

Farm Structures FACTSHEET

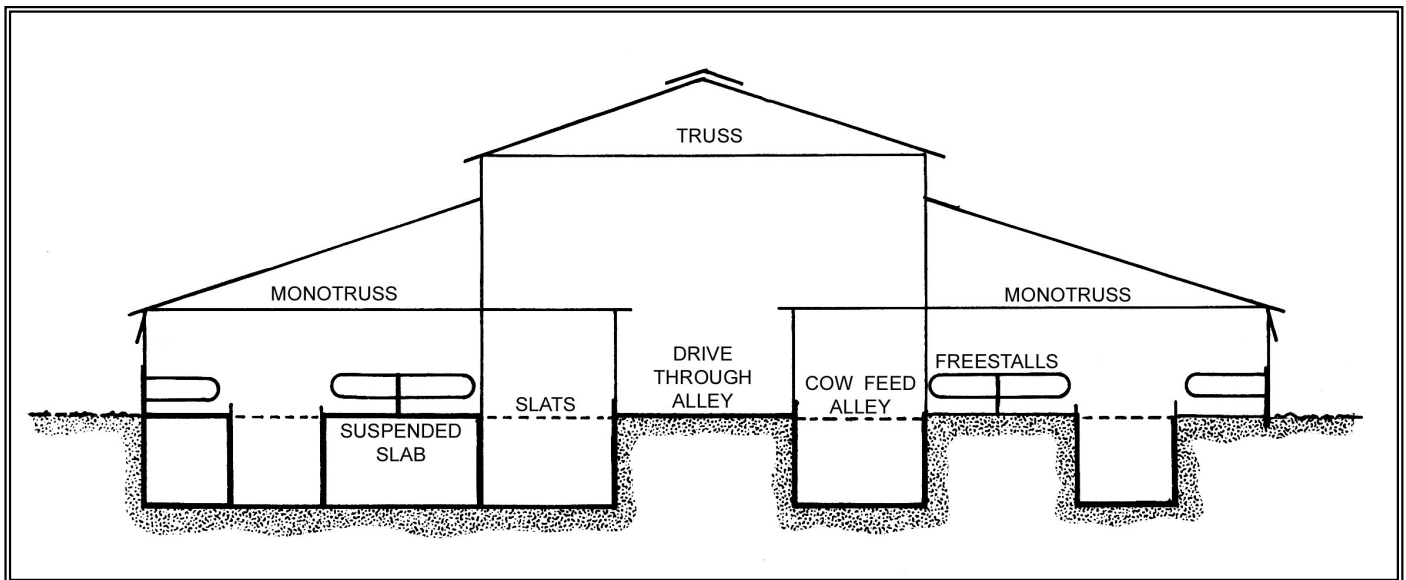


BRITISH
COLUMBIA

Ministry of Agriculture and Food

Order No. 381.210-1
Agdex: 722
January 1985

SLOTTED FLOOR FREESTALL DAIRY BARN WITH SUB-FLOOR MANURE STORAGE



**MANURE STORAGE UNDER
ALLEYS AND STALLS**

**MANURE STORAGE UNDER
SLOTTED FLOOR ONLY**

The slotted floor system of housing dairy cattle has become popular in BC since 1980. Today 13 dairy farmers are housing over 2000 cattle on the slotted floor system. This method of housing is not new, however new technology in design and management of this system has created new interest among the dairy producers. The initial cost of slotted floor housing is much higher than the conventional barn with solid concrete floors where manure is tractor scraped to an outside manure storage pit.

The cost of slotted floor housing is comparable to the combined cost of a conventional barn with outside roofed manure storage having the same storage capacity. The slotted floor design is also being adopted because of a saving in labour involved in cleaning alleys, reduced bedding required with concrete freestalls and increased stocking density. The increased stocking density reduces the cost per animal unit for this type of housing

DESIGNING THE SLOTTED FLOOR HOUSING SYSTEM

The following is a list of points to consider when planning a slotted floor barn.

1. The sub-floor manure storage must be designed to withstand all anticipated soils, manure and vehicle loads, plus uplift if a high water table exists.
2. The depth of the tank will be limited by the highest level of the water table and this will affect the storage capacity of the tank.
3. The concrete slats must be reinforced to withstand the load of animals and tractor with sawdust blower. The slats are designed with a width of 140 mm to 150 mm (5 1/2" to 6") with 40 mm (1 1/2") slots. This design gives a compromise between cleanliness and comfort.
4. Slats should be installed carefully and placed on a bed of grout to ensure that they are rock steady. Gang slats are preferred for that reason.
5. An important design factor is ensuring that the self-cleaning properties of the slats match up with stocking density. In freestall housing, this can be done by having cows in three rows of freestalls feeding from one side of a feed fence versus two rows of freestalls. This is particularly important in very cold weather and very hot weather when manure will dry before it is trampled through the slots. Alleys can also be narrower than normal.
6. In the above situation, the feed fence space per cow would be 450 mm (1'-6"). The standard space per cow for time interval feeding is 600 mm (2'-0"). New feeding methods of complete mixed rations with continuous feed, supplemented by computer grain feeding, allows for less feeding space per cow.
7. The sub-floor manure storage can be located under the cow alleys only or under the total barn including freestalls, but excluding the drivethrough-feeding alley. The costs of both methods are comparable because the excavating and backfilling work required is similar for both methods. The second case would give substantially more manure storage: 7 to 8 months' storage of manure for mature cows. (Refer to diagram on front page).
8. The sub-floor manure storage is designed with a series of racetrack manure channels. All racetracks should be connected with an overflow provision from one racetrack to another. This is required particularly where dairy wastewater is added to one racetrack, thereby filling it faster than others. Another case requiring connecting manure channels would be where heifers, producing less manure than the mature herd are housed above different channels.
9. Provide room for a surface agitator in addition to the bottom agitator. The bottom agitator acts like a pump set in a crosswall in the channel. Also provide one turbulence wall at the end of the channel. The turbulence wall and surface agitator help to break up crust formation which result from not agitating frequently enough.
10. Provide for complete cleanout of heavy sediments from time to time.
11. Design the agitation and manure removal access so it does not interfere with future expansion of the barn. **Install a fence around all open pit areas.**
12. Add water to the sub-floor manure storage before the cows begin to occupy the barn. This is to prevent manure from sticking to the pit floor.
13. Locate the barn to take advantage of prevailing winds. This is for natural ventilation and to provide extra air movement through open doors to dilute the air when agitating. **The slotted floor system with subfloor manure storage is only recommended for the naturally ventilated cold barn. The barn would have large side air inlets and a continuous open ridge ventilator.** The warm barn, mechanically ventilated, can pose disastrous results during a mechanical or power failure of the ventilation system. Without continuous, good ventilation, a buildup of manure gases can be fatal to livestock and people particularly during agitation.

MANURE GASES

All cattle manure produces odour and gases regardless of storage facility. Outside manure storage produces few problems to animal or human health. These gases can cause visible damage due to corrosion to exposed metal of roofed manure storages. The effect of gases can also be seen by large bubbles on the crust of stored manure. Manure gases develop from the bacterial degradation of organic material under anaerobic conditions. Anaerobic is the term given to the condition where

no air is added to the manure. Aeration can eliminate these gas and odour problems, however, it is not common practice on the dairy farm. Subfloor manure storage within a livestock facility, such as the slotted floor barn, requires a greater awareness on the part of the producer and the workers in the barn of the behaviour of stored manure. The following is a list of some points to be aware of:

1. The slotted floor system can result in high odour levels inside a building and has been known to produce noxious gases which are potentially dangerous to both animal and humans within the structure.
2. The major gases produced in the stored manure are ammonia, carbon dioxide, hydrogen sulfide and methane. Each of these gases could be fatal to animals and humans if present in high enough concentrations.
3. The effect on livestock productivity of long-term exposure to sub-lethal concentrations of toxic gases is unknown.
4. Under normal conditions in well-ventilated livestock structures, there is no evidence that any noxious gases reach lethal or even harmful concentrations for animals or humans.
5. There is always a danger of high manure gas concentrations when the manure is agitated, particularly at the agitation location. **Install a warning sign at all agitation port locations.** This warning sign should list proper safety precautions, as listed under management as follows:

MANAGEMENT OF THE SLOTTED FLOOR BARN

The following items required regular management in the slotted floor system.

1. Have side air inlets and ridge ventilators open at all times. There is a temptation to close these in cold weather.

2. Agitate the manure on a regular basis to prevent a crust buildup. This could be once a month depending on crust buildup.
3. Agitation should be conducted on a windy day. Open all doors for extra air to dilute the gases which will escape from the manure during agitation. The concentration of these gases will be much higher than under normal non-agitated conditions.
4. Animals in the building should be removed if possible. No person should be allowed in a building during agitation.
5. A manure pit must never be entered unless the person is equipped with a self-contained breathing apparatus. A safety rope should be attached to the person entering and should be held by an observer located in a safe position ready to pull the person out of the pit if any problems are indicated.

Used properly, manure pits are an asset to a dairy farming operation. Used without thinking, they become a liability. Make sure your manure handling practices are safe.

OTHER POINTS TO CONSIDER

1. Experience from producers indicates that there is a transition period for a cow to adjust to slotted floor housing. The major adjustment is going from a deep-bedded stall to a hard surface freestall which has a rubber mat and minimum sawdust. The cows may develop foot and joint problems for a period of time as they get used to the hard surfaced stall.
2. Additional information for dairy producers is available from the Ministry of Agriculture and Food, Resource Management Branch publication list.

FOR FURTHER INFORMATION CONTACT

John Luymes, Farm Structures Engineer
Phone: (604) 556-3114
Email: John.Luymes@gems7.gov.b.c.ca

RESOURCE MANAGEMENT BRANCH

Ministry of Agriculture and Food
1767 Angus Campbell Road
Abbotsford, BC CANADA V3G 2M