

COLD FORMED HOLLOW SECTIONS

STANDARD SPECIFICATIONS FOR WELDED CIRCULAR & NON-CIRCULAR STEEL TUBES

| Standard Specification | Scope | Grade of Tubes | Chemical Composition Percentage (max. unless range is given) | | | | Mechanical Properties | | | |
|------------------------|--|-------------------|---|---------|------|------|-------------------------------|----------------------------|--------------------------|---|
| | | | C | Mn | P | S | Condition | Tensile Strength (min.) | Yield Strength (min.) | Elongation (% min.) |
| | | | | | | | | | | |
| ASTM-A53 | E.R.W. Carbon Steel Pipes | Type E Grade A | 0.25 | 0.95 | 0.05 | 0.06 | As Rolled | ksi (MPa) 48 (331) | ksi (MPa) 30 (207) | (G.L.=2" or 50mm) As per Table X7 |
| ASTM-A120 | E.R.W. Carbon Steel Pipes for ordinary use | Standard Pipe | -- | -- | -- | -- | -- | -- | -- | -- |
| ASTM-A135 | Standard Specification for ERW Steel Pipe | Grade A | 0.25 | 0.95 | 0.05 | 0.06 | As Rolled | 48 (331) | 30 (207) | As per Table 1 Equation: (Elongation) = 56 x (Actual Thickness of Specimen, inch) + 17.50 |
| ASTM-A500 | E.R.W. Carbon Steel Structural Tubing in Round & Shapes | Round Grade A | 0.26 | -- | 0.04 | 0.05 | As Rolled | 45 (310) | 33 (228) | 25 |
| | | Grade B | 0.26 | -- | 0.04 | 0.05 | | 58 (400) | 42 (290) | 23 |
| | | Shaped Grade A | 0.26 | -- | 0.04 | 0.05 | As Rolled | 45 (310) | 39 (269) | 25 |
| | | Grade B | 0.26 | -- | 0.04 | 0.05 | | 58 (400) | 46 (317) | 23 |
| ASTM-A513 | E.R.W. Carbon Steel Mechanical Tubing | MT 1010 | 0.5-0.15 | 0.3-0.6 | 0.04 | 0.05 | As Rolled | 45 (310) | 32 (221) | 15 |
| | | MT 1015 | 0.1-0.2 | 0.3-0.6 | 0.04 | 0.05 | | 48 (331) | 35 (241) | 15 |
| | | MT 1020 | 0.15-0.25 | 0.3-0.6 | 0.04 | 0.05 | | 52 (359) | 38 (262) | 12 |
| BS-31 | E.R.W. Steel Conduits | Class A Plain End | -- | -- | -- | -- | As Rolled & Coated G.I. Strip | tonf/in ² | tonf/in ² | 15 (G.L.=8") |
| BS-980 | E.R.W. Carbon Steel Pipes for Automobile Purposes | ERW 1 | 0.20 | 0.60 | 0.06 | 0.06 | As Rolled | 20 | 11 | 20 |
| | | ERW 2 | 0.30 | 0.60 | 0.06 | 0.06 | | 25 | 15 | 15 |
| | | ERW 3 | 0.40 | 0.60 | 0.06 | 0.06 | | 30 | 20 | 10 (G.L. = 4√S ₀) |
| BS-1139 | E.R.W. Metal Scaffolding | | -- | -- | 0.06 | 0.06 | As Rolled (Black Tubes) | 20 - 30 | 13.5 | 700/T.S. (ton/in ²) (G.L. = 4√S ₀) |
| BS-1387 | E.R.W. Carbon Steel Tubes | Light | -- | -- | 0.06 | 0.06 | As Rolled | 33 - 47 | -- | 20 (G.L. = 5.65√S ₀) |
| | | Medium | -- | -- | -- | -- | | | | |
| | | Heavy | -- | -- | -- | -- | | | | |
| BS-1717 | E.R.W. Carbon Steel Tubes for Bicycle and Motorcycle Purposes | ERW 101 | 0.10 | 0.60 | 0.06 | 0.06 | As Rolled | 20 | 11 | -- |
| | | ERW 102 | 0.20 | 0.60 | 0.06 | 0.06 | | 25 | 15 | -- |
| | | ERW 103 | 0.30 | 0.60 | 0.06 | 0.06 | | 30 | 20 | -- |
| BS-1775 | E.R.W. Carbon Steel Tubes for Mechanical Structural and General Engineering Purposes | ERW 11 | -- | -- | 0.06 | 0.06 | As Rolled | 20 | 11 | 700/T.S. (ton/in ²) |
| | | ERW 16 | -- | -- | 0.06 | 0.06 | | 25 | 16 | (G.L. = 4√S ₀) |
| | | ERW 20 | -- | -- | 0.06 | 0.06 | | 30 | 20 | or 600/T.S. (ton/in ²) |
| | | ERW 23 | -- | -- | 0.06 | 0.06 | | 32 | 23 | (G.L. = 5.65√S ₀) |

*1: G.L. = Gauge Length

*4: T.P. = Test Piece as per JIS Z2201

*6: D = Outside Diameter

*2: S₀ = Original Cross-Section Area

*5: H = Distance between Outside Surfaces

*7: t = Wall Thickness of Tubes

*3: T.S. = Tensile Strength

*8: H' = Distance between Inside Surfaces

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| Other Tests | | | Dimensional Tolerances | | |
|--|---|---|--|--|---|
| Flattening (min.) | Bend Test | Hydrostatic Test | On Diameter except for Non-Circular Tubes | | On Wall Thickness |
| 12 | 13 | 14 | 15 | | 16 |
| Apply for STD & XS of NB > 2" Welded Portion: H = 2/3D The Other Side: H = 1/3D | Apply for NB ≤ 2" 12D at 90° When ordered for Close coiling: 8D at 180° | As per Table X2 | 1-1/2" & under 2" & over | + 1/64" - 1/32" ± 1% of OD | + not limited -12.5% |
| -- | -- | 1/2" to 1": P=700 psi 1-1/4" to 3": P=1,000 psi 3-1/2" to 6": P=1,200 psi | 1-1/2" & under 2" & over | + 1/64" - 1/32" ± 1% of OD | + not limited -12.5% |
| Welded Portion: H = 2/3D The Other Side: H = 1/3D | -- | P=2St/D, Max. 2,500 psi S: Allowable Fiber Stress (16,000-18,000 psi) for Grade A. But in no case shall the stress produced exceed 80% of the specified Y.P. | ± 1% of OD | | + not limited -12.5% |
| Welded Portion: H = 2/3D The Other Side: H = 1/2D | -- | -- | Up to 1.90" 2" & over Under 2-1/2" 2-1/2" to 3-1/2" excluding 3-1/2" to 5-1/2" excluding 5-1/2" & over Square of Radii | ± 0.5% ± 0.75% ± 0.02" ± 0.025" ± 0.03" ± 1% ± 2% max. | ± 10% |
| Welded Portion: H = 2/3D The Other Side: H = 1/3D | -- | P=2St/D S: Allowable Fiber Stress of 14,000 psi | As per Table 4 & 7 | | As per Table 6 & 8 |
| -- | 6D at 90° | -- | + 0.001" - 0.005" | -- | Nominal 0.04" - 0.072" Min. 0.036" - 0.068" |
| Max. 3t Max. 5t Max. 8t | -- | -- | 1" & under Over 1" to 2" Over 2" to 2-1/2" Over 2-1/2" to 3" Over 3" to 3-1/2" Over 3-1/2" to 4" Over 4" to 4-1/2" | ±0.004" ±0.005" ±0.007" ±0.008" ±0.010" ±0.012" ±0.015" | ±8% |
| -- | 6D at 180° | -- | Only 1.906" | ±0.013" - 0.017" | +20% - 10% |
| Apply for NB > 2" Welded Portion: H=0.75D The Other Side: H=0.6D | Apply for NB < 2" Ungalvanized Tubes: 6D at 180°; Galvanized Tubes: 8D at 90° | P=700 lbf/in ² (50 kgf/cm ²) | Light Tubes: Medium, Heavy Tubes: | Table 1 Table 2 | Light Tubes: -8%; + not limited Medium, Heavy Tubes: -10%; + not limited |
| Max. 3t Max. 5t Max. 8t | -- | -- | 1-1/4" & under Over 1-1/4" to 1-5/8" | +0.001" -0.005" +0.002" - 0.006" | ±8% |
| H' = 3t or 1/2D H' = 6t or 3/4D H' = 8t or 7/8D H' = 6t or 3/4D (whichever is the smaller) | -- | -- | 1" & under over 1" to 2" over 2" to 2-1/2" over 2-1/2" to 3" over 3" to 3-1/2" over 3-1/2" to 4" over 4" to 4-1/2" over 4-1/2" to 5" over 5" to 5-1/2" over 5-1/2" to 6" over 6" to 6-5/8" | ± 0.006" ± 0.007" ± 0.009" ± 0.010" ± 0.012" ± 0.014" ± 0.016" ± 0.018" ± 0.020" ± 0.022" ± 0.025" | ±8% |

*9: P = Test Pressure

*10 t = Thickness of Flat Portion

| Standard Specification | Scope | Grade of Tubes | Chemical Composition Percentage (max. unless range is given) | | | | Mechanical Properties | | | | |
|------------------------|---|--|--|------------|------|------|-------------------------|-------------------------|-------------------------|-----------------|--------------|
| | | | C | Mn | P | S | Condition (min.) | Tensile Strength (min.) | Yield Strength (% min.) | Elongation | |
| | | | | | | | | | | 8 | 9 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| JIS-G 3444 | E.R.W. Carbon Steel Pipes for Civil Engineer Architecture, Steel Towers, Scaffolding, Pile Struts & other Structures. | STK - 30 STK - 41 STK - 51 STK - 50 | -- | -- | 0.05 | 0.05 | As Rolled | kgf/mm ² | kgf/mm ² | longitudinal | transversal |
| | | | No. 11,12 T.P. | No. 5 T.P. | 30 | -- | | 30 | 25 | | |
| | | | 23 | 18 | 41 | 24 | | 23 | 18 | | |
| | | | 15 | 10 | 51 | 36 | | 15 | 10 | | |
| | | | 0.18 | 1.50 | 0.04 | 0.04 | | 50 | 32 | 23 | 18 |
| JIS-G 3445 | E.R.W. Carbon Steel Pipes for Machine Structural Purposes | STKM-11A | 0.12 | 0.25-0.6 | 0.04 | 0.04 | As Rolled | 30 | -- | No.4,11,12 T.P. | No. 4,5 T.P. |
| | | STKM-12A | 0.20 | 0.25-0.6 | 0.04 | 0.04 | | 35 | 18 | 35 | 30 |
| | | STKM-12B | | | | | | 40 | 28 | 25 | 20 |
| | | STKM-12C | | | | | | 48 | 36 | 20 | 15 |
| | | STKM-13A | 0.25 | 0.30-0.9 | 0.04 | 0.04 | | 38 | 22 | 30 | 25 |
| | | STKM-13B | | | | | | 45 | 31 | 20 | 15 |
| | | STKM-13C | 0.30 | 0.30-1.0 | 0.04 | 0.04 | | 52 | 39 | 15 | 10 |
| | | STKM-14A STKM-14B | | | | | | 42 51 | 25 36 | 25 15 | 20 10 |
| JIS-G 3452 | E.R.W. Carbon Steel Pipes for ordinary use | SGP | -- | -- | 0.05 | 0.05 | As Rolled (Black Tubes) | 30 | -- | No. 11, 12 T.P. | No. 5 T.P. |
| | | | | | | | | | 30 | 25 | |
| JIS-G 3466 | E.R.W. Carbon Steel Square Tubes for General Structural Purposes | STKR-41 | 0.25 | -- | 0.04 | 0.04 | As Rolled | 41 | 25 | No. 5 T.P. | -- |
| | | STKR-50 | 0.18 | 1.50 | 0.04 | 0.04 | | 50 | 33 | 23 | -- |

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*4: T.P. = Test Piece as per JIS Z2201
 *5: H = Distance between Outside Surfaces

*6: D = Outside Diameter
 *7: t = Wall Thickness of Tubes
 *8: H' = Distance between Inside Surfaces

| Other tests | | | Dimensional Tolerances | |
|--|--|--------------------------|---|--|
| Flattening (min.) | Bend Test | Hydrostatic Test | On Diameter except for Non-Circular Tubes | On Wall Thickness |
| 12 | 13 | 14 | 15 | 16 |
| H = 2/3D H = 2/3D H = 7/8D H = 7/8D | 6D at 90° 6D at 90° 8D at 90° 6D at 90° | -- -- -- | Under 50 mm ± 0.25 mm 50 mm & over ± 0.50 % | Under 3mm ± 0.30 mm 3mm- 12 mm ± 10% excluding |
| H = 1/2D H = 2/3D H = 2/3D -- H = 2/3D H = 3/4D -- H = 3/4D H = 7/8D | 4D at 180° 6D at 90° 6D at 90° -- 6D at 90° 6D at 90° -- 6D at 90° 8D at 90° | -- | As per Classification (No. 1,2,3) of Table 4 | As per Classification (No. 1,2,3) of Table 5 |
| H = 2/3D | 6D at 90° | P=25 kgf/mm ² | 10.5 to 48.6 mm ± 0.50 mm 60.5 to 165.2 mm ± 1% | + not limited - 12.5% |
| -- | -- | -- | Up to 100 mm ± 1.5mm Over 100 mm ± 1.5% Squareness of side ± 1.5° Radii of corner Max. 3t' | Up to 3mm ± 0.30 mm 3mm & over ± 10% |

*9: P = Test Pressure

*10 t' = Thickness of Flat Portion