



STATE OF WISCONSIN

Department of Safety and
Professional Services

Approval # 20120009
(Revised 20080005)

Environmental & Regulatory Services Division
Bureau of Petroleum Products and Tanks
201 West Washington Avenue
P.O. Box 7837
Madison, WI 53707-7837

Wisconsin SPS 310 Material Approval

Equipment: SiteSentinel iSite Automatic Tank Gauge,
Statistical Leak Detection (SLD), and Model
327 VLLD Electronic Line Leak Sensor

Manufacturer: OPW Fuel Management Systems
6900 Santa Fe Drive
Hodgkins, IL 60525

Expiration of Approval: December 31, 2014

The OPW SiteSentinel iSite Automatic Tank Gauge (ATG) was evaluated for use in monthly monitoring in accordance with **s. SPS 310.510 and SPS 310.515 (5)**. The SiteSentinel iSite Automatic Tank Gauge was also evaluated for use as a tank tightness testing method in accordance with **s. SPS 310.515 (4)**.

The OPW SiteSentinel iSite Statistical Leak Detection (SLD) system was evaluated as a means of continuous statistical leak detection for underground tanks in accordance with **s. SPS 310.510(3)(a) and 310.515 (5)**.

The OPW SiteSentinel iSite Model 327 VLLD Electronic Line Leak Detection System, was evaluated as a means of automatic line leak detection and line tightness testing for both rigid and flexible piping in accordance with s. **SPS 310.510(4)** and **310.515 (8)**. The Model 327 system was also evaluated for use in hybrid systems containing both flexible and rigid piping.

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 -Comm 10.

DESCRIPTION AND USE

SiteSentinel iSite Tank Leak Detection System

The SiteSentinel iSite automatic tank gauge provides complete inventory, delivery, automatic reconciliation, and environmental compliance information for as many as 256 tank probes or 1024 external sensing devices, or a combination of both. The color touchscreen display provides access to real-time inventory data, delivery status, alarm conditions, and leak detection information such as, product level, temperature, water level, automatic start times, and alarm levels.

The SiteSentinel iSite ATG with the Model 924B or Q0400-4XX magnetostrictive probes may be used for tanks containing gasoline, ethanol blends up to 10%, diesel, biodiesel blends B6-B20 meeting ASTM D7467, biodiesel B100 meeting ASTM D6751, aviation fuel, solvents, and other products that will not physically damage the probe and are of uniform specific gravity.

The ATG does not determine the level of groundwater above the bottom of the tank. The systems test for water incursion. The minimum water level (threshold) in the tank that the system can detect was found to be 0.75 inches for the 2 "dia. float and 0.848 inches for the 4" dia. float. The minimum change in water level that can be tested by the system was found to be 0.080 inches for the 2 "dia. float and 0.043 inches for the 4" dia. float provided the water level is above the threshold. For ethanol fuels greater than 10% water float detection may be unreliable; optional density measurement sensor may be more reliable for water detection if water content increases to produce a phase separation.

Tank deformation effects are addressed by beginning the test only after the waiting period has passed and the tank is stabilized. The 0.1 "Precision" and 0.2 gph monthly tests have built-in waiting periods after a product drop. Level changes are converted to volume changes using the theoretical ratio calculated from tank geometry or interpolation from the tank manufacturer's chart. Leak rates are calculated using data determined valid through statistical analysis. Test results are considered to be inconclusive if there is too much variability in the data, excessive temperature changes, or tank wall deformation. Lengthening the stabilization period beyond the minimum time is the only acceptable deviation in the standard test protocol.

The actual test time will vary with the tank and the amount of product according to a pre-programmed protocol.

SiteSentinel iSite Leak Detection System w/SLD

The SiteSentinel iSite Automatic Tank Gauging (ATG) Systems with Statistical Leak Detection (SLD), consist of a console and probe combination (Model 924B or Q0400-4XX) that can be used as a continuous monthly monitoring leak detection system in underground tanks. With the SLD system, up to 3 tanks can be manifolded together.

When used for continuous in-tank statistical leak detection (monthly monitoring), the system determines when the tank is stable enough to begin data collection. Data acquisition is performed continuously until enough valid data is acquired to calculate a leak rate on the data collected. If it passes the 0.2 gph test, the test is recorded, and the test cycle is started over. At the end of the 30-day period the last good test result is recorded in the permanent tank testing record. If the leak rate does not pass, or if the data was insufficient for performing the calculation, the testing continues until a passing test occurs. The Systems warns the operator if there are no passing tests completed during the monthly monitoring period; a tank shutdown may be necessary in order for the system to collect enough quiet time data for a valid test. A report can be generated either automatically or manually every 30 days showing the final results.

Electronic Line Leak Detector

The Model 327 VLLD Volumetric Line Leak Sensor may be used on pipelines containing gasoline, diesel, ethanol blends up through E100, biodiesel blends B6-B20 meeting ASTM D7647, biodiesel B100 meeting ASTM D6751, aviation fuel, fuel oil #4 and #6, alcohols, solvents, used oil, and other liquids with known coefficients of expansion and density after consultation with the manufacturer.

The Model 327 VLLD Volumetric Line Leak Sensor uses a single test at operating pressure conditions to determine if a pipeline is leaking or not. The leak sensor is typically installed in the submersible pump leak detector port. After dispensing operations are completed the pump stays on to perform the catastrophic test; if a leak is present product will flow through the sensor path and be reported to the iSite tank gauge. Optional monthly and annual leak tests can also be performed if the system has enough non-operational time (no dispensing activity). If a leak is detected the system displays a message on the tank gauge, triggers an alarm, and shuts down the dispensing system if programmed for that option.

Leak Detection Sensors:

(Note: In addition to the leak detection sensors listed below, the leak detection sensors approved under the legacy ECCO and Site Sentinel automatic tank gauges have been third-party tested and approved for use with the SiteSentinel iSite automatic tank gauge.)

Interstitial Level Sensor-Float Switch (P/N 30-0231-S)

The Interstitial Level Sensors are used primarily in the interstitial area of a steel double-walled tank. The sensor contains a float switch that activates in the presence of a liquid. The sensor is constructed from chemical-resistant non-metallic material. It can also be used in sumps, dispenser pans and other locations where the presence of a liquid could indicate that a leak has occurred. In the event of a break in the cable, the system will activate the alarm. This technology allows the SiteSentinel iSite and VSmart Module to automatically detect sensor

connection, sensor type, and sensor status; and will minimize user entry error and identify hardware issues with minimal troubleshooting.

Single-Level Sump Sensor (P/N 30-0231-L)

The Single-Level Sump Sensor is designed to detect the presence of liquid in sumps, dispenser pans and other locations where the presence of a liquid could indicate that a leak has occurred. The sensor contains a normally closed float switch that activates in the presence of liquid. In the event of a break in the cable, the system will activate the alarm.

Liquid-Only Float Sensor (P/N 30-0230-S)

Designed to detect the presence of fluid in the interstitial space of a steel double-wall tank or a containment sump. The sensor which utilizes float technology, activates in the presence of water or fuel and provides an alarm condition. An alarm condition will also occur if the cable is broken.

Discriminating Dispenser Pan Sensor (P/N 30-0232-DH-10)

Discriminating STP Sump Sensor (P/N 30-0232-DH-20)

The Discriminating Dispenser Pan and Discriminating STP Sump Sensor provides the ability to detect a low- and high-liquid level and distinguish whether the fluid is water or hydrocarbons using a polymer strip and float technology. The polymer strip will change resistance showing hydrocarbon detection; if the polymer doesn't change resistance it indicates detection of water. Detection of either will result in an alarm condition. An alarm will also occur if the cable breaks or the sensor malfunctions.

Hydrocarbon Vapor Sensor (P/N 30-0235-V)

The Hydrocarbon Vapor Sensor is designed to detect hydrocarbon vapors in dry Monitoring wells. The presence of these vapors could indicate a potentially dangerous leak that could lead to safety and environmental problems. The sensor is made from a long-life resistive element that increases dramatically in resistance in the presence of hydrocarbon vapors. After the vapors have dissipated, the sensor returns to normal and is ready to detect hydrocarbon vapors again. This process could take up to 30 minutes depending on the saturation factor. In the event of a break in the cable or sensor malfunctions the system will activate the alarm.

Discriminating Interstitial Sensor (P/N 30-0236-LW)

The Discriminating Interstitial Sensor utilizes a solid-state optical technology to detect the presence of fluid in the annular space of a tank and distinguish whether the fluid is water or hydrocarbons. This sensor utilizes conductive probes to distinguish between water and hydrocarbons. An alarm will occur on liquid detection, open cable, or sensor malfunction.

Interstitial Hydrocarbon Liquid with Water Indicator (P/N 30-0234-HW-01)

The Interstitial Hydrocarbon Liquid/Water Sensor is designed for use in the interstitial area of a fiberglass double-wall tank. The hydrocarbon liquid/water sensor contains a carbon/polymer material that changes its resistance when exposed to liquid hydrocarbons. Additionally, it contains a conductive strip to detect the presence of water, providing the ability to discriminate between hydrocarbon liquid and water. In the event of a break in the cable, the system will activate the alarm.

Hydrocarbon Liquid with Water Indicator (P/N: 6 feet: 30-0234-HW-06, 15 feet: 30-0234-HW-15
20 feet: 30-0234-HW-20)

The Hydrocarbon Liquid/Water Sensor, which is available in 6-, 15- and 20-foot lengths, is used primarily in monitoring wet wells with fluctuating groundwater tables. The sensor contains a carbon/polymer material that changes its resistance when exposed to liquid hydrocarbons. Additionally, a water sensor that relies on the conductivity of water to detect its presence is utilized, providing the ability to discriminate between hydrocarbon liquid and water. The sensor also alerts the system to the absence of groundwater in a monitoring well. It will alert the system if any fuel enters into the containment area, which would indicate a leak. In the event of a break in the cable the system will activate the alarm.

Dual-Float Dispenser Sump Sensor (P/N 30-0232-D-10)

This Dual-Float Sensor is the same as a Discriminating Dispenser Pan Sensor, Part No. 30-0232-DH-10, but without Belcor inside sensor. This makes it non-discriminating.

Dual-Float STP Sump Sensor (P/N 30-0232-D-20)

This Dual-Float Sensor is the same as Discriminating STP Sump Sensor, Part No. 30-0232-DH-20, but without Belcor inside sensor. This makes it non-discriminating.

Dual-Float Brine Sensor (P/N 30-0232-D-10B or 30-0232-D-20)

The Dual Float Brine sensor is very similar to the 30-0232-D-10 or 30-0232-D-20 but unlike the other dual float sensors it measures a level of liquid that is already present in the tank. The bottom float of the brine sensor will remain in the up position in a normal condition. When in alarm the sensor will have either triggered the upper float or the level has dropped below the bottom float.

Density Measurement Sensor (P/N 30-3232)

The Density Measurement Sensor installs on the pre-existing probe and continuously measures the average density of the fuel in the tank. This provides a measure of changes in product density within the API density range. Fuel-density reports can be displayed real-time on the iSite Console or exported to an external device. The readings can be either nominal or temperature-corrected density.

Note: This sensor is not third-party approved as part of a leak detection system at this time; however, it may be used as a product quality instrument if so desired. When the sensor receives third-party approval, this material approval will be modified to reflect approved usage.

TESTS AND RESULTS

The performance of the SiteSentinel iSite Automatic tank gauges (ATGs) was determined in accordance with the EPA testing protocol for automatic tank gauging methods. When using leak declaration thresholds of 0.05 gph and 0.10 gph, the probabilities of detection of a leak of 0.10 and 0.20 gph, respectively, were certified to within the 95-5 ranges required by the EPA protocols.

Testing of the SiteSentinel iSite Automatic Tank Gauging (ATG) Systems with Statistical Leak Detection (SLD), was conducted in accordance with a modified version of the EPA Automatic Tank Gauging Systems protocol. When using a leak declaration threshold of 0.10 gph, the

probabilities of detection and false alarm to a leak rate of 0.20 gph were certified to within the 95-5 ranges required by the EPA protocols.

Electronic Line Leak Detector

Testing of the OPW SiteSentinel iSite Model 327 VLLD Electronic Line Leak Sensor for hourly, monthly, and annual pipeline tightness testing was conducted in accordance with either the EPA Pressurized Pipeline Leak Detection Systems protocol (rigid piping) or modified versions of same protocol adapted for flexible piping or for a hybrid combination of rigid and flexible piping. When using leak declaration thresholds of 1.5 gph, 0.10 gph, and 0.05 gph, the probabilities of detection for a leak of 3.0, 0.20 and 0.10 gph, respectively, were certified to within the 95-5 ranges required by the EPA protocols.

Liquid Sensors

The performance of the OPW leak detection sensors were evaluated in accordance with the EPA standard test procedure for liquid-phase and vapor-phase out-of-tank product detectors by Ken Wilcox Associates, Inc.

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

MONITORING SYSTEM OUTPUT

Detailed here are examples of the typical Tank Compliance Report, Tank Leak Report, Sensor Alarm History and VLLD Report. (Site Name/Address is printed on 1ST sheet of report)

<div style="text-align: center; font-weight: bold; font-size: small;">OPW Fuel Management Systems</div> <div style="display: flex; justify-content: space-between; align-items: center; margin-bottom: 10px;"> <div style="text-align: center;"> <p>1 Sales Demo 6900 Santa Fe Drive Technical Support Department Hodgkins IL</p> </div> </div> <div style="text-align: center; font-weight: bold; font-size: small;">Compliance Report</div> <div style="text-align: center; font-size: x-small;">Date/Time: 08/25/2009 3:04:40 PM</div> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <td>Report Type</td> <td>Leak Test Status Report Details</td> </tr> <tr> <td>Tank Name</td> <td>TANK 1</td> </tr> <tr> <td>Product Name</td> <td>DYED DIESEL</td> </tr> <tr> <td>Start time</td> <td>08/17/2009 5:06:04 PM</td> </tr> <tr> <td>End time</td> <td>08/17/2009 7:06:04 PM</td> </tr> <tr> <td>Test Type</td> <td>Static</td> </tr> <tr> <td>Leak Test Rate</td> <td>0.2 Gph</td> </tr> <tr> <td>Leak Test Status</td> <td>Test Failed</td> </tr> <tr> <td>Measured Leak Rate</td> <td>-3.2881 gal/h</td> </tr> <tr> <td>Beginning Product Temperature</td> <td>74.59F</td> </tr> <tr> <td>Beginning Product Level</td> <td>29.27 in</td> </tr> <tr> <td>Beginning Product Volume</td> <td>5853.65 gal</td> </tr> <tr> <td>Beginning Product Net Volume</td> <td>5814.66 gal</td> </tr> <tr> <td>Beginning Product Volume %</td> <td>88.5365 %</td> </tr> <tr> <td>End product temperature</td> <td>72.05F</td> </tr> <tr> <td>Ending Product level</td> <td>29.27 in</td> </tr> <tr> <td>Ending Product Volume</td> <td>5853.65 gal</td> </tr> <tr> <td>End Product Net Volume</td> <td>5821.24 gal</td> </tr> <tr> <td>End Product volume %</td> <td>58.5365 %</td> </tr> </table>	Report Type	Leak Test Status Report Details	Tank Name	TANK 1	Product Name	DYED DIESEL	Start time	08/17/2009 5:06:04 PM	End time	08/17/2009 7:06:04 PM	Test Type	Static	Leak Test Rate	0.2 Gph	Leak Test Status	Test Failed	Measured Leak Rate	-3.2881 gal/h	Beginning Product Temperature	74.59F	Beginning Product Level	29.27 in	Beginning Product Volume	5853.65 gal	Beginning Product Net Volume	5814.66 gal	Beginning Product Volume %	88.5365 %	End product temperature	72.05F	Ending Product level	29.27 in	Ending Product Volume	5853.65 gal	End Product Net Volume	5821.24 gal	End Product volume %	58.5365 %	<div style="text-align: center; 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OPW FUEL MANAGEMENT SYSTEMS
 OEM Site

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Line Leak Test Status Report Details

Tank Name: Tank 1
 Product Name: Diesel
 Start time: 05/21/2012 9:54:16 A
 End time: 05/21/2012 9:57:29 F
 Test Type: Line Leak Test
 Leak Test Rate: 3.0 Gph
 Leak Test Status: Test Failed

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Logout Settings Help Print Thursday 05/24/2012 4:51 PM Spooler Status Active Alarms Open Alarms Home
 0 0 9

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 OEM Site

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Line Leak Test Status Report Details

Tank Name: Tank 1
 Product Name: Diesel
 Start time: 05/21/2012 10:03:43
 End time: 05/21/2012 11:29:35
 Test Type: Line Leak Test
 Leak Test Rate: 0.1 Gph
 Leak Test Status: Passed
 Measured Leak Rate: 0.0041 gal/h
 Leak Threshold: 0.1 gal/h

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Logout Settings Help Print Friday 05/25/2012 8:07 AM Spooler Status Active Alarms Open Alarms Home
 0 0 9

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Model 327 VLLD 3.0 gph On-screen Report

OPW FUEL MANAGEMENT SYSTEMS
 Falls Rd Carwash

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Compliance

SLD

Tank Name: Unleaded 1
 Product Name: Unleaded
 Start time: 05/12/2012 4:53:28 F
 End time: 05/26/2012 11:26:50
 Test Type: SLD
 Leak Test Threshold: 0.2 Gph
 Leak Test Status: Passed
 Measured Leak Rate: 0.0014 gal/h

Max Height	75.98 in
Min Height	16.9 in
Max Temperature	69.98°F
Min Temperature	61.22°F
Max Segment Length	2.65 hours
Min Segment Length	0.25 hours
# of Segments	74
Daily Throughput	3948.08 gal
Delivery Ratio	0.6

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Logout Settings Help Print Tuesday 05/29/2012 4:31 PM Spooler Status Active Alarms Home
 0 1

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SLD On-screen Report

Model 327 VLLD 0.1 gph On-screen Report

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LIMITATIONS / CONDITIONS OF APPROVAL

General

- All monitoring equipment shall be installed, calibrated, operated, and maintained in accordance with the manufacturer instructions, and certified every 12 months for operability, proper operating condition, and proper calibration in accordance with **SPS 310.510 (2)**. Records of sampling, testing, or monitoring shall be maintained in accordance with **SPS 310.500 (9)**.
- The manufacturer shall submit for a revision to this Wisconsin Material Approval application if any of the functional performance capabilities of this equipment are revised. This would include, but not be limited to changes in software, hardware, or methodology.
- While 3rd party testing does determine a required minimum tank level, EPA leak detection regulations require testing of the portion of the tank system which routinely contains product. Consistent testing at low levels could allow a leak to remain undetected.

During leak testing, a minimum level of product in tank shall be maintained so as to ensure testing of the portion of the tank and/or piping that routinely contains product, regardless of testing system capability. For instance, if product levels are routinely maintained at 60%, but the leak detection system is capable of testing at 15% product level, then testing shall be performed at 60% levels.

- If performing a tank tightness test, minimum tank level shall be 95%, regardless of leak detection system minimum capability, in accordance with **SPS 310.515 (4)**.
- Automatic tank gauges shall be programmed to provide an audible and visual alarm in the event of a tank test fail, periodic monthly tank test not performed within a 30-day interval, or tank interstitial sensor actuation. Silencing of the alarm shall require manual operator action.
- Electronic line leak detection shall be programmed to provide an audible and visual alarm in addition to providing shut-down of the submersible pump in the event of a line test fail. The ELLD shall also be programmed to provide an audible and visual alarm in the event a periodic monthly line test was not performed within a 30-day interval. Silencing of either alarm shall require manual operator action.
- Sensors used for interstitial line monitoring shall be programmed to provide an audible and/or visual alarm in addition to providing shut-down of the submersible pump or individual dispenser(s) in the event of a sump/interstitial monitoring sensor actuation. Silencing of the alarm shall require manual operator action.

- Critical performance parameters for the **2-inch and 4-inch dia. 924B or Q0400-4XX** probe with the **SiteSentinel iSite** console for annual 0.1 gph and monthly 0.2 gph testing: (Magnetostrictive probe)

Parameter	Value
Maximum Tank Size ¹	Up to 20,000 gallons
Software Version	N/A
Minimum Product Level ²	50% (0.2 gph test) 95% (0.1gph test)
Waiting time between filling tank and test start ³ (Stabilization time dependant on tank conditions)	6.0 hours (0.2 gph test) 6.0 hours (0.1 gph test)
Waiting time between dispensing and test start	None
Minimum Test Period ⁴ . (Test time determined by microprocessor based on tank size and product level)	30 minutes ⁵ (0.2 gph test- 2" or 4" float w/924B probe only) 1.5 hours (0.1 gph test- 4" float w/924B probe only) 6.0 hours (0.1 gph test- 2" float w/924B probe only) 4.0 hours (0.2 gph test- 4" float w/Q0400-4XX probe only)

- 1: Monthly and annual testing can only be performed on one tank at a time. If several tanks are manifolded together, an isolation valve will have to be installed so as to separate the tanks individually.
- 2: Minimum level from probe bottom is same as product level in tank, assuming the typical configuration where the probe touches the bottom of the tank.
- 3: There must be no delivery during waiting time.
- 4: There must be no delivery or dispensing during testing.
- 5: Testing times are approximate; microprocessor determines testing times based on site specific conditions at time of test. Listed time is from 3rd-party testing certification.

iSite ATG SLD (24-hour, 0.2 gph monthly monitoring)

- Critical performance parameters for the **2-inch and 4-inch dia. 924B or Q0400-4XX** probe with the **SiteSentinel iSite with SLD** for monthly 0.2 gph testing:

Parameter	Value
Maximum Tank Size ¹	Up to 30,258 gallons
Maximum Number of Manifolded Tanks	3
Software Version	108.132.42 or higher
Minimum Tank Level ²	14.7%
Maximum Monthly Throughput	397,883 gallons

- 1: For single or aggregate capacity of manifolded tanks.
- 2: The SLD system will automatically check the tank level, and not perform a test if the tank level is below the minimum.

Electronic Line Leak Detector

- The OPW SiteSentinel iSite Model 327 VLLD Electronic Line Leak Sensor is approved for use on pipeline systems for underground storage tank facilities that contain gasoline, diesel, ethanol blends up through E100, biodiesel blends B6-B20 meeting ASTM D7647, biodiesel B100 meeting ASTM D6751, aviation fuel, fuel oil #4 and #6, alcohols, solvents, used oil, and other liquids with known coefficients of expansion and density after consultation with the manufacturer. It is approved for use on rigid or flexible piping or a hybrid combination of rigid and flexible piping.
- An annual test of the operation of the leak detector shall be conducted in accordance with the manufacturer requirements for testing to the recognized leak thresholds by inducing a physical line leak as required by **s. SPS 310.515(8)(d)**. The individual performing the test must be qualified by the equipment manufacturer.
- The system may be used with trapped vapor present in the line.
- **Mechanical line leak detectors cannot be installed in the same line as the electronic line leak detector.**
- Critical performance parameters for the **Model 327 VLLD Electronic Line Leak Sensor**:

Parameter	Value
Total maximum allowable volume of product in any flexible test pipeline	109.8 gallons or less
Total maximum allowable volume of product in any rigid test pipeline	425.8 gallons or less
Total maximum allowable volume of product in any Hybrid (rigid and flexible piping combination) test pipeline	535.7 gallons or less¹

1: Not to exceed the above individual capacity limitations for rigid (425.8 gallons) or flexible (109.8 gallons) pipelines.

Note: All critical parameters are pre-programmed into the software and are not accessible for viewing.

Liquid Sensors

- All equipment shall be installed, operated, and maintained in accordance with procedures specified by OPW Fuel Management Systems.
- All sensors shall be placed in the lowest point of the interstice or sump and be able to detect a leak in any portion of the primary containment that routinely contains product.

This approval will be valid through December 31, 2014, 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: May, 1, 2012

Reviewed by: Signature on file
Greg Bareta, P. E.
Engineering Consultant
Bureau of Petroleum Products and Tanks

Approved by: Signature on file Date: _____