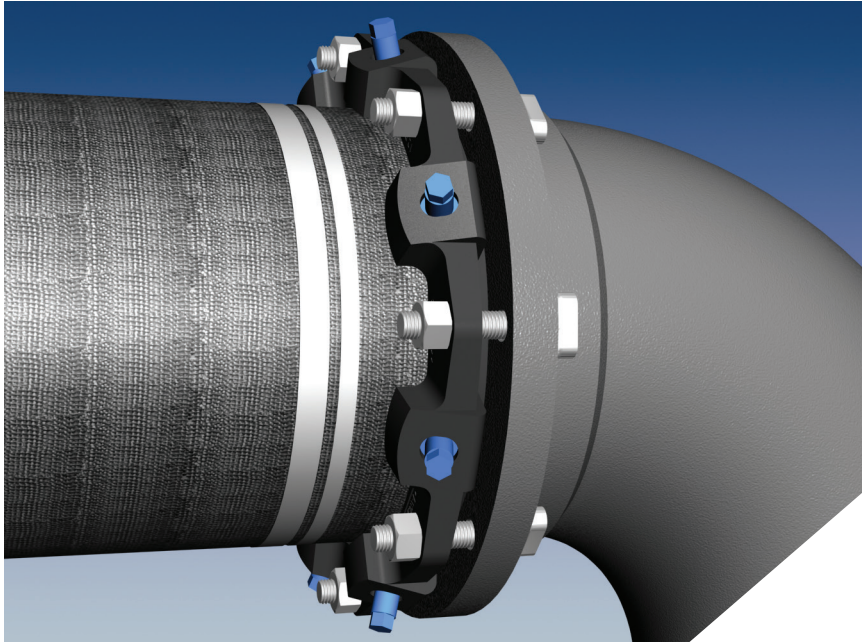


Mechanical Joint Restraint for Ductile Iron Pipe

All EBAA products intended for installation on ductile iron pipe are designed for and limited to use on ductile iron pipes that comply with the requirements of ANSI/AWWA C151/A21.51 and have a Brinell Hardness or equivalent measurement value that does not exceed 230BHN. **These requirements apply to the entire pipe wall profile at all restraining wedge engagement points and to the full penetration depth of each restraining wedge.***



Features and Applications:

- Sizes 3 inch through 60 inch
- Constructed of ASTM A536 Ductile Iron
- Torque Limiting Twist-Off Nuts
- MEGA-BOND® Restraint Coating System
For more information on MEGA-BOND, refer to www.ebaa.com
- The Mechanical Joint Follower Gland is incorporated into the restraint
- Heavy Duty thick wall design

- Support Products Available:
Split repair style available 3 inch through 54 inch.
EBAA Series 1100SD

Solid restraint harness available for push-on pipe bells.
EBAA Series 1700

Split restraint harness available for existing push-on bells.
EBAA Series 1100HD

- All MEGALUG and related restraint products can be furnished as packaged accessories complete with appropriate restraint, gasket, lubrication, and bolting hardware
- For use on water or wastewater pipelines subject to hydrostatic pressure and tested in accordance with either AWWA C600 or ASTM D2774

Nominal Pipe Size	Series Number	Shipping Weights	Post Assembly Deflection	Pressure Rating (PSI)
3	1103	6.1	3°	350
4	1104	7.7	3°	350
6	1106	11.9	3°	350
8	1108	14.8	3°	350
10	1110	23.9	3°	350
12	1112	31.2	3°	350
14	1114	48.5	2°	350
16	1116	56.4	2°	350
18	1118	63.1	1½°	250
20	1120	72.3	1½°	250
24	1124	133.1	1½°	250
30	1130	194.6	1°	250
36	1136	234.0	1°	250
42	1142	536.0	1°	250
48	1148	653.0	1°	250
54	1154	700.2	0.5°	250
60	1160	1,135.8	0.5°	200

NOTE: For applications or pressures other than those shown please contact EBAA for assistance.



U.S. Patent Nos.

4092036, 4627774, 4779900, 4896903, 5544922



MEGALUG: THE PRODUCT OF PREFERENCE SINCE 1984

Since 1984, engineers and contractors designing and installing water and wastewater pipelines and systems have come to rely on the EBAA Series 1100 MEGALUG Mechanical Joint Restraint as the “Product of Preference” for effectively and economically restraining ductile iron pipe connections above or below ground.

MEGALUG Mechanical Joint Restraints replace external restraints such as cumbersome concrete thrust blocks and corrodible metal tie rods creating a quicker, safer and more economical installation.

Major testing laboratories agree as the 3” through 24” sizes are Underwriters Laboratories (UL) listed, and the 3” through 12” sizes are Factory Mutual (FM) approved.

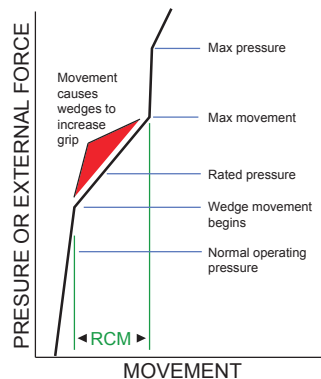
For use on all classes of ductile iron pipe (PC350 through PC150 and CL56 through CL50), for practically any application including valves, hydrants and pipe, the MEGALUG Mechanical Joint Restraint effectively and safely performs without damage to the pipe or cement linings.

THE MEGALUG GRIPPING WEDGE... PERFORMANCE PROVEN

The wedge style MEGALUG design reacts to the amount of force acting on the joint. When each wedge is set, the wedge teeth penetrate the pipe’s outer surface, and the wedge does not move on the pipe. There is very little change in this interface until the wedge movement begins inside the pocket of the main casting. Once the wedge starts moving, the formation of the buttress begins.

This “dam” of material (the wedge impression) is cold formed as the wedging action continues. If the force of pressure acting on the joint is released, the wedge moves back to near its original position. This engages the reserve-controlled movement or “RCM”. The wedge is then ready for another round.

After the wedge has moved to the back



of the pocket at the maximum pressure or load, the wedge buttress are in shear. The maximum movement is about 0.3 inch through the thirty-six inch size and 0.4 inch for forty-two and forty-eight inch.

The RCM is available even with severe

cyclic loads. This has been tested to very high-pressure differentials and the wedge impressions look the same as if a single test had been performed.

Typically, the depth of pipe wall penetration, or wedge impression at around 25,000 pounds of force per wedge (200 PSI on a six inch and 150 PSI on a twelve inch) is 0.03”. Finally, at roughly twice that force the penetration is around 0.05”. At these high pressures, there is no affect on the design thickness of ductile iron pipe made according to AWWA C150. The lack of damage to the cement lining clearly indicates that the thrust load is primarily longitudinal.

This ability to move in the pocket allows for angular flexibility as well as longitudinal flexibility.

THE ORIGINAL PATENTED GRIPPING WEDGES

Since 1964 EBAA Iron has responded aggressively to the needs of the water industry for better solutions to joint restraint problems - thus the development of the family of self actuating MEGALUG wedge action restraints.

TOOLS



MEGALUGS install using an ordinary wrench (box, ratchet, or air-driven), because the torque-limiting, twist-off nuts automatically shear during tightening when the proper torque is reached. The same 1 1/4" wrench used to tighten the T-bolts on the 4" through 24" sizes can be used to tighten and shear the twist off nuts in all sizes. If removal becomes necessary, a 5/8" hex head remains so the screws can be loosened, and retightened with a torque-indicating wrench. During removal, the wedges are held in place by retainer clips.

DEFLECTION

The MEGALUG gripping wedges provide resiliency to your pipeline design. In addition to deflecting as much as

allowed by the mechanical joint during installation, it can also deflect after assembly:

Sizes of 12" and below are capable of up to 3 degrees of deflection after installation (depending on the preset deflection.)
The 14" and 16" sizes are capable of 2 degrees deflection.
The 18" through 24" sizes are capable of 1.5 degrees deflection.
The 30" through 48" sizes are capable of 1 degree deflection.
The 54" and 60" sizes are capable of 0.5 degree deflection.

STEEL PIPE

The 1100 Series MEGALUG can be used to restrain 3" - 8" SCH 40 or 80 steel pipe when joining to mechanical appurtenances. It can also be used on steel pipe in all sizes if the pipe's outside diameter is the same as the ductile iron pipe and its thickness is equal to or greater than PC350 ductile iron pipe in sizes of 16 inch and below and PC250 ductile iron pipe 18 inches and above.

CAST IRON PIPE

Grey iron pipe diameters are often larger than ductile iron pipe diameters. The Series 1100 MEGALUG restraint may be used with grey iron pipe having standardized cast iron O.D. per AWWA C150 and C151, and with pit cast Classes "A" and "B" without modification. Use of the Series 1100 with pit cast grey iron Classes "C" and "D" will require over sizing the MEGALUG. More information on this is explained in detail in "Connections Bulletin DI-1".



MEGALUG Takes the Load

On April 11, 1997 EBAA Iron performed a remarkable force demonstration of their series 1100 MEGALUG Joint Restraint. With the use of EBAA's Series 1100 MEGALUG using a standard mechanical joint installation on 12 inch Ductile Iron Pipe, and a 80 Ton motor crane, EBAA Iron lifted a D7 Caterpillar Track Type Tractor weighing in at 50,350 lbs. Along with this, the Series 1100 MEGALUG has been tested to over 700 PSI. Concluding that EBAA's MEGALUGS can take the load.



Mechanical Joint Restraint Sample Specifications

(The text of the specifications below can be copied/pasted from www.ebaa.com/download/1100Spec.DOC)

Restraint devices for mechanical joint fittings and appurtenances conforming to either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53, shall conform to the following:

Design

Restraint devices for nominal pipe sizes 3 inch through 60 inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.

The devices shall have a working pressure rating of 350 psi for 3-16 inch, 250 psi for 18-54 inch and 200 psi for the 60 inch. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes.

All EBAA products intended for installation on ductile iron pipe are designed for and limited to use on ductile iron pipes that comply with the requirements of ANSI/AWWA C151/A21.51 and have a Brinell Hardness or equivalent measurement value that does not exceed 230BHN. **These requirements apply to the entire pipe wall profile at all restraining wedge engagement points and to the full penetration depth of each restraining wedge.***

Material

Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.

For applications requiring restraint 30 inch and greater, an alternate grade of iron meeting the material requirements of ASTM A536 is acceptable, providing the device meets all end product performance requirements.

Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 BHN.

Three (3) test bars shall be incrementally poured per production shift as per

Underwriter's Laboratory (U.L.) Specifications and ASTM A536. Testing for tensile, yield and elongation shall be done in accordance with ASTM E8.

Chemical and nodularity tests shall be performed as recommended by the Ductile Iron Society, on a per ladle basis.

Traceability

An identification number consisting of year, day, plant and shift (YYDDD)(plant designation)(Shift number), shall be cast into each gland body.

All physical and chemical test results shall be recorded such that they can be accessed via the identification number on the casting. These Material Traceability Records (MTR's) are to be made available, in hard copy, to the purchaser that requests such documentation and submits his gland body identification number.

Production pieces that are too small to accommodate individual numbering, such as fasteners and wedges, shall be controlled in segregate inventory until such time as all quality control tests are passed. These component parts may then be released to a general inventory for final assembly and packaging.

All components shall be manufactured and assembled in the United States. The purchaser shall, with reasonable notice, have the right to plant visitation at his/her expense.

Installation

Mechanical joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full

mechanical joint deflection during assembly as well as allowing joint deflection after assembly.

Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts.

Approvals

Restraint devices shall be Listed by Underwriters Laboratories (3" through 24" inch size) and Approved by Factory Mutual (3" through 12" inch size).

Mechanical joint restraint for ductile Iron pipe shall be Megalug Series 1100 produced by EBAA Iron Inc. or approved equal.

MEGA-BOND® Restraint Coating System

All wedge assemblies and related parts shall be processed through a phosphate wash, rinse and drying operation prior to coating application. The coating shall consist of a minimum of two coats of liquid thermoset epoxy coating with heat cure to follow each coat.

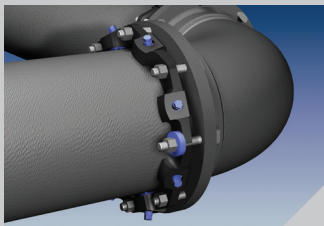
All casting bodies shall be surface pretreated with a phosphate wash, rinse and sealer before drying. The coating shall be electrostatically applied and heat cured. The coating shall be a polyester based powder to provide corrosion, impact and UV resistance.

The coating system shall be MEGA-BOND by EBAA Iron, Inc. or approved equal. Requests for approved equal must submit coating material and process details for review prior to bid.

For more information regarding MEGA-BOND, refer to the MEGA-BOND brochure or visit www.ebaa.com.

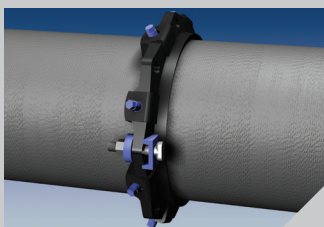
Support Products

for more information concerning these products please consult the catalog or www.ebaa.com



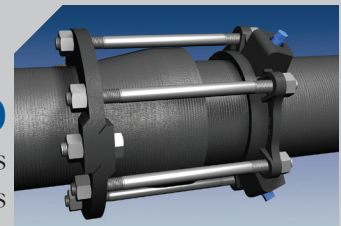
Series 1100SD

Split MEGALUG Restraint
For Existing Mechanical Joints



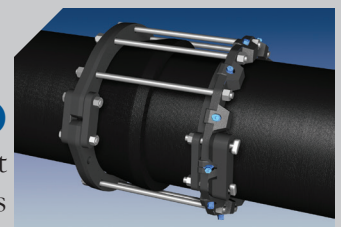
Series 1100SDB

Split MEGALUG Restraint
For Mid-Span Applications



Series 1700

MEGALUG Restraint Harness
For Push-On Bell Joints

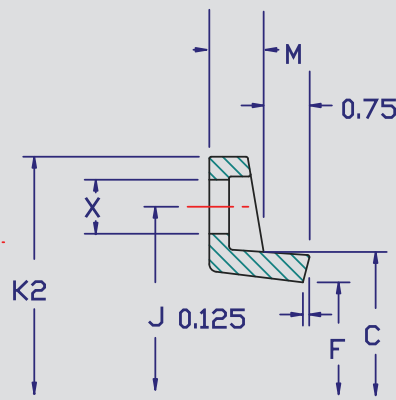
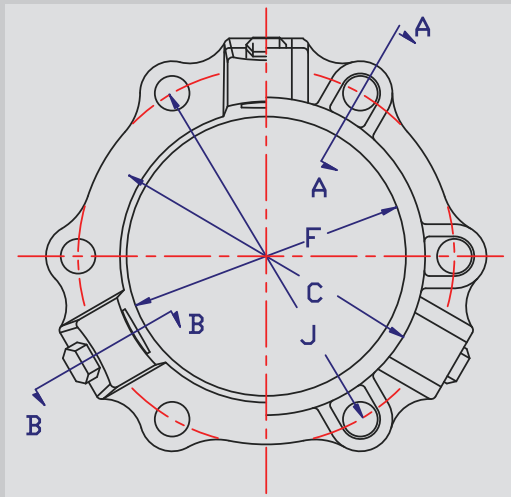


Series 1100HD

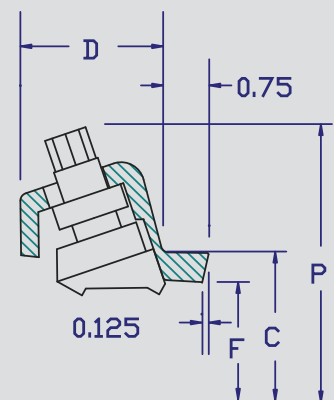
Split MEGALUG Restraint
Harness for Existing Push-On Bells

Series 1100 Submittal Reference Drawing

EBAA IRON



SECTION A-A



SECTION B-B

MADE IN USA

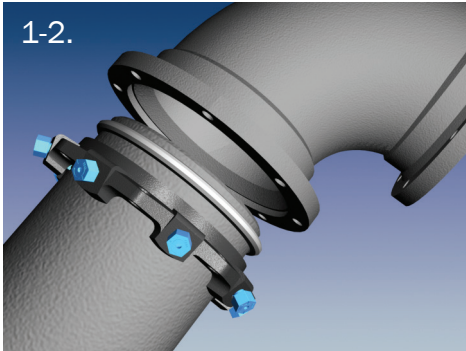
Nominal Pipe Size	Series Number	C	D	F	M	P*	X	J	K2	Wedge QTY.	Bolt (QTY.-Size)	Weight (LBS.)	Pressure Rating (PSI)
3	1103	4.48	2.27	4.06	0.62	9.06	0.750	6.19	7.69	2	4 - 5/8 x 3	6.1	350
4	1104	5.92	2.27	4.90	0.75	9.90	0.875	7.50	9.12	2	4 - 3/4 x 3 1/2	7.7	350
6	1106	8.02	2.27	7.00	0.88	12.00	0.875	9.50	11.12	3	6 - 3/4 x 3 1/2	11.9	350
8	1108	10.17	2.31	9.15	1.00	14.15	0.875	11.75	13.37	4	6 - 3/4 x 4	14.8	350
10	1110	12.22	2.37	11.20	1.00	16.20	0.875	14.00	15.62	6	8 - 3/4 x 4	23.9	350
12	1112	14.32	2.37	13.30	1.25	18.30	0.875	16.25	17.88	8	8 - 3/4 x 4	31.2	350
14	1114	16.40	2.69	15.44	1.50	20.94	0.875	18.75	20.25	10	10 - 3/4 x 4 1/2	48.5	350
16	1116	18.50	2.69	17.54	1.56	22.90	0.875	21.00	22.50	12	12 - 3/4 x 4 1/2	56.4	350
18	1118	20.60	2.69	19.64	1.63	25.00	0.875	23.25	24.75	12	12 - 3/4 x 4 1/2	63.1	250
20	1120	22.70	2.69	21.74	1.69	27.10	0.875	25.50	27.00	14	14 - 3/4 x 4 1/2	72.3	250
24	1124	26.90	3.20	25.94	1.81	32.64	0.875	30.00	31.50	16	16 - 3/4 x 5	133.1	250
30	1130	33.29	3.20	32.17	2.25	38.87	1.125	36.88	39.12	20	20 - 1 x 6	194.6	250
36	1136	39.59	3.20	38.47	2.25	45.17	1.125	43.75	46.00	24	24 - 1 x 6	234.0	250
42	1142	45.79	4.56	44.67	3.88	55.57	1.375	50.62	53.48	28	28 - 1 1/4 x 8 1/2	536.0	250
48	1148	52.09	4.56	50.97	3.88	61.87	1.375	57.50	60.36	32	32 - 1 1/4 x 8 1/2	653.0	250
54	1154	58.82	4.56	57.73	3.88	66.40	1.375	63.20	66.33	36	36 - 1 1/4 x 9 1/2	700.3	250
60	1160	62.90	6.40	61.78	4.23	73.00	1.375	67.72	70.70	36	36 - 1 1/4 x 11	1,135.8	200

* With Twist-Off Nuts twisted off.

Important Notes

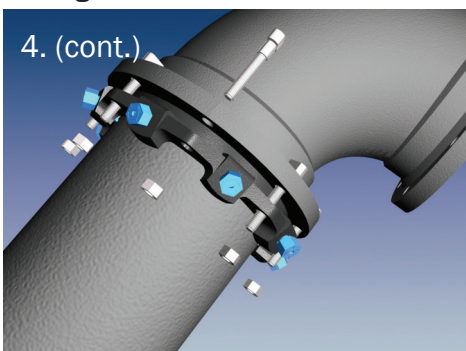
NOTE: Dimensions are in inches (±1%) and are subject to change without notice.

- The Series 1100 MEGALUG should not be used on plain end fittings.
- If encased in concrete, polyethylene wrap must be used to prevent concrete intrusion into the wedge pocket.
- For test pressures above the rated pressures shown, contact EBAA for recommendations, such as tandem restraint for high pressure applications.
- If you experience the need to install the Series 1100 MEGALUG in an unconventional manner please consult our engineering department.
- The Series 1100 MEGALUG is intended for use on ductile iron pipe. The restraint can be used on grey iron pipe if the pipe is not severely corroded and is in sound condition and has an outside diameter that can be accommodated. For more information on the use of the MEGALUG restraint on grey iron pipe ask for Connections Bulletin DI-1.
- EBAA-Seal™ Mechanical Joint Gaskets are provided with 30 inch through 60 inch MEGALUG restraints. These are required on the above referenced sizes to accommodate the pressure ratings and safety factors shown.
- Extra length T-bolts are provided with the 42 inch, 48 inch, 54 inch, and 60 inch sizes to facilitate easier assembly of the mechanical joint.
- All Series 1100 MEGALUG components are made of ductile iron conforming to ASTM A536. The wedges are heat treated to a hardness range of 370 to 470 BHN.
- LISTINGS AND APPROVALS: Sizes 3 inch through 24 inch are listed by Underwriters Laboratories, Inc. Category HJKF "Fittings, Retainer Type" with a deflection angle of 5 degrees (3 inch through 12 inch) and 2 1/2 degrees (14 inch through 24 inch). The listing file number is EX2836, Sizes 3 inch through 12 inch are Factory Mutual approved.



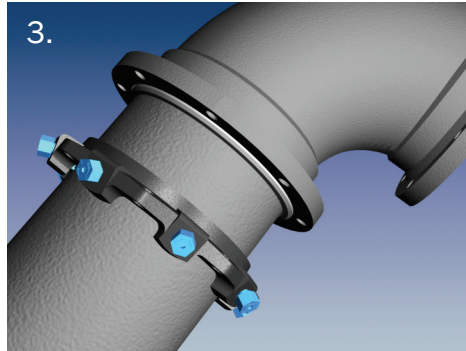
1. The Series 1100 MEGALUG® joint restraint is designed for use on ductile iron pipe conforming to ANSI/AWWA C151/A21.51 (all thickness classes) when restraining mechanical joint pipe fittings.

All EBAA products intended for installation on ductile iron pipe are designed for and limited to use on ductile iron pipes that comply with the requirements of ANSI/AWWA C151/A21.51 and have a Brinell Hardness or equivalent measurement value that does not exceed 230BHN. **These requirements apply to the entire pipe wall profile at all restraining wedge engagement points and to the full penetration depth of each restraining wedge.***

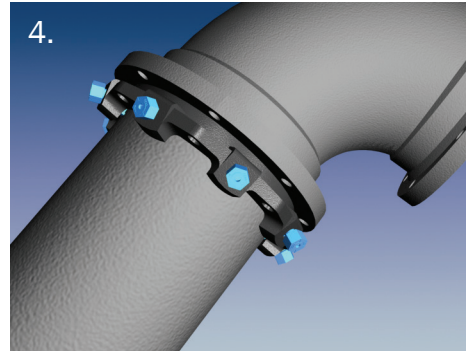


4. Push the gland toward the socket and center it around the pipe with the gland lip against the gasket. Insert bolts and hand tighten nuts. Make deflection after joint assembly but before tightening bolts.

5. Tighten the bolts to the normal range of torque as indicated [3-inch 45-60 ft.-lbs., 4 through 24-inch 75-90 ft.-lbs., 30 and 36-inch 100-120 ft.-lbs., and 42, 48, 54, and 60-inch 120-150 ft.-lbs.] While at all times maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This can be accomplished by partially tightening the bottom bolt first, then top bolt, next the bolts at either side, finally the remaining bolts. Repeat the process until all bolts are within the appropriate range of torque. In large

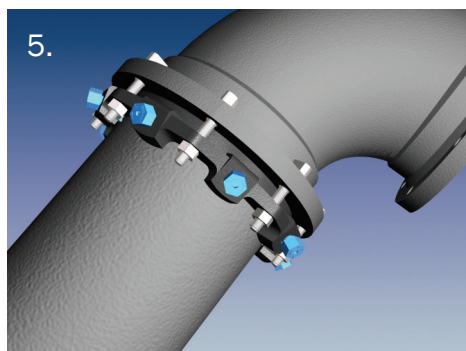


2. Clean the socket and the plain end. Lubrication and additional cleaning should be provided by brushing both the gasket and the plain end with soapy water or an approved pipe lubrication meeting the requirement of ANSI/AWWA C111/A21.11 just prior to slipping the gasket onto the plain end for joint assembly. Place the gland on the plain end with lip extension toward the plain end, followed by the gasket with the narrow edge of the gasket toward the plain end. [The gasket provided may be the EBAA-SEAL®



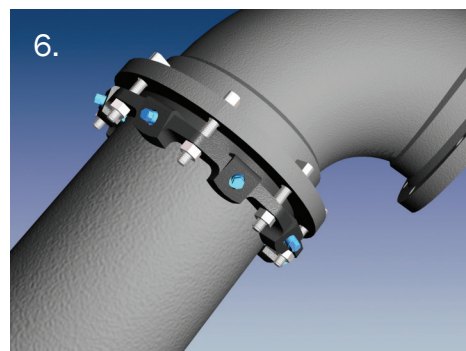
Improved Mechanical Joint Gasket, there is no narrow end as the gasket is bi-directional. In certain sizes, use of the EBAA-SEAL is required to achieve the pressure ratings of the MEGALUG.] NOTE: In cold weather it is preferable to warm the gasket to facilitate assembly of the joint.

3. Insert the pipe into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly.



sizes (30 through 64-inch [762mm – 1,600mm]), five or more repetitions may be required. The use of a torque-indicating wrench will facilitate this procedure.

6. Tighten the torque limiting twist off nuts in a clockwise direction (direction indicated by arrow on top of nut) until all wedges are in firm contact with the pipe surface. Continue tightening in an alternating manner until all of the nuts have been twisted off.



7. If removal is necessary, utilize the 5/8 inch (1 1/4 inch on the 1160) hex heads provided. If reassembly is required, assemble the joint in the same manner as above, by tightening the wedge bolts to 90 ft.-lbs (150 ft.-lbs on the 1160). If the series 1100 restraint is removed from the pipe, be sure that all the collar bolts and wedges are in place before the restraint is reassembled.

Steps 2-5 are requirements of AWWA Standard C600-17

***To learn more about this addendum, please visit:**

<https://ebaa.com/spec/dip>

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 contact@ebaa.com
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For More Information

For more information about MEGALUG restraints call EBAA today and request "EBAA Connections Bulletin DI-1" concerning use of the MEGALUG restraint on grey iron pipe, or "EBAA Connections Bulletin DI-2" covering the background and operation of the MEGALUG system of restraint.

"Restraint Length Calculation" Software is available for PC/Windows applications. Support documentation about the software can be found in "EBAA Connections Bulletin PD-1 through PD-5".