SPECIFICATIONS

ASTM

Classification \ Specification			ASTM A589					BS 1387	BS 3601			BS 3602		BS 1775			
			TYPE 1		TYPE 2	TYPE 3	TYPE 4	(L)Light (M)Medium (H)Heavy	ERW 320	ERW 360	ERW 430	ERW 360	ERW 410	ERW 11	ERW 16	ERW 20	ERW 23
Application			Drive Pipe (Grade A)	Drive Pipe (Grade B)	Water-Well Reamed and Drifted Pipe (Grade A)	Driven Well Pipe (Grade A)	Water-Well Casing Pipe (Grade A)	Ordinary piping	Pressure services			High-pressure services		Machine structural purposes, General structural purposes			
Chemical composition(%)	C(Max.)		–	–	–	–	–	0.20	0.16	0.17	0.21	0.17	0.21	–	–	–	–
	Si(Max.)		–	–	–	–	–	–	–	0.35	0.35	0.35	0.35	–	–	–	–
	Mn(Max.)		–	–	–	–	–	1.20	0.30–0.70	0.40–0.80	0.40–1.20	0.40–0.80	0.40–1.20	–	–	–	–
	P(Max.)		0.050	0.050	0.050	0.050	0.050	0.045	0.040	0.040	0.040	0.045	0.045	0.060	0.060	0.060	0.060
	S(Max.)		0.060	0.060	0.060	0.060	0.060	0.045	0.040	0.040	0.040	0.045	0.045	0.060	0.060	0.060	0.060
	Others		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mechanical properties	Tensile strength (min.)	PSI	48000	60000		48000		–	–	–	–	–	–	–	–	–	–
		MPa	331	413		331		320–460	320–460	360–500	430–570	360–500	410–550	309	386	463	494
		kgf/mm^2	33.8	42.1		33.8		32.7–46.9	32.7–46.9	36.7–51.0	43.9–58.2	36.7–51.0	41.8–56.1	31.5	39.4	47.2	50.4
	Yield point (min.)	PSI	30000	35000		30000		–	–	–	–	–	–	–	–	–	–
		MPa	207	241		207		195	195	235	275	215	245	170	247	309	355
		kgf/mm^2	21.1	24.6		21.1		19.9	19.9	24.0	28.1	21.9	25.0	17.3	25.2	31.5	36.2
	Elongation (Min.)		e = 625,000($A^{0.2}/U^{0.9}$)					20	25	25	22	24	22	600/TS(700/TS) TS : Ton/in^2, Kgf/mm^2			
Flattening test	H : Distance between Flattening plates(mm) H` : Inside disance between flattening plates D : Outside diameter of the pipe D` : Inside diameter of the pipe t : Wall thickness of the pipe		–					DN Over 50 Welded part H = 0.75D Base metal H = 0.60D Welded part is located at 90 degree	$H = \frac{(1+e)t}{e+t/D}$ Constant: Class 320: Welded part 0.029, Base metal 0.10; Class 360: Welded part 0.026, Base metal 0.09; Class 460: Welded part 0.023, Base metal 0.08			$H = \frac{(1+e)t}{e+t/D}$ e = 0.10 e = 0.08		H`=3t or H`=1/2D` whichever is the smaller	H`=6t or H`=3/4D` whichever is the smaller	H`=8t or H`=7/8D` whichever is the smaller	H`=6t or H`=3/4D` whichever is the smaller
Bending test	Bending angle X Inside radius (D : Outside diameter, t : Wall thickness)		–					DN 50below Black pipes 180° X 6D Galvanized pipes 90° X 8D	–			Outside diameter of bar is 4t		–			
Hydrostatic test	P : Test pressure S : Fiber stress, PSI(mPa) D : Outside diameter(mm) t : Thickness(mm)		Prescribed according to dimension and grade					51 (50 bar)	$P = \frac{20St}{D}$ (bar) S : 80% of the specified minimum yield strength			$P = \frac{20St}{D}$ (bar) S : 80% of the specified minimum yield strength Max : 143Kgf/cm^2 (140bar)		–			
NDT (Non-Destructive Test)			–					Eddy Current Test (substitute with hydrostatic test)	Eddy Current Test (Applied to pipes with Outside diameter of 180mm or less as substitution for hydrostatic test)			Ultrasonic Test		–			
Others			–					Bore Test (hot-dip zinc coated tubes)	–			The Charpy V-notch Impact test		Drift Expanding Test: 1D = 1.125D`	1D = 1.10D`	1D = 1.075D`	1D = 1.10D`

ASTM

Classification \ Specification			ASTM A135		ASTM A178			ASTM A252		
			A	B	A	C	D	A	B	C
Application			Sprinkler		Boiler & Heat exchanger			Steel Pipe Piles		
Chemical composition(%)	C(Max.)		0.25	0.30	0.60 ~ 0.18	0.035	0.27	–	–	–
	Si(Max.)		–	–	–	–	0.10	–	–	–
	Mn(Max.)		0.95	1.20	0.27 ~ 0.63	0.80	1.00 ~ 1.50	–	–	–
	P(Max.)		0.035	0.035	0.035	0.035	0.030	–	–	–
	S(Max.)		0.035	0.035	0.035	0.035	0.015	0.050	0.050	0.050
	Others		–	–	–	–	–	–	–	–
Mechanical properties	Tensile strength (min.)	PSI	48000	60000	47000	60000	70000	50000	60000	66000
		MPa	331	414	325	415	485	345	414	455
		kgf/mm^2	33.8	42.2	33.1	42.2	49.3	35.2	42.2	46.5
	Yield point (min.)	PSI	30000	35000	26000	37000	40000	30000	35000	45000
		MPa	207	241	180	255	275	205	240	310
		kgf/mm^2	21.1	26.7	18.3	26.1	28.2	21.1	24.7	31.7
	Elongation (min.)		E = 56t+17.50	E = 48t+15.00	35	30 (e = 48t+15.0)	30 (e = 48t+15.0)	30 (e = 48t+15.0)	25 (e = 40t+12.5)	20 (e = 32t+10.0)
Flattening test	H : Distance between Flattening plates H` : Inside disance between flattening plates D : Outside diameter of the pipe D` : Inside diameter of the pipe t : Wall thickness of the pipe		0° , 90°	0° , 90°	TEST	TEST	TEST	–	–	–
Bending test	Bending angle X Inside radius (D : Outside diameter, t : Wall thickness)		–	–	–	–	–	–	–	–
Hydrostatic test	P : Test pressure S : Fiber stress, PSI(MPa) D : Outside diameter(mm) t : thickness(mm)		P = 2St/D	P = 2St/D	–	–	–	–	–	–
NDT (Non-Destructive Test)			Eddy Current Test & Ultrasonic Test (Substitute with Hydrostatic Test)		UT or ECT	UT or ECT	UT or ECT	–	–	–
Others			–	–	Flange Test, Crush Test, Reverse flattening Test	Flange Test, Reverse flattening Test	Flange Test, Reverse flattening Test	–	–	–