



Date: February 8, 2006, March 16th, 2006, Rev July 22, 2009.

To: To Whom It May Concern

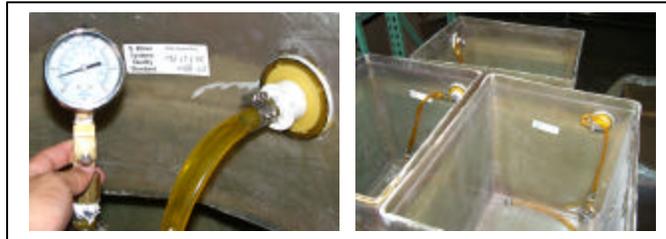
From: Don Mukai, P.E. Bravo Engineering

Subject: Testing Procedures for Bravo Double Wall UDC, Vent Transition and Tank Sumps per California AB-2481 requirements.

To Whom It May Concern:

Factory Pre-Testing

Bravo Double Wall Sumps from Bravo's factory to Job Site are kept under a 20" HG Continuous Vacuum Test.



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- 1 This Continuous Testing is part of Bravo's warranty in which the contractor must fax Bravo a copy with the recorded vacuum reading and date 12" HG or above. This assures that all boxes are in perfect condition at various points in the installation.
- 2 Bravo Double Wall sumps primary mode of testing is air pressure. Typically a **Contractor Pre-Test** will be completed at key points in the installation such as after setting the box in the ground, applying first fiberglass joint to tank sumps and installing penetration fittings. Depending on the local regulatory requirements the sump may be **Regulator Tested** under vacuum pressure or hydrostatically tested at the end of installation just prior to back filling sumps with pea gravel. This does not mean to fill the sump with water. Fluid is meant for the interstitial space only.

NOTE: Before starting any job always refer to installation instructions to review steps.

Contractor Pre -Testing

3. After installing penetrations and allowing their adhesive material to cure, install a stub / dummy pipe in each penetration fitting or complete fiberglass joint on Double Wall sump. Using the factory-installed pressure/vacuum combination gauge apply pressure gradually with manual air pump to the UDC / Vent Transition sump & Tank Sumps **4 PSI** and soap ALL fittings and any field joints inside and outside.
4. Typically tests are a minimum 2 hour test in which the air within the interstitial space must acclimate to the outside air temperature. After the first hour then pressure is recorded. The installing contractor must verify no bubble leaks and that there is no pressure decay. Longer tests such **typically 24 hrs** are **highly recommended by Bravo**. This assure installations are conducted in a thorough manner.
5. A vacuum test may also be conducted to test the sumps but soaping is not advised as this may pull soap in to sump interstice. Typically sumps vacuum tests to 15-

20”Hg may be tested over the same 2 hour period. Vacuum testing is commonly used because this type of test is affected much less by the rise and fall of ambient temperature. Longer tests such as typically 24 hrs are highly recommended by Bravo and can be reduced to 10” Hg over (24-48 hr Vacuum Test). This assure installations are conducted in a thorough manner.

Regulator Testing

6. Final **Pressure** test for regulatory approval is performed typically after all testing is performed on piping and site is ready to be backfilled with pea gravel. Using the factory-installed pressure/vacuum combination gauge apply pressure gradually with manual air pump to the UDC / Vent Transition sump & Tank Sumps 4 PSI and soap ALL fittings and any field joints inside and outside. This is a redundant step to verify that no damage has been done to the sump after it has passed prior testing.
7. Typically tests are a minimum 2 hour test in which the air within the interstitial space must acclimate to the outside air temperature. After the first hour then pressure is recorded. Regulator must verify that the sump pressure does not decay.

A vacuum test may also be conducted to test the sumps but soaping is not advised as this may pull soap in to sump interstice. Typically sumps vacuum tests to 15-20”Hg may be tested over the same 2 hour period. Vacuum testing is commonly used because this type of test is affected much less by the rise and fall of ambient temperature.

Always use Vacuum Hydrostatic Fill Method. This improves fill times and virtually eliminates burping.

8. **HYDROSTATIC FIELD INTEGRITY TEST** only after passing contractor air integrity test.

Properly prepared ahead of time, the quickest a Bravo Double Wall 9000 Series was filled with interstitial fluid using the Vacuum Hydrostatic Fill Method was 15 sec.

Hydrostatic Field Integrity Test – After the Vacuum Hydrostatic Fill Method has been applied to fill the sump with interstitial fluid, mark the date, time the test begins and fluid level within the manometer. Allow 1 hour before looking for a change in level. No change in level or no visible leaking means box passes test.

Note: The Vacuum Hydrostatic Fill Method and the Hydrostatic Field Integrity Test are two completely different things. The former is a procedure, while the latter is a timed test.

Thank You,

Sincerely,



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Senior Engineer / V.P. of Ops.
S. Bravo Systems, Inc. Home Office