



AMERICAN Flex-Lok® Ball Joint Pipe for Water and Other Liquids

AMERICAN ball joint piping complies with requirements of ANSI/AWWA C151/A21.51 and ANSI/AWWA C153, which are applicable to its manufacture. These and other standards are referenced throughout this Section either by the full ANSI/AWWA designation or by only the AWWA numbering, such as AWWA C151.

AMERICAN Flex-Lok® Pipe incorporates a very flexible ball-and-socket type joint for use in such installations as subaqueous pipeline construction. The provision for significant changes in alignment through substantial deflection and the rugged features of AMERICAN Flex-Lok Pipe make it especially

adaptable to the most difficult installations. This rugged joint configuration has an excellent record of performance and, under some of the toughest installation conditions, it has provided long life and trouble-free service. Economy and dependability have also been proven under widely varying conditions.

Typical Applications for AMERICAN Flex-Lok®

River Crossings

Where deep water and strong currents are encountered, as in unstable channels and under flood stage conditions. Where deep trenches, steep banks and other difficult approaches require special construction considerations.

Busy Waterways

Where installation time and maneuverability are critical factors.

Tidal Waters

Where changing currents and water depths are encountered, and where the line is subject to movement.

River Intakes

Where it is necessary to have a flexible intake, the level of which may be adjusted with changing water levels.

Swamps and Floodlands

Where water and earth are subject to seasonal variations, or where the underground line must give with the

sub-surface movements caused by temperature change, moisture content or other factors.

Hillsides

Where steep grades are encountered, where trenching and backfilling are impossible, or where the line may have unstable bedding.

Seismic Environments

Where significant ground movements due to earthquakes are anticipated, particularly suited for piping outside structures where differential settlement can occur.

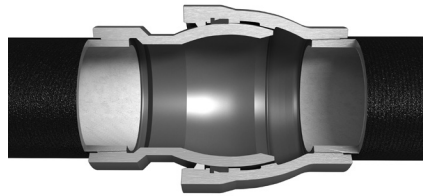
Difficult and Inaccessible Locations

Where trenching is impossible, working conditions are hazardous, service cannot be interrupted, or lines are inaccessible for maintenance or repair. All scenarios requiring a combination of significant joint deflection and positive joint restraint.



AMERICAN DUCTILE IRON PIPE

AMERICAN Ductile Iron Flex-Lok® Ball Joint Pipe



AMERICAN Flex-Lok® Pipe incorporates a very flexible ball-and-socket type joint for use in such installations as subaqueous pipeline construction. The provision for significant changes in alignment, with available joint deflections of 25° for sizes 4"-12" and at least 15° for sizes 14"-60" in any direction, and the rugged features of AMERICAN Flex-Lok Pipe make it especially adaptable to the most difficult installations. This rugged joint configuration has an excellent record of performance, and under some of the toughest installation conditions, it has provided long life and trouble-free service. Economy and dependability have been proven in many installations under widely varying conditions.

AMERICAN Flex-Lok Boltless Ball Joint Pipe — manufactured in 4"-60"¹ sizes² — is a rugged, boltless, flexible joint pipe designed and manufactured to assure the greatest economy in installation with maximum performance and reliability. This ductile iron pipe meets all applicable requirements of AWWA C151 and is designed to withstand severe installation and service conditions encountered in river crossings, treated wastewater outfall lines, water supply intakes, swamps, floodlands and rugged terrain where significant joint deflection may be required.

AMERICAN Flex-Lok Boltless Ball Joint Pipe provides variable deflection up to at least 15°, and the joint may be deflected to metal binding position at maximum deflection

without harm to the pipe or joint components. This is a result of the unique design and functionality of the pipe and joint components. In sizes 4"-12", the configuration incorporates the additional flexible restraint provided by AMERICAN's Flex-Ring joint, which cumulatively results in greater joint deflection capabilities, up to 25°.

Spherical Socket

The spherical socket of the AMERICAN Flex-Lok joint is cast of ductile iron and is accurately machined to accommodate the ball of the adjoining pipe. The thick wall and bell section provides superior strength to minimize the stresses resulting from installation and service conditions.

The Flex-Lok joint gasket recess in the socket is designed and manufactured to provide easy insertion and positive seating of the gasket to avoid displacement during assembly and for constant compression of the gasket through the entire range of deflection of the assembled joint.

Spherical Ball

The ball end of the AMERICAN Flex-Lok joint is accurately machined to fit into the adjoining pipe socket and to provide constant compression of the gasket through the entire range of deflection of the assembled joint.

The inside surface of the ball is shaped so that the waterway will not be significantly obstructed at any angle of joint deflection.

**Flex-Lok Gasket**

The AMERICAN Flex-Lok joint uses the basic dual hardness gasket design of the AMERICAN Fastite joint that has been proven with millions of joints over approximately 65 years. Designed to provide maximum sealability, the Flex-Lok gasket is manufactured to AMERICAN's rigid specification to assure controlled dimensional and material properties.

The snug fit of the gasket in the socket cavity, the design of the socket buttress and the hard section of the gasket act to restrain the gasket from dislodging during assembly.

Locking Systems

Two types of locking systems are used to prevent longitudinal joint separation of the AMERICAN Flex-Lok joint, depending on pipe size. In the 4"-20" sizes, the locking system employs a substantial external locking ductile iron gland and sizes 4"-12" also use the proven positive joint restraint system of the Flex-Ring joint. Both the spherical socket component and spherical ball component of the Flex-Lok joint in this size range have a Flex-Ring joint that is preassembled at AMERICAN. For 24"-60" sizes, the joint is restrained with a ductile iron retainer ring fitted into a mating groove inside the heavy-section bell.

4"-20" Flex-Lok Pipe Joint

The locking gland of the 4"-20" AMERICAN Flex-Lok joint is cast of ductile iron. The gland has internal lugs that interlock with external lugs on the bell.

The lugs on the gland are passed between and beyond the lugs on the bell periphery, and the gland is then rotated to lock the joint and prevent separation.

All 4"-20" AMERICAN Flex-Lok Ball Joint Pipe is prepared for shipment to the job site with the locking gland strapped to the ball. These straps must be removed to free the gland for assembly. The 4"-12" configuration has a preassembled Flex-Ring joint both directly adjacent to the spherical socket and spherical ball. The locking gland is also shipped strapped to the ball.

A steel wedge with a welded-on threaded stud is provided for each 4"-20" AMERICAN Flex-Lok joint. One wedge is placed into the space between two lugs and bolted into position. This wedge provides a positive lock to prevent gland rotation after assembly.

24"-60" Flex-Lok Pipe Joint

A split retainer ring manufactured of ductile iron is fitted into a mating groove inside the heavy bell section, providing restraint against longitudinal joint separation in the 24"-60" sizes. This ring is shipped strapped to the ball. These straps must be removed to free the ring for assembly. After the ring is fitted into the groove inside the bell, a locking clip, held in place by a stainless steel spring, is inserted into the space between the ends of the ring to securely lock it into the groove.

Joint Lubricant

Special AMERICAN Joint Lubricant for underwater installation is furnished with each order to provide ample lubrication for assembly and joint flexing. This special lubricant is different from regular Fastite lubricant and is insoluble, non-toxic, will impart no taste or odor to the conveyed liquid and will not have a deleterious effect on the rubber gasket.

AMERICAN Flex-Lok Ball Joint Pipe is centrifugally cast in laying lengths shown under Standard Dimensions with the same standard outside diameters as AMERICAN Fastite or Mechanical Joint Pipe, thus simplifying tie-in connections by allowing the use of standard fittings.

AMERICAN Flex-Lok Ball Joint Pipe may be furnished with any of the coatings and linings described in Section 11. Unless otherwise specified, the pipe is normally furnished with an asphaltic coating on the exterior and with the interior cement lined per AWWA C104.

1.) Contact AMERICAN for 64" requirements.

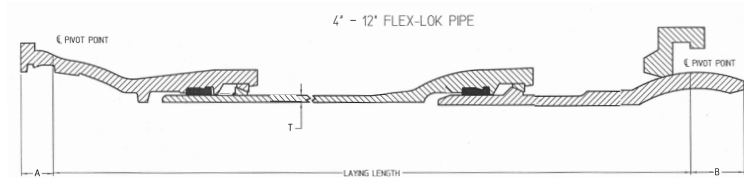
2.) The spherical ball and socket ends of 54" and 60" Flex-Lok pipes are fastened to the barrels of the pipe with a Fastite gasket and locking ring arrangement instead of threads.



AMERICAN DUCTILE IRON PIPE

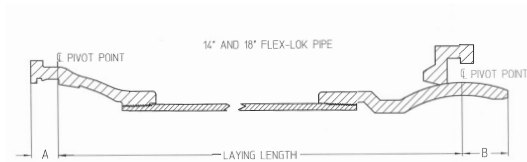
AMERICAN Ductile Iron Flex-Lok Boltless Ball Joint Pipe For Water, Sewage and Other Liquids

STANDARD DIMENSIONS 4"-12"



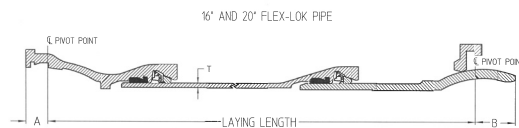
Size in.	Laying Length ¹ ft./in.	Working Pressure ² psi	T Wall Thickness ³ in.	Nominal Weight in Pounds			Nominal Underwater Weight Per Length Incl. Joint Materials ⁴	
				Per Pipe Length	Per Length Incl. Joint Materials	Per Foot Incl. Joint Materials	Full of Air lb.	Full of Water lb.
4	21'-6"	250	.41	450	480	22.3	311	427
6	21'-7"	250	.43	680	720	33.4	370	638
8	21'-8"	250	.45	945	1000	46.2	396	886
10	21'-7-5/8"	250	.47	1265	1325	61.2	418	1178
12	21'-8-5/8"	250	.49	1565	1665	76.7	377	1481

14" & 18"



Size in.	Laying Length ¹ ft./in.	Working Pressure ² psi	T Wall Thickness ³ in.	Nominal Weight in Pounds			Nominal Underwater Weight Per Length Incl. Joint Materials ⁴	
				Per Pipe Length	Per Length Incl. Joint Materials	Per Foot Incl. Joint Materials	Full of Air lb.	Full of Water lb.
14	20'-6"	250	.51	1760	1880	91.7	193	1615
18	20'-6"	250	.53 ⁵	2425	2610	127.3	-129 ⁵	2245

16" & 20"



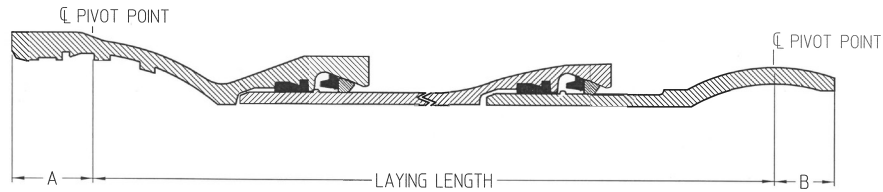
Size in.	Laying Length ¹ ft./in.	Working Pressure ² psi	T Wall Thickness ³ in.	Nominal Weight in Pounds			Nominal Underwater Weight Per Length Incl. Joint Materials ⁴	
				Per Pipe Length	Per Length Incl. Joint Materials	Per Foot Incl. Joint Materials	Full of Air lb.	Full of Water lb.
16	22'-1"	250	.52	2560	2719	124	337	2335
20	22'-3"	250	.54	3445	3681	166	77	3160



**AMERICAN Ductile Iron Flex-Lok Boltless Ball Joint Pipe
For Water, Sewage and Other Liquids**

24"– 48"

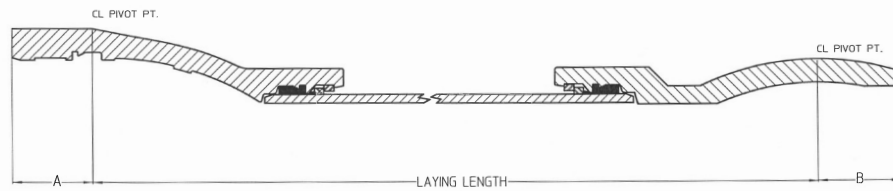
24" - 36" FLEX-LOK PIPE



Size in.	Laying Length ¹ ft./in.	Working Pressure ² psi	T Wall Thickness ³ in.	Nominal Weight in Pounds			Nominal Underwater Weight Per Length Incl. Joint Materials ⁴	
				Per Pipe Length	Per Length Incl. Joint Materials	Per Foot Incl. Joint Materials	Full of Air lb.	Full of Water lb.
24	22'-7"	250	.56 ⁵	4557	4636	206	-704 ⁵	3960
30	22'-4-5/8"	250	.63	6666	6749	302	-1862	5252
36	22'-11-5/16"	250	.73	9675	9787	426	-2943	7934
42	24'-2-5/16"	250	.83	13871	13934	596.1	-4661	10190
48	23'-6-1/4"	250	.93	17347	17435	717	-7785	11931

54"– 60"

54" AND 60" FLEX-LOK PIPE



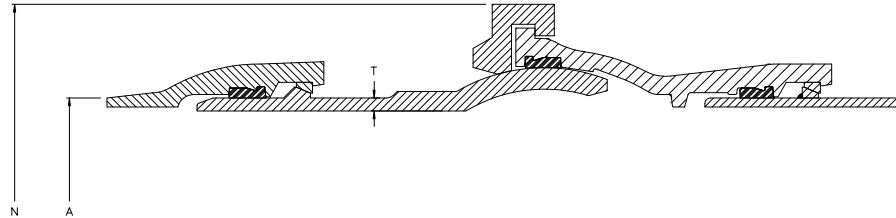
Size in.	Laying Length ¹ ft./in.	Working Pressure ² psi	T Wall Thickness ³ in.	Nominal Weight in Pounds			Nominal Underwater Weight Per Length Incl. Joint Materials ⁴	
				Per Pipe Length	Per Length Incl. Joint Materials	Per Foot Incl. Joint Materials	Full of Air lb.	Full of Water lb.
54	23'-0"	250	1.05	24000	24150	1050	-3125	20950
60	23'-3"	250	.87	26650	26875	1156	-5920	23410



AMERICAN DUCTILE IRON PIPE

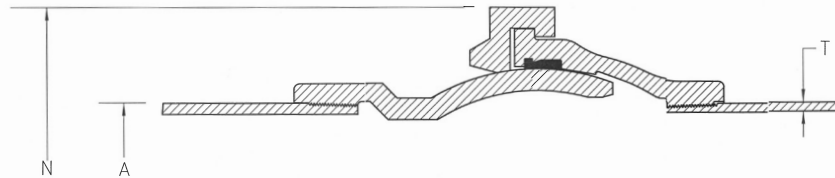
AMERICAN Ductile Iron Flex-Lok Boltless Ball Joint Pipe For Water, Sewage and Other Liquids

TECHNICAL DATA 4"– 12"



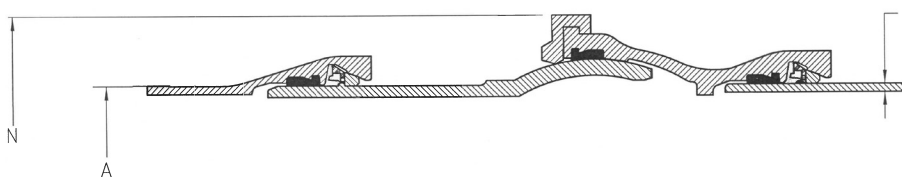
Size in.	A in.	N in.	Joint Materials Weight/lb.				Lubricant Pounds Per Joint	Maximum Joint Deflection **	Maximum Safe End Pull in Tons†
			Gland	Gasket	Locking Wedge	Complete Set			
4	4.80	11.79	27	1	1	29	0.09	25°	21
6	6.90	13.91	37	1	1	0.12	0.12	25°	35
8	9.05	16.38	50	1	2	0.16	0.16	25°	49
10	11.10	18.84	67	1	3	0.27	0.27	25°	63
12	13.20	21.56	89	1	3	0.40	0.40	25°	76

14" & 18"



Size in.	A in.	N in.	Joint Materials Weight/lb.				Lubricant Pounds Per Joint	Maximum Joint Deflection **	Maximum Safe End Pull in Tons†
			Gland	Gasket	Locking Wedge	Complete Set			
14	15.30	24.43	115	2	3	120	0.50	15°	90
18	19.50	29.70	181	3	4	188	0.75	15°	110

16" & 20"



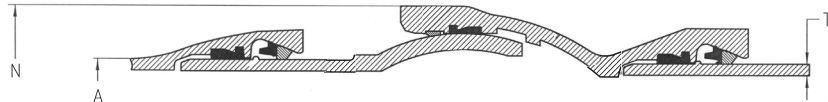
Size in.	A in.	N in.	Joint Materials Weight/lb.				Lubricant Pounds Per Joint	Maximum Joint Deflection **	Maximum Safe End Pull in Tons†
			Gland	Gasket	Locking Wedge	Complete Set			
16	17.40	26.78	140	3	4	147	0.60	22.5°	100
20	21.60	32.59	210	4	4	218	0.90	22°	119

AMERICAN DUCTILE IRON PIPE



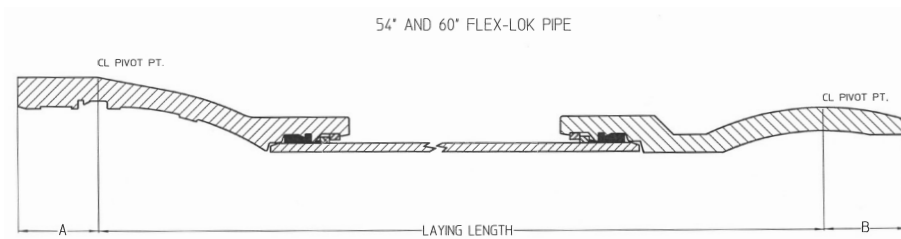
AMERICAN Ductile Iron Flex-Lok Boltless Ball Joint Pipe For Water, Sewage and Other Liquids

24"– 48"



Size in.	A in.	N in.	Joint Materials Weight/lb.				Lubricant Pounds Per Joint	Maximum Joint Deflection **	Maximum Safe End Pull in Tons†
			Retaining Ring	Gasket	Spring/Clip	Complete Set			
24	25.80	33.82	14	5	1	20	1.10	21°	130
30	32	40.57	17	6	1	24	1.06	20°	225
36	38.3	48.43	35	8	1	44	2.02	19°	255
42	44.50	57.48	53	10	1	64	2.7	19°	305
48	50.8	64.45	77	10	1	88	3.5	19°	350

54"– 60"



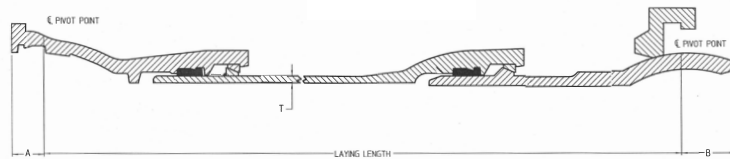
Size in.	A in.	N in.	Joint Materials Weight/lb.				Lubricant Pounds Per Joint	Maximum Joint Deflection **	Maximum Safe End Pull in Tons†
			Gland	Gasket	Locking Wedge	Complete Set			
54	57.56	73.37	121	22	2	145	4.7	15°	450
60	61.61	80.13	198	27	3	228	10	15°	500



AMERICAN DUCTILE IRON PIPE

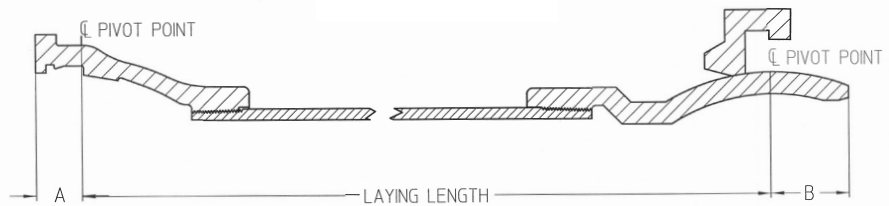
AMERICAN Ductile Iron Flex-Lok Boltless Ball Joint Pipe For Water, Sewage and Other Liquids

LAYING LENGTHS 4"– 12"



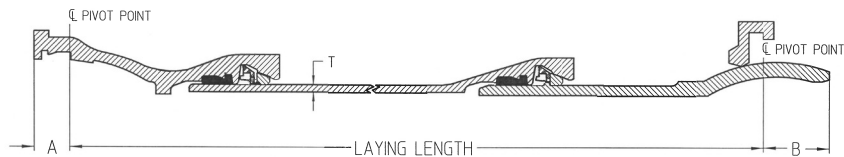
Size in.	L.L. Maximum Laying Length* ft.-in.	O.L. Maximum Overall Length** ft.-in.	A in.	B in.	Bell Weight lb.	Ball Weight lb.
4	21'-6"	21'- 9 ¹ / ₄ "	1.38	1.77	55	41
6	21'-7"	21'-10 ¹ / ₄ "	1.38	2.01	72	61
8	21'-8"	21'-11 ³ / ₄ "	1.42	2.34	99	88
10	21'-7-5/8"	21'-11 ¹ / ₂ "	1.42	2.61	143	123
12	21'-8-5/8"	22'-1"	1.42	2.91	184	169

14"– 18"



Size in.	L.L. Maximum Laying Length* ft.-in.	O.L. Maximum Overall Length** ft.-in.	A in.	B in.	Bell Weight lb.	Ball Weight lb.
14	20'-6"	20'-11 ³ / ₄ "	1.73	3.32	177	183
18	20'-6"	20'-11 ⁵ / ₈ "	1.73	3.87	277	297

16"– 20"

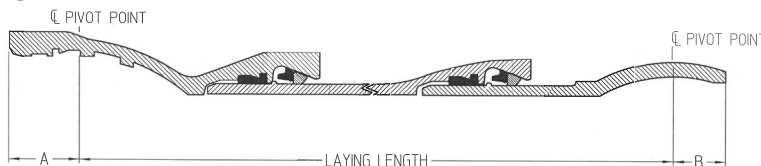


Size in.	L.L. Maximum Laying Length* ft.-in.	O.L. Maximum Overall Length** ft.-in.	A in.	B in.	Bell Weight lb.	Ball Weight lb.
16	22'-1 ⁹ / ₁₆ "	22'-6 ⁵ / ₈ "	1.73	3.58	312	290
20	22'-3 ⁵ / ₁₆ "	22'-9 ¹ / ₂ "	2.01	4.16	505	420



AMERICAN Ductile Iron Flex-Lok Boltless Ball Joint Pipe For Water, Sewage and Other Liquids

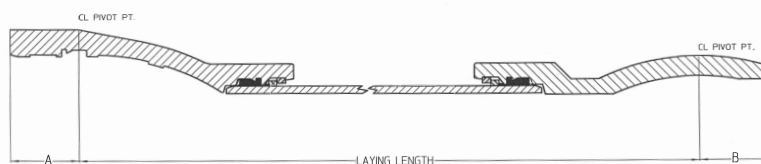
24"– 48"



Size in.	L.L. Maximum Laying Length* ft.-in.	O.L. Maximum Overall Length** ft.-in.	A in.	B in.	Bell Weight lb.	Ball Weight lb.
24	22'-7 1/8"	23'-1 7/8"	4.82	4.68	751	625
30	22'-4 5/8"	22'-3 1/4"	4.81	5.78	1320	1015
36	22'-11 15/16"	24'-1 1/4"	5.88	6.41	2100	1640
42	23'-4 1/2"	24'-10 1/4"	6.74	7.76	3292	2455
48	23'-6 1/4"	24'-10 5/8"	7.73	8.69	4412	2987

54"– 60"

54" AND 60" FLEX-LOK PIPE



Size in.	L.L. Maximum Laying Length* ft.-in.	O.L. Maximum Overall Length** ft.-in.	A in.	B in.	Bell Weight lb.	Ball Weight lb.
54	23'-0"	24'-7 1/2"	9.50	9.97	5875	5440
60	23'-3"	25'-2 3/4"	11.03	10.98	7852	9200

- 1.) The laying lengths in the above tables are subject to trim pipe allowance in accordance with AWWA C151. Also, this is the fully horned or inserted laying length of 4"-36" Flex-Lok Pipe. In installations where 4"-36" joints are pulled or extended to metal-binding contact of joint locking members, some slight additional laying length will be gained as a function of the removal of joint assembly space. Contact AMERICAN when lengths are critical, or when it is necessary to locate ball joints at specific stations, etc. The joints will seal properly in any axial position from fully horned to fully extended and with any joint deflection angles up to the maximum rating.
- 2.) The working pressure is AMERICAN's suggested standard water working pressure. Contact AMERICAN if higher working pressure is involved.
- 3.) Thicknesses correspond to Special Class 56. Check AMERICAN if pipe with other wall thickness is required.
- 4.) Does not include lining weight. Underwater pipe weights are for fresh water. Sea water is approximately 3% heavier than fresh water, and these weights should be adjusted accordingly for sea water installation.
- 5.) When full of air, pipe of this thickness will float unless weight is added. See Standard Cement Lining weights. Gross weight, including pipe, gland and lining, is painted on each length of Flex-Lok Pipe to aid in field calculations of actual buoyancy.
- 6.) Contact AMERICAN on requirements for 64" and larger Flex-Lok.
- 7.) Contact AMERICAN when lengths are critical, or when it is necessary to locate ball joints at specific stations, etc. The joints will seal properly in any axial position from fully horned to fully extended and with any joint deflection angles up to maximum rating when the joint is extended.
- 8.) Thicknesses correspond to Special Class 56 for 30"-54" sizes and Pressure Class 350 for the 60" size. Contact AMERICAN if pipe with other wall thickness is required.
- 9.) Contact AMERICAN for greater end pull requirements.
- 10.) The full deflection and laying length of 24"-60" joints is most readily obtained by fully extending the joints.
- 11.) The maximum laying length (and accordingly the maximum overall length) is subject to trim pipe allowance in accordance with AWWA C151. Also, this is the fully horned or inserted laying length of 4"-24" Flex-Lok pipe. In installations where 4"-24" joints are pulled or extended to metal-binding contact of joint locking members, some slight additional laying length will be gained as a function of the removal of joint assembly space. The joints will seal properly in any axial position from fully horned to fully extended and with any joint deflection angles up to the maximum rating.
- 12.) Overall Length (O.L.) equals Laying Length L.L. + A + B.



AMERICAN DUCTILE IRON PIPE

AMERICAN Ductile Iron Flex-Lok Boltless Ball Joint Pipe 4"-20" Flex-Lok Connecting Pieces

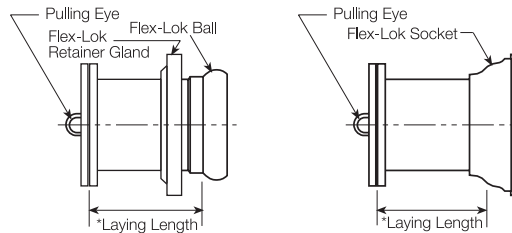


Table No. 10-8

Size in.	Laying Lengths*		Assembled Weight in Pounds	
	Flex-Lok Ball Assembly Closure	Flex-Lok Socket Assembly Closure	Flex-Lok Ball Assembly Closure	Flex-Lok Socket Assembly Closure
4	2'-10"	2'-10"	135	120
6	2'-9"	2'-10"	205	185
8	2'-8"	2'-10"	305	270
10	2'-7"	2'-10"	415	370
12	2'-7"	2'-10"	590	505
14	3'-1"	3'-0"	720	590
16	3'-2"	3'-0"	910	760
18	3'-3"	3'-1"	1130	935
20	3'-4"	3'-2"	1385	1135

*Laying lengths shown exclude the bolted on pulling flange.

Pulling flange contains 2 taps (1" taps for 4"-10" and 2" taps for 12"-54").

Flex-Lok Closure Assemblies are available on loan basis for use in installing lines by pulling and for testing of lines after installation.

They are normally furnished in pairs, i.e., one Ball and Closed End Assembly and one Socket and Closed End Assembly.

Assembled weights include the bolted on pulling flange

24"-54"† Flex-Lok Closure Assemblies

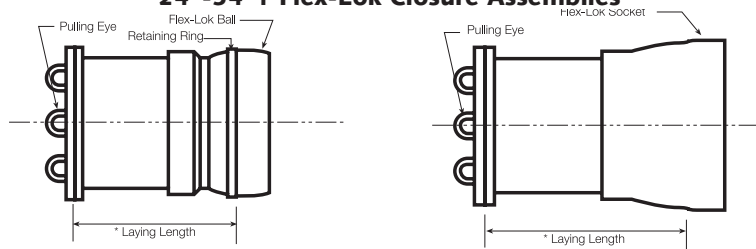


Table No. 10-9

Size in.	Laying Lengths*		Assembled Weight in Pounds	
	Flex-Lok Ball Assembly Closure	Flex-Lok Socket Assembly Closure	Flex-Lok Ball Assembly Closure	Flex-Lok Socket Assembly Closure
24	3'-5"	3'-3"	1910	1530
30	3'-7"	3'-5"	12480	12633
36	4'-0"	3'-8"	13976	14147
42	4'-8"	4'-4"	16481	16479
48	4'-9"	4'-6"	18614	19026
54	7'-0"	**9'-0"	13378	13834

*Laying Lengths shown exclude the bolted on pulling flange.

**Contact AMERICAN for the availability of a shorter closure piece if desired.

Pulling flange contains 2 taps (2" taps for 12"-54").

Flex-Lok Closure Assemblies are available on loan basis for use in installing lines by pulling and for testing of lines after installation.

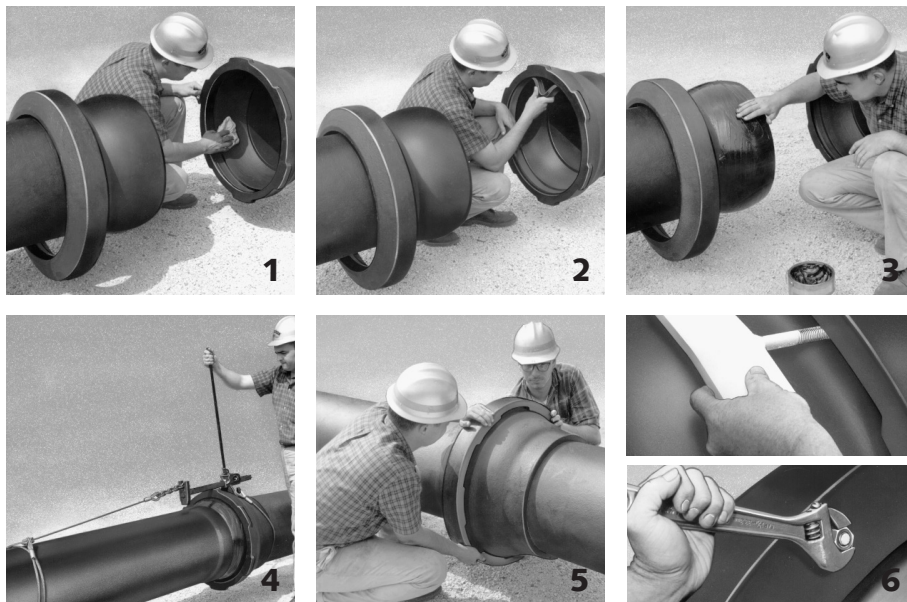
They are normally furnished in pairs, i.e., one Ball and Closed End Assembly and one Socket and Closed End Assembly.

Assembled weights include the bolted-on pulling flange.

†60" Flex-Lok Closure Assemblies are constructed differently than 24"-54", but with the same functionality (a pulling plug with taps is inserted in the bell or bell end, instead of a short length of flange pipe as pictured). Contact AMERICAN.



AMERICAN Ductile Iron Flex-Lok Boltless Ball Joint Pipe 4"-20" Assembly Instructions



Field assembly of 4"-20" AMERICAN Flex-Lok Boltless Ball Joint Pipe is fast and simple. The following procedure is recommended:

1. Remove the steel straps holding the gland on the ball. Thoroughly clean ball and gasket recess in the socket. The intermediate Flex-Ring joint comes from AMERICAN pre-assembled, complete. Note that no solvents should be used in cleaning the ball and gasket recess.

2. Insert the special Flex-Lok gasket into the gasket recess with small section of gasket facing outward.

3. For underwater installation, coat entire ball and the exposed surface of the gasket completely with the AMERICAN Underwater Joint Lubricant, which is furnished with the pipe. This coating will provide ample lubrication for assembly and joint flexing, and this special lubricant is insoluble in water.

4. Position the pipe in near straight alignment to facilitate assembly. Position the leading edge of the ball into the socket and

push or pull pipe together using methods similar to those shown on page 2-11.

5. Position the locking gland and rotate to interlock with matching lugs on the pipe bell.

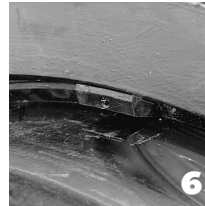
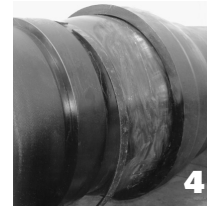
6. Insert the steel locking wedge into the space between two lugs with threaded stud through one of the drilled holes in the gland (two holes are provided 180° apart, but only one locking wedge is required per joint). Secure wedge by tightening nut on threaded stud. This wedge securely locks the gland in place.

7. Disassembly of the joint may be accomplished by essentially following the assembly instructions in reverse order.

If required, an additional quantity of lubricant can be supplied or a lubricant can be prepared in the field by mixing one gallon of melted paraffin and one-half gallon of linseed oil. Do not use other lubricants as they may be injurious to the gasket or impart taste or odor to the conveyed water.



AMERICAN Ductile Iron
Flex-Lok Boltless Ball Joint Pipe (Internal Retaining Ring Type)
24"-60"
Assembly Instructions



Field assembly of 24"-60" AMERICAN Flex-Lok Boltless Ball Joint Pipe is fast and simple. The following procedure is recommended:

1. Remove the steel strap, U-bolt and eye-bolt holding the retaining ring and let it hang freely on the shank of the ball. Thoroughly clean the outside of the ball and the socket recesses inside the bell. Do not remove protective coating from ball or bell. Note that no solvents should be used in cleaning the ball and gasket recess.

2. Insert the special Flex-Lok gasket into the gasket recess with small section of gasket facing outward.

3. For underwater installation, coat entire ball and the exposed surface of the gasket completely with the AMERICAN Underwater Joint Lubricant, which is furnished with the pipe. This coating will provide ample lubrication for assembly and joint flexing, and this special lubricant is insoluble in water.

4. Position the pipes in near straight alignment to facilitate assembly. Position the leading edge of the ball into the socket. Pull pipe together using a device such as a roller chain pull lift, which can be furnished by AMERICAN if desired.

5. Orient the loose retaining ring so the gap is at the top. Insert retaining ring into recess inside bell. Check to ensure ring is in the socket recess all the way around the joint.

6. Insert the assembly clip in the space between the ring ends and push or caulk into position. **Note that the spring end of the clip must be oriented inward toward the ball as shown on page 10-4 and in Photo 6 above.**

7. Disassembly can be easily accomplished with a reversal of these instructions. Any pulled or extended joints must, of course, be first pulled or pushed back together to allow removal of the assembly clip and the retaining ring. Also, a small tapped hole is provided in the face of the loose retaining ring approximately 180° from the assembly clip (normally at the bottom). A bolt can be threaded into this hole if disassembly is needed. This is often helpful in lifting the retaining ring out of engagement in the socket.

If required, an additional quantity of lubricant can be supplied or, in some cases, a lubricant can be prepared in the field by mixing one gallon of melted paraffin and one-half gallon of linseed oil. Do not use other lubricants as they may be injurious to the gasket or impart taste or odor to the conveyed water. Approximately 2" of relative separating movement or "joint take-up" will occur in each joint if the joint is extended or "pulled" (before locking members metal-bind to prevent further movement).



AMERICAN Ball Joint Pipe Installations

Methods of Installation

Time and time again, AMERICAN Ball Joint Pipelines have been installed where the conditions of the job site have challenged the ingenuity of the design engineer and installation contractor. The design features of Flex-Lok Pipe make it readily adaptable to extremely difficult situations. It has been installed by a variety of methods — both unique and conventional — with an unexcelled record of success.

Many installations have been made using marine equipment, thus minimizing or eliminating all underwater work. Unnavigable and navigable waters have been crossed with all jointing and installation work being performed on the opposite banks, with appropriate design and construction planning.

The majority of installations involve one or more of the installation procedures described as follows:

Installation From Bank (Line Pulling)

In many instances it is possible to plan installation methods for waterway crossings so that work will be confined to firm ground with offshore operations minimized or eliminated. AMERICAN Flex-Lok Joint Pipe may be assembled on an inclined ramp, or on launching ways, and pulled to the opposite shore by cable. The entire line may be moved as a unit or in sections. The line may be floated or pulled directly into an excavated trench depending on existing conditions.

AMERICAN Flex-Lok Joint Pipe is positively locked against separation and the allowable end pull permits the assembled pipe to be pulled as a line into otherwise inaccessible areas such as rivers, swamps and quicksand.

The joints are designed so that the joint sealing is not affected by the tension of pulling, and after the line is in final position, no further joint work is necessary. Many installations have been made by this method, and on several occasions two or more parallel lines have been pulled simultaneously.

In the construction of a ramp, the most readily available materials can be used, such as timbers, rails or steel beams. Pipe may be assembled so that the heavy flanges are in contact with the ramp or the pipe may be cradled on cross supports equipped with guide cleats. The design of the ramp and the materials used dictate how the pipe should be supported. The deflection of individual joints provides line flexibility, enabling movement



Bank installation in progress, where most of the work is performed on firm ground and the pipe is pulled across waterway by cable. (Note rail weights strapped on to create slight negative buoyancy of this size line pulled beneath barge traffic).



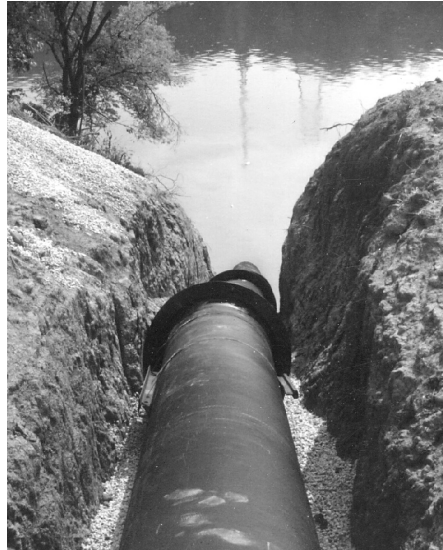
AMERICAN DUCTILE IRON PIPE

through moderate bends into various elevations and locations. The grade and long radius bend of the ramp are planned for gradual line deflection and maximum control of line movement.

In line pulling, analysis of bottom conditions should be made by thorough soundings to determine possible obstructions and resistance to be encountered by the pipe, as well as support for the pipeline in contact with the bottom.

Closure pieces with cable eyes and test taps can be furnished with the pipe on a rental basis.

An advantage is sometimes obtained by fastening an improvised deflector or sled in front of the lead socket flange.



Flex-Lok Joint Pipe can be pulled into position with a bulldozer, winch or crane with "dead man."

Line Flotation

AMERICAN Flex-Lok Joint Pipe can be installed by various methods including the use of line flotation. Some sizes of unfilled pipe are lighter than the water they displace and will float. See Table Nos. 10-1 and 10-2. If the unfilled pipe is heavier than the water it displaces, then pontoons must be secured to the line to provide the buoyancy if flotation is desired.

Unless bottom conditions or other circumstances dictate that the line be floated into position, it is usually better to pull the line submerged along the bottom with slight negative buoyancy. When necessary,

pontoons may be used to lighten the weight of a long line pulled along the bottom.

Unless water depth is relatively shallow, approximately 10 feet or less, a line floated into position should be supported as it is lowered to the bottom. This precaution is necessary to avoid placing excessive deflection and beam stresses on the joints.

Used commercial steel drums are generally available and often can be economically used as pontoons during installation. In designing flotation gear, consideration should be given to the depth at which the drums used will collapse due to external pressure.



Flotation provided by attached spheres facilitated installation of this 30" pipeline with Flex-Lok Joints.



48" Flex-Lok Pipe being positioned for assembly. The ramp attached to the barge is used as the assembly platform, and as the joints are made, the barge is moved forward, allowing assembled piping to slide into the water.

Installation From a Barge

Designed especially for submarine installations, AMERICAN Flex-Lok Joint Pipe is adaptable for installation from practically any barge or other type of marine equipment that can be used for laying pipe from the water's surface. The ruggedness and flexibility of the Flex-Lok Joint permits the suspension of the end of the pipeline above water for the addition of pipe while the balance of the line is suspended on a launching ramp or rests on the bottom.

Normally a ramp is employed in conjunction with the barge for the best control

of movement, prevention of undesirable bending loads on joints and for ease of operation. The ramp is designed to reach from the barge to the bottom and to rise and fall with the changing bottom elevations. As pipe is added onto the suspended end of the line, the barge is moved forward, pulling the ramp from under the suspended section allowing it to progressively descend to the bottom. Care should be taken to prevent any barge movement that could cause damaging overdeflection and bending moments to occur in the pipe joints.



AMERICAN Ball Joint Pipe Recommendations

Installation

The outstanding construction advantages afforded by AMERICAN Flex-Lok Pipe should be fully considered and used for long, trouble-free service.

For example, where river bottoms are of unstable soils, the flexibility of Flex-Lok Pipe will allow substantial line movement or settlement, and remain leak-free. Movement of the installed line, however, should be minimized as far as practical and confined to the underwater section of the line. It is suggested that the river bottom be trenched or dragged to stable soils where practical. Also, the ends of the lines extending above the water should be stabilized for connection to other lines. It is generally suggested that the ends of the crossings be installed in firm earth, above the high-water mark, to provide firm anchorage. Where the connecting ends of the crossings cannot be located in firm soils, other suitable means of anchoring should be provided.

After a river crossing is installed, it is normally suggested that the line be backfilled and allowed to settle for a reasonable period before end connections are made. This is due to uncertain bedding conditions that may be present in many installations. Submerged lines should be filled with water to aid their settlement.

The significant deflection provided by AMERICAN Ball Joints practically eliminates the need for line fittings; however, where steep approaches or horizontal bends are encountered requiring greater than normal line deflection, the use of short AMERICAN

Ball Joint connecting pieces will provide additional deflection within a short distance.

Testing

Upon completion of a river crossing, the ends of the line may be closed for testing by the use of closure pieces, which are available on loan from AMERICAN.

Connections

When connecting Ball Joint river crossing lines to land lines, the river crossing pipe should normally be installed first.

Sleeves are often used for connecting Ball Joint pipe to other pipelines. Such connections facilitate the joining of a field-cut piece, allow moderate movement of the river crossing ends, reduce stresses and provide for easy line maintenance.

Long pattern mechanical joint sleeves are recommended for making connection to mechanical joint or Fastite joint ductile iron pipe, both of which have the same outside diameters as Ball Joint pipe. Connections to pipe of other diameters require special connecting pieces designed to fit specific installation requirements.

The use of AMERICAN Flex-Lok Joint Pipe with or without special restrained expansion sleeves may be advantageous in seismic environments.

AMERICAN will assist in any river crossing project by making a detailed layout and by giving suggestions for installation procedures to accomplish the crossing.