Manure Storage and Handling

On average, an 1100 pound (500 kg) horse will produce 31 pounds (14 kg) of feces and 2 to 3 gallons (8-11 litres) of urine per day, plus bedding. The amount of manure that can build up over one year from just one horse is substantial. If you are not careful with manure storage and handling, “Mount Manure” can become a serious management problem.

A poorly managed manure pile can harbour intestinal parasites, provide a breeding ground for flies and insects and produce objectionable odours. Runoff from improperly stored manure can quickly become a potential environmental contaminate, because it can carry nutrients, pathogens and organic particles into the water cycle via surface runoff or leach into groundwater. In addition to the health and environmental concerns listed above, “Mount Manure” is unsightly.

Regardless of the method of disposal, manure will have to be stored for some time, so proper manure storage facilities are important. Designing a storage facility and disposal plan are essential in any livestock operation. Once proper manure storage and handling facilities have been designed and constructed, they can be used yearly until the manure is disposed of.

Conquer Mount Manure by having an appropriate manure storage and disposal plan.
Step 1: Site Selection

Selecting an appropriate location for storing manure is an important first step in the design and construction process. Be aware that AOPA legislation provides both permanent and short term storage standards that apply to all livestock production, including horses. Anyone who handles and stores manure must consider setbacks, water table and flooding areas (Refer to AOPA Standards to see what applies to you).

Whether a formal storage facility is planned or a simple free-standing manure pile, several factors must be considered when determining the location of a storage site:

Protect water sources

In Alberta, manure cannot be stored within 330 feet (100 meters) of any spring or water well or within 100 feet (30 meters) of any open body of water. Contamination of surface water, groundwater and any common body of water must be avoided (Figure 6).

Topography

Manure storage facilities should be located where there is minimal runoff potential to reduce the risk of surface water contamination. Depressed areas, where water tends to pool, should also be avoided for the same reason.

Accessibility

Ensure there is ample room to manoeuvre machinery around the storage area.

Aesthetics

If possible, locate manure storage facilities out of sight of and downwind from public places and neighbouring residences.

The Agricultural Operation Practices Act (AOPA)

As of January 1, 2002, amendments to the Agricultural Operation Practices Act (AOPA) brought major changes to livestock management in the province. AOPA is Alberta’s legislation governing new and expanding confined feeding operations (CFO’s) and is administered and enforced by the Natural Resources Conservation Board. AOPA presents management standards for manure storage and handling, nutrient management and record keeping. For more information on AOPA and how it pertains to your operation, the Agricultural Operation Practices Act and associated Regulations are posted on Alberta Agriculture, Food and Rural Development’s web site at www.agric.gov.ab.ca/navigation/livestock/cfo/index.html; click on Acts and Regulations under Categories. The Act and Regulations can also be printed from the web site. Questions can be directed to: cfoinfo@gov.ab.ca.

Figure 6. Unmanaged manure piles attract weeds and have the potential to contaminate surface or groundwater.
Step 2: Design and Layout

The design of any manure storage and handling facility will depend on the following factors:

1) Volume of manure produced
   The number of horses, the type of feed and the type and amount of bedding used will determine the amount of manure produced in each operation. The density of horse manure (urine + feces) is 63 lb/ft³ (or 1 tonne/m³). So, 51 pounds of manure would occupy 0.81 cubic feet or 22 litres. The addition of bedding can easily double or triple this volume. The volume may also vary depending on the management practices.

2) Length of storage
   Length of storage will depend on the intended use of the manure. For example, if the manure is to be used as a fertilizer, storage facilities must be able to store all the manure until the appropriate time of application, which can be up to six months or more. As a general rule, the longer the intended storage time, the larger the storage facility required.

Large horse boarding operations (10 or more horses) with insufficient land base available for the use of all the waste produced would benefit from a permanent storage facility. Conversely, smaller operations (less than 10 horses) with sufficient land base available for manure application may store manure as a free-standing manure pile, rather than building a formal storage facility.

Example:
To determine the daily volume of waste produced:

a) Multiply 0.92 ft³ (26 litres) times the number of horses on your farm. Remember to adjust upwards if bedding is included. (e.g. 1 part manure: 1 part bedding = 1.8 ft³/horse/day.)

b) Then multiply the daily volume times the number of days the manure is to be stored.

c) Take the cubed root of the total storage volume required and work from there to determine suitable dimensions.

**Table 1. Example bin size calculation for your operation.**

<table>
<thead>
<tr>
<th>Calculation</th>
<th>Imperial</th>
<th>Metric</th>
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</thead>
<tbody>
<tr>
<td>a) Waste volume calculated</td>
<td>2.4 ft³/horse/day x 6 horses = 14.4 ft³/day</td>
<td>66 L/horse/day x 6 horses = 396 L/day or 0.40 m³</td>
</tr>
<tr>
<td>b) Storage Required</td>
<td>14.4 ft³/day x 120 days = 1728 ft³</td>
<td>0.40 m³/day x 120 days = 48 m³</td>
</tr>
<tr>
<td>c) Bin Size</td>
<td>Volume = length x height x width</td>
<td>1728 ft³ = 17 ft x 17 ft x 6 ft</td>
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</table>
Step 3: Construction

Once the location of the manure storage area has been selected and a design determined, construction can begin. The type of material used in the construction is an important consideration. Choosing appropriate flooring material should not be overlooked, as proper flooring will prevent contaminants from leaching into groundwater. A concrete slab or well-compacted soils high in clay, but low in sand or gravel, are suitable flooring materials. Concrete, tightly fitted wood planks or cinder blocks can be used for constructing walls.

Storage facilities that have walls will contain the manure pile and will facilitate the use of equipment necessary to handle the manure. Constructing a roof or covering the manure pile with a tarpaulin or heavy plastic will reduce runoff and seepage from the storage area. Leaving the storage area open may be suitable in some low precipitation regions of Alberta, but this approach is not recommended. Covering the pile will reduce the risk of producing contaminated runoff. If, however, contaminated runoff becomes an issue:

- collect and contain the runoff by constructing a catch basin
- filter through a serpentine grassed waterway, grassed or treed filter strip
- disperse on cropland

Manure Storage Options

- three-walled structure with roof or tarp cover (Figure 8)
- covered or enclosed truck bed or manure spreader (Figure 9)
- covered dumpsters
- covered, free-standing manure piles

Figure 8. Three-walled structure contains the manure and can easily be covered with a tarp.

Figure 9.
The Bottom Line

- Horses produce large amounts of manure.
- Site selection of a manure storage facility is important and must comply with the *Agricultural Operation Practices Act* (AOPA) standards and regulations.
- The design and construction of a manure storage facility depends on the volume of manure produced and the storage period.
- Storage should be considered a temporary solution for handling manure, because eventually, the manure needs to be disposed of.
- Manure storage facility construction must comply with the *Agricultural Operation Practices Act*. 