

IMPORTANT INFORMATION FOLLOW ALL INSTRUCTIONS

1.0 General Information

These installation instructions contain important information about the proper installation of OPW-FCS'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-FCS'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-FCS 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-FCS'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% Ethanol
- 100% Toluene

Aviation and Marine Fuels

- 100% Premium Leaded Gas
- 100% Kerosene

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

FlexWorks Pipe Couplings (DPC Series)						
Sizes	Couplings	Male Adaptors	Female Adaptors	Tee Fittings	Elbow Fitting	Connectors
¾" FlexWorks (C075A)	DPC-2075	SMA-7575	SFA-7575			
1" FlexWorks (C10A)	DPC-2100	SMA-1010	SFA-1010			
1.5" FlexWorks (C15A)	DPC-2150	SMA-1515, SMA-1520	SFA-1520	STF-1515	SEF-1515	SCC-1515
2" FlexWorks (C20A)	DPC-2200	SMA-2020, SMA-2015	SFA-2020	STF-2020, SRT-2215, SRT-2151, SRT-2152	SEF-2020, SRT-2015	SCC-2020, SCC-2015
3" FlexWorks (C30A)	DPC-2300	SMA-3030	SFA-3030	STF-3030	SEF-3030	SCC-3030
FlexWorks Pipe Couplings (SPC Series)						
Sizes	Couplings	Male Adaptors	Female Adaptors	Tee Fittings	Elbow Fitting	Connectors
¾" FlexWorks (C075A)	SPC-0075	SMA-7575	SFA-7575			
1" FlexWorks (C10A)	SPC-0100	SMA-1010	SFA-1010			
1.5" FlexWorks (C15A)	SPC-0150	SMA-1515, SMA-1520	SFA-1520	STF-1515	SEF-1515	SCC-1515
2" FlexWorks (C20A)	SPC-0200	SMA-2020, SMA-2015	SFA-2020	STF-2020, SRT-2215, SRT-2151, SRT-2152	SEF-2020, SRT-2015	SCC-2020, SCC-2015
3" FlexWorks (C30A)	SPC-0300	SMA-3030	SFA-3030	STF-3030	SEF-3030	SCC-3030

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 125°F (52°C).

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-FCS 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-FCS 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-FCS tools and fittings. These include an OPW-FCS 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-FCS 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-FCS adapter. After all plumbing assemblies have been fabricated and installed inside the tank and dispenser sumps, install the appropriate OPW-FCS 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-FCS 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-FCS 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-FCS fitting to the next OPW-FCS 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-FCS 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.

Type Couplings	Pipe Diameter	Length Adjustment
Swivel (SPC and DPC)	1-1/2" and 2"	Subtract 1"

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-FCS 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-FCS Products Price List for a list of the appropriate swage kit.

WARNING: OPW-FCS'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 and 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-FCS 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-FCS'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 swivel couplings, hand tighten the coupling onto the OPW-FCS fittings until it is snug. With an OPW-FCS swivel 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 Swivel Coupling.

9.9.2 ¾" and 1" Swivel 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-FCS 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 3 hours 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 three (3) hours, making sure that there is no drop in pressure.

10.2 Secondary Pressure Testing

- **Pre Backfill Air Pressure Testing:** 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 three (3) hours, making sure that there is no drop or increase in pressure.
- **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 three (3) hours, 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-FCS 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-FCS 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-FCS for warranty activation. A copy of the warranty registration should be given to the site owner for their records.

13.0 OPW-FCS Contact

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



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