Superior Design

What Is Ductile Iron?

Carbon is always present in the form of graphite flakes, which favour crack initiation and brittleness. In Ductile Iron, spheroidal graphite iron, the carbon is present in the form of small spheres, thus eliminating the risk of crack propagation and resulting in higher strength.

This is done by adding magnesium into molten iron. Therefore, the continuity of the iron matrix is maintained, providing excellent ductility, flexibility and impact resistance.

In "Ductile Iron", the graphite is in spheroidal form and hence, the risk of cracking is eliminated.

In "Cast Iron", the carbon is present in flaky form making the material brittle and susceptible to cracks.

Protection

Internal Lining
YL offers standard advanced centrifugally applied cement mortar lining that gives high mortar compaction, good adhesion and silk-smooth surface flow.

Other standard linings such as Mascrete, High Alumina and Sulphate Resistant cement are also available. YL is also capable of supplying superb quality epoxy coated pipes.

External Coating
All YL pipes come with the basic requirement of Metallic Zinc coating, followed by Bitumen paint as the finishing coat.

Metallic Zinc coating protect the pipe by forming a stable protective layer of insoluble zinc salts. It also has self-healing characteristics of any damage and therefore, increases the life span of the pipe.

Other external coatings such as epoxy-based coating are also available upon request.
Features Of Ductile Iron Pipes:

- Excellent corrosion resistance
- High load bearing capabilities
- Low cost pipe installation
- Complete pipeline in shortest time
- No restriction from adverse weather and traffic
- Easy machining, tapping and cutting
- Suitable for piping in tunnels
- Widest range of factory fittings and accessories
- Pipe flanging made to specific length required

Pipe Joints

The push-in-joint, also known as socket-spigot joint, provides leak-tightness even at pipe busting pressures and allows deflection in any direction up to 5 degrees.

The push-in method also allows easy and speedy jointing even in restricted space, or during adverse weather conditions as it does not require special tools or equipment. This reduces the pipe laying cost and time while increasing efficiency.

YL flanged joint offers an excellent mechanical system. All flanges are screwed-on or welded-on with precision workmanship that offers leak-tightness.

A flanged joint allows pipe sections to be installed or dismantled in line.

**Comparison Between Ductile Iron Pipes And Mild Steel Pipes**

<table>
<thead>
<tr>
<th></th>
<th>Ductile Iron Pipe</th>
<th>Mild Steel Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength (N/mm²)</td>
<td>Min. 420</td>
<td>Min. 360</td>
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<tr>
<td>Brinell Hardness (HB)</td>
<td>Max. 230</td>
<td>Max. 140</td>
</tr>
<tr>
<td>Bending Strength (kg/mm²)</td>
<td>Min. 61.1</td>
<td>Min. 41</td>
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<tr>
<td>Elongation (%)</td>
<td>10% &lt; DN1,000</td>
<td>18%</td>
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<tr>
<td>Modulus of Elasticity (E)</td>
<td>170 GPa</td>
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Efficiency & Precision
Transportation & Handling

Recommended transportation and handling checklist:

Proper procedures for unloading of YL Ductile Iron pipes should be as recommended below:

- Use sufficient powerful lifting gear, i.e. crane, forklift and etc.
- Manoeuvre gently, controlled by the use of guide ropes. Avoid swinging, sudden jerking motions, impacts or pipes rubbing against other pipes, the ground or any other objects.
- Chain securing the pipe to the truck should not be released before ensuring the truck is positioned on level ground.
- Timber battens should be placed on the ground about 1m each end to the pipes to absorb shock and to prevent damage to the coatings (Picture 1).
- Always secure pipe with chocks with the same shape and size (Picture 2).
- Arrangement of the pipe should be parallel and equally spaced on top of the timber (Picture 3).

Methods of lifting should be as shown below:

- **Barrel Lifting**
  - Use wide, long and flat slings to maintain sufficiently wide apart support to prevent accidental slippage (Picture 4).
  - Use of wire ropes as chain slings may potentially slip and damage the coating of pipes (strictly prohibited).
  - A single sling may be used on site. In this case, lift the pipe at its centre of gravity, with the sling gripping the pipe to prevent slippage (Picture 5).

- **Bundle Lifting**
  - DN 100 to DN300 bundles is unloaded with long flat textile slings or a spreader bar (Picture 6).

- **Forklifts**
  - Use of forklift equipment for lifting is allowed.
Storage and Stacking

Storage & Stacking
- The area must be level.
- Avoid: Marshy ground, Shifting, Corrosive soils.
- Stack the pipe in homogenous piles (same diameter), in accordance with rational storage plan.
- Use sufficiently strong, good quality hard woods (timbers, wedges).
- Commonly used methods of stacking should be of pre-bundle stacking, square stacking or pyramid stack as shown in pictures 7, 8 and 9.

Recommended Stacking Height
- The height of stacks are determined by consideration of:
  - The stress on the lowest layer of pipes in the stack.
  - The total lift given by the available crane.
  - The facilities available to ensure stable stacking.

Must Avoid
- Dragging the pipes on the ground, as this risks damaging the external coating.
- Dropping pipes to the ground, even with tyres or sand interposed.
- Stringing out pipes in areas of risk; e.g. frequently moving machines, use of explosives (risk of airborne stones).
- Depositing pipes on precarious balanced surfaces.

<table>
<thead>
<tr>
<th>Nominal Size DN</th>
<th>Recommended Maximum Number Of Layers In Stack</th>
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<tr>
<td>100</td>
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<td>150</td>
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<tr>
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<td>10</td>
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Pic. 7: Pre-Bundle
Pic. 8: Square Stacking
Pic. 9: Pyramid Stacking
Steps to Effective Jointing

Assembly of Rubber Ring
- Ensure socket seat and gasket are free from all soil, sand and debris particles.
- Ensure spigot is chamfered and in good condition, even after pipe is cut, re-chamfer is needed.
- Ensure lubrication paste is apply to exposed surface of the gasket, the spigot end and chamfer.

Joint Preparation
- Ensure the spigot is properly chamfered. This prevents the spigot from displacing the rubber ring.
- Clean and remove all foreign particles like sand and dirt from the spigot, internal part of socket of joint and the rubber ring (Pic 10).

Rubber Ring Insertion
- Loop the clean rubber ring into a heart shape or cross shape and insert it into socket (Pic. 11 & 12).
- Apply radial pressure to the rubber ring at the heart-shaped or cross-shaped loop and fit it onto the retaining groove snuggly.
- Check around its whole circumference and ensure that the rubber ring is seated correctly.
- Apply a thin film of lubricant to the internal surface of the rubber ring and to outside surface of spigot.

Joint Assembly
- Align and center the spigot with the socket.
- Assemble by using either Crowbar Method (for smaller diameter only) or Excavator Bucket (Pic. 13 & 14).
- Push slowly and steadily until the joint is made to the correct insertion depth, where one of the painted stripes on the spigot end disappears and the other stripe is visible outside.

Checking
Check the insertion condition. Confirm the proper position of the rubber ring by inserting a feeler gauge into the gap between the socket and spigot, and the socket end is positioned between the two dotted lines provided by the manufacturer on the spigot end (Consult YLI technical personnel if necessary).

Methods for pipe laying
The pipe socket face must be protected with a piece of hard wood.
Push slowly and steadily, observing the rules for pipe jointing (consult YLI if necessary).
Over 200 various sizes of fittings are available at your convenience. Tees, Bends, Flanged Sockets, Flanged Spigots, Concentric Tapers, Flanged Bellmouths, Blank Flanges, Reducing Flanges, and others (see technical specifications catalogue).

YL also offers a full range of tapping saddles and Joints (Gate valves) for Ductile Iron, uPVC and AC pipelines, gate valves and other accessories.

**Bitumen coated externally, Cement Mortar lined internally**

**Ductile Iron Fittings**

Sizes Available:
DN 100 - 700 mm

- Bend
  - Double-socket 90° bend
  - Double-socket 45° bend
  - Double-socket 11 1/2° bend
  - Double-socket 11 1/4° bend
  - Double-flanged 90° bend
  - Double-flanged 45° bend
  - Double-flanged 11 1/2° bend
  - Double-flanged 11 1/4° bend
  - Double-flanged 90° long bend

- Duckfoot Bend
  - Double-flanged 90° bend

- Tee
  - All-socket tee
  - All flanged tee
  - Double-socket tee with flanged branch

- Concentric Taper
  - Double-socket taper
  - Double-flanged taper

**Gate Valve BS 5163 Type B**

DN 80 - DN 300

**Hot Fusion epoxy coated**

(both internally and externally)

Hydrostatic Pressure Test
### Technical Specifications

**PUSH-IN JOINT DUCTILE IRON PIPES**

Cement mortar lining

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DN 100 - DN 400 also available in Class K9 upon request.