Dri-sump®
Secondary &
Spill Containment
Testing Technology

Session Code TH-C3
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Danny Brevard, P.G.

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Annual Training Conference
March 24-27, 2025

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Testing should solve problems, not create them…

5-Year Development of Dri-sump® Technology

All the regulations for Petroleum Storage Tanks were first created to protect <u>water</u>.

Is water the best matrix to use for testing?

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The Cost of Hydrostatic Testing

In 2010, the Petroleum Equipment Institute was asked to create an industry standard document for testing. This document included the historical method of testing sumps with water. The test is called a "lake test" or "hydrostatic test". To test for liquid tightness:

- fill the sump completely with water
- wait 10-15 minutes for the water to settle
- measure the water level
- wait one hour and measure the water level again
- If the level dropped 1/8-inch or more, the sump fails the test. Pretty simple…

Let's look at the EPA national rule change in 2015.

The EPA did a study and cost analysis of the 550,000 fuel storage tanks.

Estimates based on EPA data determined it would take about ***120 million gallons of water*** to perform the required containment sump and spill bucket recurring compliance tests at a cost of about $245 million to ***properly dispose*** of the now contaminated water. (EPA Costs Analysis)

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Who uses water to find a leak in a roof?

What Is The Best Way?

What is the Cost of Testing with Water?

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Sumps Come in All Sizes and Shapes

The “leak threshold” for a hydrostatic test is a MEASUREMENT…1/8-inch.

The area of a 36” diameter vessel is 9 times greater than a 12” diameter vessel,

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Math Conversion of "1/8" to Gallons Per Hour (gph)

	Diameter inches	Height 1/8" =0.125"	Cubic inches	Convert to GPH
Spill Bucket	12	0.125	14.137	0.061
STP or UDC sump	36	0.125	127.235	0.551
STP or UDC sump	48	0.125	226.195	0.979

To Achieve 0.1gph Leak Rate:
<1-hour for Spill Bucket
5 ½-hrs to >9-hrs for STP/UDC

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The Science of Hydrostatic Testing

There are limitations to hydrostatic testing that become evident when trying to achieve a certain leak threshold such as 0.1gph (gallons per hour) which is the minimum requirement per EPA and most State regulations. Let's look at the science.

The most important point to consider…can hydrostatic testing consistently pass 0.1gph requirements? It's probably not possible. Here is why:

- One foot of water creates 0.433 psig, so head pressure is a significant factor.
- 1/8" thickness of water is going equal more than 0.1gph in a 1-hour test.
- Groundwater is a significant factor in hydrostatic testing that masks leaks
- Is there a certification to become a hydrostatic testing technician?

Testing with water may not be protective of human health and the environment. Over 6 million gallons of contaminated water is released into the environment at only a 5% test failure rate.

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The Science of Hydrostatic Testing

A pressure of 0.144psi would probably not identify a leak rate of 0.1gph in 4 inches of water such as used in the "low-level" hydrostatic test within one hour.

The Low-Level hydrostatic method is not effective in a one-hour test.

- The calculation to determine water pressure is:
- Pressure (P) = 0.433 x height of water in feet (h)
- 4 inches of water would create 0.144psi
- Measurement in feet = Measurement in inches ÷ 12
- 4 inches ÷ 12 = 0.3333
- 0.433 * 0.3333 = 0.144psi
  - Head Pressure is a concern.
  - Diameter is an issue.
  - Groundwater is a concern.

<u>Not all states accept this method.</u>

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The Science of Hydrostatic Testing

A leak of 0.1gph can be simulated with a precision orifice about 130 microns in diameter

How large is a micron?
There are 92,903,040,000 Square Microns in 1 Square Foot.

gph	gpm	$C_v = q(SG/dp)^{1/2}$	Head (ft)	head*.433	specific gravity		O'Keefe No.	Diameter	Part No.
	Q	Cv	Head (ft)	dP	SG	sqrt of dP/SG	Orifice	Diameter	No.
0.100	0.001666667	0.00253	1	0.433	1	0.65803	7	0.007	E-7-BR
0.005	0.0000833	0.00004	8	3.464	0.96	1.89956	6	0.006	E-6-BR
0.05	0.000833333	0.00114	1	0.433	0.81	0.73114	5	0.0050	E-5-BR
0.025	0.000416667	0.00027	4	1.732	0.713	1.55858	4	0.0040	E-4-BR
0.0016	0.0000266667	0.00122	1.732	0.0016	0.713	0.04737	saphire 6	0.0024	saphire 6

O'Keefe Precision Orifices: Catalog No. 11

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The Cost of Hydrostatic Testing

Corrosion can be Expensive…

It's easy to see the results when water contacts metal. Failures of equipment and other essential parts of the UST system are going to fail.

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The Cost of Hydrostatic Testing

Water and fuel don't mix well in any kind of transportation vehicle and can be deadly in aircraft.

Pilot seriously injured when plane crashes due to water and contaminates in the fuel

By General Aviation News

It is inevitable that test water in sumps is going to find it's way into the stored fuel in more cases that expected.

It can be Deadly.

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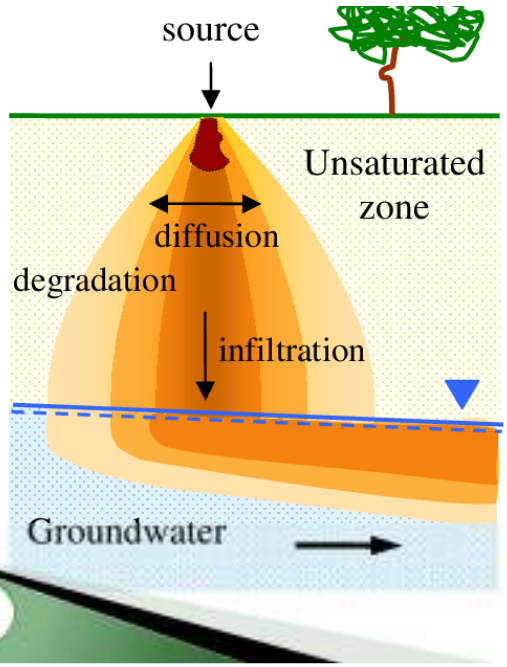
The Cost of Hydrostatic Testing



It only takes 1.3 ounces of fuel in 10,000 gallons of water for each 1 PPM increase

According to EPA calculations, 120 million gallons of water is needed annually for complete US compliance testing.

SIX MILLION GALLONS of contaminated water is released into the environment if only 5% of the containment fails the 1 hour test.

Easy to verify with your state's leaking data…

Contamination Harms our Environment

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Here are photos of water entering tanks. This is a leak of over 0.1gph…see the drip? It passed the 1-hr hydrostatic test.

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This is a consistent leak that is traveling down the side of the tank. The liquid pathway is very evident.

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Liquid is dripping from the upper manway into the tank.

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Significant leak that can be seen during the filling of the sump.

This tank passed the 1-hour low-level hydro test but not a full sump lake test.

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The results of leaks can be seen inside the bung fitting and is causing other problems within this tank.

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Consistent liquid leakage even adds to additional moisture for corrosion and biologicals as seen in this tank.

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Where would the liquid leak from this O-ring? O-rings on STPs are common areas of leakage.

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Groundwater ENTERING a sump…Would a hydrostatic test at this location identify this leak?

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Testing in freezing temps or frozen soils are impossible with a hydrostatic test method.

However, increased N2 and CO2 in soils, moisture content, regelation, frost heave and surficial frozen soils

can assist in vacuum (negative pressure) testing

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Other problems are created such as liability for the owner of the fueling facility, DOT and OSHA requirements to transport contaminated water, higher insurance and other regulatory, civil and even criminal problems are created from the hydrostatic testing fallout.

What about Liability from RCRA?

This may become significant in the future.

Some of the unknown factors include the possibility of shutting down the fueling facility for tests which causes significant financial loss for the fueling facility owner/operator.

Finally, how does groundwater affect testing sumps???

Our research discovered a better way…

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With 5 years of development, Dri-sump® Technology was finally available in 2018.

Containment Tightness Testing

ACCENT – serving since 1985

The industry has never been happy testing sumps and spill buckets with water. It is a serious environmental problem to annually dispose millions of gallons of contaminated test water.

Dri-sump® has a very robust pedigree.

- Successfully tested to extremely stringent EPA 3rd party testing conducted by the Ken Wilcox Associates.
- Heavily Patented in the United States and Internationally.
- Evaluated and Published by the National Work Group on Leak Detection Evaluations (NWGLDE) as an accepted method for secondary and spill containment January 31, 2018.
- Accepted Globally
- Sump manufacturers are publishing the Dri-sump® Technology for their products.
- Meets the requirements for the industry standard practice PEI-RP1200-24 and NLPA/KWA Standard 823.

More than 6-million dollars was allocated for the entire process of research, development and manufacturing the Dri-sump Technology.

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Testing Problem Solver

- ***All types of sumps and spill buckets in all types of soils and conditions.***
- ***Concrete sumps, containment or concrete berm areas***
- ***Double-wall sumps – both primary and secondary walls***
- ***Does not require the temporary "test-boot" needed to test with water***
- ***All types of chase or "rock-guard" piping conditions***
- ***Replaces the older "helium" leak pinpointing test***
- ***Optional connection via interstice to pin-point leaks in any kind of vessel***
- ***Pin-point leaks in any kind of single or double-wall piping including Electrical fittings and conduit***
- ***New Construction Pre-bury testing for all secondary and spill containment***
- ***Fast test for sump repairs***

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How Dri-sump® Works

60 Times FASTER than Hydrostatic Testing!

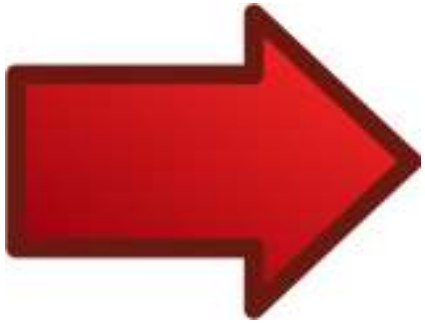
DRI-SUMP®

DRI-SUMP®

Dri-sump® uses no water

Dri-sump® creates no waste

Test in one-minute



60 seconds

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EQUIPMENT

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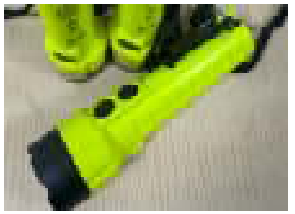
CONNECTING THE EQUIPMENT

PASS ← Laser Dot

Fail ← Laser Line

Digital Laser

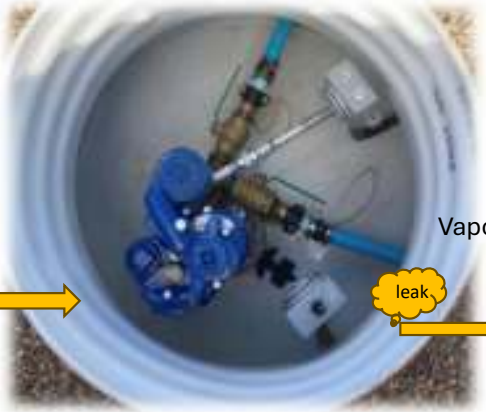


The Facility is Left with NO Environmental Impact After the Test.

View Chamber

Aerosol Fog Dispenser
Dri-sump Elixir

Aerosol FOG Flow Direction



Vapor Stimulator Tube
VST

Vacuum Flow Direction

Air Pressure Generator
Vacuum Venturi

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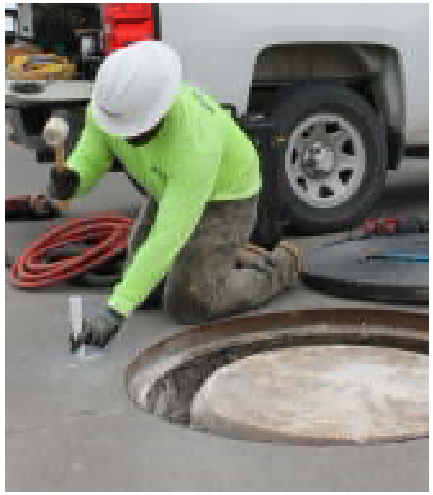
Installing VSTs

Total time to install a VST is about 10-15 minutes. It's easy to identify where "not" to install since you can see all piping penetrations in the sump.

The bottom of the VST can be above any piping for a safe installation.



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The Aerosol Elixir fills any open-top sump or interstice.

It only takes about 5-10 seconds to fill a 300 gallon sump.

The full-level of the Sub-micron Aerosol Fog can be verified by shining the digital laser inside the sump.

After testing, the Vapor Aerosol completely dissipates back to normalized air particles in about 10 minutes.

Aerosol Fog is:

- **pH Neutral**
- **Inert**
- **Does not conduct electricity**
- **Contains no hydrocarbons**
- **Made entirely of food-grade chemicals**

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Vacuum (negative pressure) Test

Filling Containment Sump

Negative Pressure One Minute

View Chamber Results

Report Results

DRI-SUMP®

Vacuum (negative pressure) Test

Filling Containment Sump

Negative Pressure One-Minute

View Chamber Results

Report Results

DRI-SUMP®

Negative Pressure Vacuum Test

Filling Containment Sump

Negative Pressure One Minute

View Chamber Results

Laser Dot…PASS!

Report Results

DRI-SUMP®

Negative Pressure Vacuum Test

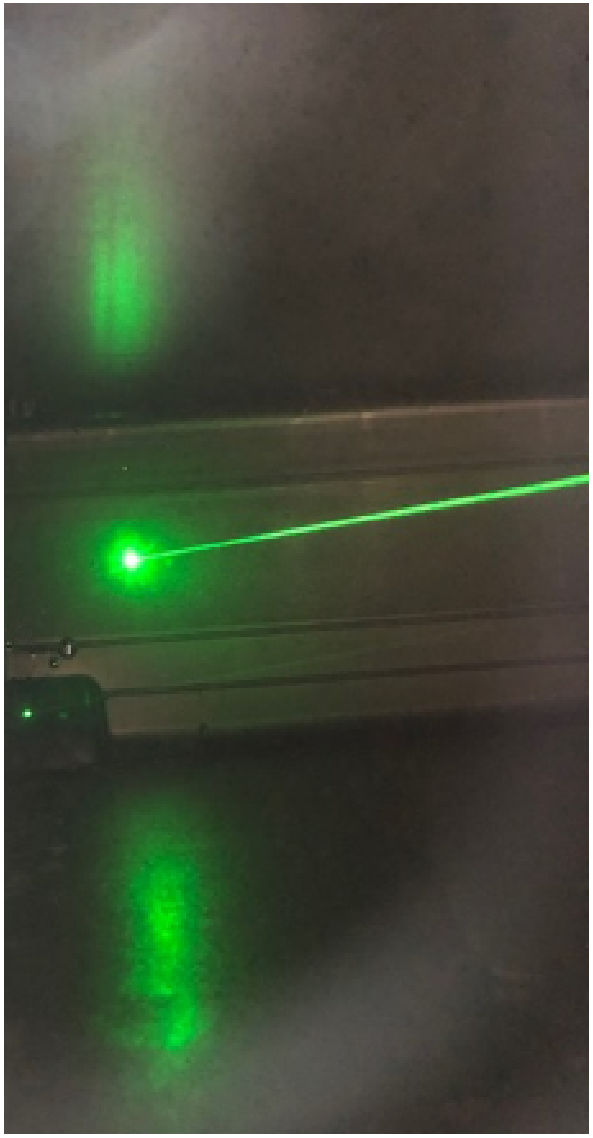
Filling Containment Sump

Negative Pressure One Minute

View Chamber Results

Laser Line…FAIL!

Report Results



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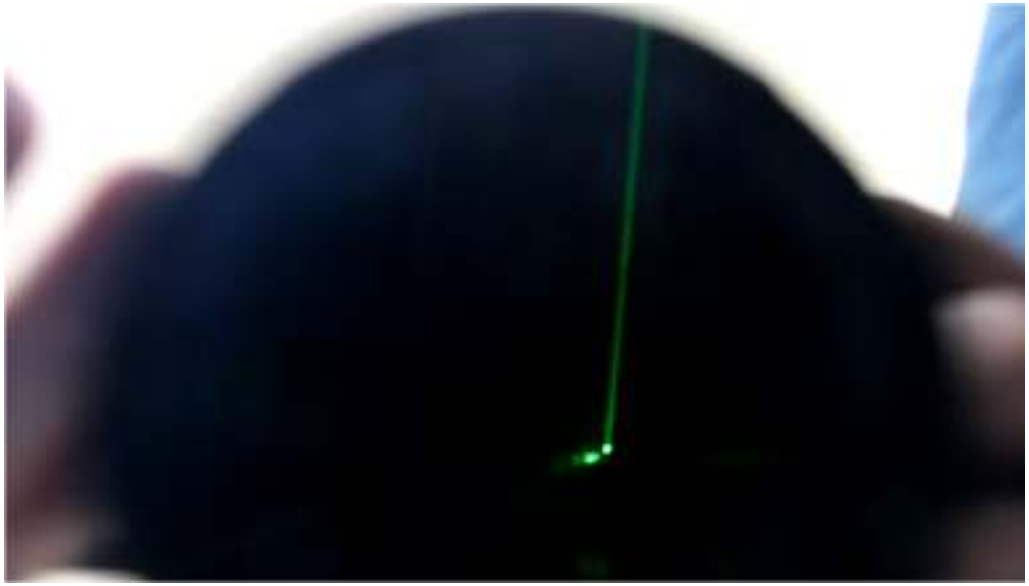
The following is an actual test performed on a UDC. A camera was placed in one of the view ports on the View Chamber to show what the Tester actually observed during an indicated leak. The green "laser Line" is very obvious and indicates the UDC has failed the Leak Test.



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New Installation and Pre-Bury Testing

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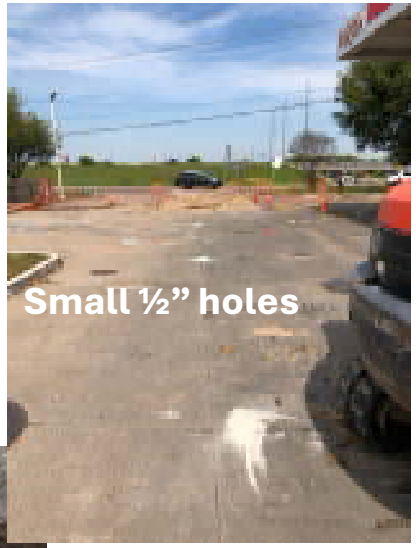
Our Technology has an unlimited Future for New Products. Use Dri-sump Technology for Leak Pin-Pointing instead of costly Helium Testing!



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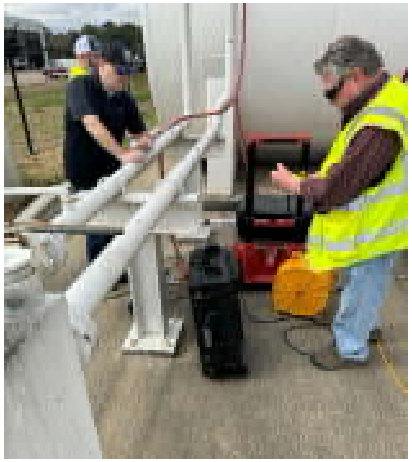
ASTs, Double-wall Tanks and Sumps, Interstitial Testing and Buried Tank Tops



CALIFORNIA CUPA FORUM

DRI-SUMP®

TESTING A SPILL BUCKET in the U.S.A.

DRI-SUMP®

TESTING Dispenser Sumps in the U.S.A.

DRI-SUMP®

TESTING STP Sumps in the U.S.A.

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Dri-sump technology is 60-times faster than hydrostatic testing.

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The secret to fast testing is the proprietary Dri-sump Aerosol Elixir™ Fog !!!

DRI-SUMP®

Our Specialized “Fog” even moves through Liquids

DRI-SUMP®

Test the Complete Containment Sump for Liquid Tightness

(sides, bottom, all penetrations)

Safe

No Water

No Waste

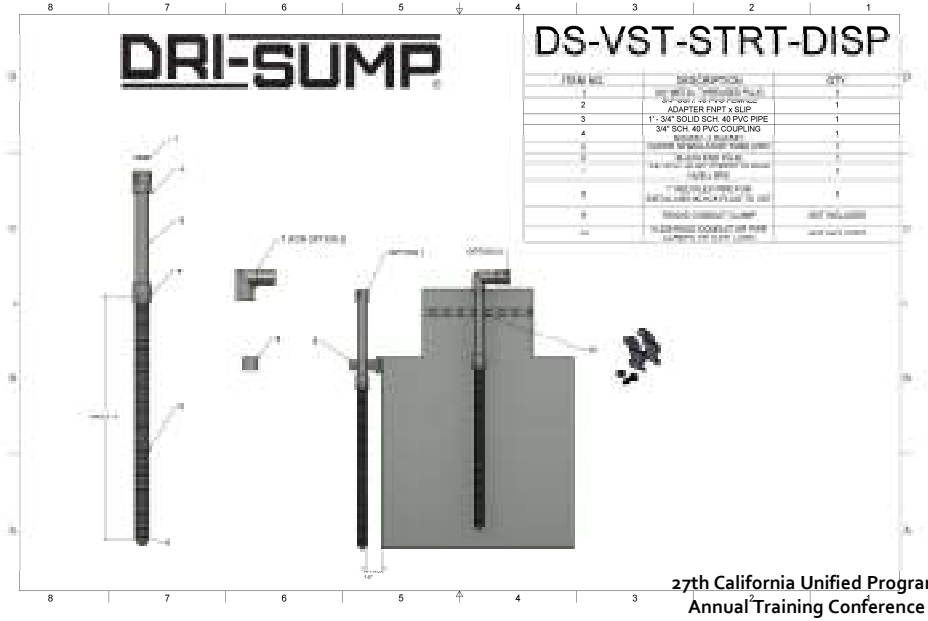
Fast Test

No Wait

No Shut-down

Fast Re-test after repairs

Standard Test Procedures for Evaluating Leak Detection Methods: Nonvolumetric Tank Tightness Testing Methods, EPA/530/UST-90/005



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