Contractor Training Guide

FLEXIBLE UNDERGROUND PIPING INSTALLATION

COUPLING & FITTING INSTALLATION

CONTAINMENT SUMPS

OPW®
RETAIL FUELING
a DOVER company

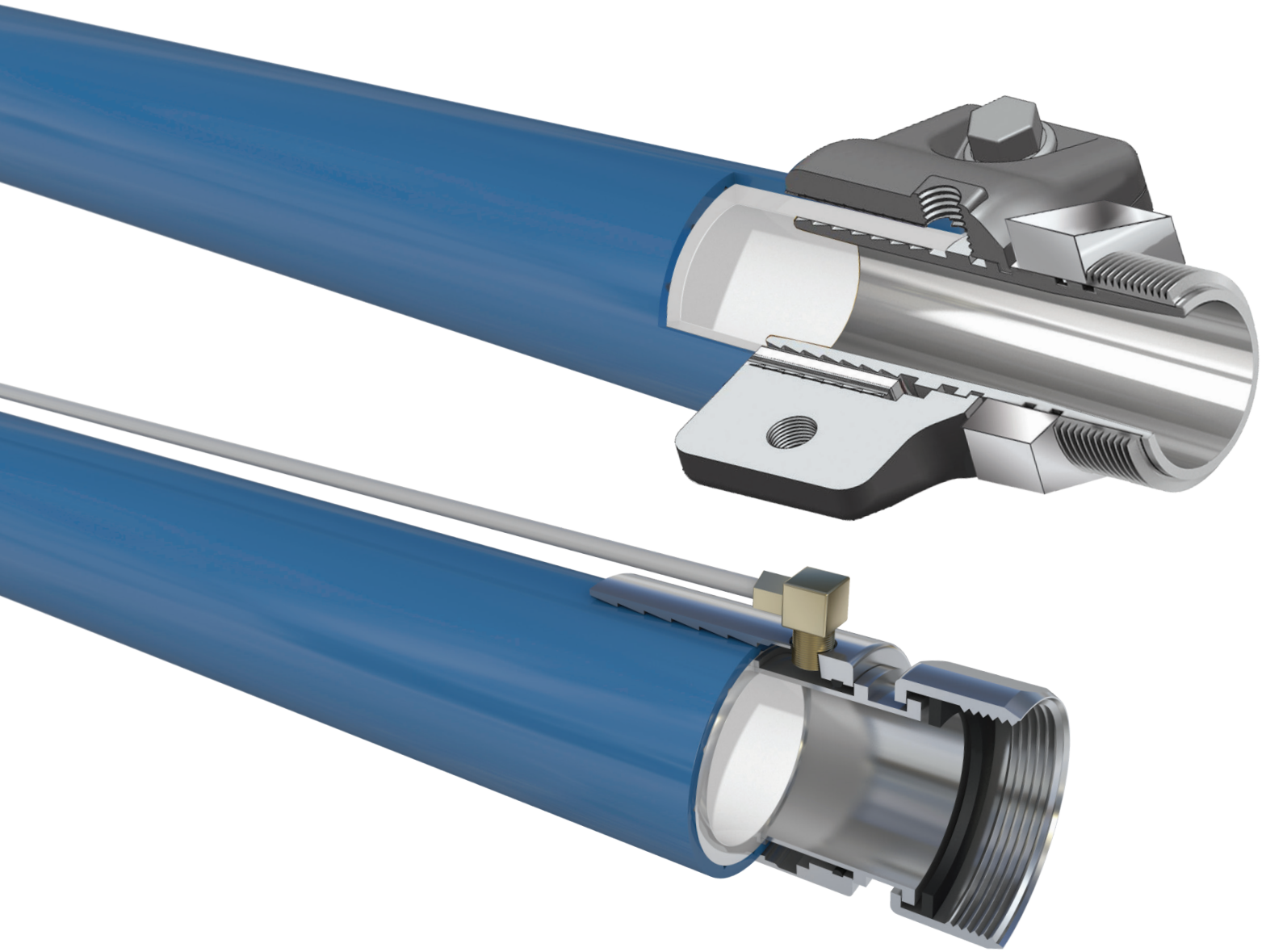
www.opwretailfueling.com

FUELED BY EXCELLENCE

FlexWORKS

TABLE OF CONTENTS

Flexible Underground Piping Installation



OPW
RETAIL FUELING
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IMPORTANT INFORMATION FOLLOW ALL INSTRUCTIONS

1.0 General Information

These installation instructions contain important information about the proper installation of OPW Retail Fueling's FlexWorks Flexible Piping Systems. This information and instructions primarily deal with underground fuel piping. Other components such as tank sumps, dispenser sumps, and other piping systems used for tank vent, stage II vapor recovery and remote fill lines have their own individual installation instructions. Refer to OPW Retail Fueling's FlexWorks Flexible Piping Manual for more detailed instructions.

This installation instruction or the information contained within, must be given to the site owner or operator upon completion of work.

NOTICE: OPW Retail Fueling system components may only be installed and serviced by a factory trained and currently certified installer in order for the product warranty to be valid. The use of non-certified personnel or any deviations from these written procedures could result in damage or leakage of the system and void the product warranty. Contact OPW Retail Fueling's Customer Service Department for more information at 1-800-422-2525.

2.0 UL Listings

FlexWorks double wall piping is listed with Underwriter's Laboratories (UL®) under file #MH16678 and labeled as follows: Motor Vehicle Fuels, High Blend Fuels, Concentrated Fuels and Aviation and Marine.

3.0 UL Listed Warranted Fuels

Below are the listed fuels that have been tested under UL 971 and are warranted for use with the FlexWorks Flexible Piping System.

Motor Vehicle Fuels

100% ASTM Reference Fuel No. 2
100% ASTM Reference Fuel C
85% Reference Fuel C – 15% MTBE
70% Reference Fuel C – 30% Ethanol
85% Reference Fuel C – 15% Methanol

High Blend Fuels

50% Reference Fuel C - 50% Methanol
50% Reference Fuel C - 50% Ethanol

Concentrated Fuels

100% Methanol
100% Ehtanol
100% Toluene

Aviation and Marine Fuels

100% Premium Leaded Gas
100% Kerosene

WARNING: Failure to secure written approval from OPW Retail Fueling concerning non-warranted fuels and liquid chemicals, will void the product warranty and could potentially cause environmental damage or personal injury.

FlexWorks Double Wall Pipe Couplings (DPC Series)						
Sizes	**Couplings**	**Male Adaptors**	**Female Adaptors**	**Tee Fittings**	**Elbow Fitting**	**Connectors**
1.5" FlexWorks (C15A)	DPC-2150A	SMA-1515, SMA-1520		STF-1515	SEF-1515	SCC-1515
2" FlexWorks (C20A)	DPC-2200A	SMA-2020		STF-2020, SRT-2151	SEF-2020, SRE-2015	SCC-2020
3" Flexworks (C30A)	DPC-2300A	SMA-3030		STF-3030	SEF-3030	SCC-3030
FlexWorks Swivel Bolt-On Pipe Couplings (SBC Series)						
Sizes	Couplings	Male Adaptors	Female Adaptors	Tee Fittings	Elbow Fitting	Connectors
3/4" FlexWorks (C075A)	SBC-2075	SMA-7575	SFA-7575			
1" FlexWorks (C10A)	SBC-2100	SMA-1010	SFA-1010			
1.5" FlexWorks (C15A)	SBC-2150	SMA-1515, SMA-1520		STF-1515	SEF-1515	SCC-1515
2" FlexWorks (C20A)	SBC-2200	SMA-2020		STF-2020, SRT-2215, SRT-2151	SEF-2020, SRE-2015	SCC-2020

4.0 Piping Applications

FlexWorks flexible piping may be used in the following applications.

- Pressure System Supply Piping
- Suction System Supply Piping
- Tank Vent Piping
- Stage II Vapor Recovery Piping
- Remote Fill Lines

WARNING: FlexWorks piping is not warranted for above ground transmission of flammable liquids due to the possible exposure to fire.

5.0 Operating Pressures & Vacuums

FlexWorks piping and its associated fitting systems have a minimum five to one (5:1) safety factor from maximum rated operating pressure for the primary pipe. The product fluids transferred should not exceed the maximum operating pressures indicated on each pipe size. For suction systems the pipe is capable of withstanding 29" mercury vacuum.

6.0 Operating Temperatures

FlexWorks pipe is for underground use only and a maximum operating temperature of 125ºF (52ºC).

7.0 Allowable Bend Radius

FlexWorks piping is a semi-flexible pipe and should never be bent at a radius of less than the designed bend radius. If a section of pipe becomes kinked, the kinked section should be cut-out of a piping length and it should be discarded and never used. NOTICE: For cold weather conditions (below freezing) refer to the Flexible Piping Manual for important installation tips.

Pipe Diameter	Min Bend Radius
3/4", 1"	18"
1-1/2"	24"
2"	36"
3"	72"

8.0 Storage, Transit & Handling

OPW Retail Fueling requires that all piping, fittings and system components be stored in such a manner that they will not be subject to direct sunlight and /or excessive environmental conditions. OPW Retail Fueling requires that the piping, fittings and system components are handled in such a manner that it will not cause any unnecessary damage. Do not drop, cut or cause severe impact to any of the components. Keep all piping, fittings and other components in the original packaging until ready for use. Keep all coupling protector caps/ covers on couplings and fittings until assembly. Inspect all fittings prior to installing. Parts that have been cut, cracked or otherwise misused should be replaced. Do not drive over, drag or damage FlexWorks Piping. Any damaged or compromised section of pipe should be discarded and not be used.

NOTICE: Never use knives or razor blades to open packaging as damage to piping could occur.

9.0 Assembly of FlexWorks Piping System

FlexWorks piping must be installed with OPW Retail Fueling tools and fittings. These include an OPW Retail Fueling coupling machine fitted with the appropriate size swage kit, bull nose plugs, a pipe cutter tool and jacket cutter/swivel wrenches for the appropriate size pipe. Failure to use OPW Retail Fueling tools and fittings may cause damage or failure of the system and void product warranty.

9.1 Pipe Burial Requirements

FlexWorks piping, and Access piping are strong, yet flexible, piping systems and must be buried in such a manner so that they will not compress. Be sure that proper pipe trenching, backfill materials and burial depth requirements are followed and in place prior to measuring and cutting FlexWorks piping and Access piping. Refer to the Flexible Piping Manual for complete instructions and warranty compliance.

Note: FlexWorks piping is intended for installation in normal soil applications.

CAUTION: Use extra caution when backfilling piping in trenches or open excavations so as not to damage or crush the piping or any associated fittings. Avoid sudden impacts from dumping backfill materials. Spread backfill gradually and evenly. Failure to do so could cause immediate or long-term damage to the piping.

CAUTION: FlexWorks and Access piping can be punctured by grade stakes or other sharp objects driven into the ground. The use of tracer tape or a schematic of the underground piping should always be kept onsite and marked off prior to commencing any work that may damage the pipe.

NOTICE: Installation instructions for containment sumps are not contained within this FlexWorks Piping instructions. Refer to the dedicated product manuals for the correct installation procedures and techniques for the containment sumps and flexible entry boots.

9.2 Installing Pipe Adapters

All FlexWorks fittings have proprietary threads and cannot be directly connected to standard National Pipe Thread (NPT) pipe fittings without an OPW Retail Fueling adapter. After all plumbing assemblies have been fabricated and installed inside the tank and dispenser sumps, install the appropriate OPW Retail Fueling pipe adapter (Swivel Adapter or Fitting) into NPT threaded pipefitting. This is done with standard pipefitting tools, but caution should be taken not to damage the OPW Retail Fueling threads or O-ring surfaces.

NOTICE: For NPT threads, use only UL classified thread sealant specifically formulated for gasoline and petroleum products. Do not over-tighten fittings for it could cause damage to the tapered threads.

CAUTION: Cutting the steel riser pipes and plumbing assemblies too long or too short could cause significant stress on the FlexWorks pipe and coupling that could ultimately cause failure. The FlexWorks fittings should always be in direct alignment with the flexible entry boot openings and cannot be used in lieu of a flex connector.

NOTE: It is important to select the correct size and type pipe entry boot to be used for a specific application and pipe size. Refer to the OPW Retail Fueling Flexible Entry Boot Manual of detailed information for installing these entry seals.

9.3 Installing Access Piping

Access Piping is a large diameter corrugated flexible piping that adds additional protection to FlexWorks piping and allows the pipe to be removed and replaced without the need for excavation. Measuring and cutting Access Pipe should be done prior to measuring

and installation of FlexWorks piping. The installation of Access Pipe is highly recommended for all FlexWorks piping systems. Refer to the Access Pipe installation manual for complete instructions and warranty compliance.

9.4 Measuring Pipe Distances

When measuring the distance between containment sumps to determine the proper length of a flexible pipe section to be installed, it is important to consider that the pipe is flexible and will not be installed perfectly straight. A slight weaving of the pipe in the piping trench is recommended to compensate for expansion and contraction characteristics of the piping. Measurements must be taken through the Duct chase pipe to insure the proper length. The measuring points will be from the face of the OPW Retail Fueling fitting to the next OPW Retail Fueling fitting. Record the "measured distance" and make the following adjustments depending on the connection system used: After the adjustments have been made to the recorded "measured distance", measure the outside of the unrolled flexible pipe carefully, following the bends in the piping and mark the location to be cut with a permanent marker. Cut the pipe with an OPW Retail Fueling pipe cutter as described in the Flexible Piping Manual.

NOTICE: Be sure the pipe cutter is sharp and free of chips for a proper cut. Inspect the end of the cut to be sure the construction of the pipe was not damaged or compromised.

9.5 Coupling FlexWorks Piping

STOP: Before coupling FlexWorks Piping, some components such as entry boots and the Duct may need to be installed onto the pipe prior to coupling. Refer to the Flexible Piping Manual for further clarification.

The FlexWorks piping system requires the use of the OPW Retail Fueling Coupling Machine for proper installation of the pipe couplings onto the ends of the flexible pipe sections. Refer to the Flexible Piping Manual for proper coupling machine use and warranty compliance. Different sizes of Swivel Couplings require their own swage kit to properly swage the coupling onto the pipe. Refer to the OPW Retail Fueling Products Price List for a list of the appropriate swage kit.

WARNING: OPW Retail Fueling's coupling machine is not intrinsically safe and cannot be used in hazardous areas.

NOTICE: Do not use silicone-based lubricants to lubricate the swage. Only metal assembly paste or white lithium grease should be applied into the coupling insert. Make sure entire coupling assembly is on the machine prior to swaging.

NOTICE: Make sure that the pipe is in a vertical position an that the coupling ferrule is against the coupling nut and the swivel nut is flush against the faceplate at all times during the swaging cycle.

9.6 Coupling Inspection

Inspect the installed pipe coupling assembly inside and out to make sure there was no damage to the insert, ferrule or nut during the swaging operation.

NOTICE: Before and after the coupling process the protective coupling cover should be kept on the coupling. This precaution will lessen the possibility of damage and contamination by dirt, sand and debris that could compromise the sealing process.

9.7 Installing Coupled Pipe Sections

After a pipe section has been coupled and inspected, the coupled pipe section may be connected to the OPW Retail Fueling adapters and/ or fittings.

9.8 Installing Pipe Through Chase

At this stage all of the Access chase piping sections should already be installed. Install the appropriate size Bull Nose Plug into the coupling and push the FlexWorks piping through the Duct. (Refer to OPW Retail Fueling's Flexible Underground Piping Manual for complete instructions)

9.9 Connecting Pipe Sections

After all coupled pipe sections have been inserted into the containment sumps then connection of the pipe sections can begin inside the containment sumps. Prior to connecting all double wall FlexWorks piping with swivel couplings, install the appropriate size test boot.

NOTICE: Prior to connecting Swivel Couplings, inspect the pipe couplings to make sure all seals are in place and free of dirt and debris. Look for any damage to the seals that may have occurred during the coupling procedure or when installing through the Access Pipe.

9.9.1 Swivel Fitting Systems

When installing DPC couplings, hand tighten the coupling onto the OPW Retail Fueling fittings until it is snug. With an OPW Retail Fueling grommet wrench, tighten the coupling nut ¼ turn more or to 200 in/lbs. Do not allow the pipe to rotate while tightening. The ¼ turn procedure will prevent over tightening of the coupling past the maximum 200 in/lbs.

CAUTION: Over tightening of the coupling will cause damage to the coupling gasket and result in the eventual leak of the system.

CAUTION: Never use pipe dope or sealant on the threads of a DPC Coupling.

9.9.2 ¾" and 1" DPC Pipe Couplings

The ¾" and 1" FlexWorks pipe couplings are fixed male NPT fittings and are assembled as rigid steel pipe. After installing the appropriate test boot, apply a liberal amount of UL Listed thread sealant to the threads of the coupling and tighten to 20 ft/lbs.

9.9.3 Interstitial Test and Connector Tube Assemblies

The jacket of double wall FlexWorks piping must be tested to ensure liquid tightness. Connect all test and connector tubes into the test boots. Tighten all band clamps to 30 in/lbs.

10.0 Testing Supply Pipe

It is important to properly test the FlexWorks piping system prior to backfill to insure there are no leaks in the primary or secondary piping. The following test procedures are provided as a guideline only and the manufacturer assumes no responsibility or liability for the consequences of any testing practices.

Note: Access piping provides additional protection and the ability to perform routine maintenance or removal of FlexWorks piping and is not intended as containment. Air testing of the Access piping is not required however, should testing of the chase be desired, pressurize the Access Pipe to no more than 5 PSI.

CAUTION: Integrity testing with air, gas or water can be dangerous and it is very important that the proper testing equipment be used and that the testing procedures be adhered to. OPW Retail Fueling assumes no responsibility or liability for the consequences of any testing practices. Only qualified and experienced personnel should conduct the air pressure testing. Never disconnect couplings, caps, or plugs unless the air pressure has been released.

NOTICE: All testing requirements must be in accordance with all applicable codes.

CAUTION: Always make sure the underground storage tank and dispensers are isolated from the piping system when conducting pressure tests.

NOTICE: Significant temperature changes can result in a pressure reading differential.

10.1 Primary Pressure Testing

- **Pre Backfill Pressure Testing:** Before backfilling of the pipe, an air pressure hold & soap test is required. Pressurize the primary pipe to sixty pounds per square inch (60 PSI). Gradually apply air pressure into the flexible piping line and maintain this pressure for a minimum of 1 hour, or in accordance with the authority having jurisdiction (AHJ), prior to backfilling.
- **Post Backfill Air Pressure Testing:** After backfilling, if the pressure on the primary was released, an additional air pressure hold test is required. Pressurize the primary pipe to sixty pounds per square inch (60 PSI). Gradually apply air pressure into the flexible piping line and maintain this pressure for a minimum of 1 hour, or in accordance with the authority having jurisdiction (AHJ), making sure that there is no drop in pressure.

10.2 Secondary Pressure Testing

- **Pre Backfill Air Pressure Testing:** After the primary line pressure stabilizes, gradually apply air pressure into the interstitial space of the flexible piping line. Do not exceed ten pounds per square inch (10psi) or 69kPa, making sure there is no drop in pressure for a minimum of one hour, or in accordance with the authority having jurisdiction (AHJ).
- **Post Backfill Air Pressure Testing:** After backfilling an air pressure hold test is required. After the primary has held pressure steadily for at least 1 hour, gradually apply air pressure to the secondary test tube, not to exceed 10 PSI. Maintain this pressure for a minimum of 1 hour, or in accordance with the authority having jurisdiction (AHJ), making sure that there is no drop or increase in pressure.

NOTICE: During pressurizing, check the reading on the interstitial test gauge that should be securely connected to the Interstitial Test Tube. Any increase in pressure will indicate a leak in the primary pipe or Fittings.

NOTICE: All testing requirements must be in accordance with all applicable codes.

CAUTION: Always make sure the underground storage tank and dispensers are isolated from the piping system when conducting pipe pressure tests.

11.0 Routine Maintenance and Visual Inspections

OPW Retail Fueling recommends routine (at least once a month) visual inspections inside all containment sumps. Fuel leaks collected in containment sumps must be reported immediately and investigated by the site owner. If leakage or damage to the piping system is suspected, OPW Retail Fueling must be notified immediately.

All sumps must be kept free of fuel, water and debris. When changing fuel filters at the dispenser, make sure any spilled product is cleaned out of the bottom of the dispenser sump to prevent a possible fire hazard.

CAUTION: Ignoring or disabling leak detection alarms can lead to further damage and possible failure of the system.

CAUTION: Failure to remove fuel and liquids from containment sumps may compromise the performance and integrity of the sump and its associated fittings and seals over prolonged periods of time.

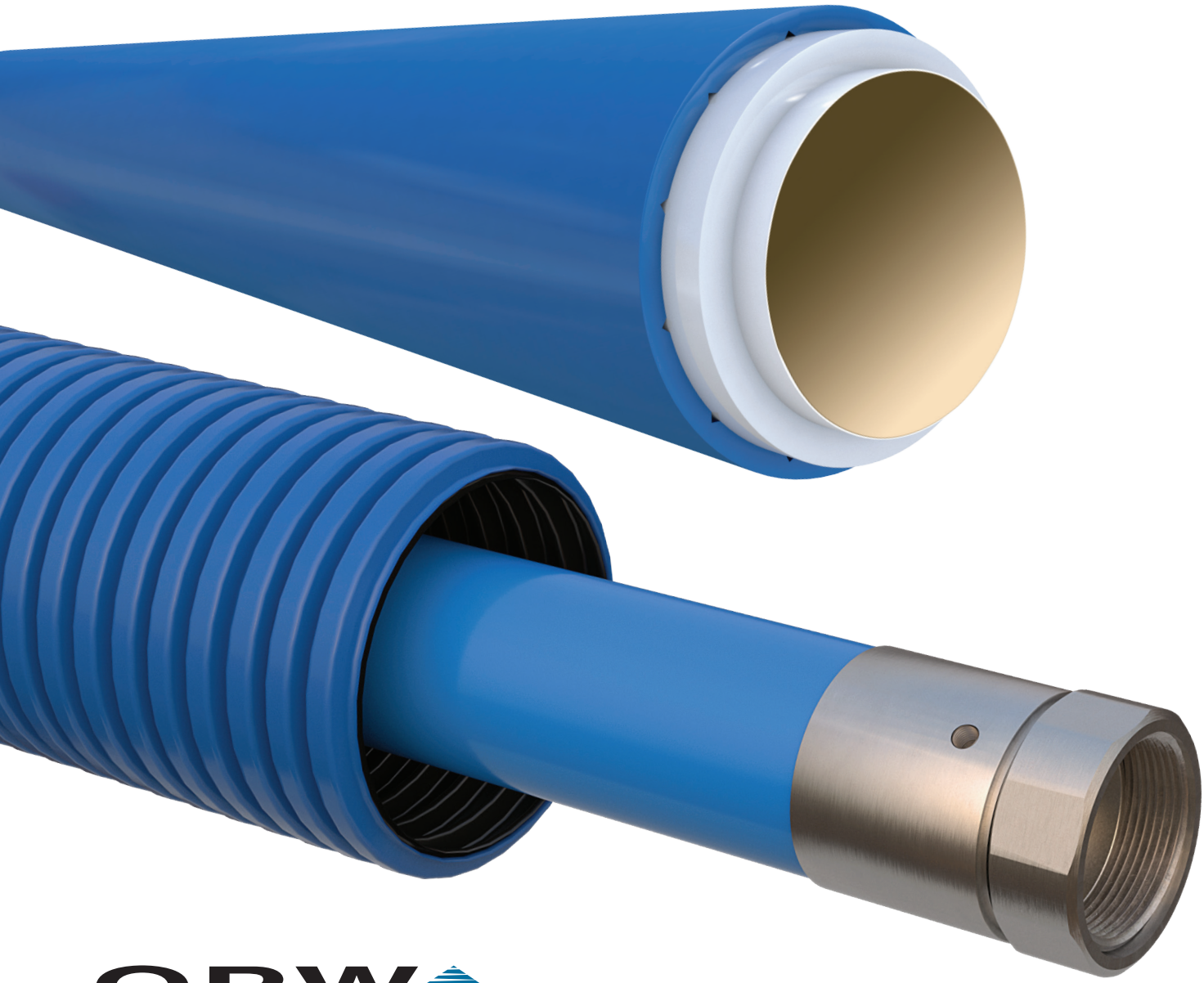
12.0 Warranty Registration

Warranty registration must be completed and mailed to OPW Retail Fueling for warranty activation. A copy of the warranty registration should be given to the site owner for their records.

13.0 OPW Retail Fueling Contact

OPW Retail Fueling can be contacted if there are any questions concerning the installation, maintenance or repair of FlexWorks piping. Additional publications are also available on OPW Retail Fueling's website www.opwglobal.com or upon request.

Flexible Underground Piping Manual



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INDEX

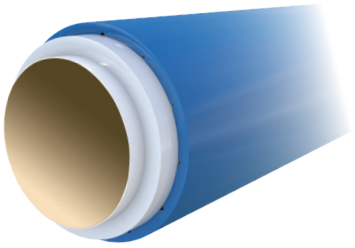
IMPORTANT INFORMATION FOLLOW ALL INSTRUCTIONS

Please contact your OPW sales representative or OPW customer service representative at 1-800-422-2525 for OPW products installation procedures. All OPW literature including installation instruction sheets and manuals can be accessed from the OPW website at: www.opwglobal.com.

The use of non-qualified personnel or any deviations from these recommended procedures could result in damage or leakage of the system.

Manual Abbreviations:
PS = Integral Primary/Secondary Pipe
NV = Normal Vent
VR = Vapor Recovery
PP = Petroleum Products
Pri = Primary
Sec = Secondary
WP = Working Pressure
PC = Primary Carrier Pipe
MV = Motor Vehicle Fuels

1.0 INTRODUCTION



The FlexWorks family of products by OPW Retail Fueling offers a full line of flexible piping and pipe connection products to provide an environmentally safe means of conveying fuels from underground storage tanks to above ground fuel dispensers. The variety of piping and pipe connections available allows for a wide range of pipe routing options to meet any site design requirements. Flexible piping has proven to be safer than conventional rigid piping which requires numerous connection joints and directional fittings. In addition, flexible piping has proven to be considerably faster to install and more cost effective than rigid piping

1.1 General Information

This product manual contains useful information about all types of flexible piping products and their associated connections, accessories and installer tools. It is required that this manual be read prior to specifying and installing flexible piping. The installation practices shall comply with these installation instructions contained within this product manual in order for the piping system warranty to be valid.

IMPORTANT: OPW Retail Fueling system components may only be installed and serviced by a factory trained and currently certified installer in order for the product warranty to be valid. The use of non-certified personnel or any deviations from these written procedures could result in damage or leakage of the system and void the product warranty. Contact OPW Retail Fueling's Customer Service Department for more information at 866-547-1816.

1.2 Certifications and Approvals

Each of OPW Retail Fueling's flexible piping systems carry various global approvals based on the individual construction of each type of pipe.

1.2.1. UL Listings

FlexWorks double wall piping is listed with Underwriter's Laboratories (UL®) under file #MH16678 and labeled as follows: Motor Vehicle Fuels, High Blend Fuels, Concentrated Fuels and Aviation and Marine.

UL Listed Fuels

Below are the listed fuels that have been tested under UL 971 and are warranted for use with the FlexWorks piping system.

Motor Vehicle Fuels
100% ASTM Reference Fuel No. 2
100% ASTM Reference Fuel C
85% Reference Fuel C – 15% MTBE
70% Reference Fuel C – 30% Ethanol
85% Reference Fuel C – 15% Methanol

High Blend Fuels
50% Reference Fuel C - 50% Methanol
50% Reference Fuel C - 50% Ethanol

Concentrated Fuels
100% Methanol
100% Ethanol
100% Toluene

Aviation and Marine Fuels
100% Premium Leaded Gas
100% Kerosene

WARNING: FlexWorks piping is not warranted for above ground transmission of flammable liquids due to the possible exposure to fire.

1.3 Piping Applications

OPW Retail Fueling's flexible supply piping can be direct buried underground or installed inside a flexible conduit.

- Pressure System Supply Piping
- Suction System Supply Piping
- Marina Supply Piping *
- Vent Piping
- Remote Fill Lines
- Vapor Piping

*Properly designed applications, such as under dock marina applications may be allowed with special approval and warranty restrictions. Other above ground applications containing flammables must have prior written approval and authorization from OPW Retail Fueling for warranty coverage. All installation practices shall comply with the installation instructions contained within this and other OPW Retail Fueling product manuals.

WARNING: Flex piping is not warranted for above ground transmission of flammable liquids due to the possible exposure to fire.

OPW Retail Fueling flexible piping and its associated fitting systems have a minimum five to one (5:1) safety factor from maximum rated operating pressure for the primary pipe. The product fluids transferred should not exceed the maximum operating pressures indicated on each pipe size. For suction systems the pipe is capable of withstanding 29" mercury vacuum. The maximum temperature rating of OPW Retail Fueling's flexible piping is 125°F (52°C).

Pipe Size	Maximum Working Pressure Rating
3/4"	145 psi
1"	125 psi
1-1/2"	100 psi
2"	75 psi
3"	75 psi

1.4 Warranted Fuels

Warranted fuels are listed as follows:

- Gasoline
- Kerosene
- Methanol
- Jet "A"
- Gasohol
- Diesel Fuels
- Alcohol fuels
- Ethanol
- Motor Oils
- Av-gas

Contact OPW Retail Fueling for chemical compatibility of fluids not listed above.

1.5 Pipe Packaging

OPW Retail Fueling's flexible piping systems are available in a variety of piping diameters on continuous rolls and packaged in easy to handle protective cartons and reels. Refer to the OPW Product Catalog for pipe diameters and packaging specifications.

CAUTION: Do not use knives or razor blades to open carton as damage to piping could occur.

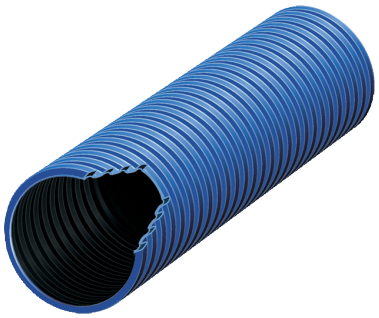
2.0 SPECIFYING FLEXIBLE PIPING

OPW Retail Fueling's flexible piping systems offers a variety of piping options for underground fuel delivery applications. Prior to specifying the type of piping required, read section 6 of this manual entitled "Pre-Installation Planning".

2.1 Double Wall Supply Piping

FlexWorks flexible supply piping is designed for direct burial as well as indirect burial within flexible ducting for future replacement capabilities. OPW Retail Fueling's supply piping is totally bonded multi-layer composite construction. The inner-most barrier layer is smooth, which enhances hydraulic flow efficiency, and is virtually impervious to gasoline, alcohol blends and a wide variety of other fuels and chemicals. The exterior of the pipe also has a barrier layer to protect the outer wall of the pipe from chemical and microbial attack. OPW Retail Fueling's flexible supply piping is available in double wall in continuous lengths.

2.2 Access Pipe



Access Pipe, recommended in all FlexWorks uses, is a large diameter corrugated flexible piping that adds additional protection to OPW Retail Fueling's flexible piping and allows the pipe to be removed and replaced without excavation. Made of high density polyethylene, this corrugated tube is strong enough to withstand H-20 loading requirements when properly buried and thick enough to minimize damage from shipping and jobsite handling. Access Pipe can accommodate the 3/4 ", 1", 1-1/2", 2" and 3" Flex supply pipe.
Access pipe is available in 4" and 6" diameters.

4" Access Pipe: 3/4" - 2" Supply Pipe

6" Access Pipe: 3" Supply Pipe

3.0 FLEX PIPING CONNECTIONS

OPW Retail Fueling's flexible supply piping can be direct buried underground or installed inside a flexible conduit.

OPW Retail Fueling offers multiple piping connection systems for use with their flexible piping. OPW's piping connections can accommodate a wide variety of piping designs, layouts and installation applications.

Swivel Couplings & Fittings

These piping connections are made of stainless and protected steel featuring a swivel nut connection with a Viton gasket seal. Swivel fittings require the use of the Flex Coupling Machine to install the pipe couplings.

3.1 Double Wall Swivel Pipe Couplings (DPC Series)

Double Wall Swivel couplings and fittings are of a double wall design and are used to interconnect FlexWorks flexible piping. These UL/ ULC listed stainless steel couplings must be contained within containment sumps or properly buried per PEI RP 100 best practices for piping materials.

The pipe connection system includes an internally expanded stainless steel coupling attached to the end of a FlexWorks pipe section. The swivel coupling has a smooth sealing face fitted with a gasket (Reach out to OPW Retail Fueling for extreme cold temperatures). Double Wall Swivel Couplings eliminate the need for cutting back the secondary jacket and rubber test boots. They have an integral interstitial access port for connector and test tubes.

Please see FlexWorks publication DPC-0001 or 205986 Installation Instructions for Double Wall Couplings (DPC) and Test Tubes (TTT and TCT).

3.1.2 Swivel Male Adapters

Male pipe adapters are designed to connect one end of a flexible pipe section fitted with a swivel pipe coupling to a threaded female coupling or fitting. These metallic adapters have a male pipe thread on one end and a custom male thread to accept the swivel pipe coupling.

3.1.3 Swivel Pipe Connectors

These connectors are designed to connect two flexible pipe sections fitted with swivel pipe coupling. These connectors cannot be directly buried and are required to be installed inside a containment sump. When used with double wall piping, it is recommended that test boots with connector tubes be used.

3.1.4 Swivel Junction Tees

These tee fittings are used in pressure type piping systems whereby the piping is routed in series. These tee fittings connect two flexible pipe sections fitted with swivel pipe couplings at the horizontal openings to a riser pipe at the vertical opening. When used with double wall piping, connector tubes are recommended.

3.1.5 Swivel Terminating Elbows

These elbow fittings can be used in both pressure and suction type piping systems when the piping is routed in series or direct. These elbow fittings connect one flexible pipe section fitted with a swivel pipe coupling at the horizontal opening and connect to a riser pipe at the vertical opening. When used with double wall piping, connector tubes are recommended.

3.1.6 Swivel Terminating Elbows

These elbow fittings can be used in both pressure and suction type piping systems when the piping is routed in series or direct. These elbow fittings connect one flexible pipe section fitted with a swivel pipe coupling at the horizontal opening and connect to a riser pipe at the vertical opening. When used with double wall piping, connector tubes are recommended.

4.0 FLEXWORKS PIPE ACCESSORIES

There are a variety of accessory components which may be used with OPW Retail Fueling's flexible piping systems.

4.1 Test Tubes

OPW's test tubes are designed to provide access to the beginning and end of the interstitial space of double wall pipe for initial and periodic air pressure testing. There are two types of test tubes available for use. One type is used with test boots and fitted with a shrader valve and stainless steel band clamp on the lower end for insertion and clamping into the test boot port.

4.2 Connector Tubes

These short flexible tube assemblies are designed to reroute the interstitial space of one double wall flexible pipe section around a metallic junction tee fitting to the next double wall flexible pipe section. They come fitted on each end with a barbed air stem coupling elbow and stainless steel band clamp for insertion and clamping into the test boot port.

5.0 INSTALLER TOOLS

OPW Retail Fueling offers a variety of Installer tools for installing OPW Retail Fueling's flexible piping system.

NOTE: To insure proper installation and product warranty coverage, only OPW Retail Fueling pipe coupling equipment and pipe fabricating tools must be used.

5.1 Pipe Cutter

FlexWorks pipe cutters are designed to produce a clean and even pipe cut which is necessary for proper coupling attachment.

Part #	OPW Pipe Sizes
PCT-2000	3/4", 1", 1.5", 2"
PCT-3000	3" Pipe Cutter

5.2 Coupling Machines

FlexWorks Coupling Machines are required for the installation of Double Wall Pipe Couplings (DPC). The machines are designed to internally expand the metal pipe insert installed at the end of a flexible pipe section. Coupling machines are available in electric, hydraulic and manuals. Consult your local OPW Retail Fueling distributor for availability for rental or purchase of the coupling machines.

Model	Application
CMM-200	Coupling Machine, Manual
CMP-200	Coupling Machine, Pneumatic
CME-200	Coupling Machine, Electronic

IMPORTANT: Before and after the coupling process, the supplied dust cover should be kept on the couplings. This precaution will lessen the possibility of damage.

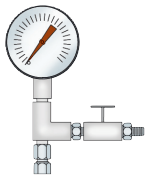
NOTE: When installing DPC couplings, hand tighten the coupling onto the OPW Retail Fueling fitting until it is snug. Tighten the coupling nut 1/4 turn more or to 200 in/lbs. Do not allow the pipe to rotate during tightening. This procedure will prevent over tightening of the coupling past the maximum 200 in/lbs.

These elbow fittings can be used in both pressure and suction type piping systems when the piping is routed in series or direct. These elbow fittings connect one flexible pipe section fitted with a swivel pipe coupling at the horizontal opening

5.3 Test Caps

These custom threaded plugs have a 1/4" NPT port in the end for attachment of an air gauge or a valve stem (not included). Test caps are used to test the integrity of each pipe section prior to installation.

5.4 Test Gauge Assembly



This air gauge assembly provides a means of testing only the interstitial space of double wall piping. These gauges connect to the end of the test tubes and have a maximum pressure rating of 15 psi.

5.5 Fishing Bullnose

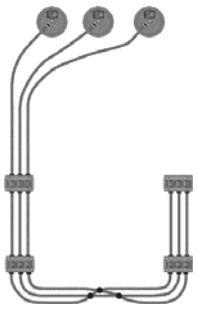
Attaches to the end of a flexible pipe section in order to fish (push or pull) the flexible pipe section through the Access Pipe. Its rounded nose provides an easy means of feeding the pipe through the Access Pipe. The swivel bullnoses are fitted with a metal eyelet for attachment of a plumber's fish. Available in 1.5", 2", 3" pipe sizes for attachment to DPC Couplings.

6.0 PRE-INSTALLATION PLANNING

The type of pipe routing design selected is dependent on the quantity and orientation of the dispensers, the type of system (either pressure or suction) and the layout of the facility. One constant design requirement is that all piping that runs between containment sumps be continuous. Single and dual piping lines may be used depending on the total quantity of dispensers to be serviced and the location and orientation of the islands. The pipe routing design criteria for OPW Retail Fueling's flexible piping system is considerably different than that of conventional rigid piping. For either new or retrofit installations, good pre-installation planning is a must to ensure a proper installation.

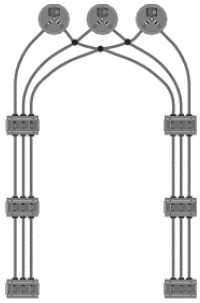
6.1 Single Series Routing

This system is used in "pressure" systems where one piping line interconnects all of the product dispensers.



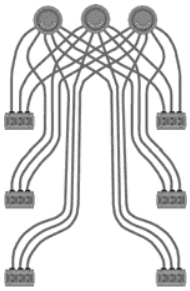
6.2 Dual Series Routing

This system is used in "pressure" systems where two piping lines interconnect all the dispensers divided equally.



6.3 Direct Routing

This system is used in "suction" systems where one piping line is directly connected to only one dispenser inlet.



7.0 PIPING DESIGN CRITERIA

When designing and installing Flex piping systems, use the following criteria to insure that they meet OPW Retail Fueling's requirements:

7.1 Piping Turns

Piping trenches should be cut with sweeping turns. Flexible piping turns require specific radii depending on the pipe diameter. Piping turns should not be less than:

75" - 18" Radius

0" - 18" Radius

5" - 24" Radius

0" - 36" Radius

0" - 72" Radius

7.2 Piping Crossovers

A minimum compacted layer of either 2" of approved pea gravel or crushed stone or 4" of approved sand backfill must separate each pipe.

7.3 Piping Supply Capacity

For a pressure piping system using single piping runs routed in series, no more than a total of six dispensing nozzles should be serviced with a 1-1/2" single piping line to prevent unacceptable product flow rates.

7.4 Vent Piping Fall

If Vent Piping is used for vent lines, make sure there is adequate fall back to the tank from the vent stack. OPW Retail Fueling requires a minimum 1/8" per foot slope for all vent lines. Vent pipe must not have any sags or traps in which liquid can collect. Must be installed per NPFA 30, NFPA 30A, and the authority having jurisdiction (AHJ).

7.5 Product Sequence

The dispensing product sequence will alternate from one dispenser to the next when "loop-around" is used. Pipe crossovers are recommended at these points to correct the change in product sequence in "series" routing of pressure piping systems.

8.0 PIPE BURIAL REQUIREMENTS

OPW Retail Fueling's flexible piping and access piping are strong, yet still flexible, and must be buried in such a manner that they will not compress. The burial requirements depend on proper pipe trenching, backfill material and burial depth. Follow these instructions for warranty compliance:

8.1 Trench Sizing

Piping trenches should be dug in such a manner that the trench width is equal to at least twice the width of all the flexible pipes contained within. All piping within the trench should be separated by the outside diameter of the piping being installed with a required minimum of 2" (50 mm) of separation for all piping. Trench turns should be sweeping rather than sharp angles. The bottom of the trench should be compacted and as uniform as possible to eliminate high spots to insure an even layer of bedding material under the pipe. Remove all sharp rocks and debris from the trench bottom before bedding material is installed.

8.2 Bedding & Backfill Materials

Approved bedding and backfill materials for OPW Retail Fueling's flexible piping, sumps and Access piping shall meet the following specifications:

8.2.1 Pea Gravel

Rounded pea gravel is permitted with a minimum diameter of 1/8" and a maximum diameter of 3/4".

8.2.2 Crushed Stone

Crushed stone is permitted providing it shall be washed clean and be of the free flowing type with an angular stone size between 1/8" and 1/2". (Meets ASTM C-33 paragraph 9.1 requirements.)

8.2.3 Sand

Sand backfill is permitted providing it shall be washed clean and is free flowing with a maximum content of 10% fines. When backfilling, make sure sand is evenly distributed and fully compacted under and fully around the piping.

NOTE: A minimum of 6" (152mm) of approved bedding material shall be spread and compacted evenly along the bottom of the piping trench. All bedding and backfill material should be clean and free from ice and snow and debris. Using material other than those described above without written approval from OPW will void the product warranty.

8.3 Flexible Pipe Sloping

If a continuous slope or "fall" is required from the last dispenser on a piping run to the tank, then the tanks should be buried at a sufficient depth and the pipe entry height into the dispenser sump should be of sufficient elevation so that 1/8" of fall per linear foot is maintained. OPW does not require its flexible pipe to be sloped in pressure systems.

8.3.1 Pressure Piping Systems

A pipe sensor must also be placed in the terminating dispenser sump or tank sump, whichever is at a lower elevation.

If the full system warranty is desired, check your local code regulations for fall and sensor requirements other than that which is previously stated.

8.3.2 Suction Piping Systems

Sloping the OPW Retail Fueling flexible piping from the dispenser back to the tank is always required for suction piping systems where maintaining prime is necessary. Shallow dispenser sumps are recommended for use in this application.

8.4 Pipe Trench Backfilling

Backfilling of the flexible piping system should occur only after the final integrity testing has been performed on both the primary and the secondary of the pipe. Prior to backfilling completely, hand shovel the backfill material between and to the outside of the pipe to maintain the minimum required spacing between the pipes and walls of the trench. Final backfilling shall be done slowly and evenly in 4" to 6" layers as not to disturb the spacing of the pipe and to insure no voids are present in the backfill. An additional air test is recommended after backfilling to insure the backfill process has not damaged the pipe.

8.5 Overburden

The type of surface installed above the piping can have an overloading effect on the flexible piping. Follow the overburden specifications below for product warranty compliance.

CAUTION: FlexWorks piping and Access piping can be punctured by grade stakes or other sharp objects driven into the ground. The use of tracer tape or a schematic of the underground piping should be kept onsite and marked off prior to commencing any work that may damage the pipe.

8.5.1 Unpaved Surfaces

If the surface is unpaved, then a minimum of 18" (457mm) of approved backfill material should be installed between the top of all flexible piping and the top of the ground surface.

8.5.2 Paved Surfaces

If the surface is paved with either asphalt or concrete the total amount of pavement plus approved backfill material shall be a minimum of 18" (457mm) between the top of either the flexible piping and the top of the paved surface.

8.5.3 Access Pipe Burial

Whether the surface is paved or unpaved with either asphalt or concrete then there shall be a minimum of 16" (406mm) between the top of the Access Pipe and the top of the paved or unpaved surface.

9.0 FLEX PIPING OPTIONS

OPW's FlexWorks Piping System offers several types of pipe coupling options. These options, in turn, allow for a variety of piping application options for the flexible pipe used in both pressure piping systems and suction piping systems.

9.1 Swivel Couplings & Fittings

These piping connections are made of stainless and protected steel featuring a swivel nut connection with a Viton/fluorosilicone gasket seal. Swivel fittings require the use of the Flex Coupling Machine to install the pipe couplings.

9.2 Double Wall Swivel Pipe Couplings (DPC Series)

Double Wall Swivel couplings and fittings are of a double wall design and are used to interconnect FlexWorks flexible piping. These UL/ ULC listed stainless steel couplings must be contained within containment sumps or properly buried per PEI RP 100 best practices for piping materials.

The pipe connection system includes an internally expanded stainless steel coupling attached to the end of a FlexWorks pipe section. The swivel coupling has a smooth sealing face fitted with a gasket (Reach out to OPW Retail Fueling for extreme cold temperatures). Double Wall Swivel Couplings eliminate the need for cutting back the secondary jacket and rubber test boots. They have an integral interstitial access port for connector and test tubes.

Please see FlexWorks publication DPC-0001 or 205986, Installation Instructions for Double Wall Couplings (DPC) and Test Tubes (TTT and TCT).

10.0 INSTALLING ACCESS PIPE

Access Pipe is a large diameter corrugated flexible piping that adds additional protection to OPW Retail Fueling's flexible piping and allows the pipe to be removed and replaced without excavation. Measuring and cutting Access Pipe should be done prior to measuring and installing the primary piping. OPW recommends the installation of Access Pipe for all installations of flexible piping.

10.1 Access Pipe Measuring

Prior to measuring for the Access Pipe, install the Access Pipe entry boots into the sidewall of the dispenser sump. Refer to the entry fitting installation manual for the proper installation procedures for the entry boots. Measure the distance from the sump wall of the first sump to the sump wall of the second sump. Make sure to follow the contour of the trench.

10.2 Access Pipe Cutting

Transfer measurement to the Access Pipe and make cut in the closest valley.

10.3 Access Pipe Connector

Insert the black stiffener into the Access Pipe, then insert the Access Pipe into the boot from outside of the sump. Repeat this same installation procedure with the other end of the Access Pipe section.

11.0 TANK SUMP PLUMBING TREES

The type of piping application used shall determine what

type of piping connections shall be made inside the tank sump.

NOTE: Prior to assembling plumbing trees, be sure the OPW fittings are aligned with the pipe entries through the sump wall to prevent excessive bending of the pipe within the sump.

11.1 Pressure Supply Systems

For pressure piping systems, the flexible piping may be connected to the tank's submersible pump using pipe adapters, fittings or a flexible connector. For this application, both single and dual line connections may be made.

11.1.1 Single Pipe Line To Pump Connections

This application includes a plumbing tree assembly which interconnects the submersible pump to a single flexible piping line. A typical pipe connection assembly would include a ball shut-off valve and standard plumbing elbow installed between the submersible pump and the pipe adapter, as shown.

For swivel type piping connections, a plumbing assembly fitted with a standard plumbing elbow fitting would be connected to a swivel or barbed adapter. The arrangement accommodates the connection of a swivel pipe coupling installed on the end of a flexible pipe section.

11.1.2 Dual Pipe Lines To Pump Connections

This application includes a plumbing tree assembly which interconnects the submersible pump to two flexible piping lines. A typical connection assembly would include a tee fitting or a "Y" adapter fitting fitted with a ball shut-off valve and two standard plumbing elbows.

The adapter is attached by first applying the specified thread sealant to the male pipe threads. Then hand tighten firmly followed by two full turns with a pipe wrench.

For swivel type piping connections, a plumbing assembly fitted with two standard plumbing elbow fittings would be connected to swivel or barbed adapter. This arrangement is to accommodate the connection of swivel pipe couplings installed on the end of two flexible pipe.

11.2 Suction Supply Systems

For suction systems, all flexible piping connections are made directly into the tank. In this application typically a tank manway cover would be fitted with a multitude of female threaded tank fittings. These tank fittings should have pipe fittings, either standard plumbing elbows or capped tees installed and aligned facing the entry point of the flexible pipe sections.

11.2.1 Metallic Connections To Tank Fittings

Install the metallic pipe adapters into the pipe fittings to accommodate the metallic pipe couplings installed to the end of the flexible pipe sections.

12.0 DISPENSER SUMP PIPE CONNECTIONS

The plumbing connections required inside dispenser sumps can be simple or complicated depending upon the plumbing requirements, dispenser size, and pipe entry locations. Pipe entries that are located considerably off the center line may require the use of flex connectors as riser pipes instead of rigid steel riser pipes.

The type of piping application specified shall determine what type of piping connections shall be made inside dispenser sumps.

12.1 UDC Pipe Assemblies

Riser and flex connector pipe assemblies are designed to interconnect one or two flexible pipe sections to the above ground product dispenser. They are fitted with a shear valve mounted to a stabilizer bar at grade. At the low end they may be fitted with either tee fittings or elbow fittings. Refer to the following riser pipe options available with OPW's flexible piping system.

12.1.1 Steel Pipe Riser Measuring

Cutting the steel riser pipe to the proper length will allow the piping to enter the dispenser sump on a straight and level plane and in line with the tees, elbows and adapters. Improper riser length results in stress at the pipe fitting/pipe coupling connection. Please follow the steps noted below:

- Install the stabilizer bars in their proper position, per OPW Stabilizer Bar Installation Instructions, which can be determined by the dispenser manufacturer's footprint for the particular dispenser model. This will allow for proper vertical alignment.
- Install the shear valve to the shear valve mounting plate and secure this to the stabilizer bar in accordance with the dispenser manufacturer's footprint.
- Install the entry boots in accordance with the OPW Entry Fitting installation instructions.
- Line up the center of the entry boot with the center of the opening of the tee, elbow or adapter.
- Determine the length of the steel riser by measuring between the bottom of the shear valve and the top of the tee, then add 1-1/2" to that length prior to cutting the NPT threads for each end of the riser.
- Install the riser to the top of the shear valve with the use of soft set pipe dope that is UL approved for use with petroleum products.
- Install the tee, elbow or adapter to the bottom of the riser, positioning it properly to align with the entry fitting horizontally, with the use of soft set pipe dope that is UL approved for use with petroleum products.
- Reinstall the riser set up to the stabilizer bar and then make sure that the tee, elbow or adapter opening is on center with the entry fitting opening on both the horizontal and vertical plane.
- Assure that the opening of the tees, elbows or adapters are all on center with the entry fitting, on both the horizontal and vertical plane.

13.0 FLEXIBLE PIPE FABRICATION

After all plumbing trees have been installed inside the tank sumps and riser assemblies installed into either the deep or shallow dispenser sumps, fabrication and installation of the flexible piping may proceed.

IMPORTANT: Only currently certified contractors with a valid factory training card are authorized to install OPW piping.

13.1 Pipe Handling At Jobsite

Care must always be taken when handling OPW flexible piping to prevent damage. It is recommended that the carton be placed in the sunlight several hours before measuring and cutting the pipe, so the pipe may relax for easier extension when measuring.

WARNING: Do not drag, cut or scrape the pipe during installation to avoid damage to the external surface of the piping. Use only OPW approved backfill materials.

13.2 Cold Weather Pipe Handling

OPW's flexible piping can be installed in ambient temperatures as low as zero degrees, provided that the flexible piping has been sufficiently warmed prior to unrolling. If the pipe is unrolled and straightened while it is warm, it will cool in a straighter position making it easier to install. For cold weather installations where the ambient temperature is below 40°F (5° C), it is recommended that the piping cartons be placed in a warm room for 8 hours directly prior to installation. If this is not possible, then a small hole should be cut in the top center of the lid of the carton for insertion of the nozzle of a conventional hair dryer. For piping reels, place a tarp over the reel and then insert the hair dryer nozzle directly into the end of the piping. If this pipe warming procedure is used, do not use the first 12" of the pipe due to possible damage by the hair dryer. Depending on the ambient temperature, it may take up to an hour to warm the roll of piping sufficiently.

13.3 Flexible Pipe Measuring

When measuring the distance between containment sumps or pans to determine the proper length of a flexible pipe section to be installed, it is important to consider that the pipe is flexible and will not be installed perfectly straight. A slight weaving of the pipe in the piping trench is recommended to compensate for expansion and contraction. The recommended measuring and cutting procedures for the flexible piping are described below:

13.3.1 Direct Pipe Burial Applications

When measuring for direct burial of flexible piping, the measuring points will be from the face of one adapter/ fitting to the next. If DPC couplings and fittings are used, subtract 1" to allow for the length of the two pipe couplings and cut the piping to that length. If Swivel Bolt-On couplings (SBC) are used, measure from the shoulder of one fitting to the shoulder of the corresponding fitting and cut pipe to that length.

13.3.2 Access Pipe Burial Applications

For Applications using Access Pipe, measurements must be taken through the Access Pipe to ensure proper length. Feed the measuring tape through the Access Pipe and measure the distance from the face of the one adapter/ fitting to the next. If DPC couplings and fittings are used, subtract 1" to allow for the length of the two pipe couplings and cut the piping to that length. See Access Pipe installation instructions for complete information and installation steps.

13.4 FlexWorks Pipe Cutting

When cutting the piping into pipe sections, cut the pipe at the measured cut mark using the pipe cutter tool. This cutting tool is designed to make clean and even cuts in the piping. Clean and even piping cuts are necessary for the proper installation of the OPW pipe couplings.

13.4.1 Cutter Positioning

Mark the pipe where it is to be cut. Next position the blade of the pipe cutter over the mark.

13.4.2 Blade Activation

Squeeze the handles up and down to activate the movement of the blade. Continue until the blade will no longer continue to activate. This procedure will cause the pipe to slightly compress.

13.4.3 Pipe Cutting

Rotate the entire pipe cutter 1/4 turn to permit the blade to penetrate the wall of the pipe. Continue to squeeze the handles up and down to complete the entire pipe cut. Inspect the cut to make sure it is even.

NOTE: Do not rotate blade more than 1/4" turn. Inspect edge of cut and inside of piping after cutting for any signs of damage.

13.5 Coupling Flexible Pipe Sections

The flexible piping system requires the use of the OPW Coupling Machine for proper installation of the DPC couplings onto the flexible piping sections.

IMPORTANT: Using the coupling machine with piping and/ or couplings not manufactured by OPW shall void the coupling machine warranty. Before and after the coupling process the supplied dust cover should be kept on the coupling. This precaution will lessen the possibility of damage. For complete instructions, please refer to the OPW coupling machine installation instructions.

13.6 Machine Set-up

- Attach hose from pump to cylinder.
- Install the correct guide block.
- Install the correct threaded shaft.
- Install the correct size swage kit.
- Open the vent plug.
- Plug in electric machine with extension cord.

IMPORTANT: Connect the coupling machine to a properly grounded outlet only.

13.6.1 Positioning Swivel Pipe Coupling

Install the appropriate size guide block, unscrew and remove the tapered swage from the threaded shaft. Lubricate the inside of the coupling insert with molybdenum or white lithium grease. Insert the pipe coupling assembly, including the ferrule over the threaded shaft and seat it onto the guide block.

Note: Do not place ferrule on the piping. Ferrule must be inserted over the insert of the coupling.

Note: Make sure coupling nut gasket is not installed during swaging.

13.6.2 Installing The Tapered Swage

Thread the tapered swage onto the threaded shaft until it meets the back of the pipe coupling assembly.

NOTE: Do not use silicone based lubricants. Be sure that the swivel nut of the pipe coupling assembly is flush against the face plate.

13.6.3 Inserting the Pipe

For 1-1/2", 2", and 3" pipe, measure 1-1/8" from the end of the pipe and mark it off with a pen.

Insert the end of a flexible pipe section inside the pipe coupling until the ferrule meets the mark. The coupling ferrule should line up with the mark. For best results, do not bottom out the fitting. Inspect the entire assembly, prior to switching on the machine for the following:

- Swivel nuts are flush against the guide block.
- The ferrule is snug against the insert shoulder.

13.6.4 Swaging

To begin the swaging process, work hand pump or push the start button on the electric and pneumatic models. Continue until the mandrel has been drawn through the coupling and the pipe/coupling assembly pops free. The nuts on the bottom of the threaded shaft can be adjusted as needed to ensure mandrel is drawn completely through coupling.

13.6.5 Inspection

Inspect the installed pipe coupling assembly and pipe, inside and out, to make sure there was no damage to the insert, ferrule, swivel nut or pipe during the swaging operation.

Always replace the protective coupling cap after the coupling has been swaged onto the pipe end.

NOTICE: Before and after the coupling process, the protective coupling cover should be kept on the coupling.

This precaution will lessen the possibility of damage and contamination by dirt, sand and debris that could compromise the sealing process.

IMPORTANT: Connect the electric coupling machine to a properly grounded outlet only.

IMPORTANT: Using this coupling machine with pipe or couplings other than those manufactured by OPW will void the product warranty.

13.7 Installing Pipe Sections - Direct Burial (non-Access Pipe)

Once the pipe has been measured and the couplings have been installed, the pipe may be installed. This section discusses the installation in a direct burial application. Refer to section 13.8 for installation of the piping using Access Pipe.

13.7.1 Insert Piping Through Entry Fitting

Take the pipe section to the trench and insert into the containment sump through entry fitting. Make sure the band clamp of the entry fitting has been removed or sufficiently loosened to permit the pipe to pass through the entry fitting. Secure entry fitting to the pipe after the installation process has been completed. For junction sump applications, repeat procedure for adjoining pipe sections.

13.7.2 Pipe Connection

After the flexible pipe(s) have been inserted, attach pipe to fittings using the methods described in section 14. Inspect the piping in the trench to make sure it is positioned properly in the trench between the containment sumps and there is sufficient pipe weaving back and forth to allow for pipe expansion and contraction.

13.8 Installing Pipe Sections-Access Pipe

Once the pipe has been properly measured, the couplings have been installed and dust covers placed back on the couplings, the pipe is ready to be installed into the Access Pipe. Refer to Section 10 and OPW's Access Pipe installation instructions for details involving the proper installation of the Access Pipe.

13.8.1 Fishing Pipe through Access Pipe

Remove Access Pipe from entry boots. Attach the appropriate OPW bullnose to one coupling. Fish rope through the Access Pipe and attach to bullnose. Pull or push flexible piping through Access Pipe.

Note: For installation tips and techniques see Access Pipe Installation Instructions.

13.8.2 Insert Pipe into Sump

Align the Access Pipe conduit/ flexible piping with the Access Pipe entry fitting. Push piping into entry fitting and attach coupling to the fitting using the methods described in section 14.

13.8.3 Insert Access Pipe into Entry Fitting

Align the Access Pipe with entry fitting and push into place until Access Pipe bottoms out. Tighten corresponding band clamps to 30 in. lbs.

14.0 PIPING CONNECTIONS

After all containment sumps have been interconnected with all of the flexible pipe sections, all riser pipe assemblies and test boots (if required) have been installed, then all piping connections may proceed. There is a different installation procedure for each type of piping connection. Comply with the following connection procedures for each type.

14.1 Coupling Inspection

Prior to connection, inspect coupling to make sure all rubber O-rings are properly in place and seated inside the O-ring grooves. Look for any dirt or damage to the O-rings which may have occurred during the coupling procedure.

14.1.1 Fitting Inspection

Remove the plastic protective cap from the fitting or adapter. Inspect the fitting or adapter to be sure that it is free of sand or debris in the core area and on the threads.

14.1.2 Hand Tightening of Swivel Nut

When installing DPC couplings, hand tighten the coupling onto the fittings until it is snug. Tighten the coupling nut ¼ turn more or to 200 in/lbs. Do not allow the pipe to rotate while tightening. The ¼ turn procedure will prevent over tightening of the coupling past the maximum 200 in/lbs.

NOTE: Failure to follow this procedure may result in damage to the coupling gasket.

15.0 INTERSTITIAL TUBE ASSEMBLIES

Both DPC and SBC Couplings attached to the ends of the flexible supply pipe sections have threaded (1/8" NPT) interstitial access ports on their ferrule for connection to Interstitial Tube Assemblies that come in various lengths. All tube assemblies are fitted on each end with 1/8" NPT brass compression fittings.

15.1 Test Tubes

Test Tubes are connected to DPC and SBC Couplings located within tank sumps and the last dispenser sump in a series piping run. These 36" (900mm) long tubing assembles are used to provide a means of air pressure integrity testing of the pipe interstitial space after installation. They can be cut to any desired length. They are used as another means of testing the interstitial space when installed inside a terminating dispenser sump. When not used for testing purposes, they may be plugged or left open depending on the pipe interstitial monitoring application - determined by AHJ..

15.2 Connector Tubes

Connector Tubes are connected to the DPC and SBC couplings located within dispenser sumps and are 12" long. Installed inside junction dispenser sumps, connector tubes are used to interconnect the interstice of one pipe section to the next.

16.0 FLEXIBLE VENT PIPING

This flexible piping is used for the transmission of aromatic fuel vapors and is designed for direct burial of the pipe and fittings without the requirement for secondary containment. The intended use for Vent is for venting vapors from an underground storage tank to a remotely located vent stack.

IMPORTANT: Vent is available in both 2" and 3" sizes and is not intended for the transfer of fluids.

16.1 Vent Connections

The Vent piping system requires the use of standard couplings & fittings. Unlike supply piping connections OPW permits Vent swivel connections to be direct buried when properly protected. All buried metal should be covered with dielectric tape and coated with 3M 08883 (or equivalent) rubberized undercoating to further protect the fitting components from corrosion.

16.2 Tank Connections Within Tank Sump

If the tank's vent connection is contained within a tank sump, the vent line should enter through an applied entry fitting. A male adapter fitting should be used to complete the connection within.

16.3 Tank Connections Extractor Fitting

If the tank's vent connection is not contained within a tank sump, then a male or female adapter fitting should be installed in the extractor fitting to accept the OPW Piping. The adapter and coupling/fitting should be properly protected.

NOTE: This applies to all occurrences of direct-bury fittings outside of containment.

16.4 Pipe Branch Connections

In between the beginning and end of a Vent piping line it may be necessary to install tee fittings to interconnect numerous pipe runs into a main return line to the tank.

16.5 Vent Stack Connections

At the other end of a Vent pipe line the pipe connects to a vent stack for tank vapor venting applications. This connection is made using an elbow fitted to the appropriate coupling. Metallic fittings must be properly protected.

17.0 TESTING & FILLING SUPPLY PIPE

It is important to properly test the flexible piping prior to backfill to ensure there are no leaks. The following test procedures are provided as a guideline only and the manufacturer assumes no responsibility or liability for the consequences of any testing practices.

IMPORTANT: Integrity testing with air or gas can be dangerous and it is very important that the proper testing equipment be used and that the pre-testing procedures be read.

17.1 Testing Equipment

- Pressurizing equipment should be of sufficient size to accommodate line pressure testing requirements.
- Pressurizing equipment should have controls to gradually increase pressures..
- Pressurizing equipment should be operated by experienced and qualified personnel only.
- Be careful not to over-pressurize the system.
- Pressure gauge should be on the end of the run, with pressure applied at the start.
- Pressure gauges must have a full scale reading not to exceed twice the required test pressure.
- Pressure gauges should be accurately and routinely tested for reliability.

17.2 Pre-Testing Procedures

- The underground storage tank should be isolated from the piping system prior to hydrostatic or air testing.
- Shear valves located under dispensers should be sealed with pressure rated plugs or caps.
- Long flex piping runs should be secured at various points with backfill material.
- All pipe coupling/swivel connections should be tightened securely before testing.
- The interstitial (secondary) line should be interconnected and fitted with an air gauge.
- All local building, safety and fire codes should be followed prior to and during testing.

17.3 Air Pressure Testing Procedures

The air pressure integrity test procedure for the flexible supply piping is one and one half (1-1/2) times the normal operating pressure of the submersible pump, not to exceed sixty pounds per square inch (60 psi). Make sure the flexible pipeline is isolated from both the underground storage tank and the above ground product dispenser when conducting this test. All pressure testing should be conducted by qualified and experienced personnel. Do not attempt to disconnect couplings, caps, or plugs unless the air pressure has been released.

NOTE: Testing requirements must be in accordance with all applicable codes.

17.3.1 Air Pressurize

Gradually apply air pressure into the flexible piping line. Do not exceed sixty pounds per square inch (60 psi) or 416 kPa.

NOTE: After the primary line pressure stabilizes, gradually apply air pressure into the interstitial space of the flexible piping line. Do not exceed ten pounds per square inch (10 psi) or 69kPa, making sure there is no drop in pressure for a minimum of one hour.

17.3.2 Air Pressure Holding

Maintain pressure for a minimum of one hour, or in accordance with the authority having jurisdiction (AHJ), making sure that there is no drop in pressure.

NOTE: Significant temperature changes can result in a pressure reading differential.

17.3.3 Test Tube Gauge Check

During primary pressurization, check the reading on the secondary test gauge. Any increase in pressure will indicate a leak.

17.3.4 Soap Test

During the pressurizing period, apply a soapy water solution to all piping connections and inspect for bubbles.

17.4.1 Water Filling

Gradually introduce water at the lowest point into the piping system and bleed off air at the highest point in the piping system through an open valve. The hydrostatic pressure applied should not exceed 60 psi.

17.4.2 Pressure Hold Inspection

Maintain pressurization for a minimum of one hour making sure there is no drop in pressure. Significant temperature changes can result in a pressure reading differential. During the pressurizing period, inspect all piping connections for leaks.

17.5 Supply System Filling

After the supply piping system has been integrity tested and connected to the product dispensers, filling of the pipe line may commence. There should be a controlled method for filling the supply line which provides an adequate means of removing air from the lines. Do not start pumps with empty lines, as it may damage the pipe and its connections. Small amounts of trapped air should dissipate under normal operations. Make sure that the pressure rating of the submersible pump does not exceed that of the maximum operating pressure of the pipe.

18.0 PERIODIC LINE LEAK DETECTION

Local or federal regulations may require periodic line leak detection tests be performed on the installed piping system. Testing requirements affect both suction and pressure piping systems. A typical requirement is that the piping lines must be tested on an annual basis at one and one half (1-1/2) times the normal operating pressure.

The typical test method will require detection of 0.10 gallons (.3785 liters) per hour with a 95% probability of detection and a 5% probability of a false alarm.

The typical test procedure requires the piping be isolated from the tank and the piping line pressurized to 1-1/2 times the normal operating pressure. A test apparatus which is connected to the piping line will then measure the bleedback volume of the piping system. Acceptable bleedback volumes on different types of piping systems will vary due to their inherent expansion and contraction characteristics. Therefore, modifications in the testing procedures are required for piping systems which have significant expansion and contraction characteristics. This characteristic is measured in the average volume increase, per linear foot under a standard test pressure.

19.0 INTERSTITIAL INTEGRITY TESTING

Prior to supply filling and periodically over the life of the flexible piping system, it is recommended that interstitial testing be used to ensure that the secondary containment is intact.

19.1 Air Pressure/Soap Testing

After primary piping connections have been integrity tested, the entire interstitial space of the double wall pipe must remain connected and only then should the outer containment jacket be integrity tested.

19.2 Testing Assembly

Inside all tank sumps the test gauge is connected to the end of the test tube. The test gauge assembly consists of an air gauge with a maximum 15 psi scale connected to a 1/4" brass tee fitting with a male 1/4" thread. The gauge threads directly into female brass fitting of the test tubes. The test tube in the terminating sump shall be capped with a .25" brass plug.

19.3 Air Pressure Testing

Gradually pressurize the piping's interstitial space through the test tube to no more than 10 psi. During the pressurization period, apply an air pressure soap test to the entire piping line. After testing, disconnect the air hose and lay the test tube down into the bottom of the tank sump.

20.0 FLEXWORKS SYSTEM MAINTENANCE

The FlexWorks System is designed to provide reliable underground fuel transfer and short-term secondary containment of leaked petroleum product. FlexWorks sumps and secondary containment pipes are not intended for long term storage of petroleum products. Liquid that accumulates in the secondary containment system must be promptly removed and properly disposed of. Operational third party approved liquid sensors should be installed and maintained in each sump to reliably indicate to the operator that liquid is present in the secondary containment system. Once a leak is detected, the system must be shut down immediately and the source of the leak must be repaired. All liquid must be thoroughly flushed and cleaned out of the secondary containment system at once. Inspect all system components at least monthly for leaks or damage, and repair or replace any suspect component as necessary.

20.1 Routine Sump Inspections

Visual inspections of all containment sumps and components should be made on a routine basis to check for damage, water infiltration or for any signs of leaking product. An electronic or mechanical shut-off leak detection system is recommended for all containment sumps. When changing fuel filters at the dispenser, make sure any spilled product is cleaned out of the bottom of the dispenser sump. Sumps are to be kept free of debris and spilled fuel.

NOTE: Failure to remove fuel and liquids from containment sumps may compromise the performance and integrity of the sump and its associated fittings and seals over prolonged periods of time. Always follow warranty registration instruction and return warranty forms to OPW.

20.2 Storage And Transit

Instructions shall specify that pipe and fittings are not intended for storage in direct sunlight or excessive temperatures and that rough handling (drops and impacts) during storage and transit may cause damage and leaking. Any special procedures for protection against environmental conditions and physical abuse during storage and transit shall be identified. Any special procedures for the inspection of parts for noncomplying damage before assembly shall be identified with instructions specifying that a damaged part shall not be used.

21.0 PERIODIC INTERSTITIAL TESTING

For periodic integrity testing of the interstitial space of the double wall pipe there is a different setup procedure for systems using coax fittings versus steel fittings with connector tubes. Both applications should have test tubes connected on each end. If they have been disconnected, reconnect them before testing. Follow the air pressure test procedures below for interstitial integrity testing.

21.1 Reconnect Test Tubes

If necessary, reconnect the test tube located inside the tank sump to the test boot. Connect the test gauge assembly to the top end of the test tube.

21.2 Reconnect Connector Tubes

If the piping system includes test boots with connector tubes then make sure all connector tubes have been reconnected.

21.3 Plug Test Tube

Plug and seal the test tube fitting located at the terminating end of the flexible piping line.

21.4 Air Pressurize

Pressurize the interstitial space to 10 psi for a period of one hour, in accordance with Section 21, Interstitial Integrity Testing. If required, disconnect all tubes after test.

22.0 PROBLEMS

Investigation

If leakage or damage is detected in any part of the system (either by inspection of the sump, a leak detector, or similar monitors), the problems are to be immediately investigated by the site operator.

Warning: Ignoring or disabling leak detection alarms may lead to further damage and possible failure.

If leakage or damage to the piping system is verified, notify the Technical Service Department of OPW at 1-800-422-2525.

23.0 GUIDE SPECIFICATIONS

23.1 Short Form

The contractor shall provide a flexible underground piping system whereby the flexible piping, fittings, adapters and under dispenser riser pipes are secondarily contained and having no metallic components exposed to the environment. The primary pipe shall be capable of being air pressure tested to 1.5 times the operating pressure of the pump not exceeding 60 psi. The secondary shall be capable of being air tested to 10 psi.

23.2 Long Form

The following guide specification is designed around the use of OPW Retail Fueling's flexible piping.

23.2.1 Design

The contractor shall provide a secondarily contained flexible underground piping system that shall provide secondary containment for all primary piping, couplings, fittings and adapters. Piping runs shall be continuous between containment chambers (ie., tank & dispenser sumps or pans) in which all joints are contained within the containment chambers. The piping design shall allow for any leak in the primary supply or secondary containment piping to be directed to a leak detection sensor.

23.2.2 Product And Chemical Compatibility

The flexible underground piping and associated couplings, fittings and adapters shall be chemically compatible with the products to be transported and with chemicals found naturally in the ground environment. The primary and secondary piping shall be compatible with gasoline, alcohols, gasoline alcohol mixtures and all EPA approved additives, including MTBE.

23.2.3 Corrosion Resistance

The flexible underground piping and associated couplings, fittings and adapters which come in contact with the ground environment shall be made of nonmetallic material or properly protected metal components.

23.2.4 Structural Integrity

The flexible underground piping and associated couplings, fittings and adapters shall be designed and constructed of materials strong enough for its intended use. The flexible piping shall not collapse, crack or break due to ground movement or from backfill and high ground water pressures. Piping shall be able to transfer fluid up to a maximum temperature of 125 degrees fahrenheit (52 degrees celsius). Piping shall be operational with in a temperature band of minus 40C and +65C.

23.2.5 Bend Radius

The double wall flexible piping shall be capable of a minimum bend radius without kinking, cracking or breaking. The minimum bend radii shall be equal to or less than the following:

0.75" = 18" radius

1.0" = 18" radius

1.5" = 24" radius

2.0" = 36" radius

3.0" = 72" radius

23.2.6 Fluid Flow Efficiency

Both the primary inner and secondary outer pipe shall have an interior surface which is a smooth (non-corrugated) profile and be made of a low friction resistant material for improved fluid flow efficiency.

23.2.7 Operating Pressures & Vacuums

The flexible underground piping shall have a minimum five to one (5:1) safety factor from maximum operating pressure for rated pressure. The maximum operating pressure rating for 1.5" diameter piping shall be 100 psi primary and 10 psi secondary. 3/4", 1", 2" and 3" piping shall be rated at a maximum operating pressure of 75 psi primary and 10 psi secondary. For suction systems the pipe shall be capable of withstanding 29" mercury vacuum.

See section 1.3 for maximum working pressure PSI per pipe size.

23.2.8 Pipe Expansion

The primary supply pipe shall not expand more than .0025% in diameter and overall length when pressurized to 60 psi to permit accurate pressure decay readings by an in-line leak detector.

23.2.9 Interstitial Interconnection

All primary and secondary piping shall be connected in such a way as to permit integrity testing both during installation and at periodic intervals in the future. Both primary and secondary piping shall remain continuous during operation.

23.2.10 UL® Testing

Flexible piping and it's associated fittings shall be independently tested in accordance with UL 971.

24.0 Storage and Handling

24.1 Storage

OPW Retail Fueling requires that all piping, fittings and system components be stored in such a manner that they will not be subject to direct sunlight and / or excessive environmental conditions. Please review the below noted warnings during product storage.

- Cover all products with UV protective tarps if outside.
- If tarps are unavailable, store in trailer or building until use.
- OPW FlexWorks piping should be stored out of direct sunlight or excessive temperatures (above 120°F/49°C).

24.2 Handling

OPW Retail Fueling requires that the piping, fittings and system components are handled in such a manner that it will not cause unnecessary damage to the system components.

Please review the below noted warnings during product handling.

- Do not drop, cut or impact the components.
- Keep all piping, fittings and components in the original packaging until ready
- Keep all thread protectors secure until ready to use.
- Keep all coupling protector caps / covers in place.
- DO NOT drag, cut or scrape pipe.
- Upon completion of pipe, inspect for cuts, scrapes and damage prior to close of pipe runs.
- DO NOT exceed 15° angle entry for pipe into a sump.
- Please visit our website, www.opwretailfueling.com, for a detailed guide specification.

LIMITED WARRANTY

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 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 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 Certified to California 2001 Standards*	1 year from date of manufacture or from date of installation registration (Not to exceed 15 months from date of manufacture)
All other Products	1 year from date of manufacture

* Products certified to California 2001 Standards will have an OPW registration card endlosed/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 any defective product) for future orders for any product that may prove defective within the applicable warranty period (repairs or replacements are subject to prorated warranty coverage fro 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 3250 US Highway 70 Business W, Smithfield, NC 27577, 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. This limited warranty also shall not apply to any FlexWorks, VAPORSAVER or other OPW product: unless all required site and warranty registration forms are completed and received by OPW within 60 days of installation; 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, with 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 with 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 OPW's Flexible Piping Manual 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.

Coupling & Fitting Installation

OPW
RETAIL FUELING
a DOVER company

Installation Instructions Double Wall Couplings (DPC) and Test Tubes (TTT and TCT)

IMPORTANT: Please read these warnings and 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.

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.

Double Wall Couplings

Double Wall Couplings require the use of the OPW Retail Fueling coupling machine for proper installation of the double wall swivel couplings onto the ends of the flexible supply piping sections. Double wall swivel couplings require the use of the correct face plate for the coupling machine that accommodates the 1-1/2", 2", 3" and 4" couplings.

NOTICE: Using the OPW Retail Fueling coupling machine with couplings or piping not manufactured by OPW Retail Fueling will void the coupling machine warranty. Installing OPW Retail Fueling couplings and piping with coupling machines manufactured by others will void our piping warranty.

Coupling Machine Set-up

Place the coupling machine on a dry, flat and clean area. Use a heavy-duty exterior type extension cord with a proper ground plug.

Step 1: Remove cover and install under the base.

Step 2: Install the correct faceplate.

Step 3: Install the correct threaded shaft.

Step 4: Install the correct size swage kit.

Step 5: Open the vent plug.

Step 6: Plug in machine with proper extension cord.

WARNING: Connect the coupling machine to a properly grounded outlet only. Failure to do so could cause electrical shock resulting in injury or death.

WARNING: The OPW Retail Fueling Coupling Machine is not intrinsically safe and must be operated in an open area free from gasoline vapors.

IMPORTANT: Connect the coupling machine to a properly grounded outlet only. Piping must be held vertically throughout the coupling process.

Protective Coupling Caps

Before beginning the coupling process, remove the protective plastic cap from the end of the coupling body and place it on top of the coupling machine making sure it is kept clean of sand and gravel. After the pipe end has been coupled, immediately replace the plastic cap onto the end of the coupling.

Swage Kits

Different size and types of flexible pipe couplings require the use of different size Swage Kits. These Swage Kits include a swage, a swage shaft and a faceplate. The swage is drawn through the inside of the Double Wall Swivel Coupling to internally expand it. The faceplate positions and secures the coupling to the top of the coupling machine during the swaging cycle.

The following swage kits are available for the double wall Swivel Fittings:

Part #	OPW Pipe Sizes
CSK-0150S	Swivel Swage Kit - 1.5"
CSK-0200S	Swivel Swage Kit - 2.0"
CSK-0300S	Swivel Swage Kit - 3.0"

NOTICE: The dust covers that are supplied with the couplings should be kept on all couplings both before and after the coupling process. This precaution will lessen the possibility of damage and contamination from dirt, sand and debris. If dust covers are not available, cover the ends of the couplings with duct tape or a plastic bag.

Positioning the Swivel Pipe Coupling

To position the coupling, install the appropriate size faceplate and then unscrew and remove the tapered swage from the threaded shaft. Lubricate the inside of the coupling insert with lithium grease. Insert the pipe coupling assembly over the threaded shaft and seat it onto the face plate.

4" Coupling Only

Prior to coupling the pipe, inspect the O-Ring in the ferrule. Be sure it is clean and free of any debris.

When swaging, insert the threaded part of the coupling onto the face plate. Fit the ferrule over the barbed end of the insert. Be sure the shoulder end of the ferrule goes on first. The ferrule should seat on the insert stop (similar to an SPC).

Installing the Tapered Swage

Thread the tapered swage onto the threaded shaft until it meets the back opening of the pipe coupling assembly. Apply a very light coating of white lithium grease or metal assembly paste around the swage at this stage.

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Supercedes: 06-17-10

Installation Instructions Double Wall Couplings (DPC) and Test Tubes (TTT and TCT)

NOTICE: Do not use silicone-based lubricants to lubricate the swage. Only white lithium grease should be applied around the swage. Do not use lubricants or sealants in or around the end of the pipe.

Inserting Pipe into Coupling

For 1.5" pipe, measure 1.25" from the end of the pipe and mark it off with a pen (for 2", 3" and 4" pipe, measure 1.5" from the end of the pipe and mark it off with a pen). Insert the end of a flexible pipe section inside the pipe coupling until it bottoms out. The couple ferrule should line up with the mark.

IMPORTANT: In Loop System applications, keep the hole for the test port that is on the outside of the collar pointed towards the inside curl of the pipe. This will insure the coupling is in the proper position for the test assembly once inside the sump. For non-Loop System applications, position the holes for the test port facing the top of the sump before tightening. Inspect the entire assembly, prior to switching on the machine, for the following:

- **Swivel nuts are flush against the base plate.**
- **The coupling and pipe are totally vertical.**

Swaging Cycle

To begin the swaging cycle, turn the switch to the DOWN position. Once the tapered swage passes through the pipe coupling assembly, the motor will turn off. Remove the couple pipe section. Turn the switch to the UP position to allow the shaft to return to the starting position.

NOTICE: Make sure that the pipe is in a vertical position and that the coupling swivel nut is flush against the faceplate at all times during the swaging cycle.

Coupling Inspection

Inspect the installed pipe coupling assembly and pipe, inside and out, to make sure there was no damage to the insert, ferrule, swivel nut or pipe during the swaging operation. Always replace the protective coupling cap after the coupling has been swaged onto the pipe end.

NOTICE: Before and after the coupling process, the protective coupling cover should be kept on the coupling. This precaution will lessen the possibility of damage and contamination by dirt, sand and debris that could compromise the sealing process.

IMPORTANT: Connect the coupling machine to a properly grounded outlet only. Piping must be held vertically throughout the coupling process.

IMPORTANT: Using this coupling machine with pipe or couplings other than those manufactured by OPW Retail Fueling will void the product warranty.

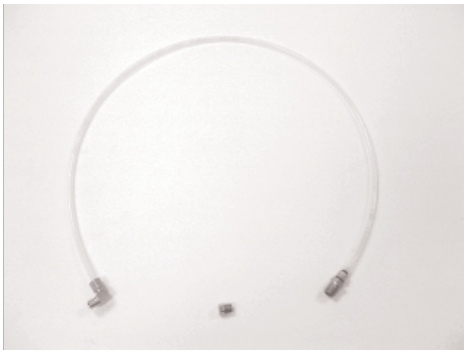
IMPORTANT - 4" ONLY: When attaching the coupling to a fitting, be sure to use a very viscous thread sealant (use Gasolia PC-30 or an equivalent).

Interstitial Tube Assemblies

The Double Wall Swivel Couplings attached to the ends of the flexible supply pipe sections have threaded (1/8" NPT) interstitial access ports on their ferrule for connection to Interstitial Tube Assemblies that come in various lengths. All tube assemblies are fitted on each end with 1/8" NPT brass compression fittings.

Test Tubes

Test Tubes are connected to the Double Wall Swivel Couplings located within tank sumps and the last dispenser sump in a series piping run. These 36" (900mm) long tubing assembles are used to provide a means of air pressure integrity testing of the pipe interstitial space after installation. They can be cut to any desired length. They are used as another means of testing the interstitial space when installed inside a terminating dispenser sump. When not used for testing purposes, they may be plugged or left open depending on the pipe interstitial monitoring application.



Connector Tubes

Connector Tubes are connected to the double wall swivel couplings located within dispenser sumps and are 12" long. Installed inside junction dispenser sumps, connector tubes are used to interconnect the interstice of one pipe section to the next by bypassing the junction safety valve or other fittings such as a "Tee".

Installation Instructions Double Wall Couplings (DPC) and Test Tubes (TTT and TCT)

Interstitial Tube Connections for installation of Interstitial Tubes if tubes are to be taken out after install testing:

The steps required for temporarily connecting the connector tubes and/or test tubes to the threaded interstitial access ports of the double wall swivel couplings is as follows:

Step 1: Apply Teflon tape to only the NPT threads of the adapter.

Step 2: Thread the adapter into the NPT threaded interstitial access port.

Step 3: Cut the tube evenly to the desired length

Step 4: Slide the compression nut onto the tubing

Step 5: Slide the ferrule onto the tubing

Step 6: Insert tube end into preinstalled adapter

Step 7: Slide down and thread on compression nut to adapter by hand

Step 8: Complete tightening compression nut with a 1/2" wrench

Interstitial Tube Connections for installation of Interstitial Tubes if tubes are to remain on coupling after install testing:

The steps required for permanently connecting the connector tubes and or test tubes to the threaded interstitial access ports of the double wall swivel couplings is as follows:

Step 1: Apply a gas grade pipe dope to the NP threads of the adapter.

Step 2: Thread the adapter into the NPT threaded interstitial access port

Step 3: Cut the tube evenly to the desired length

Step 4: Slide the compression nut onto the tubing

Step 5: Slide the ferrule onto the tubing

Step 6: Insert tube end into preinstalled adapter

Step 7: Slide down and thread on compression nut to adapter by hand

Step 8: Complete tightening compression nut with a 1/2" wrench

LIMITED WARRANTY

NOTICE: OPW Retail Fueling products must 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 material to be handled. OPW Retail Fueling makes no warranty of fitness for a particular use. 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.

Standard Product Warranty: OPW Retail Fueling warrants that products sold by it are free from defects in materials and workmanship for a period of one year from the date of manufacture by OPW. Proof of purchase may be required. For any product certified to California 2001 standards*, FlexWorks by OPW Retail Fueling warrants that products 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. As the exclusive remedy under this limited warranty,OPW Inc. will at its sole discretion, repair, replace, or issue credit for future orders for any product that may prove defective within the one year date of manufacture period (repairs, replacements, or credits may be subject to prorated warranty for remainder of the original warranty period, complete proper warranty claim documentation required.) FlexWorks by OPW Retail Fueling further guarantees that all FlexWorks primary pipe is free from defects in materials and workmanship for a period of ten (10) years from the date of manufacture. Any FlexWorks primary pipe proven to be defective in materials or workmanship within said 10-year period will, at OPW Retail Fueling's option, be repaired or replaced, or credit will be given for future orders. OPW Retail Fueling will bear the reasonable labor costs associated with the repair or replacement of non-conforming FlexWorks primary pipe when such pipe has been used exclusively in a complete FlexWorks Retractable System. Any defect will be corrected promptly upon written notification to FlexWorks by OPW, Inc. at 3250 US Highway 70 Business W, Smithfield, NC 27577, attention Customer Service Manager. This warranty shall not apply to any product that has been altered in any way, which has been repaired by any other person than a service representative authorized by FlexWorks by OPW Retail Fueling or when failure is due to misuse, improper installation or maintenance. OPW Retail Fueling shall have no liability whatsoever for special, incidental, or consequential damages to any party, and shall have no liability for the cost of labor, freight, excavation, clean-up, downtime, removal, reinstallation, loss of profit, or any other cost or charges. *Products certified to the California 2001 standards will have an OPW registration card enclosed/attached to the product. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND SPECIFICALLY THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THERE ARE NO WARRANTIES, WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.

OPW RETAIL FUELING
a DOVER company

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Smithfield, NC 27577, USA
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Customer Service Fax: 1-800-421-3297
Technical Service: 1-866-547-1816
www.opwglobal.com

Installation Instructions Stainless Steel Swivel Barbed Coupling (SBC) 1.5” and 2.0”

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

NOTICE: All 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.

Standard Product Warranty:

OPW warrants solely to its customer 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: FlexWorks Primary Pipe-10 years from date of manufacture; All products certified to California 2001 Standards—1 year from date of manufacture or from date of installation registration (not to exceed 15 months from date of manufacture); All other products—1 year from date of manufacture.

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. (Repairs or replacements are subject to prorated warranty coverage for remainder of the original warranty period). Complete and proper warranty claim documentation and proof of purchase required. 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. This limited warranty also shall not apply to any FlexWorks, VAPORSAVER™ or other OPW product: unless all required site and warranty registration forms are completed and received by OPW within 60 days of installation; 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 WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND SPECIFICALLY THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THERE ARE NO WARRANTIES, WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.

INTRODUCTION:

OPW Retail Fueling Swivel Barbed Couplings are designed to be used with FlexWorks piping and must be installed within a containment sump. When using FlexWorks double wall flexible piping, **be sure the cut is straight and clean.**

BEFORE INSTALLING

1. Read all instructions carefully.
2. Inspect barbed surfaces of fittings for loose debris or damage which may have occurred during shipping.
3. See Page 3 for Testing Procedures.
4. Refer to the FlexWorks Piping Manual for additional information

INSTALLATION

Step 1

Always cut the FlexWorks piping according to the type of fitting being used.

To cut the pipe, measure from the shoulder of one fitting to the shoulder of the corresponding fitting and cut pipe to that length.

NOTE: To avoid a miscut, always be sure to measure your pipe length twice and then cut the pipe.

Always cut the FlexWorks pipe squarely to the desired length using the FlexWorks Pipe Cutter.

Step 2

Insert the piping into the sump through the entry boot. Remove or loosen riser pipe. Install the swivel nut and insert onto the Tee Fitting using pipe thread sealant that is UL approved for the type of fuel you are using (see note below).

IMPORTANT: Only use UL Approved pipe sealant for the type of fuel you are using. TELFON TAPE IS NOT AN APPROVED THREAD SEALANT.

Be sure the “O” ring on the insert is clean and free of debris and that it has lubricant on it. **See Figure 1.**

Publication: SBC-0002
Part Number: 205864/A
Issue Date: 07-09-26
Supercedes: 09-22-11

Installation Instructions Stainless Steel Swivel Barbed Coupling (SBC) 1.5” and 2.0”

Step 3

Install the pipe onto the Barbed end. The pipe will stop at the pipe stop. Do not use lubricant. Use liquid soap if needed. See Figure 1.

Step 4

Position the clamp’s interlock lip into the groove behind the barbed fitting’s swivel nut. Be sure the nut is fully forward to expose the interlock groove. See Figure 1. Make sure that the clamp pads are clean and free of debris. DO NOT put any lubrication on the clamp pads.

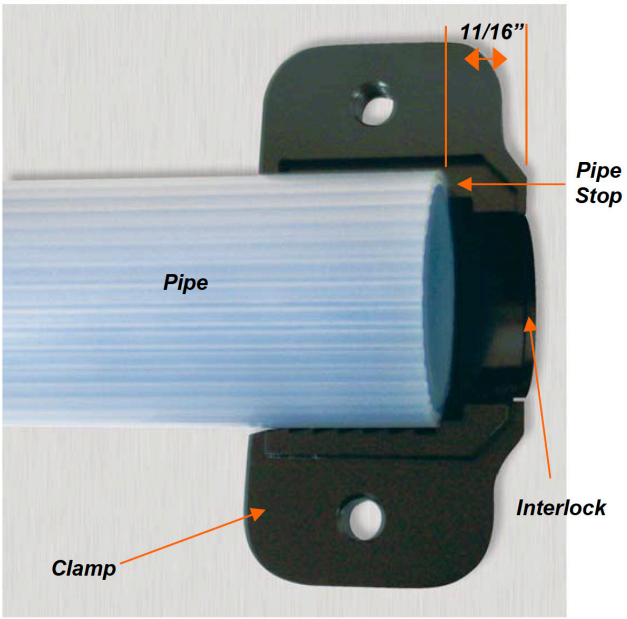
IMPORTANT: Only use UL Approved pipe sealant for the type of fuel you are using. TELFON TAPE IS NOT AN APPROVED THREAD SEALANT.

Be sure the "O" ring on the insert is clean and free of debris and that it has lubricant on it. **See Figure 1.**

Step 5

Alternately tighten the clamp bolts until the clamp segments meet, being sure to keep the clamp segments parallel to each other. Be sure clamp lip works into the interlock. Torque to 70 foot/ pounds. If an impact wrench is used, verify proper torque setting is achieved. Clamp flanges are virtually line to line.

NOTE: Re-tighten clamp after a period of 24 hours to insure proper sealing.



Retrofit Sites

On retrofit sites such as TCI pipe replacements, piping may enter the sump at an angle. In such cases, a crowbar or strap may need to be used to align the pipe with the fittings. Piping entering the Swivel Barbed Coupling MUST NOT go past the pipe stop on the insert. If necessary, pull the pipe back 1/8” from the pipe stop before installing the clamps to the fitting.

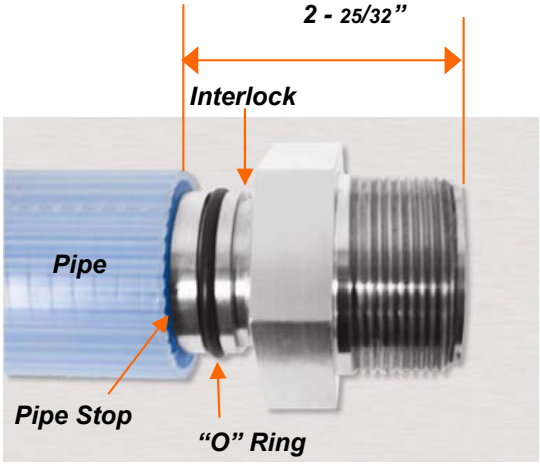
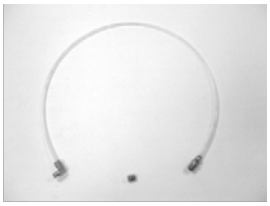


Figure 1

Testing Procedures
Interstitial Tube Assemblies

The Swivel Barbed Couplings attached to the ends of the flexible supply pipe sections have threaded (1/8" NPT) interstitial access ports on their clamp for connection to Interstitial Tube Assemblies that come in various lengths. All tube assemblies are fitted on each end with 1/8" NPT brass compression fittings.

Test Tubes (TTT-2536)



Test Tubes are connected to the Swivel Barbed Couplings located within tank sumps and the last dispenser sump in a series piping run. These 36" (900mm) long tubing assembles are used to provide a means of air pressure integrity testing of the pipe interstitial space after installation. They can be cut to any desired length. They are used as another means of testing the interstitial space when installed inside a terminating dispenser sump. When not used for testing purposes, they may be plugged or left open depending on the pipe interstitial monitoring application.

Connector Tubes

Connector Tubes are connected to the Swivel Barbed couplings located within dispenser sumps and are 12” long. Installed inside junction dispenser sumps, connector tubes are used to interconnect the interstice of one pipe section to the next by bypassing the junction safety valve.

Installation Instructions Stainless Steel Swivel Barbed Coupling (SBC) 1.5” and 2.0”

Interstitial Tube Connections for installation of Interstitial Tubes if tubes are to be taken out after install testing:

The steps required for temporarily connecting the connector tubes and/or test tubes to the threaded interstitial access ports of the double wall swivel couplings is as follows:

Step 1: Apply Teflon tape to only the NPT threads of the adapter.

Step 2: Thread the adapter into the NPT threaded interstitial access port.

Step 3: Cut the tube evenly to the desired length

Step 4: Slide the compression nut onto the tubing

Step 5: Slide the ferrule onto the tubing

Step 6: Insert tube end into preinstalled adapter

Step 7: Slide down and thread on compression nut to adapter by hand

Step 8: Complete tightening compression nut with a 1/2" wrench

Interstitial Tube Connections for installation of Interstitial Tubes if tubes are to remain on coupling after install testing:

The steps required for permanently connecting the connector tubes and/or test tubes to the threaded interstitial access ports of the double wall swivel couplings is as follows:

Step 1: Apply a gas grade pipe dope to the NP threads of the adapter.

Step 2: Thread the adapter into the NPT threaded interstitial access port.

Step 3: Cut the tube evenly to the desired length

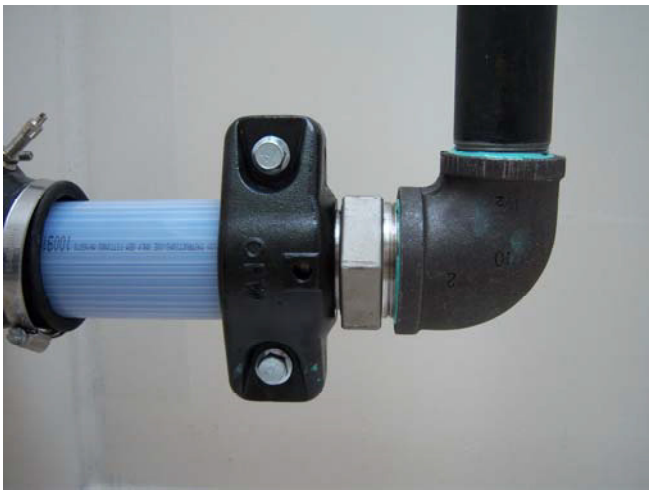
Step 4: Slide the compression nut onto the tubing

Step 5: Slide the ferrule onto the tubing

Step 6: Insert tube end into preinstalled adapter

Step 7: Slide down and thread on compression nut to adapter by hand

Step 8: Complete tightening compression nut with a 1/2" wrench.



Fully Installed

IMPORTANT INFORMATION FOLLOW ALL INSTRUCTIONS

NOTICE: OPW Retail Fueling system components may only be installed and serviced by a factory trained and currently certified installer in order for the product warranty to be valid. The use of non-certified personnel or any deviations from these written procedures could result in damage or leakage of the system and void the product warranty. Contact OPW Retail Fueling's Customer Service Department for more information at 1-800-422-2525.

Please read these warnings and use and 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.

OPW STANDARD PRODUCT WARRANTIES

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 must be based on physical specifications and limitations, compatibility with the environment and material to be handled. All illustrations and specifications in the 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.

Product	Warranty Period
FlexWorks Primary Pipe	10 years from date of manufacture
All Products Certified to California Standards *	1 year from date of manufacture or from date of installation registration (not to exceed 15 months from date of manufacture)
All other Products	1 year from date of manufacture

* Products certified to California 2001 Standards 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 any defective product) for future orders for any product that may prove defective within the applicable warranty period (repairs or replacements 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 3250 US Highway 70 Business W, Smithfield, NC 27577, Attention: Customer Service. 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. This limited warranty also shall not apply to any FLEXWORKS™, VAPORSAVER™ or other OPW product: unless all required site and warranty registration forms are completed and received by OPW within 60 days of installation; 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 all FlexWorks™ Installation Manuals and Installation Guides 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 MERCHANTABLILITY 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, 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.

NOTE: FlexWorks™ piping systems should be installed by OPW trained and certified personnel and the use of non-qualified personnel or any deviations from these recommended procedures could result in damage or leakage of the system.

Publication: REF-0001
Part Number: 205913
Issue Date: 07-09-26
Supercedes: 02-11-13

WARNING

FAILURE TO COMPLY WITH THE FOLLOWING WARNING COULD RESULT IN PROPERTY DAMAGE, INJURY OR DEATH.

WARNING

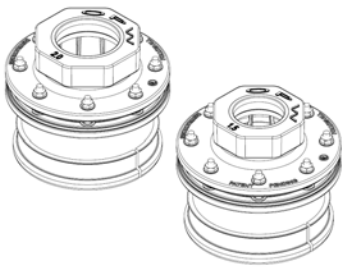
FIRE AND EXPLOSION HAZARD

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.

FlexWorks™ piping systems are for use as underground piping for primary carrier and secondary containment for motor vehicle fuels, aviation, and marine fuels.

NOTE: Failure to secure written approval from OPW concerning non-warranted fuels and liquid chemicals, will void the product warranty and could potentially cause environmental damage or personal injury.

Installation Tools Required:



- Drill with 5/16" drill bit.
- Hole saw (See Step #2)
- Strap Wrench or Smooth Jaw Wrench (Note: Do not use wrench with teeth)
- Drill
- Torque Wrench
- 7/16" Socket
- 9/32" or 7mm Socket

Only use BMA-1515, BMA-2020, DPC-2150A, DPC2200A, SPC-0150A, SPC-0200A, SBC-2150 and SBC2200 couplings and FlexWorks Double Wall pipe with REF-4015 and REF-4020 Rigid Entry Fittings. REF-0075C is for use with 3/4" Rigid Conduit and REF-0100C is for use with 1" Rigid Conduit.

Rigid Entry Fittings

Rigid Entry Fittings are designed to seal pipe entries through containment sump and AST walls. For proper installation, a template (supplied with fitting) must be used for accurate hole drilling. Rigid fittings cannot be installed on round surfaces.

Step #1 (See Figure 1)

Locate and mark the center of the pipe entry point in the flat wall section of the sump. Drill a 5/16" hole in each location. Once the holes are drilled remove the template from the sump and proceed to step number 2.

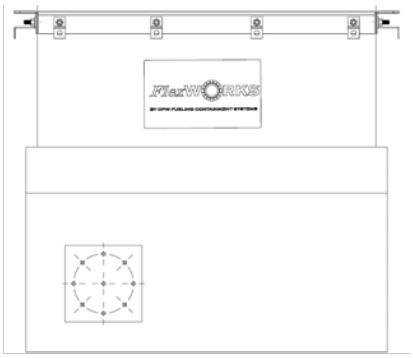


Figure 1

Step #2 (See Figure 2, and Figure 2A)

Drill out the entry fitting opening with the appropriate size hole saw using the center hole as a guide. Clean any rough edges.

Hole Saw	Entry Fitting
4"	REF-4015 / REF-4015A
4"	REF-4020 / REF-4020A
4"	REF-0200F

IMPORTANT: The correct hole saw size must always be used for proper installation of Entry Fittings.

NOTE: Only use hole saws that are sharp and in good condition. Use caution to prevent injury. The hole saw may catch unexpectedly and rotate drill.

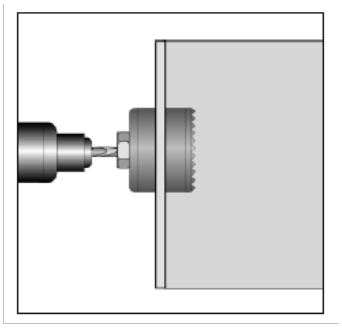


Figure 2

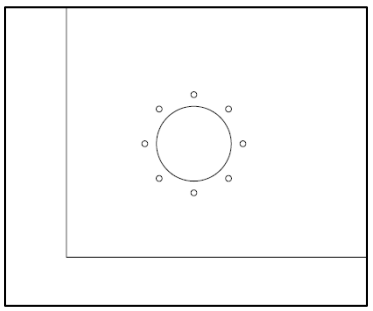


Figure 2A

Step #3 (See Figure 3)

Install the gasket on the body and place through the holes in the sump. Once through, install the interior gasket over studs.

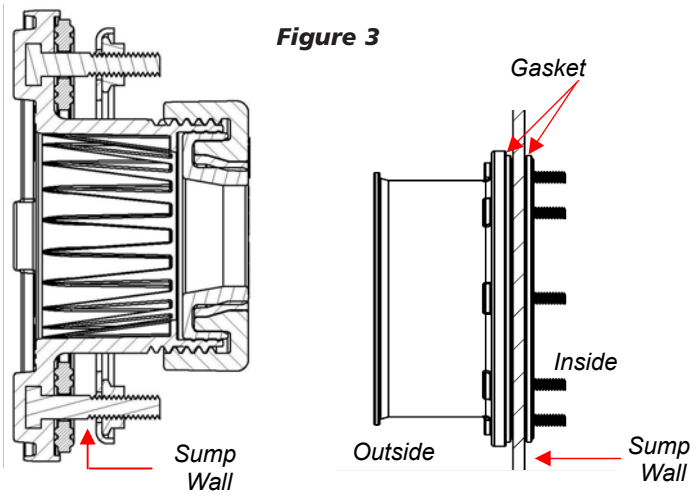


Figure 3

Step #4 (See Figure 4 and 4A)

Install the interior boot half over the studs with the raised threaded portion facing away from the sump wall and install the nuts by hand. Using a torque wrench, tighten each bolt, in increments, to 60 in-lb using a star pattern as illustrated below. Tighten 3/4" and 1" fittings in a criss-cross pattern evenly.

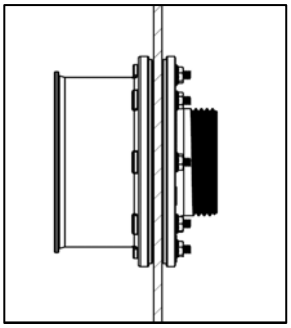


Figure 4

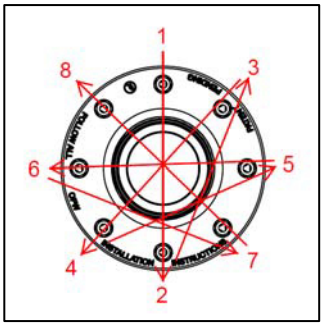


Figure 4A

Entry Fitting Sealants

OPW Retail Fueling does not recommend the use of sealants when installing entry fittings on poly sumps, however, the proper application of approved sealants on the sealing surface of our entry fittings is acceptable to OPW Retail Fueling.

The sealant(s) must be compatible with all contacted entry fitting materials, all ground environments and any fuels that may be secondarily contained within the sumps being sealed. OPW Retail Fueling in no way warrants the performance of the sealant and is in no way responsible for any environmental release resulting from the use of said sealant(s). All entry fittings must be installed in accordance with OPW Retail Fueling's written installation instructions by a currently certified installer.

If you choose to use a sealant, OPW Retail Fueling recommends the following sealants for use with our entry fittings and sumps: Bostik 920 FS Fast Set, marine grade urethane sealant; SL -1100 Urethane Sealant; Thiokol 1100 Industrial polysulfide joint sealant or PR 1440 Class B Fuel Tank sealant.

Note: Be sure all manufacturers' installation and application instructions are followed.

Step #5 (See Figure 5)

Lubricate all surfaces of the seal with OPW approved lubricants (See Appendix A). Insert pipe through the center of the fitting and slide the seal and nut over the pipe before making the connection to the tee or elbow. Note: Make sure the flat end of the seal is facing the sump wall.

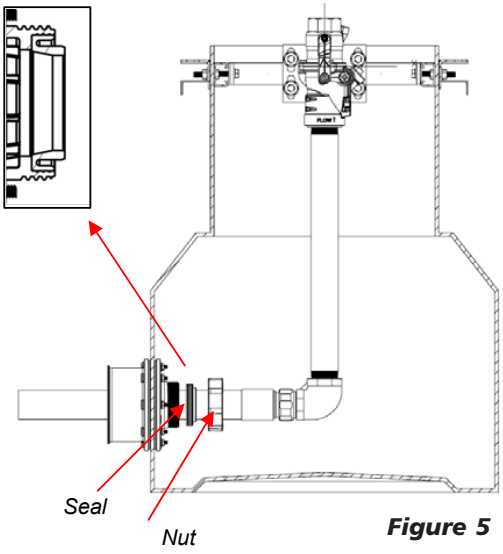


Figure 5

Step #6 (See Figure 6 and Figure 6A)

Make the pipe connection. Insert the seal inside the body of the fitting. Tighten the nut with a strap wrench until the end of the seal is flush with the face of the nut or approximately 3 and 1/2 turns.

Note: Conduit Fittings have text on the face of the seal for ease of identification.

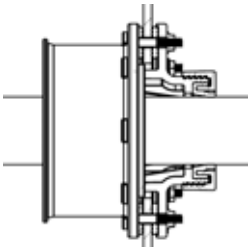


Figure 6

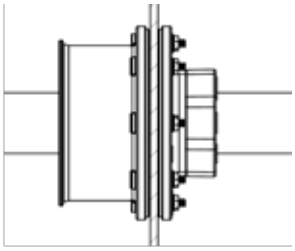


Figure 6A

Note: 3/4" must have adaptor installed in proper orientation

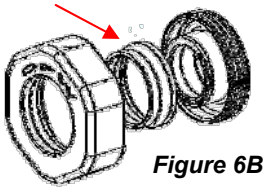


Figure 6B

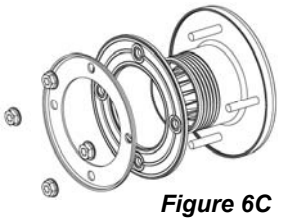


Figure 6C

NOTE: FOR REF-4015 AND REF-4020 ONLY:

Step #7 (See Figure 7, Figure 7A and Figure 7B)

Cut the AXP Piping between two ribs then install two seals on the two end grooves of the AXP piping as shown. Lubricate the interior surface (See Step 5) of the fitting, then insert the AXP piping into the body.

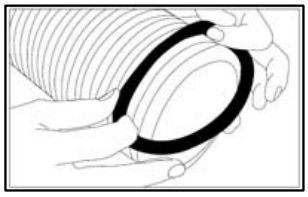


Figure 7

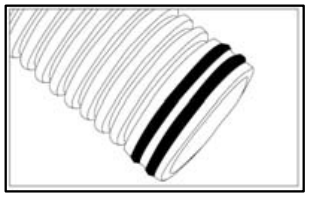


Figure 7A

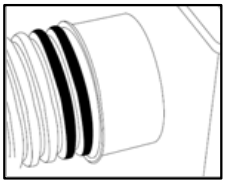


Figure 7B

Note: Crush protector is built into the fitting.

Step #8 (See Figure 8 and Figure 8A

Install the AXP clamshell around the fitting and the AXP piping. Install the band clamp to 30—35 in-lbs.

Note: Per California SB-989, all metal must be protected from direct contact with the elements. Coat stainless steel band clamps with the following approved coatings: OPW SL-1100, 3M Underseal 08883 or Polyguard Mastic CA-9.

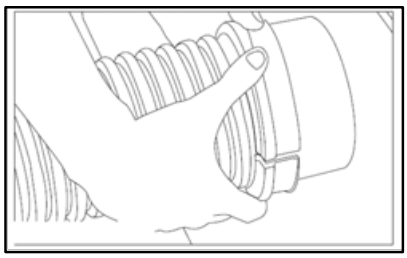


Figure 8

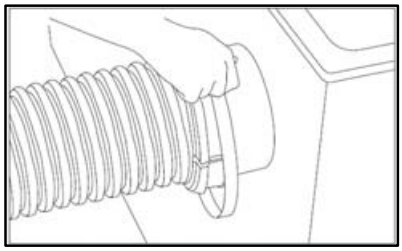
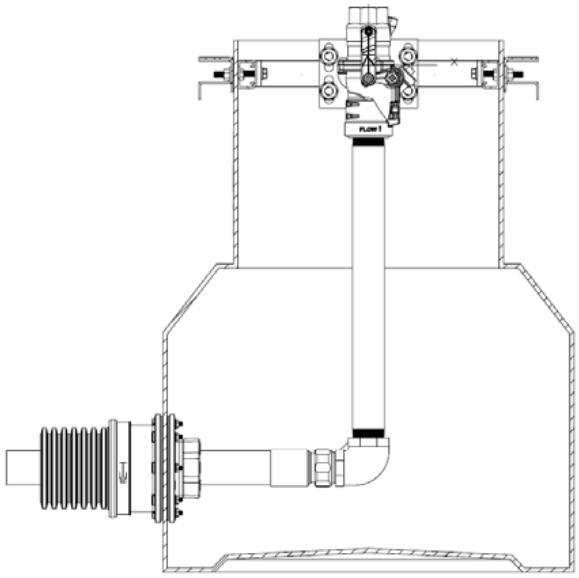


Figure 8A

Reference Illustration of Installation:



Angled Entries

The entry fitting is flexible enough to permit angled pipe or conduit entries up to 5 degrees in each direction.

Round Surface Installations

Rigid Entry Fittings **CANNOT** be installed on round surfaces.

NOTE: Keep fiberglass cleaning solvents away from the entry fittings to prevent damage.

APPENDIX A
OPW APPROVED LUBRICANTS

NOTE: Always read MSDS sheets carefully before using any chemical.

- Parker O-Lube
- Black Moly Grease
- Ru Glyde Rubber Lubricant
- Super Lube Synthetic Grease

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OPW STANDARD PRODUCT WARRANTIES

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 must be based on physical specifications and limitations, compatibility with the environment and material to be handled. All illustrations and specifications in the 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 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 Certified to California Standards *	1 year from date of manufacture or from date of installation registration (not to exceed 15 months from date of manufacture)
All other Products	1 year from date of manufacture

* Products certified to California 2001 Standards 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 any defective product) for future orders for any product that may prove defective within the applicable warranty period (repairs or replacements 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 3250 US Highway 70 Business W, Smithfield, NC 27577, Attention: Customer Service. No products may be returned to OPW without its prior written authority.

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THIS LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND ALL OTHER WARRANTIES INCLUDING, WITHOUT LIMITATION, THE WARRANTIES OF MERCHANTABLILITY 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, 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.

STORAGE & TRANSIT NOTE: OPW piping systems should be installed by OPW trained and certified personnel and the use of non-qualified personnel or any deviations from these recommended procedures could result in damage or leakage of the system.

WARNING

FAILURE TO COMPLY WITH THE FOLLOWING WARNING COULD RESULT IN PROPERTY DAMAGE, INJURY OR DEATH.

WARNING

FIRE AND EXPLOSION HAZARD

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.

Part Number: 215159
Issue Date: 07-09-26
Supercedes: 02-10-22

FlexWorks™ piping systems are for use as underground piping for primary carrier and secondary containment for motor vehicle fuels, aviation, and marine fuels.

NOTE: Failure to secure written approval from OPW concerning non-warranted fuels and liquid chemicals, will void the product warranty and could potentially cause environmental damage or personal injury.

NOTE: Fittings have been evaluated per UL/ULC for use with DS, DSE, DSF, DSL, DSW, DP, EL, FCS, FTS, PST, S, TS and AXP series of products. Failure to use recommended combinations of sump products in a completed assembly may cause damage or leakage.

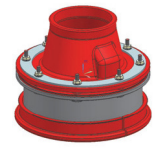
STORAGE & TRANSIT NOTE: Sump products are not intended for storage in excessive temperatures or direct sunlight. Rough handling may cause damage and leaking in use. Visually inspect sump prior to installation to ensure no damage. Damaged product shall not be used.

Installation Tools Required:

- Drill with 5/16" drill bit.
- Hole saw (See Step #2)
- Drill
- Torque Wrench
- 7/16" Socket
- 9/32" or 7mm Socket

Hybrid Entry Fittings

Hybrid Entry Fittings are designed to seal pipe entries through containment sump and above ground walls. For proper installation, a template (supplied with fitting) must be used for accurate hole drilling. Rigid fittings cannot be installed on round surfaces.



Step #1 (See Figure 1)

Locate and mark the center of the pipe entry point in the flat wall section of the sump. Drill a 5/16" hole in each location. Once the holes are drilled remove the template from the sump and proceed to step number 2.

Entry Fitting	For Use With
HEF-0751	0.5", 0.75", 1" Rigid Conduit
HEF-4075	0.75" FlexWorks Double Wall Pipe and SPC-0075 or SBC-2075
HEF-4010	1" FlexWorks Double Wall Pipe and SPC-0100 or SBC-2100
HEF-4175	Double Snout, 0.75" or 1" FlexWorks Double Wall Pipe and SPC-0075, SBC-2075, SPC-0100, or SBC-2100
HEF-4015	1.5" FlexWorks Double Wall Pipe and BMA-1515, DPC-2150A, SPC-0150A, or SBC-2150
HEF-4020	2" FlexWorks Double Wall Pipe and BMA-2020, DPC-2200A, SPC-0200A, or SBC-2200
HEF-6030	3" Flexworks Double Wall Pipe and BMA 3030, DPC-2300A or SPC-0300A

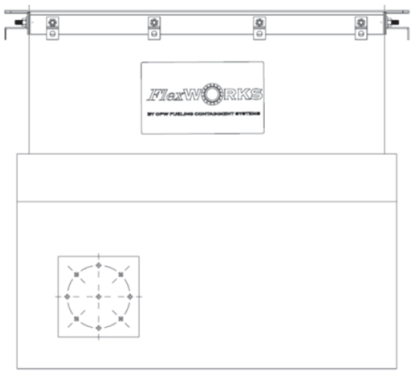


Figure 1

Step #2 (See Figure 2, and Figure 2A)

Drill out the entry fitting opening with the appropriate size hole saw using the center hole as a guide. Clean any rough edges.

IMPORTANT: The correct hole saw size must always be used for proper installation of Entry Fittings.

Hole Saw	Entry Fitting
HEF-0751	2-1/2" Hole Saw
HEF-4015, HEF-4020, HEF-4175, HEF-4075, HEF-4010	4" Hole Saw
HEF-6030	5-3/4" Hole Saw

NOTE: Only use hole saws that are sharp and in good condition. Use caution to prevent injury. The hole saw may catch unexpectedly and rotate drill.

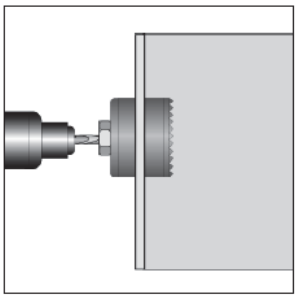


Figure 2

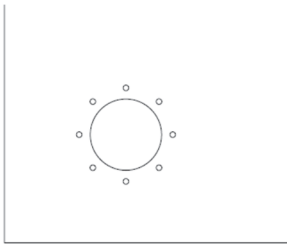


Figure 2A

Step #3 (See Figure 3)

Install the gasket on the body and place through the holes in the sump. From the inside of the sump, install the inner component of the boot, compression ring and nuts by hand.

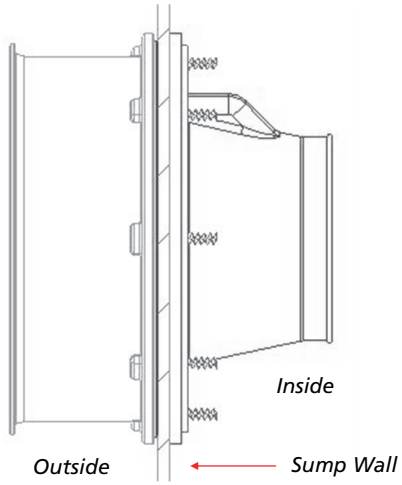
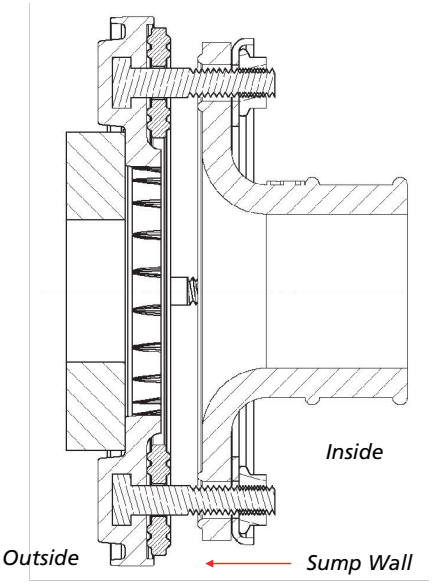


Figure 3

When Using Access Pipe



Step #4 (See Figure 4 and 4A)

Using a torque wrench, tighten each bolt, in increments, to 60 in-lb using a star pattern as illustrated below. Tighten 3/4" and 1" fittings in a criss-cross pattern evenly.

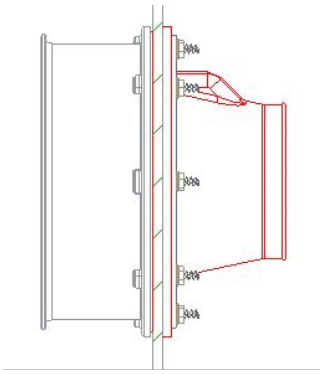


Figure 4

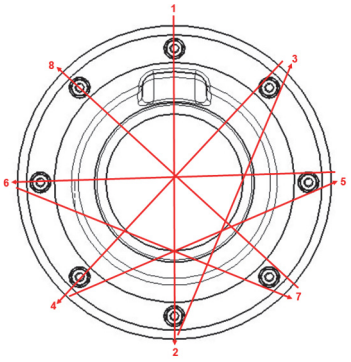


Figure 4A

Entry Fitting Sealants

OPW does not recommend the use of sealants when installing entry fittings on poly sumps, however, the proper application of approved sealants on the sealing surface of our entry fittings is acceptable to OPW.

The sealant(s) must be compatible with all contacted entry fitting materials, all ground environments and any fuels that may be secondarily contained within the sumps being sealed. OPW in no way warrants the performance of the sealant and is in no way responsible for any environmental release resulting from the use of said sealant(s). All entry fittings must be installed in accordance with OPW's written installation instructions by a currently certified installer.

If you choose to use a sealant, OPW recommends the following sealants for use with our entry fittings and sumps: **Bostik 920 FS Fast Set, marine grade urethane sealant; SL-1100 Urethane Sealant; Thiokol 1100 Industrial polysulfide joint sealant or PR 1440 Class B Fuel Tank sealant.**

Note: Be sure all manufacturers' installation and application instructions are followed.

Step #5 (See Figure 5, Figure 5A and Figure 5B)

NOTE: FOR DIRECT BURY, PROCEED TO STEP 7.

Cut the AXP Piping between two ribs then install two seals on the two end grooves of the AXP piping as shown. Lubricate the interior surface of the fitting, then insert the AXP piping into the body.

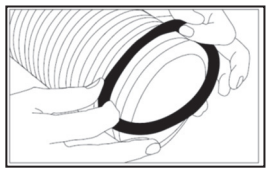


Figure 5

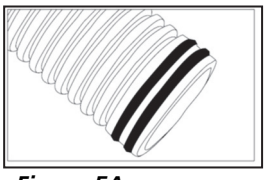


Figure 5A

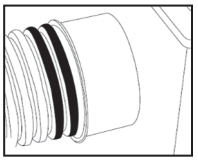


Figure 5B

NOTE: Crush protector is built into the fitting.

Step #6 (See Figure 6 and Figure 6A)

Install the AXP clamshell around the fitting and the AXP piping. Install the band clamp to 30—35 in-lbs.

Note: Per California SB-989, all metal must be protected from direct contact with the elements. Coat stainless steel band clamps with the following approved coatings: OPW SL-1100, 3M Underseal 08883 or Polyguard Mastic CA-9.

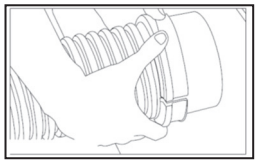


Figure 6

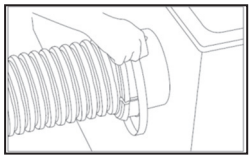
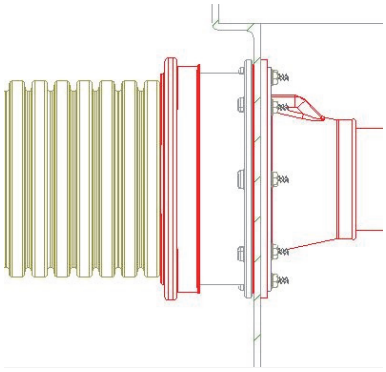


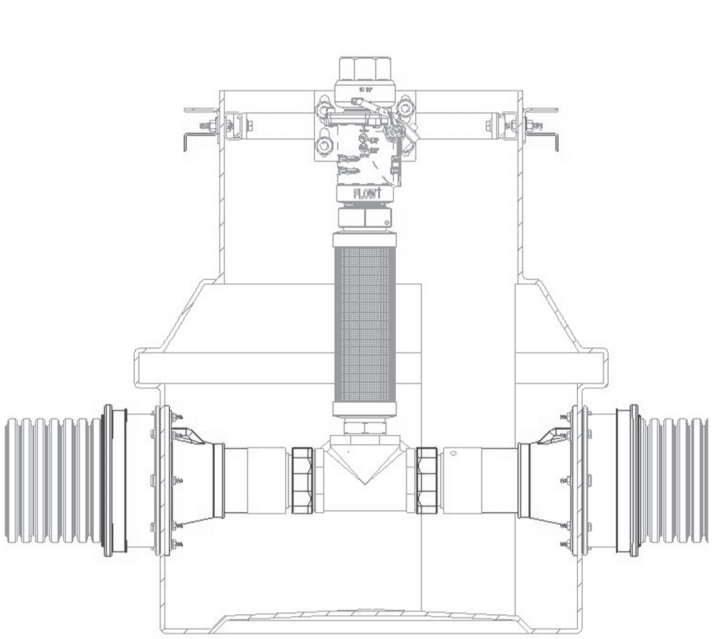
Figure 6A

Step #7

Insert the pipe or conduit into the entry boot from outside of the sump. Tighten the inner band clamp to 30 in. lbs. Do not over tighten.



NOTE: HEF models ending in "G" include a grommet for use with a heat trace cable in DEF applications. Grommet has 0.24" x 0.55" slot for use with a flat cable. Tighten dome nut to approximately 30 in-lbs.



Reference Illustration of Installation:

Angled Entries

The flexible entry boot is designed to permit angled pipe or conduit entries up to 15° off the centerline. Angles greater than 15° could prevent the boot from sealing around the pipe or conduit, and will void the product warranty.

Round Surface Installations

Standard hybrid entry fittings **CANNOT** be installed on round surfaces. "RD" style hybrid entry fittings or 'ROUNDKIT" kits must be used with round surfaces.

NOTE: Keep fiberglass cleaning solvents away from the entry fittings to prevent damage.

APPENDIX A OPW APPROVED LUBRICANTS

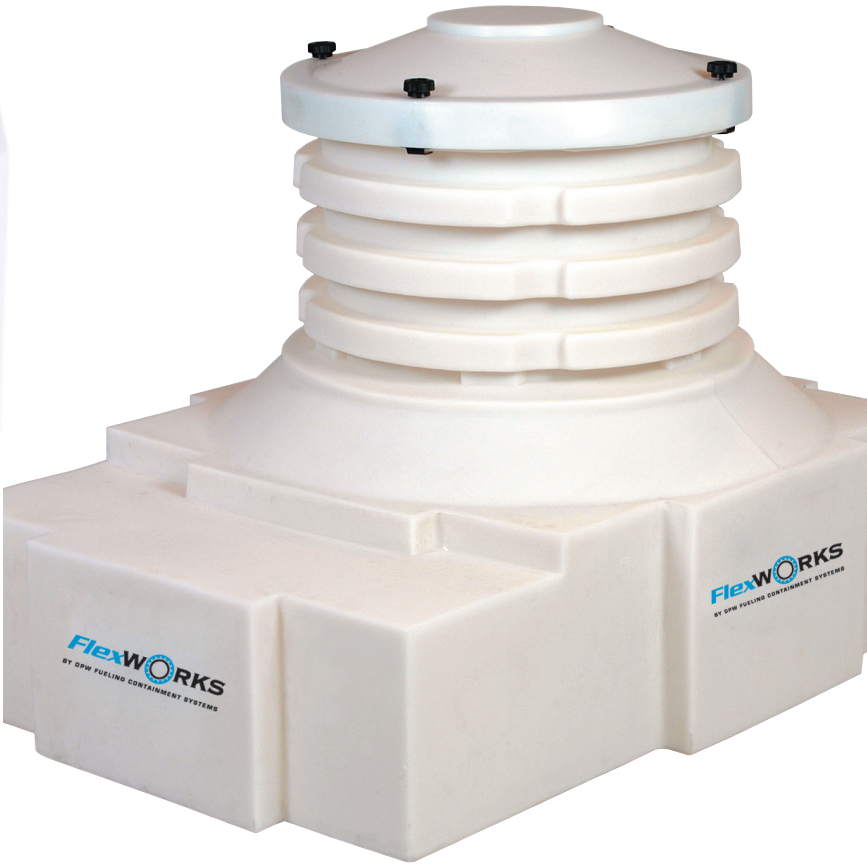
NOTE: Always read MSDS sheets carefully before using any chemical.

- Parker O-Lube
- Black Moly Grease
- Ru Glyde Rubber Lubricant
- Super Lube Synthetic Grease

Sump Installation

OPW
RETAIL FUELING
a DOVER company

Tank Sump Manual



OPW®
RETAIL FUELING
a DOVER company

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Issue Date: 07-09-26
Supercedes: 04-20-11

The following is an overview for all Tank Sumps please read and follow the specific Installation Instructions that come with the physical product when installing.

INDEX

1.0 FLEXWORKS

The FlexWorks System requires the use of tank sumps as a means of secondary containment of a tank's pump, valves and piping connections. These units extend from the top of the tank to just below the street manhole cover. They serve as a liquid tight isolation chamber, preventing ground water from entering and any leaking product from escaping into the environment. Tank sumps are non-corrosive, chemically compatible and are structurally suitable for underground burial applications.

All tank sumps are made of non-corrosive materials which are chemically compatible and excellent for soil burial applications. All tank sump models have height adjustable risers to accommodate different tank burial depths. Each tank sump model has its own specific range of height adjustability.

Tank sumps must be fabricated and also assembled at the job site. Upon delivery, make sure there is no visible damage to the sump and all sump components are contained within the sump. Failure to comply with these installation instructions shall void the Product Warranty.

1.1 General Information

This product manual contains useful information about all models of tank sumps. It is recommended that this manual be read prior to specifying and installing tank sumps. Installation practices should comply with the installation instructions contained within this product manual in order for the product or system warranty to be valid.

1.2 Independent Testing

All OPW Retail Fueling one and two piece tank sumps and piping sumps are listed with Underwriters Laboratories, Inc., (UL®). These sumps were tested in accordance with UL's "Standard Testing Procedure for Underground Dispenser Sumps and Tank Sumps." These components are listed under file #MH 19391. The scope of the tests include broad compatibility testing for both petroleum products and burial environments as well as physical testing to confirm the sumps' structural integrity and liquid tightness.

1.3 Liquid Tightness

All tank sumps and accessory components are designed to prevent any external liquids from entering the sump, and liquids originating within the sump from escaping into the surrounding environment. Compliance with the tank sump installation procedures are especially important in high ground water applications. Assembly and installation instructions must be followed to ensure the liquid tightness which is paramount for environmental safety. OPW Retail Fueling recommends hydrostatic testing on all sumps after installation to verify proper sealing of joints and connections.

1.3.1 Sump Covers

All tank sumps are equipped with a watertight sump cover, one style which does not require the use of fasteners to affect a liquid tight seal, the other with knobs to achieve proper compression and sealing capabilities. For added protection for compression style lids, optional hold-down latches are available to secure the lid firmly to the sump riser in high water table applications.

1.3.2 Pipe & Conduit Entry Seals

OPW Retail Fueling's flexible entry boots are the only type of sump entry seal permitted for warranty coverage. These composite rubber/metal type compression seals are installed in the wall of the tank sump and provide a watertight connection for all pipe and conduit entries.

1.4 Structural Integrity

Properly selected materials combined with a structurally enhanced design allow tank sumps to resist the forces associated with backfill, high ground water, and ground movement. All polyethylene sumps are rotationally molded of a high density polyethylene (rotational grade), which is a very durable and crack resistant semi-rigid plastic. The multi-sided and ribbed base, the ribbed riser section and the graduated riser to base step section further contribute to the overall strength of the sump.

1.5 Chemical Compatibility

All tank sumps are made of high density polyethylene or fiberglass. Both materials are essentially inert and each has a long history of underground burial applications. These materials have been used for the storage of a long list of chemical solvents as well as hydrocarbon and alcohol based fuels.

All pipe entry seals are made of a specially formulated PVC-Nitrile compound which has been independently tested to insure its compatibility with a wide assortment of chemicals. These tests include measuring the material's retention of properties as well as its physical characteristics of the seal after exposure.

1.6 Corrosion Resistance

All metal components used for sump connections and sealing are either zinc or nickel plated, or made of stainless steel. All metallic components are accessible from inside the sump.

The sump and associated seals are non-metallic and should not corrode.

2.0 SPECIFYING TANK SUMPS

Tank sumps are available in a variety of styles and sizes to accommodate most tank fitting configurations and tank burial depths. All sumps also feature patented watertight covers. All tank sumps are made of either polyethylene or fiberglass, both of which are compatible with all fuels and will not crack or break under burial loads. All tank sump models have height adjustable risers to accommodate different tank burial depths.

2.1 Shallow Burial Tank Sumps

A one piece polyethylene containment sump designed for tank burial depths between 21" and 37". Available in sizes to install under 36" and 42" diameter street boxes.

2.2 Standard Burial Tank Sumps

A one piece polyethylene containment sump designed for tank burial depths between 24" and 44". Available in sizes to install under 36" and 42" street boxes.

2.3 Deep Burial Tank Sumps

A one piece polyethylene containment sump designed for tank burial depths between 29" and 55". Available in sizes to install under 30", 36" and 42" street boxes.

2.3.1 Fiberglass Tank Sumps

Available in one or two piece, fiberglass tank sumps are designed for deep tank burials between 41" and 55" having high groundwater conditions and/or sand backfill. Available in sizes to install under 36" and 42" diameter street manholes.

2.4 Junior Burial Tank Sumps

A small polyethylene containment sump used for containment of miscellaneous tank valves and fittings. This containment sump is of a one piece construction.

2.5 Inline Piping Sumps

A small polyethylene containment sump available for containment of miscellaneous tank valves and fittings. This containment sump is of a one piece construction.

2.5.1 Transitional Piping Sumps

Provides containment of pipes and fittings for transitions of above grade rigid pipe to flexible pipe below grade. Refer to the transitional piping sump product data sheet for details and installation instructions on this sump.

3.0 SUMP PIPING APPLICATIONS

Flexible underground piping systems can be configured in a variety of arrangements depending on the application and dispensing specifications of the service station. Tank sumps are used to contain a variety of fittings for both pressure and suction piping applications. The following describes both piping applications.

3.1 Pressure Piping Applications

Tank sumps used in this application would typically contain the tank's submersible pump and other associated fittings. Here, the FlexWorks piping connections to the pump would be contained as illustrated.

3.2 Suction Piping Applications

Tank sumps in this application would typically contain the tanks instrumentation and other associated fittings. Here, the FlexWorks piping connections are contained as illustrated.

4.0 TANK SUMP INSTALLATION STEPS

A listing of the basic installation steps for tank sumps is provided in chronological order for easier clarification of detailed installation instructions contained within this manual.

Step 1: Mount tank sump base to the tank.

Step 2: Install flexible entry boots.

Step 3: Install pump and piping connections.

Step 4: Install water tight Sump Cover.

Step 5: Install manhole cover.

5.0 TANK SUMP MOUNTING APPLICATIONS

Tank sumps are designed to mount to the top of an underground storage tank in a variety of applications. Listed below are the approved and warranted applications:

5.1 Tank Flat-Tops

Tanks may be equipped with a flat circular surface area containing an arrangement of tank fittings. A bolt circle of metallic studs surround the top and can be used to mount the tank sump by using the flanged collar adapter.

5.2 Flanged Containment Collars

Tanks may be equipped with an inward facing flanged containment collar which generally encircles a varied arrangement of tank fittings. Tank sumps may be directly mounted to these collars using a flanged collar adapter.

5.3 Inward Flanged Manways

Tanks may be equipped with an inward facing flanged manway which has an arrangement of tank fittings on the manway cover. A bolt circle of metallic studs surrounds the manway for mounting tank sumps using the flanged collar adapter.

5.4 Vertical Containment Collars

Tanks may be equipped with a vertical fiberglass containment collar which generally encircles an arrangement of tank fittings. Tank sumps having the fiberglass base can be directly mounted to the fiberglass containment collar by using the fiberglass resin kit.

5.5 Outward Flanged Manways

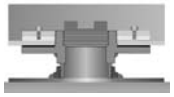
Tanks may be equipped with an outward facing flanged manway which has an arrangement of tank fittings on the manway cover. A bolt circle of metallic studs are used in securing the cover and attachment of the tank sump using the tank manway adapter.

5.6 Conventional Tank Fittings

For tanks which are equipped with female bung fittings having tapered threads, tank sumps can be directly mounted by installing the tank fitting adapter. Tank fitting adapters are available in both 4" and 6" NPT fitting sizes. Two tank fitting adapters are recommended in each tank sump.

6.0 SUMP BASE MOUNTING INSTRUCTIONS

The installation of tank sumps must be performed by a trained installer. The means of mounting the tank sumps to the top of underground storage tanks are dependent upon the design and construction of the tank. The following sump base mounting instructions cover a wide variety of mounting applications, each of which requires the sump base to be fabricated in some manner.



When determining the alignment of the sump base to the tank fittings, it is important to consider the size, height, and location of the submersible pump to ensure that it does not interfere with the wall of the riser section. The tank fittings must be no less than 10" on center if tank fitting adapters are to be installed. It is also important to consider in advance the location of piping penetrations through the sump wall. Failure to do so may result in excessive stresses on the piping joints and/or severe entry angles.

6.1 Flanged Collar Adapters

Should the tank sump require mounting to a tank's flat top, inward flanged containment collar or inward flanged manway, the flanged collar adapter must be used. Follow these fabrication and mounting instructions to comply with the product warranty.

If your tank manufacturer does not supply this type of collar as a standard component, then it will be necessary to request a custom collar be installed. The dimensions and design of the containment collar should be as illustrated and described below.

Dimensions:
Bolt Hole Circle: 38 1/2"
Number of Bolts: 24
Bolt Diameter: 3/8"

Assembly Components:
8 - Compression Ring Segments
1 - Flat Rubber Ring Gasket
24 - 3/8" Bolts
48 - 3/8" Washers
24 - 3/8" Nuts
1 - Roll of adhesive tape

6.1.1 Sump Base Layout

Turn the sump base over so that its bottom is facing up. Assemble the segmented compression ring onto the sump base evenly. Then center the assembled ring on the sump base using the fabrication guidelines. Beginning with a permanent ink marker, trace the inside circle of the segmented ring. Remove the segmented ring from the sump base.

WARNING: Verify dimensions of flanged collar prior to cutting sump.

6.1.2 Cutting Out Opening

After tracing the inside circle of the segmented compression ring, cut out the opening using an electric saber saw fitted with a cutting blade suitable for cutting plastic. Cut out the inside circle traced on the bottom of the sump base. After cutting out the opening, clean the edges using a razor knife if necessary.

6.1.3 Outside Bolt Circle Drilling

Proceed to reassemble the segmented compression ring on the sump base evenly. Center the assembled ring on the inside edge of the cut-out opening. Mark the center of the holes in the segmented compression ring with a permanent ink marker. Using an electric drill fitted with a 9/16" bit, drill out the 24 bolt holes.

6.1.4 Base/Collar Assembly

After applying the adhesive tape to the collars flange, place the flat gasket over the collars' flange. Once complete, place the sump base over the gasket and align bolt holes. From inside the sump, install a compression ring section on top of the sump base's flange. Secure the ring section to the flange with fasteners. Install the remaining segmented compression rings and tighten all fasteners to 60 inch pounds.

WARNING: Underside of sump base and gasket must be clean and free of debris prior to mounting sump.

6.2 Fiberglass Tank Sump Bases

Should the tank sump require mounting to a tank's containment collar, the fiberglass tank sump base must be used. The tank manufacturer must provide a 42" diameter fiberglass containment collar which has the specifications illustrated below. Follow these fabrication and mounting instructions to comply with the product warranty.

Dimensions:
Collar Height = 4"
Collar Outside Diameter = 42"

Assembly Components:
1 - Fiberglass Sump Base
1 - Fiberglass Resin Kit

6.2.1 Surface Preparation

Sand the inside surface of the vertical mounting flange at the bottom end of the fiberglass sump base thoroughly with a medium grit sand paper. Next, sand the outside surface of the tank's fiberglass containment collar. Make sure that all contact areas on both surfaces have been completely sanded and wiped clean with a clean cloth. This procedure removes any surface oxidation, grease or grime creating a suitable bonding surface for the resin kit.

6.2.2 Base Mounting

Place the fiberglass sump base over the top end of the containment collar. Use a level to make sure the sump is straight and level.

6.2.3 Mixing Adhesive

IMPORTANT: Read these instructions completely before mixing chemicals. The resin solution and catalyst are highly flammable. It is important to use the FRK2000/RK-5000 outside or in a well-ventilated area. Fumes are flammable and may build up in poorly ventilated areas.

WARNING: Catalyst contains METHYL ETHYL KETONE PEROXIDE (MEKP). Avoid direct contact with skin. If skin contact occurs, wash immediately with soap and water. Should eye contact occur, flush immediately with water and contact a physician.

WARNING: Resin solution is highly flammable. Avoid skin contact. Avoid inhalation of fumes. This material contains STYRENE which is listed by the IARC on Cancer as a group 2B cancer causing agent (possibly carcinogenic to humans).

Kit Includes:

2 Quart can of putty

1 Gallon can of fiberglass resin

4 oz. bottle of red catalyst

330" of fiberglass matting material

1 wooden stir stick

1 pair of latex gloves

1 3" roller with handle

1 screw package (30) screws

STORAGE: The contents of the FRK-2000/RK-5000 are highly flammable. Do not store near flames, sparks, or pilot lights. No Smoking. The shelf life of the FRK-2000/RK5000 is related to temperature. Do not store resins above 90º F. A maximum shelf life of 6 months can be expected when stored at or below 75º F. Storage in temperatures below 70º F is recommended. Discard any out dated resin in accordance with RCRA Hazardous Waste Methods.

PREPARATION: Prior to mixing the catalyst with the resin solution, the mating surfaces to be bonded must be properly prepared. Be sure all cut edges are smooth and even.
Grind or sand both surfaces to be bonded a minimum of 4" on each surface. Be sure surfaces are free from any oils or debris. Fill in any excessive gaps with putty material. This will reduce the coverage area of the matting material as well as seal the joint and prevent the resin from seeping through.

WARNING: Inadequate joint strength may result if the adhesive is cured at temperatures less then 70°F.

Shelf Life: The resin adhesive has a shelf life of 6 months at 77ÞF. If the date on the can has passed, do not use the resin. Be sure to properly dispose of the container.

Cold Weather Installation Tips: Ideal bonding conditions for this two-part adhesive is between 70ÞF and 100ÞF with normal humidity conditions. Below 70ÞF the following procedures are to be implemented:

Place adhesive kits in a warm room for 6 to 12 hours prior to fabrication so they will be 70Þ to 80ÞF for fabrication.

Wrap a roll of fiberglass building insulation around the outside of the containment collar/ sump base joint. Cover the sump base for a period of time to allow the sunlight to warm up the outside of the sump base. Other sources of heat such as a heat lamp may be introduced to the outside of the sump for warming of the collar/sump base joint.

Wrap an electric heating blanket around the outside of the containment collar/sump base joint.

Conditions of Extreme Humidity: The sanded surfaces of the containment collar and fiberglass sump base must be free from moisture and other contaminant's in order for the adhesive to produce an effective bond. The presence of moisture or other contaminants will prevent proper adhesion.

Adhesive Pot Life: After Part "A" has been mixed with Part "B", the usable application time of the adhesive is called the "Pot Life". The Pot Life for the mixed adhesive is as follows:

6.2.4 Application

On a smooth disposable surface (e.g. cardboard), lay out sections of fiberglass matting at least two plies thick. Be sure to limit the lengths of the matting strips, as the temperature will dictate the amount of time you will have to work before the fiberglass resin sets up.

CAUTION: Before handling resin and catalyst, be sure to have the following:

- **Gloves**
- **Chemical splash goggles.**
- **Well ventilated area.**

Mix putty and resin as per the proper hardener ratio: 2 oz. of hardener for 1 gallon of resin. 1 oz. of hardener for 2 quarts of putty.

Note: This will vary with temperatures and direct sunlight. If used in temperatures above 80°F reduce hardener to allow proper working time Immediately stir the mixture thoroughly and pour it onto the matting material. Once the matting is evenly wetted down, place it over the joint. Then, using the fiberglass roller, roll out the matting smoothly getting out any air bubbles and pockets, feathering out the edges into the part.

Repeat this process until the entire joint is glassed in. Once the joint has cured completely, hydrostatically test the sump to ensure liquid tightness.

6.3 Tank Manway Adapters

Should the tank sump require mounting to a tank's outward flanged manway, the tank manway adapter must be used. Both 22" and 24" diameter versions are available to mount a tank sump to a tank's manway. Refer to the manway specifications for specific dimensions. Follow these fabrication and mounting instructions to comply with the warranty.

Assembly Components:

8 - Segmented Compression Rings
1 - Adapter Ring
1 - Flat Rubber Ring Gasket
24 - 3/8" Bolts
48 - 3/8" Washers
24 - 3/8" Nuts
1 - Cork Gasket

6.3.1 Sump Base Layout

Turn the sump base over so that the bottom is facing up. Assemble the segmented compression ring on the sump base. Center the assembled ring on the sump base using the fabrication guides. Using a permanent ink marker, trace the inside circle of the segmented ring. Remove the segmented ring from the sump base.

6.3.2 Cutting Out Opening

After the tracing of the inside circle of the segmented compression ring has been completed, cut out the opening as follows: using an electric saber saw fitted with a cutting blade suitable for cutting plastic, cut out the traced circle on the bottom of the sump base. After cutting out the opening, clean the edges using a razor knife or deburring tool.

6.3.4 Outside Bolt Circle Drilling

Reassemble the segmented compression ring on the sump base evenly. Center the ring on the inside of the cut-out opening. Using two vice grips, clamp the ring to the sump base. Using an electric drill fitted with a 7/16" bit drill out the 24 bolt holes, remove the segmented ring from the sump base.

6.3.5 Installing Adapter Ring

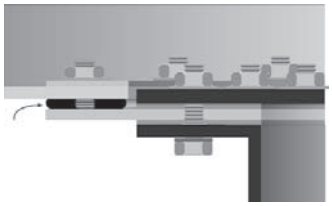
After the opening has been cut out and all the bolt holes drilled in the sump base, the adapter ring can be installed. Turn the adapter ring over so that the studs are facing down. Insert the studs into the bolt holes evenly. Push the adapter down flush with the surface of the sump base.

6.3.6 Adapter/Sump Base Assembly

Turn the sump base on its side to provide access to the inside and outside of the bottom. On the inside of the sump base, install the segmented compression ring over the penetrating studs. Next, install the washers and nuts to the studs and gradually begin all nut fasteners in stages until all are firmly secure.

WARNING: Be sure the sump base and gasket are free from debris. Gasket must be located as shown in the illustration.

6.3.7 Manway/Sump Base Assembly



Install the cork gasket over the studs/bolts of the manway flange. Position the sump base over the gasketed flange so that the manway studs/bolts fit through the adapter ring. Place the flat gasket, provided with the kit, over the adapter ring. Install the manway cover over the gasketed adapter ring and install the manway cover nuts.

NOTE: For manways which use bolts, secure them on top with the provided "Tinnerman Nuts". All bolt heads must be sealed from underneath the flange (seal not provided by OPW Retail Fueling). Use SL-1100 or an approved Bostik marine grade sealant.

6.4 Tank Fitting Adapters

Should the tank sump require mounting to a tank's 4" bung fitting, tank fitting adapters must be used. The tankfitting adapter will install into a 4" or 6" NPT threaded tank fitting. Follow these mounting instructions to comply with the product warranty. The adapter is of sufficient height to prevent interference of the sump base with the ribs of fiberglass tanks. The adapter's connection to the sump and to the tank is liquid tight and secure.

Assembly Components:

1 - Adapter Base
1 - Threaded Ring
1 - Flat Rubber Ring Gasket
8 - 3/8" bolts
1 - Compression Ring

IMPORTANT: Install two tank fitting adapters for high ground water applications.

6.4 Tank Fitting Adapters

Should the tank sump require mounting to a tank's 4" bung fitting, tank fitting adapters must be used. The tank fitting adapter will install into a 4" or 6" NPT threaded tank fitting. Follow these mounting instructions to comply with the product warranty. The adapter is of sufficient height to prevent interference of the sump base with the ribs of fiberglass tanks. The adapter's connection to the sump and to the tank is liquid tight and secure.

6.4.1 Sump Base Fabrication

After the placement of the tank fitting adapter holes have been located on the base of the sump, use a drill fitted with a 5-1/2" hole saw to cut out holes for the 4" tank fitting adapter. Use a saber saw to make the hole for a 6" SMF.

NOTE: Other brands of tank fitting adapters may require different sized hole saws. Always use the correct size hole saw.

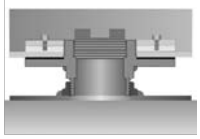
6.4.2 Installing Tank Fitting Adapters

Use a large wrench around the outside of the fitting, or a steel bar positioned in the lugs of the top of the fitting. Tighten the adapter, being careful not to damage the outside threads.

6.4.3 Riser Pipe Adjustments

It may be necessary to modify the height of the riser pipe. The riser pipe needs to be ordered 2" shorter than typically specified or cut and threaded in the field to allow for the height of the tank fitting adapter.

6.4.4 Mounting Sump Base



Remove the compression ring and washer from the adapter. Make sure the flat gasket is evenly positioned on the flange. Second, set the sump base over the threaded riser onto the rubber gasket. Make sure the sump base fits evenly on the gasket and that there are no obstructions under the base. Third, re-install washer and compression ring and tighten firmly. Make use of the two tabs of the 4" compression ring to tighten into place. When using the TFA-4090, tighten each of the eight bolts in a star pattern.

IMPORTANT: The gasket of the tank fitting adapter's flange must be located under the tank sump base. The sump base and gasket must be free from debris prior to mounting. Make sure that backfill material is evenly distributed and compacted under the sump.

7.0 BASE/RISER CONNECTIONS

For both deep and extended burial tank sumps which have separate base and riser sections, it is necessary to follow the assembly instructions for proper installation of each combination of joint.

7.1 Fiberglass Riser

Prior to installing a fiberglass riser to a fiberglass base, it is necessary to rough sand the entire outside diameter of the riser (the portion which will sit inside the collar of the base) as well as the entire inside diameter of the base collar, with a heavy grit sandpaper. This removes any oxidation, grease or grime, creating suitable bonding surface for the resin kit. Once this has been completed, carefully insert the riser into the base collar making sure it is evenly positioned.

7.1.1 Preparing the adhesive

Refer to the fiberglass adhesive mixing instructions in section 6.2.3 for proper preparation of the adhesive.

7.1.2 Applying the adhesive

Refer to section 6.2.4

8.0 RISER FABRICATION

The riser sections of polyethlene tank sumps have structural ribs which are two inches on center.

8.1 Polyethylene Riser Fabrication

Using a saber saw, the riser can be cut to the desired height by cutting in the valley of two ribs. All cuts should be even, and if necessary, all edges cleaned with a razor knife or a plastic de-burring tool. Make sure there is enough riser left to extend into the skirt of the street manhole so that the bottom of the street manhole skirt does not interfere with the top sump base. This will prevent backfill and/or debris from entering the sump underneath the sump lid.

IMPORTANT: Leave a minimum of 3" of sump riser to allow for proper clearance of the sump cover.

8.2 Fiberglass Riser Fabrication

Measure down from the top of the riser to the desired height and place a mark on the riser. Using a flexible tape, draw a line connecting the marks. With a saber saw, cut along the perimeter of the riser. Be sure to de-burr all the edges after cutting.

IMPORTANT: Leave a minimum of 3" of sump riser to allow for proper clearance of the sump cover.

9.0 RISER/COVER SEAL

After the riser has been cut to the appropriate burial height, the cover seal should be installed to the top of the riser. A tube of adhesive is provided to bond the cover seal to the top of the riser. Apply the adhesive entirely around the seal area of the riser, both inside and out. Then smooth out the adhesive so that it evenly covers the entire area. Allow to set for ten minutes. Next, install the cover seal over the riser edge and position it evenly into the riser edge. Once installed, inspect around the entire diameter for evenness.

10.0 PIPE ENTRY LOCATIONS

For standard pipe burial applications, the piping should enter at the lowest possible entry point in the sump. For determining the correct pipe entry location for tank sumps, refer to the FlexWorks piping manual. Refer to the flexible entry boot manual for the proper installation of all pipe entries.

11.0 TANK SUMP BACKFILL MATERIALS

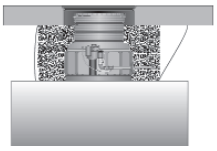
IMPORTANT: Prior to backfilling around the tank sump, make sure the sump cover has been installed to prevent any deformation of the riser during backfilling.

Approved backfill materials for tank sumps shall meet the following specifications:

11.1 Pea Gravel

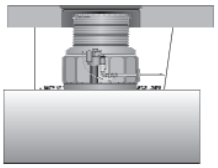
Rounded pea gravel is permitted with a minimum diameter of 1/8" and a maximum diameter of 3/4".

11.2 Crushed Stone



Crushed stone is permitted providing it is washed, cleaned and is the free-flowing type with an angular stone size between 1/8" and 1/2". (Meets ASTM C-33 paragraph 9.1 requirements.)

11.3 Sand



All sand backfill material should be washed clean and free flowing. When backfilling, make sure sand is evenly distributed and packed around the tank sumps.

IMPORTANT: All backfill material should be dry and free from ice, snow and debris. Using material other than those described above without written approval from OPW Retail Fueling Products, Inc. will void the product warranty.

12.0 POST INSTALLATION TESTING AND INSPECTION

12.1 Visual Inspection

Upon completion of installation, tank sumps must be visually inspected to verify proper installation techniques were followed. All compression ring segments must be in place, gaskets installed, fasteners tightened, flexible entry boots installed properly, joints sealed and covers in place.

12.2 Hydrostatic Testing

In addition to inspection of tank sumps, each unit should be hydrostatically tested. To properly test a tank sump, the following steps should be followed.

12.2.1 Testing Procedure

Step 1: Fully assemble tank sump, including all joints and sump penetrations.

Step 2: Be sure fill material does not obstruct view of underside of sump.

Step 3: Gradually introduce water into the tank sump.

Step 4: Fill the sump to 4" above the highest joint or boot. Level should be no less than 24".

Step 5: Inspect the outside and underside of the tank sump. Note any leakage of water.

Step 6: If no leakage is observed after 1 hour, drain or pump out the tank sump.

Step 7: If joints or penetrations show leakage, drain or pump out the tank sump. Inspect and tighten joints or penetrations that showed leakage. Re-conduct test.

13.0 FLEXWORKS SYSTEM MAINTENANCE

The FlexWorks System is designed to provide reliable underground fuel transfer and short-term secondary containment of leaked petroleum product. FlexWorks sumps and secondary containment pipes are not intended for long term storage of petroleum products. Liquid that accumulates in the secondary containment system must be promptly removed and properly disposed of. Operational third party approved liquid sensors should be installed and maintained in each sump to reliably indicate to the operator that liquid is present in the secondary containment system. Once a leak is detected, the system must be shut down immediately and the source of the leak must be repaired. All liquid must be thoroughly flushed and cleaned out of the secondary containment system at once. Inspect all system components at least monthly for leaks or damage, and repair or replace any suspect component as necessary.

13.1 ROUTINE SUMP INSPECTIONS

Visual inspections of all containment sumps and components should be made on a routine basis to check for damage, water infiltration or for any signs of leaking product. An electronic or mechanical shut-off leak detection system is recommended for all containment sumps. When changing fuel filters at the dispenser, make sure any spilled product is cleaned out of the bottom of the dispenser sump. Sumps are to be kept free of debris and spilled fuel dispenser sump. Sumps are to be kept free of debris and spilled fuel.

NOTE: Failure to remove fuel and liquids from containment sumps may compromise the performance and integrity of the sump and its associated fittings and seals over prolonged periods of time.

14.0 GUIDE SPECIFICATIONS

The following specifications are provided as general guidelines to specify tank sumps.

14.1 Short Form

The contractor shall provide a surface access tank sump as manufactured by OPW Retail Fueling products, Inc. which is to be installed under the street manhole to permit access to an underground storage tank's pump and plumbing components. Access sumps shall be installed in accordance with the manufacturer's current installation instructions.

14.2 Long Form

14.2.1 Design

Tank sumps shall be of such a design that it is capable of moving up or down within the skirt of the street manhole to prevent stresses to the tank and sump in the event of tank or ground movement.

14.2.2 Product Compatibility

All components and accessories of the tank sump shall be chemically compatible with the products to be distributed and with chemicals found naturally in the ground environment.

14.2.3 Corrosion Resistance

All tank sump components which come in contact with the ground environment shall be made of non-metallic material or protected by materials which prevent corrosion.

14.2.4 Structural Integrity

All components shall be designed and constructed of materials strong enough for its intended use. Tank sumps shall not collapse, crack or break due to ground or tank movement, or from backfill and high ground water pressures.

14.2.5 Pipe & Conduit Entries

All tank sumps shall be fitted with pipe and conduit entry seals which are semi-absorbent to ground movement and sufficiently flexible enough to permit angled entries up to 15degrees without leaking under liquid head pressures of up to six feet (1.8 m).

14.2.6 Liquid Tightness

All tank sumps shall prevent outside surface and ground water from coming into the container and prevent any leaking product originating from within the sump from escaping into the underground environment. OPW Retail Fueling recommends hydrostatic testing on all sumps after installation to check for proper sealing of joints and connections.

14.2.7 Height Adjustability

All tank sumps shall be field height adjustable to accommodate different tank burial depths.

14.2.8 Tank Mounting

Tank sumps should be secured to the underground storage tank by means of factory approved and warranted adapters and methods.

14.2.9 UL® Testing

Tank sumps shall be tested and listed by Underwriters Laboratories to meet "Standard Testing Procedure for Underground Dispenser Sumps and Tank Sumps".

LIMITED WARRANTY

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 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 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 Certified to California 2001 Standards*	1 year from date of manufacture or from date of installation registration (Not to exceed 15 months from date of manufacture)
All other Products	1 year from date of manufacture

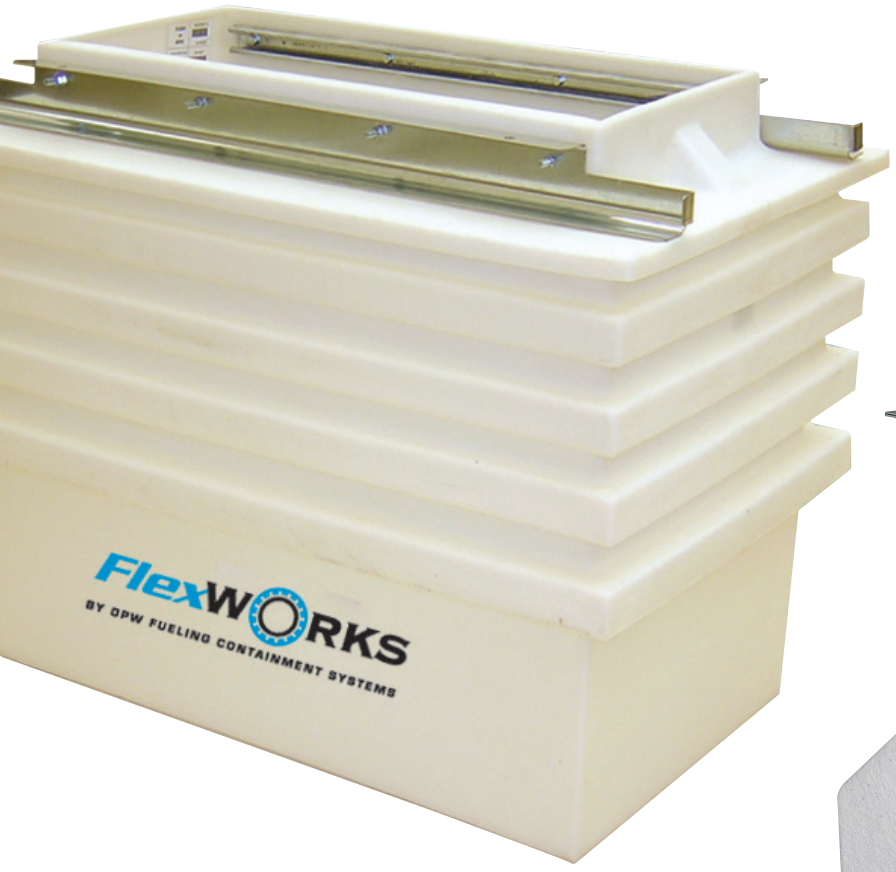
* Products certified to California 2001 Standards will have an OPW registration card enclosed/attached to the product.

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 any defective product) for future orders for any product that may prove defective within the applicable warranty period (repairs or replacements are subject to prorated warranty coverage fro 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 3250 US Highway 70 Business W, Smithfield, NC 27577, 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. This limited warranty also shall not apply to any FlexWorks, VAPORSAVER or other OPW product: unless all required site and warranty registration forms are completed and received by OPW within 60 days of installation; 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, with 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 with 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.

Dispenser Containment Manual



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a DOVER company

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FlexWORKS Dispenser Containment Manual

The following is an overview for all Dispenser Sumps please read and follow the specific Installation Instructions that come with the physical product when installing.

INDEX

1.0 INTRODUCTION

The FlexWorks System requires the use of dispenser sumps or dispenser pans as a means of secondary containment for the plumbing and piping connections located beneath the dispenser. These sumps also provide surface access to piping connections and provide a clean and dry environment for future service and maintenance. Dispenser sumps and dispenser pans are installed just beneath the above ground fuel dispensing units. Dispenser sumps are non-corrosive, chemically compatible and structurally suitable for underground burial applications.

1.1 General Information

This product manual contains useful information about all models of dispenser sumps and pans. It is recommended that this manual be read prior to specifying and installing under dispenser containers. The installation practices shall comply with the installation instructions contained within this product manual in order for the product warranty to be valid.

1.2 Independent Testing

All OPW Retail Fueling dispenser sumps and dispenser pans are listed with Underwriters Laboratories, Inc. (UL®). The dispenser sump / pan frames were tested to UL's "Standard Testing Procedure for Underground Dispenser Sumps and Tank Sumps " and are UL Listed. These tests verified the frame's ability to withstand a lateral impact from all sides and permit proper activation of a shear valve in the event of a knockover. The integrity of the sump itself was conducted in accordance with UL's "Standard Testing Procedure for Underground Dispenser Sumps and Tank Sumps" and is UL Listed This test program tested the sump's fluid compatibility as well as its ambient and low temperature physical properties.

1.3 Liquid Tightness

Dispenser sumps are open at the top and are sheltered from the weather by the dispenser housing. Most dispenser sumps and dispenser pans provide a 1" vertical lip above the surface of the island to prevent any surface run-off from entering the container. All pipe and conduit entries are required to be sealed with flexible entry boots.

1.4 Chemical Compatibility

All dispenser sumps and dispenser pans are made of either fiberglass or polyethylene plastic material; both of which are chemically inert and have a long history of underground burial applications. Polyethylene and fiberglass have been used in storage containers designed for containment of a long list of chemical solvents, hydrocarbon and alcohol based fuels. All seals are made of a specially formulated compound which has been independently tested to insure its compatibility with a wide assortment of chemicals. These tests include measuring the material's retention of physical properties and determining the capability of the compound to withstand exposure.

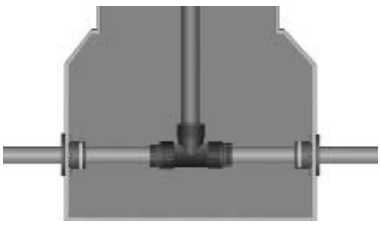
1.5 Corrosion Resistance

All metal framework components are either powder coated, galvanized or zinc plated for excellent long term corrosion protection. The entry seal fasteners are made of stainless steel. All of these metallic components are accessible from inside the sump. The sump body is non-metallic and will never corrode.

2.0 SPECIFYING DISPENSER CONTAINMENT

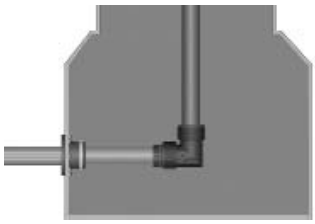
OPW Retail Fueling offers a wide variety of under dispenser containers to accommodate the most common types and sizes of product dispensers. The selection of the appropriate type of under dispenser container depends on the following:

2.1 Junction Applications



Dispenser containers used in junction applications occur only in pressure piping systems with series pipe routing (from one dispenser to the next). This application uses the tee fitting to interconnect one flexible pipe section to the next, as well as branching off vertically to the fuel dispenser.

2.2: Terminating Applications



Dispenser containers used in terminating applications are typically at the end of pressure piping systems with series routed piping. They are located under all dispensers of suction piping systems with direct routed piping. They are also located under all dispensers of pressure piping systems with branch routed piping. This application uses the elbow fitting attached to a riser pipe assembly to attach one flexible pipe section to the fuel dispenser.

2.3 Dispenser Containment Models

Five types of dispenser containers are available for use with the FlexWorks piping system. They include:

2.3.1 One Piece Sumps

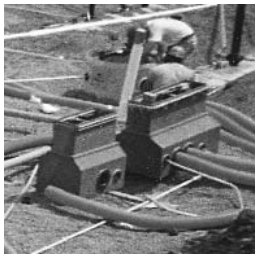
These higher profile dispenser sumps have a total height of 30 inches permitting the FlexWorks pipe to exit out of the dispenser sump at a very low elevation which is ideal for pressure piping systems requiring slope back indirectly to the tank. They are also recommended for use with pressure piping systems run in series which require piping fall back to the tank. These dispenser sumps are height adjustable to accommodate piping fall requirements between all containment sumps. These are available in poly for most dispenser models, and in fiberglass for a few dispensers. See the FlexWorks Dispenser Directory in the FlexWorks Product Catalog for availability.

2.3.2 Two Piece Polyethylene and Fiberglass Sumps

These higher profile dispenser sumps have total height of 37 inches permitting the FlexWorks pipe to exit out of the dispenser sump at a very low elevation which is ideal for pressure piping systems requiring slope back indirectly to the tank. They are also recommended for use with pressure piping systems run in series which require piping fall back to the tank. These dispenser sumps are height adjustable to accommodate piping fall requirements between all containment sumps. Because of its two piece design, connection of all fittings is easier than in standard one piece dispenser sumps.

3.0 DISPENSER MOUNTING FRAMES

All dispenser containment models share the same type of metal frame assembly. The frame assembly is specifically sized to accommodate one or more types of makes and models of product dispensers. All metal side struts, which secure the adjustable stabilizer bars, are directly anchored into the concrete using side anchors. The side struts also allow for convenient mounting of any type of leak detection probes. Specifically located anchor bolts are used to secure the dispenser frame to the concrete island.



4.0 GENERAL INSTALLATION INSTRUCTIONS

The different types of dispenser containment pans and sumps have similar installation procedures but also have some specific differences. The following instructions under this section concern only those general installation procedures which are consistent with all dispenser pans and sumps.

4.1 Dispenser Containment Mounting

The dispenser container frame has side anchors as well as a wide metal flange containing anchor bolts for secure anchoring to a concrete island. The proper anchoring of dispenser frames is very important to secure stabilizer bars, which are fitted with shear valves. There are three typical types of mounting applications and they are described as follows:

4.2 Metal Island Form Mounting

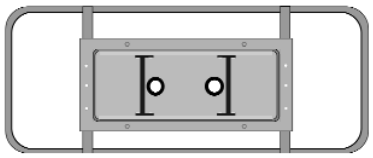
For new or extensive retrofit applications, pre-engineered metal island forms are used. These metal island forms may or may not have adjustable or fixed support bars for mounting of the dispenser sump or pan frame assembly.

4.3 Installing Anchors

Install the provided anchor bolts in the designated holes of the mounting frame to accommodate the model of dispenser to be installed.

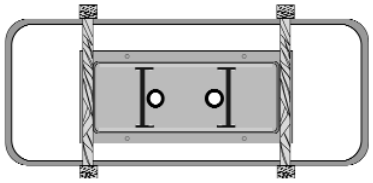
Fitted With Support Bars

Metal island forms typically have adjustable metal supports which support and fasten the dispenser sump or pan's metal frame assembly.



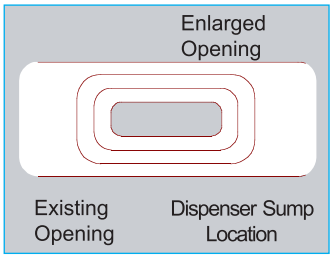
No Support Bars

For metal island forms with no supports, two pieces of lumber should be used to span across the island form to support and fasten a dispenser sump or pan's metal frame assembly.



Retrofit Mounting

For retrofit applications, it is possible to enlarge the opening in the concrete to accept the insertion of the dispenser pan unit. Expandable anchor bolts must be installed to secure the dispenser pan frame and the dispenser.

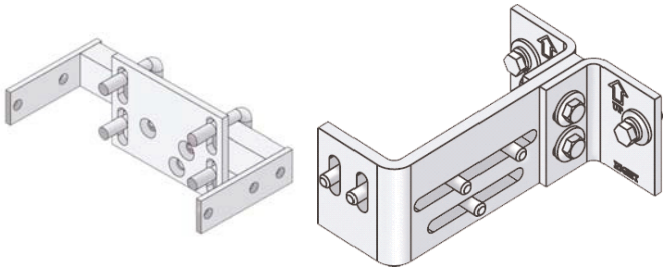


4.4 Installing Stabilizer Bars

Two strut spring nuts must be inserted into each of the two side struts of the containment sump.

IMPORTANT: Spring nut must be locked in place prior to installing stabilizer bar.

Fasten the stabilizer bars with the provided bolts loosely to permit movement from side to side movement of the bar for positioning purposes. Firmly tighten down the bolts after the shear valve has been plumbed to the dispenser.



IMPORTANT: Stabilizer bars must be tightened down securely to the side strut after the dispenser has been mounted.

4.5 Specifying Shear Valves

Shear valves need to be securely mounted to the stabilizer bar to insure that they will activate in the event of impact.

4.5.1 Standard Boss Mount Shear Valves

Shear valves having boss mounts can be used providing the valve mounting plate is attached. Attach the plate using the three flat-head socket screws provided with a 1/4" allen wrench. It is necessary to order shear valve mounting plates with these types of shear valves.

IMPORTANT: Shear Valves must be tightened down securely on to stabilizer bar after dispenser has been mounted.

5.0 SPECIFIC INSTALLATION INSTRUCTIONS

The following installation instructions refer more specifically to the different containment applications available with each type of dispenser containment pan or sump. OPW Retail Fueling recommends hydrostatic testing all sumps after installation to check for proper sealing of joints and connections.

5.1 Pipe Entries

The installation of all flexible entry boots must be completed prior to the installation of the riser pipe assembly. Determine the correct pipe entry location in the bottom of the pan so that there is direct alignment with the dispenser inlet fitting.

5.1.1 Riser Pipe Assemblies

Refer to the FlexWorks piping manual for a detailed description of available riser pipe design options and assembly procedures for this deep dispenser pan application using coax fittings & couplings with riser jackets.

5.2 One Piece Dispenser Sump Assemblies

Both deep and shallow dispenser sumps may be used for FlexWorks piping systems using coax and swivel couplings & fittings. Follow these installation instructions for this application:

5.2.1 Sump Height Adjustment

The easiest means of adjusting the pipe entry height is to install the flexible entry boot at a higher entry level in the sidewall of the sump.

Step 1: Install anchor bolts at required hole locations.

Step 2: Locate and install Flexible Entry Boots in sump side panel.

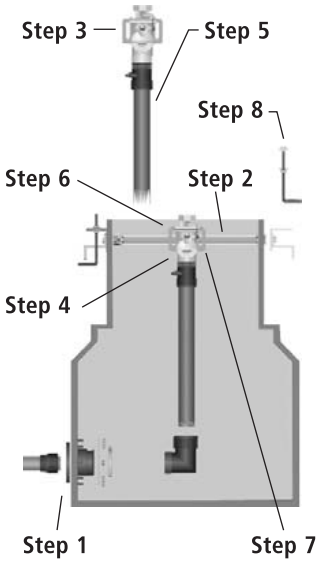
Step 3: Install Stabilizer Bars to the side struts.

Step 4: Install Shear Valve Mounting Plate to the Shear Valve (if required).

Step 5: Attach the riser pipe to Shear Valve.

Step 6: Install Shear Valve to Stabilizer bar.

Step 7: Install Conduit Entry Boots into side of sump.



5.3 One and Two Piece Poly and Fiberglass Sumps

Fiberglass dispenser sumps are available in one piece, or 2 piece widemouth design for easy connections of pipe couplings and fittings.

5.3.1 Assembly of the Fiberglass Dispenser Sump

Step 1: Locate flexible entry boot centers and install boots in the side wall of the base. Refer to the flexible entry boot installation manual for proper installation of the boot.

Step 2: Insert sections of piping through flexible entry boots and attach to fittings inside the dispenser sump base.

Step 3: Install stabilizer bars to dispenser sump riser frame. Attach shear valves to stabilizer bars. Install anchor bolts to the dispenser sump frame.

6.0 DISPENSER MOUNTING

After all riser pipe assemblies have been loosely installed into either a dispenser sump or a dispenser pan, mounting of the product dispenser may be completed. The stabilizer bars and valve plate assembly are designed to provide multi-directional side-to-side positioning of the shear valve as well as providing up to 1" of up and down movement. This will greatly assist in the connection of the shear valve to the product dispenser.

6.1 Tighten Down Fasteners

Once all the shear valves have been connected to the inlet fittings of the product dispenser, all stabilizer bars and valve plate fasteners must be securely tightened. Make sure all spring nuts are in absolute horizontal alignment prior to final tightening of the bolt fastener.

WARNING: Failure to properly secure stabilizer bar and valve plate fasteners could prevent the shear valve from activating in the event of a dispenser knock-over.

7.0 FLEXWORKS SYSTEM MAINTENANCE

The FlexWorks System is designed to provide reliable underground fuel transfer and short-term secondary containment of leaked petroleum product. FlexWorks sumps and secondary containment pipes are not intended for long term storage of petroleum products. Liquid that accumulates in the secondary containment system must be promptly removed and properly disposed of. Operational third party approved liquid sensors should be installed and maintained in each sump to reliably indicate to the operator that liquid is present in the secondary containment system. Once a leak is detected, the system must be shut down immediately and the source of the leak must be repaired. All liquid must be thoroughly flushed and cleaned out of the secondary containment system at once. Inspect all system components at least monthly for leaks or damage, and repair or replace any suspect component as necessary.

7.1 ROUTINE SUMP INSPECTIONS

Visual inspections of all containment sumps and components should be made on a routine basis to check for damage, water infiltration or for any signs of leaking product. An electronic or mechanical shut-off leak detection system is recommended for all containment sumps. When changing fuel filters at the dispenser, make sure any spilled product is cleaned out of the bottom of the dispenser sump. Sumps are to be kept free of debris and spilled fuel.

NOTE: Failure to remove fuel and liquids from containment sumps may compromise the performance and integrity of the sump and its associated fittings and seals over prolonged periods of time.

8.0 GUIDE SPECIFICATIONS

The following specifications are provided as general guidelines to specify under dispenser containment:

8.1 Short Form

The contractor shall provide liquid-tight dispenser containers located under each fuel dispenser as manufactured by OPW Retail Fueling. Containers shall house and permit access to the plumbing components located under each product dispenser. Containers shall be installed in accordance with manufacturer's current installation instructions.

8.2 Long Form

8.2.1 Design

The under dispenser container shall be of such a design as to permit access to all associated fittings and valves located directly below an above ground dispenser. The frame of the container shall be sized to fit the framework of the dispenser and permit anchoring of the dispenser directly into a concrete slab.

8.2.2 Product Compatibility

All components and accessories of the dispenser container shall be chemically compatible with the products to be distributed and with chemicals found naturally in the ground environment.

8.2.3 Corrosion Resistance

All dispenser container components which come in contact with the ground environment shall be made of non-metallic material or protected by materials which prevent corrosion.

8.2.4 Structural Integrity

All components shall be designed and constructed of materials strong enough for their intended use. The dispenser containers shall not collapse, crack or break due to ground movement, backfill stress or high ground water pressures.

8.2.5 Pipe & Conduit Entries

All dispenser containers shall be fitted with pipe and conduit entry seals which are semi-absorbent to ground movement and sufficiently flexible enough to permit angled entries up to 15 degrees without leaking under liquid head pressures of up to three feet.

8.2.6 Liquid Tightness

All dispenser containers shall prevent outside surface and ground water from coming into the container and prevent any product originating from within the sump from escaping into the underground environment. OPW Retail Fueling recommends hydrostatic testing on all sumps after installation to check for proper sealing of joints and connections.

8.2.7 Hydrostatic Testing

OPW Retail Fueling recommends the following procedure for hydrostatic testing of dispenser sumps, tank sumps and specialty application sumps.

1. Visually inspect all entry boots for band clamps, compression rings and donuts for possible leak points prior to connecting. Correct as needed.
2. Be sure all test tubes, connector tubes or any other open secondaries into the sump are sealed and liquid tight.
3. Fill all sumps to a minimum of 1" above the highest penetration fitting or sump joint. Mark the liquid level with a permanent marker.
4. Hydrostatic test should be held for 1 hour or per local regulations.
5. Be sure all water is disposed of properly after completing the test.

Note: Should the liquid level drop during testing, visually identify the leak source. Remove water and tighten band clamps to 30 in/lbs. Entry boot compression rings should be tightened in a clockwise manner until each stud reaches 60in/lbs. Repeat testing procedure.

If you have any questions, please feel free to call our Customer Service Department at 1-800-422-2525 for more details.

8.2.8 Height Adjustability

All deep type dispenser containers shall be field height adjustable to accommodate different tank and piping burial depths.

8.2.9 Anchoring & Stabilization

Dispenser containers shall provide a means of securing the above-ground dispenser unit, shear valve and piping.

- Dispenser anchoring: Dispenser containers mounting frames shall be of such a design that the base frame of the product dispenser is mounted directly over the concrete slab and not cantilevered.
- Shear Valve Stabilization: Dispenser containers shall provide a metal framework including one or more fully adjustable stabilizer bars to securely attach a shear valve in such a manner that the valve will properly activate in the event of a dispenser knock-over.

8.2.10 UL Testing

Under dispenser containers shall be tested and listed by Underwriters Laboratories to meet the following listings:

NON-METALLIC UNDERGROUND PIPING FOR FLAMMABLE LIQUIDS

NON-METALLIC SECONDARY CONTAINMENT PIPING SYSTEMS FOR UNDERGROUND PIPING FOR FLAMMABLE LIQUIDS

MISCELLANEOUS DISPENSING DEVICE ACCESSORIES
FLAMMABLE AND COMBUSTIBLE LIQUID TANK ACCESSORIES

8.2.11 Leak Detection

Under dispenser containers shall be equipped with a leak detection sensor which shall be capable of activating a remote alarm and/or turn-off a submersible pump or product dispenser in the event a collection of 1/4" of product or 6" of water inside the dispenser container.

LIMITED WARRANTY

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 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 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 Certified to California 2001 Standards*	1 year from date of manufacture or from date of installation registration (Not to exceed 15 months from date of manufacture)
All other Products	1 year from date of manufacture

* Products certified to California 2001 Standards will have an OPW registration card endlosed/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 any defective product) for future orders for any product that may prove defective within the applicable warranty period (repairs or replacements are subject to prorated warranty coverage fro 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 3250 US Highway 70 Business W, Smithfield, NC 27577, 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. This limited warranty also shall not apply to any FlexWorks, VAPORSAVER or other OPW product: unless all required site and warranty registration forms are completed and received by OPW within 60 days of installation; 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, with 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 with 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.

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