



EPA Region 8 Drinking Water Unit Tech Tips

Sanitary Protection of Drinking Water Storage Tanks: Vents

EPA Region 8 requires all drinking water storage tanks to be vented.

Vents are a tank's lungs, breathing air in and out as water levels and air pressures change. As water fills a tank it displaces air, increasing internal air pressure. That air escapes through the vent (and overflow, too, if the tank isn't overflowing water), thus equalizing air pressures and preventing a tank **explosion**. When water is drawn out of the tank, air space can increase rapidly and create a vacuum. The vent (and again, possibly the overflow) pulls outside air into the tank, once again equalizing internal and external air pressure and preventing a tank **implosion**. If a tank is overflowing, only the air vent can breathe, so the two facilities must be separate. Vents must be properly designed by a Professional Engineer to handle airflow through a tank.

Downturned Vent: Configuration deters contamination entry.

Vents are a contamination pathway, so they must be screened with non-corrodible #24 mesh to keep out insects, rodents, and birds (See #24 Mesh Tech Tip). One bird dropping can contain thousands of Salmonella! A proper vent height prevents dust, oocysts, dried feces, etc. being inhaled into the tank.

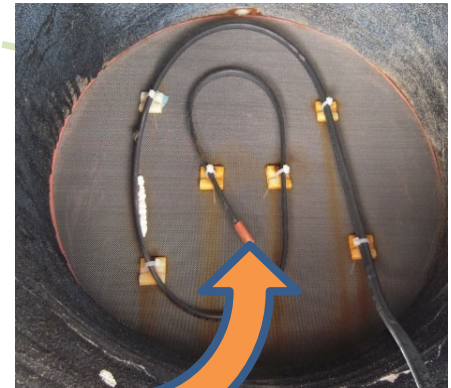


A Significant Deficiency will be triggered by:

- A buried tank vent that is not downturned.
- Lack of #24-mesh vent screen.
- Termination height less than 24 inches above the roof.

Installing #24-mesh screen between 2 flanges allows the screen to set flush. This creates a better seal than wrapping it around the pipe with a hose clamp. Also, the flanges keep the screen inside the vent, making it harder to vandalize.

Install a heating coil if freezing is a concern



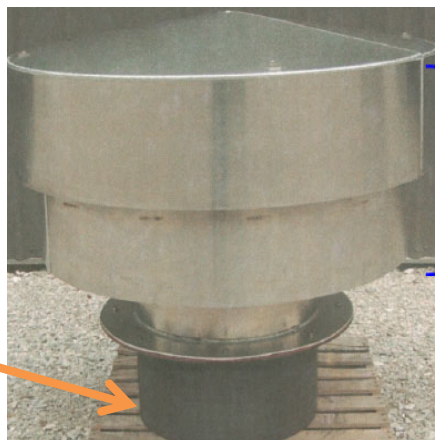
Non-downturned Vent: Elevated or Ground Level Tanks Only



The watertight cover must extend to the vent screen bottom to keep out rain and snow and minimize dust and sunlight entry. While the screen is only required to terminate 8 inches above a horizontal surface, best practice recommends that it be elevated at least 24 inches to protect against inhalation hazards such as bird excrement.

For elevated and ground-level tanks with a non-downturned vent, if the bottom of the vent & its #24-mesh screen is < 8 inches above a horizontal surface, it will trigger a significant deficiency.

In addition to the #24-mesh screen, the vent should have a bird screen or bird spikes to prevent birds from nesting on top of a horizontal screen. In cases of severe bird or other animal problems, the vent height should be > 24 inches.



Lack of a solid cover that extends to the bottom of the #24-mesh screen will trigger a significant deficiency.

Vents not accessible for inspection can trigger a significant deficiency.



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Vents: Elevated Tank Vacuum/Pressure Relief

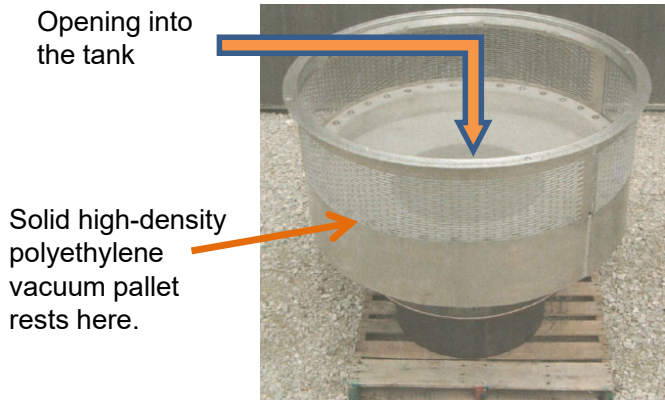
Protection for Thin-Walled Tanks: Elevated (pedestal, standpipe) tank vents, like all tank vents, must be protected from insects and other contaminant vectors with #24 mesh non-corrodible screen (see Tech Tip on #24 mesh). However, while concrete ground-level tank walls can be 8 to 10 inches thick, elevated tank wall thickness may be as little as $\frac{1}{4}$ inch (depending on tank height and diameter). Since such thin walls can be easily deformed by internal/external pressure differentials, elevated tanks must be protected with some type of vacuum/pressure relief mechanism.

One Example: Movable Pallet Vacuum/Pressure Relief

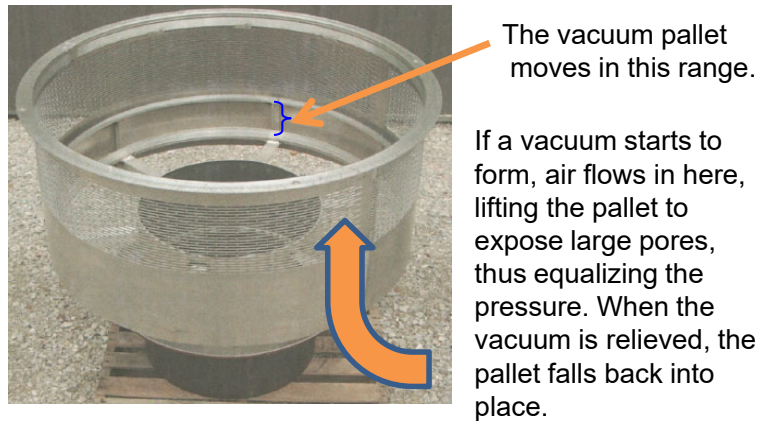
Operation during vacuum:

If the tank level drops rapidly due to something like a main break, or if the #24-mesh screen is plugged by ice or something else while the tank level drops during normal operation, it will cause a vacuum. The building vacuum force lifts the lower pallet, exposing large pores that allow rapid, unobstructed airflow into the tank. As the vacuum subsides, gravity pulls the pallet back down, sealing off the flow and restoring the #24-mesh screen protection.

Vacuum pallet (normal or resting state)



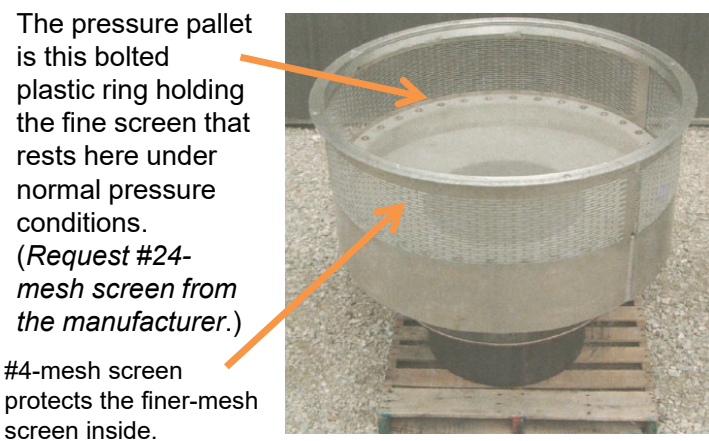
Vacuum pallet (equalizing state)



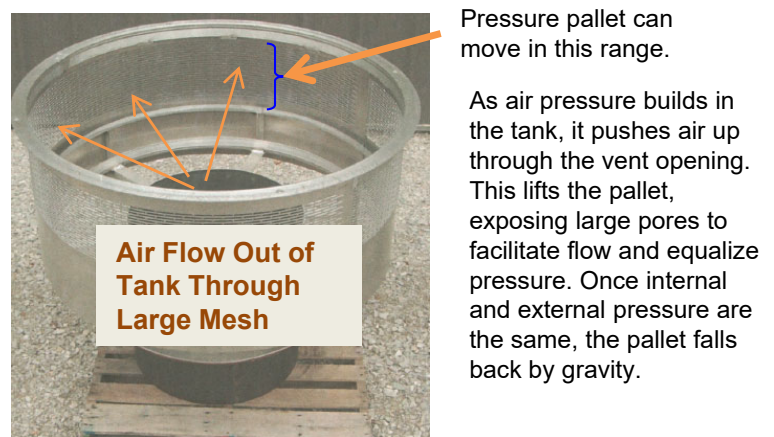
Operation during pressure build-up:

If the #24-mesh screen is blocked for any reason while the tank is being filled, air pressure will build and push the pallet up, temporarily exposing the larger-diameter screen to allow faster airflow out of the tank. Once pressure is relieved, gravity pulls the pallet back down, sealing off the flow and restoring the #24-mesh screen protection.

Pressure pallet (normal or resting state)



Pressure pallet (equalizing state)



Routine Inspections:

This is an example of a mechanism that relieves both pressure and vacuum in a thin-walled tank to prevent damage. Such a mechanism is just one element of tank protection. Another important element is daily, weekly, and quarterly tank inspections, which in many cases requires climbing the tank.