

California Environmental Protection Agency

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**ARB Approved**

**Installation, Operation and Maintenance Manual**

for

Executive Order  
VR-401-C

OPW Phase I Enhanced Vapor Recovery System  
For  
Aboveground Storage Tanks

**NOTICE:**

The **ARB Approved Installation, Operation and Maintenance Manual (IOM) for the VR-401** describes the tools, methods and skill levels required to install the **OPW Phase I Enhanced Vapor Recovery (EVR) System for Aboveground Storage Tanks (AST)**.

Unless specified otherwise, only skilled technicians that are trained, certified and licensed by OPW (i.e. OPW Certified Technicians) are able to perform installation, maintenance or repairs of components manufactured by OPW or warranty will be void.

It is the responsibility of each OPW Certified Technician to be familiar with the current requirements of state, federal, local codes and air district rules and regulations of installation and repair of gasoline dispensing equipment.

It is also the responsibility of each OPW Certified Technician to be aware of all the manuals, necessary safety precautions, and site requirements to assure a safe and trouble-free installation.

To schedule a training class or to confirm the status of an OPW Certified Technician, please visit OPW's website at [www.opwglobal.com](http://www.opwglobal.com) or contact:

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# **Section 1**

## **331/332 Spill Containers**



# OPW Installation and Maintenance Instructions

## 331, 332-AST Direct Fill Spill Container

**IMPORTANT:** Please read these warnings and use the assembly instructions completely and carefully before starting. Failure to do so may cause product failure, or result in environmental contamination due to liquid leakage into the soil, creating hazardous spill conditions.

**IMPORTANT:** The OPW Spill Containers are pre-assembled for your convenience and ease of installation. Check to make sure the unit is intact and undamaged and all parts have been supplied. Never substitute parts for those supplied. Doing so may cause product failure.

**WARNING-DANGER:** Using electrically operated equipment near gasoline or gasoline vapors may result in a fire or explosion, causing personal injury and property damage. Be sure that the working area is free from such hazards, and always use proper precautions.

**NOTE:** At all times when product is in the storage tank keep the riser pipe capped, so the vapors cannot escape into the environment.

**NOTICE:** OPW products must be used in compliance with applicable federal, state, and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and material to be handled. All illustrations and specifications in this literature are based on the latest production information available at the time of publication. Prices, materials and specification are subject to change at any time, and models may be discontinued at any time, in either case, without notice or obligation.

### 331, 332-AST Direct Fill Spill Container Performance Specifications:

This spill container has been tested for leaks prior to leaving the factory.

#### Torque Specifications:

4" & 6" NPT - 125 ft-lbs min. to 250 ft-lbs max.

Base Bolts 5/16-18UN – 15-20 ft-lbs

Drain Valve Bolts (5/16-18UN) – 11.5-13.5 ft-lbs.

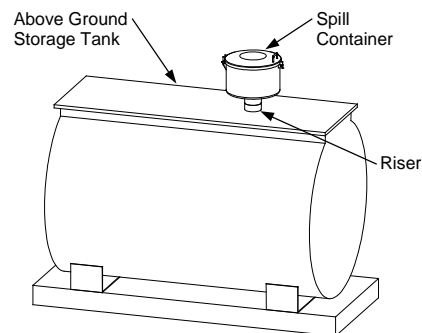
#### Replacement Parts:

Bolts, 5/16-18UN:	H11023M
Lock Washer:	H11763M
Washer:	200330
Base O-ring:	C05170M
Drain Valve Replacement Kit:	1DK-2100-EVR

(Replacement Skirts are also available.)

### 331, 332-AST Direct Fill Spill Container Installation Instructions

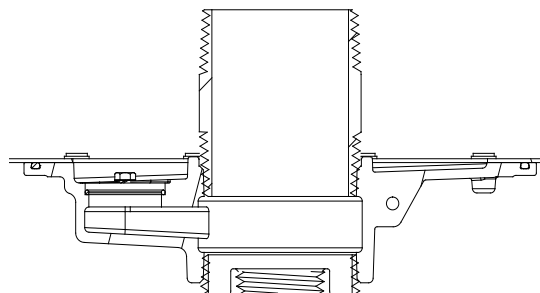
1. Inspect and clean riser threads prior to spill container installation.
2. Apply pipe dope to riser. The pipe dope is to be a non-hardening, gasoline-resistant, pipe-thread seal compound.
3. Place the spill container onto the riser pipe and thread on hand tight. (See Figure 1)



**Figure 1**

4. Tighten the spill container onto the riser using the specified torque values for the size spill container being installed, being careful to avoid cross threading. Refer to torque specifications at the beginning of this instruction sheet. If the riser is not plumb, position the drain valve to the low side to insure drainage.
5. Apply pipe dope to a 4" or 6" NPT pipe nipple no more than 6" in length and thread into the inside of the spill-container base. The pipe dope is to be a non-hardening, gasoline-resistant, pipe-thread seal compound. (See Figure 2.)

**NOTE:** The nipple installed must be no more than 6" in length to avoid contact with the lid after installation of Kamvalok® Adaptor.



**Figure 2**

6. Complete the overfill-valve installation instructions prior to continuing. (OPW p/n 203163)
7. If the skirt is damaged it can be replaced by removing the eight base bolts and replacing the Base O-ring. Tighten the bolts to 15-20 ft-lbs using a crossing pattern. Be sure to note the drain valve chain hanger bracket location in relation to the drain valve. Position accordingly. (See Figure 3.)

### Operation and Preventative Maintenance

After each fuel delivery, the operator must remove any standing fuel from the spill container. Fuel can be removed by actuating the drain valve or with a gasoline absorbing disposable towel. Follow local rules and regulations for the disposal of hazardous waste where applicable. The following steps should be followed on at least a semi-annual basis.

1. Inspect and clean the interior of the spill container and drain valve screen. Remove accumulated dirt and grit.
2. If the drain valve screen becomes clogged, remove the valve, soak in water and use high-pressure air to clean.
3. Reinstall the drain valve to its proper position and test.
4. If desired, a hydrostatic test can be performed, use California ARB Test Procedures: These Test Procedures will check the seals between the drain valve, nipple and adaptor, and the base o-ring. To test the spill containers base and skirt fill the container with 2" of water. A drop in the water level equivalent to 0.17 CFH is allowable, to determine whether a leak is greater than this refer to the chart below. To determine where the leak is, look for a steady stream of

bubbles coming from one of the joints or water leaking on the outside of the bucket.

**NOTE:** Do not drain the water into the tank after the test is complete. Water must be disposed of per local requirements for hazardous waste. If the leak cannot be corrected the spill container should be replaced with another.

Time Elapsed	Allowable Drop
36 min, 45 sec	1"
18 min, 22 sec	1/2"
9 min, 11 sec	1/4"
4 min, 36 sec	1/8"

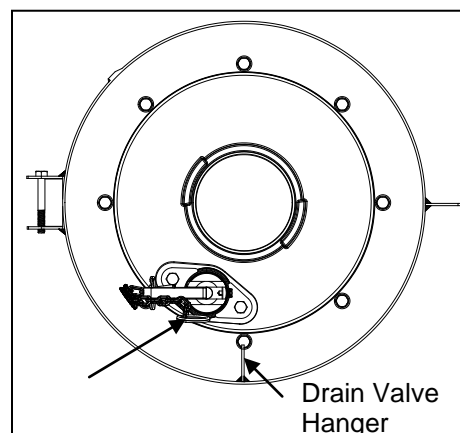


Figure 3



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## **Section 2**

### **1DK-2100 EVR Replacement Drain Valve**



## OPW Installation and Maintenance Instructions

### OPW 1DK-2100 EVR Replacement Drain Valve

**IMPORTANT:** Please read these warnings and use the assembly instructions completely and carefully before starting. Failure to do so may cause product failure, or result in environmental contamination due to liquid leakage into the soil, creating hazardous spill conditions.

**IMPORTANT:** Check to make sure the unit is intact and undamaged and all parts have been supplied. Never substitute parts for those supplied. Doing so may cause product failure and void warranty.

**WARNING-DANGER:** Using electrically operated equipment near gasoline or gasoline vapors may result in a fire or explosion, causing personal injury and property damage. Be sure that the working area is free from such hazards, and always use proper precautions.

**NOTE:** At all times when product is in the storage tank keep the riser pipe capped, so the vapors cannot escape into the environment.

The OPW 1DK is an optional drain valve replacement kit for the OPW 1 Spill Container Series. It is designed to return incidental spillage of liquid back to the underground storage tank.

### HOW TO INSTALL

1. Remove and discard existing drain valve and O-ring.
2. Clean any dirt or debris from the sealing surface where the new drain valve will be installed.
3. Apply any common grease or light oil to the new supplied O-ring. Assemble the O-ring into the spill container base.
4. Insert the 1DK into the spill container O-ring. Be sure that the drain valve seats flush with the floor of the spill container base.
5. The pull lever of the 1DK **MUST** be positioned halfway between the riser pipe nipple and the spill container bellows. Rotate the drain valve until that position is attained.
6. Secure the 1DK by installing the provided retaining clips and nuts. Tighten the nuts to a torque of 11.5 ft-lbs min. to 13.5 ft-lbs max.
7. The drain valve is now installed and ready for testing.

### HOW TO TEST

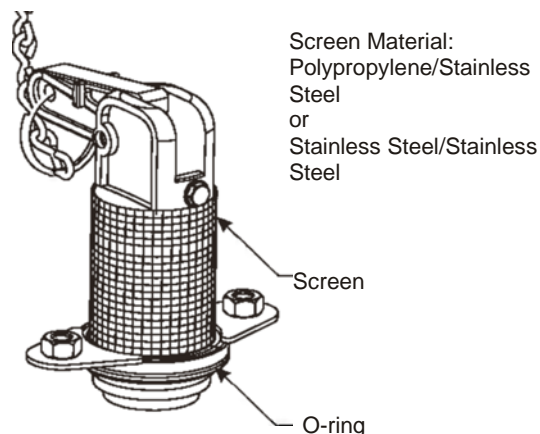
Upon preliminary installation perform the California Test Procedures TP-201.1C or equivalent. These Test Procedures will check the seals between the drain valve, nipple and rotatable adaptor. To test the spill containers base and bellows fill the container with water. A drop in the water level of 1/16" or more after one hour means that a leak exists. To determine where the leak is, look for a steady stream of bubbles coming from one of the joints.

**NOTE:** Do not drain the water into the UST after the test is complete. Water must be disposed of per local requirements for hazardous waste.

If a leak is observed in the Test Procedure, check to see that the drain-valve poppet is sealing properly. To do this, lift up the drain-valve pull chain several times to actuate the poppet. This will ensure that the drain-valve poppet is seating properly. If this doesn't correct the leak remove the 1DK valve and inspect the O-ring for nicks or tears, replace if needed; also clean the sealing surfaces of the spill-container base that the 1DK valve and O-ring are installed into. Reinstall 1DK valve and repeat test.

If spill container passes the Test Procedure but does not hold water then there is a leak in the bucket and it will need to be replaced.

### Alternative Construction





## 1DK-2100 EVR Replacement Drain Valve Performance Specifications:

This Spill Container drain valve has been manufactured and tested to the following California specifications: Leak Rate to be less than or equal to 0.17 CFH @ 2.0" W.C.

### Operation and Maintenance:

To open, pull drain valve chain up and hold open until liquid is drained. To close, release chain.

### Annually:

Inspect and clean the interior of the spill container and drain valve screen. Remove accumulated dirt and grit. Test the drain valve using CARB procedure TP-201.1C or TP-201.1D. If the drain valve passes testing no further maintenance is required. If the drain valve fails testing, remove the valve, soak in water and use high-pressure air, if needed, to clean. Reinstall the drain valve to its proper position and test the valve with CARB procedure TP-201.1C or TP-201.1D.

<b>Important:</b>	Leave these instructions with the Station Operator.
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### NOTICE:

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## **Section 3**

### **61fSTOP-XXXXT Series Overfill Prevention Valves**



# OPW Installation and Maintenance Instructions

OPW 61fSTOP-XXXXT Series Above Ground Storage Tank Overfill Prevention Valve

**IMPORTANT:** Please read these warnings and use the assembly instructions completely and carefully before starting. Failure to do so may cause product failure, or result in environmental contamination due to liquid leakage into the soil, creating hazardous spill conditions.

**IMPORTANT:** The OPW 61fSTOP-\*T Overfill Prevention Valve is pre-assembled for your convenience and ease of installation. Check to make sure the unit is intact and undamaged and all parts have been supplied. Never substitute parts for those supplied. Doing so may cause product failure.

**WARNING-DANGER:** Using electrically operated equipment near gasoline or gasoline vapors may result in a fire or explosion, causing personal injury and property damage. Be sure that the working area is free from such hazards, and always use proper precautions.

**NOTE:** At all times when product is in the storage tank keep the riser pipe capped, so the vapors cannot escape into the environment.

**NOTICE:** OPW products must be used in compliance with applicable federal, state, and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and material to be handled. All illustrations and specifications in this literature are based on the latest production information available at the time of publication. Prices, materials, and specification are subject to change at any time, and models may be discontinued at any time, in either case, without notice or obligation.

## PRODUCT SPECIFICATIONS

<b>Pressure Rating:</b>	<b>150PSI*</b>
*OPW Does not recommend pumping pressures above 100PSI for Class 1B Fuels.	
<b>Flow Rate:</b>	
1000T and 2000T	20GPM min to 150GPM max
3050T	30GPM min to 400GPM max

## DIRECT FILL INSTALLATION INSTRUCTIONS:

### Step 1:

331/332 Spill Container should be installed according to OPW Installation Instructions (P/N 203168) prior to proceeding.

### Step 2:

Determine the necessary length (C) for the 2" (3" for 61fSTOP-3050T) nipple. The length can be found by first using the appropriate tank chart to find 10% of total tank capacity (A) and then measuring the length from the inside top of the tank to the top of the nipple in the spill container (B). The following equations will give the length necessary for the nipple for each type of overfill prevention valve. **(See Figure 1 or 2.)**

61fSTOP	Equation
61fSTOP-1000T	$C=A+B-13"$
61fSTOP-2000T	$C=A+B-11"$
61fSTOP-3050T	$C=A+B-13"$

**NOTE:** Dimension A must be a minimum of 4" for 61fSTOP-2000T or 7" for the 61fSTOP-1000T or 61fSTOP-3050T. The float must have ample clearance to prevent striking against foreign objects or structures. If the float is obstructed the valve will not close resulting in a hazardous condition.

**Step 3:**

Cut and thread the 2<sup>2</sup>/<sub>3</sub>" nipple to the length found in Step 2.

**Step 4:**

Apply pipe dope to one end of the 2<sup>2</sup>/<sub>3</sub>" nipple and thread into the inlet of the valve. Pipe dope is to be a non-hardening, gasoline-resistant pipe-thread seal compound. (See reference torque table on page 76.)

**Step 5:**

Apply pipe dope to the other end of the nipple and thread on Kamvalok® (1611AN, 1612AN). Pipe dope is to be a non-hardening, gasoline-resistant pipe-thread seal compound. (See reference torque table on page 76.)

**Step 6:**

Set the assembly upright, lift and release the float to verify that the valve moves freely.

**NOTE: If required to install an 61FT, please do so at this step. Please refer to 61FT installation instructions before continuing on to Step 7.**

**Step 7:**

Apply pipe dope to the 4" (6" for 61fSTOP-3050T) threads on the nipple in the spill container and insert the valve and 2<sup>2</sup>/<sub>3</sub>" nipple assembly into the tank. Pipe dope is to be a non-hardening, gasoline-resistant pipe-thread seal compound. Thread the Kamvalok® and valve assembly onto the riser pipe. (See reference torque table on page 76.)

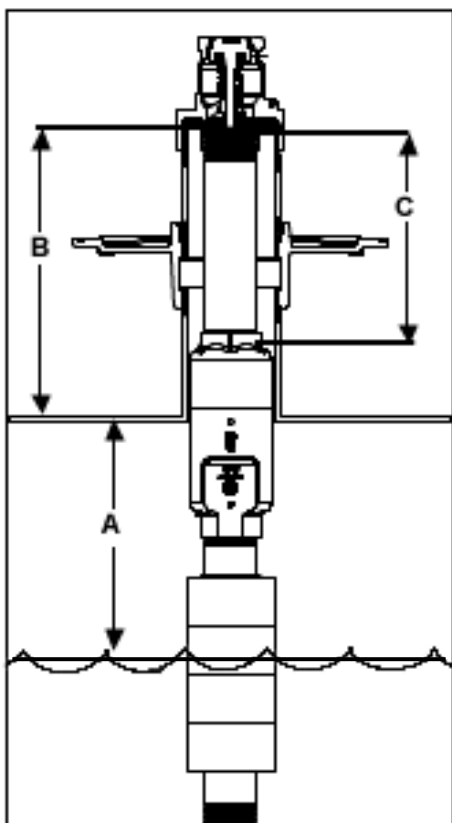


Figure 1: 61fSTOP-1000T/3050T

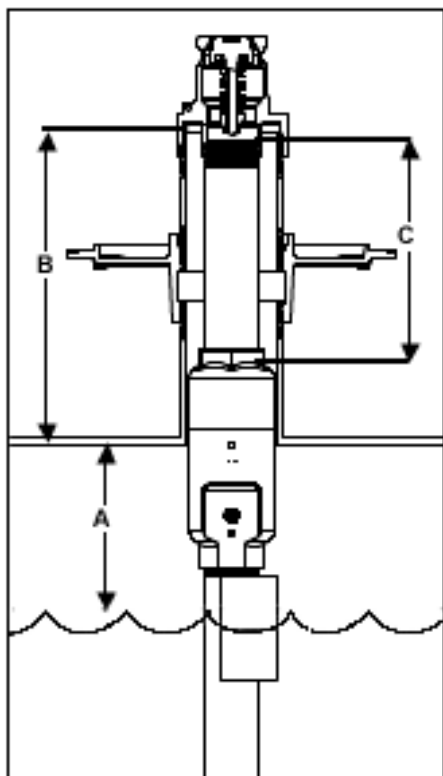
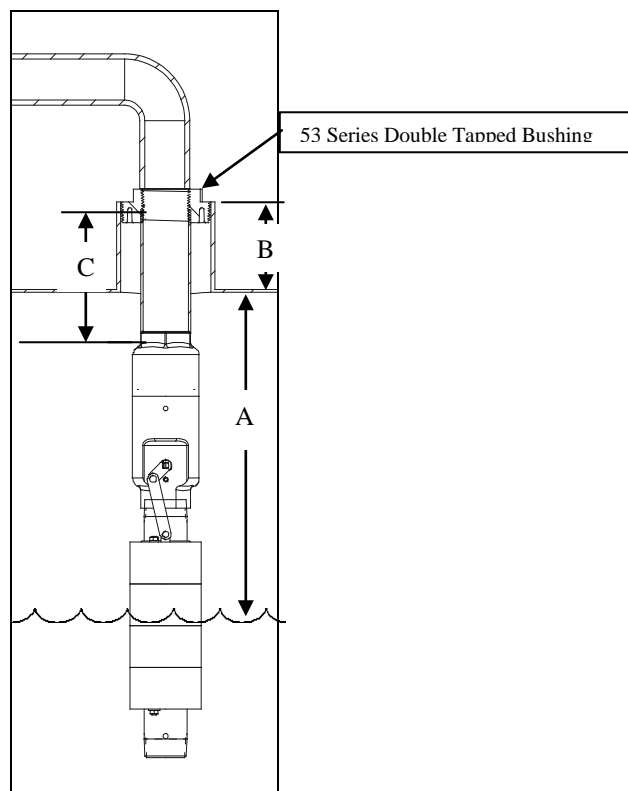
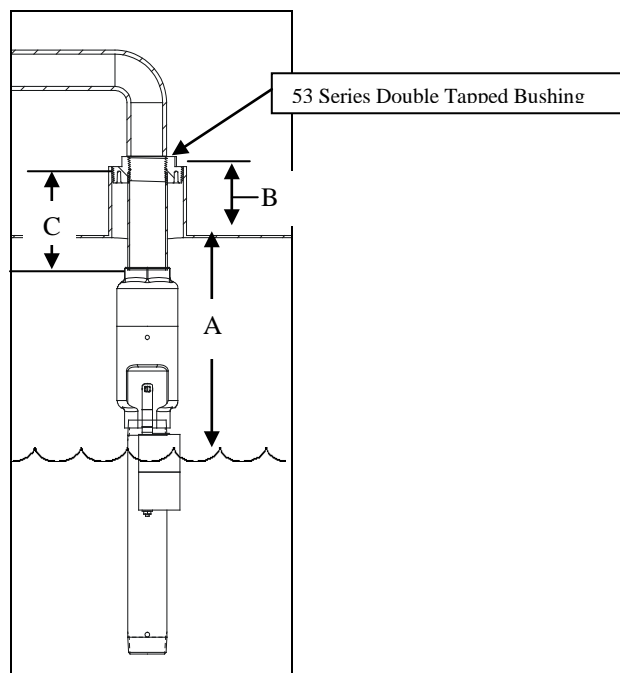


Figure 2: 61fSTOP-2000T

HORIZONTAL TANK DIAMETER (in)	PRODUCT LEVEL AT:	
	90% (in)	95% (in)
30	25.3	27.1
34	28.7	30.7
38	32.1	34.3
42	35.4	37.9
46	38.8	41.5
50	42.2	45.2
54	45.6	48.8
58	48.9	52.4
62	52.3	56
66	55.7	59.6
70	59	63.2
74	62.4	66.8
78	65.8	70.4
82	69.2	74
86	72.5	77.7
90	75.9	81.3
94	79.3	84.9
98	82.7	88.5
102	86	92.1
106	89.4	95.7
110	92.8	99.3
114	96.2	102.9
118	99.5	106.6
122	102.9	110.2
126	106.3	113.8
130	109.7	117.4
134	113	121
138	116.4	124.6
142	119.8	128.2
146	123.2	131.8
150	126.5	135.5
154	129.9	139.1
158	133.3	142.7
162	136.7	146.3
166	140.1	149.9
170	143.5	153.5
174	146.9	157.1
178	150.3	160.7
182	153.7	164.3
186	157.1	167.9
190	160.5	171.5
194	163.9	175.1
198	167.3	178.7
202	170.7	182.3
206	174.1	185.9
210	177.5	189.5
214	180.9	193.1
218	184.3	196.7



**Figure 3: 61fSTOP-1000T/3050T  
Remote fill**



**Figure 4: 61fSTOP-2000T  
Remote Fill**

### REMOTE FILL INSTALLATION INSTRUCTIONS:

#### Step 1:

Determine the necessary length (C) for the 2" (3" for 61fSTOP-3050T) nipple. The length can be found by first using the appropriate tank chart to find 10% of total tank capacity (A) and then measuring the length from the inside top of the tank to the top of the tank riser (B). The following equations will give the length necessary for the nipple for each type of overfill prevention valve. (See Figure 3 or 4.)

61fSTOP	Equation
61fSTOP-1000T	$C=A+B-13"$
61fSTOP-2000T	$C=A+B-11"$
61fSTOP-3050T	$C=A+B-13"$

**NOTE:** Dimension A must be a minimum of 4" for 61fSTOP-2000T or 7" for the 61fSTOP-1000T or 61fSTOP-3050T. The float must have ample clearance to prevent striking against foreign objects or structures. If the float is obstructed the valve will not close resulting in a hazardous condition.

#### Step 2:

Cut and thread the 2" or 3" nipple to the length found in Step 1.

#### Step 3:

Apply pipe dope to one end of the nipple and thread into the top of the 61fSTOP. Pipe dope is to be a non-hardening, gasoline resistant pipe thread seal compound. (See reference torque table on page 76.)

#### Step 4:

Apply pipe dope to the other end of the nipple and thread into the 53 Double-Tapped Bushing. Pipe dope is to be a non-hardening, gasoline-resistant pipe-thread seal compound. (See reference torque table on page 76.)

#### Step 5:

Set the assembly upright, lift and release the float to verify that the valve moves freely.

#### Step 6:

Apply pipe dope to the Double-Tapped Bushing and thread the assembly onto the tank. Pipe dope is to be a non-hardening, gasoline-resistant pipe-thread seal compound. (See reference torque table on page 76.)



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## **Section 4**

### **61FT Series Drop Tubes**



# **OPW Installation and Maintenance Instructions**

## **OPW 61FT Drop Tube**

**IMPORTANT:** Please read these warnings and use the assembly instructions completely and carefully before starting. Failure to do so may cause product failure, or result in environmental contamination due to liquid leakage into the soil, creating hazardous spill conditions.

**IMPORTANT:** The OPW 61FT Drop Tube is pre-assembled for your convenience and ease of use. Check to make sure the unit is intact and undamaged and all parts have been supplied. Never substitute parts for those supplied. Doing so may cause product failure.

**WARNING-DANGER:** Using electrically operated equipment near gasoline or gasoline vapors may result in a fire or explosion, causing personal injury and property damage. Be sure that the working area is free from such hazards, and always use proper precautions.

**NOTE:** At all times when product is in the storage tank keep the riser pipe capped, so the vapors cannot escape into the environment.

**NOTICE:** OPW products must be used in compliance with applicable federal, state, and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and material to be handled. All illustrations and specifications in this literature are based on the latest production information available at the time of publication. Prices, materials, and specification are subject to change at any time, and models may be discontinued at any time, in either case, without notice or obligation.

### **61FT Drop Tubes**

The OPW 61FT Drop Tube attached to the 61fSTOP Overfill Prevention Valves' lower pipe nipple in order to permit efficient fuel delivery. Less vapor is generated during the fuel drop when using the 61FT. The upper end of the drop tube is fitted over the 61fSTOP's lower pipe nipple and attached using a clevis pin.

**NOTE:** The 61FT Drop Tube is not recommended for use in fuels with greater than 15% alcohol content.

### **61FT Drop Tube Installation Instructions**

1. Check to see if the lower nipple of the 61fSTOP has the drop tube mounting holes. On some older models it may be necessary to drill these holes into the nipple. If this is the case, see the illustration below for the appropriate size of drop tube for your application. (See Figures 1 & 2.)



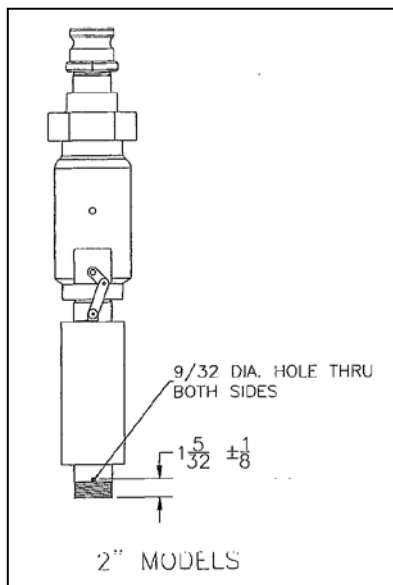


Figure 1: 2" Models

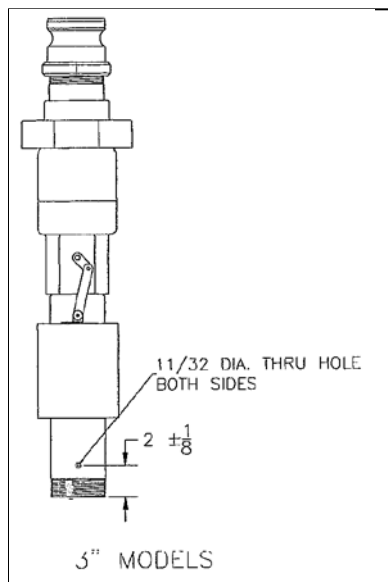


Figure 2: 3" Models

2. Slide the drop tube over the lower nipple of the 61fSTOP.
3. Align the holes in the drop tube with the holes in the bottom nipple and insert the clevis pin.
4. Insert the cotter pin into the clevis pin and bend the ends over to fasten the pin in place.
5. Make sure drop tube does not contact float. This may cause premature shut-off.

6. **For Direct Fill:** Cut tube to length so that the tube will be 6" above the bottom of the tank or per local code requirements. Tube is to be cut at 45°. (See Figure 3.)

**For Remote Fill:** Cut tube to length so that the tube will be 12" above the bottom of the tank or per local code requirements. Tube is to be cut at 45°. (See Figure 3.)

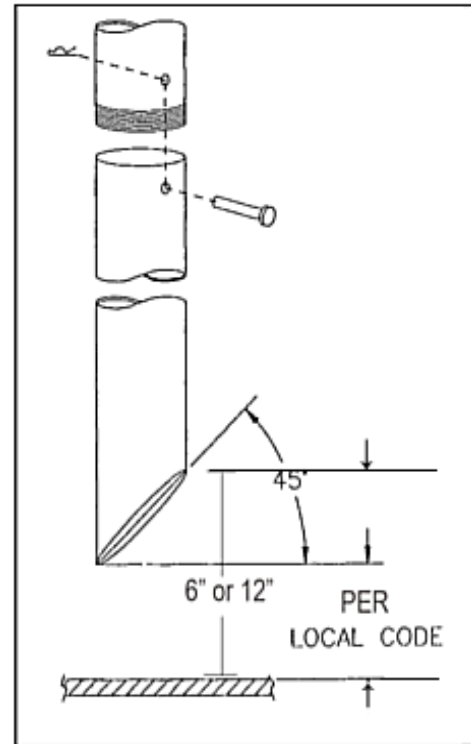


Figure 3: For Direct/Remote Fill



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## **Section 5**

### **61T Series Drop Tubes**



## **OPW Installation and Maintenance Instructions**

### **OPW 61T 2" Drop Tube**

**IMPORTANT:** Please read these warnings and use the assembly instructions completely and carefully before starting. Failure to do so may cause product failure, or result in environmental contamination due to liquid leakage into the soil, creating hazardous spill conditions.

**IMPORTANT:** The OPW 61T Drop Tube is pre-assembled for your convenience and ease of use. Check to make sure the unit is intact and undamaged and all parts have been supplied. Never substitute parts for those supplied. Doing so may cause product failure.

**WARNING-DANGER:** Using electrically operated equipment near gasoline or gasoline vapors may result in a fire or explosion, causing personal injury and property damage. Be sure that the working area is free from such hazards, and always use proper precautions.

**NOTE:** At all times when product is in the storage tank keep the riser pipe capped, so the vapors cannot escape into the environment.

**Notice:** OPW products must be used in compliance with applicable federal, state, and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and material to be handled. All illustrations and specifications in this literature are based on the latest production information available at the time of publication. Prices, materials, and specification are subject to change at any time, and models may be discontinued at any time, in either case, without notice or obligation.

### **61T Drop Tubes**

**NOTE:** The 61T Drop Tube is not recommended for use in fuels with greater than 15% alcohol content.

### **61T Drop Tube Installation Instructions**

1. The 61T Drop Tube should be installed prior to the installation of the tank gauge.
2. Cut tube to length so that the drop tube end shall be completely submerged when 6" of fuel is present in the tank or per local code requirements. Tube end is to be square cut.
3. Drill a 5/16" vent hole within 6 inches from the top of the drop tube.
4. Insert cut drop tube into tank bung opening.
5. Continue installation of tank gauge.



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## **Section 6**

### **1611/1612 Series Kamvalok® Adaptors**



# **OPW Installation and Maintenance Instructions**

## **1611AN/1612AN Series Kamvalok® Adaptor Instructions**

**IMPORTANT:** Please read these warnings and use the assembly instructions completely and carefully before starting. Failure to do so may cause product failure, or result in environmental contamination due to liquid leakage into the soil, creating hazardous spill conditions.

**IMPORTANT:** Check to make sure the unit is intact and undamaged and all parts have been supplied. Never substitute parts for those supplied. Doing so may cause product failure.

**WARNING-DANGER:** Using electrically operated equipment near gasoline or gasoline vapors may result in a fire or explosion, causing personal injury and property damage. Be sure that the working area is free from such hazards, and always use proper precautions.

**NOTE:** At all times when product is in the storage tank keep the riser pipe capped, so the vapors cannot escape into the environment.

**NOTICE:** OPW products must be used in compliance with applicable federal, state, and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and material to be handled. All illustrations and specifications in this literature are based on the latest production information available at the time of publication. Prices, materials, and specification are subject to change at any time, and models may be discontinued at any time, in either case, without notice or obligation.

### **1611AN/1612AN Series Kamvalok®**

#### **Installation Instructions**

1. Inspect and clean pipe prior to installation.
2. Apply pipe dope to threads. Pipe dope is to be non-hardening, gasoline resistant, pipe thread seal compound.
3. Thread on Kamvalok® and torque to 100-105 ft-lbs.

#### **Adaptor Tear Down Instructions**

4. Clamp the adaptor Kam groove end of valve in vise with soft jaws. Take care not to mar machined surfaces of adaptor.
5. Remove the snap ring from adaptor exercising care and caution. Poppet in valve is spring loaded. Spring forces range from 28 pounds on 1-1/2"-size products up to 50 pounds on 3"-size products.

**WARNING-DANGER:** Exert pressure on the bridge to relieve force against the snap ring. Remove snap ring from groove in adaptor. Carefully remove pressure from bridge to prevent it from flying out of the adaptor and causing personal injury.

6. Remove bridge, spring and poppet from adaptor. The poppet is not included in the repair parts kit. It will be necessary to replace the old O-ring.
7. Position poppet in collet or vice with soft jaws. Carefully pry O-ring out of the poppet groove (be careful not to scratch the groove seat with the prying tool. This could result in an O-ring leak). Discard old O-ring.

8. Re-assemble poppet and O-ring in the following manner:
  - a. Position new O-ring on top of the poppet.
  - b. With your thumb, press a section of the O-ring into the groove.
  - c. Press the O-ring around the poppet and over the groove lip (it is necessary to slightly stretch the O-ring to accomplish this).
  - d. Continue pressing the O-ring around the poppet until the O-ring is seated in the groove.

**NOTE:** Teflon encapsulated O-rings should be heated in hot water for easier installation.

9. Place rebuilt poppet, spring and bridge into position in the adaptor. Place the adaptor Kam groove end of valve in vise with soft jaws. Take care not to mar machined surfaces of adaptor.
10. Exert pressure on bridge to compress spring until snap ring groove is visible. While maintaining pressure insert snap ring into groove in adaptor. Carefully release pressure from bridge until it seats against snap ring.

### Test Procedure

It is recommended that the valve be pressure-tested utilizing the air-underwater method by checking for leaks in the area of the poppet seat.

#### Step 1:

Place valve under water, tapping and rotating it to release any trapped air.

#### Step2:

Pressurize the valve to 2 PSI and check for leaks.

#### Step 3:

Then, increase pressure to 80 PSI and again check for leaks.

If pressurized air is not available, low pressure leaks could be checked by submerging the entire adaptor face up in a container of clear water. Air trapped inside the valve will bubble through or around the poppet if seal is not proper.

This test should be repeated 3-4 times to ensure that the seal does not leak.

#### Step 4:

Depress and release the poppet each time before submerging the unit into water.



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## **Section 7**

### **1611AV Series & 61VSA Series Vapor Adaptors**



## **OPW Installation and Maintenance Instructions**

### **1611AV Series Vapor Recovery Adaptor Installation Instructions**

**IMPORTANT:** Please read these warnings and use the assembly instructions completely and carefully before starting. Failure to do so may cause product failure, or result in environmental contamination due to liquid leakage into the soil, creating hazardous spill conditions.

**IMPORTANT:** Check to make sure the unit is intact and undamaged and all parts have been supplied. Never substitute parts for those supplied. Doing so may cause product failure.

**WARNING-DANGER:** Using electrically operated equipment near gasoline or gasoline vapors may result in a fire or explosion, causing personal injury and property damage. Be sure that the working area is free from such hazards, and always use proper precautions.

**NOTE:** At all times when product is in the storage tank keep the riser pipe capped, so the vapors cannot escape into the environment.

**NOTICE:** OPW products must be used in compliance with applicable federal, state, and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and material to be handled. All illustrations and specifications in this literature are based on the latest production information available at the time of publication. Prices, materials, and specification are subject to change at any time, and models may be discontinued at any time, in either case, without notice or obligation.

#### **Preventative Maintenance:**

Annually, inspect the adaptor for large dents, cracks or deformation. Replace if necessary.

#### **Step 1**

Check the vapor poppet for damage and ensure that the poppet seats evenly with the adaptor.

#### **Step 2**

Clean out any foreign objects from the vapor poppet's seal and seal surface if necessary.

#### **Step 3**

Test the poppet seal by applying a soap solution to the poppet while the storage tank is under a positive gauge pressure of at least 2.00 inches W.C and inspect for the presence of bubbles.

If the facility continuously operates under vacuum, a bag test may be used by sealing a clear plastic bag to the adaptor's sides.

If no bubbles appear at the poppet under positive pressure or the bag test shows no signs of the bag collapsing, no further maintenance is required.

If bubbles appeared around the poppet seal or the bag collapsed, replace the poppet components and re-test.

#### **Torque Specification:**

Adaptor, 4" NPSM, 90 ft-lbs minimum to 110 ft-lbs maximum.

#### **Replacement Parts:**

Complete Poppet Replacement, P/N: 61VSA-KIT  
Gasket, P/N: H04145M (3" Riser)  
H04150M (4" Riser)



### **1611AV Series Vapor Recovery Adaptor Installation Instructions**

1. The riser nipple must be cut square and deburred.
2. Apply pipe dope to the nipple. Pipe dope is to be non-hardening, gasoline-resistant pipe-thread seal compound.
3. Tighten the Adaptor onto the nipple with a torque of 90 ft-lbs min. to 110 ft-lbs max. This will be enough torque to seat and seal the gasket.

Executive Order VR-401-C



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## ***OPW Installation and Maintenance Instructions***

### **OPW 61VSA EVR Poppetted Rotatable Vapor Recovery Adaptor**

**IMPORTANT:** Please read these warnings and use the assembly instructions completely and carefully before starting. Failure to do so may cause product failure, or result in environmental contamination due to liquid leakage into the soil, creating hazardous spill conditions.

**IMPORTANT:** Check to make sure the unit is intact and undamaged and all parts have been supplied. Never substitute parts for those supplied. Doing so may cause product failure.

**WARNING-DANGER:** Using electrically operated equipment near gasoline or gasoline vapors may result in a fire or explosion, causing personal injury and property damage. Be sure that the working area is free from such hazards, and always use proper precautions.

**NOTE:** At all times when product is in the storage tank keep the riser pipe capped, so the vapors cannot escape into the environment.

**NOTICE:** OPW products must be used in compliance with applicable federal, state, and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and material to be handled. All illustrations and specifications in this literature are based on the latest production information available at the time of publication. Prices, materials, and specification are subject to change at any time, and models may be discontinued at any time, in either case, without notice or obligation.

#### **61VSA Performance Specifications:**

This Rotatable Adaptor has been manufactured and tested to the following California specifications: Rotatable 360°, Static torque of 108 inch-lbs.

#### **Preventative Maintenance:**

Annually, inspect the adaptor for large dents, cracks or deformation. Replace if necessary. (The rotation mechanism is not field serviceable.)

#### **Step 1:**

Check the vapor poppet for damage and ensure that the poppet seats evenly with the adaptor.

#### **Step 2:**

Clean out any foreign objects from the vapor poppet's seal and seal surface if necessary.

#### **Step 3:**

Test the poppet seal by applying a soap solution to the poppet while the aboveground storage tank is under a positive gauge pressure of at least 2.00 inches W.C and inspect for the presence of bubbles.

If the facility continuously operates under vacuum, a bag test may be used by sealing a clear plastic bag to the adaptor's sides.

If no bubbles appear at the poppet under positive pressure or the bag test shows no signs of the bag collapsing, no further maintenance is required.

If bubbles appeared around the poppet seal or the bag collapsed, replace the poppet components and re-test.

#### Replacement Parts:

Nipple-Sealing Gasket: → OPW P/N: H09039M

Vapor Poppet Kit: → OPW P/N: 61VSA-Kit

#### Torque Specification:

Adaptor, 4" NPSM, 90 ft-lbs minimum to 110 ft-lbs maximum.

#### Installation Instructions:

##### Step 1

The riser nipple in the spill container must be cut square and deburred. If installing in a direct or remote fill spill container be sure to leave room for the lid to completely close when the vapor cap is installed.

(Optional: Use an OPW FSA-400 Face Seal Adaptor with nipple to insure an adequate sealing face. If installing in a direct or remote fill spill container be sure to leave room for the lid to completely close when the vapor cap is installed).

##### Step 2

Apply pipe dope to the nipple. Pipe dope is to be non-hardening, gasoline-resistant pipe-thread seal compound.

##### Step 3

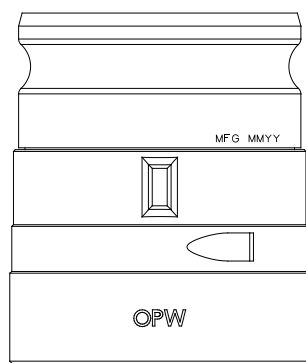
Tighten the Rotatable Adaptor onto the nipple with a torque of 90 ft-lbs min. to 110 ft-lbs max. This will be enough torque to seat and seal the gasket. Use a 61SA-TOOL to install rotatable adaptor.

#### Static Torque Test:

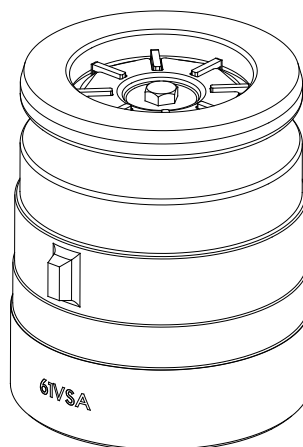
Using OPW 200459 Swivel Adaptor Torque Tool and OPW 1711T Vapor Cap, annually verify the static torque of the swivel adaptor by performing California ARB test procedure TP-201.1B.

**Patent # 5,664,951**

**IMPORTANT:** Leave these Installation Instructions with the Station Operation.



Manufacture: "OPW"  
Date Manufactured: "MFG MMY"  
MM= Month, YY=Year



Product ID: "61VSA"



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## **Section 8**

### **1711T & 1711LPC Vapor Recovery Cap**



# **OPW Installation and Maintenance Instructions**

## **1711T-7085-EVR Vapor Recovery Cap Instructions**

**IMPORTANT:** Please read these warnings and use the assembly instructions completely and carefully before starting. Failure to do so may cause product failure, or result in environmental contamination due to liquid leakage into the soil, creating hazardous spill conditions.

**IMPORTANT:** Check to make sure the unit is intact and undamaged and all parts have been supplied. Never substitute parts for those supplied. Doing so may cause product failure.

**WARNING-DANGER:** Using electrically operated equipment near gasoline or gasoline vapors may result in a fire or explosion, causing personal injury and property damage. Be sure that the working area is free from such hazards, and always use proper precautions.

**NOTE:** At all times when product is in the storage tank keep the riser pipe capped, so the vapors cannot escape into the environment.

**Notice:** OPW products must be used in compliance with applicable federal, state, and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and material to be handled. All illustrations and specifications in this literature are based on the latest production information available at the time of publication. Prices, materials, and specification are subject to change at any time, and models may be discontinued at any time, in either case, without notice or obligation.

### **Preventative Maintenance:**

Annually inspect the cap and gasket for cracks or deformation. Replace if necessary.

### **Replacement Parts:**

Nitrile Gasket, P/N: H10886M

### **1711T Vapor Recovery Cap Function Testing**

#### **Pressure Leak Testing**

Cap should hold 3.5 PSI for 30 seconds. If the cap does not hold this pressure, replace the gasket and re-test.

#### **Lock Test**

Clamp cap onto adaptor and insert 5/16" diameter pin into lock hasp. Cap should not disengage from adaptor.



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## **OPW Installation and Maintenance Instructions**

### **1711LPC-0300 Low Profile Cap Vapor Cap Instructions**

**IMPORTANT:** Please read these warnings and use the assembly instructions completely and carefully before starting. Failure to do so may cause product failure, or result in environmental contamination due to liquid leakage into the soil, creating hazardous spill conditions.

**IMPORTANT:** Check to make sure the unit is intact and undamaged and all parts have been supplied. Never substitute parts for those supplied. Doing so may cause product failure.

**WARNING-DANGER:** Using electrically operated equipment near gasoline or gasoline vapors may result in a fire or explosion, causing personal injury and property damage. Be sure that the working area is free from such hazards, and always use proper precautions.

**NOTE:** At all times when product is in the storage tank keep the riser pipe capped, so the vapors cannot escape into the environment.

**Notice:** OPW products must be used in compliance with applicable federal, state, and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and material to be handled. All illustrations and specifications in this literature are based on the latest production information available at the time of publication. Prices, materials, and specification are subject to change at any time, and models may be discontinued at any time, in either case, without notice or obligation.

#### **Preventative Maintenance:**

Annually inspect the cap and gasket for cracks or deformation. Replace if necessary.

#### **Replacement Parts:**

Nitrile Gasket, P/N: H15005M

#### **1711LPC-0300 Low Profile Vapor Cap**

#### **Pressure Leak Testing**

Cap should hold 3.5 PSI for 30 seconds. If the cap does not hold this pressure, replace the gasket and re-test.

#### **Lock Test**

Clamp cap onto adaptor and insert 5/16" diameter pin into lock hasp. Cap should not disengage from adaptor.



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## **Section 9**

### **301 Series Emergency Vents**



## ***OPW Installation and Maintenance Instructions***

### **OPW 301 Series Above Ground Storage Tank Emergency Vent**

**IMPORTANT:** Please read these warnings and use the assembly instructions completely and carefully before starting. Failure to do so may cause product failure, or result in environmental contamination due to liquid leakage into the soil, creating hazardous spill conditions.

**IMPORTANT:** The OPW 301 Series Emergency Vent is pre-assembled for your convenience and ease of installation. Check to make sure the unit is intact and undamaged and all parts have been supplied. Never substitute parts for those supplied. Doing so may cause product failure.

**WARNING-DANGER:** Using electrically operated equipment near gasoline or gasoline vapors may result in a fire or explosion, causing personal injury and property damage. Be sure that the working area is free from such hazards, and always use proper precautions.

**NOTE:** At all times when product is in the storage tank keep the riser pipe capped, so the vapors cannot escape into the environment.

**NOTICE:** OPW products must be used in compliance with applicable federal, state, and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and material to be handled. All illustrations and specifications in this literature are based on the latest production information available at the time of publication. Prices, materials, and specification are subject to change at any time, and models may be discontinued at any time, in either case, without notice or obligation.

#### **OPW 301 Series Emergency Vent (PATENT PENDING)**

##### **Torque Specifications:**

125 ft-lbs minimum to 250 ft-lbs maximum

##### **Tools Recommended:**

Pipe Wrench or Strap Wrench

For flange models, OPW recommends the use of flange gaskets that are certified to meet the listed specifications: MIL-G-12803A/B/C, ASTM F 104 or ASTM D2000.

##### **Bolt torque values for ASME B 16.5 Class 150#**

Nom. Pipe Size (inches)	No. of Bolts	Size of Bolts (inches)	Minimum Torque (ft-lbs)	Preferred Torque (ft-lbs)
8	8	0.75	115	200
10	12	0.88	125	320



**OPW 301 SERIES EMERGENCY VENT  
INSTALLATION INSTRUCTIONS****Step 1:**

Apply pipe dope to pipe threads. Pipe dope to be a non-hardening, gasoline resistant pipe thread seal compound.

**Note: Do not use Teflon® tape.**

**Step 2:**

Thread the OPW 301 Series Emergency Vent onto the pipe nipple. Tighten using a pipe wrench or strap wrench.

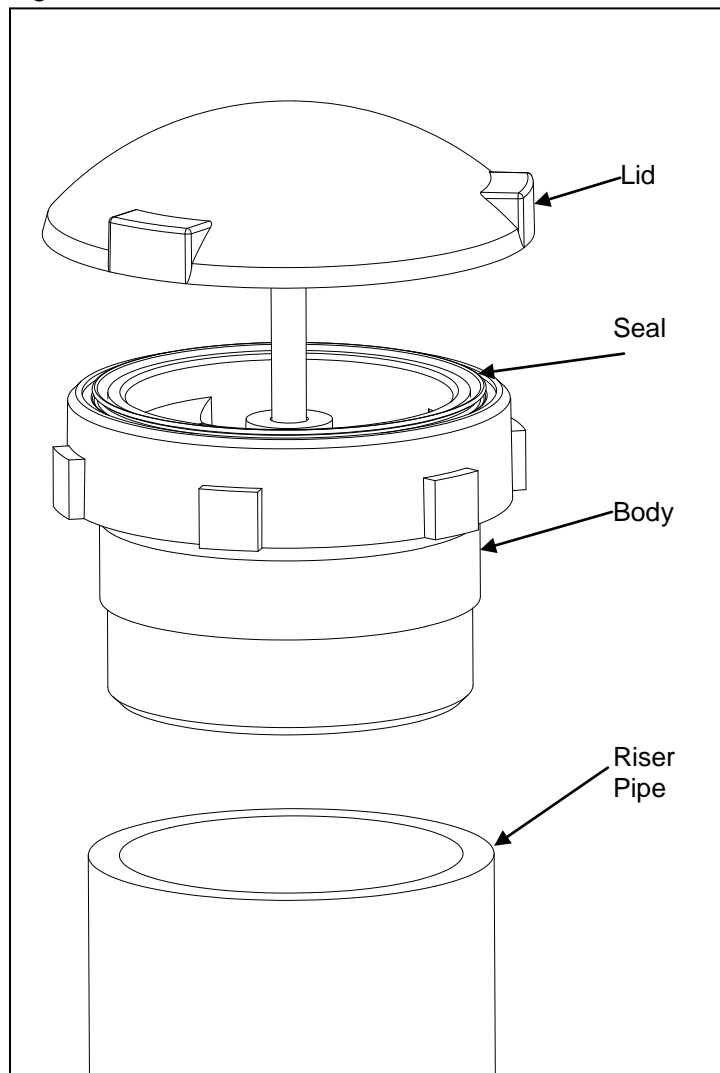
**Step 3:**

Check to be sure the lid raises and lowers once installation has been completed. Make sure the seal is completely seated in the machined groove in the body.

**Operation and Maintenance:**

Periodic maintenance is required for all OPW 301 Emergency Vents.

1. If the vent has been activated, inspect the seal for damage or debris and clean the seal and sealing area.
2. The lid should be raised and lowered once a year to assure no binding or obstruction.
3. Inspect the seal for damage or debris and clean the seal and sealing area.



**Figure 1**



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## **Section 10**

### **62M Monitoring Probe Caps**

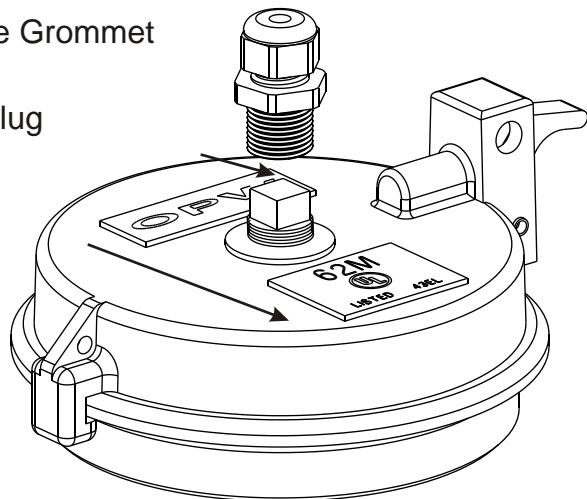


## **OPW Installation and Maintenance Instructions**

### **OPW 62M Monitoring Probe Caps**

Wire Grommet

Plug



#### Product Identification:

Manufacture: "OPW", Model: "62M"

Date Manufactured (Located on underside of cap): "MFG MMY"; MM = Month, YY = Year

**IMPORTANT:** Please read these warnings and use the assembly instructions completely and carefully before starting. Failure to do so may cause product failure, or result in environmental contamination due to liquid leakage into the soil, creating hazardous spill conditions.

at any time, in either case, without notice or obligation.

**IMPORTANT:** Check to make sure the unit is intact and undamaged and all parts have been supplied. Never substitute parts for those supplied. Doing so may cause product failure.

**WARNING-DANGER:** Using electrically operated equipment near gasoline or gasoline vapors may result in a fire or explosion, causing personal injury and property damage. Be sure that the working area is free from such hazards, and always use proper precautions.

**NOTE:** At all times when product is in the storage tank keep the riser pipe capped, so the vapors cannot escape into the environment.

**NOTICE:** OPW products must be used in compliance with applicable federal, state, and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and material to be handled. All illustrations and specifications in this literature are based on the latest production information available at the time of publication. Prices, materials, and specification are subject to change at any time, and models may be discontinued

**Installation and Maintenance:**

1. Install the 62M Monitoring Cap onto a FSA-400(-S) Face Seal Adapter. (Optional) Apply pipe dope to nipple.
2. Tighten Monitoring Cap onto the FSA-400(-S) adapter with a strap wrench. Torque to be 90 ft-lbs to 110 ft-lbs.
3. Remove plug and install wire grommet if needed. Apply gasoline resistant pipe dope to threads. (Torque values: 3/8 NPT thread; 20 in-lbs to 40 in-lbs. 1/2 NPT thread; 30 in-lbs to 50 in-lbs).

Annually inspect O-ring and Gasket seal for nicks, tears or deformations. If required replace with OPW Part numbers: O-ring: H13806M, Gasket: H09039M.





## **Section 11**

### **1711D/1712D Series Kamvalok® Couplers**



PART #H32116PA  
February 2009

## Kamvalok® Dry Disconnect Couplings

OPW Kamvalok® Dry Disconnect Couplings are considered the standard of the industry. Used at liquid transfer points where product loss could occur, OPW Kamvaloks® provide a reliable solution to prevent spillage during connection or disconnection.

### BENEFITS

#### Spill Protection

Helps to reduce the hazards involved in the connection/disconnection process of transferring hazardous materials.

#### Provides for Total Closed-Loop Loading Capabilities

Keeps hazardous liquids and vapors in-line and out of the environment.

#### Dual Protection

Provides automatic closure from both directions – the coupler and the adaptor.

#### Autelok™ Locking Arms

Provides added protection with an automatic locking mechanism signaled by a positive click. Release requires only an easy tug on the lock release.

#### SST Locking Lever Assembly

Locks in both the opened and closed positions to prevent accidental release or uncoupling.

#### Ease of Use

Simple connection and disconnection design provides for smooth and easy operation.



1700DL  
Dry Disconnect Couplings

### INSTALLATION PREPARATIONS



**WARNING:** Read & understand these instructions before starting installation or dismantling:

- Coupler to be used for its designated purpose only
- Local regulations for (un)loading must be followed at all times
- Product flow may result in static electricity; grounding of equipment is required
- OPW instructions must be followed for installation or dismantling at all times
- Make sure to use adequate personal protection at all times during operation
- Secure whatever device coupler will be mounted to (e.g. loading arm, hose, etc.)
- Thread coupler onto pipe (use proper thread sealant)



### MAINTENANCE



**ATTENTION:** The same risks and procedures of initial installation apply.

#### Consider the following when servicing the coupler:

- When coupler is over pressurized, it must be inspected thoroughly
- After maintenance is performed, it must be tested before the next use (see Testing After Servicing)
- Periodic inspection (every 3 months) for leakages (especially with toxic or hazardous mediums)
- Maintenance must be performed by authorized personnel
- Periodic maintenance (once a year) is required according to the maintenance instructions
- In case of (parts of) couplers being redirected, the initiator must provide information about the mediums, which have been in contact with (parts of) the coupler
- During maintenance, (partial) dismantling could be necessary; the same risks and procedures apply



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## Kamvalok® Dry Disconnects

## KAMVALOK® MAINTENANCE

### DETAILED DISASSEMBLY

(for seal replacement)

**Recommended Tools:** Adaptor body of OPW Kamvalok® Adaptor, Flat Head Screwdriver, 17mm and 1-1/4" Driver and Torque Wrench



**DISMANTLING WARNING:** Verify what kind of medium is loaded with this coupler (read the manuals provided). When the medium is nuclear, hazardous or toxic, one is obligated to clean parts with the help of specialized personnel, companies or governments.

#### Step 1:

- Remove coupler from piping or hose
- Install adaptor and close Autolok™ arms
- Depress release latch and rotate lever only part of the way
- Do not rotate the lever into the fully opened position
- The adaptor is only in place to take the pressure off of the poppet



**WARNING:** With the release latch depressed, the operating lever is unlocked and can rotate. Do not unlock or apply pressure to the lever unless you are trying to open the valve. Use caution when working around the lever when the system is under pressure. Once the lever starts moving, pressure can cause it to rotate violently. Under pressure, poppet will cause lever to rotate violently, if not restrained.

#### Step 2:

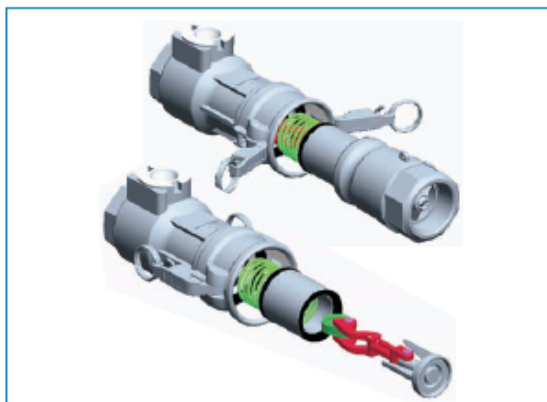
- Remove shaft nut and lock washer from top of lever assembly
- Remove lever assembly from shaft
- Unthread stuffingbox and pull out shaft
- Pull stuffingbox off of shaft and remove the 3 O-rings from it
- Remove spacer from the shaft



**WARNING:** Use caution when performing this next step.

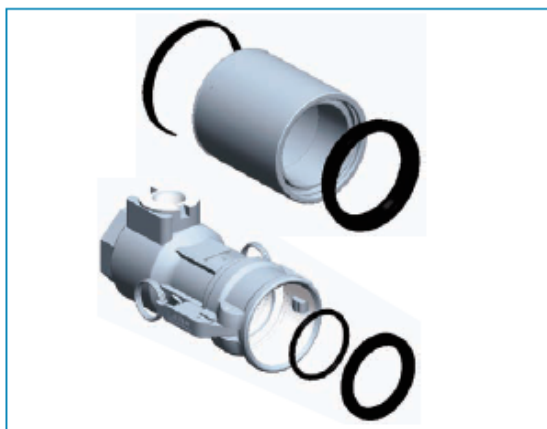
#### Step 3:

- While pressing the adaptor into the body, release the Autolok™ arms
- Slowly allow the adaptor, poppet & seal cylinder assembly to spring out of the body
- Once all spring pressure is relieved, you can remove the adaptor
- Remove the poppet assembly, followed by the seal cylinder and spring



#### Step 4:

- Remove the seals from the seal cylinder
- Remove the seals from inside the coupler body
- Be careful not to scratch the sealing surfaces of the coupler body



#### Disassembly Complete:

- Clean and inspect all sealing surfaces after removing seals
- Install new seals and re-assemble coupler

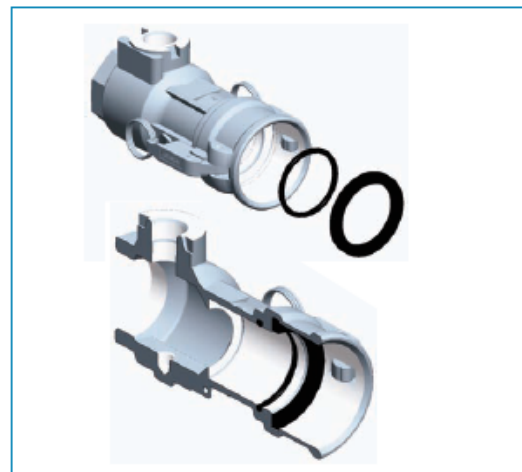
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**Kamvalok® Dry Disconnects****KAMVALOK® MAINTENANCE****DETAILED REBUILD****Step 1:**

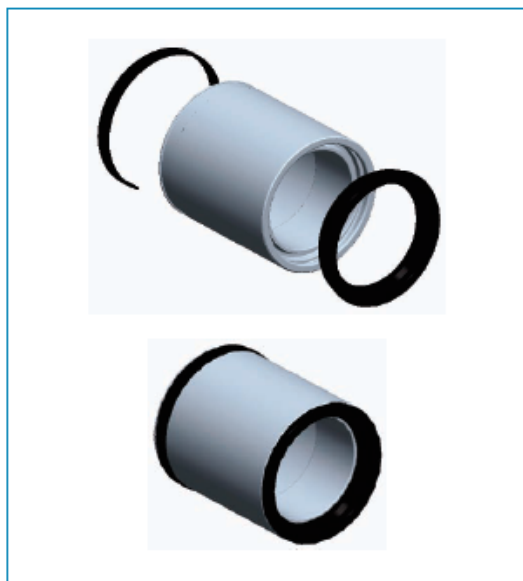
- Lubricate o-rings with proper grease and fit into the grooves in the stuffingbox
- Lubricate stuffingbox threads
- Fit new o-rings into the grooves in the stuffingbox

**Step 3:**

- Fit o-ring and gasket into body
- Gasket should be compressed slightly and allowed to spring into its groove

**Step 2:**

- Carefully fit nose seal into seal cylinder and slightly expand sleeve bearing and fit into lubricated outer groove on seal cylinder
- Run finger over inside mating surface between nose seal and body to check for any uneven seating. If any raised edges exist remove nose seal and re-seat more evenly.

**Step 4:**

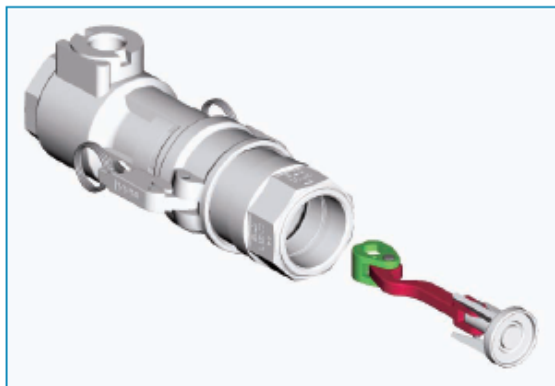
- With coupler body in a vertical position, insert cylinder spring & seal cylinder using the adaptor body to compress the spring and push all components into the body
- Use caution not to disturb the O-ring already installed in the body when working the seal cylinder into the opening
- Open the Autolok arms to allow the adaptor to fully seat in the coupler body
- Once the adaptor is fully seated, lock adaptor into body by closing Autolok handles





**Kamvalok® Dry Disconnects****KAMVALOK® MAINTENANCE****Step 5:**

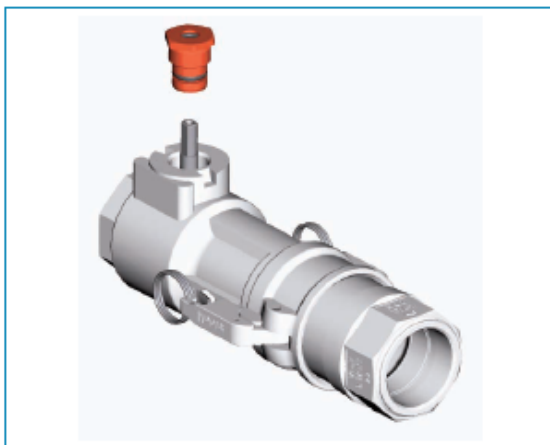
- Insert poppet linkage assembly through adaptor with cast "dots" on linkage components facing up towards stuffingbox area of coupler body

**Step 6:**

- Insert spacer through threaded end of the coupler
- Insert shaft through stuffingbox hole in coupler body
- Insert shaft through shaft link, aligning flats on shaft with flats on shaft link
- Insert shaft through spacer and into hole in bottom of coupler body
- When installed, the shaft and poppet linkage assembly should be oriented as shown

**Step 7:**

- Turn the shaft 90 degrees from the closed position to relieve the spring pressure on the linkage
- Install stuffingbox over shaft and thread down with a wrench until it is tight
- Using a torque wrench, tighten the stuffingbox to 960 inch-pounds (108 Newton-meter)
- Remove the adaptor from the coupler

**Step 8:**

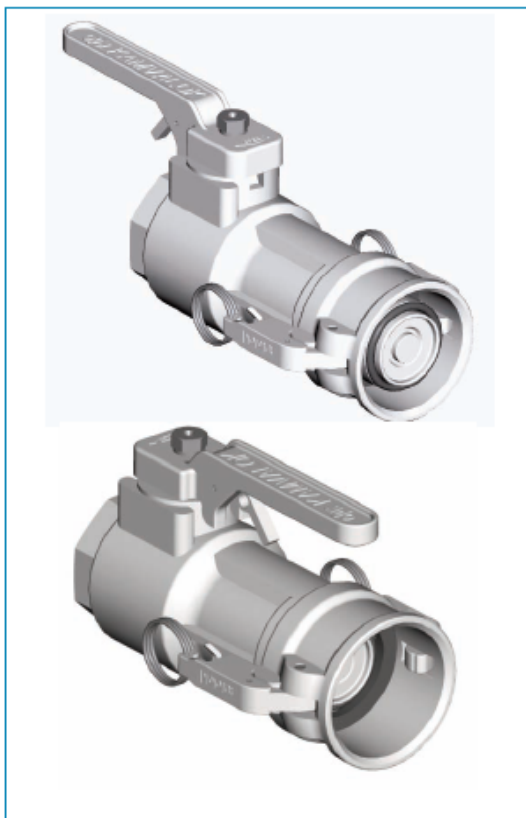
- With the poppet in the outward position, install the handle as shown
- Secure the lever by threading the shaft nut with lock washer on the shaft
- Tighten the shaft nut to a torque of 290 inch-pounds (33 Newton-meter)



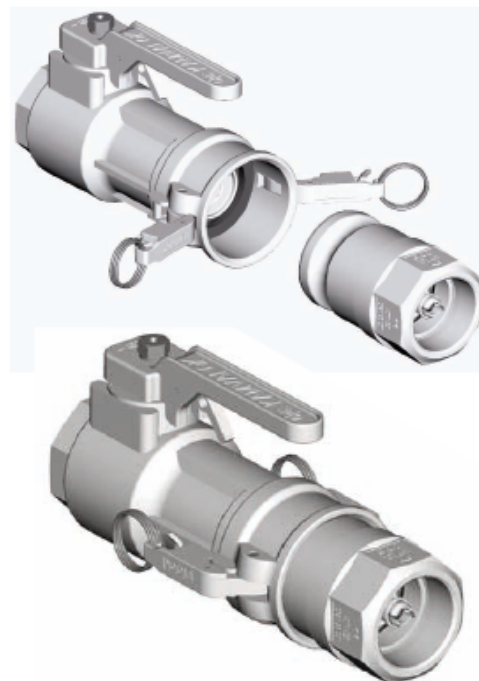
**IMPORTANT:** OPW products should be used in compliance with applicable federal, state, provincial, and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and materials to be handled. OPW MAKES NO WARRANTY OF FITNESS FOR A PARTICULAR USE. All illustrations and specifications in this literature are based on the latest product information available at the time of publication. OPW reserves the right to make changes at any time in prices, materials, specifications and models and to discontinue models without notice or obligation.

**Kamvalok® Dry Disconnects****KAMVALOK® MAINTENANCE****Step 9:**

- Rotate the lever assembly into the closed position
- Assembly complete. Re-attach coupler to piping or hose.

**Testing After Servicing:**

- When servicing has occurred and parts have been replaced, it is necessary to test the coupler for a safe and secure use.
- Open Autolok™ handles, and bring coupler and adaptor together. Once fully seated, close the Autolok™ handles.

**WARNING**

Failure to follow these warnings could result in serious personal injury, property damage or product failure.

- 1) Do not attempt any maintenance service while the equipment is in operation. System pressure must be relieved and the product drained before attempting any service on the unit. The line must be locked out while service is in progress. Proper thermal relief must be provided at all times while equipment is in service.
- 2) OPW products do not eliminate possible exposure to hazardous substances. The conditions of handling and use are beyond our control, and we make no guarantee and assume no liability for damages or injuries related to the use of our products. Follow the safety precautions outlined in the Material Safety Data Sheets for the material being used. It is the responsibility of the user to comply with all federal, state and local regulations. Always employ proper safety precautions and handling techniques.
- 3) Proper seal and wetted material part selection is critical for safe operation. To assure maximum life for the service intended, use only those materials compatible with the fluids being handled. Please note material being supplied and make certain that it is suited for the intended service.



## **Section 12**

### **200TG Series Tank Gauge**



# **OPW Installation and Maintenance Instructions**

## **OPW 200TG Mechanical AST Liquid Level Gauge**

**IMPORTANT:** Please read these warnings and use the assembly instructions completely and carefully before starting. Failure to do so may cause product failure, or result in environmental contamination due to liquid leakage into the soil, creating hazardous spill conditions.

**IMPORTANT:** The OPW 200TG Tank Gauges are pre-assembled for your convenience and ease of use. Check to make sure the unit is intact and undamaged and all parts have been supplied. Never substitute parts for those supplied. Doing so may cause product failure.

**WARNING-DANGER:** Using electrically operated equipment near gasoline or gasoline vapors may result in a fire or explosion, causing personal injury and property damage. Be sure that the working area is free from such hazards, and always use proper precautions.

**NOTE:** At all times when product is in the storage tank keep the riser pipe capped, so the vapors cannot escape into the environment.

**NOTICE:** OPW products must be used in compliance with applicable federal, state, and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and material to be handled. All illustrations and specifications in this literature are based on the latest production information available at the time of publication. Prices, materials, and specification are subject to change at any time, and models may be discontinued at any time, in either case, without notice or obligation.

### **200TG Specifications:**

**Accuracy:**  $\pm 2$  inches

**Specific Gravity of Fluid:** 0.65 to 1.025.

**Temperature Range:** -40°F to 120°F (-40°C to 59°C)

#### **Materials:**

Enclosure/Base – Powder-Coated Aluminum,  
Float – Stainless Steel,  
Lens – Tempered Borosilicate,  
Gears – Acetal,  
Gaskets/O-rings – Nitrile,  
Hardware – Stainless Steel

### **Torque Specifications:**

**Swivel Base:** 80 ft-lbs maximum. (As a general rule, hand-tighten plus 1½ turns is adequate.)

**Cover Bolts:** 15-20 ft-lbs.

**Lens Screws:** Tighten evenly; be careful not to over-tighten.

### **Replacement Parts:**

**Lid Gasket:** P/N H14909M

**Lens:** P/N H14358M

**Float:** P/N C05165M

**Cover Bolt** P/N: H14911M

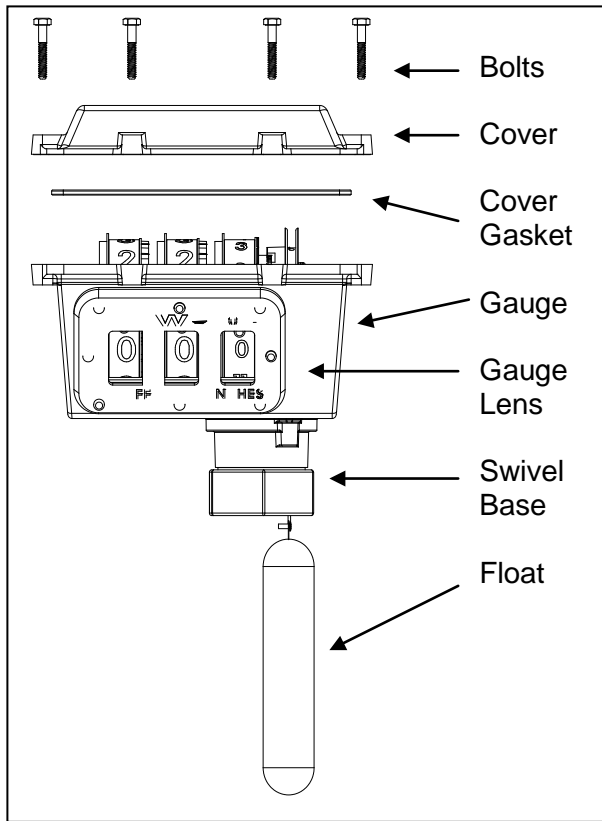


Figure 1

### 200TG Installation Instructions

#### Step 1

For maximum accuracy, calibration should be undertaken when the tank is half full. Using a dipstick, measure and record tank fluid level in feet and inches. If tank is empty, record level as 3.75 inches.

#### Step 2

Remove tank gauge from packaging. Be sure to keep the cable taut before installation.

#### Step 3

If installing a drop tube, drill a 5/16" vent hole within 6 inches from the top of the drop tube.

**NOTE:** Drop tubes are highly recommended for use in tanks that have any components near the tank gauge operating space in which the float and cable could become entangled, or in any tanks in which there is a high amount of turbulence. OPW offers a line of 61T Drop Tubes specifically for the 200TG.

#### Step 4

Apply pipe dope to threads on swivel base to ensure a tight seal. Pipe dope is to be a non-hardening, gasoline resistant pipe thread sealant compound.

#### Step 5

Thread swivel base onto desired tank opening and tighten to 80 ft-lbs.

#### Step 6

Rotate tank gauge to desired orientation for best visibility.

#### Step 7

Remove the eight (8) bolts from the top of the gauge. Place them, the cover and the lid gasket in a safe place. Be careful not to damage the lid gasket.

#### Step 8

While supporting the float, remove the cardboard insert that is holding the drive gear in place. (See Figure 2.)

**WARNING:** When this cardboard piece is removed the spool is no longer secured. It is necessary to hold the float to prevent the spool from tangling. This insert must be removed for operation of the gauge.

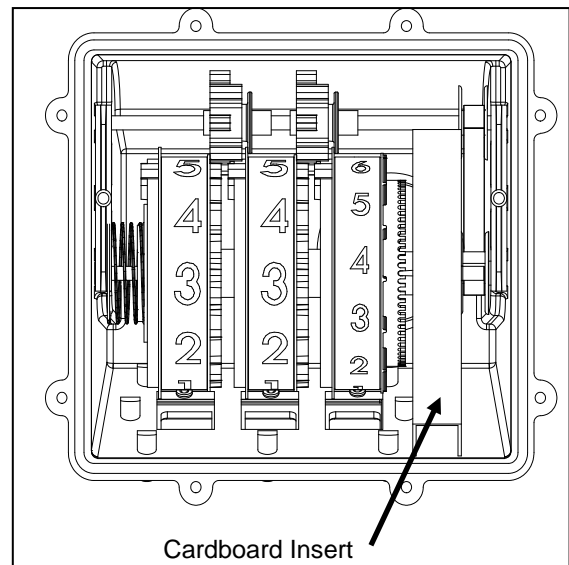


Figure 2

#### Step 9

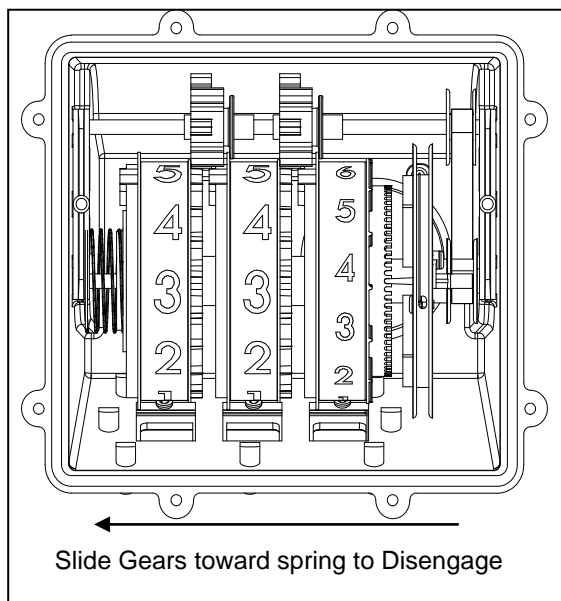
Slowly lower the float into the desired tank opening. Remember to keep the cable taut at all times.

#### Step 10

From the inside of the tank-gauge housing, disengage the gears by sliding them toward the spring at one end of the housing to allow for calibration of gears. While the gears are disengaged, start by rotating the inch gear to the match the inch value found in **Step 1**. Slide this gear away from the spring to re-engage. Repeat for two remaining gears. Be sure to view the gauge

from the vantage point it will be viewed from in day-

to-day operations to properly calibrate the gears.  
(See Figure 3.)



**Figure 3**

#### **Step 11**

Place the lid gasket back into the groove, being careful not to damage it and keep it clean from debris. No sealant is necessary for this gasket. Add the cover and secure it tightly with the eight (8) bolts, using a crossing pattern, torque the bolts to 15-20 ft-lbs.

#### **Annual Maintenance:**

Using a dip stick, measure the liquid level of the tank and check this value with the value displayed on the tank gauge. The values should be within  $\pm 2$  inches of each other. Recalibrate if necessary. Remove cover and visually inspect the internal parts for signs of wear, tangles in the spool, and corrosion. Replace parts if necessary.



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## **Section 13**

### **144TA/444TA Series Tank Alarm**



## **Installation and Maintenance Instructions**

### **144TA/444TA Series Audible Tank Alarms**

**IMPORTANT:** Please read these warnings and use the assembly instructions completely and carefully before starting. Failure to do so may cause product failure, or result in environmental contamination due to liquid leakage into the soil, creating hazardous spill conditions.

**IMPORTANT:** Check to make sure the unit is intact and undamaged and all parts have been supplied. Never substitute parts for those supplied. Doing so may cause product failure.

**WARNING-DANGER:** Using electrically operated equipment near gasoline or gasoline vapors may result in a fire or explosion, causing personal injury and property damage. Be sure that the working area is free from such hazards, and always use proper precautions.

**NOTICE:** OPW products must be used in compliance with applicable federal, state, and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and material to be handled. All illustrations and specifications in this literature are based on the latest production information available at the time of publication. Prices, materials, and specification are subject to change at any time, and models may be discontinued at any time, in either case, without notice or obligation.

#### **Preventative Maintenance:**

Test system prior to each fill-up.

Replace battery module if Low Battery Indicator is on. Use only the appropriate OPW P/N listed in replacement parts.

If wiring is damaged, replace as necessary following NEC, NFPA and any other applicable local, state and federal requirements.

#### **Alarm Technical Information:**

Hazardous Location Approval: Class I, Groups C & D

Maximum Voltage: 7.2 Volts

Maximum Current: 8 ma.per input (32 ma. total)

Maximum Internal Capacitance: 23 uF

Maximum Internal Inductance: 33 mH

Maximum Ambient Temperature Rating: 60° C

Maximum Surface Temperature Classification:

T4 Surface Code

Wiring limitations: 1,000-foot maximum (of OPW

Twisted-Pair Wire: P/N 12-1029) between the

144TA/444TA unit and any remote switch for each

channel of the alarm. This assumes that

maximum capacitance for any input is 60

nanoFarads and that the maximum inductance is

0.2 milliHenry per input (UL-913 A7.3)

**NOTE:** This device is designed to work independently and should not be wired in parallel with another device, except as defined in the following Instructions.

#### **Requirements for devices wired to the 144TA/444TA:**

- Attached wiring and devices must be classed Intrinsically Safe
- No voltage or current source
- Maximum capacitance: 60 nanoFarads (.06 uF) per input
- Maximum inductance: 200 microHenrys (.2 mH) per input



**Float Switch Technical Information:**

Minimum liquid specific gravity: 0.45.

Stem material: Stainless Steel.

Float Material: Closed Cell Buna-N (UL-Approved) for gasoline services.

Max Pressure: 150 psi @ 70°F.

Thread: 1/8" NPT.

**Replacement Parts:**

Float Switch ASSY P/N: 44TA-LLFS

- Wire Fitting P/N: H15412M
- Float Switch P/N: H15411M
- SST Tube P/N: C05295M

Items to Convert to a Low Level Alarm:

- 1/8" SST Nipple P/N: 202430
- SST Tube P/N: C05295M

Battery Module P/N:

- 444TA-0100: H15937M
- 144TA-0100

**NOTE:** When replacing the battery for the 144TA-0100, open the alarm box and locate the OPW number on the black battery module. If the number reads "C05346" then use the replacement part H15615M. If the number reads "144TA-0100" then use the replacement part 202891.

**DOCUMENT CONTROL NUMBERS:**

**200216 → 144TA**

**200056 → 444TA**

<b>Important:</b> Leave these Installation Instructions with the Station Operator.
--

## INSTALLATION INSTRUCTIONS – 144TA/444TA Tank Alarm



CONFORMS TO ANSI / UL 913

CERTIFIED TO CAN / CSA STD C22.2 No. 157-92

CONTROL NUMBER – 3069072

**NOTE:** As defined in article 501 – Class 1 Locations of the National Electric Code, this apparatus and its interconnect wiring are intrinsically safe. Under normal conditions this apparatus and its wiring cannot release sufficient energy to ignite a specific ignitable atmospheric mixture by opening, shorting or grounding.

**WARNING:** Interconnect wiring between the switch and the alarm unit must be kept totally isolated and separate from any other wiring. This wiring must not share any junction box, conduit, raceway, or fixtures with circuits other than those defined by NEC as being intrinsically safe for all Class 1 locations.

**LOCATION:** NEC ARTICLE 501-3-CLASS 1 Locations exempt intrinsically safe enclosures in paragraph 501-3(b)(1)(c), and therefore may be placed in the most convenient location but must be within reach to the operator and within audible range.

**MOUNTING:** Since a general purpose NEMA 4X enclosure is used to protect the alarm circuits and batteries, any mounting holes, conduit or fasteners must be sealed in order to maintain the weatherproof integrity of the enclosure. All penetrations into enclosure must be made at the bottom of alarm unit.

### Instructions for Remote Fill Installation

#### Step 1 – Sensor Installation

If using OPW 44TA-LLFS Float Switch Sensor, skip to Step 2. If using other 3<sup>rd</sup>-party approved intrinsically safe sensors, install them according to their manufacturers' installation instructions and per NEC and NFPA, then move to step 11.

#### Step 2 – Minimum Ullage Size

Determine type and size of tank. Follow the below calculations for Horizontal or Vertical tanks; or use provided Tank Charts to determine required ullage (I). (See Tank Charts on page 53) Record answers as (I) on the Float Tube Worksheet.

#### Horizontal Tank Calculations

For 90% Product Height:  
Multiply the tank diameter (inches) x 0.8435

**Example** for 27 (inch) Diameter Tank: Product Level @ 90% = 27 (inches) x 0.8435 = 22.78 (inches)

For 95% Product Height:  
Multiply the tank diameter (inches) x 0.903

**Example** for 27 (inch) Diameter Tank: Product Level @ 95% = 27 (inches) x 0.903 = 24.38 (inches)  
**NOTE:** Round the answer down to the nearest 1/8 (inch) increment.

#### Vertical Tank Calculations

For 90% Product Height  
Multiply the tank height (inches) x 0.9

For 95% Product Height:  
Multiply the tank height (inches) x 0.95

**Example** for 8 (feet) tall vertical tanks: Product Level @ 95% = 96 (inches) x 0.95 = 91.2 (inches)

**NOTE:** Round the answer down to the nearest 1/8 (inch) increment.

#### Step 3 – (See Figure 1.)

Measure from the top of the tank inlet to the inside of the top of the tank and record this as value (A).

Thread adaptor into tank inlet, hand tighten, then measure exposed/unexposed threads (B) that are above/below tank surface.

Record A + B as (II).  
Remove adaptor from tank inlet.

**NOTE:** If you are mounting on a riser pipe (B), add riser height to exposed thread (II).

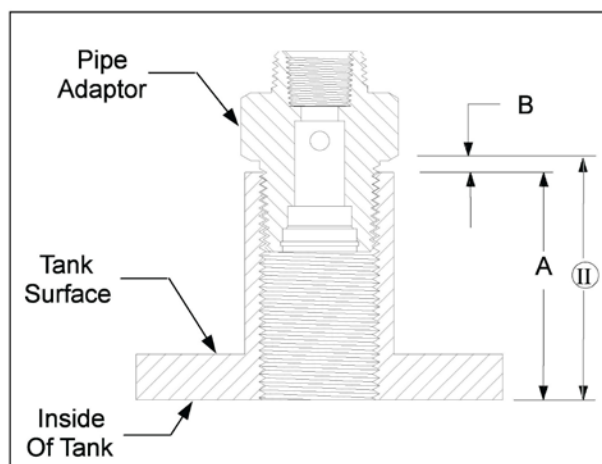


Figure 1

**Step 4 – (See Figure 2.)**

Thread float switch assembly into float drop tube, hand tighten, and measure exposed thread.

Record this value as C.

Add 1.19 inches to C and record this value as (III).

**Step 5**

Use the following equation to determine required float drop tube length:

**For High Level:**

Required Length = Tank Diameter – I + II - III + 1.5 inches (See Float Tube Worksheet)

**For Low Level:**

Required Length = I + II – III + 1.5 inches  
(See Float Tube Worksheet)

For larger tanks it may be necessary to use multiple pieces of the 36" SST Tubing (Part Number C05295M) threaded together with 1/8" SST Nipples (Part Number 202430) to obtain the length required. See Figure 3. Once the necessary length has been determined, thread together the tubing and then cut the tubing assembly to the required length and deburr.

**WARNING: Chamfer and Deburr the end of the pipe before proceeding. Failure to do so may result in cut O-rings.**

**NOTE:** Both ends of tube are threaded. Either end may be cut.

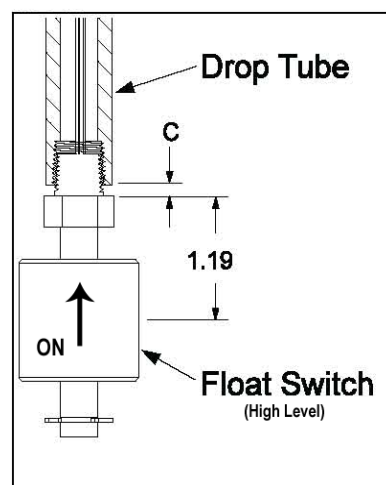


Figure 2

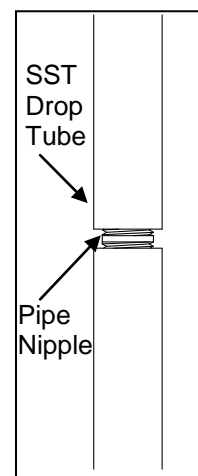


Figure 3

<b>FLOAT TUBE WORKSHEET</b>									
TANK TYPE									
Horizontal / Vertical Tanks - See Step 2									
Horizontal May Also Use Tank Chart									
Riser Pipe Height		(A)	(C)	Switch Thread Reveal					
Adaptor Thread Reveal		(B)	+ 1.19 (D)	Fluid Level					
<b>High Level</b>									
Float Drop Tube Length =	Tank Diameter or Tank Height	(I)	-	Minimum Ullage	(II)	-	(III)	+ 1.5	Inches
<b>Low Level</b>									
Float Drop Tube Length =	Minimum Ullage	(I)	+	(II)	-	(III)	+ 1.5	Inches	

**Step 6**

**NOTE:** Apply proper thread sealant (i.e. Teflon® tape) to float switch threads before tightening. Attach float switch to float drop tube by running the two (2) switch wires through the tube and tightening the switch into the tube threads.

**Step 7 – (See Figure 4.)**

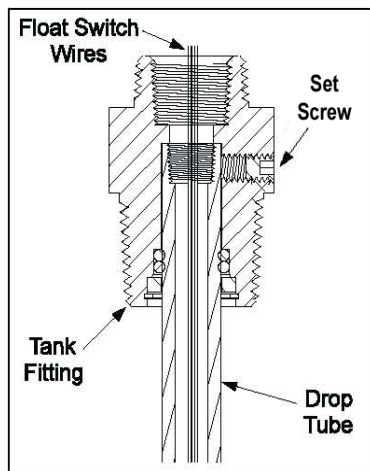
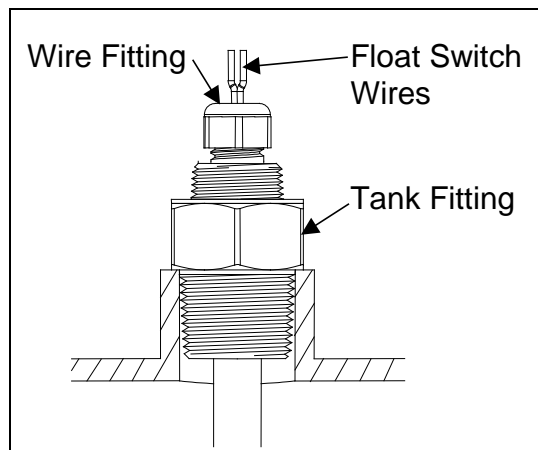
**Lubricate the outside of the cut end of the drop tube.**

Run wires through bottom of tank adaptor and firmly insert float drop tube into the tank fitting. Secure the drop tube firmly with the supplied set screw.

**Step 8 – (See Figure 5.)**

Run the two (2) switch wires through the wire fitting, and fasten fitting securely into tank fitting. Make sure to apply proper thread sealant (i.e. Teflon® tape) to the wire fitting before tightening.

**WARNING: DO NOT over-tighten plastic wire fitting. Over-tightening may cause stripping of threads.**

**Figure 4****Figure 5****Step 9**

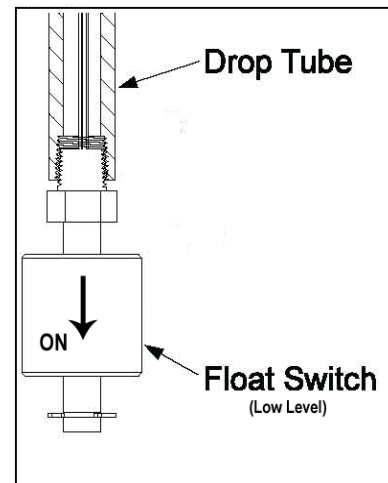
Apply proper thread sealant (i.e. Teflon® tape) to tank fitting and thread into tank opening.

**Step 10 (444TA ONLY)**

Repeat **Steps 2-9** up to three times to utilize all four available switches if applicable.

**Instructions to Convert to Low Level:****Step 1**

Remove the retaining ring and reverse the float switch. An arrow points in the alarm **ON** direction. (See Figure 6.)

**Figure 6****Step 2**

Reattach the retaining ring and complete assembly.

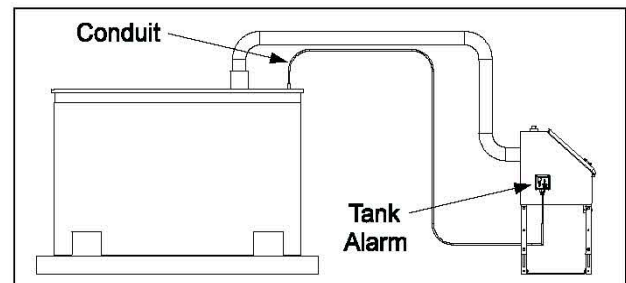
**Box Mounting Instructions:****Step 1**

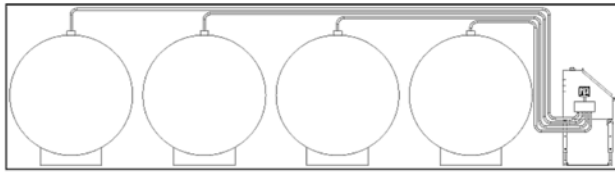
Mount enclosure back to remote fill spill container or other desired location using the blind holes in the enclosure.

**NOTE:** Make sure to use screws that do not puncture the blind holes in the enclosure to keep the enclosure's weather resistant integrity.

**Step 2 – (See Figure 7.)**

Run wiring to remote alarm location (per NFPA 30A Automotive and Marine Service Station Code for Electrical Equipment – Chapter 7).

**Figure 7-144TA Installation**



**Figure 8-444TA Installation**

**NOTE:** Junction box(es) and conduit (not supplied) are required for running to a remote fill. Installation needs to follow Article 501 Class I locations in the NEC code.

**Step 3**

Insert electrical conduit from junction box through one of the two holes in the bottom of the enclosure only.

**Step 4**

Trim wires to approx. 10-12 inches long. Use wire strippers to strip back approx. ¼" of thread insulation.

Secure the wires to two (2) inputs on one of the four terminal blocks available and note which block goes to which sensor.

**NOTE:** Wire orientation in terminal block is not important.

**Step 5**

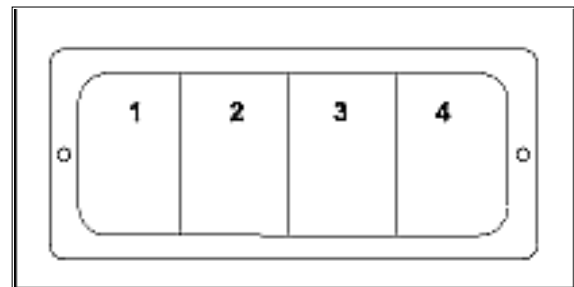
Fasten lid assembly to rear enclosure using the four (4) provided plastic screws.

**Step 6**

Test alarm following the "Instructions for Testing Tank Alarm".

**Step 7 –See Figure 9**

For the 444TA, use a Sharpie or equivalent style marker to write which alarm goes to which tank or operation on the upper label shown in Figure 9. When finished, apply the clear cover to the label. (See Figure 9.)



**Figure 9**

**Instructions for Testing Tank Alarm**

**Step 1**

Push switch down. An audio signal should be heard and a red flashing LED should be visible. Release switch.

**Step 2**

Lift float up and down, allowing system to sound alert, and repeat several times.

**Step 3**

Repeat steps 1 and 2 for each float switch that is attached to alarm. Test each alarm separately.

**Low Battery Indicator**

A yellow LED will be displayed when battery power is low and the test switch is activated. Replace battery module as necessary, using only the replacement battery module supplied by OPW. (See Replacement Parts on page 47.)

## HORIZONTAL TANK CALCULATIONS

HORIZONTAL TANK DIAMETER (in.)	PRODUCT LEVEL AT:		HORIZONTAL TANK DIAMETER (in.)	PRODUCT LEVEL AT:	
	90% (in)	95% (in)		90% (in)	95% (in)
30	25.3	27.1	126	106.3	113.8
34	28.7	30.7	130	109.7	117.4
38	32.1	34.3	134	113	121
42	35.4	37.9	138	116.4	124.6
46	38.8	41.5	142	119.8	128.2
50	42.2	45.2	146	123.2	131.8
54	45.6	48.8	150	126.5	135.5
58	48.9	52.4	154	129.9	139.1
62	52.3	56	158	133.3	142.7
66	55.7	59.6	162	136.7	146.3
70	59	63.2	166	140.1	149.9
74	62.4	66.8	170	143.5	153.5
78	65.8	70.4	174	146.9	157.1
82	69.2	74	178	150.3	160.7
86	72.5	77.7	182	153.7	164.3
90	75.9	81.3	186	157.1	167.9
94	79.3	84.9	190	160.5	171.5
98	82.7	88.5	194	163.9	175.1
102	86	92.1	198	167.3	178.7
106	89.4	95.7	202	170.7	182.3
110	92.8	99.3	206	174.1	185.9
114	96.2	102.9	210	177.5	189.5
118	99.5	106.6	214	180.9	193.1
122	102.9	110.2	218	184.3	196.7



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## **Section 14**

### **44TA-LLFS Tank Alarm Liquid Level Float Switch**

# **Installation and Maintenance Instructions**

## 44TA Liquid Level Float Switch

**IMPORTANT:** Please read these warnings and use the assembly instructions completely and carefully before starting. Failure to do so may cause product failure, or result in environmental contamination due to liquid leakage into the soil, creating hazardous spill conditions.

**IMPORTANT:** Check to make sure the unit is intact and undamaged and all parts have been supplied. Never substitute parts for those supplied. Doing so may cause product failure.

**WARNING-DANGER:** Using electrically operated equipment near gasoline or gasoline vapors may result in a fire or explosion, causing personal injury and property damage. Be sure that the working area is free from such hazards, and always use proper precautions.

**NOTICE:** OPW products must be used in compliance with applicable federal, state, and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and material to be handled. All illustrations and specifications in this literature are based on the latest production information available at the time of publication. Prices, materials, and specification are subject to change at any time, and models may be discontinued at any time, in either case, without notice or obligation.

### **Float Switch Technical Information:**

Minimum liquid specific gravity: 0.45.

Stem material: Stainless Steel.

Float Material: Closed Cell Buna-N (UL-Approved) for gasoline services.

Max Pressure: 150 psi @ 70° F.

Thread: 1/8" NPT.

### **Replacement Parts:**

Float Switch ASSY P/N: 44TA-LLFS

- Wire Fitting P/N: H15412M
- Float Switch P/N: H15411M
- SST Tube P/N: C05295M

Items to Convert to a Low Level Alarm:

- 1/8" SST Nipple P/N: 202430
- SST Tube P/N: C05295M

### **DOCUMENT CONTROL NUMBERS:**

200216 → 144TA

200056 → 444TA





## INSTALLATION INSTRUCTIONS 44TA-LLFS

CONFORMS TO ANSI / UL 913

CERTIFIED TO CAN / CSA STD C22.2 No. 157-92

CONTROL NUMBER – 3069072

**NOTE:** As defined in article 501 – Class 1 Locations of the National Electric Code, this apparatus and its interconnect wiring are intrinsically safe. Under normal conditions this apparatus and its wiring cannot release sufficient energy to ignite a specific ignitable atmospheric mixture by opening, shorting, or grounding.

**WARNING:** Interconnect wiring between the switch and the alarm unit must be kept totally isolated and separate from any other wiring. This wiring must not share any junction box, conduit, raceway or fixtures with circuits other than those defined by NEC as being intrinsically safe for all Class 1 locations.

**LOCATION:** NEC ARTICLE 501-3-CLASS 1 Locations exempt intrinsically safe enclosures in paragraph 501-3(b)(1)(c), and therefore may be placed in the most convenient location but must be within reach to the operator and within audible range.

**MOUNTING:** Since a general purpose NEMA 4X enclosure is used to protect the alarm circuits and batteries, any mounting holes, conduit or fasteners must be sealed in order to maintain the weatherproof integrity of the enclosure. All penetrations into enclosure must be made at the bottom of alarm unit.

**Important:** Leave these Installation Instructions with the Station Operator.

### Instructions for Remote Fill Installation

#### **Step 1 – Sensor Installation**

If using OPW 44TA-LLFS Float Switch Sensor, skip to Step 2. If using other 3<sup>rd</sup>-party approved intrinsically safe sensors install them according to their manufacturers' installation instructions and per NEC and NFPA.

#### **Step 2 – Minimum Ullage Size**

Determine type and size of tank. Follow the below calculations for Horizontal or Vertical tanks; or use provided Tank Charts to determine required ullage (I). (See Tank Charts on page 60) Record answers as (I) on the Float Tube Worksheet.

#### Horizontal Tank Calculations

For 90% Product Height  
Multiply the tank diameter (inches) x 0.8435

**Example** for 27 (inch) Diameter Tank: Product Level @ 90% = 27 (inches) x 0.8435 = 22.78 (inches)

For 95% Product Height  
Multiply the tank diameter (inches) x 0.903

**Example** for 27 (inch) Diameter Tank: Product Level @ 95% = 27 (inches) x 0.903 = 24.38 (inches)

**NOTE:** Round the answer down to the nearest 1/8 (inch) increment.

#### Vertical Tank Calculations

For 90% Product Height  
Multiply the tank height (inches) x 0.9

For 95% Product Height  
Multiply the tank height (inches) x 0.95

**Example** for 8 (feet) tall vertical tanks: Product Level @ 95% = 96 (inches) x 0.95 = 91.2 (inches)

**NOTE:** Round the answer down to the nearest 1/8 (inch) increment.

#### **Step 3 – (See Figure 1.)**

Measure from the top of the tank inlet to the inside of the top of the tank and record this as value (A)  
*Thread adaptor into tank inlet, hand tighten, then*



**Step 6**

**NOTE:** Apply proper thread sealant (i.e. Teflon® tape) to float switch threads before tightening. Attach float switch to float drop tube by running the two (2) switch wires through the tube and tightening the switch into the tube threads.

**Step 7 – (See Figure 4.)**

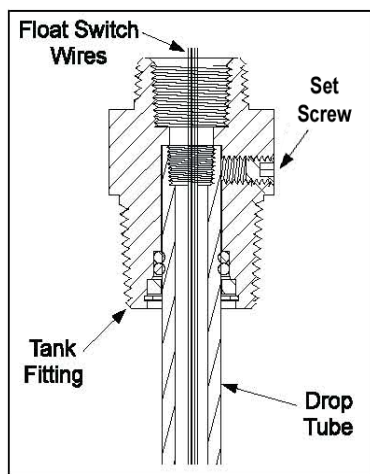
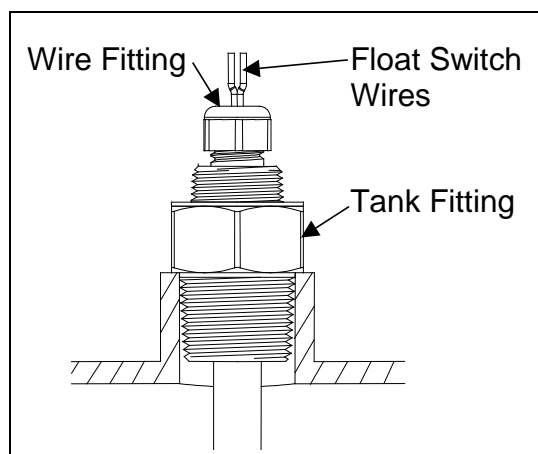
**Lubricate the outside of the cut end of the drop tube.**

Run wires through bottom of tank adaptor and firmly insert float drop tube into the tank fitting. Secure the drop tube firmly with the supplied set screw.

**Step 8 – (See Figure 5.)**

Run the two (2) switch wires through the wire fitting, and fasten fitting securely into tank fitting. Make sure to apply proper thread sealant (i.e. Teflon® tape) to the wire fitting before tightening.

**WARNING:** Do NOT over-tighten plastic wire fitting. Over-tightening may cause stripping of threads.

**Figure 4****Figure 5****Step 9**

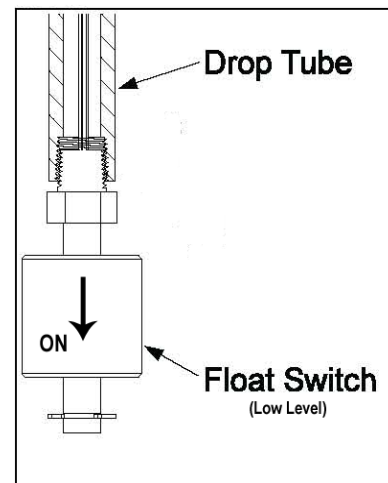
Apply proper thread sealant (i.e. Teflon® tape) to tank fitting, and thread into tank opening.

**Step 10 (444TA ONLY)**

Repeat **Steps 2-9** up to three times to utilize all four available switches if applicable.

**Instructions to Convert to Low Level:****Step 1**

Remove the retaining ring and reverse the float switch. An arrow points in the alarm on direction. (See Figure 6.)

**Figure 6****Step 2**

Reattach the retaining ring and complete assembly.

## HORIZONTAL TANK CALCULATIONS

HORIZONTAL TANK DIAMETER (in.)	PRODUCT LEVEL AT:		HORIZONTAL TANK DIAMETER (in.)	PRODUCT LEVEL AT:	
	90% (in)	95% (in)		90% (in)	95% (in)
30	25.3	27.1	126	106.3	113.8
34	28.7	30.7	130	109.7	117.4
38	32.1	34.3	134	113	121
42	35.4	37.9	138	116.4	124.6
46	38.8	41.5	142	119.8	128.2
50	42.2	45.2	146	123.2	131.8
54	45.6	48.8	150	126.5	135.5
58	48.9	52.4	154	129.9	139.1
62	52.3	56	158	133.3	142.7
66	55.7	59.6	162	136.7	146.3
70	59	63.2	166	140.1	149.9
74	62.4	66.8	170	143.5	153.5
78	65.8	70.4	174	146.9	157.1
82	69.2	74	178	150.3	160.7
86	72.5	77.7	182	153.7	164.3
90	75.9	81.3	186	157.1	167.9
94	79.3	84.9	190	160.5	171.5
98	82.7	88.5	194	163.9	175.1
102	86	92.1	198	167.3	178.7
106	89.4	95.7	202	170.7	182.3
110	92.8	99.3	206	174.1	185.9
114	96.2	102.9	210	177.5	189.5
118	99.5	106.6	214	180.9	193.1
122	102.9	110.2	218	184.3	196.7



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## **Appendix**

EVR Product Registration Card

OPW–FC Standard Product Warranties

OPW Venting Guide for Aboveground Storage Tanks


AST Vent Selection Examples

Reference Tables

Summary of Guidelines for Maintenance Activities Required of  
OPW EVR Aboveground Storage Tank Equipment

Aboveground Storage Tank EVR Equipment Installation  
Checklist

5.50

 **OPW PRODUCT REGISTRATION CARD**

Installation Date: \_\_\_\_\_

Store Owner: \_\_\_\_\_

Address: \_\_\_\_\_


City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Email Address: \_\_\_\_\_

OPW Product(s): \_\_\_\_\_

\_\_\_\_\_

For any product certified to California 2001 standards, OPW warrants that product sold by it are free from defects in material and workmanship for a period of one year from date of manufacture or one year from date of registration of installation not to exceed 15 months from date of manufacture by OPW. The complete limited warranty is printed in the Installation Instructions

  
A DOVER COMPANY

P/N: H15003PA Rev. B 3/10

(Front)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Stamp  
Here

**OPW Fueling Components  
9393 Princeton-Glendale Road  
Hamilton, OH 45011-9707**

**Attention: Warranty Administrator**

(Back)

## OPW-FC STANDARD PRODUCT WARRANTIES

**Notice:** FlexWorks by OPW, Inc., VAPORSAVER™ and all other OPW products must be used in compliance with all applicable federal, state, provincial and local laws, rules and regulations. Product selection is the sole responsibility of the customer and/or its agents and must be based on physical specifications and limitations, compatibility with the environment and material to be handled. All illustrations and specifications in this literature are based on the latest production information available at the time of publication. Prices, materials and specifications are subject to change at any time, and models may be discontinued at any time, in either case, without notice or obligation.

OPW warrants solely to its customer (the initial purchaser and any subsequent purchasers within the warranty period) that the following products sold by OPW will be free from defects in materials and workmanship under normal use and conditions for the periods indicated:

PRODUCT	WARRANTY PERIOD
FlexWorks Primary Pipe	10 years from date of manufacture
All Products and replacement parts installed in the State of California Certified to California CP-201 and/or CP-206 Standards*	1 year from-date of installation (proof of purchase from certified contractors/technicians required) OPW warrants ongoing compliance with the standards and specifications for the duration of the warranty period required by the State of California; this limited warranty is under the condition the equipment was installed and maintained by trained and certified contractors/technicians unless noted in Installation Manual
All other Products and replacement parts	1 year from date of manufacture**
*Products certified to California CP-201 and/or CP-206 Standards have been factory tested and met all applicable performance standards and specifications and will have an OPW registration card enclosed/attached to the product	

OPW's exclusive obligation under this limited warranty is, at its option, to repair, replace or issue credit (in an amount not to exceed the list price for the product) for future orders for any product that may prove defective within the applicable warranty period. (Parts repaired or replaced under warranty are subject to prorated warranty coverage for remainder of the original warranty period). Complete and proper warranty claim documentation and proof of purchase required. All warranty claims must be made in writing and delivered during the applicable warranty period to OPW at OPW 9393 Princeton-Glendale Road Hamilton, Ohio, USA 45011, Attention: Customer Service Manager. No products may be returned to OPW without its prior written authority.

This limited warranty shall not apply to any FlexWorks or VAPORSAVER™ product unless it is installed by an OPW attested installer and all required site and warranty registration forms are completed and received by OPW within 60 days of installation. This limited warranty also shall not apply to any FlexWorks, VAPORSAVER™ or other OPW product: unless all piping connections are installed with a nationally-recognized or state-approved leak detection device in each tank and dispenser sump (which are not for storage and from which all discharge hydrocarbons must be removed, and the systems completely cleaned, within 24 hours); unless testable sumps utilize FlexWorks pipe and access fittings; unless a sump inspection log or an EPA recommended/required checklist is maintained and the results are furnished to OPW upon request; and unless OPW is notified within 24 hours of any known or suspected product failure and is provided with unrestricted access to the product and the site. This limited warranty also shall not apply to any product which has been altered in any way, which has been repaired by anyone other than a service representative authorized by OPW, or when failure or defect is due to: improper installation or maintenance (including, without limitation, failure to follow FlexWorks Quick Reference Manual Installation Guide and all product warning labels); abuse or misuse; violation of health or safety requirements; use of another manufacturer's, or otherwise unauthorized, substances

or components; soil or other surface or subsurface conditions; or fire, flood, storm, lightning, earthquake, accident or any other conditions, events or circumstances beyond OPW's control.

THIS LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND ALL OTHER WARRANTIES INCLUDING, WITHOUT LIMITATION, THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY EXCLUDED.

OPW shall have no other liability whatsoever, whether based on breach of contract, negligence, gross negligence, strict liability or any other claim, including, without limitation, for special, incidental, consequential or exemplary damages or for the cost of labor, freight, excavation, clean-up, downtime, removal, reinstallation, loss of profit, or any other cost or charges. No person or entity is authorized to assume on behalf of OPW any liability beyond this limited warranty. This limited warranty is not assignable.

\*\* Date of manufacture on this product is located (*location will be specific to each component*)



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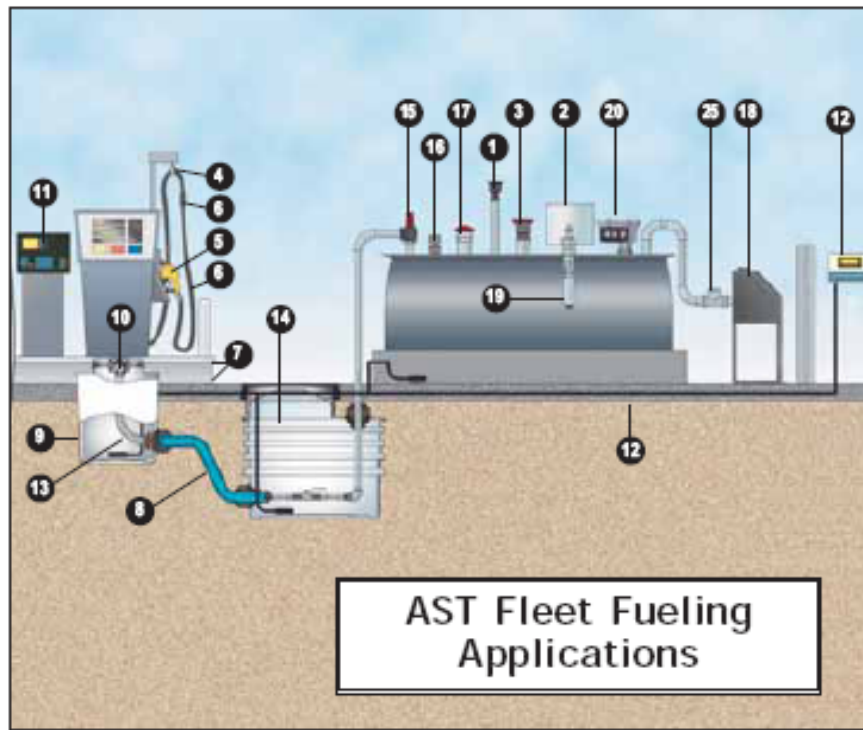
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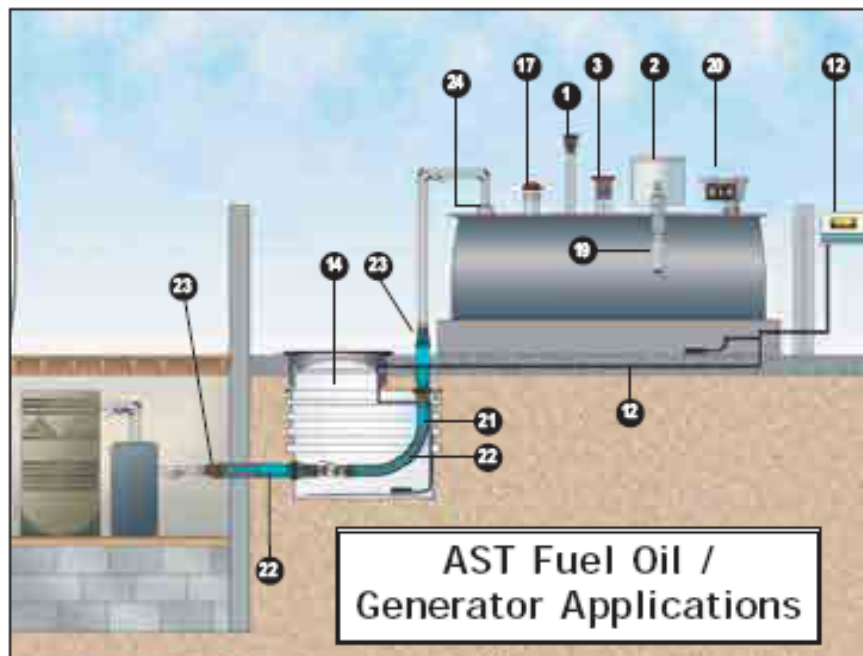


# **Venting Guide for Aboveground Storage Tanks**

# ABOVEGROUND STORAGE TANK EQUIPMENT AND FUEL MANAGEMENT EQUIPMENT FOR FLEET FUELING AND DIESEL ENGINE GENERATOR/OIL-FIRED BOILER APPLICATIONS



AST Fleet Fueling Applications



AST Fuel Oil / Generator Applications

Underground & Aboveground Storage Tank Equipment and Fuel Management Equipment for Fleet Fueling and Diesel Engine Generator/Oil-Fired Boiler Applications

## Environmental

- 1 Tank Venting Equipment
- 2 AST Spill Containment
- 3 Caps and Adaptors
- 7 Island Forms/Pipe Bumper Guards
- 8 Primary & Secondary Flexible Piping
- 9 Dispenser Sumps
- 10 Emergency Shut-Off Valves
- 13 Flex Connectors
- 14 Transition Sumps
- 15 Anti-Siphon Valves
- 16 Solenoid Valves (821 Series)
- 17 Emergency Vent
- 18 AST Remote Spill Containment
- 19 AST Overfill Prevention Valves
- 20 AST Tank Gauges & Tank Alarms
- 21 Fuel Oil Piping
- 22 Fuel Oil Containment Piping
- 23 Transition Assemblies
- 24 Double-Tapped Bung Fittings
- 25 Swing Check Valves

## Dispensing

- 4 Hose Retractors
- 5 Fueling Nozzles
- 6 Breakaways & Swivels

## Fuel Management

- 11 Fuel Management Systems
  - Fuel Site Controller/Card Authorization
  - C/OPT Automated Commercial/Outdoor Payment Terminals.
- 12 Monitoring Equipment
  - Automatic tank gauging/leak detection equipment
  - Probes and sensors for liquid and vapors

## Introduction

The OPW AST Venting Guide is supplied to assist emergency venting selection for aboveground storage tanks (AST). The following charts, tables and examples were taken directly from NFPA 30 and UL 142.

Examples of emergency vent calculations have been provided to demonstrate the selection process. The provided tables have common tank sizes. The examples show how to select an emergency vent from the charts and include horizontal and vertical tanks.

### Definitions:

- **Atmospheric Tank\*** – A storage tank that has been designed to operate at pressure from atmospheric through 1.0 psig (760 mmHg through 812 mmHg) measured at the top of the tank.
- **Emergency Relief Venting\*** – An opening, construction method, or device that will automatically relieve excessive internal pressure due to an exposure fire.
- **Low Pressure Tank\*** – A storage tank designed to withstand an internal pressure above 1.0 psig (6.9 kPa) but not more than 15 psig (103.4 kPa) measured at the top of the tank.
- **Normal Venting\*\*** – The amount of normal vent required is based on liquid addition or withdrawal and atmospheric temperature change. Normal vents should be sized in accordance with accepted design standards and be at least two-inch diameter nominal pipe size.
- **Test Pressure\*\*** – The maximum recommended pressure for testing vertical tanks is 2.5 psig. For horizontal tanks it is 5 psig. To prevent over pressurization during testing, install a pressure-relief device with the capability of relieving the entire output of air source at 0.5 psig greater than the recommended test pressure.
- **Wetted Area** – Exposed surface or shell area of a tank used in determining the venting requirements needed for that size tank in the event of an exposure fire. In a horizontal tank, the wetted area is calculated as 75% of the exposed surface area. In a vertical tank, the wetted area is calculated as the first 30 feet above grade of the exposed shell area of the tank.

\*NFPA 30

\*\*PEI RP200

## AST Vent Selection Examples

### Horizontal Tank

Table 1 is a pre-calculated chart that may have all the information needed to choose the proper emergency vent. If the tank size is not in the pre-calculated chart, use the example below as a guide to figure out the wetted area, cubic feet per hour (CFH), and proper vent selection for the particular tank.

#### Example\*:

Given: Tank capacity is 10,000 gallons. The tank is 10 feet in diameter and 17 feet long.

#### Step 1

From Table A2: **WA=518 sq. ft.**

If the wetted area value corresponding to the size tank in use is not in the chart, the following formula can be used to calculate the wetted area:

$$WA = 0.75 \left[ \frac{\pi d^2}{2} + \pi d l \right]$$

Where:

WA=wetted area, d=diameter of the tank in feet, and l=length of the tank in feet.

#### Step 2

If the tank is in the chart, use the supplied CFH values to determine the emergency vent size needed in Table 1 and/or Table 4.

If the tank is not in the charts, continue following the example.

Using 518 square feet, the CFH can be found using Table 4. Since 518 falls between the values of 500 and 600, interpolation is necessary as follows:

$$\begin{array}{l} \text{Difference:} \quad 600 \text{ sq. ft.} - 500 \text{ sq. ft.} = 100 \text{ sq. ft.} \\ \quad \quad \quad 392000 \text{ CFH} - 354000 \text{ CFH} = 38000 \text{ CFH} \end{array}$$

$$; \quad \frac{38000 \text{ CFH}}{100 \text{ sq. ft.}} = \frac{x}{518 \text{ sq. ft.} - 500 \text{ sq. ft.}} \quad \text{Therefore, } x=6840 \text{ CFH.}$$

$$\text{Total CFH required} = 354000 \text{ CFH} + 6840 \text{ CFH} = \mathbf{360840 \text{ CFH}}$$

#### Step 3

Vent selection: Using Table 1 and/or Table 4, find the range in which 360840 CFH falls. The tables show that an 8" emergency vent is needed. Table 1 lists the available OPW vents for this application.

**NOTE:** In specifying pressure settings, it is recommended that the emergency vent NOT be less than the normal vent.

\*PEI RP200

## AST Vent Selection Examples (cont.)

### Vertical Tank

Table 2 is a pre-calculated chart that may have all the information needed to choose the proper emergency vent. If the tank size is not in the pre-calculated chart, use the example below as a guide to figure out the wetted area, cubic feet per hour (CFH), and proper vent selection for the particular tank.

#### Example\*:

Given: Tank capacity is 10,000 gallons. The tank is 10 feet in diameter and 17 feet high.

#### Step 1

From Table A2: **WA=534 sq. ft.**

If the wetted area value corresponding to the size tank in use is not in the chart, the following formula can be used to calculate the wetted area:

$$WA = \pi dh$$

Where:

WA=wetted area, d=diameter of the tank in feet, and h=height of the tank in feet.

#### Step 2

If the tank is in the chart, use the supplied CFH values to determine the emergency vent size needed in Table 2 and/or Table 4.

If the tank is not in the charts, continue following the example.

Using 534 square feet, the CFH can be found using Table 4. Since 534 falls between the values of 500 and 600, interpolation is necessary as follows:

$$\begin{aligned} \text{Difference: } & 600 \text{ sq. ft.} - 500 \text{ sq. ft.} = 100 \text{ sq. ft.} \\ & 392000 \text{ CFH} - 354000 \text{ CFH} = 38000 \text{ CFH} \end{aligned}$$

$$\frac{38000 \text{ CFH}}{100 \text{ sq. ft.}} = \frac{x}{534 \text{ sq. ft.} - 500 \text{ sq. ft.}} \quad \text{Therefore, } x = 12920 \text{ CFH}$$

$$\text{Total CFH required} = 354000 \text{ CFH} + 12920 \text{ CFH} = \mathbf{366920 \text{ CFH}}$$

#### Step 3

Vent selection: Using Table 2 and/or Table 4, find the range in which 366920 CFH falls. The tables show that an 8" emergency vent is needed. Table 2 lists the available OPW vents for this application.

**NOTE:** In specifying pressure settings, it is recommended that the emergency vent NOT be less than the normal vent.

**Table 1 - Standardized Horizontal Tank Chart**

Tank Specifications										
Capacity		Diameter		Length		Wetted Area		Required Vent Capacity		OPW 301 Vent Size
Gallons	Liters	ft. or in.	Meters	ft. or in.	Meters	sq. ft.	sq. m.	CFH	CMH	
280	1560	3'	0.914	5'-2"	1.6	47	14.3	49520	15094	4"
300	1135	38"	0.965	5'	1.5	49	15	51640	15740	4"
500	1892	4'	1.219	5'-5"	1.7	69	21	72650	22144	4"
530	2006	4'	1.219	6'	1.8	71	21.6	74750	22784	4"
550	2081	64"	1.626	6'	1.8	75	22.9	78950	24064	4"
1000	3784	64"	1.626	10'-8"	3.3	119	36.3	124950	38085	6"
1000	3784	64"	1.626	6'	1.8	109	33.2	114450	34884	6"
1500	5676	64"	1.626	9'	2.7	147	44.8	154350	47046	6"
2000	7569	64"	1.626	12'	3.7	184	56.1	193200	58807	6"
2500	9461	64"	1.626	15'	4.6	222	67.7	223320	68067.9	6"
3000	11353	64"	1.626	18'	5.5	259	79	243680	74273.7	6"
3000	11353	6'	1.8	14'	4.3	240	73.1	233400	12140.3	6"
4000	15137	64"	1.626	24'	7.3	335	102.1	281100	85679.3	8"
4000	15137	6'	1.8	19'	5.8	311	94.8	270060	82314.3	8"
5000	18921	8'	2.4	13'-4"	4.1	326	99.3	276960	84417.4	8"
6000	22706	8'	2.4	16'	4.9	376	114.6	300480	91586.3	8"
8000	30274	8'	2.4	21'-4"	6.5	477	145.4	344340	104955	8"
10000	37843	8'	2.4	27'	8.2	584	178	385920	117628	8"
10000	37843	9'	2.7	21'	6.4	540	164.6	369200	112532	8"
10000	37843	10'	3	17'	5.2	518	157.9	360840	109984	8"
10000	37843	10'-6"	3.1	15'-7"	4.7	515	157	359700	109637	8"
12000	45412	8'	2.4	32'	9.8	678	206.7	420080	128040	8"
12000	45412	9'	2.7	25'	7.6	625	190.5	401000	122225	8"
12000	45412	10'	3	20'-6"	6.2	600	182.9	392000	119482	8"
12000	45412	11'	3.4	17'	5.2	583	177.7	385540	117513	8"
15000	56764	8'	2.4	40'	12.2	829	252.7	470990	143558	10"
15000	56764	8'	2.4	23'-5"	7.1	703	214.3	429020	130765	10"
20000	75686	10'	3	34'-2"	10.4	922	281	499820	152345	10"
20000	75686	10'-6"	3.1	31'	9.5	896	273	491760	149888	10"
20000	75686	11'	3.4	28'	8.8	868	264.6	483080	147243	10"
25000	94607	10'-6"	3.1	38'-6"	11.7	1082	329.8	537530	163839	10"
30000	113529	10'-6"	3.1	46'-3"	14.1	1274	388.3	568100	173157	10"

**Table 2 - Standardized Vertical Tank Chart**

Tank Specifications										
Capacity		Diameter		Length		Wetted Area		Required Vent Capacity		OPW 301 Vent Size
Gallons	Liters	ft. or in.	Meters	ft. or in.	Meters	sq. ft.	sq. m.	CFH	CMH	
280	1560	3'	0.914	5'-2"	1.6	48	14.6	50580	15416.8	4"
300	1135	38"	0.965	5'	1.5	49	14.9	51640	15739.9	4"
500	1892	4'	1.219	5'-5"	1.7	68	20.7	71600	21823.7	4"
530	2006	4'	1.219	6'	1.8	72	21.9	75800	23103.8	4"
550	2081	64"	1.626	6'	1.8	75	22.8	78950	24064	4"
1000	3784	64"	1.626	10'-8"	3.3	134	40.8	140700	42885.4	6"
1000	3784	64"	1.626	6'	1.8	100	30.5	105000	32004	6"
1500	5676	64"	1.626	9'	2.7	151	46	158550	48326	6"
2000	7569	64"	1.626	12'	3.7	201	61.3	213100	64952.9	6"
2500	9461	64"	1.626	15'	4.6	251	76.5	239520	73005.7	6"
3000	11353	64"	1.626	18'	5.5	301	91.7	265460	80912.2	8"
3000	11353	6'	1.8	14'	4.3	263	80.2	245760	74907.6	6"
4000	15137	64"	1.626	24'	7.3	402	122.5	312840	95353.6	8"
4000	15137	6'	1.8	19'	5.8	358	109.1	291840	88952.8	8"
5000	18921	8'	2.4	13'-4"	4.1	335	102.1	281100	85679.3	8"
6000	22706	8'	2.4	16'	4.9	402	122.5	312840	95353.6	8"
8000	30274	8'	2.4	21'-4"	6.5	536	163.4	367680	112069	8"
10000	37843	8'	2.4	27'	8.2	678	206.6	420080	128040	8"
10000	37843	9'	2.7	21'	6.4	593	180.7	389340	118671	8"
10000	37843	10'	3	17'	5.2	534	162.7	366920	111837	8"
10000	37843	10'-6"	3.1	15'-7"	4.7	514	156.7	359320	109521	8"
12000	45412	8'	2.4	32'	9.8	804	245.1	463240	141196	10"
12000	45412	9'	2.7	25'	7.6	706	215.2	430040	131076	10"
12000	45412	10'	3	20'-6"	6.2	644	196.3	407840	124310	8"
12000	45412	11'	3.4	17'	5.2	587	179	387060	117976	8"
15000	56764	8'	2.4	40'	12.2	1005	306.3	524825	159967	10"
15000	56764	8'	2.4	23'-5"	7.1	764	232.9	449760	137087	10"
20000	75686	10'	3	34'-2"	10.4	1073	327.1	536045	163387	10"
20000	75686	10'-6"	3.1	31'	9.5	1022	311.5	527630	160822	10"
20000	75686	11'	3.4	28'	8.8	967	294.7	513770	156597	10"
25000	94607	10'-6"	3.1	38'-6"	11.7	1269	386.8	567350	172928	10"
30000	113529	10'-6"	3.1	46'-3"	14.1	1525	464.8	603875	184061	10"

<b>Table A2 - Wetted Area for Horizontal Tanks</b>										
<b>Tank Length</b>	<b>Tank Diameter (ft.)</b>									
	<b>Wetted Area of Tanks with Flat Heads in Square Feet</b>									
<b>ft.</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>
3	32									
4	39	57								
5	46	66	88							
6	53	75	100	127						
7	60	85	112	141	173					
8	67	94	124	156	190	226				
9	74	104	135	170	206	245	286			
10	81	113	147	184	223	264	307	353		
11	88	123	159	198	239	283	329	377	428	
12	95	132	171	212	256	302	350	401	454	509
13	102	141	183	226	272	320	371	424	479	537
14	110	151	194	240	289	339	392	448	505	565
15	117	160	206	254	305	358	414	471	531	594
16	124	170	218	269	322	377	435	495	557	622
17	131	179	230	283	338	396	456	518	583	650
18	138	188	242	297	355	415	477	542	609	679
19		198	253	311	371	434	498	565	635	707
20		207	265	325	388	452	520	589	661	735
21		217	277	339	404	471	541	613	687	763
22		226	289	353	421	490	562	636	713	792
23		236	300	368	437	509	583	660	739	820
24		245	312	382	454	528	604	683	765	848
25			324	396	470	547	626	707	791	877
26			336	410	487	565	647	730	816	905
27			348	424	503	584	668	754	842	933
28			359	438	520	603	689	778	868	961
29			371	452	536	622	710	801	894	990
30			383	467	553	641	732	825	920	1018



**Table A2 - Wetted Area for Horizontal Tanks**

Tank Length	Tank Diameter (ft.)									
	Wetted Area of Tanks with Flat Heads in Square Feet									
ft.	3	4	5	6	7	8	9	10	11	12
31			395	481	569	660	753	848	946	1046
32				495	586	679	774	872	972	1074
33				509	602	697	795	895	998	1103
34				523	619	716	816	919	1024	1131
35				537	635	735	838	942	1050	1159
36				551	651	754	859	966	1076	1188
37				565	668	773	880	990	1102	1216
38					684	792	901	1013	1127	1244
39					701	811	922	1037	1153	1272
40					717	829	944	1060	1179	1301
41					734	848	965	1084	1205	1329
42					750	867	986	1107	1231	1357
43					767	886	1007	1131	1257	1385
44						905	1028	1155	1283	1414
45						924	1050	1178	1309	1442
46						942	1071	1202	1335	1470
47						961	1092	1225	1361	1499
48						980	1113	1249	1387	1527
49						999	1135	1272	1413	1555
50							1156	1296	1438	1583
51							1178	1319	1466	1612
52							1199	1342	1492	1640
53							1220	1366	1518	1668
54							1246	1389	1544	1696
55							1263	1413	1570	1725
56								1437	1593	1753
57								1460	1622	1781
58								1484	1648	1809
59								1507	1674	1839
60								1531	1700	
61									1726	
62									1752	
63									1778	
64									1803	
65									1829	
66									1855	

For SI Units: 1 ft=0.3 m, 1 ft<sup>2</sup>=0.09m<sup>2</sup>

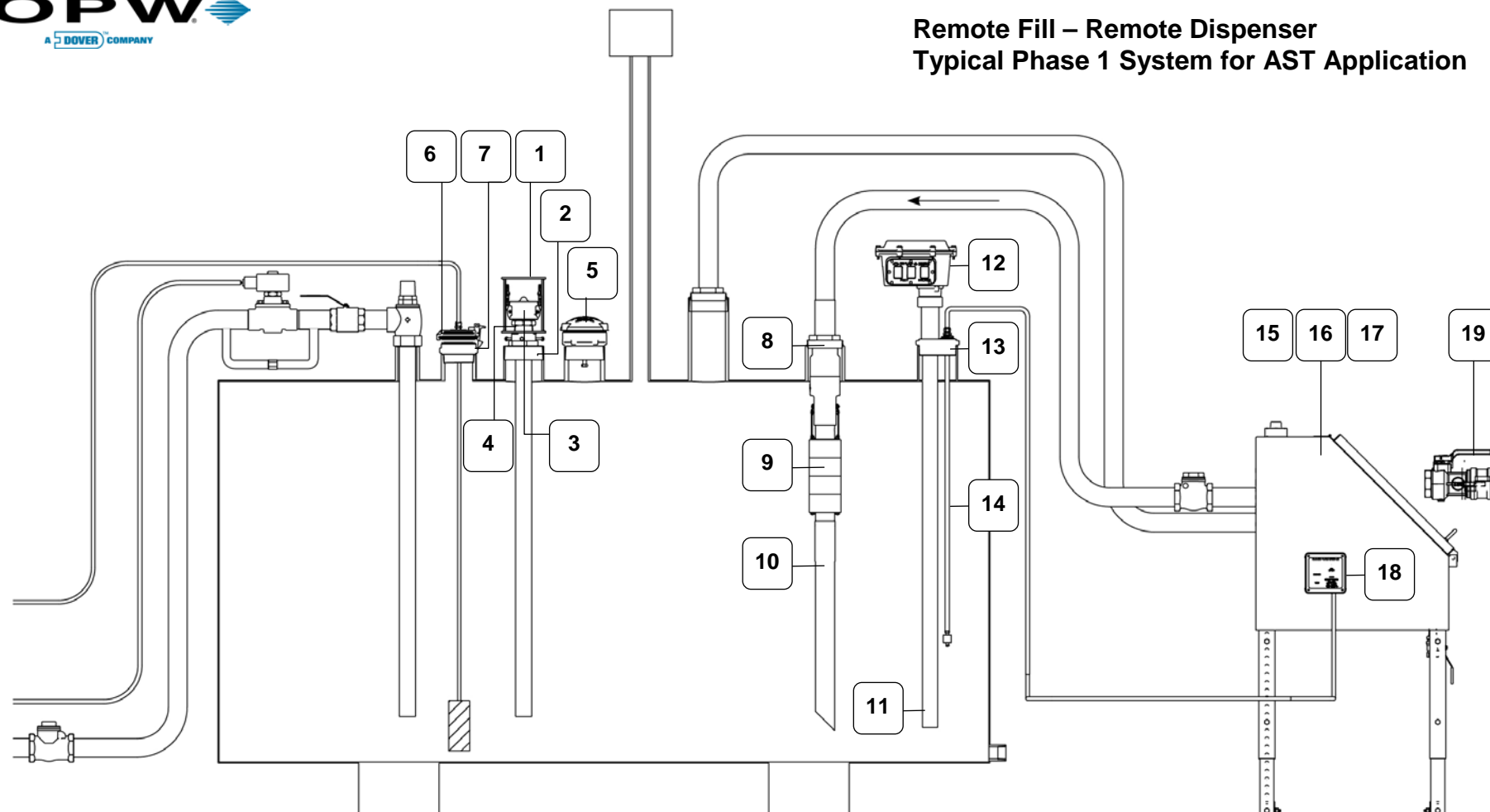
<b>Table A3 - Wetted Area for Vertical Tanks</b>										
<b>Tank Height</b>	<b>Tank Diameter (ft.)</b>									
	<b>Wetted Area of Tanks with Flat Heads in Square Feet</b>									
ft.	3	4	5	6	7	8	9	10	11	12
3	28									
4	38	50								
5	47	63	79							
6	57	75	94	113						
7	66	88	110	132	154					
8	75	101	126	151	176	201				
9	85	113	141	170	198	226	254			
10	94	126	157	188	220	251	283	314		
11	104	138	173	207	242	276	311	346	380	
12	113	151	188	226	264	302	339	377	415	452
13		163	204	245	286	327	368	408	449	490
14		176	220	264	308	352	396	440	484	528
15		188	236	283	330	377	424	471	518	565
16		201	251	302	352	402	452	503	553	603
17			267	320	374	427	481	534	587	641
18			283	339	396	452	509	565	622	679
19			298	358	418	478	537	597	657	716
20			314	377	440	503	565	628	691	754
21				396	462	528	594	660	726	792
22				415	484	553	622	691	760	829
23				434	506	578	650	723	795	867
24				452	528	603	679	754	829	905
25					550	628	707	785	864	942
26					572	653	735	817	898	980
27					594	679	763	848	933	1018
28					616	704	792	880	968	1056
29						729	820	911	1002	1093
30						754	848	942	1037	1131

For SI Units: 1 ft=0.3 m, 1 ft<sup>2</sup>=0.09m<sup>2</sup>

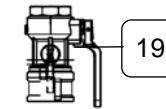
<b>Table 4 - Emergency Venting Capacity</b>		
<b>Wetted Surface</b>	<b>Venting Capacity</b>	<b>Minimal Opening Nominal Pipe Size</b>
<b>sq. ft.</b>	<b>CFH</b>	<b>inches</b>
20	21100	2
30	31600	2
40	42100	3
50	52700	3
60	63200	4
70	73700	4
80	84200	4
90	94800	4
100	105000	5
120	126000	5
140	147000	5
160	168000	5
180	190000	5
200	21100	6
250	239000	6
300	265000	6
350	288000	8
400	312000	8
500	354000	8
600	392000	8
700	428000	8
800	462000	8
900	493000	8
1000	524000	10
1200	557000	10
1400	587000	10
1600	614000	10
1800	639000	10
2000	662000	10
2400	704000	10
2800 and over	742000	10



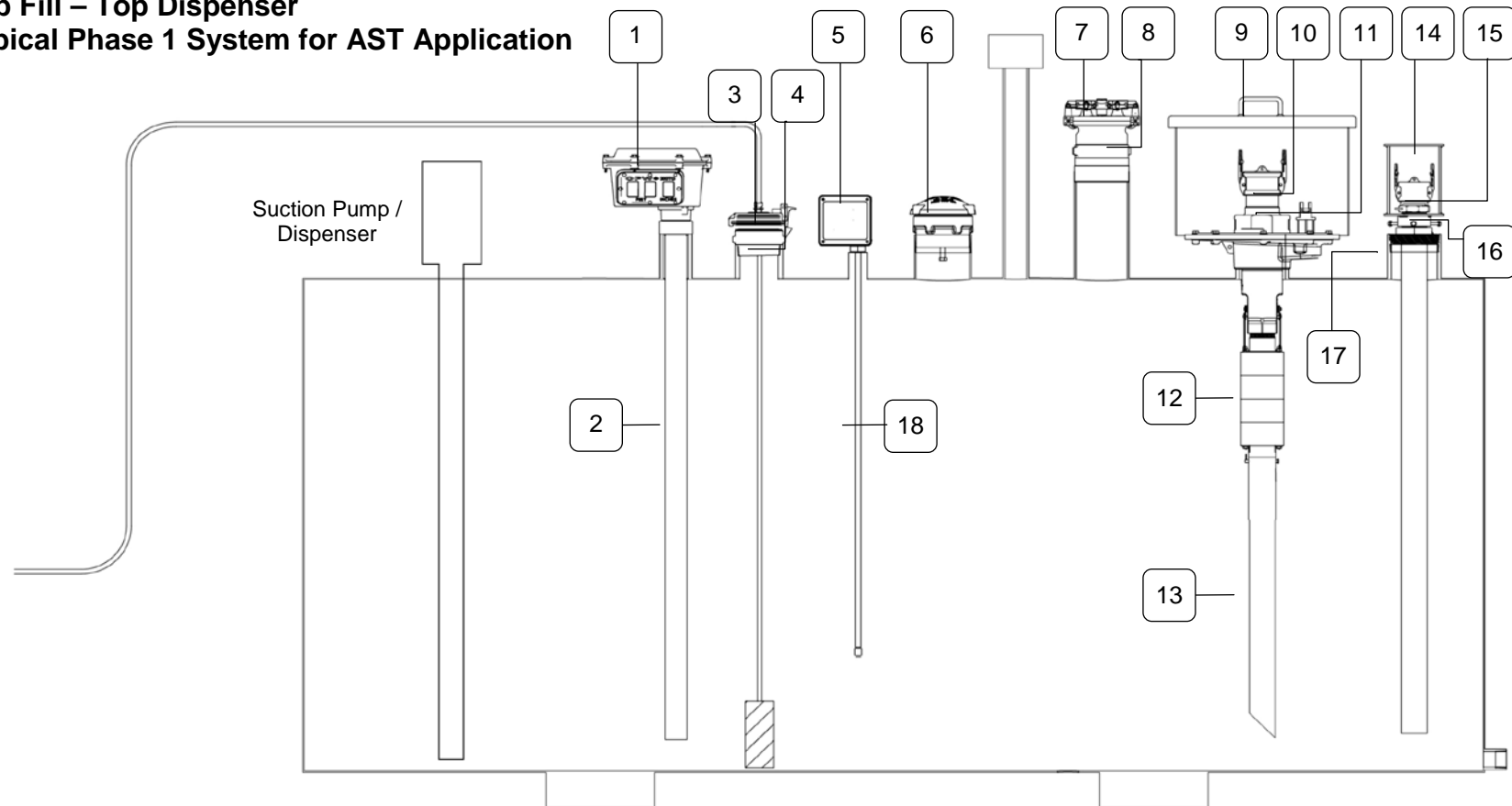
### Remote Fill – Remote Dispenser Typical Phase 1 System for AST Application



1	204247 Fill Prevention Cage	8	53 Series Bushing	15	1611AN / 1612AN Series Kamvalok® Adaptor*
2	53-00XX Series Double Tapped Bushing	9	61fSTOP-XXXXT Series Overfill Prevention Valve	16	1611AV or 61VSA Series Vapor Recovery Adaptor*
3	634B-0150 or 634B-0090 Series Dust Cap	10	61FT Series Drop Tube	17	1711T or 1711LPC Series Vapor Recovery Cap*
4	633AST-0XXX Adaptor	11	61T Series Drop Tube	18	144TA/444TA Series Tank Alarm (optional)
5	301 Series Emergency Vent	12	200TG Series Tank Gauge (optional)	19	1711D-YYYY Series Kamvalok® Coupler
6	62M Monitoring Cap	13	TGTA-0400 4" Gauge/Alarm Combo Fitting (optional)	* Inside spill container	
7	FSA-400 Face Seal Adaptor	14	44TA-LLFS Liquid Level Float Switch (optional)		



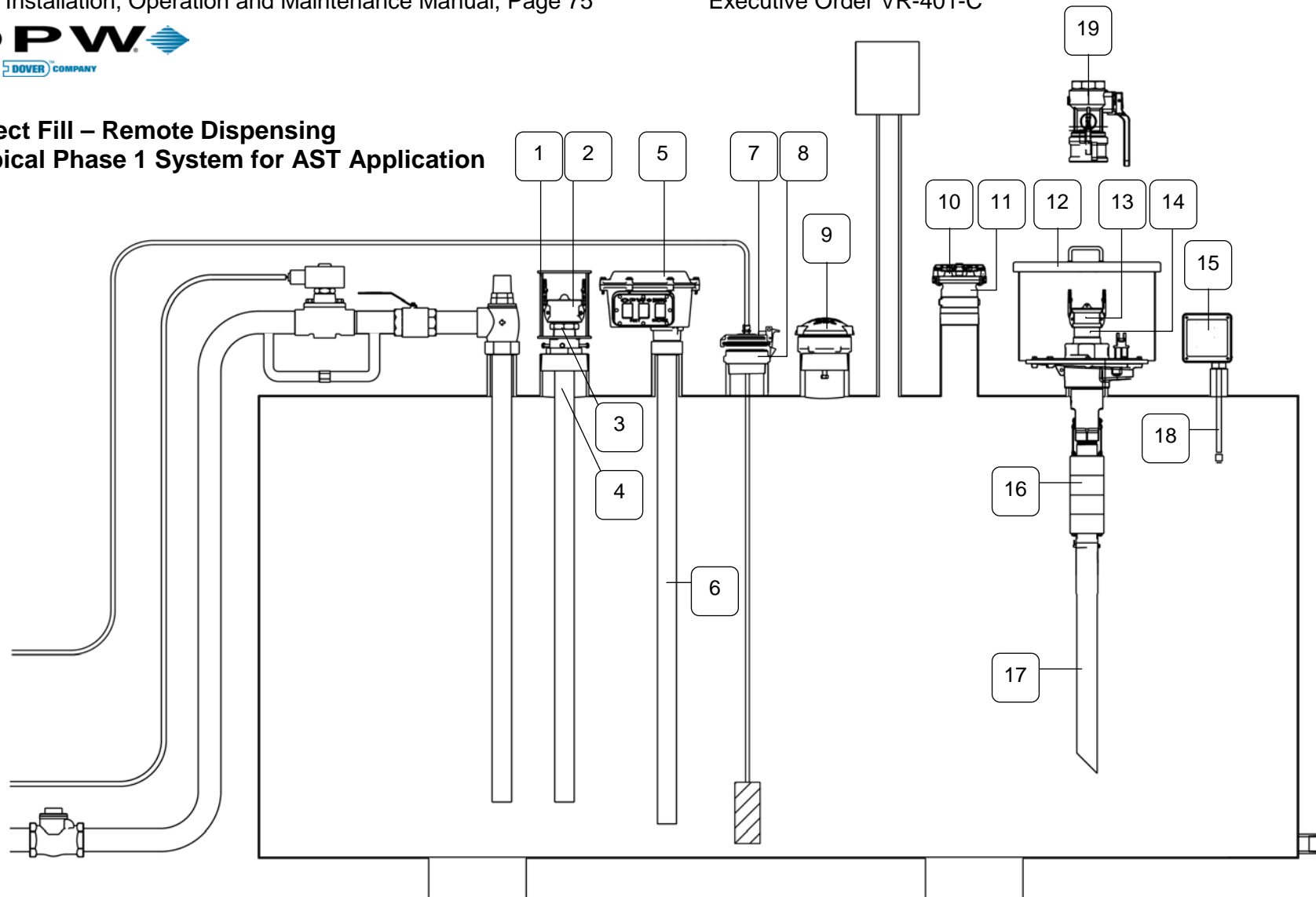
### Top Fill – Top Dispenser Typical Phase 1 System for AST Application



1	200TG Series Tank Gauge	8	1611AV/AVB Series Vapor Recovery Adaptor or 61VSA-1020 EVR	15	634B-0150 or 634BK-0090 Cap
2	61T Series Drop Tube	9	331/332 Series Spill Container	16	633AST-2190 Adaptor
3	62M Monitoring Cap	10	634B or 634BK Series Dust Cap	17	53-00XX Series Double-Tapped Bushing
4	FSA-400 Face Seal Adaptor	11	1611AN/1612AN Series Kamvalok® Adaptor	18	44TA-LLFS Liquid Level Float Switch (optional)
5	144TA/444TA Series Tank Alarm (optional)	12	61fSTOP-XXXXT Series Overfill Prevention Valve	19	1711D-YYYY Series Kamvalok® Coupler
6	301 Series Emergency Vent	13	61FT Series Drop Tube		
7	1711T-7085 or 1711LPC Series Vapor Recovery Cap	14	204247 Fill Prevention Cage		



### Direct Fill – Remote Dispensing Typical Phase 1 System for AST Application



1	204247 Fill Prevention Cage	8	FSA-400 Face Seal Adaptor	15	144TA/444TA Series Tank Alarm (optional)
2	634B-0150 or 634BK-0090 Cap	9	301 Series Emergency Vent	16	61fSTOP-XXXXT Series Overfill Prevention Valve
3	633AST-0XXX Adaptor	10	1711T or 1711LPC Series Vapor Recovery Cap	17	61FT Series Drop Tube
4	53-00XX Series Double Tapped Bushing	11	1611AV or 61VSA Series Vapor Recovery Adaptor	18	44TA-LLFS Liquid Level Float Switch (optional)
5	200TG Series Tank Gauge	12	331/332 Series Spill Container	19	1711D-YYYY Series Kamvalok® Coupler
6	61T Series Drop Tube	13	634B Series Dust Cap		
7	62M Monitoring Cap	14	1611AN/1612AN Series Kamvalok® Adaptor		

## Reference Tables

**NOTICE:** OPW products must be used in compliance with applicable federal, state and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and material to be handled. OPW makes no warranty of fitness for a particular use.

**API Std. 2000** Venting Atmospheric & Low Pressure Storage Tanks

American Petroleum Institute  
1120 L Street, Northwest, Washington, D.C. 20005

**NFPA 30**  
**NFPA 30A**

Flammable and Combustible Liquids Code  
Code for Motor Fuel Dispensing Facilities and Repair Garages  
National Fire Protection Association  
1 Batterymarch Park, Quincy, MA 02269-9904

**PEI RP200**

Recommended Practices for Installation of Aboveground Storage Systems for Motor Vehicle Fueling.  
Petroleum Equipment Institute  
PO Box 2380, Tulsa, OK 74101-2380

**UL 142**  
**UL 2085**

Steel Aboveground Tanks for Flammable and Combustible Liquids  
Standard for Safety Protected Aboveground Tanks for Flammable and Combustible Liquids  
UL Publication Stock  
333 Pfingsten Road, Northbrook, IL 60062

EVR Aboveground Storage Tank Components Installation Torque Specifications (August 10th, 2009)	
Component	Torque Specification (Foot-Pounds)
All 4" and 6" NPT pipe. See <b>Note 1</b> .	125 to 250 ft-lb
Spill Containment Bucket (4" NPT). See <b>Note 1</b> .	125 to 250 ft-lb
Spill bucket bolts/nuts	15 to 20 ft-lb
Drain-valve retaining bolts/nuts	11-1/2 to 13-1/2 ft-lb
61VSA Vapor Swivel Adaptor	90 to 110 ft-lb
3" NPT	125 to 200 ft-lb
2" NPT	100 to 150 ft-lb
<b>Note 1:</b> All NPT threads are to be torqued progressively lower from the tank up.	

### Summary of Guidelines for Maintenance Activities Required of OPW EVR Aboveground Storage Tank Equipment

Component	Interval	Maintenance To Be Performed
<b>Spill Containers and Drain Valves</b> OPW – All Models	Annual and after each delivery	After each delivery, the operator must remove any standing fuel from the container. Annually, clean the interior of the container and drain valve. Annually, remove accumulated dirt and grit. If the drain valve becomes clogged, remove the valve, soak in water and use high-pressure air to clean. If valve is removed, reinstall to its proper position.
<b>Dust Caps</b> OPW – All Models	Annual	Visually inspect the seal in cap and replace if damaged or missing. Test per OPW Installation and Maintenance Instructions if applicable.
<b>Vapor Adaptor</b> OPW 61VSA or 1611AV	Annual	Visually inspect the adaptor for large dents, cracks or deformations. Check the vapor poppet for damage and ensure that the poppet seats evenly with the adaptor. Clean out any foreign objects from the vapor poppet's seal and seal surface if necessary. Test the poppet seal by applying a soap solution to the poppet while the storage tank is under a positive gauge pressure of 2.00 inches water column and inspect for the presence of bubbles. If the facility continuously operates under vacuum, a bag test may be used by sealing a clear plastic bag to the adaptor's sides. If no bubbles appear at the poppet under positive pressure or the bag test shows no signs of the bag collapsing, no further maintenance is required. If bubbles appeared around the poppet seal or the bag collapsed, replace the poppet components and re-test.
<b>Drop Tubes</b> OPW 61T/61FT	Annual	Visually inspect Drop Tube to see if it is installed and ensure that the bottom of tube is within 6 inches of the bottom of tank.

<sup>1</sup> These maintenance requirements shall not circumvent use of the Manufacturer's Installation and Maintenance Instructions. Maintenance contractors or owner/operators shall refer to the manufacturer's complete installation and maintenance instructions found herein to ensure that all maintenance and torque requirements are met.



### Summary of Guidelines for Maintenance Activities Required of OPW EVR Aboveground Storage Tank Equipment

Component	Interval	Maintenance To Be Performed
<b>Tank Alarm</b> OPW 144TA/444TA	Annual and before each delivery	<p>Test system prior to each fill-up. Replace battery module if Low Battery Indicator is on. Use only the appropriate OPW P/N listed in replacement parts. Annually inspect the wiring of the system for damage and deterioration. If wiring is damaged, replace as necessary following NEC, NFPA and any other applicable local, state, and federal requirements.</p> <p><b>NOTE:</b> When replacing the battery for the 144TA-0100, open the alarm box and locate the OPW number on the black battery module. If the number reads "C05346" then use the replacement part H15615M. If the number reads "144TA-0100" then use the replacement part 202891. Battery for 444TA-0100 is part number H15937M.</p>
<b>Pressure/Vacuum Vent Valve</b> Husky 5885	Annual	<ol style="list-style-type: none"> <li>1. Remove screws that hold top cover on.</li> <li>2. Remove any debris that might be sitting inside the lower cover.</li> <li>3. Check the drain holes in the lower cover for blockage.</li> <li>4. Do not remove the two (2) screens.</li> <li>5. Reinstall the top cover and retaining screws.</li> <li>6. Tighten the screws firmly.</li> </ol>
<b>Emergency Vent</b> OPW 301	Annual	<p>Visually inspect the seal and sealing surface for signs of wear and deformation. Replace seal or washer, if necessary.</p>
<b>Anti-Siphon Valve</b> OPW 199ASV	Annual	<p>Visually inspect the valve for dents, cracks or deformations.</p>

<sup>1</sup> These maintenance requirements shall not circumvent use of the Manufacturer's Installation and Maintenance Instructions. Maintenance contractors or owner/operators shall refer to the manufacturers complete installation and maintenance instructions found herein to ensure that all maintenance and torque requirements are met.

### Summary of Guidelines for Maintenance Activities Required of OPW EVR Aboveground Storage Tank Equipment

Component	Interval	Maintenance To Be Performed
<b>Drop Tube Overfill Prevention</b> OPW 61fSTOP	None	No maintenance is required for this product.
<b>Swing Check Valve</b> OPW 175	Annual	Visually inspect the valve for dents, cracks or deformation.
<b>Emergency Valve</b> OPW 178S	Annual	Visually inspect the valve for dents, cracks or deformation.
<b>Ball Valve</b> OPW 21BV	Annual	Visually inspect the valve for dents, cracks or deformation. Valve can be closed to verify functionality.
<b>Kamvalok® Fill Adaptor</b> OPW 1611AN/1612AN	Annual	Visually inspect the adaptor for large dents, cracks or deformations. Check the vapor poppet for damage and ensure that the poppet seats evenly with the adaptor. Clean out any foreign objects from the poppet's seal and seal surface if necessary. Test the poppet seal by applying a soap solution to the poppet while the storage tank is under a positive gauge pressure of 2.00 inches water column and inspect for the presence of bubbles. If the facility continuously operates under vacuum, a bag test may be used by sealing a clear plastic bag to the adaptor's sides. If no bubbles appear at the poppet under positive pressure or the bag test shows no signs of the bag collapsing, no further maintenance is required. If bubbles appeared around the poppet seal or the bag collapsed, replace the poppet components and re-test.
<b>Thermal Pressure Relief Valve</b> OPW 82RV	Annual	Visually inspect the adaptor for dents, cracks or deformation.

<sup>1</sup> These maintenance requirements shall not circumvent use of the Manufacturer's Installation and Maintenance Instructions. Maintenance contractors or owner/operators shall refer to the manufacturers complete installation and maintenance instructions found herein to ensure that all maintenance and torque requirements are met.

# OPW

## Aboveground Storage Tank EVR Equipment Installation Checklist

(Revised 08/11/09)

### **Site Identification Information**

**Site Address:**

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**Installing Company:**

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**Technician's Name (Print Clearly):**

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**Technician's Signature:**

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**Date of installation:** \_\_\_\_\_

# OPW

## Aboveground Storage Tank EVR Equipment Installation Check List

(Revised 08/11/09)

**Components Installed**

OPW 331/332 Series Spill-Containment Bucket	Yes ____	No ____
OPW 6211R Series Remote-Spill Container	Yes ____	No ____
OPW 61fSTOP-XXXXT Series Overfill Prevention Valve	Yes ____	No ____
OPW 61FT Series Straight Drop Tube	Yes ____	No ____
OPW 200TG Series Tank Gauge	Yes ____	No ____
OPW 61T Series Straight Drop Tube	Yes ____	No ____
OPW 144TA/444TA Series Tank Alarm	Yes ____	No ____
OPW 44TA-LLFS Liquid Level Float Switch	Yes ____	No ____
OPW 61VSA Vapor Swivel Adaptor	Yes ____	No ____
OPW 1611AV Series Vapor Adaptor	Yes ____	No ____
OPW 1611AN/1612AN Series Kamvalok® Adaptor	Yes ____	No ____
OPW 1711LPC Low Profile Vapor-Recovery Cap	Yes ____	No ____
OPW 1711T Top Seal EVR Vapor-Recovery Cap	Yes ____	No ____
OPW 301 Series Emergency Vent	Yes ____	No ____
OPW 199ASV Series Anti-Siphon Valve	Yes ____	No ____
OPW 82RV Thermal Pressure Relief Valve	Yes ____	No ____
OPW 175 Series Swing Check Valve	Yes ____	No ____
OPW 178S Emergency Valve	Yes ____	No ____
OPW 21BV Series Ball Valve	Yes ____	No ____

**Installation Acknowledgment**

Installed OPW 331/332 Series \_\_\_\_ Fill spill containment bucket and tightened to \_\_\_\_\_ ft. lb. For Remote Fill Applications, installed 6211R Series \_\_\_\_ Spill Container.  
Thread sealant compound used \_\_\_\_\_

Installed OPW 61fSTOP-XXXXT Series overfill prevention valve in fill pipe.  
Yes \_\_\_\_ No \_\_\_\_

Installed OPW 61FT Series Drop Tube on 61fSTOP. Yes \_\_\_\_ No \_\_\_\_

Installed faced off 2", 4", or 6" NPT pipe nipple (Dependent upon Spill Container Size) in direct fill spill containment bucket and tightened nipple to \_\_\_\_\_ ft. lb.  
Thread sealant compound used \_\_\_\_\_  
Tool used to install nipple \_\_\_\_\_

Installed OPW 61 VSA Vapor Swivel Adaptor onto vapor recovery riser pipe and tightened vapor adaptor to \_\_\_\_\_ ft. lb.

Thread sealant compound used \_\_\_\_\_

Installed OPW 1611AV Vapor Recovery Adaptor onto vapor recovery riser pipe and tightened vapor adaptor to \_\_\_\_\_ ft. lb.

Thread sealant compound used \_\_\_\_\_

Installed OPW 1611AN/1612AN Kamvalok® Adaptor in spill container and tightened adaptor to \_\_\_\_\_ ft. lb.

Thread sealant compound used \_\_\_\_\_

Installed 200TG Series Tank Gauge

Yes \_\_\_\_\_ No \_\_\_\_\_

Calibrated according to OPW 200TG Instructions

Yes \_\_\_\_\_ No \_\_\_\_\_

Thread sealant compound used \_\_\_\_\_

Installed 61T Series Drop Tube

Yes \_\_\_\_\_ No \_\_\_\_\_

Installed 301 Series Emergency Vent and tightened to \_\_\_\_\_ ft. lb.

Thread sealant compound used \_\_\_\_\_

Installed 199ASV Series Anti-Siphon Valve and tightened to \_\_\_\_\_ ft. lb.

Thread sealant compound used \_\_\_\_\_

Installed 82RV Thermal Pressure Relief Valve and tightened to \_\_\_\_\_ ft. lb.

Thread sealant compound used \_\_\_\_\_

Installed 175 Series Swing Check Valve and tightened to \_\_\_\_\_ ft. lb.

Thread sealant compound used \_\_\_\_\_

Installed 178S Emergency Valve and tightened to \_\_\_\_\_ ft. lb.

Thread sealant compound used \_\_\_\_\_

Installed 21BV Series Ball Valve and tightened to \_\_\_\_\_ ft. lb.

Thread sealant compound used \_\_\_\_\_

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