AMERICAN Ductile Iron Flex-Ring® Joint Pipe
Field Flex-Ring®

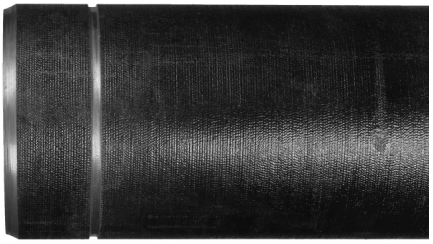
4-inch, 6-inch, 8-inch and 12-inch

The AMERICAN Field Flex-Ring is a field adaptable restrained joint utilizing a grooved fabricated end in conjunction with a corrosion-resistant, high-strength, low-alloy (HSLA) steel Field Ring. AMERICAN Field Flex-Ring® Restrained Joint Ductile Iron Pipe, utilizing the sealing features of the time-proven Fastite® Joint and a one-bolt restrained connection, provides flexible, easily assembled and positive restraint against endwise separation due to thrust.

The AMERICAN Field Flex-Ring is an integral part of the AMERICAN Flex-Ring Joint restraint system on 4-, 6-, 8- and 12-inch ductile iron Flex-Ring Pipe and fittings as an easy, one-bolt field adaptable way of restraining field connections, which also does not require a factory or field weldment. Where field cuts are anticipated, the AMERICAN Field Flex-Ring may be used to restrain joints with any suitable ductile iron plain end or cut pipe for water service in lieu of a standard Flex-Ring Joint spigot with a factory welded-on ring.

The AMERICAN Field Flex-Ring is designed to restrain joints using the Flex-Ring sockets with the same allowable working pressures and deflection capabilities as the standard Flex-Ring Joint. (See Table 9-1.) Field Flex-Rings may be used with a minimum 53 thickness class ductile iron pipe with a maximum working pressure of 350 psi. Restrained joints using the AMERICAN Field Flex-Ring have been thoroughly factory tested to withstand dead end thrust resulting from more than twice the rated working pressure.

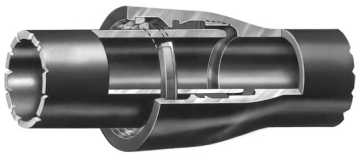
For the 4-, 6-, 8- and 12-inch sizes, the restraint is provided by wedging action between the beveled corrosion-resistant, high-strength, low-alloy (HSLA) steel Field Ring and a yellow painted ductile iron split Flex-Ring assembled behind the retainer ring. Once the grooved fabricated end is created and the Field Ring is installed, the Field-Flex Ring spigot end behaves identically to the Flex-Ring spigot end. After the spigot end of the Field Flex-Ring pipe is assembled into the Flex-Ring bell, the split Flex-Ring is inserted and springs into the socket locking groove. The Flex-Ring is securely positioned behind the bolt-on retainer ring and in the socket locking groove on the inside of the pipe bell, providing the flexible restraint.



AMERICAN Ductile Iron Flex-Ring® Joint Pipe Field Flex-Ring®

4-inch, 6-inch, 8-inch and 12-inch

Assembly Instructions



AMERICAN Field FLEX-RING® Spigot Rings are intended for use with AMERICAN Flex-Ring® Ductile Iron Pipe, 4-, 6-, 8- and 12-inch, for thickness classes 53 through 56 per ANSI/AWWA C151/A21.51 having a pressure rating of 350 psi.

Field-Cut Joint

Measure the pipe diameter at the desired cut distance to ensure it meets the ANSI/AWWA C111/A21.11 tolerances. Cutting the pipe can be performed using abrasive wheels, torch or milling cutter. When the cut end is to be assembled in a Flex-Ring® bell, an adequately smooth (without sharp edges) bevel should be ground or filed on the cut edge to prevent damage to or dislodgement of the gasket during assembly (Figure 1). If desired, a thin field assembly line may be drawn in marker or paint, with the line located from the spigot end the same distance as the far edge of factory-applied assembly stripe.

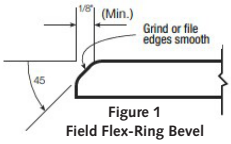
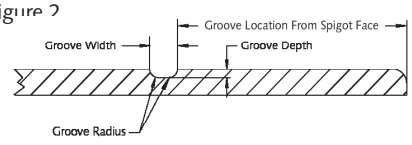


Figure 1
Field Flex-Ring Bevel

Groove Pipe

Several types of grooving machines are available that operate hydraulically, pneumatically, electrically, or are self-powered by a gasoline engine. The grooving machine will normally cut pipe from 4- to 64-inch diameter. The set-up time for this cutter is usually less than ten minutes; it requires a minimum clearance of 12 inches and has a cutting speed of approximately one minute per inch of pipe diameter. The grooving machine should be installed to provide the cut edge at the designated distance from the spigot end as shown in Table 1. The groove should be cut as a standard AWWA C606 groove as seen in Figure 2.



Installing Field Flex-Ring

Once a proper AWWA C606 groove has been created at the specified distance from the spigot end, the specified coating system shall be applied to the grooved section, unless otherwise specified. Once the coating is dry to the touch install the Field Flex-Ring into the groove with the square side of the ring facing the spigot end, ensuring proper placement around the pipe (Photo 2). Using a 3/16-inch Allen wrench, tighten the bolt to approximately 3 to 5 ft-lbs of torque to snug ring in groove (not to exceed 9 ft-lbs of torque), making sure that the cleat on the ID of the spigot ring stays aligned with the groove on the pipe (Photo 4). The ring is sufficiently tight when the gap between the ends of the ring has almost completely closed and when it requires tapping on the ring with a hammer to make it move back and forth in the groove. Coat the installed Field Flex-Ring with the specified coating system, unless otherwise specified. (Photo 3) Once sufficiently dry, proceed with the 4- to 12-inch Flex-Ring assembly instructions.

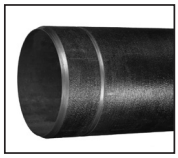


Photo 1

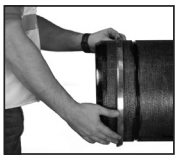


Photo 2

Photo 3

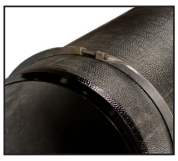


Photo 4

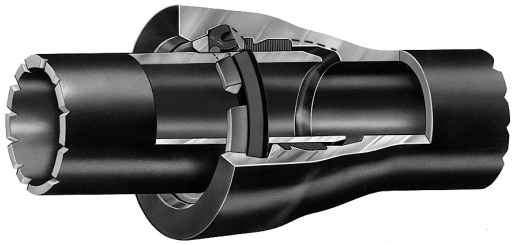
Table No. 9-3

Field Groove Dimensions				
Size	Groove Location From Spigot Face	Groove Width	Groove Depth	Groove Radius
4-inch	4.06 inches (+0.10/-0.03)	0.38 inches (+0.03/-0.02)	0.12 inches (+0.03/-0.02)	0.120 inches
6-inch	4.06 inches (+0.10/-0.03)	0.38 inches (+0.03/-0.02)	0.13 inches (+0.02/-0.03)	0.120 inches
8-inch	4.18 inches (+0.06/-0.06)	0.50 inches (+0.03/-0.02)	0.15 inches (+0.02/-0.05)	0.145 inches
12-inch	4.75 inches (+0.09/-0.04)	0.50 inches (+0.03/-0.02)	0.15 inches (+0.04/-0.03)	0.145 inches

AMERICAN Ductile Iron Flex-Ring® Joint Pipe

Field Flex-Ring®

14"-36"



The AMERICAN Field Flex-Ring with black-toothed gripping segments is an integral part of the AMERICAN Flex-Ring Joint restraint system. The AMERICAN Field Flex-Ring method of restraining AMERICAN 14"-36" ductile iron Flex-Ring pipe and fittings is an easy, totally boltless and glandless way of restraining field connections, which also does not require a factory or field weldment. Where field cuts are anticipated, the Field Flex-Ring may be used to restrain joints with any suitable ductile iron plain end or cut pipe, for water service in lieu of a standard Flex-Ring joint spigot with a factory welded-on bead.

The patented* AMERICAN Field Flex-Ring is designed to restrain joints using Flex-Ring sockets with the same allowable working pressures and deflection capabilities as the standard Flex-Ring joint. (See Table 9-2.) Field Flex-Rings may be used with any standard pressure class of ductile iron pipe with an allowable working pressure equal to that of the pipe class, or a maximum of 350 psi in the 14"-24" sizes and 250 psi in the 30" and 36" sizes. Flex-Ring fittings are manufactured per ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53.

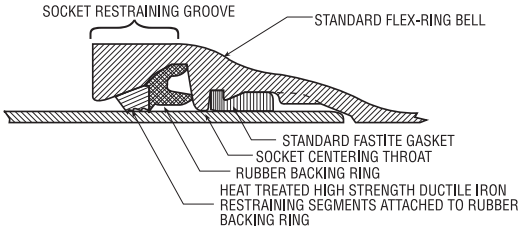
Restrained joints using Field Flex-Ring have been thoroughly factory tested to withstand dead end thrust resulting from more than twice the rated working pressure. The restraint is provided by the wedging action of heat-treated, high-strength ductile iron segments. The segments have a wedge-shaped cross-section with gripping teeth on the inner surface.

The ductile iron segments are held in the proper position for assembly by a rubber backing ring. This rubber backing ring is compressed during assembly to ensure that the restraining segments are held firmly in place against the socket wedging surface and spigot. The positioning and compressive force exerted by the backing ring on the restraining segments result in dependable gripping of the spigot when thrust is applied.

The rubber backing ring for the Field Flex-Ring does not perform any sealing function for the joint. (A separate, standard Fastite gasket is employed in the joint for this purpose.) The backing ring is made of gasket-quality SBR rubber which meets all the material requirements of ANSI/AWWA C111/A21.11, Rubber-Gasketed Joints for Ductile-Iron Pressure Pipe and Fittings.

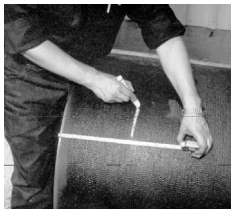
AMERICAN Ductile Iron Flex-Ring® Joint Pipe

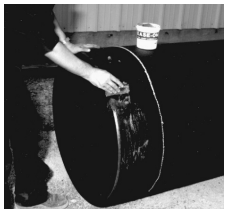
Field Flex-Ring®
14"-36"
Assembly Instructions



1) Cleaning, gasket insertion, spigot marking and lubrication of the joint

Remove the standard flex-ring with yellow metal segments from the socket, if present. Place an assembly mark on the spigot plain end located as shown in Table No. 9-3. Thoroughly clean the socket restraining groove (nearest the bell end), the Fastite gasket recess, and the pipe plain end, removing dirt, sand, ice, mud, or any other material that could prevent the proper placement of the Field Flex-Ring or Fastite gasket. As in normal Fastite joint assembly, insert the gasket into the gasket socket grooves, then lubricate the inside surface of the gasket. **Important :** A Fastite gasket must be used as the Field Flex-Ring does not perform any sealing function. Lubricate the first four inches of the spigot, including the pipe end and bevel. Do not allow the spigot end of the pipe to touch the ground after it is lubricated.





Spigot Assembly Stripe Location

Table No. 9-4

Pipe Size in.	Location of Stripe from spigot end
14–16	7 1/4"
18–20	8 1/16"
24	8 13/16"
30–36	9 1/2"

2) Placement of the Field Flex-Ring in socket

Remove the Field Flex-Ring with black-toothed gripping segments from its container and place it in the socket restraining groove (nearest to the bell end) in gasket-like fashion. The metal restraining segments of the Field Flex-Ring should be oriented toward the entering spigot. This may be done by first placing the Field Flex-Ring in the groove at the bottom of the socket, so that the rubber backing ring is fitted flush against the radial surface of the socket centering throat. The rubber ring may then be worked into the restraining groove around the sides of the socket until a loop is formed at the top. At this time, the formation of a second smaller loop at the bottom of the socket will facilitate placement of the first looped section into the top of the socket restraining groove.

It is often easier to properly insert the top loop of the Field Flex-Ring by pushing it axially into the socket after it has been allowed to protrude beyond the face of the bell. The second smaller loop may then be pushed radially outward into the restraining groove.

Any bulges present in the rubber backing ring after it is placed in the socket should be removed. This may normally be done by simply pushing the protruding rubber radially outward. Some bulges may require forming a small loop in the ring opposite the bulge. The ring maythen be allowed to slide circumferentially around the socket toward the loop, thus relieving rubber compression in the bulging area. Make sure that the angled bearing surface of the segments are secure against the socket, and the toothed side of the segments are facing inward. This should be done by examining and pushing each segment toward the back of the socket until the rubber backing ring is firmly in place against the socket centering throat.

3) Initial placement of beveled plain end into socket

With the spigot in reasonably straight alignment and centered within the Field Flex-Ring, insert the spigot until it contacts the back of the socket per normal Fastite joint assembly procedure. Joint deflection may be taken immediately after assembly. Verify correct position of the locking segments in the fully assembled joint.

(Note: The complete insertion of a factory supplied spigot stripe on a Fastite pipe into the deeper Flex-Ring socket does not indicate full assembly. The use of a field-applied assembly mark is recommended.)

4) Field-cut pipe

A) Selecting pipe: When possible, an appropriate pipe to be field cut should be selected before it is required. This may be done by measuring the outside diameter or circumference of the pipe at the location to be cut. The measured diameter or circumference of the candidate pipe should be within the ranges shown in Table No. 9-4. In 16″ and larger sizes, the ordering and use of a few select pipes that have been gauged full length at the factory should be considered when field cuts are anticipated.

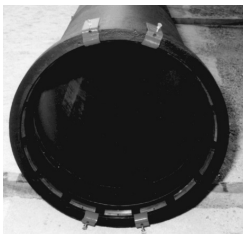
B) Preparing pipe end when making a field cut: The cut end must be properly prepared prior to assembly. The pipe should be cut as square as possible with the pipe axis and beveled on the outside extreme end after cutting. A portable grinder should be used to make a bevel 3/8″ to 5/8″ long at an angle of 30-40° with the axis of the pipe. All sharp corners or rough edges that might damage or dislodge the Fastite gasket or Field Flex-Ring should be removed from the beveled pipe end.

Table No. 9-5 **Recommended Spigot Diameters at Pipe Field-Cut Locations**

Pipe Size in.	Diameters		Circumference	
	Min. in.	Max. in.	Min. in.	Max. in.
14	15.22	15.35	$47\frac{13}{16}$	$48\frac{7}{32}$
16	17.32	17.45	$54\frac{13}{32}$	$54\frac{13}{16}$
18	19.42	19.55	61	$61\frac{13}{32}$
20	21.52	21.65	$67\frac{19}{32}$	68
24	25.72	25.85	$80\frac{13}{16}$	$81\frac{7}{32}$
30	31.94	32.08	$100\frac{11}{32}$	$100\frac{25}{32}$
36	38.24	38.38	$120\frac{1}{8}$	$120\frac{9}{16}$

C) Rounding Clip Set:

Rounding clips* are available from AMERICAN and are helpful when making a joint using an out-of-round field-cut end. These clips may be readily attached to a Flex-Ring bell containing a Field Flex-Ring to quickly and easily round a pipe spigot during insertion assembly. When using rounding clips with a severely oval field-cut pipe, they may be placed at the 12:30, 5:30, 6:30, and 11:30 o'clock** positions. The spigot should then be oriented with the maximum diameter in a vertical position and, while in reasonably straight alignment, centered within the funnel formed by the rounding clips. The spigot will then be automatically rounded when inserted into the socket. The rounding clips should then be removed after assembly and reused as needed.



** U.S. Patent No. 5,426,842*

*** Due to actual field conditions and pipe shape, adjustment of rounding clip locations may be needed.*

5) Assembly of fittings

Flex-Ring pipe and fitting joints using Field Flex-Rings can be assembled with the same tools and methods used for many years with Fastite joints. When using a fieldcut pipe to locate a fitting, it may be advantageous to use a standard Flex-Ring spigot with a factory weld bead and a standard flex-ring with yellow metal segments in the fitting rather than pipe socket. A Field Flex-Ring with black-toothed gripping segments and cut pipe plain end may then be used in the nearest pipe socket on either side of the fitting. When possible, the use of a standard flex-ring and a factory spigot with weld bead in the sockets of a cumbersome fitting may allow easier orientation or rotation of the fitting relative to the pipe after assembly. The use of a pipe socket with a Field Flex-Ring may also facilitate easier alignment of the joint during insertion assembly and installation. (See Section 4 for additional detail on the assembly of Fastite fittings.)

6) Deflection

Flex-Ring joints using Field Flex-Rings have an allowable deflection equal to those of standard Flex-Ring joints (Table No. 9-2). Deflection may be taken immediately after full insertion of the spigot into the socket.

7) Joint extension after installation

The Field Flex-Ring locking mechanism is activated by relative movement between the socket and spigot. This allows for movement, joint take-up and substantial flexibility after installation. The joints may be extended after assembly to minimize joint take-up in test or service conditions. This may be accomplished by pulling or jacking the spigot away from the socket until firm resistance is encountered. This will not limit joint deflection.

In vertical applications, such as exposed risers, standard (weld bead) Flex-Ring joints that also should be effectively extended and braced in original installation are required instead of Field Flex-Rings.

In most underground installations (including most restrained bend locations), joint take-up is advantageous in that increased thrust-resisting forces are generated. Also, expansion and contraction due to temperature variations may be accommodated without excessive stress in pipe members. The amount of joint take-up or line movement in buried restrained pipelines is substantially limited by the surrounding soil. Therefore, system security and safety is maximized by filling and testing restrained sections of pipelines after backfilling as recommended by ANSI/AWWA C600, Installation of Ductile Iron Water Mains and Their Appurtenances and AWWA M41.

In any application where axial or lateral movement may be undesirable, such as some exposed or unburied piping applications, or certain connections of restrained pipe sections to rigid piping, special provisions, including effective joint extensions, may be necessary to control unacceptable pipeline movement. Depending on job conditions and restrained pipe length, cumulative joint take-up can be substantial, particularly in exposed piping applications.

8) Disassembly instructions

Flex-Ring joints containing Field Flex-Rings may normally be disassembled if required. Field Flex-Ring disassembly kits, consisting of a shim holder and high-strength disassembly shims, are available from AMERICAN. (Use Fast-Grip disassembly kits for the 14"-16" sizes.) In some cases, due to the time and effort involved for disassembly of these joints, it may be preferable to disassemble the pipeline at the nearest standard Flex-Ring (using a standard flex-ring and spigot weld bead) or other joint. In this manner, the Field Flex-Ring-joined pipes and/or fittings can be removed as a unit.

If joint disassembly is required, a disassembly kit should be used in accordance with the procedure below to separate a Flex-Ring joint containing a Field Flex-Ring.

Disassembly Procedure:

A) If the joint has been subjected to separating thrust, movement, or joint deflection, first push the spigot back into the rear of the socket so as to "unwedge" the straining segments. B) Using gloves to protect hands from sharp edges, insert the long end of a disassembly shim fully into the groove in the shim holder. Two lengths of shims are supplied with the 18"-36" disassembly kit for customer convenience. The shorter shims may often be easier to use in some hard-to-reach locations such as the bottom of a joint, or when a small gap exists between the longer shims.

C) Carefully drive a disassembly shim between the gripping teeth of the segments and the spigot with a hammer. Lifting or offsetting of the spigot relative to the socket (to relieve metal-to-metal contact) may be required to insert some shims. It is sometimes easier to start a shim under the teeth if the holder is initially placed near one end of the shim (off center) so that one corner of the shim is inserted first. The holder may then be slid along the shim to start the middle, while the other end of the shim is placed under the teeth.

D) When properly in place, the end of the shim should be visible 1/4" to 3/4" outside the socket for the 14"-16" sizes and 1 1/2" to 2" for the 18"-36" sizes. Remove the holder from the shim and progressively place other shims around the joint. It is often easier to drive a shim under the teeth if the edge of one shim is initially inserted 1/8" to 1/4" under the previously placed shim. Shims should be in contact with one another to ensure all teeth are disengaged from the spigot. Overlapping of some shims may be required to dislodge all teeth.

E) After all shims are inserted, place a reference mark on the spigot even with the exposed end of the shims. Pull, jack, or deflect the spigot out from the socket. After the spigot has been pulled from the socket approximately 1 1/2" to 2", check the positioning of each shim. Any shim found to have been pulled out of the socket 1/2" or more from its original position should be tapped back into the socket. The procedure of pulling the spigot out of the socket 1 1/2" to 2" and adjusting the shim positioning may have to be repeated several times before the joint is completely disassembled. *NOTE: The measured distance between the reference mark on the pulled-out spigot and the exposed edge of the shims (when shims are fully in place inside the socket) is indicative of the length of spigot removed from the socket. A very tight joint may have to be separated by cutting the pipe with a pipe saw or oxyacetylene torch.*