

## University of Missouri Extension

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# Tip Tank for Flushing Dairy Free-Stall Alleys

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A 500-gallon cylindrical tip tank is capable of flushing dairy free-stall alleys up to 10 feet wide and 40 feet long. Wider areas may be flushed, but they may need two or more tanks discharged simultaneously. Longer alleys may be flushed with larger volumes of water.

The tip tank is a horizontal cylinder. Water is discharged through an opening in the side. The tank pivots around its central axis, which is an axle extending through the side of the tank and resting on pillow blocks at both ends. The tank is dumped manually, since the dairy operator probably will be near the tank as often as it needs to be dumped (usually twice a day).

Construction details are given for a tank with a capacity of about 500 gallons. Smaller tanks could be constructed in a similar manner. Tanks as large as 1,000 gallons may need some internal bracing.

## Constructing the tank

Start with a cylindrical tank of the size you want. You may be able to acquire tanks with the discharge opening. If not, the first construction step is to cut the discharge opening in the tank.

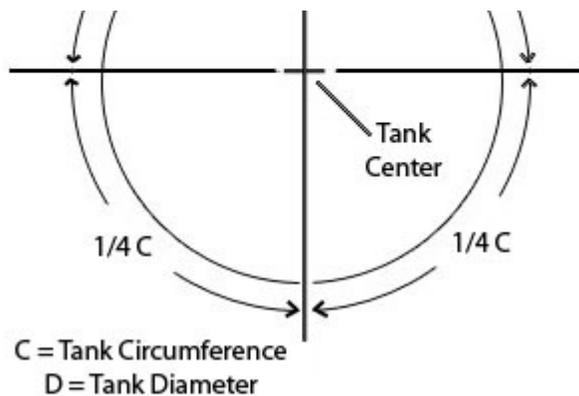
The discharge opening should be large enough so that it does not restrict water flow from the tank. Opening widths equal to 0.4 times the diameter of the tank should work well. When cutting the opening in the tank, take care that it runs parallel to the horizontal axis of the tank and doesn't corkscrew around the tank. You can do this by using the seam of the cylinder as a reference line. Then cut the edges of the opening an equal distance on both sides of the reference line so that the total opening width equals 0.4 times the diameter of the tank (Figure 1).

Use seam as reference line when measuring for tank opening and to locate center of tank



Figure 1

Measuring for tank opening and center of tank.



The end of the opening should stop 1-1/2 inches from the end of the tank to save the structural strength of the corner edge of the tank. Reinforcing strips 1-1/2 inches wide should be left at 2-foot intervals in the opening to keep the hole edges from spreading too much when the tank is full. This interval will depend somewhat on tank length.

After the discharge opening is cut, weld some bracing along the lip on either side of the opening to prevent buckling. Tanks of 300 gallons or less capacity may not need bracing, depending on tank material weight and the ratio of tank length to tank diameter.

Angle iron bracing (1-3/4 by 1-3/4 by 3/16-inch) has been used successfully in 500-gallon tanks. Pipe that is 1-1/4 inches would offer about the same bracing strength as the angle iron and could be used if it is easier to get.

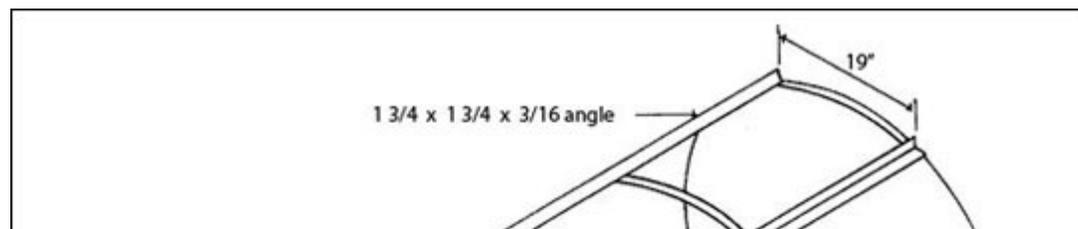
The next step is to install the axle in the tank. Find the center of the tank by measuring around it, starting at the reference line used as the center of the discharge opening. Mark the point exactly opposite the seam or reference line, which is one-half the way around the tank. Draw a diameter line across the end of the tank connecting this mark and the reference line at the top of the tank. Similarly measure a distance around the tank on both sides of the reference line equal to a fourth the circumference of the tank. Connect these two points with another diameter line across the end of the tank. The intersection of these two diameter lines is the geometric center of the tank. Do this for both ends.

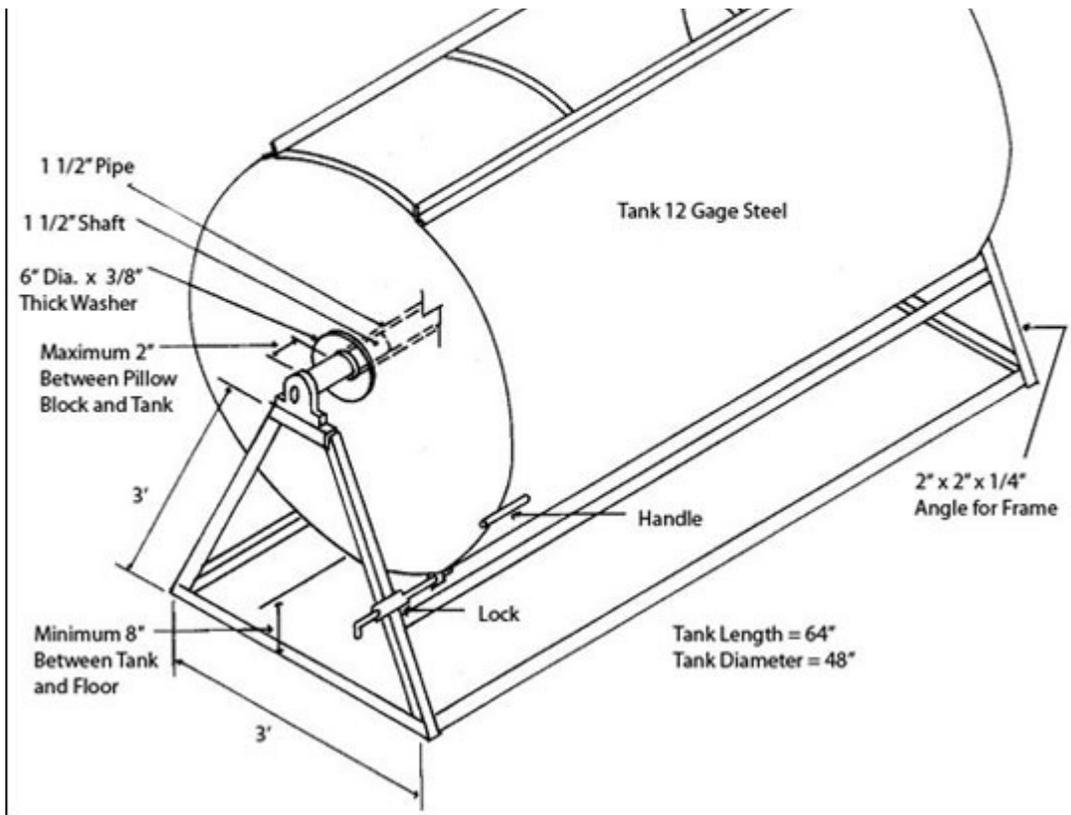
The axle on the tank in Figure 1 is a 1-foot length of 1-1/2-inch cold rolled steel welded into each end of a length of 1-1/2-inch pipe. The hole for the axle in either end of the tank should be cut large enough for the 1-1/2-inch pipe. A large washer 6 inches in diameter and 3/8-inches thick should be welded to the outside of the tank and around the axle to distribute the stress over a larger area on the end of the tank. Axles made entirely of pipe, with pipe bearings, have been used successfully for tanks with up to 300 gallons capacity.

The frame that supports the tank may be made of angle iron or pipe. The frame for the tank in Figure 2 is constructed from 2 by 2 by 1/4-inch angle; however, 2-inch pipe also could be used for the frame. Install a lock to hold the tank in the upright position, as shown in Figure 2, and weld a handle to the edge of the tank to make dumping easier.

Wider areas may be flushed by placing two or more tanks end-to-end and connecting the axles so that all tanks dump simultaneously.

The dimensions and instructions given are intended primarily to introduce the manually dumped cylindrical tip tank. Some adjustments in material selection, construction technique, etc., may make tank construction in your situation easier.





**Figure 2**  
 500-gallon manually operated tip tank.

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## Related MU Extension publications

- AED17, Three-Inch, 150 Gallon Siphon-Flush Tank  
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=AED17>
- EQ301, Dairy Manure Management Systems in Missouri  
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=EQ301>
- G1927, Spin-Through Flush Tank  
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=G1927>
- WQ308, Flushing Systems for Dairies  
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=WQ308>
- WQ313, Flush Gutters for Dairies  
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- WQ314, Basic Requirements for Flushing Dairies  
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=WQ314>
- WQ315, Tip Tanks for Dairy Flushing  
<http://extension.missouri.edu/publications/DisplayPub.aspx?P=WQ315>
- WQ316, Siphon Tanks for Dairy Flushing  
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