C Sections
COLD FORMED STRUCTURAL SECTIONS

TECHNICAL NOTES

C AND Z-SECTION TECHNICAL NOTES

1. Steel C and Z-section properties were calculated in accordance with 2004 NAS – Canada (LSD).
2. Steel conforms to ASTM A1011/1011M or G40.21, grade 55 ksi (380 MPa)
3. Roll-forming tolerances are in accordance with A660-04, Figure 2 Fabrication tolerance for formed structural members.
4. Point loads may require additional engineering and web stiffeners.
5. Field cutting/coping of flange/lips is not permitted. Adding additional openings in the web of the C and Z-sections for duct-work, cable trays or piping is not permitted unless the requirements of the CSSBI 59-05 Chapter 6 publication are followed.
6. Hanging loads from the outer most flange/lip of the C and Z-section is not permitted. See ExSteel guidelines for maximum hangar load locations and capacities. The ideal location for attachment of hanger load connections is directly from the web of the section. Hangar connection design not by ExSteel.
7. All load capacities assume the ends of the members are adequately restrained against rotation. Design of end connections is not by ExSteel.
8. When C and Z-sections are to be used in floor applications, the specific vibration characteristic of the floor should be evaluated by the designer. For information and guidance on vibrations due to walking of light-framed construction made of light steel members and wood deck, see the ATC design guide, Minimizing Floor Vibration (ATC, 1990).
9. When cyclic loading is a design consideration, the provisions of the 2004 NAS-Canada (LSD) Chapter G must be followed.
10. The provisions listed in the 2004 NAS-Canada (LSD) under section D3 Lateral Bracing must be checked. These provisions are for bracing that restrain C and Z-sections used as beams loaded in the plane of the web against twisting. This requirement applies when (a) the top flange is connected to deck or sheathing material in such a manner as to effectively restrain lateral deflection of the connected flange, or (b) neither flange is connected.
11. It is the customer's responsibility to specify to ExSteel the appropriate coating requirements of the sections ordered based on the products as installed application. Our standard pricing is for grey powder coat primer (epoxy/polyester hybrid), 1.5 mils film thickness.
12. The customer is to notify ExSteel of any damaged sections within 24 hours of receiving material.
13. The material presented in this section and the example calculation has been prepared for the general information of the reader. While the material is believed to be technically correct and in accordance with recognized practice at the time of publication, it should not be used without securing competent advice with respect to its suitability for any specific application. ExSteel does not warrant or assume any liability for the suitability of the material for any general or particular purpose.

C Sections
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SAMPLE CALCULATIONS

EXAMPLE (IMPERIAL)

Single span of:	20 ft.
Spacing of:	5 ft.
External pressure:	11.0 psf
Internal suction:	6.6 psf
External suction:	5.9 psf
Internal pressure:	4.4 psf
Total pressure =	(11.0 + 6.6) = 17.6 psf
Total suction =	(5.9 + 4.4) = 10.3 psf

Sag rods located at third points will hold straight horizontal line of girt, siding on outside flange attached at 12"o/c.

Pressure w_f =	1.4 x 17.6 psf x 5.0 ft. = 123.2 plf
Suction w_f =	1.4 x 10.3 psf x 5.0 ft. = 72.1 plf
M_f^+ =	0.123 klf x (20 ft.)^2 / 8 = 6.16 ft.-kip
M_f^- =	0.072 klf x (20 ft.)^2 / 8 = 3.605 ft.-kip
V_f =	0.123 klf x 20 ft. / 2 = 1.2 kip

$$I_{min} \text{ (deflection} < \text{span / 180)} = \frac{180 \times 5 \times 0.088 \text{ klf} \times (20 \text{ ft.})^3 \times 144}{384 \times 29{,}500 \text{ ksi}} = 8.1 \text{ in}^4$$

From the properties table, many profiles can be selected that will satisfy the value of I_{min}:

08C16	I_x = 8.9 in^4
08C14	I_x = 11.0 in^4
09C16	I_x = 12.1 in^4

From the resistance table for these three profiles:

$M_r > M_f^+$
M_p with 6 ft. 8 in. of unsupported compression flange > M_f^-

The sag rods (with double nut connection at each end) combined with exterior siding will provide lateral support to the interior flange of the girt in the absence of an interior lining.

$V_r > V_f$

$P_r > V_f$ except for the 09C16. If this profile is selected, the connection to the column shall be made by bolting the web to prevent web crippling over the bearing.

This design example is for simple span sections with one flange through fastened to deck or cladding and discrete bracing providing support for the opposite flange. For sections with one flange through fastened and no bracing, refer to 2004 NAS - Canada (LSD) C3.1.3.

For design of members in standing seam roof systems refer to 2004 NAS - Canada (LSD) C3.1.4 and all relevent appendices.

EXAMPLE (METRIC)

Single span of:	7500 mm
Spacing of:	1600 mm
External pressure:	0.38 kPa
Internal suction:	0.32 kPa
External suction:	0.28 kPa
Internal pressure:	0.32 kPa
Total pressure =	(0.38 + 0.32) = 0.7 kPa
Total suction =	(0.28 + 0.32) = 0.60 kPa

Sag rods located at third points will hold straight horizontal line of girt, siding on outside flange attached at 12"o/c.

Pressure w_f =	1.4 x 0.70 kPa x 1.6 m = 1.57 kN/m
Suction w_f =	1.4 x 0.60 kPa x 1.6 m = 1.34 kN/m
M_f^+ =	1.57 kN/m x (7.5 m)^2 / 8 = 11.0 kN-m
M_f^- =	1.34 kN/m (7.5 m)^2 / 8 = 9.5 kN-m
V_f =	1.57 kN/m x 7.5 m / 2 = 5.9 kN

$$I_{min} \text{ (deflection} < \text{span / 180)} = \frac{180 \times 5 \times 1.12 \text{ kN/m} \times (7{,}500 \text{ mm})^3}{384 \times 200{,}000 \text{ MPa}} = 5.5 \times 10^6 \text{ mm}^4$$

From the properties table, many profiles can be selected that will satisfy the value of I_{min}:

09C14	I_x = 6.2 x 10^6 mm^4
08C12	I_x = 6.3 x 10^6 mm^4
10C16	I_x = 6.7 x 10^6 mm^4

From the resistance table for these three profiles:

$M_r > M_f^+$
M_p with 2,500 mm of unsupported compression flange > M_f^-

The sag rods (with double nut connection at each end) combined with exterior siding will provide lateral support to the interior flange of the girt in the absence of an interior lining.

$V_r > V_f$

$P_r > V_f$ except for the 10C16. If this profile is selected, the connection to the column shall be made by bolting the web to prevent web crippling over the bearing. Final selection should be made according to the other bays of the building, as well as the value of saving steel or space.