STATE OF WISCONSIN
Department of Agriculture,
Trade and Consumer Protection

Approval # 20160003
(Renewal of 20110006)

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

Wisconsin ATCP 93 Material Approval

Equipment: MassTech 2 Wet Volumetric and MassTech 002 Ullage Non-volumetric Tank Tightness Tests

Manufacturer: MassTech International, Ltd. as Licensed to:
Leighton O'Brien USA, Inc.
29101 FM 2978, ST. F4
Magnolia, TX 77354

Expiration of Approval: December 31, 2019

SCOPE OF EVALUATION

The MassTech 2 Wet Volumetric and the MassTech 002 Ullage Non-volumetric Tank Tightness Tests, manufactured by MassTech International, Ltd. have been evaluated in accordance with **s. ATCP 93.130(1)(a)** of the current edition of the Wisconsin Administrative Flammable, Combustible and Hazardous Liquids Code.

This evaluation summary is condensed to provide the specific installation, application and operational parameters necessary to maintain the subject systems in compliance with the Wisconsin Administrative Code – ATCP 93.

DESCRIPTION AND USE

The MassTech tank tightness testing system consists of two separate components; the wet test and the ullage test. The wet test component tests only the liquid filled portion of the tank, the ullage test component tests only the non-liquid portion of the tank; combining both tests would test the whole tank. The ullage test can be used for precision tightness testing a completely empty tank.

MassTech 2 Wet Test Method:

The MassTech 2 Wet Test Method is based on measurement of the liquid mass in an underground tank using a pressure sensor located at the bottom of the tank. The technology relies on hydrodynamic principles, which essentially negates temperature effects. The floor of the tank is used as the reference point for all measurements. During the leak test data acquisition phase the position of the sensor must not move as all readings are taken relative to the bottom location. The sensor may be inserted into the tank at any suitable opening in the tank top, including the fill pipe as long as the sensor is in a position where the weight of the fuel in the body of the tank impacts on it.

The electronic sensor is connected to a probe by a narrow tube carrying low pressure nitrogen and is monitored externally to the tank with results collected using a computer. Data collected is electronically transmitted to a data collection center for analysis. All mass readings are taken with the tank open to atmosphere; the system measures a quantity equivalent to the mass of liquid in the tank at atmospheric pressure during the course of a test. If suitable conditions exist, the method may be combined with a pressure ullage test to complete testing of the entire tank. If no ullage pressure test is required or possible, mass measurements are collected at the start and finish of the test period.

Since the difference in mass between the start and finish of the test, combined with the time between these events defines the apparent rate of change of mass, the system can detect ingress as well as egress of any liquid (water or fuel) that might be in the backfill surrounding the tank. This principle allows the system to test for any liquid ingress including water ingress. If the ingressed liquid is not water, the system will understate or overstate volumes gained in proportion to the density difference, though the mass of the ingress will not change.

The sensitivity of the system to changes of mass is lowest where the surface area is at a maximum. The certification tests contained within the certification document show that with a surface area of 355 ft2, a change rate as low as 0.027gph can be detected within 30 minutes. Proportionately, smaller surface areas and larger leak rates can be detected. Mass readings are usually duplicated at each point in time to allow invalid readings to be eliminated without requiring a retest. Where ingress is suspected a second wet test is normally carried out back to back with the first but with under different conditions. The second test is typically conducted with an ullage pressure increase or reduction between the two sets of mass readings. By this means the rate of loss or gain of the tank can be compared under different conditions avoiding problems with possible pressure imbalances between the inside and the outside of the tank shell. The two back to back tests may also allow for diagnostic and leak location possibilities.

MassTech 002 Ullage Test Method:

The MassTech 002 Ullage test system can be used in one of several modes: 1) Monitoring absolute pressure changes (either positive pressure or vacuum) or 2) acoustic signals with computer generated results (either positive pressure or vacuum) or 3) a combination of the two. The tank pressure is adjusted to approximately 1.5 psig above or below the

ambient pressure conditions and pressure changes are monitored. A computer is used to log the data usually at 10-second intervals. This data is remotely analyzed and is therefore normally forwarded electronically to an analysis center where trained staff uses proprietary software to assist in the determination of the tank condition.

To conduct a test, all of the openings in the tank such as bungs, risers, manways, etc., shall be sealed completely. This is accomplished by pressurizing the tank and soaping all visible fixtures along the top of the tank. Any leaks here will adversely affect the test results and may cause a false alarm. The test equipment must be installed, including the pressure sensors, as well as a means to produce vacuum or pressure on the ullage of the tank. While the on-site test technicians may have some indication of the condition of the tank, the final call is made by the analysis center.

Testing is conducted in three stages. The first stage involves monitoring the sealed tank under ambient conditions (25-minute stabilization). The sealed tank is monitored for pressure changes without any initial pressure or vacuum on the tank. This data is used to correct the test results for background effects such as pressure changes due to temperature or volatility of the product in the tank.

The second stage of the test is the pressure portion, with the pressure adjusted to the test conditions, usually a pressure difference of around +1 to -1.5 psig, using nitrogen pressure or a vacuum pump.

The third stage is the data collection, typically lasting 20 minutes of which the last five are considered of critical importance for declaring a result.

TESTS AND RESULTS

The performance of the MassTech 2 Wet Test as an annual tank tightness testing method was verified by Ken Wilcox Associates in accordance with the EPA Protocol for volumetric tank tightness testing systems. The MassTech 2 Wet Test system was found to detect a leak of 0.1 gph with 100 percent probability of detection and 0% percent probability of false alarm. The calculated confidence interval was within established parameters; this illustrates that the data set was large enough to provide a realistic assessment of the expected detection and false alarm capabilities.

The performance of the MassTech 002 Ullage Test as an annual tank tightness testing method was verified by Ken Wilcox Associates in accordance with the EPA Protocol for non-volumetric tank tightness testing systems. The MassTech 002 Ullage Test system was found to detect a leak of 0.1 gph with 100 percent probability of detection and 0% percent probability of false alarm. The calculated confidence interval was within established parameters; this illustrates that the data set was large enough to provide a realistic assessment of the expected detection and false alarm capabilities.

LIMITATIONS / CONDITIONS OF APPROVAL

- Data is collected and reviewed for accuracy by technician on-site; however, result declaration and certification can only be determined by remote analysis using MassTech proprietary software.
- When using acoustic listening devices, testing must be conducted under reasonably quiet conditions. Heavy traffic, nearby trains, industrial centers, or construction activities could produce sound levels that could compromise the test. Testing periods should be selected in order to minimize these effects.
- Atmospheric conditions shall be stable and not subject to violent change during data collection process.

- All operators of the MassTech tank tightness testing methods shall pass certification testing through MassTech International, Ltd., and be re-certified every two years to maintain their certification.
- Equipment shall be calibrated on an annual basis by MassTech International, Ltd., and documented by serial number. The Certificate of Calibration shall be provided with the submittal of any test forms to the department.
- A sample MassTech UPSS Test report is provided in Appendix A of this approval.

MassTech 2 Wet Test Method:

- The MassTech 2 Wet Test is approved for use as a method of tank tightness testing for the liquid containing portion of the tank as specified in **s. ATCP 93.510(3)**.
- This method can be used to test tanks with gasoline, diesel, aviation fuel, #4 fuel oil, used oil, and other liquids with manufacturer's approval.
- **If the groundwater level is above the tank bottom, or if depth to groundwater is not determined, then the MassTech 2 Wet Test shall consist of two separate tests with a minimum of a nominal 1.5 psi pressure differential in the ullage between the two tests.**

Critical performance parameters for the MassTech 2 Wet Test Method:

Parameter	Value
Tank size for a single tank	Up to 30,000 gallons
Minimum allowable product level	5 % of tank volume
Average waiting time after filling tank	15 Minutes
Maximum allowable temperature difference between product in the tank and product delivered just prior to running a test	± 9.9 deg F
Average Data Collection Time per Test	30 Minutes

MassTech 002 Ullage Test:

- The MassTech 002 Ullage Test is approved for use as a method of tank tightness testing for the ullage space only as specified in **s. ATCP 93.510(3)**.
- This method can be used to test tanks with gasoline, diesel, aviation fuel, #4 fuel oil, used oil, and other liquids with manufacturer approval. Tank can be empty or contain up to 95% liquid by volume. If tank contains liquid then a separate wet test shall be performed to confirm tightness of the whole tank.
- **Prior to beginning any testing, groundwater level must be determined by measurement through the use of an observation well or soil probe in the tank excavation backfill.**
- **If groundwater is above tank bottom, a water sensor shall be located at the bottom of the tank or the test shall be conducted in conjunction with the standard MassTech Wet Test.**
- Vacuum test method may not be effective in some tank backfills due to clay plugging the tank hole or free product in the tank backfill. Conversely, pressure tests may not be effective in all cases due to the possibility of a crack closing under test pressure. If a leaking tank is suspected then both a vacuum and pressure test may be appropriate.

Critical performance parameters for the MassTech 002 Ullage Test Method:

Parameter	Value
Tank size for a single tank	Up to 30,000 gallons
Minimum allowable ullage volume	greater than 5 %
Nominal test vacuum or pressure	1.5 psi
Average waiting time after filling tank	2.38 hrs. with tank filled to 5% 1.5 hrs. with tank filled to 50% 0.27 hrs. with tank filled to 95%
Total Data Collection Time per Test[1]	2.63 hrs. with tank filled to 5% 1.75 hrs. with tank filled to 50% 0.52 hrs. with tank filled to 95%

1: 25-minute static test may be shortened by the technician when steady-state conditions are reached earlier.

This approval will be valid through December 31, 2019, 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: January 22, 2016

Reviewed by: Signature on file Date: January 22, 2016
Edward J. Sindelar, RS, REM, CESCO
Environmental Engineering Specialist
Bureau of Weights and Measures
Storage Tank Regulation

Approved by: Signature on file Date: January 22, 2016
Greg Bareta, P. E.
Section Chief
Bureau of Weights and Measures
Storage Tank Regulation

UPSS Test Report

June 30, 2011

Marathon
24820 75th St.
, WI

Test Date: June 20, 2011
Reason for Test: Due Diligence
Service Distributor: Petroleum Svcs.

LEIGHTON O'BRIEN INC
Tank Integrity Solutions

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E-mail: jeffstevenson@leightonobrien.com
Website: www.leightonobrien.com

Executive Summary

The Regular & Premium tanks & lines passed the tests.

There are no recommendations.

Aim

To investigate the integrity of the UPSSs as a due diligence exercise.

Method

The tanks and all their associated tank top components (i.e. vent, fill, ATG) were subjected to the MassTech tank test.
Individual tests were performed on the product lines.

Summary of Tank Results as Tested

Test Round 1			
Tank	**Test**	**Result**	**Rate**
Regular Tank 1 (10000 Gal.)	Wet Static Test	not tested	
at 0 gal or 0 % fill (& 0 in. H2O)	Wet Pressure Test	not tested	
Jun 15 2011 Cert. No. 144086	Ullage Test	PASS	
Premium Tank 2 (10000 Gal.)	Wet Static Test	not tested	
at 0 gal or 0 % fill (& 0 in. H2O)	Wet Pressure Test	not tested	
Jun 20 2011 Cert. No. 144091	Ullage Test	PASS	

Nomenclature for tables above

- A 6.5 times ullage fail is the nitrogen decay equivalent to a liquid leak under 1.45 PSI at the USEPA threshold of 0.1 gal/hr
- 0.1 gal/hr is the PASS/FAIL criteria for a USEPA precision test.
- MassTech technology used: Masstech 2 wet test (mass based) and Masstech 002 ullage test (pressure). For further details go to www.nwglde.org/vendor_indexG_M.html
- (i) indicates a liquid ingress was detected during the test at the noted rate
- (e) indicates a liquid egress was detected during the test at the noted rate

Summary of Line Results as Tested

Line Test Round 1		
Description	**Date**	**Result**
Regular	20-Jun-11	PASS
Premium	20-Jun-11	PASS

Leighton O'Brien PM2 test equipment & procedure used

Other Relevant Observations

- All visible parts of the systems, sealed by the technician, were shown to be tight using soapy water.

Comments/Discussions

The Regular & Premium tanks & lines passed the tests.

Recommendations

There are no recommendations.

Addendum

Date of Test: June 20, 2011
Licensed MassTech Tester: Casey Mangrum
Report Prepared by: Jeff Stevenson
Report ID: Diagnostic Report to 20-Jun-11.doc

Glossary of Acronyms used
UPSS Underground Petroleum Storage System
USEPA United States Environmental Protection Agency

The underground pipe and tank configurations contained in this report are deduced from information gathered at the site by Leighton O'Brien and by information given to Leighton O'Brien by the client.

Details of Line Test

Regular				
Line	PASS	Time	psi	gal/hr
Valve	NA	10:35:37	48.59	0.003
Tested	Wet			
Start	10:30:00			
Date	20-Jun-11			
Unit SN				
Cert No.	242			

Premium				
Line	PASS	Time	psi	gal/hr
Valve	NA	11:26:15	48.61	-0.025
Tested	Wet			
Start	11:20:37			
Date	20-Jun-11			
Unit SN				
Cert No.	243			

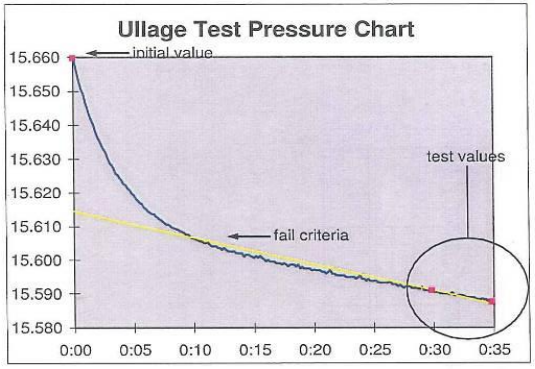
MassTech Tank Test Report

Dry **PASS**

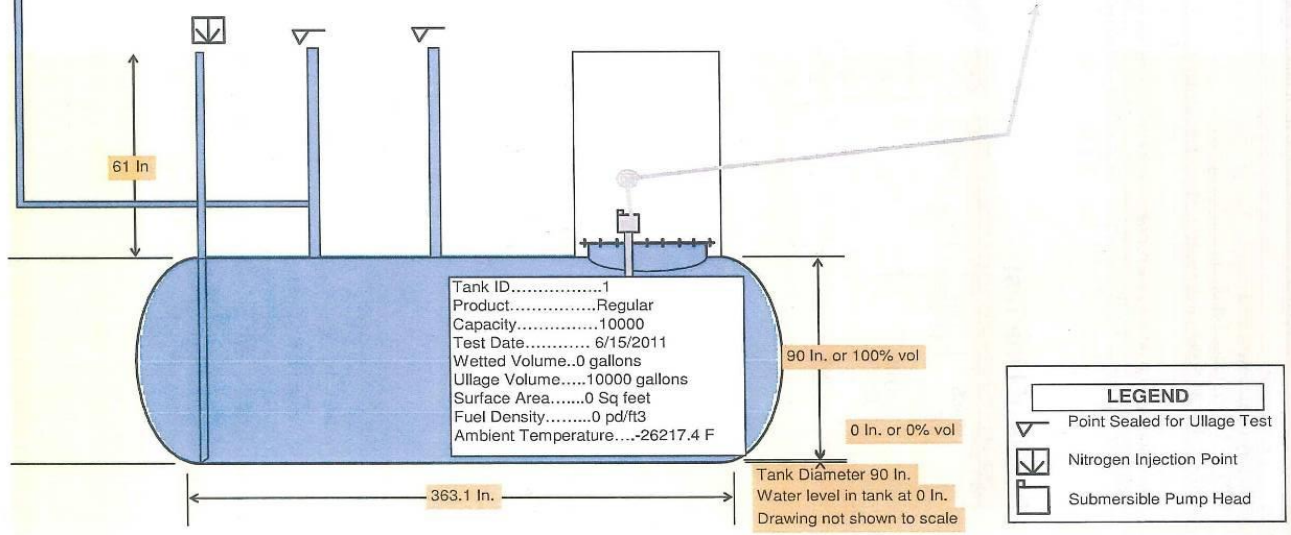
Facility Details

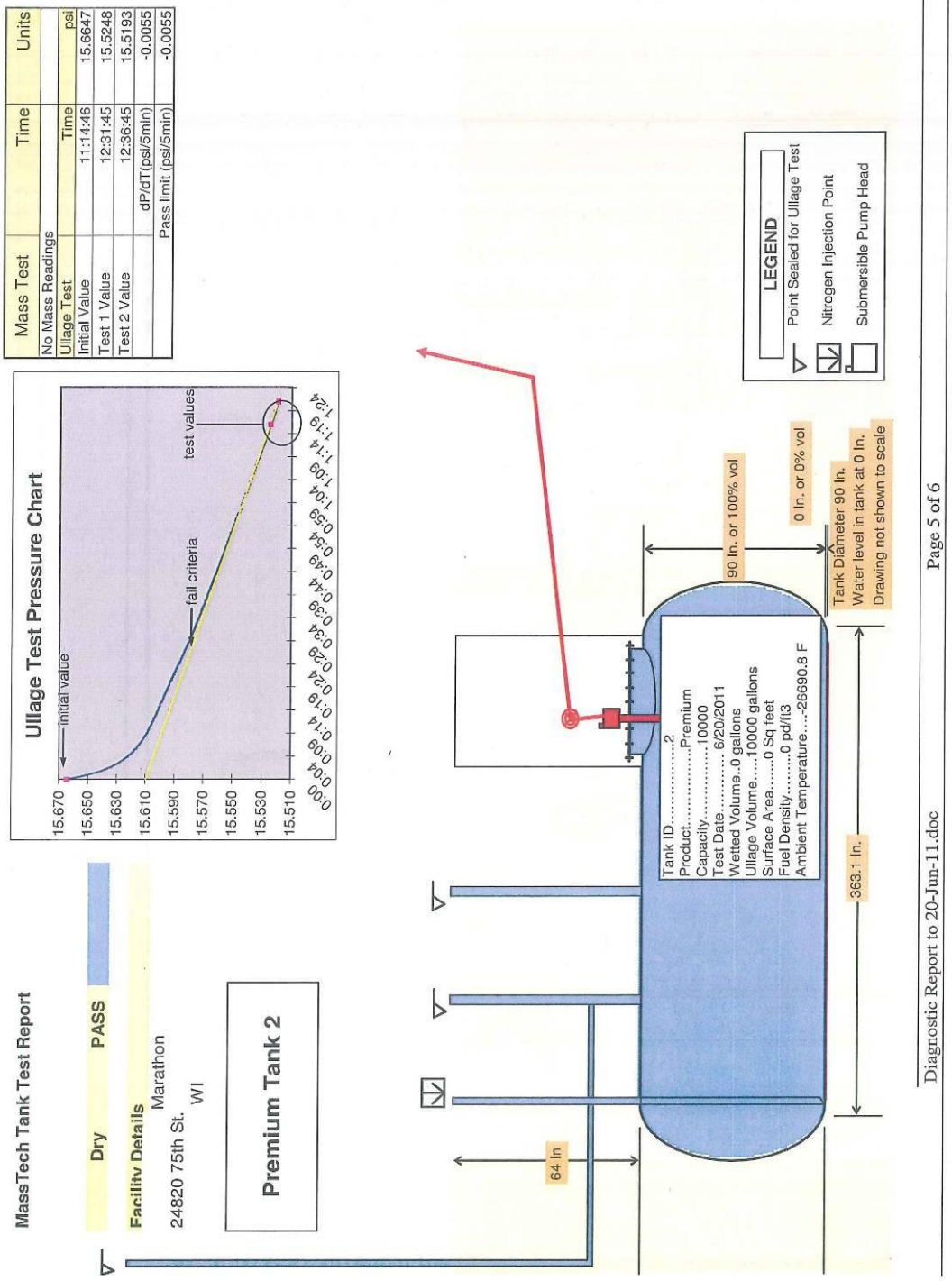
Marathon
24820 75th St.
WI

Regular Tank 1



Mass Test	Time	Units
No Mass Readings		
Ullage Test	Time	psi
Initial Value	10:55:55	15.6597
Test 1 Value	11:25:45	15.5911
Test 2 Value	11:30:45	15.5878
	dP/dT(psi/5min)	-0.0033
	Pass limit (psi/5min)	-0.0039




MassTech Tank Test Report
Dry
PASS
Facility Details
Marathon
24820 75th St.
WI
Premium Tank 2
Mass Test
Time
Units
No Mass Readings
Ullage Test
Time
psi
Initial Value
11:14:46
15.6647
Test 1 Value
12:31:45
15.5248
Test 2 Value
12:36:45
15.5193
dP/dT(psi/5min)
-0.0055
Pass limit (psi/5min)
-0.0055
Ullage Test Pressure Chart
initial value
fail criteria
test values
15.670
15.650
15.630
15.610
15.590
15.570
15.550
15.530
15.510
0:00
0:04
0:09
0:14
0:19
0:24
0:29
0:34
0:39
0:44
0:49
0:54
0:59
1:04
1:09
1:14
1:19
1:24
LEGEND
Point Sealed for Ullage Test
Nitrogen Injection Point
Submersible Pump Head
Tank ID.....2
Product.....Premium
Capacity.....10000
Test Date..... 6/20/2011
Wetted Volume..0 gallons
Ullage Volume....10000 gallons
Surface Area.....0 Sq feet
Fuel Density.....0 pd/ft3
Ambient Temperature....-26690.8 F
64 In
90 In. or 100% vol
0 In. or 0% vol
Tank Diameter 90 In.
Water level in tank at 0 In.
Drawing not shown to scale
363.1 In.
Diagnostic Report to 20-Jun-11.doc
Page 5 of 6

Site Diagram
MARATHON
Canopy
3
4
1
2
7
8
5
6
Premium
Tank 2
Regular
Tank 1
75TH STREET
Not to Scale