DUCTILE IRON PIPE VERSUS PVC PIPE COMPARISON

McWANE DUCTILE | IRON STRONG

COMPARISON	DUCTILE IRON PIPE	C 900 PVC	C905 PVC	C909 PVCO
SIZES	**3" — 64"**	**4" — 12"**	**14" — 48"**	**4" — 24"**
Pressure Ratings	12" and smaller 350 psi min 14" — 20" 250 psi min 24" 200 psi min 30" — 64" 150 psi min	12" and smaller DR 25 — 165 psi DR 18 — 235 psi DR 14 — 305 psi	DR 51 — 80 psi DR 32.5 — 125 psi DR 25 — 165 psi DR 18 — 235 psi	Pressure Classes 100, 150, 200 No DRs used but if used would be PC100 — DR 47 PC200 — DR 25.5
	Higher pressure pipes are available.	Material properties and pressure ratings reduced at temperatures other than 73.4 degrees Fahrenheit.		
Surge Allowance	100 psi	No surge allowance is included in design. If surge pressures are anticipated, reduce pipe pressure rating by the design or anticipated surge pressure. Cyclic loading reduces the lifespan of the pipe. Pipe is affected by a minor change in velocity of 1.0 ft/sec.		
Internal Pressure Safety Factor	Design Safety Factor is 2.0 based on Design Working Pressure **PLUS** surge allowance. Cyclic loading does not affect ductile iron pipe properties or performance over time.	Design Safety Factor is 2.0. Stress due to working pressure plus surge pressure cannot exceed the HDB (4,000 psi) divided by 2.0 Safety Factor (HDS = 2,000 psi).		Uses a higher HDB of 7,100 psi and a Safety Factor of 2.5 but no surge allowance. Not proven in practical experience.
Maximum Allowable Velocity	No max allowed velocity due to higher internal design pressure, addition of surge allowance, and safety factor applied to combined working and surge pressure.	C900 - 07 eliminated surge allowance. Hydrostatic Design Basis (HDB) / 2.0 = working pressure. No surge allowance = The AWWA Standards require the designer to reduce the pressure rating of the pipe to allow for pressure surges. PVC pipe has routinely proven susceptible to rupture from water hammer and other velocity changing conditions. A*WWA Manual M-23 "PVC Pipe Design & Installation states;* "adequate for operating conditions where flow is maintained at or below 2 fps." (page 64)		
Capabilities for Fire Flows	Pipe design allows for high velocities plus surges based on 50 psi per ft/sec. change in velocity.	A 6" pipe and hydrant with 1,000 gal/min flow rate = a Velocity of 10.36 ft./sec. (fpsi). This equates to 518 psi surge potential — PVC has no surge allowance. *AWWA Manual M-23 "PVC Pipe Design & Installation* states; "adequate conditions where flow is maintained at or below 2 fps (page 64). *AWWA Manual-31 "Distribution System Requirements for Fire Protection* lists required fire flows at 2500 GPM or less and 3,000 GPM. A *June 2013 AWWA OPFlow* article stated; "flows below 500 GPM as inadequate for fire flow and flows of 500-999 GPM as marginally adequate.		
Special Considerations for Cyclic Loading	None needed because Ductile Iron does not lose strength over time.	"Cyclic Loading" or Water Hammer" Cyclic Loading - number of cycles until failure. A scratch with a depth of .01 inch reduces the fatigue factor of PVC pipe.		
Material Description	Recycled steel and iron scrap	Manufactured from Vinyl Chloride Monomer and other chemicals.		
Susceptibility to Shipping Damage	Scratch resistant. Not affected by cold temperatures. Not affected by truck smoke.	10 percent scratch depth reduces performance to rejection. Becomes brittle when temperatures are below freezing. Subject to smoke damage during transit.		

COMPARISON TABLE CONTINUED ON REVERSE SIDE...

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Susceptibility to UV Rays	Does not affect Tensile/Impact Strength.	Uni-Bell Study: Can lose up to 34 percent of impact strength after one year of exposure. Avoid discolored areas. Warranty Concern: Potential exclusions from coverage due to UV degradation.		
Direct Tap	DIPRA test shows .20" wall thickness capable of multiple taps.	Warning: Over-tightening tapping machine may distort the pipe. Do not use a hand-held drill. Rupture Hazard Warning posted on pipe.		Direct Tapping not permitted. Over-tightening tapping machine may distort the pipe. Do not use a hand-held drill.
Susceptibility to Corrosion	V-Bio® Polyethylene Encasement cost effective, proven method of corrosion control.	Resistant to "hot" soils. Does not resist damage from UV rays and temperature fluctuations. Strength breaks down over time.		
Susceptibility to Temperature	Charpy Impact Test performed at -40 degrees Fahrenheit.	PVC becomes less resistant to impact at very low temperatures. At high temperatures, PVC lowers pressure rating and becomes more flexible and susceptible to over tightening of tapping machines and saddles.		
Tracer Wire Required	Tracer Wire is not necessary.	Tracer Wire required: Does not help with leak detection.		
Deflection	5 degrees/19 inches	No deflection at joints. Deflection by bending pipe which creates stress (DO NOT TAP HERE).		
Pumping Costs	No increase.	Increased due to wall thickness requirements. Weaker due to less tensile strength.		
100+ Year Service	600 Utilities in the U.S. and Canada with 100 years of service and 23 with 150 years of service.	The first PVC waterline installation occurred in 1955, therefore any communications suggesting PVC has a 100+ year lifespan has not been proven. *AWWA's Study "Buried No Longer"* gives independent life expectancy of 55 to 70 years.		
Sustainability & Recycled Content	Made from 95% recycled content. No end of life. Can easily be recycled.	PVC pipe can only be down-cycled, therefore the recyclability of PVC is nearly zero. Releases Carcinogens, Vinyl Chloride, Ethylene, and Dichlorides during manufacturing. Not recognized by any "Green" organization as an environmentally sustainable product.		
Horizontal Directional Drilling	Extreme safe-end-pull capacities. Pipe not affected by scratches or bore loads.	Factors of concern include weakening from scratches and buckling loads from bore fluids or soils.		
Permeability & Absorption	Non-permeable	Susceptible to permeation and absorption of hydro carbons and other harmful chemicals.		
Combustibility	Non-combustible	Combustible and subject to melting.		

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