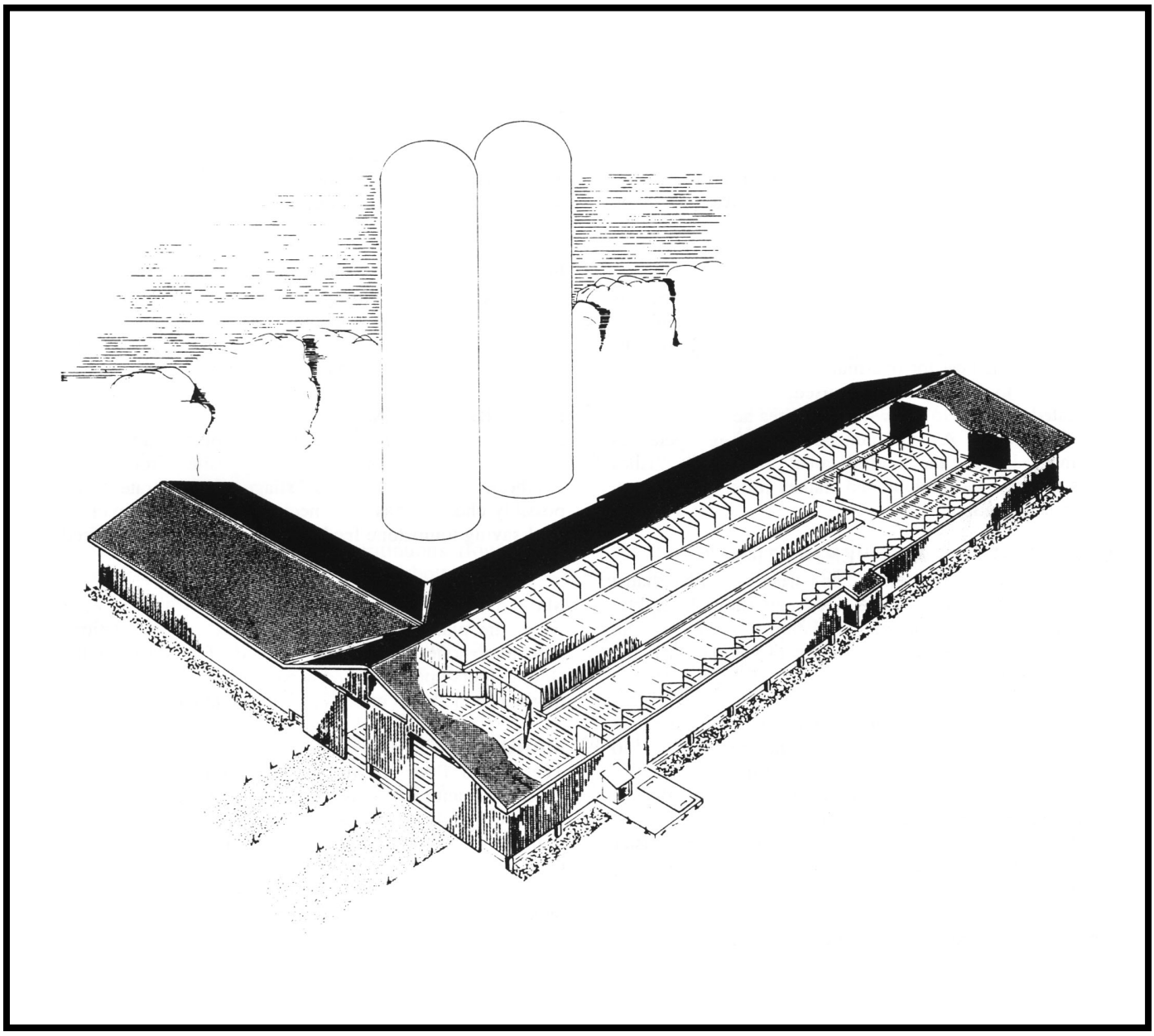
FREE STALL DAIRY SYSTEM - SLOTTED FLOORS



DEVELOPED BY CANADA PLAN SERVICE

321-14

FREE STALL DAIRY SYSTEM – SLOTTED FLOORS

CPS
PLAN M-2102 REVISED 84:07

This is a detailed plan set showing a free-stall dairy barn 12 x 40.8 m to house a milking herd of about 70 cows. An optional wing can be added to either double the herd to 140 cows (12 x 34.8 m), or to house dry cows and bred heifers normally required to maintain a 70-cow milking herd (see Figure 2).

The extra wing may be added at first or later, but be sure to plan for later expansion even if the extra wing is not required immediately. This wing may be of similar construction and detail to the milking herd area except that the free stalls can be slightly narrower for heifers. Both wings can be fitted into a compact 12 m clear span barn, since with slotted floors there is no need to provide extra space for a tractor and scraper to move among the cattle.

MILKING SYSTEM

To allow for possible expansion, the milking center is attached at the side of the main barn. A double-4 herringbone milking parlour is shown (Plan 324-61 CPS M-2501); this is best for one-man milking, although other milking parlour types could be used. The milking center is located adjacent to a cow-holding area across the width of the barn. A mechanized crowding gate is recommended for the holding area; this gently pushes cows towards the parlour and makes milking a smooth one-man operation.

CONSTRUCTION AND VENTILATION

The plans show fully-insulated construction, with exhaust fans and thermostat controls for ventilation. In milder parts of Canada, a natural ventilation system (with an open ridge slot and adjustable sidewall ventilation flaps) could be substituted.

Walls are framed on pressure-treated square poles spaced at 2.4 m centers; between the poles, horizontal girts 140 mm wide are fitted to support the claddings and friction-fit insulation. This construction has important advantages over conventional concrete foundation and stud-frame walls (i.e., better windstorm resistance, and faster construction which is especially important when building in bad weather).

The roof is framed with clear-span trusses usually spaced at 1.2 m. Build your own Canada Plan Service trusses, or see your truss supplier for a suitable prefabricated truss designed for the snow loads expected in your area. Roof with galvanized steel on 38 x 89 mm strapping, screw a prepainted steel ceiling to the underside of the trusses, and insulate the ceiling from above.

For ventilation, an adjustable baffle controls air-flow from a long baffled slot at the center of the ceiling. The plan gives a schedule for fan capacities and stepped thermostat settings to automatically handle the full range of weather from winter cold to summer heat. The only regular adjustment required is to set the air inlet slots to correspond with the fans that will be running during the weather expected. For example, to prevent drafts in cold winter weather, adjust the inlet down to 3 mm slots to maintain at least 4 m/s air velocity across the ceiling when the step 1 fan is ventilating; when the second thermostat starts the next fan, the ventilation rate will almost double, and the ceiling air inlet will allow this increased flow without any adjustment. With milder weather, the step 3 fan will also operate occasionally and the inlet must be opened to 9 mm, and so on.

The plan shows a separate inlet over the cow holding area; this allows for wider inlet slots to give extra ventilation here when cattle are crowded in for milking during hot weather.

Four-step ventilation is shown for year round housing. If cattle are pastured during hot weather, or if the big sliding doors can be left open all around for natural wind ventilation in summer, the biggest step 4 fans can be reduced to the same size as the step 3 fans.

FEEDING SYSTEM

A convenient feed room can be built on the side of the milking center, or on the side opposite. From there, overhead conveyors carry silage, concentrates and possibly chopped hay to a mechanical bunk conveyor. A feed-saving tombstone feed fence is used around the feed bunk.

Many dairymen want to feed baled hay as well. In each wing, the plan provides for baled-hay feeding stations with tombstone feed fencing instead of four free stalls; sliding doors open in the adjacent outside wall for putting in giant round bales or conventional square bales.

MANURE SYSTEM

The slotted floor manure system eliminates the daily chores of manure cleaning and keeps both stalls and cows remarkably clean. Slotted floors can be made from reinforced concrete 'grid' sections made 1.2 x 2.4 m. Concrete slats 200 mm wide provide a firm, textured walking surface for the cattle, and 38 mm slots let manure and urine pass through the floor.

Top-quality concrete slotted-floor girds with uniform slot widths and smooth, pencil-rounded top edges are most important, to prevent chipping and minimize risk of catching a hoof. Single slat floor units may be used, but these are more likely to wobble if improperly fitted and they require more reinforcing steel than the slat grids.

To provide enough manure storage for long Canadian winters at minimum cost, concrete trenches under the slotted floor passages conduct the semiliquid manure

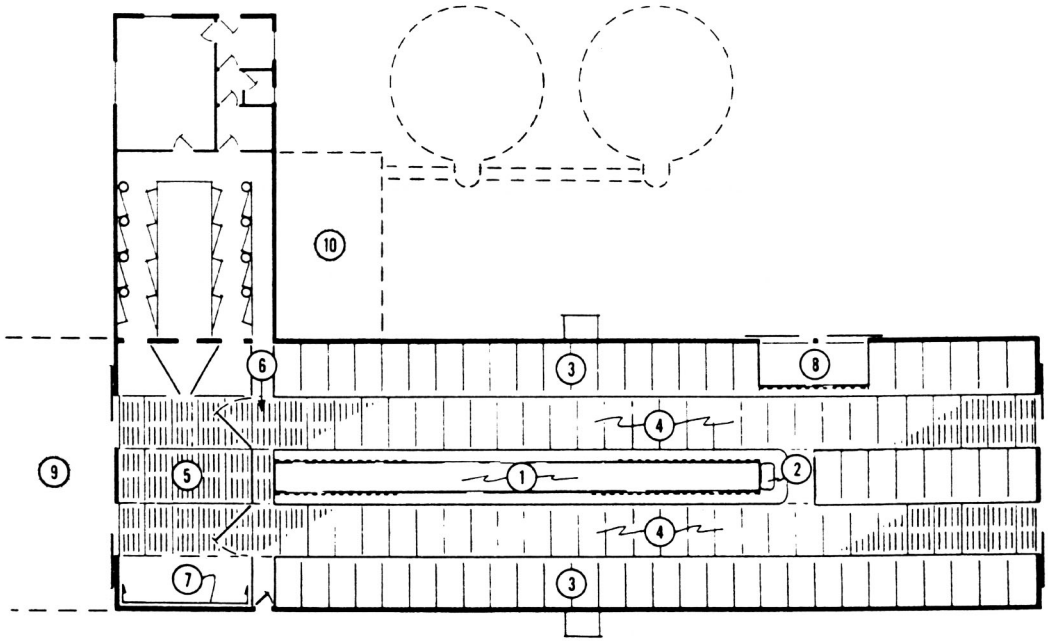


Figure 2 Floor plan of a two-alley free-stall dairy, barn, 60-64 free stalls

1 feed bunk, with mechanical feeder
2 watering tank on raised platform
3 free stalls, 60 or 64 stalls
4 cow alley, floor slotted
5 holding area (1.5 m^2/cow), to milking dry cows and heifers
6 cows return from milking parlour 10 feedroom, silos, etc.
7 mechanical crowding gate
8 optional baled hay feeder with tombstone feed fence
9 optional housing for more milk cows, or dry cows and heifers
10 feedroom, silos, etc.

by gravity to a deeper cross trench under the holding area. This cross trench in turn carries it to a pumping pit designed for a portable tractor-powered agitator pump for transfer to long-term storage. Some operators prefer the convenience of an electric pit pump for this weekly transfer operation.

The manure trenches function as 'continuous flow' gutters as used in Europe. Each gutter bottom is made smooth and level, with a 150 mm dam across the overflow drop. Start by filling the trench with water to the top level of the dam; this dilutes and lubricates the manure as it accumulates. The manure starts to flow slowly over the dam, and the top surface develops a slope, with the manure accumulating deepest at the end remote from the overflow. The longer the gutter, the deeper it should be to make room for the manure slope without overfilling the trench at the far end. For dairy cattle manure with very little bedding included, German literature gives the following:

Gutter length (m)	15	19.2	24	30	34.8	39.6
Minimum gutter depth (m)	0.75	0.80	0.87	.0975	1.075	1.20

Note that Plan 321-14 (CPS M-2102) shows a gutter length of 33.6 m with a channel depth of 1.2 m. Limited experience in Quebec and Manitoba indicates this will work if silage is the main feed; if considerable hay is fed, relocate the deep cross channel to split the barn in two and thereby shorten the long channels.

Never allow waste hay to get into the gutters; this is why the feed-saving tombstone feed fence is recommended here. Watch the continuous flow gutters for undesirable meandering flow or islands of solids which indicate manure sticking to the trench walls, especially at the rear of the free stalls where excess bedding can get tramped through the slotted floor. Cut these islands free of the walls and keep them flowing.

With either a tractor-powered or electric agitator-type pump, stir and pump manure to tanker or remote storage about once a week. In this case, extra holding capacity is provided by a cross trench 2.25 m wide. If the barn is located near a hillside, it may be possible to drain the manure continuously to long-term storage by gravity alone. The only problem is freezing; in winter it is necessary to drain the cross trench into the unfrozen bottom of the storage so that the entire system is sealed against cold. Details of the gravity transfer system are not included in this plan.

Completely drain and flush the trenches each summer if cattle go to pasture; this prevents manure from drying out and caking in the trenches when cattle aren't kept inside the barn. Re-prime the trenches with water and treat with insecticide or oil to control flies. Obtain approval for your plans from proper local authorities before you start construction.