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animal sciences swine

COOPERATIVE EXTENSION SERVICE, PURDUE UNIVERSITY, WEST LAFAYETTE, INDIANA 47907

Baker-Purdue Animal Sciences Center Swine Facilities

V. B. Mayrose, J. R. Foster, H. W. Jones, M. P. Plumlee, A. L. Sutton and Larry Underwood, Department of Animal Sciences

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Planning for the Baker-Purdue Animal Sciences Center, located 9 miles northwest of Lafayette, began about 1964. Development of a new facility had become necessary when the West Lafayette School System purchased 29 acres of the former Swine Breeding Farm. The Baker land, which lies 2 miles north and east of the junction of U. S. highways 52 and 231, was acquired in 1968. The Center now consists of 440 acres on the north side of County Road 500N.

The Animal Sciences Department's swine genetics and nutrition units were the first to be relocated at the Baker-Purdue Center. Eventually, all the Department's animal units will be moved to the Center, a relocation program evolving over a 10-year period or longer.

Construction of the swine buildings at the Baker-Purdue Animal Sciences Center started in June, 1968; and the first building -- the farrowing house -- was occupied in February, 1969. Present swine buildings at the Center include two 48-sow farrowing houses, two gestation houses, two growing-finishing buildings and a feed processing building (Figures 1 and 2). In addition, there is a lagoon for handling the swine manure. All these facilities are being used for interdisciplinary research involving breeding, nutrition, meats, physiology and management, including animal waste management.

Secondary SPF Durocs and Hampshires were purchased initially as the foundation stock and were maintained as a closed herd. At present, a 3-way rotational cross of Hampshire-Yorkshire-Duroc is being used. SPF boars are used and all gilts are selected from the herd.

GESTATION FACILITIES (Figures 3 and 4)

Each gestation house is 32 feet by 80 feet. In each building there are six pens with a 8- by 32-foot service area in the center. Each pen is 12 feet by 32 feet, with 16 feet of slotted area to the front and 16 feet of solid floor space to the rear. This

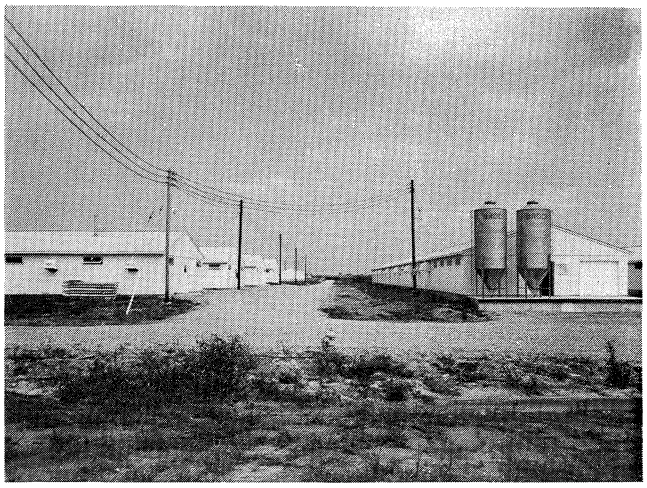

Figure 1. Some of the Swine Buildings at Baker-Purdue.

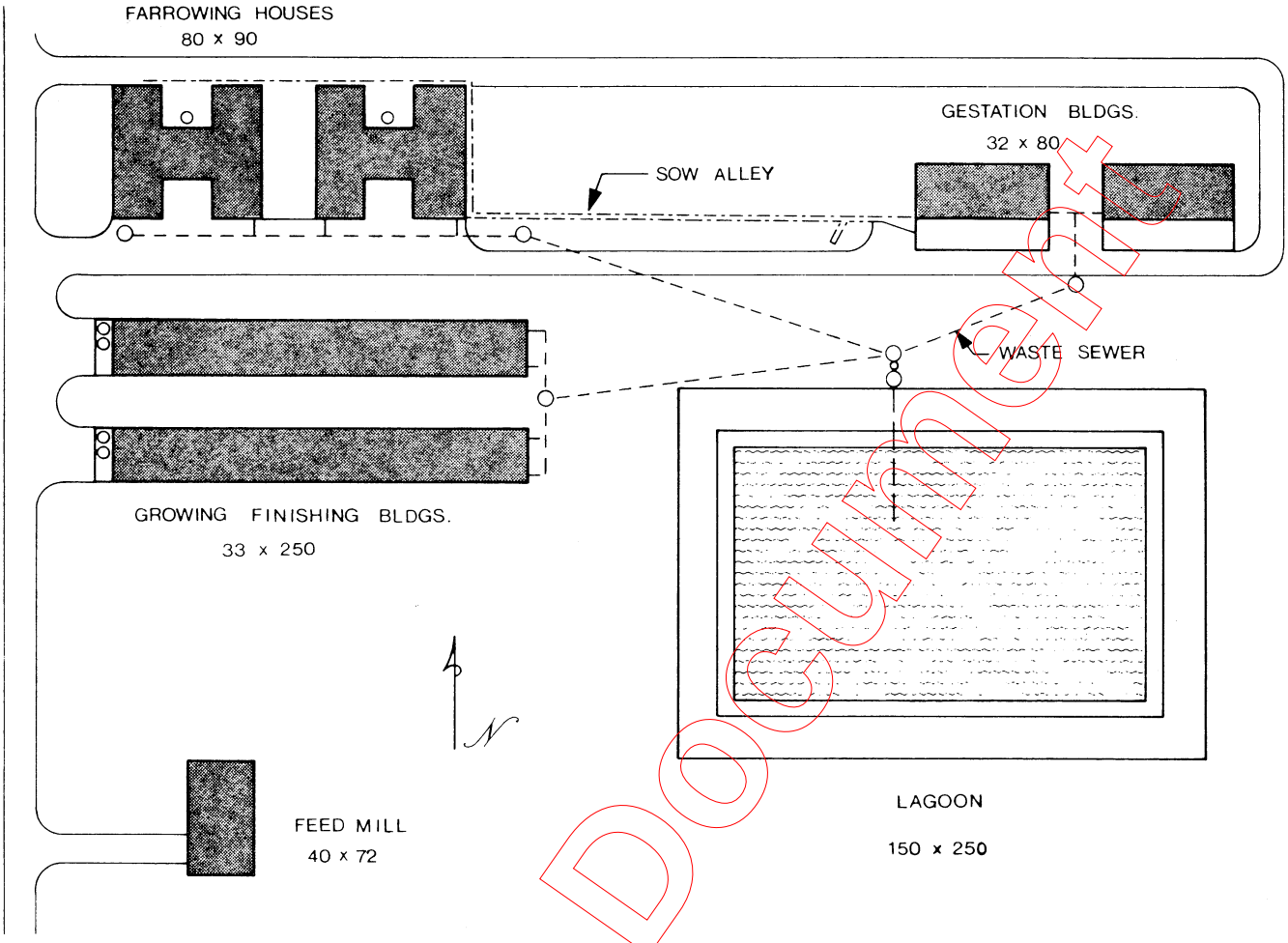

Figure 2. Layout of the Swine Complex. (All illustrations in this publication courtesy of W. H. Friday, Agricultural Engineering Department.)

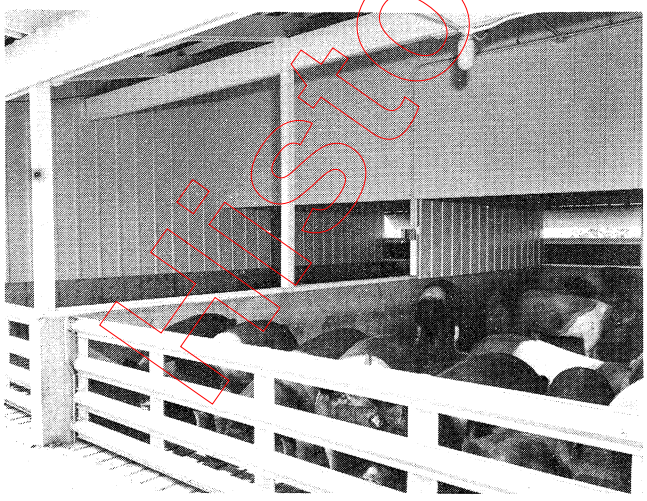

Figure 3. Pen Arrangement in the Gestation Houses.

amounts to 384 square feet per pen for 20 sows or 19 square feet per sow.

In addition to the 32-foot depth, there is an 18-foot concrete apron in front of each pen. On this apron, animals are fed either individually in stalls or in a group at intervals at a self-feeder. This concrete apron is also used for breeding. The original metal gates to the pens have been replaced with more rigid tubular metal-type gates. There are two 6-foot gates for each pen, making it possible to divide the pen, if necessary.

Waterers are located in the center of each pen on the solid area next to the slotted area, making it possible to divide the pen. In this location there is some manure buildup and water spillage, creating damp conditions in the sleeping area. Perhaps a more satis-

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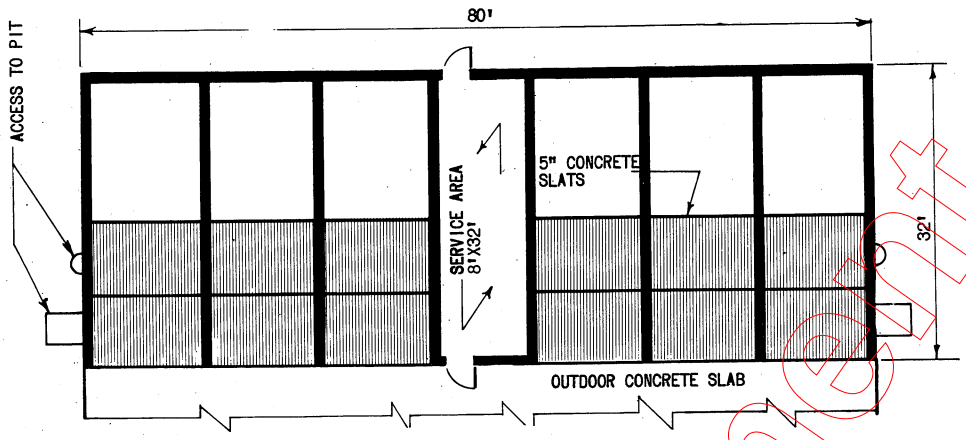

Figure 4. Floor Plan of the Gestation Houses.

factory arrangement would have been to locate the waterer to the front of the pen.

Construction of the gestation houses consists of a 30-inch high solid concrete wall with pole-type construction above this. The 30-inch concrete pen divider walls should be 6 inches higher to eliminate the possibility of hogs jumping out of their proper pen. The siding is aluminum with baked-on enamel, and the roofs on all buildings have asbestos shingles. Considerable difficulty has been encountered with the siding blowing loose in moderate-to-heavy winds.

Insulation in the buildings is 1/2-inch impregnated asphalt fiberboard in the sidewalls and ceiling. Insulated hinged doors along the rear of the buildings can be opened to help provide summer ventilation. A pen divider extends to the ceiling above the 30-inch wall in the back 16 feet between each pen. In addition, a divider running the length of the building extends from the ridge of the roof down to within 6 feet of the floor (Figure 3) to reduce the drafts in the sleeping area. Wood-framed plastic drops (4 feet x 8 feet) are hinged on the open front eaves, and these are put down in cold weather.

There are no mechanical means for cooling; however, a mist-type spray could easily be added to the buildings.

The slats used are pre-cast concrete 5 inches wide at the top tapered to 3 1/2 inches at the bottom, 4 inches deep with 1/4-inch and 3/8-inch reinforcing rods. There is 3/4- to 1-inch space between the slats.

The manure pits are 44 inches deep plus the 4-inch slat, making a total depth of 48 inches. The pit floor is reinforced concrete with no slope. There is a concrete wall in the pit at each pen division and a 10-inch opening in these dividing walls at the bottom. Initially, manure was to be pumped out from half of the house at a time when required. However, sludge or solids accumulation causes the 10-inch opening to plug, resulting in difficulties with liquid waste removal. At present, the liquid manure is drained by tile line to a sump and pumped into the lagoon. In addition, there are outlets at both ends of the buildings so that liquid manure can be removed by a vacuum liquid tank wagon.

Gestation house #2 differs from house #1 in that it has hot water heat in the floor if needed; and the circulation of the water may be controlled either by pen or half pen. Since no bedding is used in either house, supplementary heat was also needed in gestation house #1, and 8,000-BTU radiant gas heaters were installed in each pen.

To facilitate movement of animals, a fenced alleyway was built between the gestation houses and farrowing houses.

FARROWING FACILITIES (Figures 5 and 6)

The farrowing houses are in the form of a block H with 24 farrowing crates in each wing and a wall dividing each of the wings of the H in half. This arrangement provides four sections of 12 crates each, or a total

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of 48 crates in each farrowing house. In the center service area are located the scales, sow wash pen, office, washrooms and space to store 15-20 tons of bagged feed. The scales and sow wash pen receive little use since the movement of animals into this area is extremely difficult. Sows are washed and disinfected in the crates prior to farrowing. Also in the service area is an outlet from a 5-ton bulk feed bin.

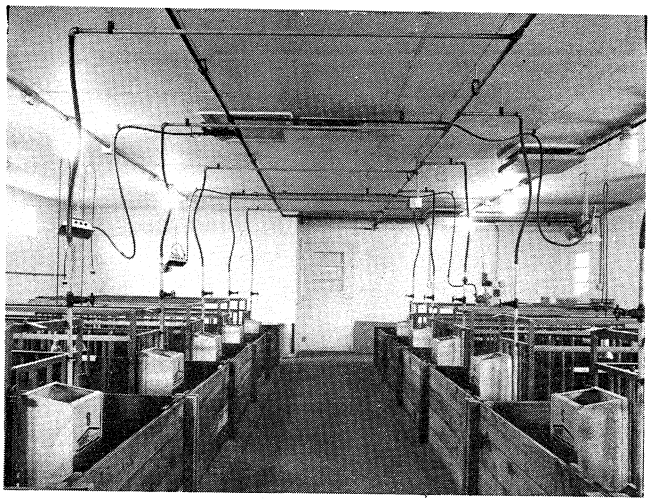

Figure 5. Inside One of the Farrowing Units.

Sows remain in the crates from pre-farrowing to weaning and are hand-fed once daily. A portable medicator can be easily inserted into the water lines in the farrowing units. Filters have been installed into the intake water lines to remove iron, which was interfering with the proper functioning of waterers.

These houses are prefabricated structures, and the siding and roofing are the same as the gestation houses. The insulation is 4-inch fiberglass in the walls and ceiling. Plies of material include a layer of sheeting, a polyethylene vapor barrier, insulation, plywood and then aluminum siding.

The farrowing crates are 8 feet long and 24 inches wide, with an 18-inch area on each side for the pigs. Total pen size for the pigs is 5 feet by 9 feet to provide additional area in front of the farrowing crates.

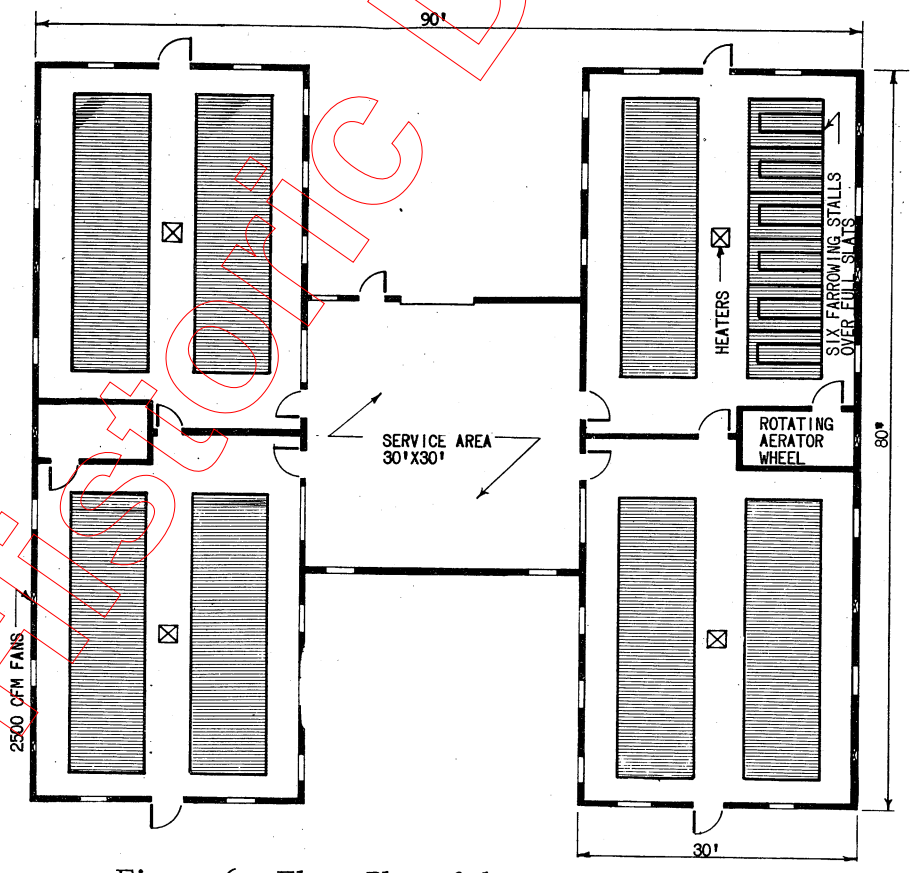

Figure 6. Floor Plan of the Farrowing Houses.

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The floors are completely slotted with 9 feet of slotted area within the pen and an additional 4 inches on the outside.

Dimensions of the slats are the same as those used in the gestation houses; however, plans were to have a 3/8-inch space between slats in the farrowing units. There are four slot openings at the rear of each crate having an opening of 1 1/4 inches. This opening is covered during farrowing with an expanded metal piece that clips on the slats. Recently, one 1 1/4-inch slot in each crate opening was enlarged by cutting a 4-inch by 4-inch hole to facilitate manure removal.

The farrowing crates are somewhat larger than conventional crates because pigs are weaned at approximately 5 weeks of age and remain in the farrowing pen until 7 weeks. After the sows are removed, the pen serves as a nursery. There is a slight slope toward the slotted area in the floor of the 3-foot aisle behind the crates. There is also a crown in the center of the 4-foot center aisle to facilitate washing and cleaning.

In each room containing 12 farrowing crates, there is a 125,000-BTU thermostatically-controlled heater above the ceiling. The location of this heater has caused some problems with condensation of flue gases, resulting in rusting and breakage of the heat exchanger. Also, in this ceiling location the furnaces draw fresh air through attic vents. In extremely cold weather, the furnace does not have enough capacity to warm incoming air.

In addition, for every two farrowing pens, there is a 6,000-BTU supplemental radiant gas heater; and for each 12 crates, there are two 16-inch reversible fans. In summer, air can be pulled directly into the building, and in the winter tempered air enters from the attic.

The manure pit is 4 feet deep with no slope in the pit floor. Each wing of the house (24 crates) has a racetrack-shaped oxidation ditch with paddle wheel. Overflow from the oxidation ditches, which have a liquid level control, collects in a sump at the end of the house. This manure is transported through a 6-inch tile to a lagoon. A vacuum liquid tanker wagon can be used to remove liquid manure from the pits at the sump at the end of each house.

GROWING-FINISHING FACILITIES (Figures 7 and 8)

The growing-finishing houses are completely enclosed, environmentally-controlled units 33 feet wide by 250 feet long, which includes a 33-foot by 24-foot service area at one end. Each house is designed to hold 800 finishing pigs. The prefabricated structures are similar to the farrowing units. In growing-finishing house #1, there are 76 pens, each 5 1/2 feet by 14 feet and separated by 38-inch-high oak partitions with a 4-foot center aisle. The arrangement in growing-finishing house #2 is the same except that there are 60 pens, 7 feet by 14 feet. Six 75,000-BTU heaters are available for heating and are located in the attic above the center aisle. There are 14- and 16-inch reversible fans alternated along one wall. Insulation is the same as in the farrowing units.

These units have fully-slotted floors. Cement slats are 5 inches wide (same as in the gestation house) and 8 feet long. Four sections of slats cover the width of the building, with a 3/4-inch spacing between slats. Four racetrack-shaped oxidation

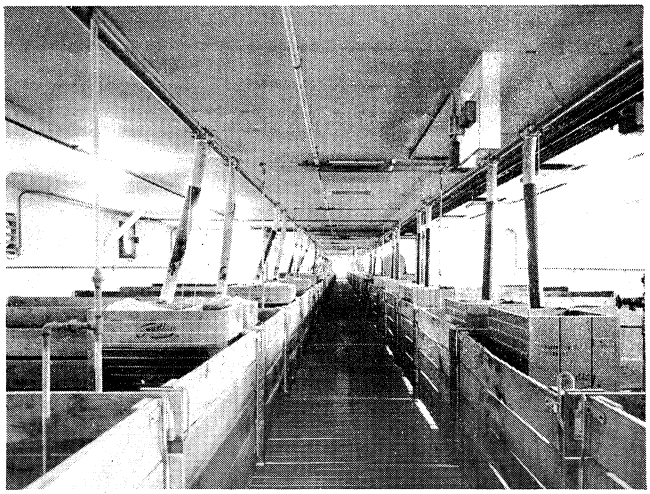

Figure 7. Inside One of the Growing-Finishing Units.

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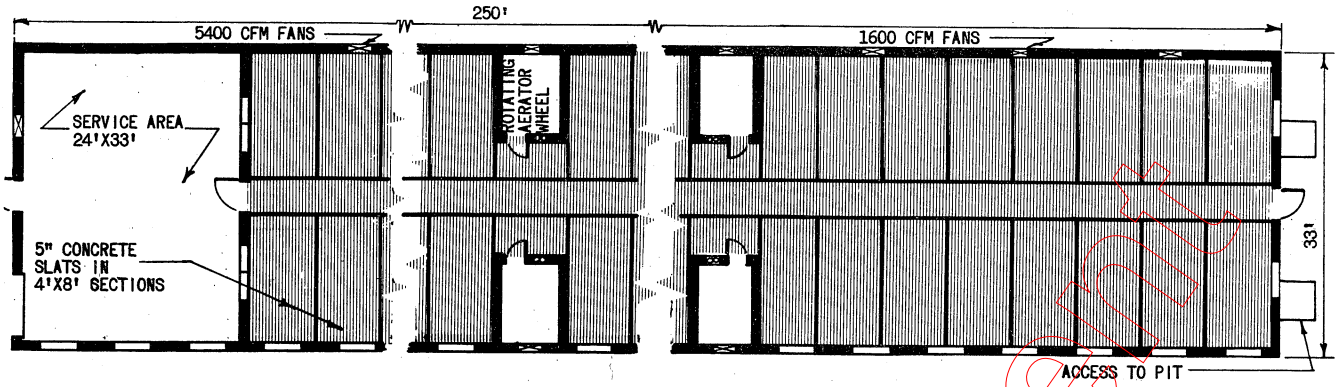

Figure 8. Floor Plan of the Growing-Finishing Units.

ditches of equal size with paddle wheels are used for manure disposal, with the same alternatives and flexibility as exists in the farrowing units. The paddle wheels are not considered essential for routine operation of handling and disposal of manure, but are used as needed in waste management research.

Two 8-ton bulk bins and a concrete dock area, with access to the service area (where up to 30 tons of bagged feed may be stored), are located at one end of each building. A mechanical auger on each side of the aisle is used for automatic filling of the self-feeders when needed. With two augers and two bulk bins in each house, there is more flexibility to feed different rations. Feed for experimental purposes is bagged and delivered to the self-feeders on manual carts.

Initially, the self-feeder and cup-type waterer in each pen were located on opposite sides of the floor near the gate. Problems were encountered with water wastage, dirty waterers and contamination of the feed. Consequently, the waterer was raised to a lip height of 8 inches and relocated on a stainless steel plate near the center of the partition. As a further improvement, cup-type waterers are being replaced with the nipple-type. Also, a flexible hose section is inserted in the rigid metal pipe which is clamped to the partition; this facilitates height adjustment of the nipple as needed by various-sized animals.

WASTE HANDLING SYSTEM

Liquid manure from the 2,500 head of swine marketed per year plus the breeding herd at the Baker-Purdue Center, is collected in pits under the slotted floors in the confinement buildings. Six-inch tile (vitrified, bell-shaped clay except cast iron under roadways) drains the manure from all pits to a 2,000-gallon pre-cast sump tank, where it is then pumped into a large lagoon (Figure 1). Slope of the tile line is 0.4 percent. The lagoon is 70 feet wide and 170 feet long at the bottom, and 150 feet by 250 feet at the top of the freeboard. The lagoon extends 11 feet below and 9 feet above the existing grade with 2:1 side slopes. It will store about one year's production of manure from 2,000 hogs.

Waste from the lagoon will be irrigated on adjacent cropland. The irrigation equipment includes a Gorman-Rupp 54MB pump capable of pumping 360 gallons per minute at 100 psi, aluminum irrigation tubing, and six 1/2-inch Rain Bird EW-TNT nozzles. The pump is driven by a 40 hp three-phase electric motor.

FEED MILL

Plans for the feed mill and grain-handling complex at the Baker-Purdue Animal Sciences Center have as their objective: (1) to prepare experimental rations and supplements for animal research studies, (2) to store and process grain, and (3) to store

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the wide variety of ingredients used in livestock rations.

The initial facility is a 40-foot by 72-foot building which houses the feed mill and which will be operational in 1975. A roller mill, hammer mill, pellet mill and liquid metering equipment will be available for grain processing. Various-sized mixers, including various small laboratory models, will be available for mixing batches of feed from 1 pound to 2 tons. Outside facilities for drying wet grain and storing dry grain will accommodate about 115,000 bushels. Fourteen bins with about 10,000 cubic feet capacity are planned for storage of processed grain, soybean meal, supplements and other ingredients. Experimental rations will be bagged or bulked and delivered to the area of use.

In a feed mill preparing experimental rations, it is extremely important to accurately weigh and uniformly mix rations and at the same time avoid contamination of ingredients or rations. Design of the unit has taken these points into consideration.

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