

VACUUM TEST WARNING

ASTM International and The National Precast Concrete Association (NPCA) recommend vacuum testing of manholes prior to backfill.

VACUUM TEST BACKFILLED MANHOLES AT YOUR OWN RISK!

Risks include:

- *damage to structures, joints and connections*
- *contamination of the system*
- *increased difficulty in identifying and locating cause of failed test*

If local codes and practices require vacuum testing after the system has been backfilled: Existing soil pressure and hydrostatic head *must* be known or determined for the lowest part of each manhole and the test vacuum-adjusted to prevent overloading system components during the test. Failure to adjust vacuum properly may result in damage to the structure, joints, connections and system.

In all vacuum testing: Pipes, pipe stubs and plugs used in testing must be positively restrained to prevent damage to the structure and injury to personnel. Consult the test equipment manufacturer's recommendations.

For specific vacuum testing recommendations consult the following:

ASTM C 1244, "Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill" (Latest Edition)

ASTM International, 100 Barr Harbor Drive,
P. O. Box C700, West Conshohocken, PA 19428-2959
www.astm.org

The National Precast Concrete Association (NPCA)
10333 North Meridian Street, Suite 272, Indianapolis, IN 46290
www.precast.org



Precast ... The Concrete Solution

The Association of the Manufactured Concrete Products Industry
10333 North Meridian St., Suite 272 | Indianapolis, Indiana 46290

Vacuum Testing Backfilled Manhole Systems in the Presence of Ground Water

Many people do not fully understand the effects of vacuum testing backfilled manhole systems in the presence of ground water. Vacuum testing backfilled manhole systems is not recommended, especially in the presence of ground water. Vacuum testing a manhole system that is already subjected to hydrostatic pressure may exceed the design limits of critical flexible connectors, leading to a system failure.

If ground water is present, use the following information to determine if a reduction in vacuum pressure is warranted:

Note: For simplicity, the effects of soil pressure are not taken into account in the following information. In reality, the actual in-place loads may be greater when in-place soil conditions (effective stress) are taken into consideration. To determine the actual loads induced on a backfilled structure, use the following information in addition to the actual in-place soil properties to properly calculate the effective stress at the critical location.

Depth to water table
Pressure rating for flexible connector
Depth to bottom-most critical connector

With this information, you can determine the theoretical in-place loads experienced by the deepest connector by calculating the hydrostatic pressure at that depth (visit the NPCA Web site for example calculations and adjustments). If the combined pressure differential (vacuum and hydrostatic) between the interior and exterior of the manhole exceeds the connector's pressure rating, appropriate adjustments must be made.

Adjusting Vacuum Pressure

Most connectors have a pressure rating of only 10 psi when deflected, which is fairly common in a field installation. Drawing a vacuum of 10 inches Hg creates a pressure differential of 5 psi between the interior and exterior of a manhole system. An exterior water column of 11.5 feet creates an additional 5 psi of external pressure. This ultimately creates a pressure differential of 10 psi at a connector located 11.5 feet under water when drawing a vacuum of 10 inches Hg.

A conservative rule of thumb is to reduce the vacuum by 1 inch Hg for every 1 foot of hydrostatic head between 12 feet and 21 feet. A vacuum test should not be performed when the hydrostatic head exceeds 22 feet.

Hydrostatic Head (ft)*	12	13	14	15	16	17	18	19	20	21	22
Vacuum Pressure (in Hg)	10	9	8	7	6	5	4	3	2	1	**

* Hydrostatic head above critical connector

**At 22 feet below the groundwater table, the connector is naturally subjected to 9.5 psi



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