

## BACKGROUND AND TESTING OF THE MEGAFLANGE® FLANGE ADAPTER

### INTRODUCTION

EBAA Iron developed the Series 2100 MEGAFLANGE® flange adapter to make the installation of flanged piping and fitting more field adaptable. The Series 2100 utilizes wedges rather than set screws to grip the pipe. The MEGAFLANGE flanging system provides a fully restrained joint with deflections capabilities. It is available in sizes 3 inch through 36 inch. The Series 2100 has been subjected to several kinds of hydrostatic pressure tests on a variety of piping material. This report details the 3 through 12 inch sizes.

### BACKGROUND

Although the installation procedure for the flanged joint is very simple and straight forward, there are several problems associated with the flanged joint that make it difficult to install in the field. For example, the flanged joint requires an excessive 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 or pipe fabrication.

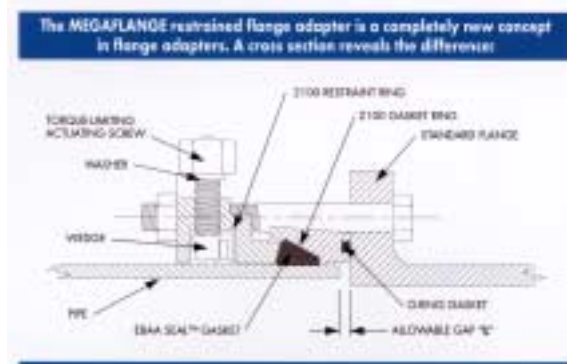
Products such as the flange adapter and the flanged coupling adapter were introduced to make flanged joints easier to assemble in the field. While these products have been helpful, they are limited. Typical flange adapters use a standard mechanical joint gasket for both the pipe and the flange seal and are still prone to leaks. The flanged coupling adapter separates the pipe seal from the flange seal but most are not restrained. In most cases, unrestrained flange adapters and flange coupling adapters must be restrained. In some cases, set screws are incorporated to restrain these devices, but set screw restraints are ineffective when compared to the “pull out strength” of the standard flanged joint. However, the MEGAFLANGE adapter from EBAA Iron provides a field fabricated, fully restrained flanging system for use on plain end ductile iron, steel, and PVC pipe. The MEGAFLANGE flange adapter not only provides a way of connecting plain end pipe to a flanged fitting, it also delivers flexibility, up to 5° in three through eight inch sizes and up to 3°

in the ten and twelve inch sizes, both during and after assembly.

### SERIES 2100 MEGAFLANGE FLANGING SYSTEM

For years, EBAA has produced flange adapters similar in design to any other flange adapter. Consequently, EBAA’s flange adapters encountered the same problems as the others on the market. The Series 2100 MEGAFLANGE adapter from EBAA is a completely new product. The cross section of the Series 2100 can be seen in Fig. 1. As can be seen in the figure, the Series 2100 is comprised of two rings. The first is the restraint ring. Wedges, around the circumference of the ring, grip the pipe. The wedge style of restraint offers enormous pullout strength when compared to that of the set screw type restraint. The resiliency of the wedge style restraint allows the Series 2100 to withstand severe moment loads. The second ring, the gasket ring, separates the seals dedicated to each sealing surface. This ring allows the pipe to be cut in the field at the tolerance of 0.6 inch or more. The gasket ring also enables the joint to deflect during assembly.

The MEGAFLANGE flange adapter can be deflected five degrees during assembly through the eight inch size and three degrees in the ten and twelve inch sizes. The deflection capabilities provided by the gasket ring allows offset of almost nineteen inches of an eighteen foot length of pipe through the eight inch size. The ten and twelve inch sizes are capable of an eleven inch offset or greater over an eighteen foot span. However, the gap between the pipe end and the flange face should never be greater than the dimension “L”.



### TESTING

The Series 2100 has been subjected to several hydrostatic pressure tests. The testing procedure was as follows:

- 1) A test section was made using a length of pipe closed with the Series 2100 restraint and blind flanges.
- 2) The test section was filled with water and vented of all the air.
- 3) The section was pressurized to the specified requirements.

The testing conducted on PVC involved a quick burst, high pressure test, and a long term test. Our quick burst test requirement was that the test section was to be pressurized to or beyond the minimum burst pressure for various dimension ratios (DR'S or SDR's). For example, DR18 PVC pipe was tested to 755 psi and DR14 PVC pipe was tested to 985 psi.

The long term pressure test consisted of the test sections being pressurized to a specific pressure for 1000 hours. The pressure is determined by a stress regression line equation developed by Robert T. Hucks. A DR18 sample should be able to hold 615 psi for 1000 hours. The Series 2100 has been tested on DR18 PVC pipe at 615 psi for 1000 hours without failure.

The testing performed on steel and ductile iron pipe was conducted according to Underwriters Laboratory standard UL213. This standard required three separate tests: a leakage test, a hydrostatic test, and a flexural test.

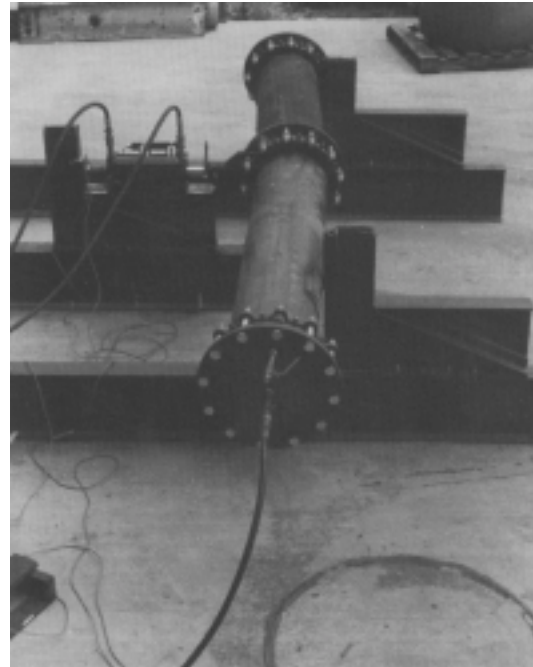
The leakage test required the test section to withstand twice the rated pressure without leaking for one minute. The hydrostatic test required the test sample to withstand for one minute a multiple of the rated pressure without rupture. The three through six inch sizes were required to withstand a pressure five times the rated pressure. The eight and ten inch sizes were tested to four times the rated pressure and the twelve inch size was subjected to a pressure three times three times the rated pressure.

The final test was the flexural test. The pipe and joint were required to withstand a bending moment based on twice the weight of water filled pipe over twice the maximum distance between pipe supports as specified in the "Standard for Installation of Sprinkler", NFPA 13-1991. The test was conducted with the test section at rated pressure. The photograph to the

right shows the test set up for the flexural test. The moment requirements are listed below.

Nominal Fitting Size (Inches)	Moment Requirements (Ft-lbs.)
3	2426
4	3845
6	7085
8	11304
10	16785
12	22950

The tests were conducted on SCH40 steel and PC350 ductile iron pipe. An additional pipe damage test was conducted on the ductile iron samples according to paragraph 9 of the Underwriters Laboratories standard UL194. The purpose of this test was to confirm the fact that the Series 2100 does not damage the pipe wall or the mortar lining.



### SUMMARY

The Series 2100 MEGAFLANGE adapter provides a strong, resilient and field adaptable flanging system. The MEGAFLANGE adapter is listed for above ground use by Underwriters Laboratories in sizes three through twelve inch for joining plain end Schedule 40 steel or ductile iron pipe to flanged fittings. The Series 2100 may also be used on C900 and IPS PVC at the full pressure rating of the pipe. The MEGAFLANGE adapter is simple to install and allows a greater tolerance in plant layout than

ever before. The MEGAFLANGE adapter is provides a quick and efficient way to join a

variety of pipe material to flanged appurtenances.

#### REFERENCES

1. "UL194, Standard for Gasketed Joints for Ductile-Iron Pipe and Fittings for Fire Protection Service", Fourth Edition, Underwriters Laboratories, Northbrook, IL, April 28, 1989.
2. "UL213, Standard for Rubber Gasketed Fittings for Fire Protection Service", First Edition, Underwriters Laboratories, Northbrook, IL, Reprinted, 1992.

3. "Recommended Performance Specification for Joint Restraint Devices for Use with Polyvinyl Chloride (PVC) Pipe", Uni-B-13-92, Uni-Bell PVC Pipe Association, Dallas, TX.
4. Robert T. Hucks, "Changes in Strength of Pressurized PVC Pipe with Time", Journal AWWA, July, 1981.

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P.O. Box 857, Eastland, Texas 76448 USA    PHONE: (254) 629-1731

CALL TOLL FREE: 800-433-1716    TELEFAX: (254) 629-8931

[contact@ebaa.com](mailto:contact@ebaa.com)

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