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INDUSTRY TECHNICAL NOTE
COLD FORMED STEEL CONSTRUCTION

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METRIC CONVERSION – SSMA TABLES

INTRODUCTION

Occasionally it is desirable to convert English units to metric units especially for federal projects where a "soft conversion" is required.

SSMA along with the input from the ASTM Committees that address cold-formed steel issues have agreed that a "soft conversion" is appropriate for section properties and the limiting load or span capacities, but is not required for the section designator. The depth of the member, width of the flange, and thickness are part of the designation call-out and is not to be converted to a metric designator. The designator is for specifying a certain member configuration, which is based on the English system, however it does not require converting to a metric designator. As an example, 600S162-33 in the English system would remain 600S162-33 in the metric system. All of the section properties and limiting heights or load capabilities can be converted to the metric system using a conversion multiplier.

OBSERVATIONS

To perform the "soft conversion", the appropriate conversion factor must be used for each section property value and each load or limiting height table. In general, dimensions will be expressed in millimeters (mm), height in meters (m), loads per unit length in Newton per meter (N/m), and applied pressure in Newton per square meter (N/m^2). Allowable spans will be expressed in meters (m), allowable axial loads in kilo Newtons (k-N), and allowable uniform loads in Newton per meter of length (N/m).

For the commonly used section property values, the yield stress (F_y) will be expressed in megapascals (Mpa), moment of inertia (I_{xx}) in millimeters to the fourth power (mm^4), section modulus (S_{xx}) in millimeters to the third power (mm^3), cross sectional area (A) in millimeters squared (mm^2), and allowable moment (M_a) in Newton-meters (N-m).

To assist with the "soft conversion", the common references and dimensional properties of the SSMA published standard shapes can be cross referenced as follows:

Thickness – Steel Components

Minimum Thickness		Design Thickness		Gauge Reference
(mils)	(mm)	(inches)	(mm)	Only
18	0.454	0.0188	0.478	25
27	0.683	0.0283	0.719	22
30	0.753	0.0312	0.792	20(drywall)
33	0.835	0.0346	0.879	20(structural)
43	1.088	0.0451	1.146	18
54	1.366	0.0566	1.438	16
68	1.720	0.0713	1.811	14
97	2.454	0.1017	2.583	12

Member Properties

Web Depths		Flanges	
(inches)	(mm)	(inches)	(mm)
1.625	41	1.00	25
2.5	64	1.25	32
3.5	89	1.375	35
3.625	92	1.50	38
4	102	1.625	41
5.5	140	2.00	51
6	152	2.50	64
8	203		
10	254		
12	305		

CONVERSION VALUES

The conversion values to be used for the section properties and allowable load or span tables listed in the SSMA Catalog are as follows:

Section Properties	Multiplier	Units
Dimensions in inches	25.4	mm
Yield Stress (F_y) ksi	6.895	Mpa
Area in sq. inches	645.2	mm^2
Weight in lb/ft	14.592	N-m
Mom. of Inertia (I_{xx},I_{yy}) in^4	416,231	mm^4
Sect. Modulus (S_{xx},S_{yy}) in^3	16,387	mm^3
Allowable Mom. (M_a) in-kips	113.0	N-m
Allowable Shear (V_a) lb	4.448	N
St. Venant Constant (J) in^4	416,231	mm^4
Warping Constant (C_w) in^6	268.5 x 10^6	mm^6
Allowable Tables	**Multiplier**	**Units**
Limiting Span (ft & in) (convert to feet first)	0.3048	meter (m)
Pounds/sq.ft. (psf)	47.880	N/m^2
Kips (1000 lbs)	4.448	k-N
Uniform Loads (lb/ft)	14.594	N/m
Load in Pounds (lbs)	4.448	N
Pound per Inch (lb/in)	0.175	N/mm

EXAMPLE

An example of a standard section from the SSMA Catalog will be used to demonstrate a conversion from English to metric units. A **600S162-33** will be used in this example.

Section Properties (Page 7)		
Area (in^2) =	(0.344 x 645.2) =	221.9mm^2
Weight (lb/ft) =	(1.17 x 14.592) =	17.07 N/m
Effective I_{xx} (in^4) =	(1.793 x 416,231) =	746,302mm^4
Effective S_{xx} (in^3) =	(0.577 x 16,387) =	9,455mm^3
Allow. Mom. M_a (in-k) =	(11.41x 113.0) =	1289 N-m
Allowable Shear V_a (lb) =	(612 x4.448) =	2722 N
Torsional Properties:		
St. Venant Coef. J =	(0.137x416,231) =	57,023mm^4
Warping Cons. C_w =	(0.851x268.5x10^6) =	228.5x10^6
Shear Ctr. to N.A. X_o =	(-1.091x25.4) =	-27.711mm
Radii of Gyration R_o =	(2.595x25.4) =	65.913mm

The allowable limit values for this section can also be converted based on the respective tables in the SSMA Catalog.

Limiting Wall Heights – Curtain Wall (Page 18)

15psf (718 N/m^2), 16 in. oc (406mm)		
L/240	18' 0"	(18.0' x 0.3048) = 5.49m
L/360	15' 9"	(15.75' x 0.3048) = 4.80m
L/600	13' 3"	(13.25' x 0.3048) = 4.04m

Combined Axial And Lateral Load (Page 23)

20psf (957 N/m^2), 10ft. Wall (3.05m)	
12" oc 305mm)	2.54 Kips (x 4.448) = 11.30 k-N
16" oc 406mm)	2.41 Kips (x 4.448) = 10.72 k-N
24" oc 610mm)	1.95 Kips (x 4.448) = 8.67 k-N

Floor Joist Span Tables (Page 33)

10psf (479 N/m^2), 40psf (1915 N/m^2), Single Span	
12" oc (305mm)	12' 3" (12.25' x 0.3048) = 3.73m
16" oc (406mm)	10' 8" (10.67' x 0.3048) = 3.25m
24" oc (610mm)	8' 8" (8.67' x 0.3048) = 2.64m

Header Allowable Uniform Loads (Page 37)

3' Span (0.91m), 816 lb/ft (x 14.594) =	11,909 N/m
4' Span (1.22m), 612 lb/ft (x 14.594) =	8931 N/m
5' Span (1.52m), 489 lb/ft (x 14.594) =	7136 N/m
6' Span (1.83m), 408 lb/ft (x 14.594) =	5954 N/m
8' Span (2.44m), 237 lb/ft (x 14.594) =	3459 N/m

Allow. Web Crippling - Single Member (Page 40)

Condition 1, with Different Bearing Lengths
1.0" (25mm) 156lbs (x 4.448) = 694 N/web
3.5" (89mm) 244lbs (x 4.448) = 1085 N/web
4.0" (102mm) 262lbs (x 4.448) = 1165 N/web
6.0" (152mm) 332lbs (x 4.448) = 1477 N/web

Allow. Ceiling Spans - Def'l Limit L/240 (Page 42)

4psf (192 N/m^2) Unsupported Compression Flange		
Joist Spacing		
12"oc (305mm)	16' 10"	(16.83' x .3048) = 5.13m
16"oc (406mm)	15' 7"	(15.58' x .3048) = 4.75m
24"oc (610mm)	14' 0"	(14.0' x .3048) = 4.27m