Revised Code Brings Together Full Design Team

By Charles J. Carter, S.E., P.E.

For the first time, AISC brought together representatives from the entire steel design and construction team to revise the *Code of Standard Practice for Steel Buildings and Bridges*. The new document, the fifth revision since it was first published in 1924, also features another first: It can be downloaded at no charge from AISC's website at:

www.aisc.org/code.html

From adding provisions for fast-track project delivery to clarifying the language relating to connection design responsibility, the new Code offers clear-cut document language for every steel project. In essence, the Code helps to eliminate the need to reinvent the wheel every time a new contract is let. The scope statement in Section 1.1 of the Code indicates "In the absence of specific instructions to the contrary in the contract documents, the trade practices that are defined in this Code shall govern the fabrication and erection of structural steel." Thus, the Code is the standard of custom and usage for structural steel fabrication and erection. Alternative and supplementary requirements may exist in the contract documents and would control; however, the corresponding commentary clarifies that there may be some cost associated with such requirements.

Dated March 7, 2000, the new edition replaces the June 10, 1992 edition. Represented on the code Committee were six structural engineers, two architects, one general contractor, seven fabricators, one steel detailer, three steel erectors and one attorney. These members also brought informal representation of several affiliated and interested organizations: the National Council of Structural Engineering Associations (NCSEA), the Council of American Structural Engineers (CASE), the Structural Engineering Institute (SEI) of the American Society of Civil Engineers (ASCE), the American Institute of Architects (AIA), NEA The Association of Union Constructors (formerly the National Erectors Association), the Steel Erectors Association of America (SEAA), the National Institute of Steel Detailing (NISD) and Arcom Master Systems (MASTERSPEC).

What's New in the Updated Code?

The following is a summary of the major changes that have been made in this 2000 edition of the Code. In many cases, it may be helpful to have the new Code handy while reading this article. The new Code is available as a free download from the AISC web site:

www.aisc.org/code.html

It's also available as a printed (paper) document for a fee of $10 + s/h from the AISC bookstore at www.aisc.org or by calling 800/644-2400.

Commentary information, when applicable, has been placed in shaded boxes immediately following its corresponding section of the Code. The Commentary often provides guidance and insight into the issues that surround a particular Code provision or requirement. This additional information can often be invaluable when applying and interpreting the Code.

Use of the term "Owner" throughout this Code generally has been eliminated, where appropriate. As it used to be, the term "Owner" most often really meant the owner's representative, but it was just as often not clear whether this was the designer or the constructor. To eliminate this confusion in the new Code, one or both of the terms "Owner's Designated Representative for Design" and "Owner's Designated

Representative for Construction" has been used. These terms and the term "Owner", which is still used when appropriate, remain general enough to allow for the normal range of contractual arrangements, but are specific enough so that the intent is clear.

Both U.S. customary units and metric units have been provided. Inches and pounds are the base units, with rationalized conversions to millimeters and kilograms given as an alternative. To avoid conflict due to rounding, it is required that these two systems of units be used consistently and independently. See Code Section 1.3.

Requirements for existing structures have been added in Section 1.7 to cover issues in existing structures, such as demolition and shoring, protection against damage, surveying or field dimensioning and hazardous materials. Although each of these considerations is not applicable to every project, their inclusion in this Code serves to highlight the associated issues. The default condition in the Code states that someone other than the fabricator and erector is responsible for these considerations.

The classifications of materials in Section 2 have been editorially revised and expanded. Section 2.1 lists items that are considered to be structural steel and, therefore, covered by the Code. Section 2.2 lists items that are not. For the most part, the items in Section 2.1 are produced in the fabrication shop or are directly related to those items. Other items and the items in Section 2.2 are not.

Provisions for the resolution of discrepancies have been added in Section 3.3. Essentially, the added provisions require that discrepancies be reported when discovered, but do not obligate the fabricator to find discrepancies. For the case where a discrepancy is discovered after fabrication and/or erection, an order of precedence of the various contract documents is maintained as well, although the order of precedence has been changed for simplicity and to better reflect current practices. In the new Code, the design drawings govern over the specifications for both buildings and bridges.

The provisions in the Code for revisions have been clarified in Section 3.5. "… all revisions, including those that are communicated through the annotation of shop and/or erection drawings …, shall be clearly and individually indicated in the contract documents." It is also required that the contract documents be dated and identified by revision number (and the same drawing number throughout the project). See box on next page and also Code Sections 3.5, 3.6, 4.4.2 and 9.4.1.

Provisions for fast-track project delivery have been added in Section 3.6. Fast-track is recognized as a great option among project delivery systems that has the potential to make steel the best (if not the only) choice for construction. On the other hand, it also highlights the risk the Owner must accept for additional design and construction costs when the structural design, fabrication and/or erection is completed before other aspects, such as the architectural program and mechanical systems, have been completed.

The responsibilities of the various entities involved in the shop and erection drawing approval process have been simplified and clarified in Section 4. This item is discussed in greater detail later in this article.

Issues regarding the use of design drawings by the fabricator and/or the erector are now covered in Section 4.3. Permission is required for such use, since drawings represent intellectual property. Other more specific requirements apply as indicated in that Section.

The permissible variation from theoretical curvature for a curved member is now covered in Section 6.4.2. To do so, the ASTM A6/A6M tolerances for out-of-straightness for a straight member are applied relative to the theoretical line of curvature of the curved piece of equivalent length.

Provisions have been added in Section 6.4.5 to cover permissible variations in camber for fabricated trusses. At specified points of camber in fabricated trusses, the tolerance on the camber ordinate is given as 1/800 times the distance from that point to the nearest point of support. (See Figure C-6.1 above).

Section 6.5 has been editorially restructured and substantively modified to recognize that the majority of steel in building structures need not be primed or painted. Otherwise, the requirements in Section 6.5 are similar to those in past editions of the Code.

Coverage of bearing devices has been revised: installation of bearing devices is now covered in Section 7.6 and grouting is covered in Section 7.7. Mostly, this change emphasizes the importance of the timing of the grouting operation, which is now more specifically covered in the Code.

Use of the terms self-supporting and non-self-supporting (in the old Section 7.9) has been eliminated and replaced with the provisions for temporary support in Section 7.10. Also, the loads that require consideration during erection have been revised. These changes are discussed in greater detail later in this article.

The intent of the provisions that address the accumulation of mill tolerances and fabrication tolerances and their relationship to the erection tolerances has been clarified in Section 7.12. The accumulation of mill and fabrication tolerances is allowed, but subject to the limitation that the erection tolerances are not exceeded.

Quality-assurance provisions in Section 8 have been revised to recognize both the AISC Quality Certification program for fabricators and the AISC Erector Certification program.

AESS requirements for welds have been clarified in Sections 10.2.5. In the absence of other criteria, the visual criteria in AWS D1.1 apply.

AESS requirements for HSS weld seams have been added in Section 10.2.8. It is required that weld seams be oriented away from view or as directed in the contract documents.

There are other changes, but those are the major ones. The following two sections of this article deal with two issues in greater detail: (1) the approvals process and connection design responsibility; and, (2) temporary support of the structural steel frame during erection.

Revisions

The Commentary in Section 3.5 clarifies that, when revisions are communicated through the annotation of shop or erection drawings or contractor submissions, such changes must be confirmed in writing by revising or reissuing the appropriate contract documents.

As a fabricator, I was pleasantly surprised at how strongly the engineers on the Committee felt that it was improper to use fabricator submittals, such as the shop and/or erection drawings, as a means to communicate revisions or to complete designs. I certainly agree with this since the practice can cause delays in fabrication and erection. I have always believed that shop and erection drawings that are submitted for approval are intended to reflect that which is to be constructed, and that the fabricator has the right to expect that, once approved, this work can be produced.

By Barry L. Barger

The Approvals Process and Connection Design Responsibility

The Committee deliberations surrounding the approvals process were quite interesting. Given the mixed reception of the approvals language in the 1992 edition of the Code by the design community, all members of the Committee anticipated that it would be an uphill battle to find the middle ground on issues that included design responsibility. However, as usual, perception and reality are often different.

The engineers that served on the AISC Code Committee were in general agreement with the basic intent of the default cases covered in the Code. Instead, it was the face-slapping lightning-rod terminology used to convey that intent to which they objected. Accordingly, the language was modified as it now reads, particularly in Section 4.4.1. In simpler terms, the Code approvals process:

- Uses submittals to ensure that the fabricator has met the designer's intent in preparing the shop and erection drawings; and,
- Provides that the fabricator can start fabricating using approved (or approved as noted) shop and erection drawings.

The fabricator retains all responsibility for dimensional accuracy on the shop and erection drawings and for fit-up in the field. It is interesting to note that the current language is very similar to that used in older editions of the Code.

With regard to connection design responsibility, there are two general extremes with a vast number of permutations in between. At the one end, the structural engineer of record designs and draws everything on the design drawings. On the other end, everything is delegated. As a matter of practicality, three options are specifically addressed in this Code (see Section 3.1.2).

The first option is essentially the first extreme, where the structural engineer of record designs and draws everything on the design drawings. Helpful guidance is given in the Commentary as to the nature of the information that must be reflected in the design drawings.

The second option is an intermediate step between the extremes where the structural engineer of record allows the selection and/or completion of basic connections that can be picked out of the AISC Manual and similar references to be done by the fabricator and/or steel detailer. For the latter case, restrictions on connections, data for connection selection and/or completion and design method requirements are required to be specified.

As clarification that neither the fabricator nor the steel detailer is making design decisions in either of these options, the Commentary indicates that "it is not the intent ... that the steel detailer practice engineering." Thus, the structural engineer of record "retains responsibility for the adequacy and safety of the entire structure", through the approvals process outlined in the Code. This language parallels that in CASE Document 962, which is also referenced in the Commentary.

A few other points are worthy of note:

- Fabricator responsibility has been summarized in Section 4.2, including responsibility for the transfer of information from the contract documents into accurate and complete shop and erection drawings and the development of accurate, detailed dimensional information to provide for fit-up of parts in the field.
- Notification is required in advance

of the submission of shop and erection drawings when the fabricator intends to request a change to connection details that are described in the Contract Documents (see Section 4.2).
- The approvals process is still based upon a 14-day portal-to-portal time for the return of shop and erection drawings. The intent is that, in the absence of information to the contrary in the Contract Documents, 14 days may be assumed for the purposes of bidding, contracting and scheduling.

The third option is design-build—a special case of the "everything is delegated" end of the spectrum. This option is covered more implicitly than explicitly in the Code.

Temporary Support of the Structural Steel Frame During Erection

The new Code could not be clearer in its intent on means, methods and safety of erection. In Section 1.8, it is stated that the structural engineer of record is responsible for the structural adequacy of the structure in the completed project, and that the erector, not the structural engineer of record, is responsible for the means, methods and safety of erection.

Section 7.10 expands upon this premise and is equally clear. The old terms "self-supporting" and "non-self-supporting," lightning rods in their own right, are now gone, replaced with requirements that center on what information the erector needs from the designer and constructor to properly erect the structural steel. Accordingly, in Section 7.10.1, the owner's designated representative for design is required to identify the lateral-load-resisting system and connecting diaphragm elements that provide for lateral strength and stability in the completed structure. And in Section 7.10.2, the owner's designated representative for construction is required to indicate when the non-structural-steel elements identified by the designer will be in place, including, for example, roof and floor diaphragms of metal-deck with or without concrete.

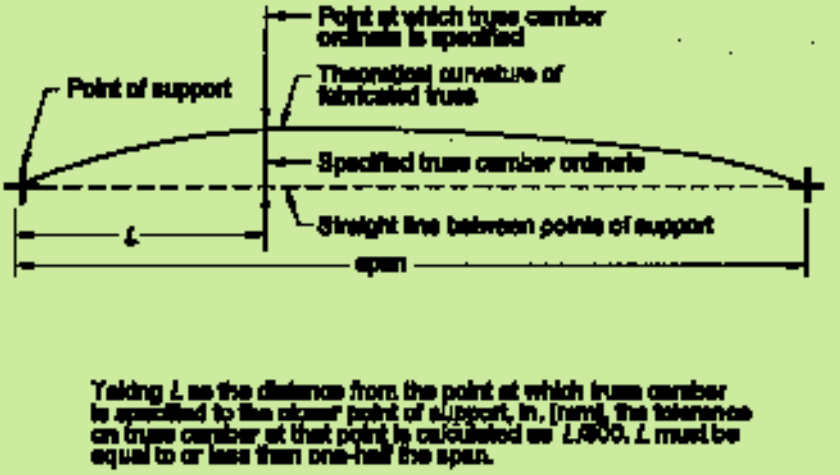

Figure C-6.1. Illustration of the tolerance on camber for fabricated trusses with specified camber.

Armed with this information, the erector can then meet the requirements in Section 7.10.3 to secure the bare structural steel framing in whole and part against the loads that are "likely to be encountered during erection, including those due to wind and those that result from erection operations." Included in this language revision is the switch of hurricane and earthquake loads to the default category of unpredictable during erection, a category that also includes tornado, explosion and collision.

Again, a few other points are worthy of note. Unless specifically contracted to do so, the erector need not consider loads that result from the work of others, or loads caused by non-structural-steel elements (cladding, partitions, etc.), during or after erection. Also, coordination of the work of the erector and that of the various other trades is the responsibility of others.

In Conclusion

The March 7, 2000 AISC Code of Standard Practice for Steel Buildings and Bridges represents a major advancement in the basis for contractual agreement for the purchase of fabricated structural steel. It is the result of the deliberations of a fair and balanced Committee. Users of the new Code will find that it is much more straightforward and plainspoken, with improvements in several key areas that should spur increased acceptance of the Code, thereby minimizing project misunderstandings.

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