



Vacuum Testing of Septic Tanks

By Ronald Thornton, PE

ASTM C1227 allows for the design of a septic tank to be performed either by computation or proof-of-load testing. Because the tank is a sealed chamber, proof testing can be readily conducted by creating a vacuum within the tank. Vacuum, measured in inches of mercury, simulates an external uniform load equally applied to all surfaces including the side walls, top slab and bottom slab.

When selecting a tank for testing, it must be representative of tanks made on the same size mold and made from the same materials and methods. In other words, tanks represented by the proof test must be made from the same mix design, use the same reinforcing, and have the same dimensions and member thicknesses.

The tank should be inspected prior to testing for compliance with the shop drawing and for signs of cracking or other defects. The tank should be set on a yielding foundation during the test (i.e. sand bed) in order to assure that the tank dead load does not control the bottom slab design.

The top and bottom slabs may have a greater structural capacity than the side walls. Since vacuum pressure is equally applied to all surfaces, additional uniform load may be applied to the top slab, if desired, in order to increase the allowable capacity of the top and bottom slabs over and above the capacity of the side walls.

Once the tank has been inspected

and is properly sealed and prepared for testing, the tank shall be subjected to a gradually increasing vacuum pressure until the target value is reached.

Watertightness may be evaluated during the proof test by applying a vacuum level of 4"Hg and holding it for 5 minutes. This test is passing if the tank holds 90% of the vacuum dur-

The target vacuum pressure for a structural test should be at least 7"Hg for tanks under 2' of earth fill and in dry soil conditions.

ing the 5 minute duration. *Note: This criteria exceeds the vacuum test requirements of ASTM C1227 but is consistent with the NPCA "Best Practices Manual for Precast Concrete On-Site Wastewater Tanks.*

The target vacuum pressure for a structural test should be at least 7"Hg for tanks under 2' of earth fill and in dry soil conditions. If a tank is buried 5' below grade in saturated soils, it would be subjected to a load equal to about 14"Hg. Therefore, be sure that your test load is consistent with anticipated field conditions.

If the target vacuum pressure is achieved without collapse, then the vacuum should be held for approximately one minute, after which the pressure may be gradually released.

Once the vacuum source is removed, all interior and exterior surfaces of the tank should be inspected for the presence of cracks or spalls.

Test results should be evaluated by a Licensed Professional Engineer to determine the allowable live loads and placement depth of the tank under various soil conditions. A minimum safety factor of 1.5 is used when computing the structural capacity of the tank.

Periodic testing is recommended to assure that the results you are using are representative of the tanks being produced. Changes in materials or manufacturing require additional testing in order to verify that the design has not been affected.

Delta provides design services based on vacuum test results. Delta Engineers has developed a complete design package for septic tanks that includes a detailed vacuum test procedure and report form. Submit the completed form along with detailed drawings of the tank model used for testing and Delta will provide an analysis and report indicating the allowable live load and maximum placement depth under various ground water conditions. The report also includes the maximum depth of water in the excavation before the tank becomes buoyant.

PE seal is available for most states.

For more information contact

Ron Thornton

Call: 607-231-6612

E-mail:

rthornton@deltaengineers.com