

DESIGNING FOR LARGE COPE DEPTHS

Beams coped at both flanges are constrained to $c \leq 2d$ and $d_c \leq 0.2d$ in the 2nd Edition *LRFD Manual*, Vol. II, where c is the length of cope, d is the depth of the beam, and d_c is the depth of cope. How can beams with deeper copes ($d_c > 0.2d$) be designed?

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in compression only, the washers are normally controlled by erection considerations. If there is a moment at the base, uplift and/or shear, the washer requirements may be very critical to the performance of the structure and the engineer should specify what is required.

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ASTM A572 GRADE 50 AND ASTM A992

Are there any differences between steel grades ASTM A572 Gr. 50 and ASTM A992?

Question sent to AISC Steel Solutions Center

There are differences, although the two materials are similar. ASTM A992 should be specified for all W-shapes used today. It is similar to ASTM A572 Gr. 50, but has better controls on chemistry and mechanical properties. It includes minimum values for yield and tensile strengths, a maximum ratio for yield strength to tensile strength, and a maximum carbon equivalent value. It is also less expensive than ASTM A572 Gr. 50 (and ASTM A36) for wide flange shapes. Note, however, that ASTM A992 is not currently used in the production of any shapes besides W-shapes

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BENDING LIMITS

What are the maximum and minimum curved radii of HSS and W-shapes?

Question sent to AISC Steel Solutions Center

Limits on radii of curved shapes are essentially a function of the capabilities of the bender. Such deformations generally cannot approach deformations that would damage the material as can be the case for bent plates. As a result, AISC does publish guidelines for bending plates in the 3rd Edition

Cold bending guidelines for shapes are also found in the 3rd Edition on page 2-39. They are summarized below:

1. The minimum radius for camber induced by cold bending in members up to a nominal depth of 30" is between 10 and 14 times the depth of the member. Deeper members may require a larger minimum radius.
2. Cold bending may be used to provide sweep in members to practically any radius desired.
3. A length limit of 40 ft to 50 ft is practical.

Bending by heat is also a possibility, but this procedure is generally much more expensive than cold bending.

Note that providers for structural shape (including HSS) curving/bending often advertise their services in and/or participate in the steel bending products listing (see the May 2003 issue). A curving or

bending service supplier would be the best contact for determining minimum and maximum curved radii of specific shapes.

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PREVIOUS QUESTIONS

Do you have an answer? Send it to solutions@aisc.org.

PRYING ACTION

From January 2003 Steel Interchange

The 9th Edition *ASD Manual* illustrates procedures for bolted hanger-type connections with a single line of resistance to prying action on each side of the hanging member. If each line of resistance consists of a bolt group, what design and analysis methods should be used?

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HEIGHT-THICKNESS RATIOS

From March 2002 Steel Interchange

Referring to *LRFD Specification* Sections F2.2, Appendix F2.2, and Appendix G.3:

For all of the standard rolled W-shapes, is the h/t_w ratio always less than 260? In other words, if a standard rolled shaped is being considered, is it necessary to check for the limit states of web shear yielding or bucking? Also, for all the standard rolled W-shapes utilizing up to 50 ksi specified minimum yield strength, is it always true that:

$$h/t_w \leq \frac{418}{\sqrt{F_y}}$$

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HEIGHT LIMITATIONS IN OMFS

From March 2003 Steel Interchange

Why has the height limitation of 160 ft for OMFs in UBC 97 been reduced to 35 feet in the IBC 2000, for structural steelwork buildings in Seismic Design Category (SDC) D? I can't point to an exact reason, but commentary from some of the steel seismic seminars leads me to believe that AISC wants people use special frames of all types for almost everything (except maybe SDC A and B). I would expect the penalties to keep going for using ordinary frames in zone with moderate seismicity as well.



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