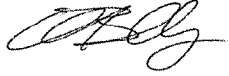

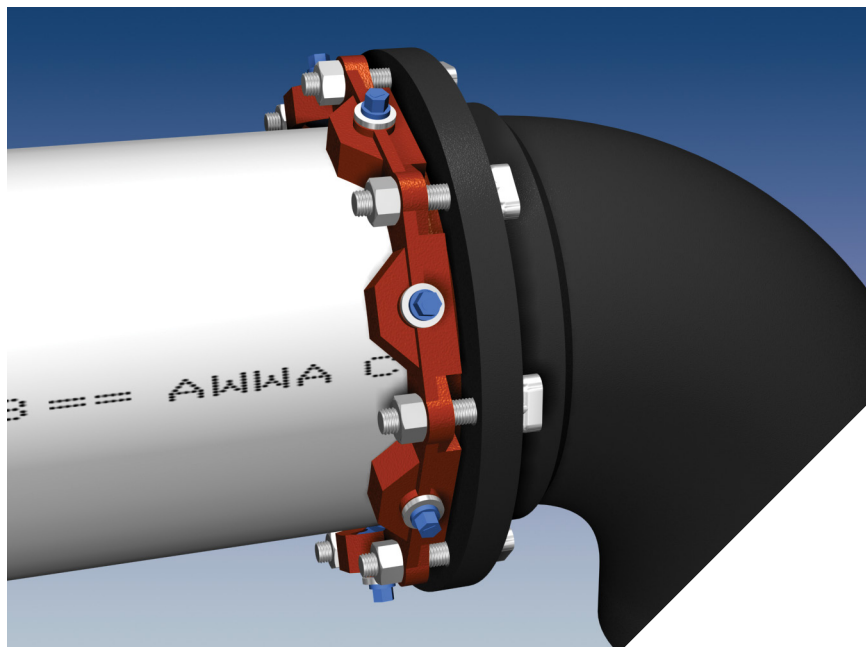


CONTRACTOR SUBMITTAL FORM

Project Name: Navajo Gallup Water Supply Project Reach 26.3	<input checked="" type="checkbox"/> M (Materials) <input type="checkbox"/> T (Testing) <input type="checkbox"/> A (Administrative)	Submittal No.
SMA Project No: 6921307		M020
Date: 07-16-2019		
Contractor: Navajo Engineering and Construction Authority	No. of Copies: 1	

Supplier: Core & Main	Manufacturer: EBAA Iron, Inc.
Specification No.: 33 11 13-2.1B5b	Drawing No.: C-32, DT-3,6,8,9-11
Bid Item No(s): 9, 11, 17-24, 34, 39	
Submittal Checklist No(s): M204	
Product Description: EBAA Mega Lug Series 2000 – PVC (red) – 4", 6", 8", 10", and 12" EBAA Mega Lug Series 1100 – DI (black) – 4", 6", 8", and 10" EBAA Mega Flange Series 2100 – 6", 10" and 12" (Stainless Steel Hardware required, addressed in later submittal)	
Are there any deviations from the Contract Documents? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes Explain:	
Contractor's certification that product meets requirements of Contract Documents: <input checked="" type="checkbox"/> Certified <input type="checkbox"/> Certified with variations as noted on shop drawings and/or attached sheets.	
Signed:  Quentin Benally, NECA	Date: 07-16-2019

Engineer's Comments: <input checked="" type="checkbox"/> No Exception Taken <input type="checkbox"/> Approved as Corrected <input type="checkbox"/> Exceptions as Noted <input type="checkbox"/> Submittal Rejected <input type="checkbox"/> Revise and Resubmit to Engineer <input type="checkbox"/> Contractor to Submit Specified Information	Review is limited to check for compliance with design concept. No changes from provisions of Contract Documents are intended and Contractor remains responsible for compliance with revisions therein. The Contractor is solely responsible for quantities; correctness of dimensions; verification of physical interrelation of elements of the work as required by the drawings and specifications and by field determination; fabrication procedures, construction methods, techniques and sequences. This review does not relieve the Contractor from these responsibilities. Non-conformities and errors detected have been noted but such markings, or lack thereof, shall not relieve the Contractor from compliance with all requirements of the contract drawings and specifications.
Signed: 	Date: 7/22/19



Series 2012PV on 12inch C900 PVC pipe at a ductile iron fitting.

Features and Applications:

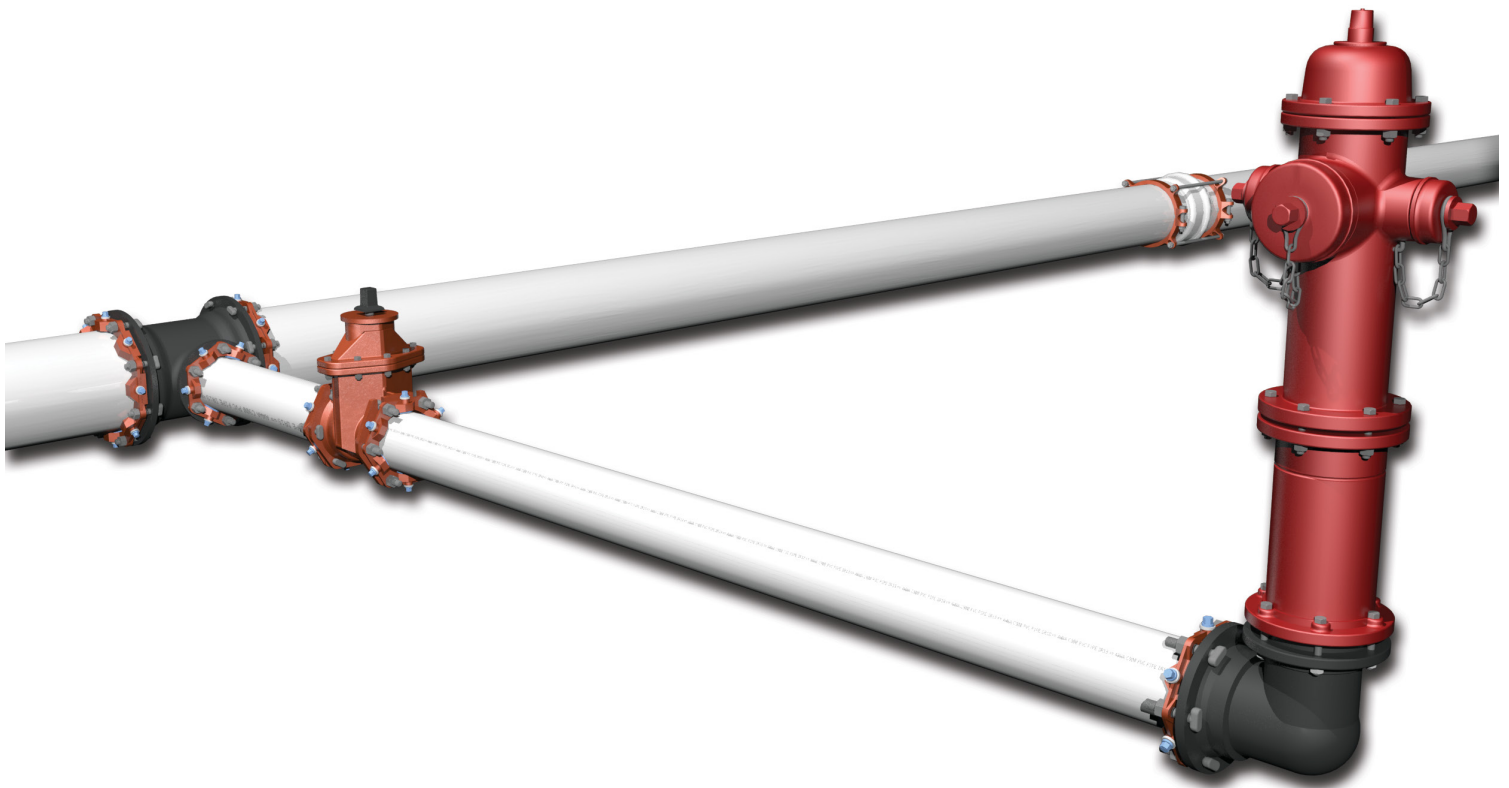
- For restraining plain end PVC pipe at mechanical joint fittings and appurtenances
- Sizes 3 inch through 36 inch
Sizes 42 inch through 48 inch accommodated by Series 2200
- MEGA-BOND® Restraint Coating System
For more information on MEGA-BOND, refer to www.ebaa.com
- Constructed of ASTM A536 Ductile Iron
- The mechanical joint follower gland is incorporated into the restraint
- Accommodates full deflection of the mechanical joint on which it is used
- Heavy duty thick wall design
- Support Products Available:
 - Split mechanical Joint style available for 3 inch through 12 inch
EBAA Series 2000SV
 - Solid restraint ring harness available for C905 PVC pipe bells
EBAA Series 2800
 - Split restraint ring harness available for C900 and C905 PVC pipe bells and PVC fittings
EBAA Series 1500, 1600 and 2500
- All 2000PV and related restraint products can be furnished as packaged accessories complete with appropriate restraint, gasket, lubrication and bolting hardware

Nominal Pipe Size	Series Number	Shipping Weight
3	2003PV	7.0
4	2004PV	8.8
6	2006PV	12.1
8	2008PV	16.3
10	2010PV	26.0
12	2012PV	31.4
14	2014PV	47.6
16	2016PV	52.8
18	2018PV	61.8
20	2020PV	70.9
24	2024PV	92.9
30	2030PV	128.5
36	2036PV	161.3
42	2242*	652.0
48	2248*	711.1

*Restraint for pipe size 42 inch and greater, please refer to Series 2200 Brochure found at www.ebaa.com.

U.S. Patent No.
4627775 4896903 5071175

For use on water or wastewater pipelines subject to hydrostatic pressure and tested in accordance with either AWWA C600 or ASTM D2774.



Series 2000PV:

Mechanical Joint Restraint Gland for use With AWWA C900 or IPS Outside Diameter PVC Pipe

The 2000PV MEGALUG Mechanical Joint Restraint is the fastest and most economical method of restraining PVC pipe to mechanical joints. Now the need for costly concrete thrust blocks and corrodible steel tie rods is eliminated. It can be used in straight alignment or at the preset deflection recommended for mechanical joints.

The 2000PV was the first PVC joint restraint to be tested to UNI-B-13, Underwriters Laboratories, and Factory Mutual.

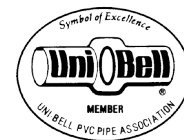
Tested to and meets the requirements of ASTM F 1674-96 'Standard' Test Method for joint restraint products use with PVC pipe through 24 inch size.

UL Listed in the four through twelve inch sizes for joining UL Listed ductile iron fittings to UL Listed, Class 150 PVC pressure pipe. The maximum allowable joint deflection is five degrees.

Factory Mutual approved for use on DR18 PVC pipe in four through twelve inch sizes.



**ASTM
F1674**



The 2000PV MEGALUG Concept

EBAA Iron started manufacturing joint restraint products for PVC pipe in the early 1980s. The testing of early prototypes of various configurations of restraints on large diameter PVC pipe indicated that a restraint device must be capable of consistently and reliably gripping the pipe. If not, the restraint can slip under pressure, resulting in a sudden impact, and cause the pipe to burst. Armed with this background knowledge and an appreciation for the capabilities of PVC pipe, EBAA purposefully deviated from what many in the industry once considered to be the 'only' way to grip PVC pipe. This led to development of the Series

2000PV MEGALUG Mechanical Joint Restraint for PVC pipe.

The design of the 2000PV incorporates the gripping mechanism into the design of the mechanical joint gland and utilizes a simple two part assembly process. The first step involves assembling the joint the same as any standard mechanical joint. The assembly procedure we recommend is that established in AWWA C600. The second is the actuation of the restraint.

Three Testing Methods

The design philosophy behind the 2000PV joint restraint is that the pipe with the restraint should be capable of being tested to the same minimum requirements of the pipe alone. In doing so, the restraint is shown to have no detrimental effect on the pipe and will have the same pressure rating and safety factor as the pipe on which it is used. To that end the 2000PV has been subjected to hundreds of static and cyclic pressure tests to demonstrate the performance and reliability of the restraint.

One of the primary tests of PVC is its quick burst strength. For pipe meeting the requirements of AWWA C900, AWWA C905 and ASTM 2241, the minimum quick burst requirement for the hoop stress is 6,400 PSI. For DR18, pipe pressure is 755 PSI.

The second test is sustained pressure test at a hoop stress of 4,200 PSI. For DR18 pipe, that pressure is 500 PSI.

Third, a conservative cyclic pressure surge design for the pipe exists in the form of Vinson Equation.

The 2000PV restraint has been tested to over one million cycles to the peak pressures predicted by the Vinson Equation for that number of cycles.



Series 2000PV Takes the Load

On April 11, 1997 EBAA Iron performed a remarkable force demonstration of their Series 2000PV joint restraint. With the use of EBAA's Series 2000PV using standard mechanical joint installation on 12 inch PVC 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 2000PV has been tested to over 700 PSI. Concluding that EBAA's Series 2000PV MEGALUG can take the load.

Mechanical Joint Restraint for AWWA PVC Pipe Sample Specification

(The text of the specification below can be downloaded as a Microsoft® Word Doc from our website www.ebaa.com)

Restraint devices for mechanical joint fittings and appurtenances conforming to either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A2153, shall conform to the follow:

Design

Restraint devices for nominal pipe sizes 3 inch through 36 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 equal to that found in the most current product brochure. Ratings are for water pressure and must include a minimum safety factor of 2:1 in all sizes.

Material

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

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

Approvals

Mechanical Joint Restraints shall be Listed by Underwriters Laboratories in the 4 inch through 12 inch sizes. Mechanical Joint Restraints shall be Factory Mutual Approved in the 4 inch through 12 inch sizes. Mechanical Joint Restraints, 4 inch through 24 inch, shall meet or exceed the requirements of ASTM F1674 of the

latest revision.

Mechanical joint restraint shall be Series 2000PV 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.

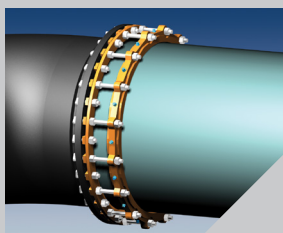
All casting bodies shall be surface pretreated with a phosphate wash, rinse and sealer before drying. The coating shall be electrostatically applied and heat cured. The coating shall be a polyester based powder to provide corrosion, impact and UV resistance.

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

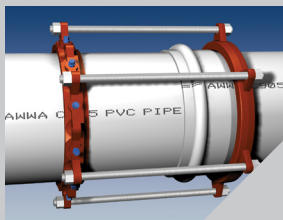
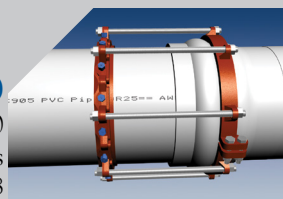


Series 2200

MEGALUG® Restraint for C905 PVC Pipe at Mechanical Joint Fittings
Sizes 42 and 48 inch

Series 2500

MEGALUG® Restraint for C900 and C905 PVC Pipe at PVC Fittings
Sizes 4 inch through 48

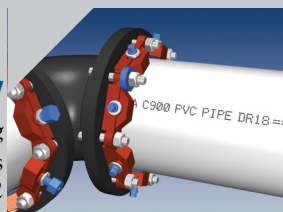


Series 2800

MEGALUG® Restraint Harness for C905 PVC Pipe
Sizes 14 inch through 48
Sizes 4 through 12 accommodated by either Series 1500 or 1600

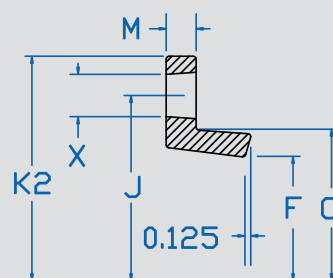
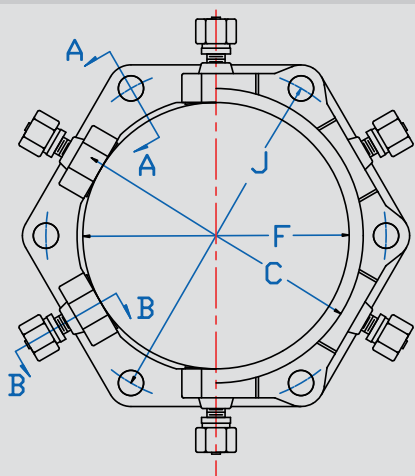
Series 2000SV

Split MEGALUG® Restraint for existing C900 PVC Pipe at Ductile Iron Fittings
Sizes 4 inch through 12

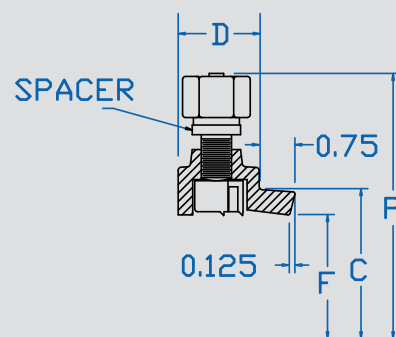


Series 2000PV Submittal Reference Drawing

EBAA IRON



SECTION A-A



SECTION B-B

MADE IN USA

Submittal Reference Drawing Dimensions (in.)

Nominal Pipe Size	Series Number	C	D	F	M	P	P [†]	X	J	K2	Wedge Qty	Bolt Qty	Weight (lbs.)
3	2003PV	4.84	1.55	3.60	0.50	9.8	8.6	3/4	6.19	7.69	4	4	7.0
4	2004PV	5.92	1.68	4.90	0.50	10.5	9.5	7/8	7.50	9.13	4	4	8.8
6	2006PV	8.02	1.68	7.00	0.50	13.0	12.1	7/8	9.50	11.13	6	6	12.1
8	2008PV	10.17	1.68	9.15	0.62	14.5	13.6	7/8	11.75	13.38	6	6	16.3
10	2010PV	12.22	2.10	11.20	0.62	17.0	16.0	7/8	14.00	15.63	8	8	26.0
12	2012PV	14.32	2.10	13.30	0.75	19.0	18.1	7/8	16.25	17.88	8	8	31.4
14	2014PV	16.40	2.25	15.49	0.88	21.7	20.9	7/8	18.75	20.38	10	10	47.6
16	2016PV	18.50	2.25	17.58	0.88	23.8	23.0	7/8	21.00	22.63	12	12	52.8
18	2018PV	20.60	2.25	19.68	1.13	25.9	25.1	7/8	23.25	24.88	12	12	61.8
20	2020PV	22.70	2.25	21.79	1.25	28.0	27.2	7/8	25.50	27.13	14	14	70.9
24	2024PV	26.90	2.75	25.99	1.42	32.3	31.5	7/8	30.00	31.63	16	16	92.9
30	2030PV	33.29	2.70	32.22	1.50	38.5	37.7	1 1/8	36.88	39.12	20	20	128.5
36	2036PV	39.59	2.70	38.52	1.50	44.8	44.0	1 1/8	43.75	46.00	24	24	161.3
42	2242	Submittal information for pipe sizes 42 inch and greater can be found in the Series 2200 Brochure.											
48	2248	Submittal information for pipe sizes 42 inch and greater can be found in the Series 2200 Brochure.											

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

P[†]: Outside Diameter with "Twist-Off" nuts twisted off.

Pressure Ratings (PSI)

Nominal Pipe Size	Series Number	Ratings for Ordinary Water Works w/Transient surges only										Ratings for Peak Pressures used in Sewage Force Mains and other installations designed for Cyclic Surges of 1-Mill. Cycles					
		DR14	DR18	DR21	DR25	DR32.5	DR41	DR51	SDR17	SDR21	SDR26	DR14	DR18	DR25	SDR17	SDR21	SDR26
3	2003PV	305	235	-	165	-	-	-	250	200	160	244	188	132	200	160	120
4	2004PV	305	235	-	165	-	-	-	250	200	160	244	188	132	200	160	120
6	2006PV	305	235	-	165	-	-	-	250	200	160	244	188	132	200	160	120
8	2008PV	305	235	-	165	-	-	-	250	200	160	244	188	132	200	160	120
10	2010PV	305	235	-	165	-	-	-	250	200	160	244	188	132	200	160	120
12	2012PV	305	235	-	165	-	-	-	250	200	160	244	188	132	200	160	120
14	2014PV	305	235	-	165	125	100	-	-	-	-	-	-	-	-	-	-
16	2016PV	200	235	-	165	125	100	-	-	-	-	-	-	-	-	-	-
18	2018PV	-	200	165	165	125	100	-	-	-	-	-	-	-	-	-	-
20	2020PV	-	200	-	165	125	100	-	-	-	-	-	-	-	-	-	-
24	2024PV	-	235	-	165	125	100	-	-	-	-	-	-	-	-	-	-
30	2030PV	-	-	165	165	125	*	*	-	-	-	-	-	-	-	-	-
36	2036PV	-	-	125	125	125	*	*	-	-	-	-	-	-	-	-	-

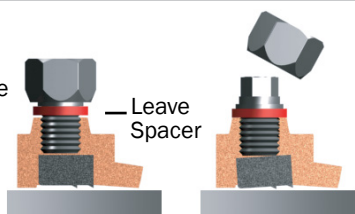
* Refer to Series 2200 Product Brochure found either in our Catalog or on EBAA's web site.

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

Spacer Instructions

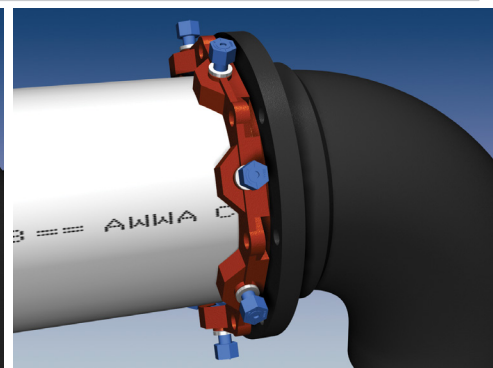
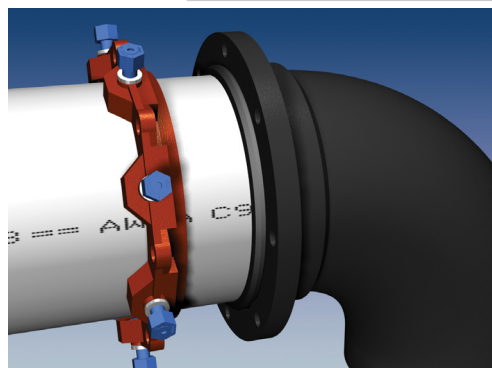
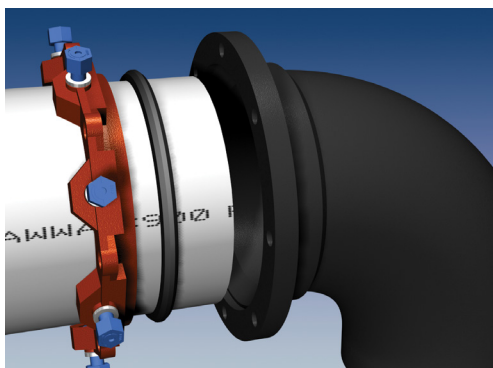
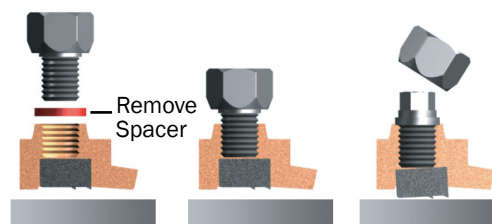
Ductile Iron or C900 PVC Pipe Sizes

For installation on **C900 PVC** pipe, use as received and install per instructions.



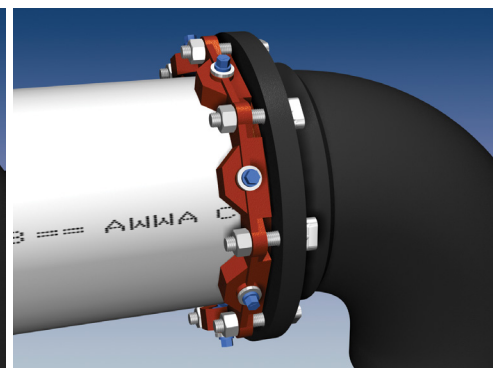
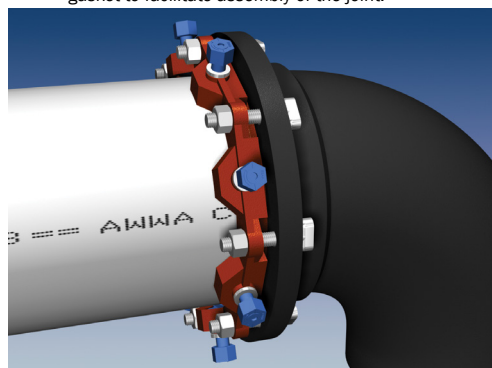
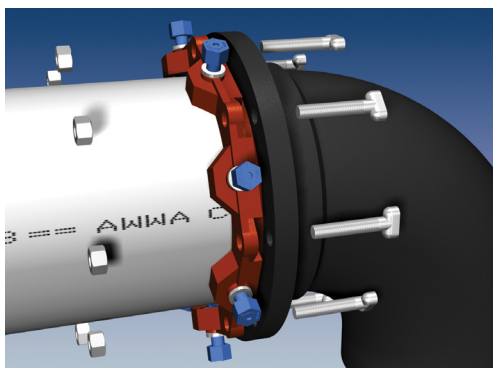
ASTM 2241 PVC Pipe Sizes (IPS O.D.)

For installation on **ASTM 2241** sized pipe, remove spacers and replace screws. Install per instructions.



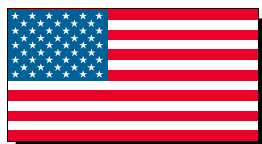
1. Identify the pipe. The 2000PV is for use with PVC and HDPE pipe. The 4 inch through 12 inch size may be used on C900, and IPS PVC pipe as well as C906 HDPE pipe. Check to see if the spacers under the screws are in place. If the pipe is C900 or is ductile iron O.D., proceed with spacers in place. If the pipe is IPS O.D., remove the spacers. Since 3 inch and 14 inch through 24 inch restraints are only used with one pipe diameter, no spacers are used.
2. Clean the socket and the plain end. Lubrication and additional cleaning should be provided by brushing both the gasket and plain end with soapy water or an approved pipe lubricate meeting the requirements 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 the lip extension toward the plain end; follow 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 for C900 PVC Pipe. This gasket is bi-directional having no front or back. For ASTM 2241 PVC Pipe Sizes (IPS O.D.) a Transition Gasket must be used. The use of a pipe wall stiffening insert is required on High Density Polyethylene pipe.].
3. Insert the pipe into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly.
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.

NOTE: In cold weather it is preferable to warm the gasket to facilitate assembly of the joint.



5. Tighten the bolts to the normal range of bolt torque [45-60 ft-lbs for 3 inch, 75-90 ft-lbs for 4 inch through 24 inch, 100-120 ft-lbs for 30 inch and 36 inch, and 120-150 ft-lbs for 42 inch and 48 inch.] 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 the 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 sizes (30-48 inch), five or more repetitions may be required. The use of a torque-indicating wrench will facilitate the 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 hex heads provided. If reassembly is required, assemble the joint in the same manner as above; tighten the screws to 60 to 80 ft-lbs. If the Series 2000PV restraint is removed from the pipe, be sure that all of the screws, spacers (if required), and wedges are in place before the restraint is reassembled.

*These steps are requirements of AWWA C600.



EBAA IRON Sales, Inc.

P.O. Box 857, Eastland, TX 76448

Tel: (254) 629-1731

Fax: (254) 629-8931

(800) 433-1716 within US and Canada

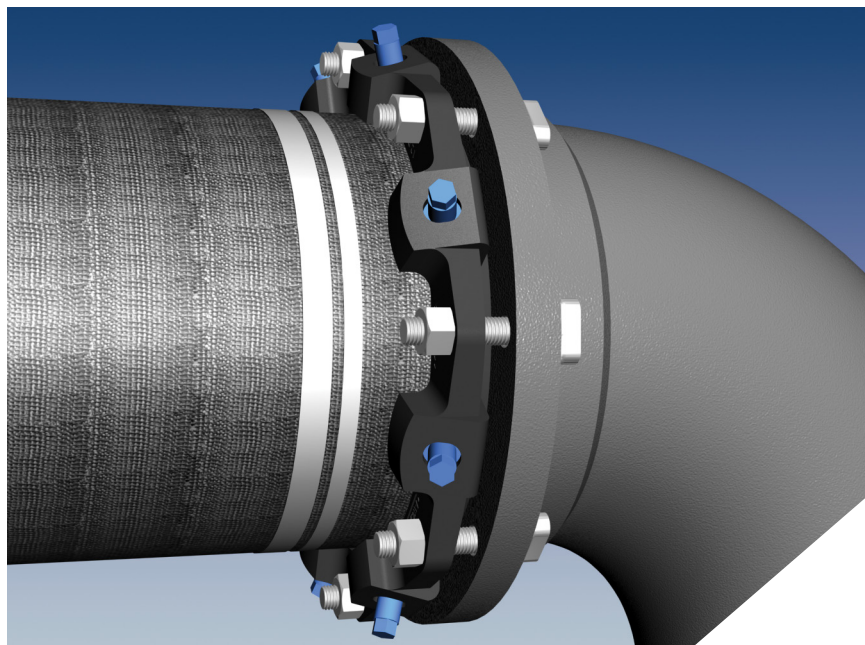
contact@ebaa.com

www.ebaa.com

Members of...



Mechanical Joint Restraint for Ductile Iron Pipe



Features and Applications:

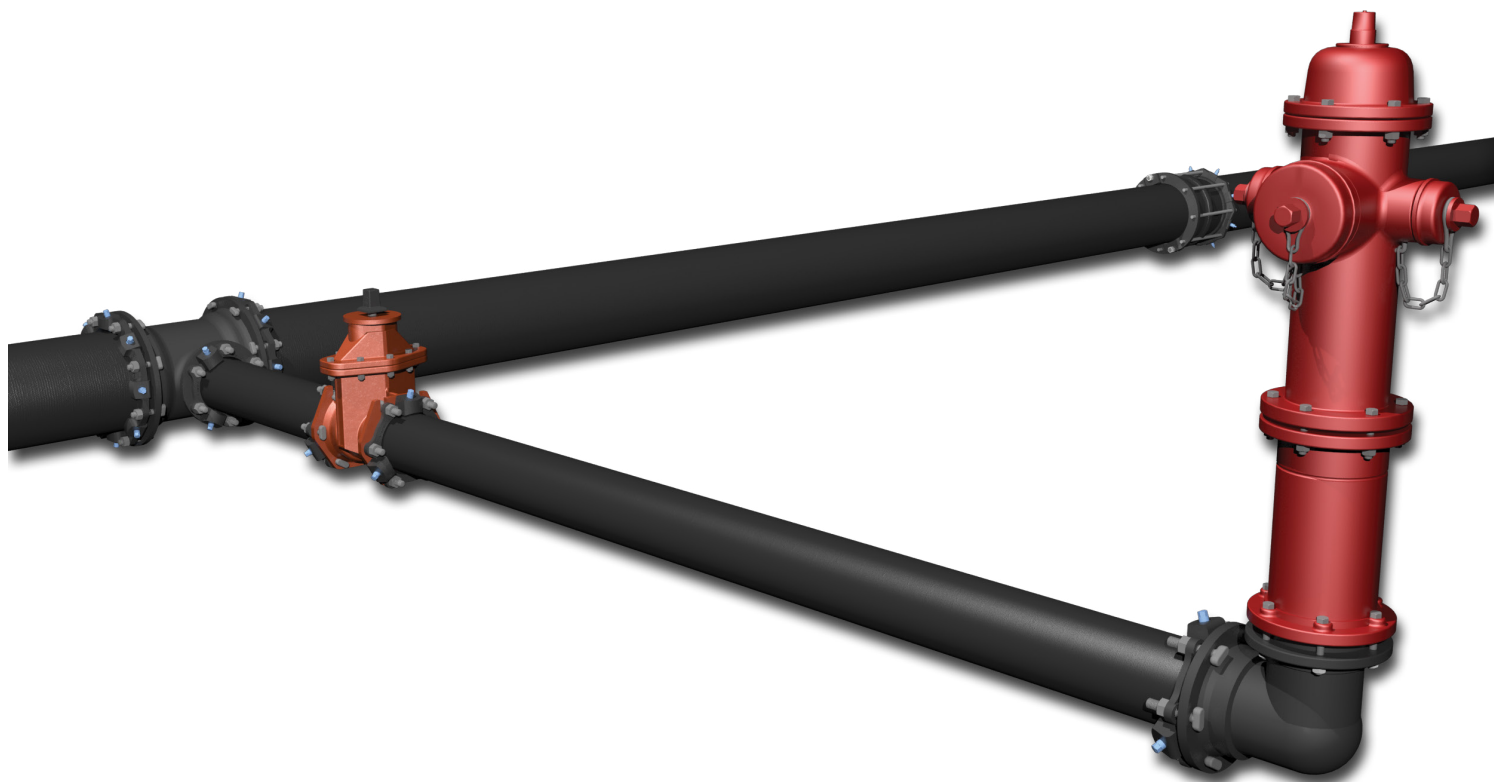
- Sizes 3 inch through 48 inch
- Constructed of ASTM A536 Ductile Iron
- Torque Limiting Twist-Off Nuts
- MEGA-BOND®
Restraint Coating System
For more information on MEGA-BOND, refer to www.ebaa.com
- The Mechanical Joint Follower Gland is incorporated into the restraint
- Heavy Duty thick wall design
- Support Products Available:
Split repair style available 3 inch through 48 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

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



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 corrosible 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.

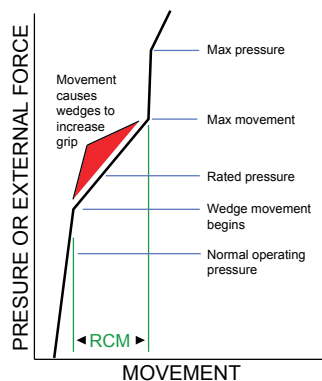
For use on all classes of ductile iron pipe (PC350 through PC150 and CL56 through CL50), for practically any application including valves, hydrants and pipe, the MEGALUG Mechanical Joint Restraint effectively and safely performs without damage to the pipe or cement linings.

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 1¼ 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.

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 48 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 and 250 psi for 18-48 inch. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes.

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.

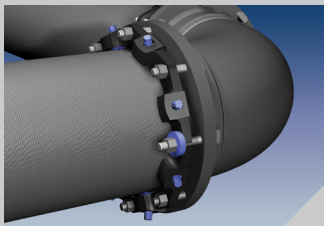
All casting bodies shall be surface pre-treated with a phosphate wash, rinse and sealer before drying. The coating shall be electrostatically applied and heat cured. The coating shall be a polyester based powder to provide corrosion, impact and UV resistance.

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.

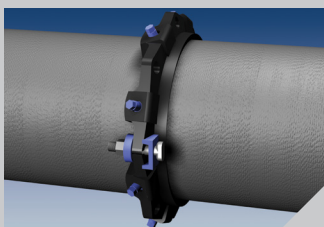
Support Products

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



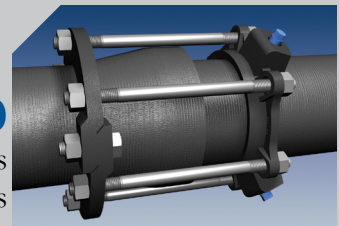
Series 1100SD

Split MEGALUG Restraint
For Existing Mechanical Joints



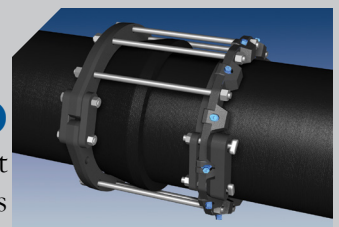
Series 1100SDB

Split MEGALUG Restraint
For Mid-Span Applications



Series 1700

MEGALUG Restraint Harness
For Push-On Bell Joints

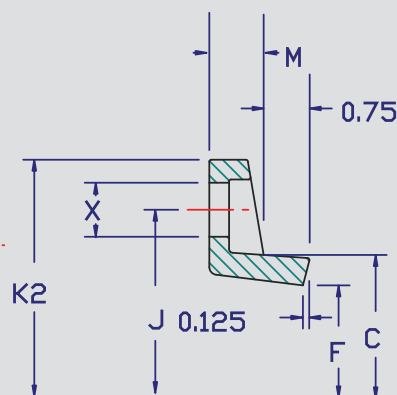
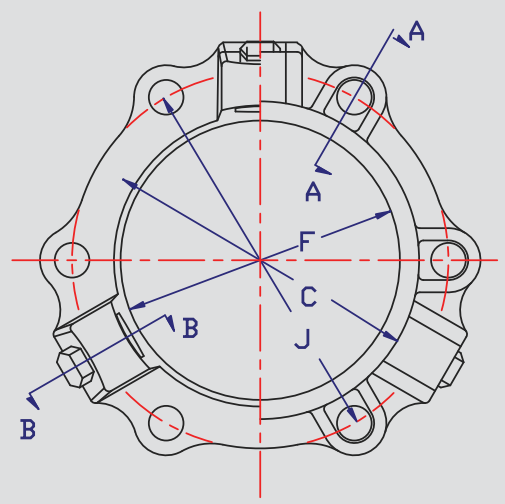


Series 1100HD

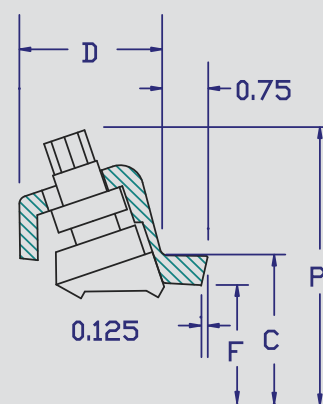
Split MEGALUG Restraint
Harness for Existing Push-On Bells

Series 1100 Submittal Reference Drawing

EBAA IRON



SECTION A-A



SECTION B-B

MADE IN USA

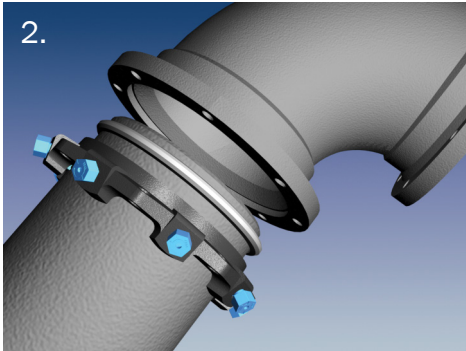
		C	D	F	M	P*	X	J	K2	Wedge QTY.	Bolt QTY.	Weight (LBS.)	Pressure Rating (PSI)
Nominal Pipe Size	Series Number												
3	1103	4.48	2.27	4.06	0.62	9.06	0.750	6.19	7.69	2	4	6.1	350
4	1104	5.92	2.27	4.90	0.75	9.90	0.875	7.50	9.12	2	4	7.6	350
6	1106	8.02	2.27	7.00	0.88	12.00	0.875	9.50	11.12	3	6	11.8	350
8	1108	10.17	2.31	9.15	1.00	14.15	0.875	11.75	13.37	4	6	14.9	350
10	1110	12.22	2.37	11.20	1.00	16.20	0.875	14.00	15.62	6	8	23.9	350
12	1112	14.32	2.37	13.30	1.25	18.30	0.875	16.25	17.88	8	8	31.2	350
14	1114	16.40	2.69	15.44	1.50	20.94	0.875	18.75	20.25	10	10	49.7	350
16	1116	18.50	2.69	17.54	1.56	22.90	0.875	21.00	22.50	12	12	56.4	350
18	1118	20.60	2.69	19.64	1.63	25.00	0.875	23.25	24.75	12	12	63.6	250
20	1120	22.70	2.69	21.74	1.69	27.10	0.875	25.50	27.00	14	14	71.0	250
24	1124	26.90	3.20	25.94	1.81	32.64	0.875	30.00	31.50	16	16	128.7	250
30	1130	33.29	3.20	32.17	2.25	38.87	1.125	36.88	39.12	20	20	190.7	250
36	1136	39.59	3.20	38.47	2.25	45.17	1.125	43.75	46.00	24	24	226.5	250
42	1142	45.79	4.56	44.67	3.88	55.57	1.375	50.62	53.48	28	28	518.9	250
48	1148	52.09	4.56	50.97	3.88	61.87	1.375	57.50	60.36	32	32	608.3	250

* With Twist-Off Nuts twisted off.

Important Notes

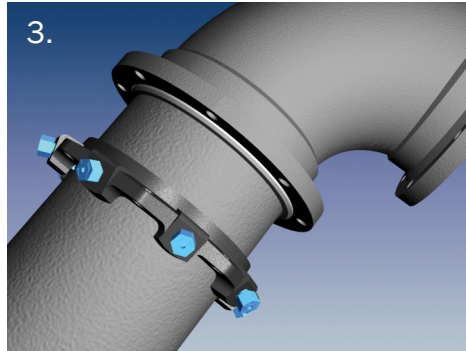
NOTE: Dimensions are in inches and are subject to change without notice.

- 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 48 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 and 48 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 2½ 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.

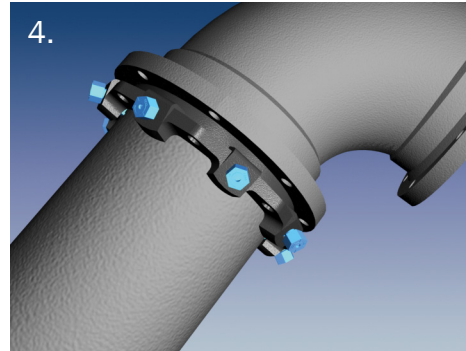
2.* Clean the socket and the plain end. Lubrication and additional cleaning should be provided by brushing both the gasket and the plain end with soapy water or an approved pipe lubrication meeting the requirement of ANSI/AWWA C111/A21.11,



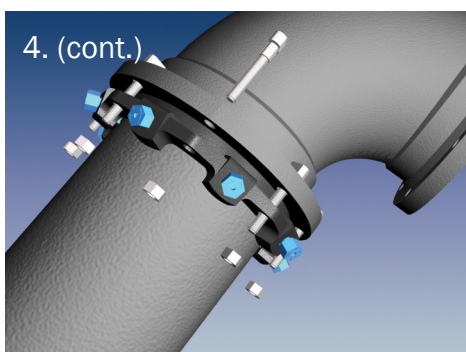
just prior to slipping the gasket onto the plain end for joint assembly. Place the gland on the plain end with lip extension toward the plain end, followed by the gasket.

NOTE: In cold weather it is preferable to warm the gasket to facilitate assembly of the joint.

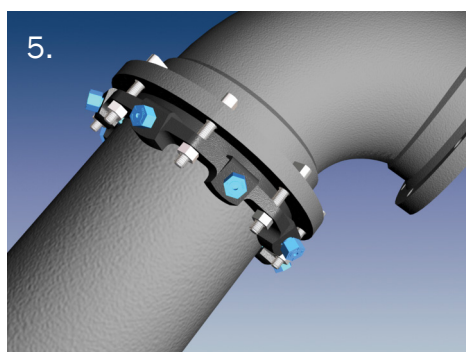
3.* Insert the pipe into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly.



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.

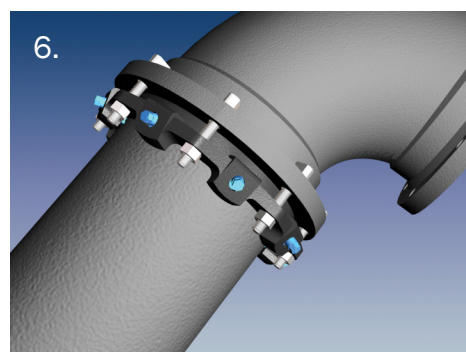


5.* Tighten the bolts to the normal range of torque as indicated [3 inch 45-60 ft-lbs., 4-24 inch 75-90 ft-lbs., 30-36 inch 100-120 ft-lbs., and 42-48 inch 120-150 ft-lbs.] While at all times maintaining approximately the same distance between the gland and the face of the flange at all points around 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.



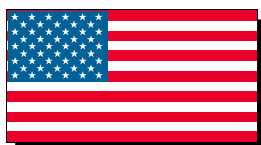
In large sizes (30-48 inch), five or more repetitions may be required. The use of a torque-indicating wrench will facilitate this procedure.

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 $\frac{5}{8}$ inch 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. 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.

* These steps are requirements of AWWA. AWWA Standard C600



EBAA IRON Sales, Inc.

P.O. Box 857, Eastland, TX 76448

Tel: (254) 629-1731

Fax: (254) 629-8931

(800) 433-1716 within US and Canada

contact@ebaa.com

www.ebaa.com

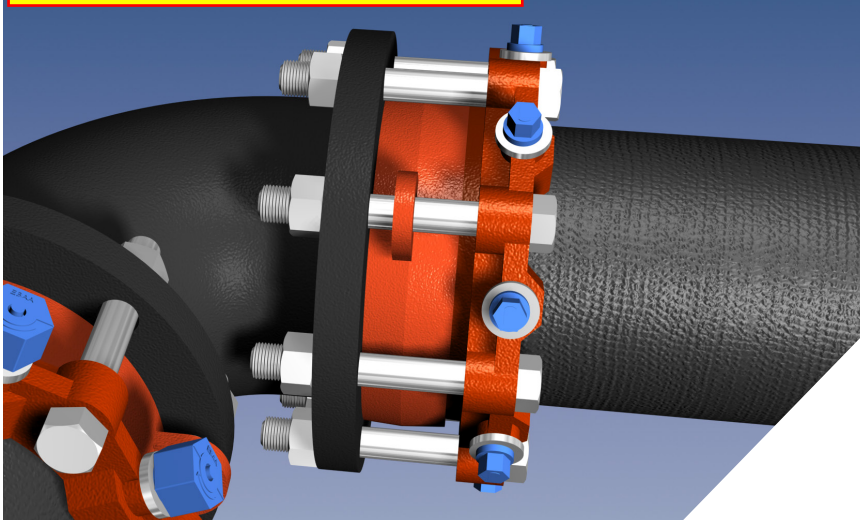
For More Information

For more information about MEGALUG restraints call EBAA today and request

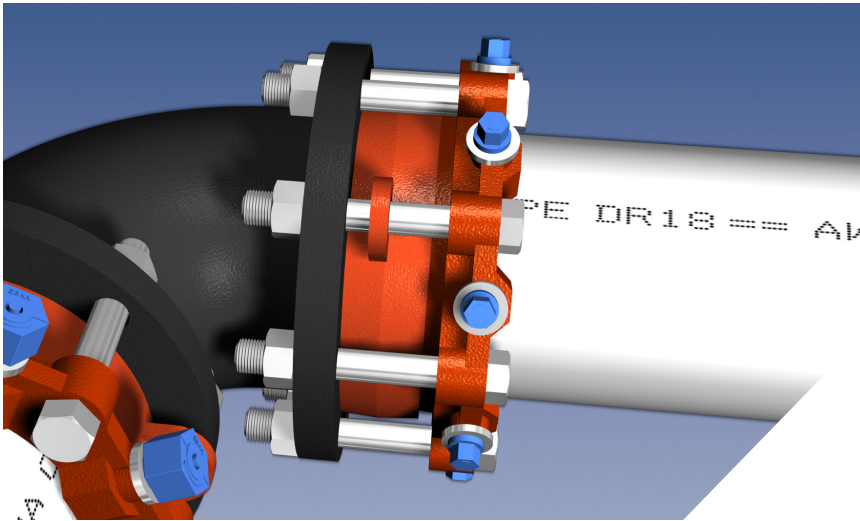
"EBAA Connections Bulletin DI-1" concerning use of the MEGALUG restraint on grey iron pipe, or "EBAA Connections Bulletin DI-2" covering the background and operation of the MEGALUG system of restraint.

"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".

TO BE ORDERED WITH 304SS
BOLTS



Series 2106 on Ductile Iron Pipe



Series 2106 on C900 PVC Pipe

Features and Applications:

- MEGAFLANGE adapts and restrains plain end Ductile Iron, PVC, Steel and HDPE pipe to flanged pipe or fittings, where the flange conforms to ANSI/AWWA C111/A21.11 with flange surface facing in accordance with ANSI/AWWA C207 of the latest revision.
- Meets ANSI B16.5 Class 150/125 drilling pattern.
- Not for use on plain end fittings.
- **MEGA-BOND®** Restraint Coating System
- For more information regarding MEGA-BOND, refer to our web site @ www.ebaa.com
- Minimum 2 to 1 Safety Factor
- Fully Restrained
- Constructed of ASTM A536 Ductile Iron
- **UL** listed on sizes 3 inch through 12 inch
- **FM** approved on sizes 4 inch through 12 inch on C900 Class 150 and Class 200 PVC Pipe
- Pipe can be cut to length in the field
- Joint deflection up to 5°
- Easy dismantling allows fast removal of valves, meters or fittings for replacement or repair

For use on water or wastewater pipelines subject to hydrostatic pressure and tested in accordance with either AWWA C600, C605 or ASTM D2774.

Sample Specification

Restrained flange adapters shall be used in lieu of threaded or welded flanged spool pieces. Flanged adapters shall be made of ductile iron conforming to ASTM A536 and have flange bolt circles that are compatible with ANSI/AWWA C110/A21.10 (125#/Class 150 Bolt Pattern).

Restraint for flange adapter shall consist of a plurality of individual actuated gripping wedges to maximize restraint capability. Torque limiting actuating screws shall be used to insure proper initial set of gripping wedges.

The flange adapters shall be capable of deflection during assembly or permit lengths of pipe to be field cut to allow a minimum 0.6 inch gap between the end of the pipe and the mating flange without affecting the integrity of the seal.

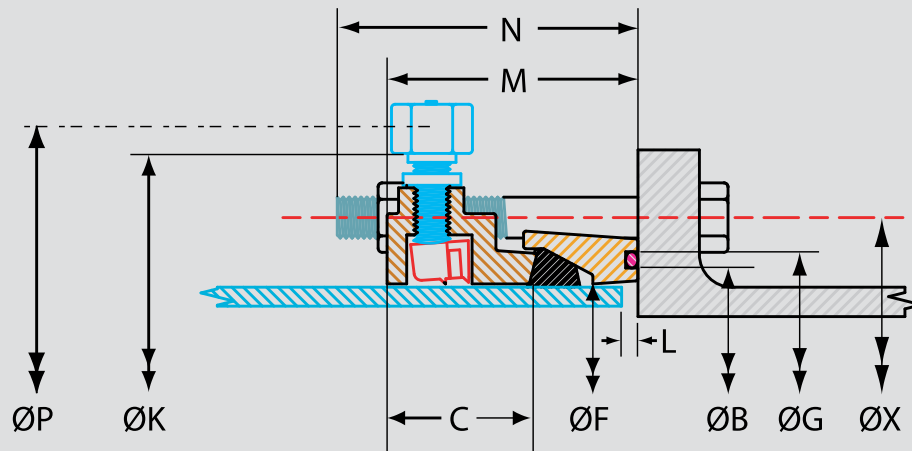
All internal surfaces of the gasket ring (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213. Sealing gaskets shall be constructed of EPDM. The coating and gaskets shall meet ANSI/NSF-61. Exterior surfaces of the gasket ring shall be coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C116/A21.16.

Restraint Ring coated with MEGA-BOND® Restraint Coating System More Information regarding MEGA-BOND can be found at www.ebaa.com.

Pressure ratings shall be a minimum of those shown in the table within current brochure.

The flange adapter shall be the Series 2100 MEGAFLANGE® Restrained Flange Adapter as produced by EBAA Iron, Inc. or approved equal.

Series 2100 Submittal Reference Drawing



Nominal Pipe Size	Series Number	Restraint Ring			Gasket Ring			Bolts				L MAX.	Assembly Deflection Degrees	M	P*	Ship Weight (lbs.)
		K	F	C	F	B	G	No.	Dia.	Length	X					
3	2103	7.5	4.1	2.2	4.1	4.3	4.9	4	5/8	5 1/2	6.00	0.7	5.0	4.0	9.2	14
4	2104	9.0	4.9	2.2	4.9	5.4	6.0	8	5/8	5 1/2	7.50	0.6	5.0	4.0	10.0	20
6	2106	11.0	7.0	2.3	7.0	7.5	8.1	8	3/4	6	9.50	0.8	5.0	4.3	12.1	32
8	2108	13.5	9.2	2.4	9.2	9.8	10.4	8	3/4	6	11.75	0.9	5.0	4.5	14.3	38
10	2110	16.0	11.2	2.5	11.2	11.8	12.4	12	7/8	7 1/2	14.25	1.0	3.0	4.7	16.3	65
12	2112	19.0	13.3	2.5	13.3	13.8	14.4	12	7/8	7 1/2	17.00	1.0	3.0	4.8	18.4	73
14	2114	21.0	15.5	2.5	15.5	16.1	16.9	12	1	8	18.75	1.3	2.0	5.0	20.6	89
16	2116	23.5	17.6	2.5	17.6	18.2	19.0	16	1	8	21.25	1.3	2.0	5.0	22.6	109
18	2118	25.0	19.7	2.6	19.7	20.2	21.0	16	1 1/8	8 1/2	22.75	1.3	1.5	5.1	24.7	134
20	2120	27.3	21.8	2.6	21.8	22.4	23.2	20	1 1/8	8 1/2	25.00	1.3	1.5	5.1	26.8	157
24	2124	32.0	26.0	2.6	26.0	26.7	27.5	20	1 1/4	8 1/2	29.50	1.3	1.0	5.1	31.0	192
30	2130	38.5	32.2	3.3	32.2	32.9	34.1	28	1 1/4	11	36.00	2.0	1.0	6.0	38.8	296
36	2136	45.5	38.5	3.3	38.5	39.2	40.4	32	1 1/2	10 1/2	42.75	2.0	1.0	6.0	44.6	426
42	2142	52.3	44.7	4.1	44.7	45.8	47.0	36	1 1/2	12	49.50	2.0	1.0	8.0	50.8	642
48	2148	58.8	51.0	4.1	51.0	52.1	53.3	44	1 1/2	12	56.00	2.0	1.0	8.0	57.1	797

* The "P" dimensions is measured with torque-limiting nuts twisted off.

Nominal Pipe Size	Minimal Distance Required To Install N
----------------------	--

3	4.75
4	4.56
6	5.00
8	4.88
10	6.31
12	6.25
14	6.62
16	6.56
18	6.94
20	6.81
24	6.62
30	8.88
36	8.12
42	9.38
48	9.25

MEGAFLANGE TESTING RESULTS

PVC TESTING

- Quick Burst Test
- DR18 tested to 755 PSI
- DR14 tested to 985 PSI
- Long Term Pressure Test
- On DR18 PVC pipe at 615 PSI for 1000 hours without failure
- Cyclic Pressure Test
- DR18 tested from 94 to 188 PSI for over 1,000,000 cycles

DUCTILE IRON AND STEEL TESTING

- Leakage Test (one minute required)
- Tested to twice rated pressure without leakage
- Hydrostatic Test (one minute required)
- 3 inch though 6 inch sizes tested to 5 times rated pressure
- 8 inch and 10 inch sizes tested to 4 times rated pressure
- 12 inch size tested to 3 times rated pressure
- Flexural Test
- Tested to withstand a bending moment based on requirements of NFPA 12-1991 "Standard for Installation of Sprinkler Systems"

Note: Dimensions are in inches and are subject to change without notice. All Dimensions are $\pm 1\%$.

Pipe Size	Ductile Iron Pipe Pressure (PSI)	Steel Pipe* Pressure (PSI)	C900/C905 PVC Pipe				IPS PVC Pipe*		
			DR14 Pressure (PSI)	DR18 Pressure (PSI)	DR25 Pressure (PSI)	DR32.5 Pressure (PSI)	SDR17 Pressure (PSI)	SDR21 Pressure (PSI)	SDR26 Pressure (PSI)
3	350	350	-	-	-	-	250	200	160
4	350	350	305	235	165	-	250	200	160
6	350	350	305	235	165	-	250	200	160
8	350	350	305	235	165	-	250	200	160
10	300	350	305	235	165	-	250	200	160
12	350	350	305	235	165	-	250	200	160
14	350	-	-	235	165	125	-	-	-
16	350	-	-	235	165	125	-	-	-
18	300	-	-	235	165	125	-	-	-
20	250	-	-	235	165	125	-	-	-
24	200	-	-	-	165	125	-	-	-
30	150	-	-	-	-	-	-	-	-
36	150	-	-	-	-	-	-	-	-
42	150	-	-	-	-	-	-	-	-
48	150	-	-	-	-	-	-	-	-

*Transition Gasket Required

NOTE: For Application on HDPE pipe see EBAA's HDPE Restraint Catalog Sheet.

MEGAFLANGE Components

The **Series 2100 MEGAFLANGE** restrained flange adapter is comprised of two rings. The first is the restraint ring which incorporates wedges around the circumference of the ring to grip the pipe firmly and securely. The wedge style restraint offers enormous pullout strength when compared to set screw restraints. The resiliency of the wedge style restraint allows the MEGAFLANGE to withstand severe moment loads. The restraint ring and its sub-components are protected from corrosion by the MEGA-BOND® Restraint Coating System. For more information regarding MEGA-BOND see our MEGA-BOND Brochure found at www.ebaa.com.

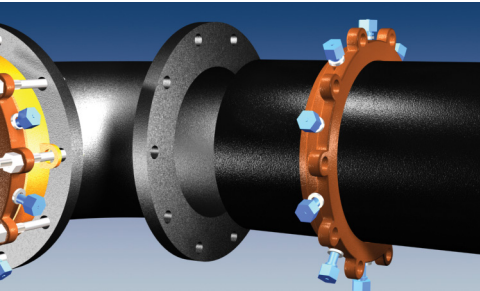
The second ring is the gasket ring which separates the seals dedicated to each sealing surface. This ring allows pipe to be cut to lengths in the field at a tolerance of 0.6 inch or more. In addition, the gasket ring also enables the joint to deflect during assembly. The gasket ring is coated with a NSF 61 approved Fusion Bonded Epoxy (FBE) so that it may be utilized on potable drinking water systems.

DEFLECTION

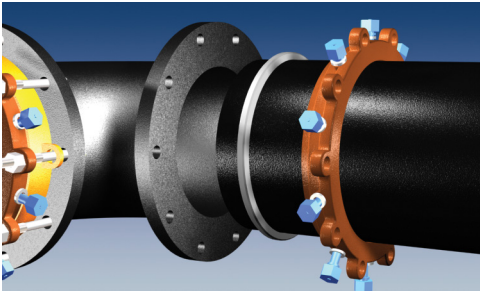
Traditional flanged joint connections require a tremendous amount of torque on the bolts to achieve a good seal. The pipe layout must be precisely planned to avoid misalignment errors due to deviations in appurtenances of pipe fabrication.

The Series 2100 MEGAFLANGE is a speedy, on-site fabrication tool which is generous in its deflection limits, from 0.5° to 5° depending on pipe size. The deflection capabilities provided by the gasket ring allow offset of almost nineteen inches of an eighteen foot length of pipe through the eight inch size.

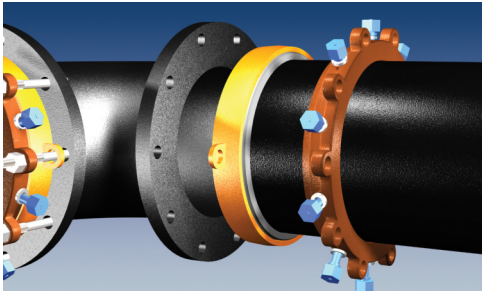
1. Identify the pipe. The MEGAFLANGE 2100 Flange Adapter, sizes 4 inch through 12 inch, is designed for use on ductile iron pipe, PVC (C900 & IPS O.D. (ASTM D2241)) pipe, and steel pipe. Check to see if the spacers under the screws are in place. If the pipe is ductile iron or C.I. O.D. PVC (C900) **DO NOT REMOVE THE SPACERS.** If the pipe is steel or IPS O.D. PVC, **REMOVE THE SPACERS** (sizes 4 inch through 12 inch). The 3 inch size is designed for use on ductile iron, IPS O.D. PVC pipe. Sizes 30 inch and larger are designed for ductile iron pipe only. There are no spacers on the 3 inch and the 14 inch and larger sizes.



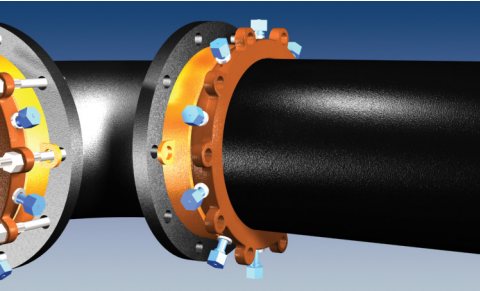
2. Cut the pipe to the required length. Clean the end of the pipe for a length approximately one foot using a wire brush if needed, removing all excess paint and foreign material. Also clean the opposing flange to be connected to the 2100. Place the 2100 restraint ring on the clean pipe with the lip facing the plain end.



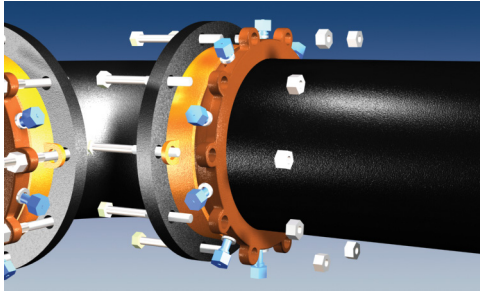
3. Lubricate and place the EBAA-Seal™ Gasket on the clean pipe following the restraint ring. (USE A TRANSITION GASKET IN PLACE OF THE EBAA-SEAL GASKET FOR STEEL AND IPS O.D. PVC PIPE.)



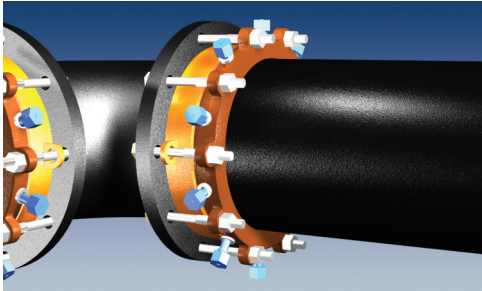
4. Place the O-ring into the groove of the 2100 Gasket Ring. (This step may have been completed at the factory, check Gasket Ring to see if O-ring is already in place.) Place the Gasket Ring on the pipe with the O-ring facing the pipe end and the gasket recess facing the EBAA-Seal (or transition) Gasket and restraint ring.



5. Bring the pipe and flanges together within the maximum assembled deflection and maximum allowable gap “L” to the flange face. Slide the gasket ring, gasket and restraint ring until contact is made with the opposing flange.

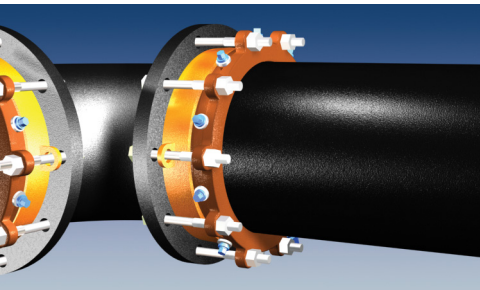


6. Insert and tighten all flange bolts. Torque all flange bolts an alternating manner to the value listed in Table 1.1. Be sure to make any necessary joint deflection before tightening the actuating screws. Joint deflection should not exceed the maximum allowable deflection. Be sure that deflection of the joint does not cause the end of the pipe to be separated from the opposing flange more than the maximum allowable gap “L”.



7. Tighten the actuating screws in an alternating manner until all wedges touch the pipe. Continue tightening the nuts in an alternating pattern until all the torque-limiting nuts have been twisted off.

Table 1.1 Flange Bolt Torques	
Nominal Pipe Size	Bolt Torque (ft.-lbs.)
3	45 - 60
4 - 6	75 - 90
8 - 24	90 - 110
30 - 48	110 - 130



8. If removal is necessary, utilize the 5/8 inch hex head provided. For reinstallation, repeat steps 2 through 7, torquing the actuating screws to 70 ft-lbs or until the hex heads bottom out on the spacers or gland.

EBAA IRON Sales, Inc.
P.O. Box 857, Eastland, TX 76448
Tel: (254) 629-1731
Fax: (254) 629-8931
(800) 433-1716 within US and Canada
contact@ebaa.com
www.ebaa.com