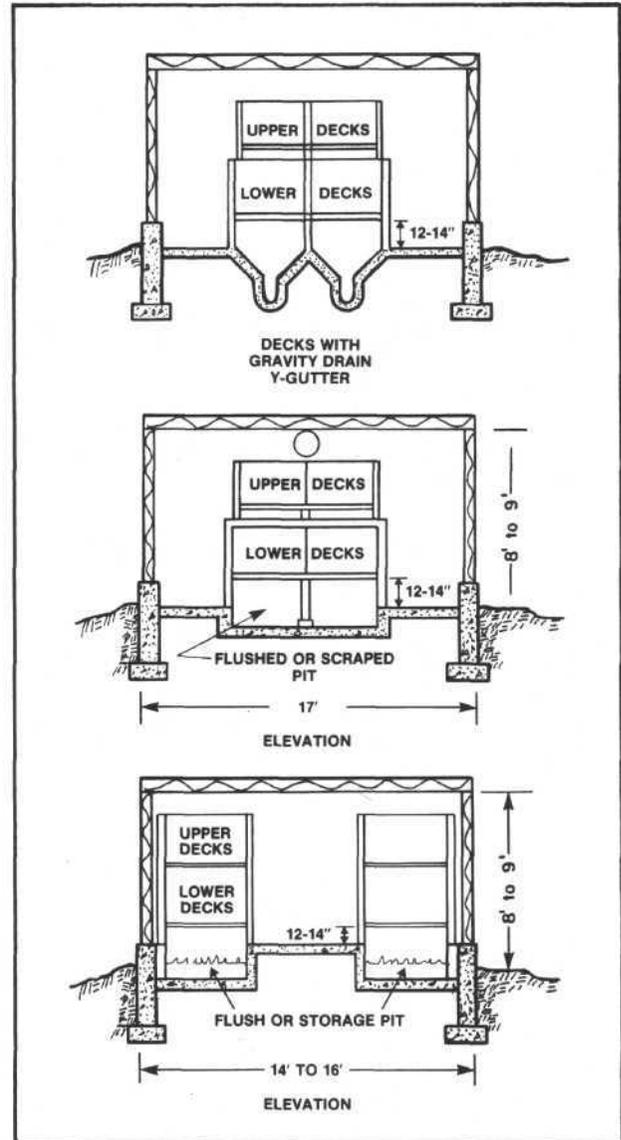
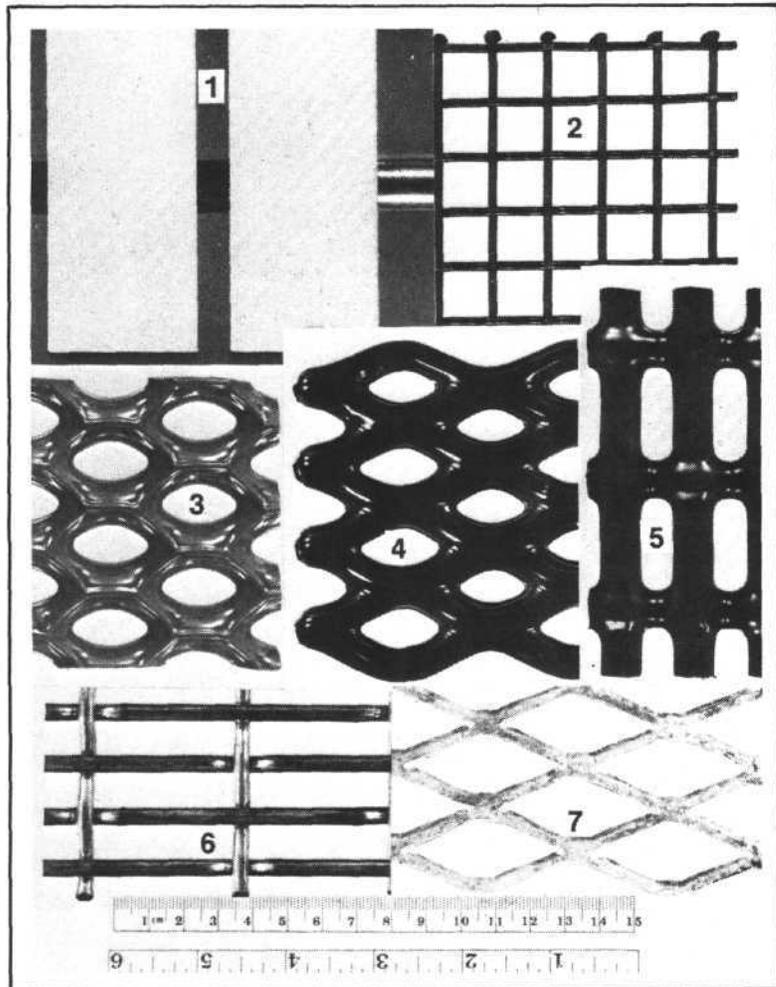


Figure 4. End views of multi-decked nurseries.

Figure 5. Flooring materials that have been used for nurseries.
 (1) Fiberglass t-bars,
 (2) oil tempered wire cloth,
 (3) plastic coated expanded metal,
 (4) plastic coated expanded metal,
 (5) plastic coated woven wire,
 (6) galvanized woven wire and
 (7) galvanized expanded metal.



portunity for dunging in the trough becomes greater. Placement of the male pigs on the upper decks helps minimize the problem.

Feeder space per pig is as important as stocking density and is especially critical until pigs are eating well. Early weaned pigs which have eaten relatively little solid food before weaning should have about 2-3 in. of feeding space per pig, initially. The feed spaces should be sectioned such that the pigs cannot crawl into, be caught in, or sleep in them. Ideally, there should be one feeding space per pig, especially with early weaned pigs. Unfortunately, the section spacing that is best for young pigs may be too small for larger pigs and could prevent easy access to the feed by older pigs. This means that if a producer is following an early weaning program (less than 4 weeks) and wishes to keep pigs in the nursery for a long period of time (more than 40 lb.), a two-stage system would be best (pre-nursery and nursery).

Nipple waterers work well, although some producers prefer small bowl waterers for the young pigs unaccustomed to using nipple waterers. If the waterers drip continuously for a few hours after the pigs are first put into the pen, young pigs are quickly trained to use nipple waterers. The tip of the nipple waterer should be about the height of the pig's back. One nipple waterer is recommended for 8 to 10 pigs.

Temperature and ventilation. Temperature of the nursery is extremely important for the first few days after weaning, especially until the pig starts eating well.

For pigs weaned at 3 wks. of age, the temperature at pig level should be about 85 F. for the first 2 wks. Thereafter, it may be lowered about 3 degrees F. per wk. to a minimum of about 70-75 F. for 8-wk.-old pigs. The type of flooring mate-

rial, amount of wall and ceiling insulation, and the amount of air movement will all influence the temperature needed.

If pigs are all piled-up and drawn-up, they are probably cold, no matter what temperature is observed on the thermometer, and thus more prone to scours outbreaks. Maintenance of a constant temperature is as important as the actual temperature. Variation of more than 5 degrees F. can cause scours outbreaks, poor performance and death losses during the first few weeks.

Ventilation is necessary in totally enclosed buildings to provide fresh air and to remove odors, gases and moisture, all of which help to improve the pigs' comfort and to reduce the temperature in warm weather. The greater the density of pigs in the nursery, the greater the volume of air required. Method of manure removal and amount of manure exposed to air affect ventilation rate. A minimum continuous ventilation of 2 cubic feet per minute (cfm) per pig is required in cold weather with an installed mild weather capacity of 10-15 cfm per pig.

For hot weather, provide 25-40 cfm per pig depending upon average size of pig and location in the U.S. Low volume, continuous underfloor exhaust fans seem to work best for cold weather ventilation in slotted floor buildings.

Locate decks in existing nurseries away from the direction of the incoming air. For example, in nurseries with a slot inlet where incoming air is directed across the ceiling, the decks should be located next to the wall. In cases where air is directed down the wall or with an inlet in the center of the building, locate decks near the center of the nursery. Incoming air should not enter the deck area until it has a chance to mix with warm air. Keep the upper deck at least 30 inches below the ceiling to prevent drafts. Consider using solid partitions on 3 sides to further reduce chilling

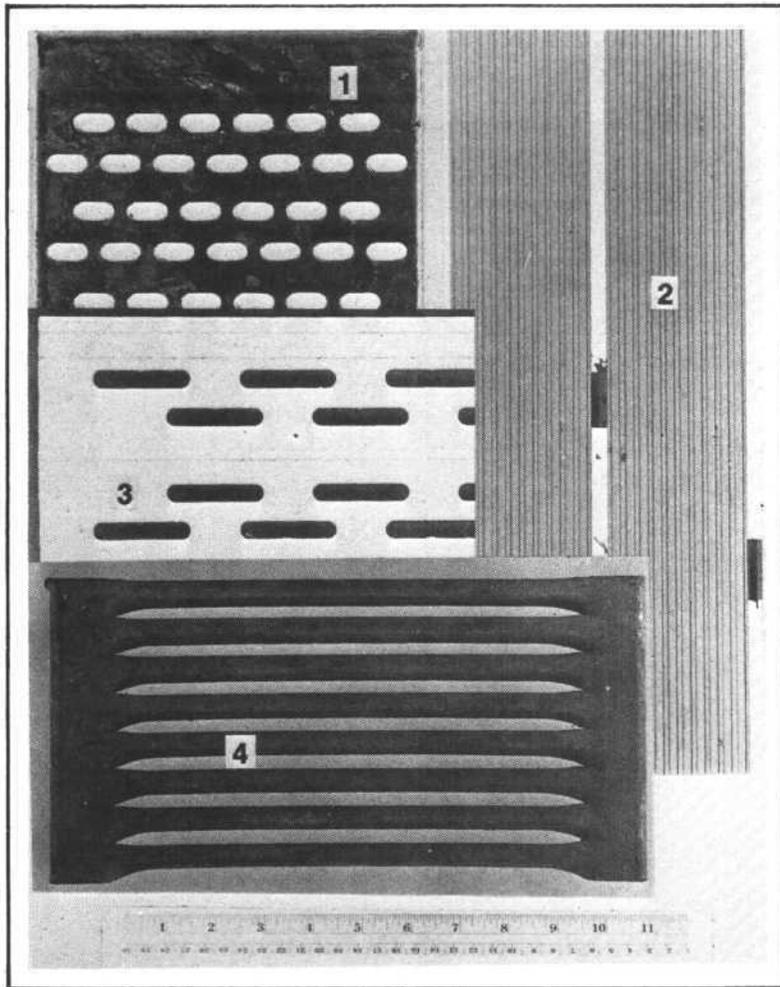


Figure 6. Flooring materials that have been used in nurseries.
(1) Perforated metal panels,
(2) plastic slats,
(3) fiberglass and
(4) slatted steel panels.

drafts. A partial hover may also be needed to prevent severe draft problems. See PIH fact sheets numbered 41, 54 and 60 for more information on ventilation.

Nursery heat should be turned on about 24 hrs. prior to intended use so that pigs are introduced to a warm, clean and dry environment.

Light Intensity. Subdued light (red or dim) and minimum traffic in the nursery are reported to reduce vices, such as ear and navel sucking, flank nuzzling, tail biting, and even to reduce the incidence of scours. Low light levels subdue the activity of pigs. Bright lights are necessary for feeding and inspecting the pigs twice daily.

Nutrition and Feeding

Early weaned pigs should initially be offered fresh food daily. In general, if pigs are consuming dry diet prior to weaning, the stress at weaning and any associated problems can be minimized. Exposure during lactation of early weaned pigs to a high quality creep diet may be more important than with late weaned pigs.

The early acceptance of a dry feed by newly-weaned pigs is largely based on the feed's palatability. Quality and kind of ingredients, including freshness, influence the palatability of a starter feed. Palatability can be lost if the feed is allowed to become moldy or stale. Provide fresh feed daily during the first week.

Scours, which often occur 4 to 5 days after weaning in newly-weaned pigs, may be caused by pigs gorging themselves. Postweaning digestive disorders from overeating can be minimized by stimulating a high intake of the pig starter (creep) feed before weaning and restricting the intake of the same feed for a few days after the pig is weaned. A low protein level in starter diets will not greatly reduce

scours in newly-weaned pigs. Rotaviruses are thought to be involved in this type of scours.

If pigs become gaunt or have rough hair coats, they probably are not eating enough. Perhaps the starter feed was not palatable or the pig did not learn to eat. Carefully observe; then identify and give these problem pigs special attention.

Fineness of grind, if a meal is fed, may be important for pigs weaned before 3 wks. of age. Younger pigs tend to sort out certain ingredients if the diet is not finely ground (.07 in. screen). However, the meal should not be powdery. Good quality pellets are very acceptable.

Wet feeding has no advantage over dry feeding and requires greater management to get equal performance.

Sanitation and Disease Control

The all-in, all-out concept is necessary to minimize disease risk to which the pig is exposed. Facilities and equipment must be thoroughly cleaned and disinfected between groups of pigs and then kept as clean as possible during the time the pigs are in the pens. However, washing down pens and floors should be kept to a minimum while pigs are in the nursery. Dry scraping would be best. The ability of the pigs to respond immunologically to disease-causing organisms and to the normal microflora found in a swine operation is at its lowest when the pigs are 2-5 wks. of age and when the pigs are no longer protected by antibodies that are normally present in sow's milk.

Research indicates a 25-50% improvement in weight gains for weaned pigs raised under all-in, all-out systems compared to a continuous system. Diarrhea and pneumonia can be significantly reduced when the all-in, all-out system is followed.

Guidelines for Success in Decking

1. Minimize stresses due to environment, nutrition, social and disease factors.
2. Provide a comfortable environment. Maintain temperature at 80-85 F., depending upon age, for the first 2 weeks. Lower about 3 degrees F. per wk. thereafter.
3. Provide a clean environment. Practice the "all-in, all-out" system when possible. Thoroughly clean and disinfect between each group of pigs.
4. Design decks to provide good visibility so that pigs can be carefully observed. Give prompt attention when needed.
5. Feed a fresh, high quality starter feed. Be sure that pigs are eating. Provide fresh feed daily during the first week. Pigs can be self-fed thereafter.
6. Monitor the ventilation system closely. Check for distribution and fluctuation of temperature and air movement. Ventilation needs will increase as the pig grows.
7. Provide properly insulated walls and ceiling. Uninsulated walls and ceilings result in radiant heat loss from pigs even when the air temperature is warm.
8. Prevent drafts. Overlays in sleeping areas are helpful.
9. Select a floor type that cleans well, is comfortable and causes a minimum of foot and pad abrasions.
10. Allow 1.6 sq. ft. of floor space per pig up to 30 lbs.; 2.0 sq. ft. up to 40 lbs.; and 2.7 sq. ft. up to 50 lbs.

11. Group pigs according to size, and keep number per cage small. Ten pigs or less per cage is preferred.
12. Low light levels subdue activity and should reduce ear and navel sucking, flank nuzzling and tail biting.
13. With totally slotted floors, a floor overlay placed adjacent to the feeder or in the center of the pen provides a solid surface for the pigs to lie on and upon which to place a small amount of feed initially to entice the pigs to eat. An overlay adjacent to the feeder can also encourage pigs to dung in the rear of the pen where the nipple waterer should be located.
14. Decking is not the cure for poor management, but it is conducive to better management.

Additional information can be found in the following publications:

PIH-41	Maintenance and Operation of Ventilation Fans for Hog Barns
PIH-54	The Environment in Swine Housing
PIH-60	Mechanical Ventilation of Swine Buildings
PIH-70	Swine Nursery Units
MWPS-8	Swine Handbook, Housing and Equipment

Reference to products in this publication is not intended to be an endorsement to the exclusion of others which may be similar. Persons using such products assume responsibility for their use in accordance with current directions of the manufacturer.

MICHIGAN STATE UNIVERSITY



MSU is an Affirmative Action/Equal Opportunity Institution. Cooperative Extension Service programs are open to all without regard to race, color, national origin, or sex.

Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8, and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Gordon E. Guyer, Director, Cooperative Extension Service, Michigan State University, E. Lansing, MI 48824.

This information is for educational purposes only. Reference to commercial products or trade names does not imply endorsement by the Cooperative Extension Service or bias against those not mentioned. This bulletin becomes public property upon publication and may be reprinted verbatim as a separate or within another publication with credit to MSU. Reprinting cannot be used to endorse or advertise a commercial product or company.

1P-3M-6:81-UP, Price 25 cents. Single copy free to Michigan residents.