EBAA IRON
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TECHNICAL DATA FOR THE WATER & WASTEWATER PROFESSIONAL
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USE OF MEGALUG® RESTRAINT PRODUCTS ON GREY IRON PIPE

As users have become more familiar with joint restraint and EBAA Iron's Series 1100 MEGALUG® restraint, we have sought ways to apply this technology to restraining existing grey iron pipelines. Because MEGALUG restraints were designed for use with ductile iron pipe, applications involving grey iron pipe have been limited. The Series 1100 can be a valuable restraint tool for many grey iron piping applications however. Use of the 1100 Series with grey iron requires recognition of the fundamental differences between ductile and grey iron piping systems and informed application of restraint principles.

Three factors limit the use of MEGALUG restraints on existing grey iron systems:

1. The strength limitations of grey iron,
2. The condition of the existing grey iron pipeline, and
3. Dimensional differences between grey and ductile iron pipe standards.

GREY IRON

Ductile iron pipe became the industry standard in the early 1960's. Prior to 1960 most of the iron pressure pipe installed in the U.S. was grey iron. Ductile iron quickly replaced grey iron as the industry's standard because ductile's higher tensile and yield strengths permitted manufacturers to produce lighter weight pipe and fittings with superior strength and resilience.

The MEGALUG wedge takes advantage of ductile iron's higher strengths by cold-working a slight groove and buttress at the surface of the pipe during installation. As pressure on the system increases, the wedge design responds by increasing the depth of the groove penetration and thus the shear resistance provided to resist joint separation. This "positive restraint" is dependent on the ductile yield of the pipe material to provide increased shear resistance.

It has been our experience that the Series 1100 MEGALUG restraint will perform well in normal installations when installed on good quality grey iron pipe. EBAA has tested the 1100 Series on samples of grey iron pipe in various sizes through twenty-four inch. On the basis of these tests the restraint may be used on sizes through twelve inch for working pressures to 250 psi, and sizes fourteen inch through twenty-four inch to 150 psi. While we have not been able to test 1100 Series on the larger sizes, field experience indicates that sized thirty and thirty-six inch may be safely restrained using the MEGALUG restraint. Due to the variety and conditions of the pipe in the field, these pressure ratings cannot be guaranteed.

CONDITION OF THE PIPE

A major concern when tying into an existing piping system is the condition of the pipe in the ground. MEGALUG restraints should only be used with piping that is in good condition, structurally sound, and relatively free of corrosion products. Prior to attempting to use a Series 1100 on a section of grey iron pipe, the pipe should be closely inspected to insure its structural integrity.

Of particular concern with grey iron is a form of corrosion called "graphitization". Graphitization occurs when iron is dissolved and removed from the grain structure leaving behind a porous carbon matrix. This carbon is in the form of graphite. Graphitization may result in a pipe that appears outwardly competent and continues to hold water under pressure, but fails brittlely when jarred by a shovel. Graphitic corrosion often occurs in highly acidic soils, soils high in sulfates, or in the presence of sulfate-reducing bacteria.

MEGALUG joint restraint should not be used in corroded or graphitized pipe. Where significant corrosion or graphitization is evident, the corroded section of pipe should be replaced back to the nearest competent pipe section. Restraint utilizing thrust blocking and tie rodding may be advisable in some situations.

CAST IRON PIPE DIMENSIONS

Prior to 1908 pipe wall thickness and outside diameters were often specified by the customer. In 1908 the AWWA adopted a standard specification for pit cast grey iron pipe that established eight pressure classes lettered "A" through "H". Pipe wall thickness and outside diameters (OD's) were varied to meet the strength requirements of these various classes. Predominant pressure classes were "A" through "D".

Centrifugal casting methods developed in the 1920's prompted standardization of the outside pipe diameters to

Class “B” pit cast dimensions. These same OD dimensions were carried over into AWWA C150 and C151.

The Series 1100 may be used with Class “A” and Class “B” pipe with no modification to the gland. Using the Series 1100 with Classes “C” and “D” pipe will require modification of the gland to accommodate the greater OD’s. The 1100 Series cannot be modified to accommodate Class “D” pipe in the thirty and thirty-six inch sizes. See Table 1.

Modern mechanical joint was standardized in the 1930’s. Availability of Class “C” and “D” fittings with oversized mechanical joints may be a limiting factor, particularly for large diameter applications.

Attaching new piping to an existing grey iron line may require use of a bolted sleeve type coupling. A MEGALUG harness with special tie- bars can be used to retrain across the coupling. The gasket lips of the restraint rings must face each other to provide restraint.

SUMMARY

The Series 1100 MEGALUG joint restraint for use with ductile iron pipe may be used with grey iron pipe for tie-ins and modifications where adequate understanding of the limitations of grey iron pipe are understood and accommodating. Grey iron pipe, because of its lower strengths and lower pressure ratings, may be safely restrained to 250 psi working pressure in sizes three through twelve inch, and 150 psi in sizes fourteen through twenty-four inch. Grey iron pipe may be restrained using the Series 1100 in pipe sizes through thirty-six inch. Because of the variety of pipe and conditions these pressures ratings cannot be guaranteed by EBAA Iron.

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 oversizing the MEGALUG gland. Table I is a summary of pit cast O.D.’s and available oversized MEGALUG restraints.

Reference

Handbook of Ductile Iron Pipe, Sixth Edition: Ductile Iron Pipe Research Assoc., 1984

NOMINAL SIZE	PIPE BARRELL O.D.’S PIT CAST GREY IRON CLASSES				OVERSIZED MEGALUG “F” Dim
	Class A	Class B	Class C	Class D	
3”	3.8	3.96	3.96	3.96	4.06
4”	4.8	5.00	5.00	5.00	5.10
6”	6.9	7.10	7.10	7.10	7.20
8”	9.05	9.05	9.30	9.30	9.40
10”	11.10	11.10	11.40	11.40	11.50
12”	13.20	13.20	13.50	13.50	13.60
14”	15.30	15.30	15.65	15.65	15.80
16”	17.40	17.40	17.80	17.80	17.94
18”	19.50	19.50	19.92	19.92	20.06
20”	21.60	21.60	22.06	22.06	22.20
24”	25.80	25.80	26.32	26.32	26.46
30”	31.74	32.00	32.40	(32.74)	32.57
36”	37.96	38.30	38.70	(39.16)	38.87

Table 1: Pit cast barrel O.D.’s for Classes “A” through “D” pipe and maximum Series 1100 Oversized I.D.’s.

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