

Specification Addendum: EBAA Restraints for use on Ductile Iron Pipe

Background

- EBAA Iron, Inc. introduced the MEGALUG® mechanical joint restraint in 1984. It was developed and designed based upon EBAA's testing ductile iron pipe from many different manufacturers.
- Since then, it has been EBAA's experience that ductile iron pipe in the market has remained consistent as to hardness and the restraint/pipe combination provides a reliable system for water system construction.
- In recent years EBAA has been made aware of occurrences of ductile iron pipe in the market with surface hardness levels above what EBAA has observed to be the historical norm.

What is the problem with increased pipe surface hardness?

- Mechanical joint restraints in the industry were developed and designed to function on pipe with a surface hardness level not to exceed 230 BHN, and such restraints have performed consistently and reliably in the market for decades.
- The proper function of the restraint depends on the wedges ability to form a buttress on the surface of the pipe.
- Pipe surface hardness levels above 230 BHN inhibits and ultimately can prevent the wedges from properly gripping and the restraint from performing as intended.
- This problem typically is not discovered until a project enters the proof testing phase when a pipeline fails to hold the required pressure.

Why 230 BHN?

- AWWA currently has no standard requirement for surface hardness for ductile iron pipe. Therefore, EBAA Iron, Inc. is compelled to require that ductile iron pipe on which our products are to be used must have a surface hardness through the top layer to a depth of about 0.05" not to exceed 230 BHN (or its equivalent with Vickers or Rockwell testing).
- EBAA does not guarantee in any fashion or to any degree mechanical joint restraints installed on ductile iron pipe which exceeds or fails to comply with the foregoing requirements.
- A maximum hardness of 230 BHN is the standard for ductile iron pipe in Europe, Japan, Australia, and New Zealand as noted in ISO 2531 – "Ductile Iron Pipes, Fittings, Accessories and Their Joints for Water Applications", JIS G 5526 "Ductile Iron Pipes", and AS/NZS 2280 "Ductile Iron Pipe and Fittings".
- The AWWA standard for ductile iron pipe ANSI/AWWA C151/A21.51 has requirements for minimum levels for tensile strength, yield strength, elongation, and Notched Charpy. The minimum grade of iron, as listed in C151, is 60-42-10. That is a minimum tensile strength of 60,000 psi, a minimum yield strength of 42,000 psi, and a minimum elongation of 10%.
- As a general rule, the hardness of ductile iron goes up as the tensile and yield strengths increase and, at the same time, the elongation decreases. The hardness range for this classification of ductile iron is around 130-180 BHN.
- At hardness levels above 230 BHN the elongation starts to fall below the 10% minimum.

Conclusion

- The requirement by EBAA Iron, Inc. for stipulating that ductile iron pipe have a maximum 230 BHN hardness level is reasonable and should be accepted as an industry-wide standard.