



Coffee Break Training - Fire Protection Series

Inspection Techniques: Ductile Iron Pipe

No. FP-2013-28 July 9, 2013

Learning Objective: The student shall be able to describe the physical characteristics of ductile iron pipe.

There are numerous references in fire protection codes and standards to the use of ductile iron pipe. We see it used in underground water mains, fire sprinkler and standpipe systems, flammable and combustible liquid product transfer, and many other uses.

What exactly is “ductile iron” pipe?

Ductility is a solid material’s ability to deform by stretching; this is called tensile stress. Imagine powerful forces pulling in opposite directions on a copper penny until it stretches into a long, thin wire. Ductility is a measure of how a solid can be deformed without fracturing.

Iron may be produced from ore in a variety of ways. Iron ore may contain impurities such as sulfur, phosphorous and carbon. By adjusting the amount of carbon and other additives, the manufacturer can produce various grades of iron and steel.

One grade of iron is called gray iron. It is used for housings where tensile strength isn’t critical such as internal combustion engine cylinder blocks, pump housings, valve bodies, electrical boxes, decorative castings, cast iron cookware and disc brake rotors. When ordinary iron is produced, it is characterized by a random flake pattern of carbon (graphite).

The difference between gray iron and ductile iron is in the graphite formation. Ductile iron is manufactured with the addition of other elements such as copper-magnesium alloys. In ductile iron, the addition of a few hundredths of 1 percent of magnesium or cerium (a rare earth) causes the graphite to form in small spheroids rather than flakes. These create fewer discontinuities in the structure of the metal and produce a stronger, more ductile iron. Ductile iron also may be called “nodular iron” because of the graphite formations.

In addition to pipe, ductile iron can be cast into a variety of fittings such as elbows, tees, flanged fittings, bell joints, wye branches and connectors.



The black pipe on this sprinkler manifold and risers is typical of ductile iron pipe.

