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FUELING CONTAINMENT SYSTEMS

Flexible Entry Boot Manual

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FlexWORKS
BY OPW FUELING CONTAINMENT SYSTEMS



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1.0 GENERAL INFORMATION

These rubber boots are designed to seal pipe and conduit entries for underground applications. Flexible entry boots have a composite construction of rubber and metal. A studded compression ring is molded into a boot which provides a means of fastening the boot to the containment sump wall using a compression ring and nut fastener to insure a waterproof seal.



All entry boots are designed to provide universal flexibility for pipe or conduit providing up and down, side to side, back to front movement, as well as angled pipe entries. This flexibility is important for aligning pipe connections and providing stress relief.

The standard boot design allows for angled pipe entries up to 15 degrees off the centerline and has no corrodible components exposed to the soil environment. All materials used are suitable for underground burial and are chemically compatible with all fuels.

1.1 Independent Testing

All OPW-FCS double flexible entry boots in the DEB product series are listed with Underwriters Laboratories, Inc. (UL®). The boots have been successfully tested to UL's standard testing procedure for petroleum transport accessories and are UL listed. These tests confirmed the compatibility of the specially formulated Rubber compound in typical ground environments as well as exposure to petroleum and alcohol based fuels.

1.2 Positive Seal

Flexible entry boots have been tested to withstand a minimum of 6' of liquid head pressure. These seals provide a studded flange connection to create a positive and secure seal where the rubber contacts the sump wall. Tightening a series of stud fasteners with a compression ring provides a very high compression seal compared to screw on type bulkhead seals.

1.3 Corrosion Resistance

The exterior studded compression ring which provides the sealing pressure is encapsulated within rubber to protect it from corrosion. (more than an 1/8" of rubber isolates this metallic studded ring from the ground environment). The inside compression ring is made from corrosion resistant steel. All studs are made of 401 stainless steel and are only exposed on the inside of the containment sump.



1.4 Chemical Compatibility

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

WARNING: Keep all fiberglass cleaning solvents away from boots. These types of solvents could cause severe damage.

1.5 Angled Entries

Flexible entry boots are flexible enough to permit angled pipe or conduit entries (on two axis) into the sidewall of a containment chamber. This seal is also capable of multi-directional pipe alignment either up and down or side to side. This vital feature also allows accommodation of pipe entry holes which are installed slightly off exact alignment in the chamber wall.



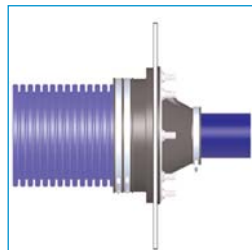
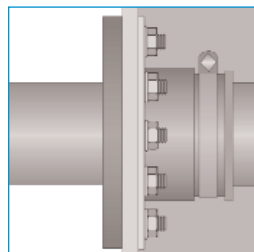
This movement will prevent the chamber wall from putting undue stress on the pipe coupling/fitting joint and the entry boot as well. For flexible piping applications within dispenser sumps, the stresses on pipe fittings below the product dispenser's inlets are minimized by the boot's alignment flexibility.

Pipe and conduit entering the containment chambers may not be perpendicular with the wall of the chamber. Angled entries are generally a result of directional plumbing restrictions on the inside of the containment chamber due to space limitations. All flexible entry boots permit angled entries up to a 15 degree angle off the center line in any direction without breaking a seal or putting undue stress on the pipe conduit or entry seal.

WARNING: Angles greater than 15 degrees off center could possibly cause the rubber boot to tear due to prolonged stress.

2.0 ENTRY BOOT APPLICATIONS

There are a number of different sizes and types of flexible entry boots designed to be installed within the sidewall of secondary containment sumps. OPW-FCS offers both single sided (EBF) and double sided (DEB) entry boots. The following types of flexible entry boots and seals available are described as follows:



WARNING: Installation of entry boots in the bottom of containment sumps is prohibited.

2.1 Conduit Entries

There is a universal conduit entry boot made to accommodate 1/2", 3/4" and 1" conduit. This entry boot may be installed in the sidewall of a dispenser sump or tank sump.



Model	Application
CEB-3075	3/4" Conduit Entry Boot
EBF-0751	1/2", 3/4" and 1" Conduit Entry Boot Fitting
EBF-0150	1.5" Entry Boot Fitting for 1.5" DW FlexWorks Pipe
EBF-0200	2" Entry Boot Fitting for 2" DW FlexWorks Pipe and LCX/MCX Pipe
EBF-0200F	2" Entry Boot Fitting for 2" Fiberglass
EBF-0300	3" Entry Boot Fitting for 3" DW FlexWorks Pipe, LCX/MCX pipe or 3" Rigid Pipe
EBF-0400	4" Entry Boot Fitting for 4" Rigid Pipe
EBF-0600	6" Entry Boot Fitting for 6" Rigid Pipe
SAB-7400	4" Sump Access Boot

2.2 Pipe Entries

There are various sizes of pipe entry boots to accommodate various types of piping. These entry boots may be installed in either the sidewall of a dispenser sump or tank sump.



Model	Application
DEB-0751	1/2", 3/4" and 1" Conduit Double Entry Boot Fitting
DEB-0150	1.5" Double Entry Boot Fitting for 1.5" DW FlexWorks Pipe
DEB-0200	2" Double Entry Boot Fitting for 2" DW FlexWorks Pipe
DEB-0200X	2" LCX Double Entry Boot Fitting for 2" Ameron LCX/MCX Pipe
DEB-0300	3" Double Entry Boot Fitting for 3" DW FlexWorks or 3" Rigid Pipe
DEB-0300X	3" LCX Double Entry Boot Fitting for 3" Ameron LCX/MCX Pipe
DEB-0400	4" Double Entry Boot Fitting for 4" Rigid Pipe
DEB-4015	4" to 1.5" Double Entry Boot Fitting for 4" FlexWorks Access Pipe to 1.5" DW FlexWorks Pipe
DEB-4020	4" to 2" Double Entry Boot Fitting for 4" FlexWorks Access Pipe to 2" DW FlexWorks Pipe

2.3 Access Pipe Entry Boots

There are various sizes of pipe entry boots to accommodate various types of piping. These entry boots may be installed in either the sidewall of a dispenser sump or tank sump.



3.0 INSTALLATION INSTRUCTIONS

For proper and warranted installation of flexible entry boots, these instructions must be followed. Prior to installing the rubber entry boots, make sure the exact location has been properly calculated. Sump access boots may be used to permanently seal any miscalculations.



3.1 Bolt Holes

Locate the center entry point in the flat wall section of the sump base and drill a 5/16" hole. Install the entry boot template to the sump base wall using a 1/4" bolt and nut. Drill out the appropriate bolt hole circle for the size boot to be installed using the same 5/16" drill bit. After drilling, remove the template from the sump base wall.



For proper installation, the appropriate size fabrication template should be used for accurate hole drilling.

3.2 Boot Openings

After the bolt hole circle has been drilled, drill the entry boot opening by using the appropriate size hole saw. After the opening is drilled, clean any rough edges with a deburring tool or razor knife.



WARNING: The appropriate hole saw size must always be used for proper installation of the flexible entry boot. Failure to use the required hole saw could damage the rubber boot after installation or prevent the boot from sealing properly and void product warranty.

Hole Saw	Flexible Entry Boots
2-3/8"	EBF-0751, DEB-0751
4-1/4"	EBF-0150, EBF-0200, EBF-0200X, DEB-0150, DEB-0200
5-1/2"	EBF-0400, EBF-0300, All FlexWorks Entry Boots, DEB-0400, DEB-0300, All FlexWorks Double Entry Boots, except the DEB-4020 and DEB-4015.
Saber Saw	EBF-0600

3.3 Installing Rubber Boot

Install the rubber boot from outside the sump by inserting the studs through the bolt holes. From the inside of the sump, install the compression ring over the studs and install nuts by hand. When installing double entry boots, install the inner portion of the boot and compression ring over the studs, and install the nuts by hand.



Note: When using the DEB-0150 and DEB-0200 double entry boot with FlexWorks piping, you must insert the pipe through the entry boot prior to coupling the pipe. The nut of the SPC-0150 or the SPC-0200 will not fit through the outer portion of the boot. A remote coupling machine may also be used in this application if the boots were previously installed.

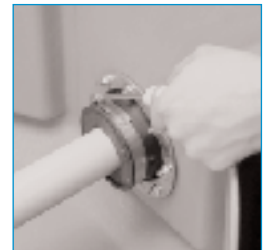
3.4 Boot Fastening

Using a 7/16" nut driver, tighten all of the nuts evenly in a clockwise sequence until 60 inch/lbs is attained on all nuts. This may require two to three revolutions to achieve. To prevent deformation of the boot, do not overtighten nuts.



3.5 Clamp Fastening

Insert the appropriate sized pipe or conduit into the flexible boot from outside of the sump. After the pipe or conduit have been positioned, install the band clamp around the boot and tighten to 30 inch/lbs.



WARNING: Do not over tighten the band clamp beyond the maximum torque of 30 inch pounds or it is possible to damage the rubber boot.

4.0 SUMP ACCESS BOOTS

An optional "plug" style boot is available. This boot was designed to seal holes that are purposely drilled in the side of a dispenser sump for easier access to the sump's plumbing, or to seal any mistakenly drilled holes. See section 3.2 for proper hole saw size (Part# SAB-0400).



5.0 FLEXIBLE ENTRY BOOT INSTALLER TOOLS

In order for proper installation of the flexible entry boot to occur, the correct size bolt holes and boot openings must be drilled. The following installer tools are available:

5.1 Entry Boot Templates

These pre-drilled metal templates have all of the bolt hole patterns for each size of the flexible entry boots. Refer to Section 3.1 of this manual for usage of the entry boot template.



5.2 Hole Saws

Hole Saws are available in a variety of sizes to accommodate different size flexible entry boots. Refer to the chart under [Section 3.2](#) for the appropriate hole saw for the type of flexible entry boot being used.



5.3 Urethane Foam

When using OPW-FCS flexible entry boots in either high water table or sand backfill conditions, OPW-FCS recommends applying an expanding urethane foam to the outside of the boots to help prevent excessive pressure from distorting the boots.

WARNING: Read the instructions below thoroughly before applying foam.

Before commencing work, obtain a can of Polycel® Insulating Foam or equivalent. Be sure to read and follow all instructions and precautions on the foam canister label. A clean dry cloth will also be needed for proper application of the foam.

5.3.1 Step 1

Locate and install the flexible entry boot according to the instructions provided with each boot. Be sure all pipe connections have been made and the pipe is positioned properly. Clean the outside of the entry boot with water as shown. Remove any debris from the surface. Allow to dry.



5.3.2 Step 2

Apply expanding urethane foam around the boot as shown. Observe all precautions and follow directions on the foam canister label. Proper application will leave approximately 1/2" of the foam beyond the surface of the boot.



5.3.3 Step 3

Allow the foam to set and dry for approximately 2 hours (or for the full recommended cure time as indicated on the foam canister label) before backfilling.



5.4 Entry Boot Sealants

OPW-FCS does not recommend the use of sealants when installing entry boots on poly sumps, however, the proper application of approved sealants on the sealing flange of our flexible entry boots is acceptable to OPW-FCS. The sealant(s) must be compatible with all contacted entry boot materials, all ground environments and any fuels that may be secondarily contained within the sumps being sealed. OPW-FCS 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 boots must

be installed in accordance with OPW-FCS's written installation instruction by a currently certified instructor. If you choose to use a sealant, OPW-FCS recommends the following sealants for use with our entry boots and sumps:

- Bostik 920 FS Fast Set, marine grade urethane sealant
- SL-1100 Urethane Sealant
- Thiokol 1100 Industrial polysulfide joint sealant
- PR 1440 Class B Fuel Tank sealant

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

6.0 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 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.

6.1 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.

7.0 GUIDE SPECIFICATIONS

The following specifications are provided as general guidelines to specify under sump entry seals for piping and conduit.

7.1 Short Form

The contractor shall provide liquid tight seals, as manufactured by OPW-FCS for sealing of all pipe and conduit entries into the containment sumps. Pipe and conduit entry seals shall be installed in accordance with manufacturers current installation instructions.

7.2 Long Form

7.2.1 Design

Pipe and conduit entry seals shall be of such a design to permit angled pipe and conduit entries up to 15° off the centerline in any direction. The entry boot shall attach and seal to the wall of the sump by means of a corrosion resistant compression ring, studs and nuts.

7.2.2 Product Compatibility

All components of the pipe and conduit entry seals shall be chemically compatible with the products to be stored and with chemicals found naturally in the ground environment.

7.2.3 Corrosion Resistance

All components of the pipe and conduit entry seals which come in contact with the ground environment shall be made of non-corrosive material or encapsulated by materials which prevent corrosion. All metallic components not exposed to the ground environment shall be made of either stainless steel or have a protective coating to prevent corrosion.

7.2.4 Structural Integrity

Pipe and conduit entry seals shall be designed and constructed of materials strong enough for their intended use. The seals shall not crack, tear or break due to ground movement or from backfill and high ground water pressures up to 6 feet (1.8 m).

7.2.5 Liquid Tightness

Pipe and conduit entry seals shall be designed to prevent outside ground water from coming into the container and prevent any leaking product originating from within the sump from escaping into the underground environment.

7.2.6 UL Testing

Pipe and conduit entry seals shall be tested and listed by Underwriters Laboratories to meet standard testing procedure for petroleum transport accessories and are listed under file #MH17938 and MH19391. These tests confirm the compatibility of the specially formulated Rubber compound in typical ground environments as well as exposure to petroleum and alcohol based fuels.

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 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 P.O. Box 405003, Cincinnati, Ohio 45240, 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.

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Notice: OPW-FCS 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-FCS 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. For complete OPW-FCS warranty information, visit our web site at www.opwfcs.com.