

### Ductile Iron Pipe Foundry In Action

Casting machines centrifugally force molten iron against the mould to form pipe.



Iron pipe is being prepared for removal from casting mould.

## DUCTILE IRON PIPE MANUFACTURING

Canada Pipe Ductile Iron Pipe is cast centrifugally in metal moulds in accordance with ANSI/AWWA C151/A21.51 Standard. A small but precise amount of magnesium is added to molten iron, which is introduced into a rotating metal mould fitted with a bell core. The centrifugal force evenly distributes and holds the molten iron against the mould until it solidifies. The newly formed pipe is then removed and furnace annealed to obtain the prescribed physical properties.

Canada Pipe Ductile Iron Pipe meets or exceeds the following acceptance test requirements set forth by the ANSI/AWWA C151.A21.51 Standard.

<b>Tensile Test</b>	60,000 psi (min) ultimate strength 42,000 psi (min) yield strength 10% (min) elongation
<b>Impact Test</b>	7 ft.-lb. (min) at 70°F 3 ft.-lb. (min) at -40°F
<b>Hydrostatic Test</b>	500 psi test on every length prior to leaving the foundry
<b>Ball Impression Test</b>	The spigot of every length is tested for ductility prior to leaving the foundry.

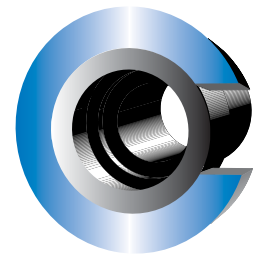
## DUCTILE IRON PIPE DESIGN

Canada Pipe Ductile Iron Pipe is designed to the ANSI/AWWA C150/A21.50 Standard which was originally adopted in 1965. The current revision of this standard recognizes both the Pressure Class and the Special Class (originally called Thickness Class) designations and utilizes the same design criteria, principles and safety factors in their designs. Ductile Iron Pipe is considered a flexible conduit and is therefore designed separately to withstand internal pressure and external loads. Two selection tables have been developed using the design procedures described in ANSI/AWWA C150/A21.50. These tables are provided on the following pages to assist a designer in selecting, rather than calculating, the appropriate Ductile Iron Pipe class.

Ductile Iron is an improvement to the cast irons that have served the water industry with distinction through the centuries. The first Ductile Iron Pipe was produced experimentally in 1948. Minor but significant changes in chemistries and processing result in physical differences at the micro-structure level that result in a vastly improved fracture toughness and ductility making Ductile Iron piping products substantially more resistant to damage from impact or concentrated stresses.

During the solidification stage of the casting process, the carbon, sometimes called graphite, comes out of solution and collects in numerous small pools. The shape of these pools of carbon is a major factor in the mechanical properties of the material.

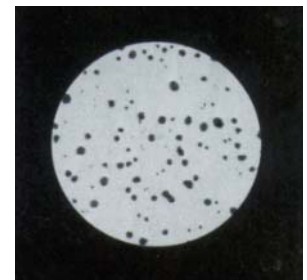
Although both materials are classified as cast irons, in today's terminology the older material is identified as gray iron and the newer material as Ductile Iron.



## DUCTILE IRON PIPE MANUFACTURING



Cast (Gray) Iron Pipe



Ductile Iron Pipe

These photomicrographs compare the microstructures of gray iron and Ductile Iron. Note the relative continuity of the matrix exhibited by the Ductile Iron (bottom).