



STATE OF WISCONSIN
Department of Agriculture,
Trade and Consumer Protection

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Bureau of Weights and Measures
Storage Tank Regulation
P.O. Box 7837
Madison, WI 53707-7837

Wisconsin ATCP 93 Material Approval

Equipment: Detection Devices Mesa Model 2D Non-
volumetric Tank Tightness Testing method
with ACTv1 and ACTv2 Water Sensors

Manufacturer: Mesa Engineering/Detection Devices, LLC
286 Houses Corner Rd
Sparta, NJ 07871

Expiration of Approval: December 31, 2022

SCOPE OF EVALUATION

The Mesa 2D non-volumetric tank tightness testing method as manufactured by Mesa Engineering/Detection Devices, LLC.; have been evaluated for use as a tank testing system complying with **ATCP 93.130(3)** and **ATCP 93.515(4)** of the current edition of the Wisconsin Flammable, Combustible, and Hazardous Liquids Code.

DESCRIPTION AND USE

Mesa 2D as a Non-Volumetric Tank Tightness Testing Method

The Model 2D test method consists of a microphone placed in the ullage portion of the underground tank. Under normal testing conditions, a pressure of 60 inches of water vacuum (-2.16 psig) must be used for testing. The microphone is connected to a computer that digitally records the sounds of the underground tank. The signals are then processed by a computer analysis program to determine if a leak is present. The tester, another qualified individual, or the control manager can use the recorded signal to play back the sounds in the tank for additional review and/or supplementary review methods if necessary.

ACTv1 Water Level Sensor

The ACTv1 Water Level Sensor operates based on the conductivity between two electrodes when both touch a conducting fluid such as water. The two electrodes are mounted in a housing that is connected by a cable to a screw mechanism. During testing, the screw mechanism is installed inside a riser using an expansion plug and allows the electrode housing to be lowered until it contacts the water in the tank. A graduated dial on the screw mechanism provides information on the position of the electrode relative to its initial position. The actual level change can be calculated from the inches per turn of the screw mechanism.

The water level at the beginning of the test is measured and recorded, and again at the conclusion of the test. If the level change is less than the minimum detection limit (MDL) for the ACT system, water incursion is assumed not to be a problem.

ACTv2 Water Sensor for Use with Ethanol and Diesel Fuels

The ACTv2 sensor has the ability to detect the presence or ingress of water at the bottom of an underground storage tank (UST) containing gasoline, diesel, and ethanol blends up to 15% ethanol. The sensor is used during a tank tightness test that utilizes a vacuum where the presence of ground water is above the bottom of the tank. The sensor is also used during a tightness test if the presence of ground water is unknown.

Detection Devices, LLC has a proprietary calibration solution called HydroBal which is used to create a calibration solution. The calibration solution is created by mixing 50% HydroBal with 50% water. This calibration solution is used to raise the level of water to just under the ACTv2 sensor before a tank tightness test is performed. This allows for the water sensor to detect a very small, known amount, of water ingress during the tank tightness test.

The ACTv2 is included as part of Detection Devices tank tightness test method which is an acoustic test method where vacuum is applied to the tank. During the setup period before a tightness test is performed, the ACTv2 sensor is lowered to the bottom of the tank to detect the presence of water before the test starts. Just above the top of the tank, the cable of the sensor is ran through a precision dial adjuster that allows the technician to mathematically raise and lower the sensor during the water sensor calibration phase of the setup before a tightness test is performed. The precision dial device has numbered increments to allow the technician to make measured adjustments to the water sensor level during the water sensor calibration. Once the sensor is just off the bottom of the tank, the calibration solution is slowly added to the bottom of the tank through a 1/8" tube until the ACTv2 sensor goes into alarm. After the alarm is generated, the number of the precision dial is noted. Then sensor then slowly raised up using the precision dial until the sensor alarm stops. The sensor is then slowly lowered back down to just above where the alarm was generated. The vacuum is then applied to allow for the tank tightness test to begin.

If there is an ingress of water during the tightness test that causes the water level to exceed the threshold of the ACTv2 water sensor, an alarm will be generated. The alarm is recorded as part of the Detection Devices tank tightness test.

TESTS AND RESULTS

Mesa 2D as a Non-Volumetric Tank Tightness Testing Method

The performance of the Mesa 2D was determined in accordance with the EPA's protocol for non-volumetric tank testing methods.

The Mesa 2D was found to be capable of detecting ullage leaks equivalent to 0.1 gal/hr with a probability of 100%. The 95 percent confidence interval for P_d is from 94.1 to 100 percent. The false alarm rate was determined to be 0 percent. The confidence interval for P_{FA} is from 0 to 8.2 percent.

The EPA test procedures only addressed the issue of the method's ability to detect leaks and not for safety hazards.

ACTv1 Water Level Sensor

The minimum level change that was detected at least 95 percent of the time was calculated to be 0.016 inches. The time to determine an in-leak of 0.1 gal/hr when the initial water level is 0.05 inches is 0.97 hrs.

ACTv2 Water Sensor for Use with Ethanol and Diesel Fuels

Table 1: Test Results for the Detection Devices ACTv2 Sensor with the Addition of Water*

Fuel Type	Height at Alarm (inches)					
	Trial #1	Trial #2	Trial #3	Trial #4	Trial #5	Trial #6
Diesel	1/16	1/16	1/16	1/16	1/16	1/16
E0 Unleaded	1/16	1/16	1/16	1/16	1/16	1/16
E15 Unleaded	1/16	1/16	1/16	1/16	1/16	1/16

*Detection time for all consoles and liquids is less than 1 minute.

*Fall time for all consoles and liquids is less than 1 Minute.

Limitations/Conditions of Approval

Procedures specified by the manufacturer shall be used to install and maintain all equipment and to conduct all tests.

Mesa 2D as a Non-Volumetric Tank Tightness Testing Method

- All operators of the Model 2D are trained by Mesa engineering staff before they can use the equipment in the field.
- The Mesa 2D is approved for a method of tank tightness testing specified in **ATCP 93.515(4)**.
- The system may be used for gasoline and diesel underground storage tanks.
- Test conditions shall be reasonably quiet during the data collection process.

Table 2. Critical Parameters for the Mesa 2D Non-Volumetric Test Method

Parameter	Value
Tank size for a single tank	30,000 gallons
Minimum allowable product level	Between 0 and 91 percent of the tank capacity
Average Data Collection Time	1 Minute
Maximum allowable temperature difference between product in tank and product delivered just prior to running a test	No temperature compensation is required
Average data collection time between test	No stabilization period is required.

This approval will be valid through December 31, 2022, unless manufacturing modifications are made to the product or a re-examination is deemed necessary by the department. The

Wisconsin Material Approval Number must be provided when plans that include this product are submitted for review.

DISCLAIMER

The Department is in no way endorsing or advertising this product. This approval addresses only the specified applications for the product and does not waive any code requirement unless specified in this document.

Effective Date: 5/6/2019

Reviewed by: Signature on File
Erik Otterson
Environmental Engineering Specialist
Bureau of Weights and Measures
Storage Tank Regulation

Date: 5/6/2019

Approved by: Signature on File
Greg Bareta, P. E.
Section Chief
Bureau of Weights and Measures
Storage Tank Regulation

Date: 5/6/2019