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## Combining Swine Housing Units into a System of Buildings

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Specialized commercial pork producers have caused many changes in the typical swine production setup. The facilities of an intensified system today are likely to resemble an assembly line. The size and other characteristics of the units may vary, but an overall unit must be complete, including farrowing through finishing, feed processing and manure handling. Most of the animals, including the breeding stock are kept on surfaced floors under roof. Capacities, in number of hogs finished per year, are highly variable but most units require a large financial investment. Careful planning is essential when considering the initial setup and possible future changes and expansion which ensure that the system operates profitably and with a minimum of problems.

### System Planning

The first principle of planning is to consider the complete swine unit, not just one building at a time. When planning a new system, keep in mind the expansion that might be planned 5 to 10 years ahead, or longer. Consider the flow patterns of the three major products—feed, pigs and manure. Handle each with a minimum of labor and expense, but bear in mind that the overall unit must provide optimal environmental conditions for efficient pig growth and operators' comfort and safety.

### Site Selection

Proper choice of a site for a new operation or a major expansion is very important. If a poor location is chosen, there may be serious problems for a long time. Some factors to consider:

**Zoning.** Check out local zoning laws and regulations for the proposed location. If it is zoned other than agriculture, study the situation carefully before building. Even agricultural zoning is no guarantee against a nuisance suit due to poor management of the operation. Also, check state regulations relating to constructing a new hog unit or manure management system. Some

states today have established setback distances for new or major expansions to be located in relation to their neighbors. Other states have stringent water quality protection standards that must be met.

**Prevailing wind direction.** Locate downwind from your residence and from any neighboring residence to minimize potential odor problems. Normally, this means having a major concern for the neighbors to the north, northeast and east of the hog operation. When possible, choose a location which protects the facilities from cold winter winds and snow accumulations.

**Access to roads.** Hogs, and usually feed, must be moved at all times of the year. An all-weather road for trucks marketing hogs and delivering feed is essential to connect your setup to the public road system.

**Access to power and water.** Check the installation cost when considering locating a long distance from where electricity is available. Power companies can charge a sizable amount for running a line to the new buildings. If a high electricity demand is anticipated, check the availability of three-phase power. Consider standby generating equipment with proper switching to disconnect from the utility company source. Warning devices or an alarm system to indicate loss of power also should be considered.

Determine total daily water requirements. As a general rule, water intake will be about 2 to 2 1/2 times the feed intake, although this varies with season, temperature and amount of salt in the ration. In hot weather, water consumption may be twice what it is during the winter months. Allow for some wastage and plan for some reserve for peak demands and for future expansion. Allowances also should be made for washing floors and flushing gutters if fresh water is used. If enough water cannot be provided, choose another location or scale down the proposed facility.

**Drainage.** Surface and subsurface drainage is necessary for all buildings. Choose higher locations with good drainage, and

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those where the drainage can be controlled so as not to pollute ground or surface water. Construct the building above ground level and use gravel fill under the floor to insure good drainage. Drainage from covered buildings is not as much of a problem as surface drainage from open lots. Proper collection and disposal of all runoff which comes in contact with manure is necessary.

**Security.** Locate hog operations near enough to an owner or operator residence to provide security for the unit. It is not a good idea to locate a new hog operation at an abandoned farmstead just because the utilities are already present if there are no living quarters to provide needed security.

**Environmental concerns.** Locate the hog operation a reasonable distance away from neighbors, from your residence and from major highways. It is important to practice good house-keeping and maintain a neat farmstead because a messy appearance leads people to think there is an odor. Landscaping should be a part of the planning process. Manage manure handling carefully to minimize odors which affect your family as well as your neighbors.

Consider an active public relations program. Visit with your neighbors and learn of any complaints. Let them know you are concerned. Allocate some expenses for neighborhood barbecues, pig roasts or other public relations activities.

**Existing facilities.** Evaluate existing facilities carefully. Use them only if they are located properly, are in good condition and fit into your system plans. Frequently, producers lock themselves into a location because of an existing building, even if it is in a poor location or is otherwise unsuitable. Many times a small beginning grows into a large complex which should not be situated in an unsatisfactory location because of an earlier existing building.

## Building Planning

The first consideration in planning the buildings is to determine the number of pigs you plan to produce. Building sizes depend on the number and kind of pigs to be housed. These factors, in turn, depend primarily on the size of the sow herd and the interval between farrowing or the number and frequency for purchasing feeder pigs. However, many times producers cannot construct the complete farrow-to-finish unit at one time. They may start with a conservative farrowing schedule with a farrowing-nursery unit and sell feeder pigs. Later they can increase the farrowing frequency and add to the nursery unit as they develop their managerial skills and acquire capital, which allows the building construction to be phased. A producer may prefer to purchase feeder pigs and begin with a growing-finishing unit with the farrowing and nursery units added later.

**Future expansion.** Always keep future expansion in mind when planning a system. Many operators have no intention of expanding when the system is initially established. But circumstances change rapidly, and increased production may be desired only a few years later. If possible, don't build yourself into a corner where expansion is not possible because of location or the arrangement of buildings.

**Manure management.** Plan manure management carefully for the entire system. Check all the latest regulations which may apply to the operation. Some states require permits based on facility design, soil types and manure waste water utilization planning. Water pollution and odor nuisance are the major concerns. All polluted overflow and runoff must be controlled so there is no danger of ground-water or surface water pollution in the area. Manure must be managed so odors do not become a problem for neighbors or the operator's family. Decide whether or not to retain maximum fertility value from the manure—different methods of handling greatly affect the fertility value when applied to the land for crops. If a lagoon is planned, check the soil conditions to see if it will hold water; special synthetic or clay liners may be required. Consider expansion at a future date when choosing and sizing this system.

**Reliability, durability and simplicity.** When planning facilities, consider the factors of reliability of equipment and availability of repair parts, durability of materials and simplicity of design. Many systems will require considerable maintenance and repair in a short time. Use reliable, pig-proof equipment that will not immediately require repair or replacement. Choose materials and equipment that are nonerodable whenever possible. For equipment that must function each day for satisfactory operation of the unit, such as feed augers, ventilation fans, waterers and possibly some manure handling functions, use reliable equipment for minimal maintenance. Good feeders can reduce feed costs by minimizing waste. Reliable waterers minimize water waste.

Durable materials also help reduce maintenance. Pen partitions, gates and wall linings all must be durable to withstand hogs in enclosed areas. Many hog buildings have wall linings that lack durability and are not rodent resistant. Use materials that are nonerodable whenever possible. Some buildings have required extensive renovation after 3 to 5 years. Producers also should seek simplicity in design, resulting in minimal maintenance. When the design is kept simple, fewer operational problems seem to arise. This is especially true for ventilation, heating and manure management.

**Building spacing and orientation.** Where several buildings are lined up together, sufficient space must be left between buildings to allow for adequate ventilation and operating space. More space for air movement is required between taller buildings than between low-profile buildings and between naturally ventilated buildings than between mechanically ventilated buildings. For good air movement and adequate operating space for filling bulk tanks and hauling manure, provide a minimum of 40 ft between buildings. Fifty to 60 ft is better if the buildings are to be naturally ventilated and if big manure tank wagons (3,000 gallons and larger) are to be used.

Open buildings should be oriented so the open portion is away from the prevailing winter winds—usually they would face the south or east. Buildings that are naturally ventilated should be oriented so the prevailing winds strike the side of the building rather than the end; locate them on a ridge instead of in a valley. Silos and similar obstructions to airflow should be located on the downwind side of the building to reduce turbulence. For good solar orientation, run the long axis east-west to reduce wall exposure during summer and to permit sun penetration in winter.

**Plan for fire safety.** Fires in hog buildings continue to be fairly prevalent. Most of the fires can be traced to gas heaters or electrical wiring. New building materials with poor fire ratings spread the fires once they have started. Many pigs have died, costly facilities have been lost and human beings have narrowly escaped in these fast-burning fires. Insurance companies are very concerned about how the fires are started and what materials contribute to their rapid spread. Consideration must go into reducing fire hazards since insurance companies are forcing change through increased insurance premiums. Insurance companies are recognizing construction techniques that reduce fire hazards by offering lower premiums.

Consider the following factors to reduce the fire hazard:

- Choice of materials. Choose materials wisely. Eliminate materials that have a rapid flame-spread rating. Some of the rigid foam insulations may need a lining to retard the spread of fire.
- Electric wiring. Follow an approved code such as the National Electric Code for all wiring. Careless wiring can be a cause of fires. Corrosion in exposed wiring and switches can cause shorts and result in a fire. Refer to PIH-110, *Electrical Wiring for Swine Buildings* for more information. Many insurance companies will not insure a hog unit unless noncorrosive materials are used and standard codes followed.



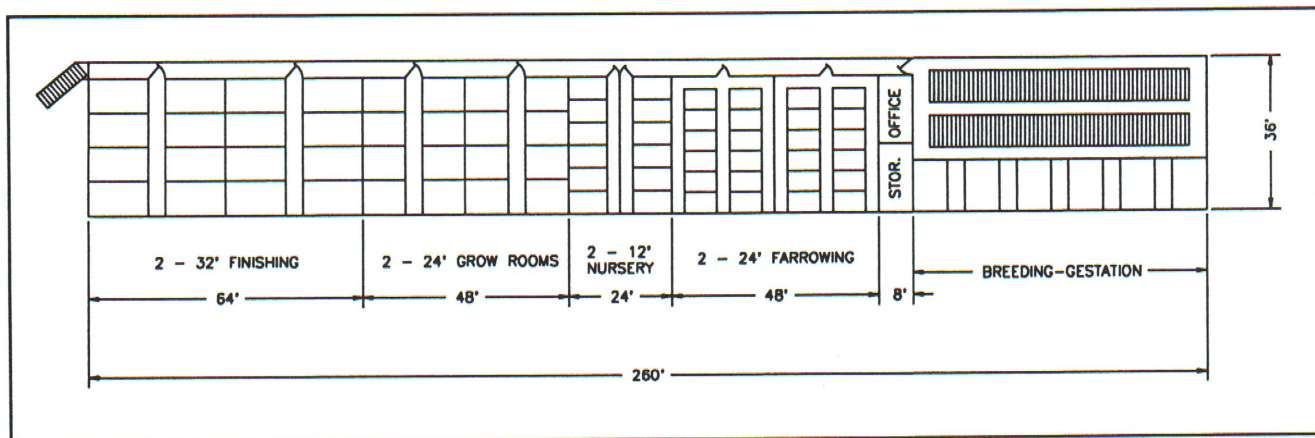


Figure 1. Production-line System, 100 Sow Herd.

- Heaters. Install all heaters properly. Provide routine maintenance as needed (cleaning, oiling motors, etc.). Gas space heaters located inside have been identified as a major cause of fires. Heaters located outside the building should reduce this hazard. Heat lamps and other heating units should be protected from the pigs at all times.
- Fire walls. Intensified pork production systems have become quite large. In many systems, very long buildings are constructed and/or separate buildings are connected without using fire barriers. If a fire started in any part of these large, connected complexes, the entire unit would be lost. Use approved fire walls in large complexes to restrict a possible fire to one portion of the building instead of letting it spread throughout the entire unit.

**Aesthetics.** Plan to give your pork production facilities a pleasing appearance. A little landscaping effort, such as grading, keeping the grass neatly mowed and planting a few bushes and flowers, can do wonders to improve the appearance of otherwise drab facilities and help promote pork products. Colored siding or regular painting also can do a lot to help the appearance.

There also may be a management benefit with attractive buildings. The manager will take greater pride in the system and, consequently, will tend to spend more time working in the buildings and caring for the animals. Building maintenance is usually also improved. Neighbors will not be as critical of a neatly kept place as they are of a messy, unsightly place.

## Building Systems

There are several different methods for arranging buildings into a production system. New systems are planned for a certain sized sow herd or for a certain production size. Many others just grow as the production expands. If existing buildings are used, their worthiness in a long-range plan should be carefully evaluated. It may be better to use them for sows or overflow and build at a different location or in a more efficient arrangement than to incorporate an old building into a new production system.

All farrowing units in the following systems presented in this paper are planned using 5-ft by 7-ft farrowing crates. For nursery, growing and finishing facilities, space is planned by allowing 2 to 2.5 sq ft per pig to 30 lb, 3 to 4 sq ft to 75 lb, 6 sq ft to 150 lb and 8.5 sq ft to 240 lb.

**Production-line system.** The production-line system was developed as an in-line system because of the ease of moving pigs. In systems with separate buildings, it is difficult to move pigs from one building to another even though the buildings are connected with a paved walkway. One person can move pigs almost any place within the production-line system as shown in Figure 1.

This production-line arrangement has been planned to allow for all-in/all-out management where each room is emptied and thoroughly cleaned before more pigs are moved in. For several years there has been an interest in using smaller farrowing and nursery rooms to practice the all-in/all-out principle. Today improved performance has resulted in a major interest in carrying the all-in/all-out management on through the finishing stage.

The 36 ft by approximately 260 ft building shown in Figure 1 will handle a 100-sow herd producing about 1,800 pigs per year. Each 12-sow farrowing room would have sows farrowing once each 6 weeks. It would be possible to wean at about 4 1/2 weeks and leave the pigs an additional week before moving them into the nursery. They could be in the nursery unit 6 weeks, in the grower for 6 weeks and in the finishing unit for 6 weeks for a total of 6 months from birth to market. Expansion could be accomplished by lengthening the building for more frequent farrowings. Additional units could be located alongside this one.

**Two building system.** Figure 2 shows an arrangement for a two building system also using all-in/all-out management from farrowing to market. These two 36 ft by 224 ft buildings should house a 150-sow herd which will produce approximately 2,500 pigs per year. Each of the two 12-sow farrowing rooms would have sows farrowing once a month so there would be 12 sows farrowing every 2 weeks. After 3 to 4 weeks, the pigs would be weaned and moved to the nursery. They would remain in the nursery for about a month, in the grower for about 2 months, and in the finishing unit for another 2 months making them ready for market by 6 months after farrowing.

The two buildings are about equal in length and are connected by a covered walkway. The small nursery pigs would be hauled to the grower pens, which is common for most producers. The walkway allows moving the gilts, chosen for the breeding herd from the finishing unit, to the breeding-gestation unit. This arrangement has many of the same advantages of the production-line arrangement because most animals would only be moved within one building which makes for easier movement. The size could be constructed for a larger enterprise by making both a wider and longer building. Locating an office-storage room between the farrowing and gestation units provides a more effective disease barrier.

**Multiple site system.** A fairly new building arrangement that is increasing in popularity with some of the larger producers, especially producers raising breeding stock, is the multiple site system. With this system, the different phases of production are separated by some distance primarily for disease control. Figure 3 depicts such a system with different locations for breeding-gestation-farrowing, nursery and growing-finishing. The distance necessary for separation is not well-defined at this time. Some producers of breeding stock would like to have up to a three mile separation, but most producers should strive to



separate the units by at least one mile. For maximum security against disease transmission between units, it is recommended that a different work force be employed at each location and that there be minimal traffic between the separate units. A further barrier would be to have an all-in/all-out system at each location. This could be possible at the nursery location but would not be possible at the other two sites unless there were separate sites for farrowing and breeding-gestation and possibly more than one growing-finishing site available.

Disadvantages of this system include requiring three different manure management systems which could be more costly. This would also be true of the feed storage and some of the feed distribution equipment. With some units, it may be necessary for some employees to work at more than one site. Another disadvantage is that some state disease control regulations may require that pork producers test a minimum number of hogs at each building site which would increase testing costs.

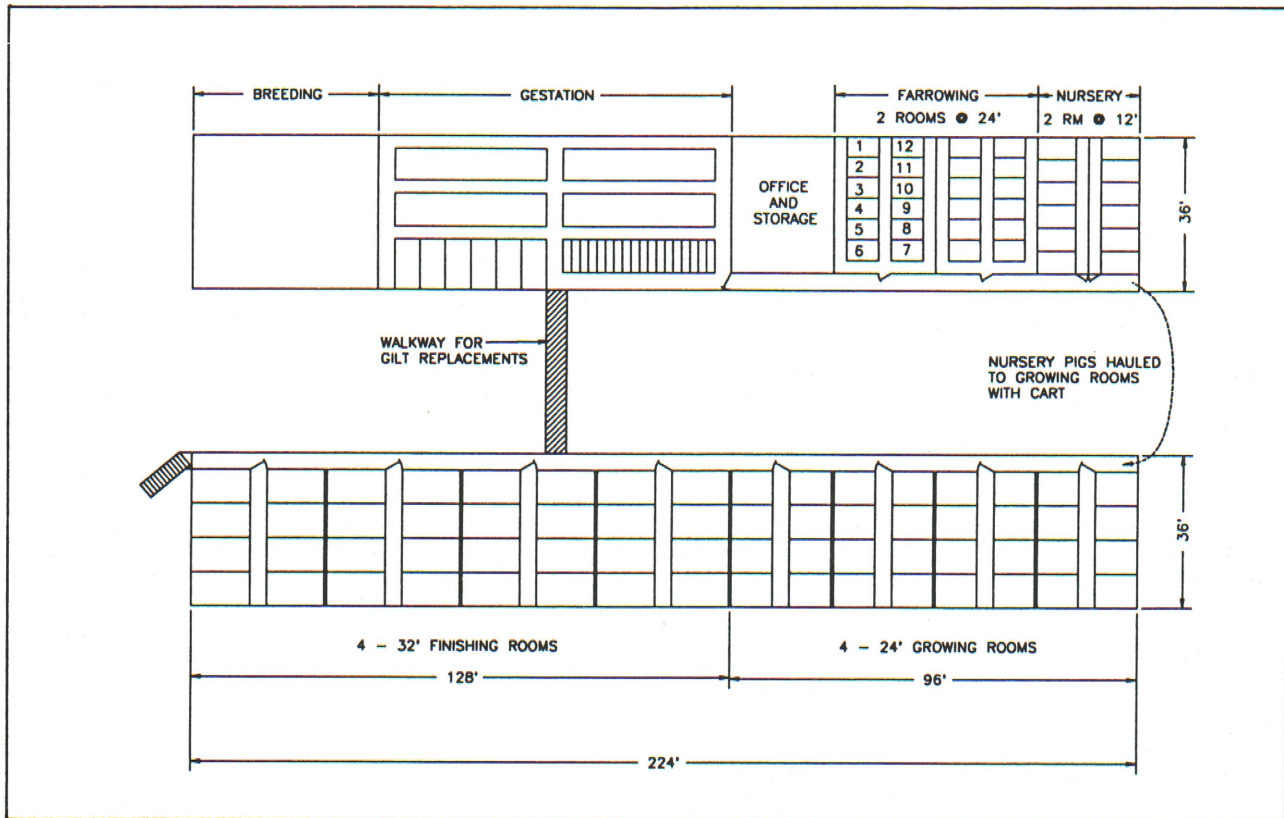


Figure 2. 150-Sow Two-Building All-in/All-out Production Unit.

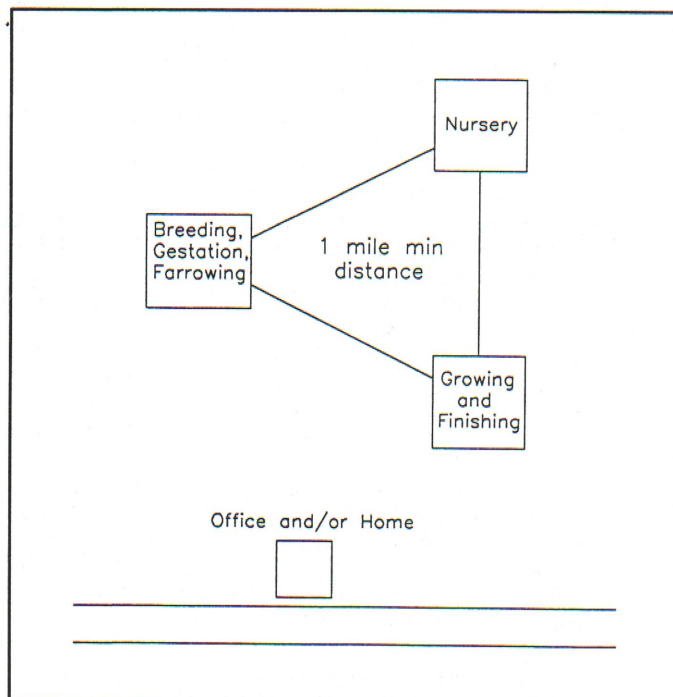


Figure 3. Multiple Site System.