PLAN
M-3428

GROWER-FINISHER UNIT

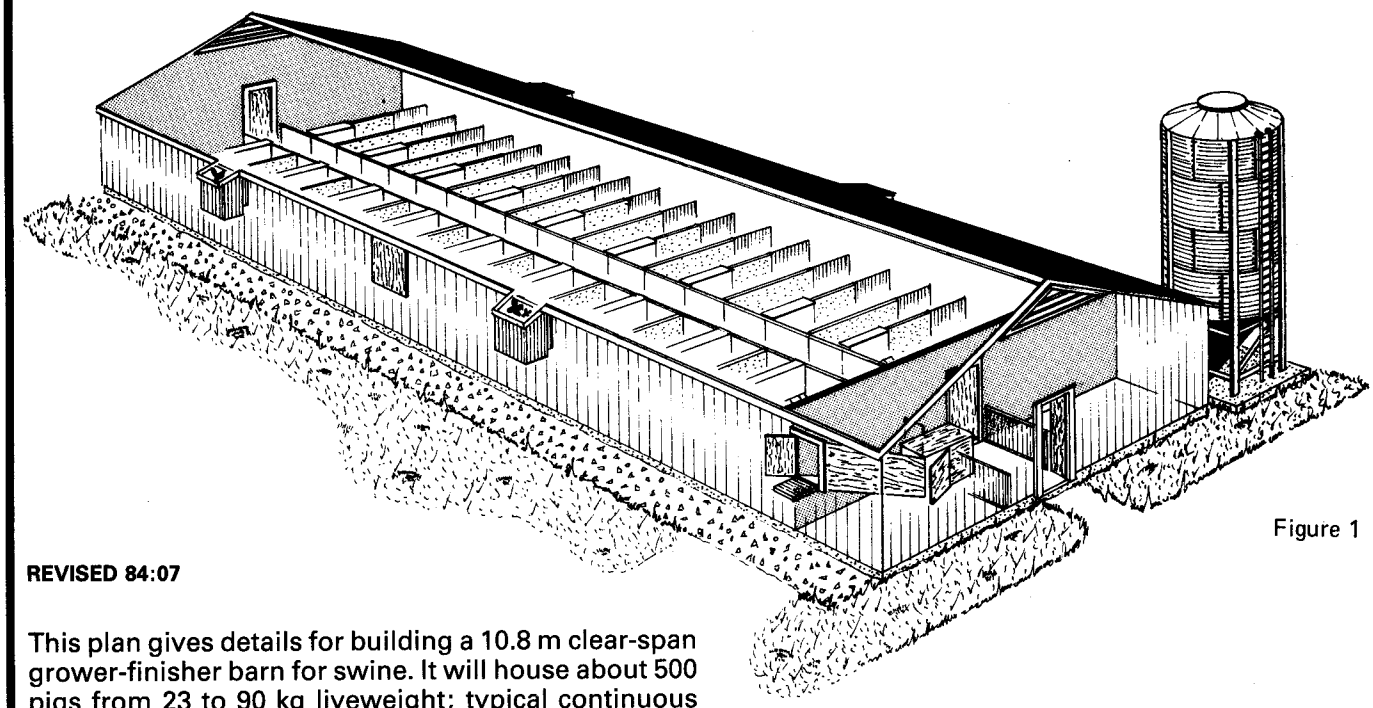

Figure 1

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This plan gives details for building a 10.8 m clear-span grower-finisher barn for swine. It will house about 500 pigs from 23 to 90 kg liveweight; typical continuous production capacity based on 14 weeks growing-finishing period will be about 1800 market pigs per year. Building length can be increased or decreased to adjust the capacity of the unit (see Figure 2).

WEIGHING AREA This plan includes a weighing area with an arrangement of pens and gates for easy sorting of pigs. A ramp and small door are provided for trucking pigs in and out.

PENS For floor feeding, relatively small 1.5 × 4.8 m pens are suitable for up to 20 growers at 0.36 m^2/pig, or 10 finishers at 0.72 m^2/pig. This allows the manager to move groups of 20 weanlings into the grower pens without introducing any 'strangers' into the group, a practice that helps prevent fighting and stress. As soon as more pens are available, the groups of 20 pigs are split into uniform finishing groups of 10, doubling the space per pig. Since growing and finishing pens are identical, this makes a flexible arrangement that keeps the barn full yet allows some variation in pig production. Reduce pen groups to eight finishers @ 0.9 m^2/pig in hot weather and when finishing to the full 100 kg liveweight now allowed by the grading rules.

For feeding with self-feeders, the 1.5 × 4.8 m pens will be too small; an alternate floor plan shows larger 2.4 × 4.8 m pens, suitable for up to 32 growers or 16 finishers. Pens 1.8 to 2.4 m wide can be used, but pens wider than 2.4 m can cause bad dunging habits and more problems with dirty pens.

There is evidence that pen design, ventilation air supply and 'good housekeeping' habits of the pigs are all closely related. The pens have solid front doors and solid partitions at the front sleeping and feeding area (the 'clean' area). At the rear of the pens, the dunging and drinking area (over the slotted floors) has open gate pen partitions, to encourage socializing between pens. Also, the twin air inlet slots over the center alley

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The Canada Plan Service prepares detailed plans showing how to construct modern farm buildings, livestock housing systems, storages and equipment for Canadian Agriculture.

This leaflet gives management information and describes one of these detailed plans. To obtain a copy of the Canada Plan Service detailed plan, cdntact your local provincial agricultural engineer or extension advisor.

should be adjusted to direct the cold fresh air outwards across the ceiling. This cooler air mixes with some of the room air and finally comes down to meet the floor over the slotted dunging area where the pigs tend to be more active.

MANURE SYSTEMS Three different manure systems are shown; sheets 2, 3 and 4 each give one option. Whichever system is used, check with local pollution-control authorities to be sure your plans are approved before starting to build.

GUTTER CLEANER (sheet 2) If you plan to use a bedded system (straw, sawdust, etc.), this is the best method of manure removal. A gutter cleaner in a shallow gutter follows the outside walls, and a steel grill over the gutter keeps out pigs. It is relatively easy to scrape manure and soiled bedding under the grill. Provide a storage pad outside to stack the bedded manure, and collect the polluted stack runoff in a tank or holding pond for land-spreading. The 'step 1 continuous' exhaust fan should be relocated to blow warm air out through the gutter cleaner opening; otherwise the gutter opening becomes the cold fresh-air inlet during winter, causing cold drafts in nearby pens and freezing the gutter-cleaner chain.

SLOTTED FLOOR CONTINUOUS FLOW (sheet 3) This is a liquid manure system designed to operate without bedding and with minimum labor. Slotted concrete floors occupy the outer 1.8 m part of the 4.8 m pens, or 37% of the pen area; the actual proportion of slotted floor is not fixed, but pigs do better on floors partly slotted than on floors 100% slotted.

Concrete slats are 200 mm wide with smooth flat tops, pencil-round edges, and with 25 mm slots parallel to the 4.8 m pen length. Foot injuries seem to be minimized with this arrangement. Another arrangement (with slats running parallel to the gutters) cleans better but is more complicated to build; see Agriculture Canada Publication 1451, *Confinement Swine Housing.*

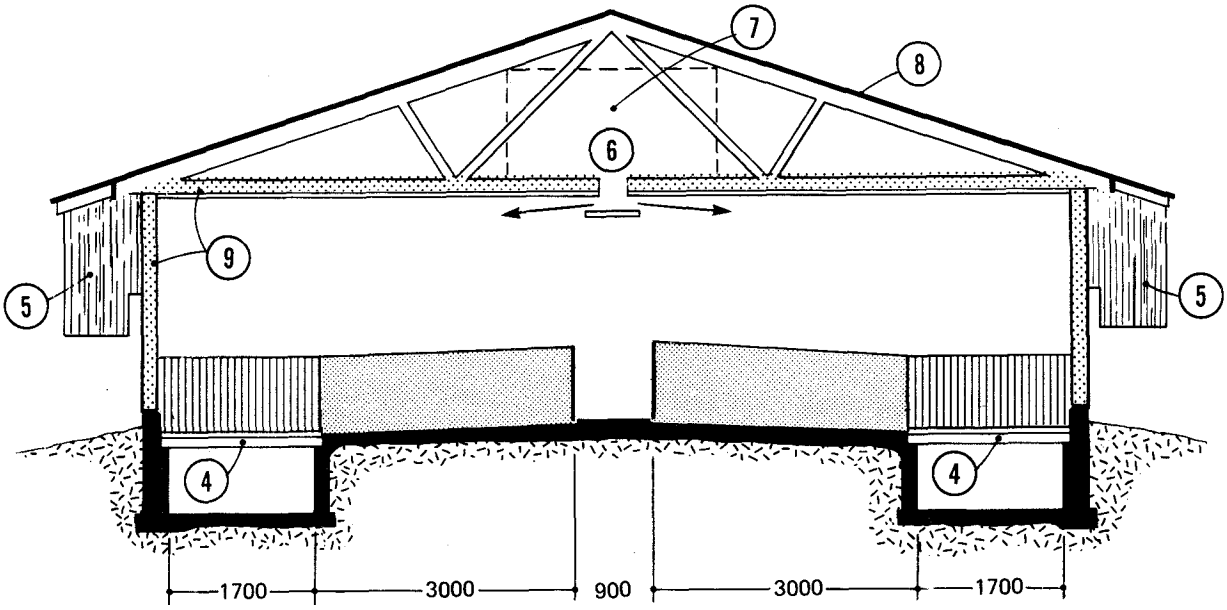
Shallow gutters under the slotted floors are drained slowly and continuously to a deeper cross-gutter at the center of the building length. The system is a proven European development. The gutter bottoms are made smooth and dead level, and a small, level overflow dam at the outflow from each gutter traps up to 150 mm depth of liquid in the gutter to prevent drying and sticking. To start, the gutters are primed with 150 mm of washwater. After the first pigs go in, manure soon starts to trickle over the dams, and the manure surface builds up to a slight slope (enough to keep the entire gutter contents moving slowly towards the outlet gutter). This deeper gutter (which crosses the barn at the center of the length) is drained each day or two by opening a valve leading through a gas trap to separate storage outdoors.

STOP-AND-FLOW MANURE SYSTEM (sheet 4) Here the gutters under the slotted floors are deepened to give 2-3 weeks of storage. Whenever the gutter fills to about 100-200 mm below the slats, plug-valves are jerked open, and manure drains rapidly into a sewer pipe crossing the barn under the gutters. This is the simplest manure system, but it produces more odors and manure gases due to the increased storage time. Watch for manure solids that accumulate in the gutter bottom if flushing is incomplete. Emergency pumpout pipes are suggested at the 'far' end of each gutter, for back-flushing and pumpout with a vacuum tanker in case solids start building up.

VENTILATION AND HEATING Ventilation consists of a cluster of thermostats (located at the center passage) controlling eight exhaust fans grouped in four fan hoods on both sides of the building. It is important to provide automatic control of ventilation rate through 'stepped' thermostat settings and properly matched fan capacities. A table on sheet 1 gives a schedule of fan sizes, thermostat settings and air inlet adjustments for optimum ventilation, from coldest winter to warmest summer weather. Adjust the thermostats in a series of temperature steps so that a suitable range of room temperature is maintained regardless of weather. Note that the step 1 fan is sized well below the average cold-weather ventilation rate, and is intended to run continuously; its thermostat is set below room operating temperature, and it serves only as a safety cut-off in case of heating failure or other emergency.

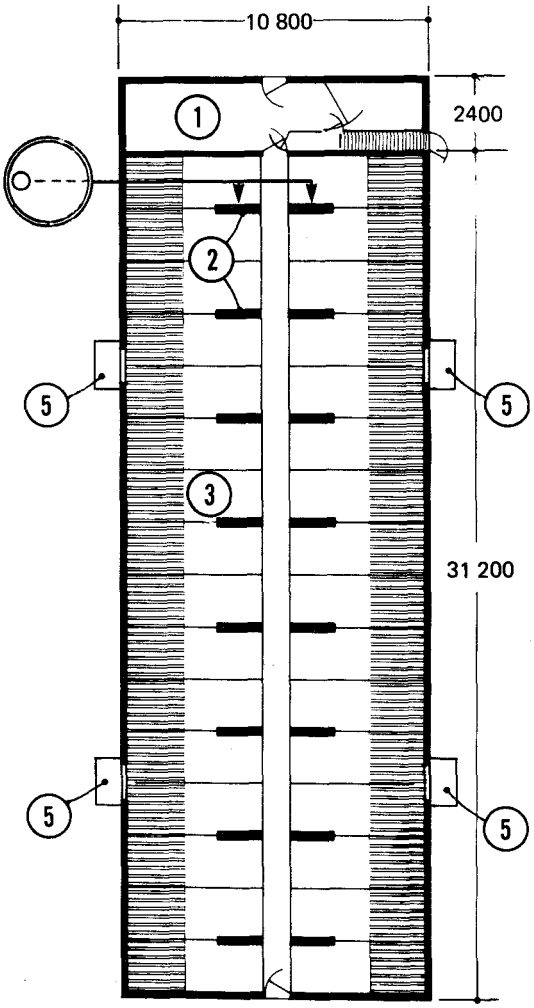
The key to good ventilation is a precise, adjustable air inlet like Plan M-9711 (Center Air Inlet). The recommended inlet is a pair of continuous slots located along the ceiling centerline and blowing fresh air across the ceiling towards the two outside walls. In hot summer weather, maximum fresh air is drawn through inlet slots adjusted to give about 2 m/s air velocity. If summer air is introduced through the attic, take steps to ensure minimum temperature rise in the attic (white painted roof, or a layer of insulation board between roofing steel and purlins, and abundant screened air openings under the eaves around the attic perimeter). Flap doors under the soffits can be opened for maximum attic ventilation in summer, but hooked 'closed' to make a much smaller opening to keep out snow in winter. Make sure that ceiling insulation does not block this summer airflow to the attic -- the space between insulation and roof should be at least as deep as the soffit openings are wide.

In winter, adjust the ceiling center air inlets to give at least 4 m/s inlet air velocity at the slots. The best way to do this is to install an inclined-tube manometer to indicate the pressure drop where air passes through the inlet slots (inlet duct to room). Then adjust the inlet flaps with winch and cable until the pressure drop is about 13 Pa (about 1.3 mm water gauge) across the inlets; this pressure drop corresponds to the minimum 4 m/s air velocity. When the next thermostat calls for increased ventilation, the suction in the barn will increase, the fans will work harder, and the air velocity at the inlet will almost double; this will do an even better job of mixing air along the ceiling. As shown in the Ventilation Schedule (Plan sheet 1), the operator should anticipate which thermostat will be cycling



1 vestibule, with pig sorting and loading, heating, electrical & watering equipment
2 self-feeder, or feed on floor
3 pens 4.8 to 2.4 m wide, 4.8 m long
4 slotted floor
5 exhaust ventilation fans
6 double-slot adjustable fresh air inlet from attic
7 summer attic ventilation doors, both ends
8 white or insulated roof
9 insulated walls and ceiling

Figure 2 Growing/Finishing barn with mechanical ventilation, part slotted floors.



at any given weather period, and set the inlet adjustment accordingly; four basic inlet settings will be required for the five-step ventilation shown in the schedule. Note that in hot summer weather it is better to open the inlets more fully, to take advantage of the air-moving capacity of the big, belt-driven summer fans.

For good operating economy, it is important to specify the new high-efficiency motors, particularly for the smaller fans that operate all year.

Supplementary heating will be required for good ventilation whenever outside temperature goes below about-15°C. Heat may be added by hot-water piping in the floor near the front of the pens, by hot-water piping suspended under the inlets, or by various air-heating systems. Air-to-air heat exchangers and wall-mounted solar systems offer further choices for warming the intake air supply.