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MARCH 2022

JEPCO-1000 Vacuum Testing Kit \$3,110.00 one 30" diam plate with foam and fittings(26 lbs) (\$2,004.00 sold seperately) one venturi pump with 20 ft reinforced hose and fittings one large faced gauge reads 0-10 in. Hg (36 inch plate instead.(37 lbs).. add \$150)

Optional: extra gauges

large face gauge reads 0-15 in.Hg \$300.00 large face gauge reads 0-10 in. Hg \$300.00

11/15/2023



ConSeal CS 367

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ENTRY SEAL

CS 367 Entry Seal is a general purpose butyl sealant for multiple applications. CS 367 remains pliable, is non-oxidizing, and has excellent adhesion to most clean dry surfaces. A typical application for Entry Seal is to provide a watertight seal that can readily be re-opened. This all temperature flexible sealant will provide long or short term sealing solutions. Re-entry requires minimal effort. To re-seal, inspect the gasket and replace as necessary. CS 367 is not intended as a replacement for ConSeal CS 102 or other ConSeal performance-rated sealants.

CS 367 Physical Properties

Color	Earthtone
Hardness (150 gram cone penetration) ASTM D-217	7.0-7.5 ± .05 mm
% Solids ASTM D-6	99% Minimum

Flash Point ASTM D-92

Adhesion

Application Temperature

Aging Properties

Shelf Life

Specific Gravity ASTM D-71

400°F Minimum

Excellent to most Clean dry surfaces

0°F to 100°F

Non-Shrinking

2 year minimum

1.65 to 1.70



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JEPCO NEWS

SUMMER

by Ed Pennypacker

Vacuum Testing: Why

We live at the bottom of a deep sea of air. Just as submarines can be crushed by deep water, the air exerts a crushing pressure on everything around us. When we draw the air out of a structure the difference in pressure between inside and outside exert a force on the structure that tries to crush it. At sea level the air presses us with 15 pounds of pressure per square inch (actually about 14.7 psi). Air pressure varies with changes in the weather and changes



in altitude. On beautiful, dry, sunny days the air pressure is high. Weathermen report this as inches of mercury (Hg) . A good day may show a pressure of over 30 inches of Hg . A hurricane may show a very low pressure around 29 inches of Hg. For our purposes we use 30 inches of Hg as one

10 inches of Hg applies a load of 720 psf to Winchester Building Supply septic tank

atmosphere which is about 15 psi of pressure. Since, 30 inches Hg equals 15 psi. One inch of Hg equals 0.5 psi. Further, since a square foot is 144 square inches, one inch



Ken Dustin (Michie Corp) proves strength of Forta Ferro fibers



Diehl Vault, Orangeville,PA loads septic tank with 77,500 lbs on top. A 22 inch vacuum could load the top just as much, but it would also load the sides.

of Hg equals 72 pounds per square foot (psf). Using a vacuum pump, we draw air out of a structure and measure the effect in terms of inches of Hg pressure difference. Total vacuum would read 30 inches of Hg on a gauge. It never happens. Septic tanks are usually tested for water tightness at 4 inches of Hg and perhaps 7-12 inches to demonstrate structural integrity.

Soil weights vary by type, and water content. Obviously wet soil weighs more than dry soil. Again, let us take a rule of thumb weight of 120 pounds per cubic foot. Three feet down this soil exerts 360 psf. Ten feet deep it is 1,200 psf. Knowing these facts, we can test structures to simulate various loads. For example, most septic tanks are never buried more than three feet deep, so an anticipated load on the top of the tank would be 360 psf. To test whether the tank will withstand this load, 5 inches Hg (5x 72 psf=360 psf) is exactly the right load. ASTM C-1227 is the standard applied to septic tanks and it tells how to test for water tightness and structural soundness.

2006

To test for water tightness ASTM C-1227 allows either a water test, where the tank is filled with water (to what level is vague) and let stand for 24 hours. When checked, if there is no water loss, the tank is declared water tight, if the water has dropped, it is



CSA standard (Canada) for plastic tanks: top loading with weight, Here 300-500 psf. Measure the "squat. Look for rebound when weight is removed. This yields "Flexural Modulus of Elasticity." Seems like a simulation of earth burial, but it avoids the issue of structural soundness for a buried tank pumped dry. Then there will be no rebound.

refilled and checked an hour later, if it still holds the water without loss it passes. OR the tank can be subjected to 4 inches Hg and if it holds the vacuum with less than a 10% loss over two minutes it passes. Vacuum testing is faster and easier to complete. Total test time may be less than ten minutes, instead of the 24 hour water test.

What are the dangers?

Concrete tanks can fly into a pieces as the air crushes a heavily loaded tank. Plastic tanks crush and collapse, fiberglass tanks can fly in pieces too. There is



Two identical boxes. One with steel reinforcing the other with structural fibers 2 inch thick wall at knockout, Both held 9 inches Hg

not much warning. The typical top seam concrete tank is not dangerous until vacuums of over 7 inches Hg occur. Mid-seam tanks are stronger. Still, care should be taken to stay away from any tank under vacuum loading. No matter what the load. It is a good idea to place the test tank in among other tanks, so that flying chunks of concrete are contained. (I personally have tested hundreds of tanks and never had any chunks fly off, but I know it can happen and I am careful)



ConSeal CS-367 Seals openings air-tight and water-tight. Later, the cover is easily removed.

To begin

- 1. Select tanks that have sufficient age for testing.
- 2. Examine the tanks before testing to look for flaws that may indicate a problem
- 3. Seal all entries except the one through which the equipment draws a vacuum
- 4. If the top of the tank is rough , use CS-367 sealant under the test plate
- 5. It is good to have two gauges, one verifies the other.
- 6. Gauges with large displays are easier to read, a range of 0 10 inches is ideal.

During the test

- 1. Do not rush the process. It is better to slowly raise the vacuum load.
- 2. Have a timer ready.
- 3. Once 4 inches is achieved, shut off the system and begin the two minute cycle.
- 4. Watch the gauge, if it holds steady continue timing.
- 5. If the gauge drops, inspect the tank. Listen for hissing air leaks.
- 6. If the equipment is leaking, re-seal it. If the tank is leaking, decide how to fix it.
- 7. Most often, the leak is where the equipment seals at entries.
- 8. If you cannot hear the leak, spray soapy water all over the inside and repeat the test

- 9. Bubbles will show where the leak is.
- 10. Staying inside to look for bubbles while the test is run will probably kill you!
- 11. To test for structural loading gradually increase the load.
- 12. Stop when the ultimate load is achieved. There is no need to hold the pressure.
- 13. Achieving the high load without cracks or fracture is sufficient..

Keep records

Take pictures to document your process. Write down the results. Note that a single test is not enough to predict how all of your tanks will perform. At least three tests before a trend is indicated.



Flemington Precast (NJ) uses air-brake compressor to vacuum test at 5 inches Hg before backfill. Note homemade plate over center hole.

Fibers vs. Steel

As steel prices go up, there is a search for alternate reinforcement. NYCON XL-100 is a new breed of "Structural Fiber' that shows prom-

ise. Engineers will help you select the ideal dosage to achieve the performance you

need.. Maine DOT has approved structursl fiber as a replacement for 6 x 6 #10 welded wire fabric (WWF) in drainage manholes and catch basins. Septic tanks made with no wire prove just as strong and they have the test records to prove it! Flared-end pipes are labor in- tensive to make with steel reinforcing. Each cage has to be hand-cut and bent to shape. Positioning the steel in the form, and holding it there takes special care and a lot of acces-

sories. On the other hand, when NYCON XL-100 structural fibers are added to the mixer, millions of fibers disperse throughout the batch. They are everywhere. The labor spent on steel is the substantial savings you get when structursl fiber is used. Does it perform? Yes it does.

Quality Control



Permatile, Bristol VA vacuum tests manholes before they leave the shop. Each piece is brought to a soft rubber covered test stand where vacuum is instantly drawn. Only a few minutes is required to assure leak-proof structures.



Results in head-to-head tests matching Fiber vs. Steel Wire prove the strength of structursl fiber. In a three edge bearing test, specifications demand that neither pipe crack at under 6,000 pounds of force. The steel only pipe cracked at 12,000 lbs (double the requirement) the fiberonly pipe cracked at 12,500 lbs. Even when cracked the pipes stayed in one piece. Flared end pipes are an ideal use of NYCON XL-100. Unsightly corrosion is eliminated, production labor is eliminated, cracks are eliminated.

TEEDTALK

USEFUL INFORMATION RELATED TO SEPTIC TANKS

QUESTION: Which is better - water testing or vacuum testing?

ASTM C-1227 allows *either water testing or vacuum testing* to test for leakage in concrete septic tanks. In the case of water testing, the procedure is to "Seal the tank, fill with water, and let stand for 24 hours. Refill the tank. The tank is approved if water level is held for 1 hour."

What does "fill with water" mean? Is this the level to the bottom of the outlet? Or is it to the inside top of the tank? Or is it to a level above the tank into a riser?

Manufacturers of septic tanks made of other materials, such as plastic, fiberglass or steel, insist on water testing instead of vacuum testing, since they are prone to collapse under vacuum. Further, most tanks other than concrete require filling with some amount of water to counteract earth pressure on all sides while backfilling. Since water is needed anyway, it serves as a practical onsite test for plastic tanks. [Further ASTM C-1227 requirement: "Tanks shall be designed to anticipated earth and hydrostatic pressures when the tanks are *either full or empty*.]

ASTM C-1227 also says "Proof testing is used to demonstrate the strength of the tank to resist anticipated external and internal loads. Proof testing, when required by the purchaser, shall be performed in such a way as to simulate the actual anticipated loads."

Actual anticipated loads from liquids inside the tank will never result from liquid levels higher than the outlet opening invert - - unless the system is in some failure mode! Then why specify water testing to higher levels? *This is not a test – it is a trick!* Concrete tanks depend on the weight of the upper half or top slab, plus the weight of the earth cover, to keep the gasketed joint closed and watertight. But as you can see from the illustration and calculations below, filling a tank above its nominal capacity will result in an upward force on the tank top section which may be large enough to force it apart – a condition for which it was neither intended nor designed. *This is not a test – it is a trick!*

Vacuum testing of concrete tanks is the best choice for many reasons. It can be performed in any weather conditions, and does not require thousands of gallons of water. It only takes minutes, not days. If a leak is detected, it can be immediately and permanently sealed, using readily available materials. The vacuum force applied during testing actually helps compress the joint gasket. It replicates a real life structural condition which occurs when a tank is pumped dry and must withstand the full (possibly saturated) force of earth loading on top, bottom, and sides. Water testing may be appropriate for plastic tanks, but the precast industry has proven that vacuum testing is best for concrete septic tanks.

ANSWER: Water testing and Vacuum testing are recognized methods, but Vacuum Testing is most appropriate for concrete septic tanks!

Many tanks are tested to 9" – 10"Hg for structural proof testing, in order to account for 3' of earth load plus live load and safety factor. All concrete septic tanks listed under the PCANY Certification Program for Water and Wastewater Products, as shown by the cast in red disk, have demonstrated structural soundness and watertightness. If properly installed and maintained, they will last a lifetime.

Do not install a septic tank without a cast-in red disk proving it is "PCANY Listed"



Why this is a trick

The adjacent illustration shows a midseam tank with a riser assembly. If the riser is 3 feet tall and filled with water, it will exert an upward force on the top portion of the tank of 1.3 psi. If the tank top is 5' x 10', the water's lift force is 9,360lbs. This is considerably more than the 6800lb weight of the tank's upper half. Top seam tanks are even more vulnerable to this trick.

If the tank was buried under 3ft of earth load, this added weight (18,000lbs) would keep it tight.

SEPTIC TANK VACUUM TEST REPORT

Manufacturer:			Test Date:	
Address Report By:		Report By:		
City, State Zip				
TANK DESCIPTION	(Attach detailed d	rawings)		
Model No:	Volume an	d/or working capacity: _	Mfg Date:	
Outside Dimensions:	Length	Width	Height	
Member Thickness:	Top Slab	Base Slab	Walls	
Compartments:	Dual	_Single		
Seam:	Mid	_Top		
If top seam; does cover sl	ab interlock with top	of wall?Yes	No	
Joint Sealant Brand/Size:				
Pipe Seals Brand/Type: _		No. of Inlet Seals:	No. of Outlet Seals:	
MIX DESIGN				
Mix No:	W/C Ratio			
Fibers: No Yes	Brand/Type		Dosage	/cy
REINFORCING STEEL	Ĺ			
Rebar:Grade	40Grade 6	0None		
Wire Fabric:Smoo	th (ASTM A185)	Deformed (ASTM	A497)None	
CONCRETE TEST RE	SULTS			
Slump: %Air:	Temp:	Unit Weight:		
Compressive Strength:	psi @	Days		
WATERTIGHTNESS 7	EST			
Tank withheld 4" of merc	ury for 2 minutes wit	hout loss of vacuum: _	_YesNo	
STRUCTURAL TEST				
Vacuum measuring devic	e:Manometer	Gauge: Date of last	gauge calibration	
Tank tested to failure:	_YesNo			
Maximum vacuum pressu	re tested: ind	hes Hg. Additional	load applied to top slab	psf
Tank was inspected after	the load was applied a	and there were no signs o	of cracks: yes no (describ	e below)





Large gauges make it easy to read test results. The set-up with three gauges is used so that one gauge verifies the others. Due to the large dial it is easy to tell within a tenth of an inch (.10) the level of vacuum pressure applied.





I have plumbed the top of the plate to receive the Camlock fitting on the end of the twenty foot hose. At top is a quick connect which I connect to my gauges by a 25 ft air hose. I stand away from tanks that are being tested at high pressures. Testing at 4 inches Hg for water tightness is not usually a danger, but I have imploded concrete tanks at 10 inches Hg. Mid-seam concrete tanks usually stand 13 inches Hg. topseam tanks break at 8-10





Inside my gauge kit I have plumbed the three gauges in series. By turning a valve, I can remove the 0-10 gauge from the series.

Note the plugs that seal the extra "Low Pressure" port. It does not matter if you close one of the "High Pressure" ports or not. Do not seal both "High Pressure" ports.

Directions for cutting the holes and using the mounting rings are included with each gauge.

Piping, valves and fittings are not included, but are standard items at any hardware store.

The wood is 3/4 oak veneer plywood.



My gauge kit is home made, but effective. Two of the gauges read vacuum from 0-15 inches Hg. The other reads from 0-10. One verifies the others. I can disconnect the 0-10 gauge for elevated pressures.



Gauges with a large face are easy to read. This one reads vacuum pressures from 0-10 inches Hg. It is easy to read small increments, like 5.1 inches Hg.

Gauges must be held in a vertical position to read accurately



On the back and side of each gauge are two openings. One marked "Low pressure" and one marked "High pressure" Select which Low Pressure opening you are using, seal the other one with the provided plugs. Leave either one or both "High Pressure" Ports unplugged.





1080L Venturi Vacuum Pump with quick connect Option

- 1. Muffler
- 2. Quick connect to air supply- match to your system
- 3. On/Off air supply
- 4. Ball value $1/2 \times 1/2$
- 5. Quick connect to vacuum plate- match to your system



Venturi with hose. Allows tester to stand 20 ft away from test tank

- 1. 1080-L-VH Venturi Vacuum Pump
- 2. 1/2 threaded nipple and $1/2 \ge 3/4$ adaptor
- 3 3/4 ball valve
- 4. 3/4 x 3/4 connector
- 5. 3/4 barbed fitting-clamped
- 6. 3/4 reinforced hose 20 ft.
- 7. 3/4 barbed fitting clamped
- 8. 3/4 female camlock