# canadian institute of steel construction

national organization representing the structural steel, open-web joist and plate fabricating industries


1979 - April

CANADIAN INSTITUTE OF STEEL CONSTRUCTION

TO: CHIEF CONTACTS

Re: Technical Memorandums 2 and 3

Enclosed are Technical Memorandums No. 2 and 3 containing important information on the design of Hollow Structural Sections (HSS) manufactured according to CSA G40.20 Class C and on the eccentric load capacity of bolt groups.

Please refer this material to your technical staff.

The first technical memorandum concerned the modes of failure of certain bolted connections and was distributed in May 1978.

Yours very truly,

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TECHNICAL MEMORANDUM NO. 2

Re: Compressive Capacities of HSS Manufactured according to CSA G40.20 Class C

Both CSA Standards S16.1-1974 and S16.1-M78 limit the use of the column curve, given in these standards, to Class H (cold formed stress relieved or hot formed) HSS only, without giving any guidance as to the appropriate curve or curves to use when using Class C (cold formed non-stress relieved) HSS as compression members.

The matter of the appropriate column curves to be used for Class H and Class C, HSS is currently being debated by a special task group of the CSA S16 Committee.

In the interim, a conservative approach for Class C HSS columns would consist of computing the factored compressive resistance according to Curve 3 of the Structural Stability Research Councils' (SSRC), "Guide to Stability Design Criteria for Metal Structures", 3rd Edition.

Modified for LSD designs, Curve 3 is as follows:

1) $0 \leq \lambda < 0.15,\ C_r = \phi A F_y$

2) $0.15 \leq \lambda < 0.8,\ C_r = \phi A F_y\ (1.093 - 0.622\ \lambda)$

3) $0.8 \leq \lambda < 2.2,\ C_r = \phi A F_y\ (-0.128 + 0.707\ \lambda^{-1} - 0.102\ \lambda^{-2})$

4) $2.2 \leq \lambda < 5.0,\ C_r = \phi A F_y\ (0.008 + 0.792\ \lambda^{-2})$

where $\lambda = \frac{KL}{r}\sqrt{\frac{F_y}{\pi^2 E}}$

For allowable stress designs, the above values divided by 1.5 may be used as the allowable column load.

In the CISC Limit States Design Steel Manual, reference was made in Part 2, the Commentary, to Article 10.5 of the SSRC's "Guide" for round cold formed tubes. In addition, the paper by Drs. Birkemoe and Bjorhovde, in the Proceedings of the 1978 Canadian Structural Engineering Conference, is part of the material on the compressive strengths of HSS being reviewed by the S16 Committee.

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# TECHNICAL MEMORANDUM NO. 3

Re: AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, November 1, 1978

## General

The above specification comes with a warning about the use of Tables X, XI, XII and XIII, Eccentric Loads on Fastener Groups, as published in the 7th Edition of the ASIC Manual.

Using these AISC tables with the new higher stresses for bolts will result in an overestimate of the eccentric load permitted on the bolt group in the order of 20%.

## Alternate Procedures

Any of the following three procedures will result in comparable satisfactory designs.

1) Using the coefficient C from Tables 3-7 to 3-16 of the CISC LSD Steel Manual and
   a) the allowable shear on the bolt will produce the allowable load on the group of bolts
   or
   b) the factored resistance of the bolt will produce the total factored eccentric load permitted on the group of bolts.

2) Use the real eccentric distance instead of the effective distance for the AISC tables. This is conservative with the higher bolt stresses.

3) Follow the procedure recommended by Fisher & Struik's "Guide to Design Criteria of Bolted and Riveted Joints" (page 223). This will result in an almost identical capacity as that calculated in alternative 1).