

HOLLOW STRUCTURAL SECTIONS

**RECOMMENDATIONS FOR SOFT CONVERSION OF HSS SIZES
FROM U.S. CUSTOMARY UNITS TO METRIC (SI) UNITS**



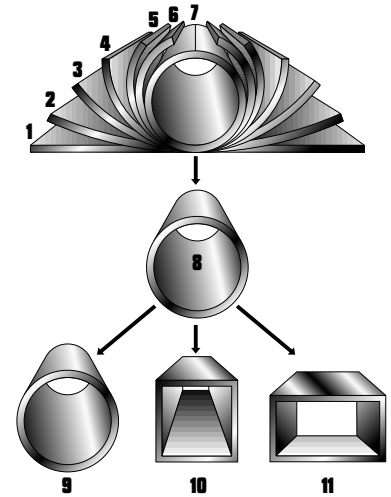
**Steel Tube
Institute**
OF NORTH AMERICA

HSS Manufacturing Methods

The transformation of steel strip into hollow structural sections (HSS) is the result of a series of operations including forming, welding and sizing. Currently three methods are being used in North America for the manufacture of HSS. These methods are described below. Each method meets ASTM A-500 and CSA-G40.21-92 requirements for the manufacture of HSS, and the sizes listed in this brochure may be produced to either standard.

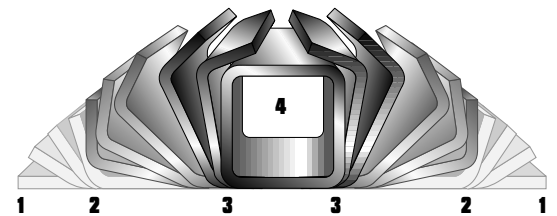
Electric Resistance Welding (ERW) Process

In the tube mill, flat steel strip (1) is formed continuously around its longitudinal axis to produce a round tube. This is done by moving the strip through a progressive set of rolls (2-6). The strip edges (7) are heated by either high-frequency induction or contact welding and then forged together by weld rolls to create a continuous longitudinal weld without the addition of filler metal. The weld seam (8) is then cooled and processed through a set of sizing/shaping rolls which cold-form it into a round (9), square (10) or rectangular (11) section.



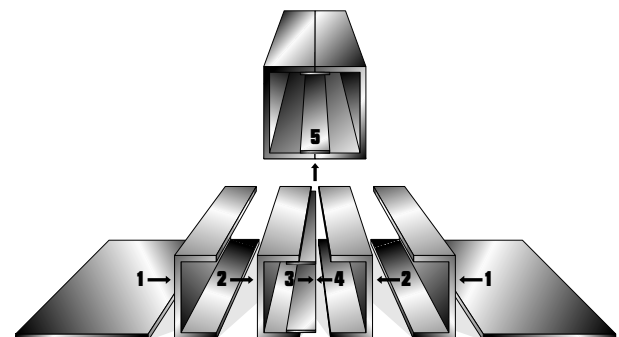
Form-Square Weld-Square (ERW) Process

In the weld mill, driven forming dies progressively shape the flat strip (1) by forming the top two corners (2) of the square or rectangular tube in the initial forming station. Subsequent stations form the bottom two corners (3) of the shape. No cold working of the sides of the shape is performed, and the shape's seam is welded by high-frequency contacts when the tube is near its final shape and size. The welded tube (4) is cooled and then driven through a series of sizing stations which qualifies the tube's final dimensions.



Submerged Arc Weld (SAW) Process

Two identical pieces of flat strip (1) are placed in a press brake and formed into two identical halves (2) of a finished tube size. A backup bar is tack welded to each leg of one of the half-sections (3). The two half-sections are fitted together toe-to-toe (4) and welded by the submerged arc process to complete the square or rectangular section (5).





A User's Guide for the Soft Conversion of HSS Sizes from U.S. Customary Units to Metric (SI) Units

The International System of Units (System International or 'SI') has been adopted as the preferred system of measurement in the United States. As a result, architects, engineers and fabricators are increasingly being required to use metric products in construction.

This publication is intended to provide help to designers, builders and manufacturers in specifying and providing HSS in metric applications. These guidelines can be used to develop soft conversion of HSS sizes from U.S. customary units to metric units.

Conversion Factor:

- 1 inch equals 25.4 millimeters exactly

Nominal Width and Nominal Depth (millimeters)

Presented as a decimal number, rounded to the nearest one-tenth of a millimeter.

e.g., 8 inch width or depth

= 203.200 mm (exact conversion)

= 203.2 mm (rounded value)

See Table 1 for a summary of typical nominal widths and typical nominal depths for square and rectangular HSS.



Nominal Thickness (millimeters)

Presented as a decimal number, rounded to the nearest one-tenth of a millimeter.

e.g., 1/8 inch thickness

= 3.1750 mm (exact conversion)

= 3.2 mm (rounded value)

Design Thickness (millimeters)

Presented as a decimal number, rounded to the nearest one-tenth of a millimeter.

e.g., 0.116 inch thickness

= 2.9464 mm (exact conversion)

= 2.9 mm (rounded value)

See Table 2 for a summary of typical nominal wall thicknesses and corresponding typical design wall thicknesses for square and rectangular HSS.

See Table 4 for a summary of typical nominal wall thicknesses and corresponding typical design wall thicknesses for round HSS.

Nominal Diameter (millimeters)

Presented as a decimal number, rounded to the nearest one-tenth of a millimeter.

e.g., 8.75 inch diameter

= 222.250 mm (exact conversion)

= 222.3 mm (rounded value)

See Table 3 for a summary of typical nominal diameters for round HSS.

Sample Soft Conversions to Metric

HSS 5 x 3 x 3/16 becomes

HSS 127.0 x 76.2 x 4.8 (metric)

HSS 1 1/4 x 1 1/4 x 1/8 becomes

HSS 31.8 x 31.8 x 3.2 (metric)

HSS 8.625 x 0.322 becomes

HSS 219.1 x 8.2 (metric)



**Table 1: Metric Conversion of Depth/Width
for Rectangular & Square HSS**

Depth & Width Dimensions							
U.S. Customary Units	U.S. Customary Units	Metric* Units (Exact Conversion)	Metric Units Rounded	U.S. Customary Units	U.S. Customary Units	Metric* Units (Exact Conversion)	Metric Units Rounded
Inches	Inches	mm	mm	Inches	Inches	mm	mm
32	32.000	812.800	812.8	6	6.000	152.400	152.4
30	30.000	762.000	762.0	5 1/2	5.500	139.700	139.7
28	28.000	711.200	711.2	5	5.000	127.000	127.0
26	26.000	660.400	660.4	4 1/2	4.500	114.300	114.3
24	24.000	609.600	609.6	4	4.000	101.600	101.6
22	22.000	558.800	558.8	3 1/2	3.500	88.900	88.9
20	20.000	508.000	508.0	3	3.000	76.200	76.2
18	18.000	457.200	457.2	2 1/2	2.500	63.500	63.5
16	16.000	406.400	406.4	2 1/4	2.250	57.150	57.2
14	14.000	355.600	355.6	2	2.000	50.800	50.8
12	12.000	304.800	304.8	1 3/4	1.750	44.450	44.5
10	10.000	254.000	254.0	1 5/8	1.625	41.275	41.3
9	9.000	228.600	228.6	1 1/2	1.500	38.100	38.1
8	8.000	203.200	203.2	1 1/4	1.250	31.750	31.8
7	7.000	177.800	177.8	1	1.000	25.400	25.4

**Table 3: Metric Conversion of
Outside Diameter for Round HSS**

Outside Diameter Dimensions					
U.S. Customary Units	Metric* Units (Exact Conversion)	Metric Units (Rounded)	U.S. Customary Units	Metric* Units (Exact Conversion)	Metric Units (Rounded)
Inches	mm	mm	Inches	mm	mm
20.000	508.0000	508.0	6.625	168.2750	168.3
18.000	457.2000	457.2	6.125	155.5750	155.6
16.000	406.4000	406.4	6.000	152.4000	152.4
14.000	355.6000	355.6	5.563	141.3002	141.3
12.750	323.8500	323.9	5.500	139.7000	139.7
12.500	317.5000	317.5	5.000	127.0000	127.0
11.250	285.7500	285.8	4.500	114.3000	114.3
10.750	273.0500	273.1	4.000	101.6000	101.6
10.000	254.0000	254.0	3.500	88.9000	88.9
9.625	244.4750	244.5	3.000	76.2000	76.2
8.750	222.2500	222.3	2.875	73.0250	73.0
8.625	219.0750	219.1	2.500	63.5000	63.5
7.625	193.6750	193.7	2.375	60.3250	60.3
7.500	190.5000	190.5	1.900	48.2600	48.3
7.000	177.8000	177.8	1.660	42.1640	42.2
6.875	174.6250	174.6			

Table 2: Metric Conversion of Wall Thickness for Rectangular & Square HSS

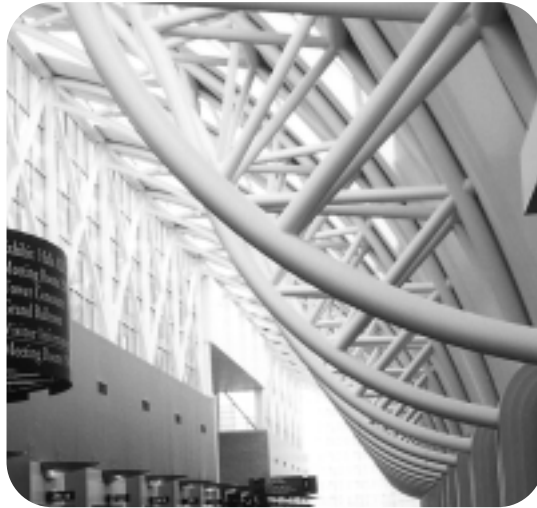
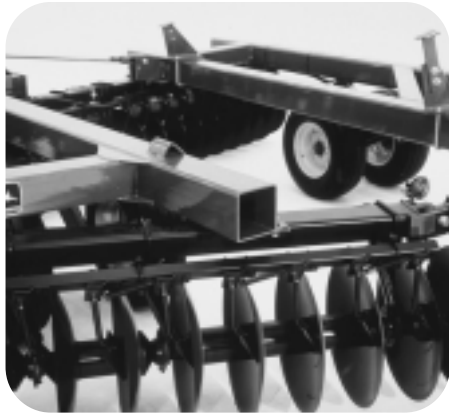
Thickness Dimensions						
	Nominal Thickness			Design Thickness		
U.S. Customary Units	U.S. Customary Units	Metric* Units (Exact Conversion)	Metric Units Rounded	U.S. Customary Units	Metric* Units (Exact Conversion)	Metric Units Rounded
Inches	Inches	mm	mm	Inches	mm	mm
5/8	0.6250	15.8750	15.9	0.581	14.7574	14.8
1/2	0.5000	12.7000	12.7	0.465	11.8110	11.8
3/8	0.3750	9.5250	9.5	0.349	8.8646	8.9
5/16	0.3125	7.9375	7.9	0.291	7.3914	7.4
1/4	0.2500	6.3500	6.4	0.233	5.9182	5.9
3/16	0.1875	4.7625	4.8	0.174	4.4196	4.4
1/8	0.1250	3.1750	3.2	0.116	2.9464	3.0

* Metric Units = U.S. Customary Units x 25.4

Table 4: Metric Conversion of Wall Thickness for Round HSS

Thickness Dimensions					
Nominal Thickness			Design Thickness		
U.S. Customary Units	Metric* Units (Exact Conversion)	Metric Units (Rounded)	U.S. Customary Units	Metric* Units (Exact Conversion)	Metric Units (Rounded)
Inches	mm	mm	Inches	mm	mm
0.6250	15.8750	15.9	0.581	14.7574	14.8
0.5000	12.7000	12.7	0.465	11.8110	11.8
0.4380	11.1252	11.1	0.407	10.3378	10.3
0.4320	10.9728	11.0	0.402	10.2108	10.2
0.3750	9.5250	9.5	0.349	8.8646	8.9
0.3650	9.2710	9.3	0.340	8.6360	8.6
0.3370	8.5598	8.6	0.313	7.9502	8.0
0.3220	8.1788	8.2	0.300	7.6200	7.6
0.3130	7.9502	8.0	0.291	7.3914	7.4
0.3120	7.9248	7.9	0.291	7.3914	7.4
0.3000	7.6200	7.6	0.279	7.0866	7.1
0.2800	7.1120	7.1	0.260	6.6040	6.6
0.2580	6.5532	6.6	0.240	6.0960	6.1
0.2500	6.3500	6.4	0.233	5.9182	5.9
0.2370	6.0198	6.0	0.220	5.5880	5.6
0.2260	5.7404	5.7	0.210	5.3340	5.3
0.2200	5.5880	5.6	0.205	5.2070	5.2
0.2180	5.5372	5.5	0.203	5.1562	5.2
0.2160	5.4864	5.5	0.201	5.1054	5.1
0.2130	5.4102	5.4	0.198	5.0292	5.0
0.2030	5.1562	5.2	0.189	4.8006	4.8
0.1880	4.7752	4.8	0.175	4.4450	4.4
0.1540	3.9116	3.9	0.143	3.6322	3.6
0.1520	3.8608	3.9	0.141	3.5814	3.6
0.1450	3.6830	3.7	0.135	3.4290	3.4
0.1400	3.5560	3.6	0.130	3.3020	3.3
0.1340	3.4036	3.4	0.125	3.1750	3.2
0.1250	3.1750	3.2	0.116	2.9464	2.9
0.1200	3.0480	3.0	0.112	2.8448	2.8

* Metric Units = U.S. Customary Units x 25.4



**“Designs for
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