Ductile Iron Pipes

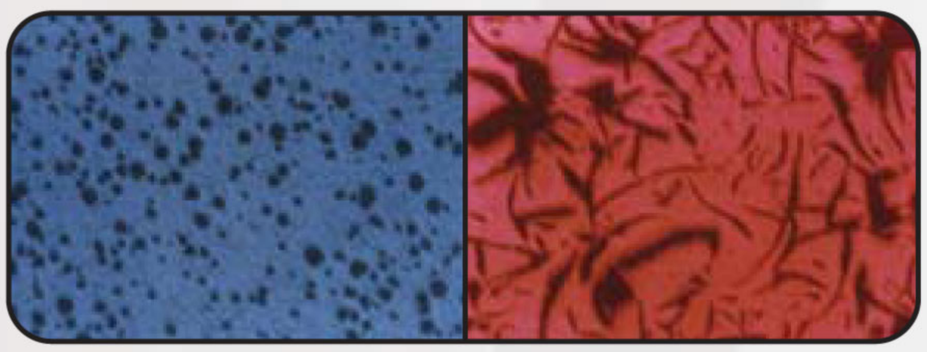
A decisive advance was made in 1948, when research led to the discovery of spheroidal graphite iron, more commonly known as ductile iron. The graphite no longer exists in flake form but precipitates in a spherical form. The possibility of crack propagation lines is therefore eliminated. Graphite precipitation in spheroidal form is obtained by the controlled addition of small amount of magnesium to the previously desulfurized base iron. Within the last fifty years ductile iron as an important material has been used in producing wide varieties of products as pipes, fittings, valves, manhole covers ....etc.

Ductile iron owes its remarkable mechanical properties to the spheroidal shape of its graphite.
- Tensile strength.
- Impact resistance.
- High elastic limit (yield strength).
- Good elongation.

These properties are further enhanced by control of the chemical analysis and heat treatment of the metal matrix.

Ductile iron maintains the traditional qualities of cast iron resulting from the high carbon content.
- Compression strength.
- Castability.
- Abrasion resistance.
- Machinability.
- Fatigue strength.

Ductile iron pipes which can convey many fluid media such as water, gas, are widely used in various pipeline projects for metallurgy, mine, water conservancy, petroleum and urban public facilities



The Flake Graphite of Brittleness e Spheroidal Graphite of Strength

Ductile Iron Pipe is suitable for mounting under the different topography and climate situation. Ductile iron pipes are produced according to the following International Standards:

	ISO	DIN	BS-EN
Ductile Iron Pipes	2531	28 600	545
Zinc Coating	8179	30 674	545
Cement Lining	4179	2614	545
Bitumen Coating	-	30 674	545
Tyton Rubber Gasket	4633	7715	545
Polyethylene Sleeving	8180	30 674	545
Pipe Socket	-	28 603	545

Note: ISO (International Organization for Standardization). DIN (German Standard - Deutsche Institute for Normung) BS (British Standard) EN (European Standard)

This International Standard specifies the requirements and test methods applicable to ductile iron pipes, fittings, accessories and their joints for the construction of pipelines.

- to convey water (e.g. potable water) or gas;
- operated with or without pressure;
- installed below or above ground.

Note: In this international standard, all pressures are relative pressure expressed in bars.(100Kpa = 1 bar)

This International Standard gives specifications for materials, dimensions and tolerance, mechanical properties and standard coatings of pipes, fittings and accessories. It also gives performance requirements for all components including joints.

This International Standard cover pipes, fittings and accessories cast by any type of foundry process or manufactured by fabrication of cast components as well as corresponding joints, of a size range extending from DN 40 to DN 2,600 inclusive.

Centrifugal ductile cast iron pipe has many excellent properties such as higher strength (it is three times of gray cast iron pipe strength). Higher elongation (The elongation of gray iron is 0 and that of ductile iron is equal to more than 10%), better anti- corrosion (thirty times higher than steel pipe) and good anti-knocking.

Definitions

For the purpose of this International Standard, the following definitions apply:

Ductile Iron : Type of iron used for pipes, fittings and accessories in which graphite is present primarily in spheroidal form.

Pipe : Casting of uniform bore, with straight axis, having either socket, spigot or flange ends, except for flanged sockets, flanged spigots and collars which are also classified as fittings.

Fitting : Casting other than pipe, which allows pipeline deviation, changes direction or bore. In addition, flanged sockets, flanged spigots and collars are also classified as fittings.

Accessory : Any casting other than pipe or fitting, which is used in a pipeline, such as;
- Glands and bolts for mechanical flexible joints
- Glands, bolts and locking rings or segment for restrained joints.

Note : Valve and hydrants of all types are not covered by the term accessory.

Flange : Flat, circular end of a pipe or fitting, extending perpendicular to its axis, with bolt holes equally spaced on a circle.

Note : A flange may be fixed (e.g. internally cast, threaded-on or welded-on) or adjustable; an adjustable flange comprises a ring; in one or several parts bolted together, which bears on an end joint hub and can be freely rotated around the pipe axis before jointing.

Collars, Coupling : Connecting piece used to join together the spigots of mating pipes or fittings.

Spigot : Male end of a pipe or fitting.

Socket : Female end of a pipe or fitting to make the joint with the spigot of an adjacent component.

Gasket : Sealing component of a joint.

Joint : Connection between the ends of pipes and/or fittings in which a gasket is used to affect a seal.

Flexible joint : Joint, which provides significant angular deflection and movements parallel and/or perpendicular to the pipe axis.

Push-in flexible joint: Flexible joint assembled by pushing the spigot through the gasket into the socket of the mating component.

Mechanical flexible joint : flexible joint in which sealing is obtained by applying pressure to the gasket by mechanical means, e.g. a gland.

Restrained joints : joint in which a means is provided to prevent separation of the assembled joint.

Flanged joint : Joint between two flanged ends.

Nominal size (DN) : Numerical designation of size, which is common to all components in a piping system. It is convenient round number for references purposes and is only loosely related to the manufacturing dimensions (see ISO 6708).

Nominal Pressure (PN) : Numerical designation expre-ssed by a number, which is used for reference purposes. All components of the same nominal size DN designated by the same PN number have compatible mating dimensions (see ISO 7268 and its Amendment

Allowable Operating Pressure (PFA) : Internal pressure, excluding surge that a component can safely withstand in permanent service.

Allowable Maximum Operating Pressure (PMA): Maximum internal pressure, including surge that a component can safely withstand in service.

Allowable Test Pressure (PEA) : Maximum hydrostatic pressure that a newly installed component can withstand for a relatively short duration, when either fixed above ground level or laid and backfilled underground, in order to measure the integrity and the tightness of the pipeline.

Note : This test pressure is different from the system test pressure (STP), which is related to the design pressure of the pipeline and is intended to insure integrity and leak tightness.

Diametral Stiffness of a pipe : Characteristic of a pipe, which allows it to resist diametral deflection under loading.

Batch : Quantity of castings from which a sample may be taken for testing purposes during manufacture.

Type test : Proof-of-design test, which is done once and is repeated only after change of design.

Length : Effective length of a pipe or fitting, as shown in the international standard.

Note : For flange pipes and fittings, the effective length L (l for branches) is equal to the overall length. For socket pipes and fittings, the effective length Lu (lu for branches) is equal to the overall length minus the spigot insertion depth as indicated in the manufacturer's catalogues.

Deviation : Amount by which the design length may differ from the standardized length of a pipe or a fitting.

Note : Pipes and fittings are designed to a length selected in the range of standard length plus or minus the deviation (see table 4); they are manufactured to this length plus or minus the tolerance given in table 5.

Ovality : Out of roundness of a pipe section, equal to

$$100\ \frac{A1-A2}{A1+A2}$$

Where A1 is the maximum axis, in millimeters, and A2 the maximum axis of the pipe cross-section, in millimeters.