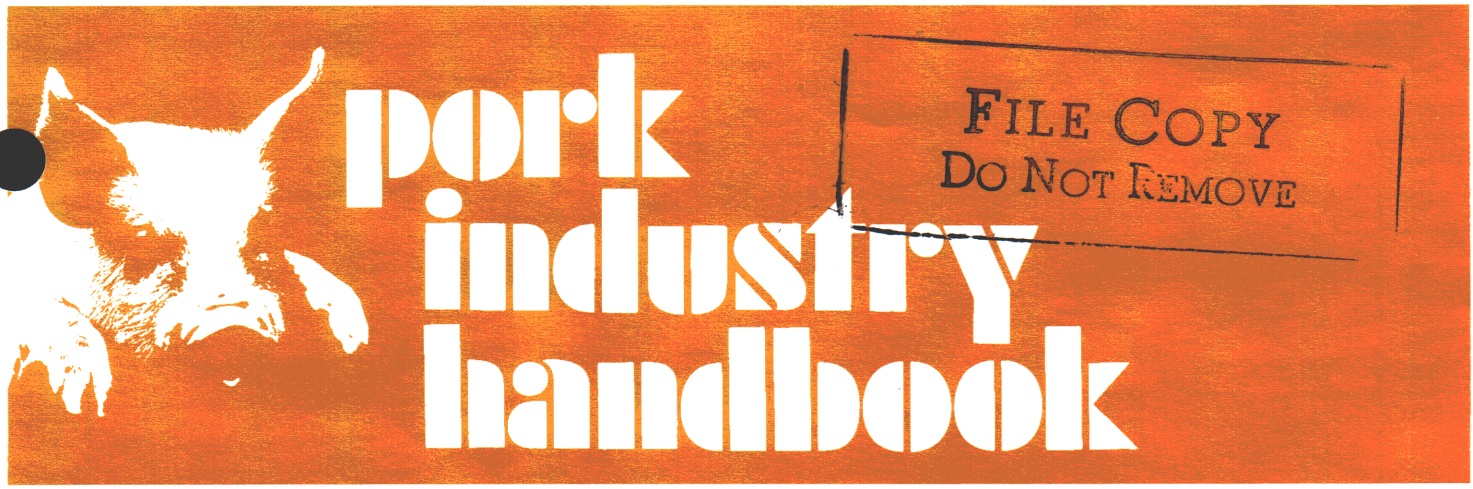

Michigan State University Extension

Remodeling Ideas for Farrowing Facilities

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Existing farm buildings, such as dairy barns, sometimes can be remodeled into successful farrowing facilities. Other times, however, the only benefit of remodeling is saving the cost of the building "shell," a relatively small percentage of the total construction cost. Therefore, analyze all available options, considering present and future goals, before proceeding with a remodeling project. This fact sheet first discusses the decision factors in remodeling and then how one should approach such a project.

Decision Factors

Location

If an existing facility is not properly located, it should not be remodeled. Criteria for proper site selection include: correct distance and direction from residences, location near existing pig facilities, space for future expansion, ease of materials (animals, feed, and manure) handling, drainage, reasonable access to utilities, and some degree of security. Rarely can all of these guidelines be met when considering locations. But if the site is, for instance, adjacent to and upwind from a residence or on the opposite side of the farmstead from the other pig buildings, reconsider remodeling.

Structural Soundness

The structural condition of an existing facility is important and the building should be sound from the foundation to the roof. If work is needed to solve major problems such as a cracked foundation, a sagging roof, a leaning wall, or a series of broken ceiling joists, then do not remodel the facility. Tolerate only a minimum amount of exterior work, such as shingling and painting, in a proposed remodeled building.

Physical Size

First determine the space required for the proposed farrowing operation. If the building is of sufficient size, consider it a candidate for remodeling. Do not reduce original size requirements to fit an existing structure; instead, build a new unit. If a building is too large, add a partition wall to accommodate the proposed farrowing room.

Pros and Cons

Before starting a remodeling project, list the advantages and disadvantages of the proposed remodeled structure. Consider the location, the structural soundness, the size and other criteria in the list. Economic considerations are important, but remember, most people underestimate the cost of materials and labor required for remodeling. If remodeling expenditures exceed two-thirds (2/3) the cost of a new unit, do not remodel. The time spent listing the pros and cons often can save a great deal of money, time and disappointment.

Design Factors

Layout

After deciding to remodel, consider layout design first. The arrangement of the farrowing crates or pens depends on the following: inside dimensions of the facility; condition and contour of the floor; location of support posts, gutters, mangers, partitions; and other obstructions. Most dairy barns accommodate up to three rows of standard (5 ft x 7 ft) farrowing crates or two rows of farrowing or sow-pig nursery pens (Figure 1). Other facilities (Figure 2) tolerate only 2 rows of crates or a single row of pens. Narrower buildings accommodate the arrangement shown in Figure 3 which allows for two

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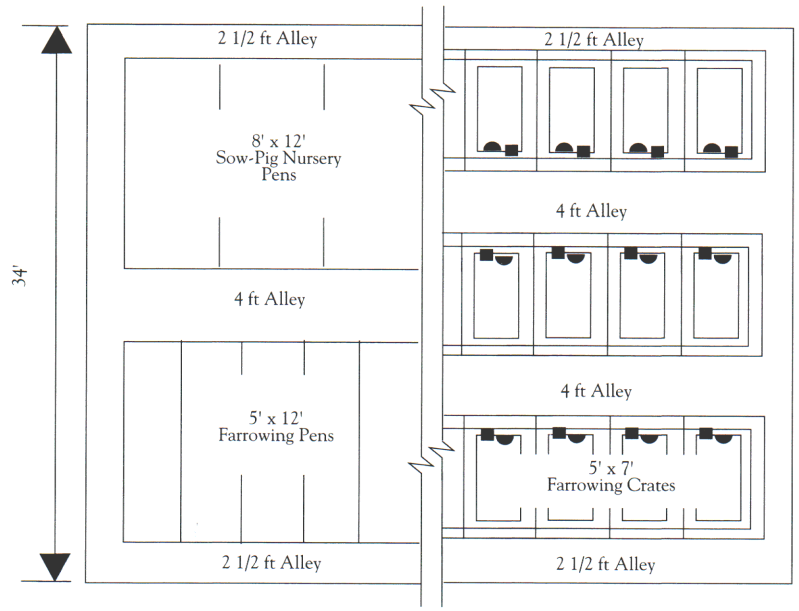

Figure 1. Arrangement of three rows of crates or two rows of pens in a typical dairy barn.

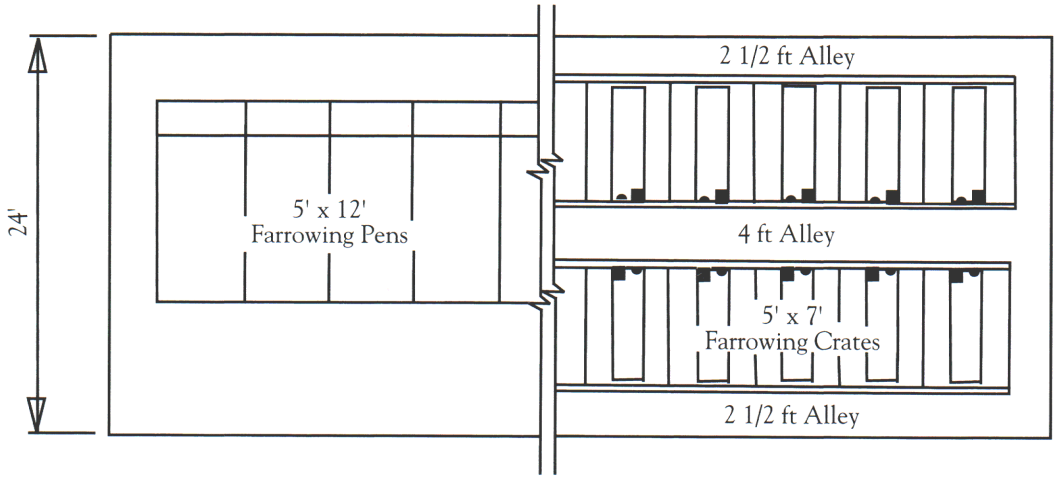

Figure 2. Arrangement of two rows of crates or a single row of pens in a 24- foot wide building.

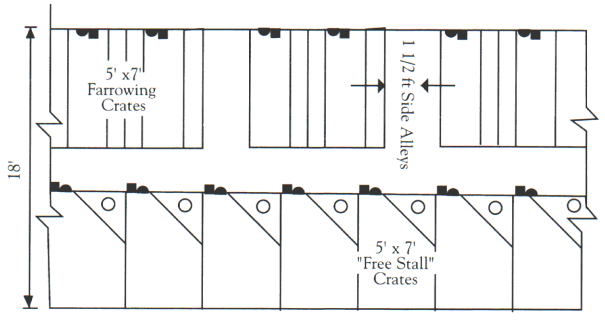

Figure 3. Arrangement of crates and "free stall" crates in an 18-foot wide building.

rows of crates with narrow side alleys used for feeding sows and handling piglets, or free stall crates. As a general rule, it is preferable to have rows of crates and pens run the length of the building rather than across the width of the barn. However, partitions may be added to a large facility, as shown in Figure 4, to allow for separate farrowing rooms with a common hallway. The individual rooms allow for an all-in, all-out animal flow which reduces disease and improves performance. If farrowing crates are desired, raised units with or without manure trays (Figure 5) adapt to most types of existing floors. Considerable concrete work often is required if crates are placed on the existing floor. In addition, raised crates can be purchased preassembled which speeds up the remodeling process. A disadvantage includes difficulty getting sows in and out of crates from a lower alley. A solution to this problem is to use a movable ramp.

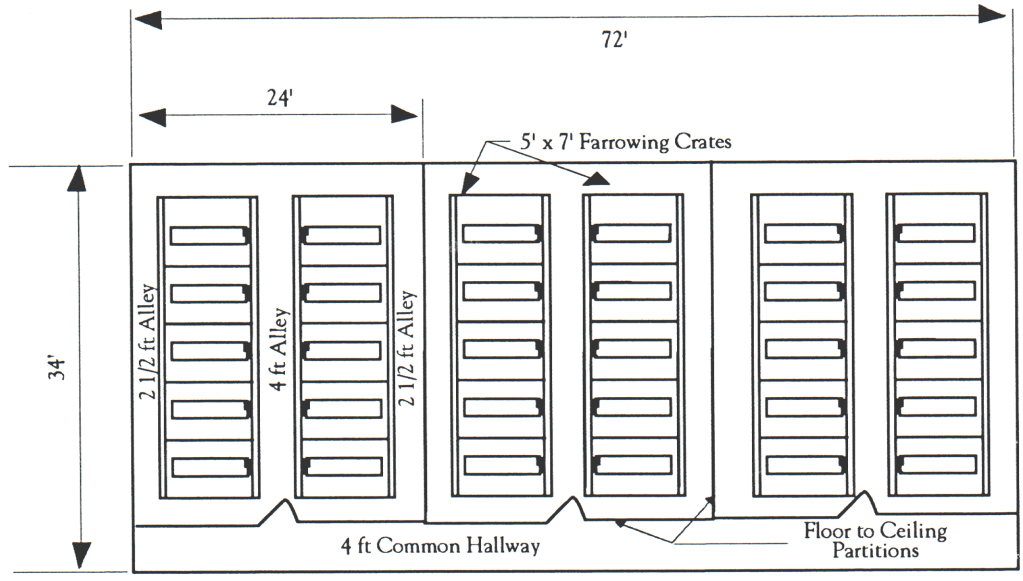

Figure 4. Arrangement of a large building into separate farrowing rooms with access to a common hallway.

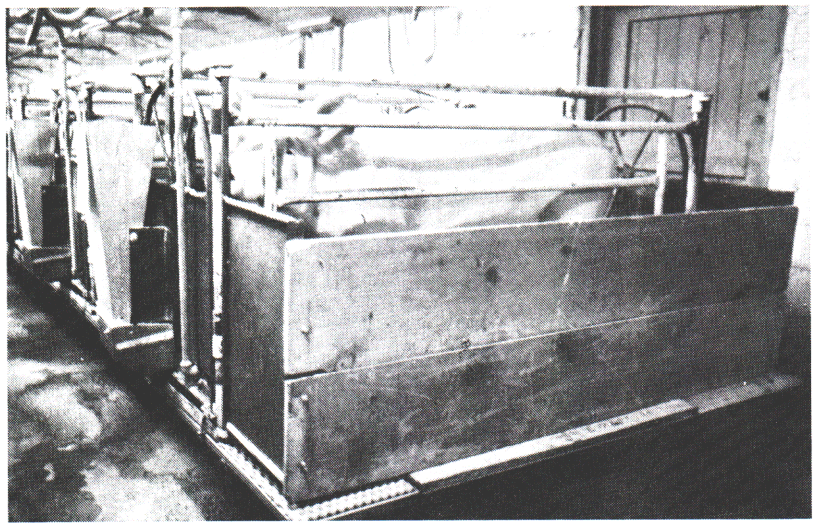

Figure 5. Raised farrowing crates are quite adaptable in a remodeled facility.

The layout of farrowing crates or pens in a remodeled facility is a compromise by how easily manure, feed, and animals can be handled and about the maximum use of the available space. More labor per sow typically is required in a remodeled facility than in a new facility. Many times producers try to squeeze in an extra stall or two which makes their labor requirements excessively high compared to those where "extra" stalls were left out.

Manure Handling

The method of manure handling also is an important consideration in the remodeled farrowing facility. Manure can be handled either as a solid or a liquid. When handled as a solid, some type of bedding is required. Since a relatively small amount of manure is generated in the farrowing barn, it may be removed by hand scraping. Sloped floors are necessary for separation of solids and liquids. As the lowest investment, highest labor system, it puts very few constraints on crate or pen location, so space efficiency of the remodeled unit is high. Some solid manure systems use gutters and barn cleaners (Figure 6). Often the existing equipment in an old dairy barn is used directly. Labor is significantly reduced compared to hand scraping, but daily or frequent hauling is necessary.

Liquid systems should have storage facilities (capacity for at least 6 months), which adds to the initial investment but reduces labor. Deep underfloor pits are not recommended. An easily adapted liquid system in a remodeled facility is gravity drain. This technique drains manure to an outside storage unit without the aid of a flush tank. Build the storage unit outside of the building and at an elevation below its gradeline; otherwise, rely on a sump and pump to transport manure. Existing narrow gutters in many barns can be converted into a gravity

Figure 6. Gutter cleaners with a solid manure system.

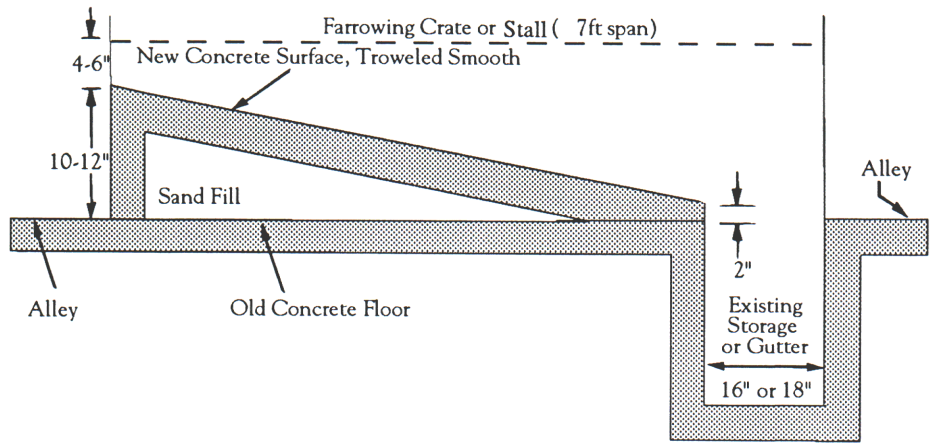

Figure 7. Sloping concrete surface to existing gutter under raised farrowing crate or stall.

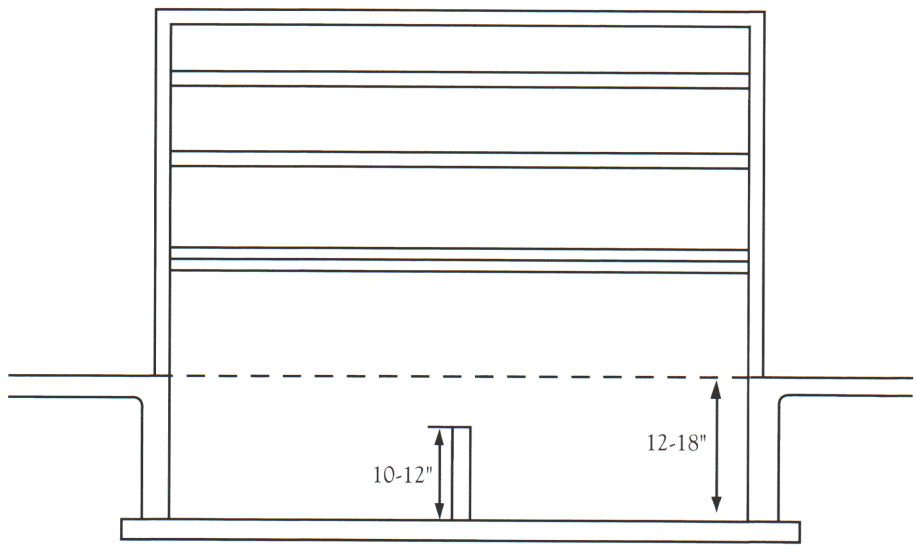

Figure 8. Full width gutter under farrowing crate or stall with center "flow straightener."

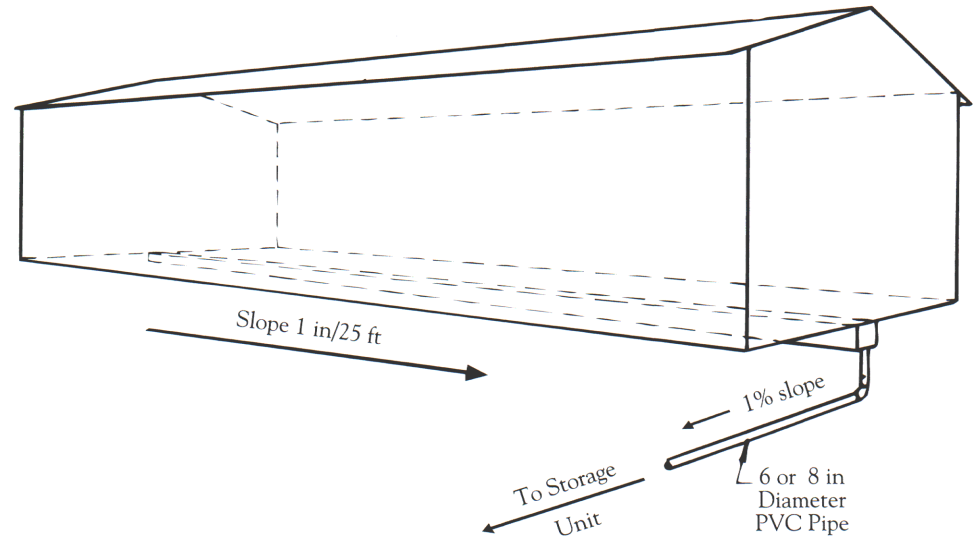

Figure 9. Slope of gutters in a gravity drain system.

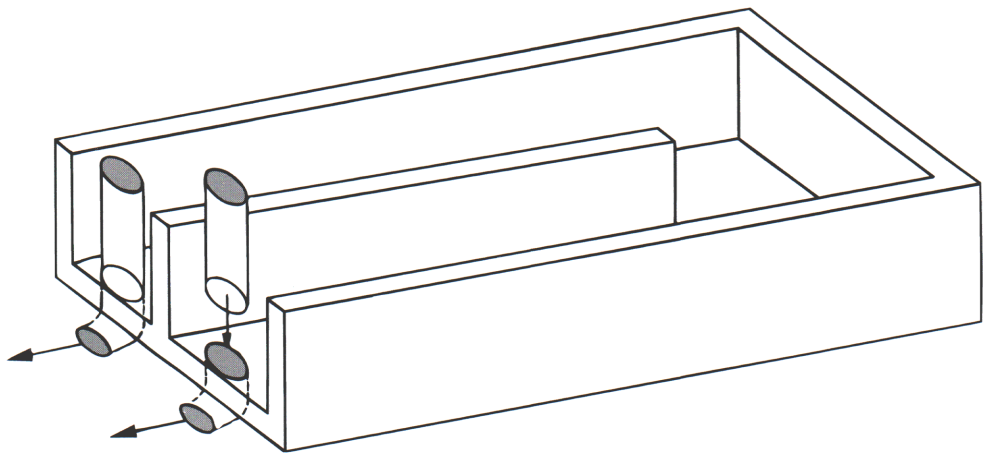

Figure 10. "Hairpin" gravity drain gutter.

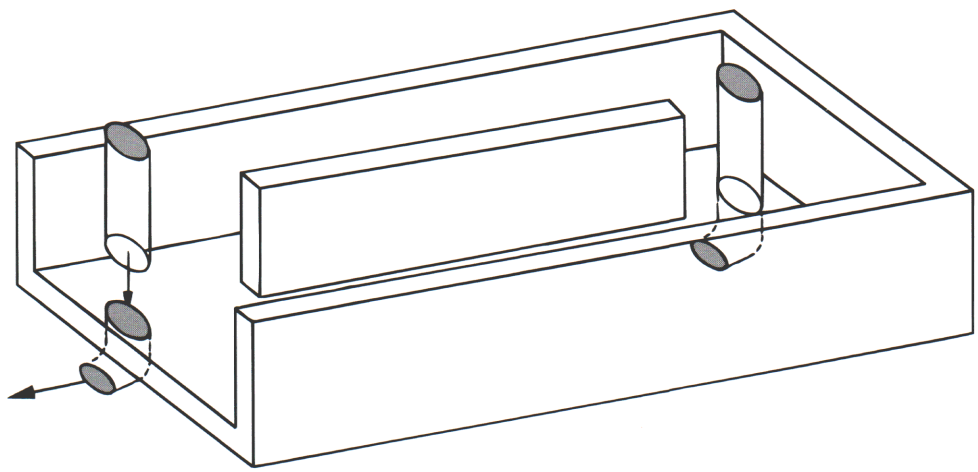

Figure 11. Flat bottom drain gutter with plug at each end.

drain system by placing the rear of the raised farrowing crate over the gutter and constructing a sloping concrete surface from a 12-inch high curb directly below the front of the crate as shown in Figure 7. A better design is to construct a full 7-foot wide gutter (or equal to the length of the crate) as shown in Figure 8, which eliminates any scraping of manure into the gutter but requires a "flow straightener" to prevent channeling of manure during the draining process. Gutters need a slight slope (1 inch in 25 feet) for a one-way drain system as shown in Figure 9, or be flat for either a hairpin gutter design (Figure 10) or one with a drain at each end (Figure 11). Manure is removed in any of these drain gutter designs by "pulling the plug" at least once every two weeks and letting the manure drain into the storage unit. The plugs of the hairpin or "plug at each end" systems are alternately pulled to facilitate better removal of solids in the gutters. Place a 6-inch diameter PVC vent pipe on the storage unit so that "back pressure" does not restrict the draining action. After cleanout, make sure that the bottoms of the gutters are covered either with liquid manure or additional water to avoid the problem of manure drying or "sticking".

Insulation

The walls and ceiling of the facility should be insulated to prevent condensation on the interior surfaces. Insulation also reduces the building's heat loss in the winter and heat gain in the summer. Place a 4 or 6 mil (0.004 or 0.006 inch) polyethylene vapor retarder on the warm side of the insulation to protect it from moisture damage. Also, use construction techniques which retard or eliminate rodent damage to insulation.

A horizontal ceiling should be present in a remodeled farrowing building. The flat ceiling allows for either a hayloft or an attic space from which incoming ventilation air is taken. Several feet of old hay or several tiers of baled hay in a hayloft of an old barn are sufficient insulation. Other facilities should have 6 to 8 inches of fill insulation (R-value of at least 25) in the ceiling. Place a vapor retarder (polyethylene) on the warm side of the insulation and, either steel or exterior grade plywood to form a smooth ceiling surface.

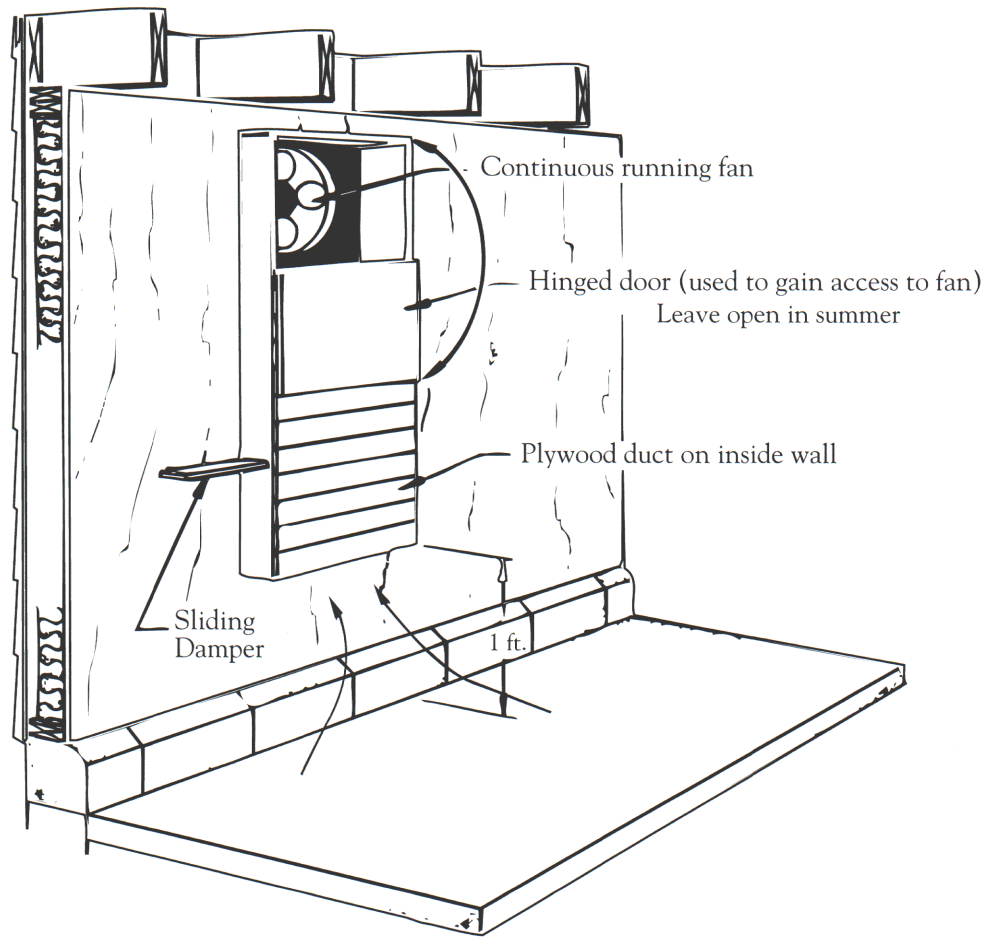

Figure 12. Plywood duct built around the continuously running fan to draw air from near the floor and throttle down a large fan.

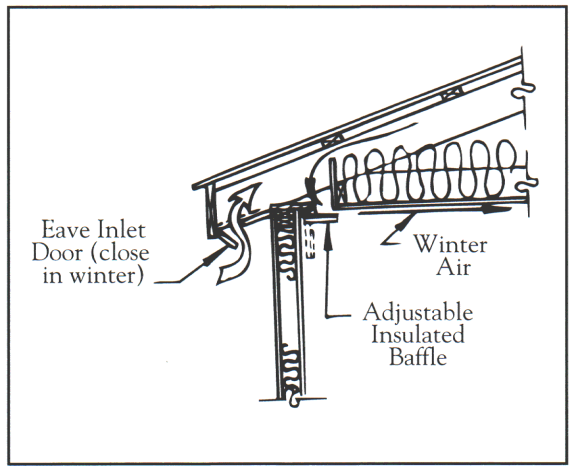

Figure 13. Adjustable slot inlet design for removing air from the attic in winter and from under eaves in summer.

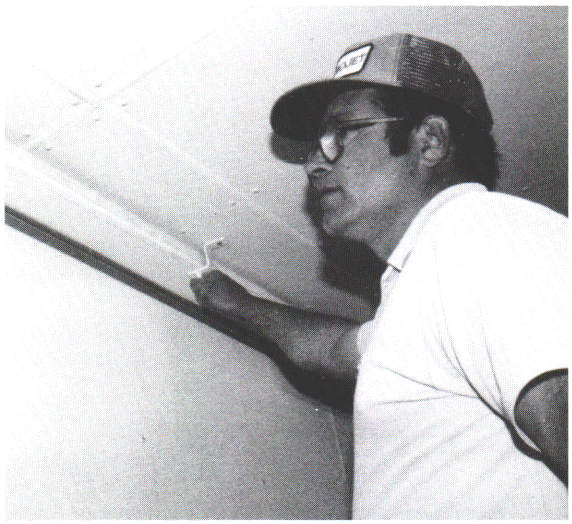

Figure 14. Adjustable slot inlet system.

Figure 15. Three-inch diameter holes drilled in a ceiling to approximate a slot inlet.

There are three basic types of walls in existing facilities. The first is where either 2 in. x 4 in. or 2 in. x 6 in. studs are used. Insulate the wall by fitting 3 1/2 inch (R-value=11) or 6 inch (R-value=19) fiberglass blankets between the studs. Put a vapor retarder over the insulation, and nail exterior grade plywood or other durable rigid material to the studs to form a protective covering.

Another common type of wall has unexposed studs. For this case, remove the inside boards and insulate the spaces with fiberglass blankets as suggested earlier. Blowing in loose-fill fiberglass, cellulose, or foam-in place urea formaldehyde is possible, but settling and shrinkage of these materials may occur.

The remaining type of wall is block or tile. The insulation value of such walls is very low (R-value of 0.5 to 2). One can insulate these walls by vertically stripping 2 in. x 2 in. studs two feet on-center against the wall and placing sheets of 1 1/2 inch thick foam-type insulation between them. Apply a polyethylene vapor retarder on the warm side of the insulation and 5/8 inch plywood, fire-rated 1/2 inch plywood, or place some other acceptable material on the wall for fire protection. Normal placement is on the inside, but the same procedure can be used on the outside surface. Urethane insulation sprayed on the outside of concrete walls shows acceptable results, but ultraviolet protection paint must be applied to prevent deterioration. Any one of these methods results in an insulation value for the wall which prevents condensation under most conditions. If a higher R-value is desired (R -value=3), strip the walls with 2 in. x 4 in. studs instead of 2 in. x 2 in. studs and use 3 1/2-inch fiberglass blankets instead of foam insulation.

Ventilation

Approach the ventilation in a remodeled facility as you would in a new unit. Often producers try to modify an inadequate existing system which causes more problems than it solves.

Choose fan capacities based on the recommended ventilation rates in cubic feet per minute, cfm, at 1/8 inch static pressure (See Table 1). Locate fans so they do not face prevailing winds. Make sure the winter minimum fan runs continuously and is rated at 1/8 inch static pressure. The minimum fan can have a duct built over it so air is removed from near the floor (Figure 12). This conserves heat and, by adjusting the sliding damper, airflow of an oversized fan can be throttled down to the correct level. Control the other fans by thermostats and operate in a stepwise fashion.

Table 1. Recommended ventilation rates or fan capacities for farrowing facilities.

Cold	Mild	Warm
	cfm/sow and litter	
20	80	500*

*May need to increase for "hot" climate.

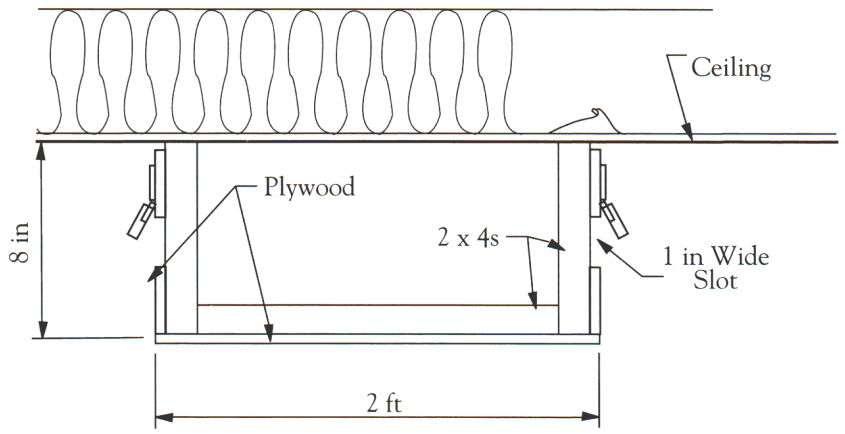

Figure 16. Plywood duct used to distribute heated air down the length of a building.

Fans control the amount of air moved, but the distribution of air inside the facility is determined by the size and location of the air inlets. During the winter, provide one square foot of inlet area for every 800 cfm of mild weather (i.e. 80 cfm/sow and litter) fan capacity. Construct the necessary inlet area by cutting one-inch wide slots and removing air from the attic space (See Figures 13 and 14). An alternative is to drill 3-inch diameter holes, as shown in Figure 15. Twenty 3-inch diameter holes gives approximately one square foot of inlet area. Sufficient air distribution results if the slots or holes are evenly spaced along both walls. One must place header boards in the attic to protect inlets from plugging with insulation or hay. Additional inlet area is required for warm weather operation. As before, provide one square foot of inlet area for every 800 cfm of added warm or hot weather fan capacity. Locate the additional inlet area in the ceiling, adjacent to the winter inlets, or provide by using outside ventilation doors (old converted windows) or eave openings. All other windows should be permanently closed and covered with insulation. Locate the outside summer inlets on the building's north or east sides, because this is the coolest air available.

Management of these inlets can be done either automatically with static pressure-sensitive devices or manually. Generally, only two basic settings are necessary; one for winter and one for summer conditions. Any time that inlets are placed in the ceiling, provide louvers or vents in the attic to allow air to enter that space. Louver area should be 1 1/2 times larger than the ceiling inlet area.

Heating

A remodeled farrowing building requires more supplemental heat than a new facility. For cold climates, use 5,000 BTU per sow to determine heater size and 3,000 BTU per sow for milder climates. Hot air furnaces often are used to provide this supplemental heat. To obtain even heating, a plywood distribution duct (Figure 16) works well. Caution should be used in the thermostat settings of the fans and the heater so that they do not overlap. The continuous running (cold weather) fan should be the only one operating when the heater operates. A single multi-stage controller, instead of individual thermostats, is highly recommended to "interlock" the fans and heaters together so large fans **never** operate when the furnace is running. Additional supplemental heat in the creep area is necessary for maintaining warm surface temperatures for baby pigs.

Summary

Remodeling of existing farmstead buildings into farrowing facilities is one feasible approach to starting or expanding a pig operation. However, the building under consideration must meet certain cost, location, and upkeep criteria to qualify for remodeling. Should these criteria not be met, then the decision to remodel that building should definitely be reconsidered.

The following fact sheets contain additional information related to remodeling and should be consulted before entering into construction.

PIH-10	Swine Farrowing Units
PIH-32	Building Materials and Equipment for Swine Facilities
PIH-53	Flooring for Swine
PIH-57	Supplemental Heat for Swine
PIH-60	Mechanical Ventilation of Swine Buildings
PIH-107	Controlling Rats and Mice in Swine Facilities
MWPS-40	MidWest Plan Service Swine Farrowing Handbook