

DUCTILE IRON PIPE VERSUS HDPE PIPE COMPARISON



IRON STRONG

COMPARISON	DUCTILE IRON PIPE — AWWA C150/C151	HIGH DENSITY POLYETHYLENE (HDPE)— AWWA C906
SIZES	3" — 64"	4" — 63"
Laying Lengths	18' and 20' depending upon manufacturer.	40' and 50' 80' to 100' foot jointing can be challenging in urban locations.
Material Description and Recycled Content	Steel and iron scrap. Minimum 90% recycled content.	Thermoplastic polymer pellets derived from petroleum and ethylene 0% recycled content.
Maximum Pressure Ratings and Hydrostatic Design Basis (HDB) at Thickest Available Pipe Wall per Diameter	24" and smaller = 350 psi , Joint Rating = 350 psi.....HDB = 21,000 psi. 30" though 64" = 250 psi , Joint Rating = 250 psi.....HDB = 21,000 psi. Maximum wall thicknesses range 0.40" (3" pipe) to 1.05" (64" pipe).	24" and smaller = 335 psi (DR 7), Jointless.....HDB = 800 psi. 30" = 250 psi (DR 9), 36" = 200 psi (DR 11), Jointless.....HDB = 800 psi. 42" and 48" = 160 psi (DR13.5), Jointless.....HDB = 800 psi. 54" = 125 psi (DR 17), 63" = 100 psi (DR 21), Jointless.....HDB = 800 psi. Maximum wall thicknesses range 0.643 (4" pipe) to 3.556" (48" pipe). Pressure ratings for 20" and larger pipe may be progressively reduced due to limited extrusion capabilities for walls > 3" thick.
Hydrotesting by Manufacturer	Every pipe hydrotested by manufacturer to 500 psi	One pipe hydrotested per production run.
Surge Allowance	100 psi – based on instant velocity change of 2.0 fps.	None included in design standard – reduce operating pressure by anticipated surge pressure psi which drops Safety Factor below 2.0.
Method of Design and Yield Strengths	Designed as flexible conduit. Separate designs for internal pressure , and external loads (bending stress and barrel deflection design) including a 16,000 lb. truck wheel Live Load with a 1.5 impact factor applied. Use greatest computed thickness to choose pipe wall. Casting tolerance and service allowance per diameter added on top of the computed net thickness. Yield strength design basis of 42,000 psi.	Flexible material design basis considers internal pressure only. External and Live Load design is not covered by a design standard. Yield strength design basis of 1,600 psi.
Internal Pressure Safety Factor and Cyclic Loading Affects	Design safety factor is 2.0 based on design working pressure PLUS 100 psi surge allowance. Cyclic loadings and/or pressure surges do not affect Ductile iron pipe properties or performance over time.	Design safety factor is 2.0 based on design working pressure WITHOUT a surge allowance. Any surge pressures compromise the design factors and REDUCE the safety factor below 2.0. HDPE pipe walls can be deformed and or weakened by pressure surges.

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<p>Additional Factory Tests</p>	<p>At least one Charpy impact test per hour (min. 7 ft-lb.). At least one tensile strength test per casting period (min. yield 42,000 psi min. ultimate 60,000 psi and min. elongation 10%). At least one low-temperature impact test (3 ft-lb. at -40°F) from each 10% of coupons taken for the normal (room temp.) Charpy test.</p>	<p>One bend-back or elongation-at-break test per production run. One ring tensile, quick burst, or 5 second pressure test per production run. One melt flow index and material density test per day. One carbon black content test per production run. Length of defined production run is determined by pipe manufacturer.</p>
<p>Specified Trench Conditions</p>	<p>Five specified backfill conditions (Types 1-5) described in design standard. Conservative soil support parameters listed for all trench types available. Type 1 is lowest support; Type 5 is strongest support.</p>	<p>None.</p>
<p>Temperature Effects on Pipe Material</p>	<p>Ductile iron material properties as published remain stable and serviceable from -40°F through 212°F and beyond. Expansion / contraction rate for Ductile iron is 0.75" per 10°F change per 1,000' of pipe.</p>	<p>High Density Polyethylene material properties as published exist only at 73.4°F. Temperatures other than 73.4°F proportionally weaken HDPE. Expansion / contraction rate for HDPE is 10.00" per 10°F change per 1,000' of pipe.</p>
<p>Internal Diameters</p>	<p>Actual Inside Diameters of DI pipes are LARGER than their listed nominal size.</p>	<p>Actual Inside Diameters of HDPE pipes are SMALLER than their listed nominal size. HDPE flow areas are 24% to 40% LESS THAN equivalent DI pipe diameter pipes.</p>
<p>Joining Procedure</p>	<p>Simple push-on assembly rubber-gasketed bell and spigot joint creating a watertight seal.</p>	<p>Butt-fusion welding (melt pipe ends and press together) utilizing specialized equipment and procedures to combine into a jointless pipeline. Process is weather and ambient temperature dependent.</p>
<p>Installation Concerns and Maintenance or Operational Issues</p>	<p>No resting period or other adjustment or address needed post-assembly. HDD Installations easily accomplished with Ductile iron restrained joint pipe. No concerns of merit from common operation, maintenance, or typical water treatment protocols.</p>	<p>Manual removal of internal circumferential joint beads created by melt-welding required using specialized equipment for proper flow through HDPE pipe. HDD installations typically require a 3 to 5-day rest period. HDPE is known to stretch when pulled through the bore. Weakening or greater damage of the pipe material has been shown to occur against some water treatment protocols, and particularly oxidative degradation.</p>
<p>Fitting, Valve, or Future Connections</p>	<p>Standardized Mechanical Joint connections allow for a wide range of readily available fittings and valves. Ductile iron fitting walls are equal to class 54 pipe therefore no pressure reduction concerns.</p>	<p>HDPE pipe manufacturers do not produce fittings. The use of butt-fusion weld fabricated fittings requires a 25% reduction in pipeline pressure rating overall.</p>
<p>Flammability Permeability</p>	<p>Melting Point = 2,100° F, not flammable. Pipe walls are not permeable. Specific gasket compounds available to prevent joint permeation in aggressive circumstances.</p>	<p>Melting Point 260° F, flammable under certain conditions or in fire. Pipe walls are permeable to hydrocarbons and aggressive chemical streams.</p>

To view an informative blog and video on the advantages of using Ductile iron pipe over HDPE, visit McWaneDuctile.com/blog.