RESPONSIBILITIES OF COLD-FORMED STEEL SYSTEMS

By the AWCI Interior & Exterior Steel Framing Committee

Over the last 25 years, cold-formed steel framing — also referred to as light gauge steel framing — has become an increasingly popular material and system for nonload-bearing and load-bearing framing for entire structures, curtain walls, roof framing and trusses and many other applications. This increased popularity is a result of steel framing’s lower material cost, its resistance to weather, pests, fire and mold and the fact steel is easily recycled. Additionally, placement costs are considerably lower when compared to other construction methods due to faster installation and the absence of weather restrictions associated with this type of construction. As the use of steel framing and other similar cold-formed steel shapes and accessories has grown in usage and diversity of applications, there has been an equivalent growth in the number of users in the architectural, engineering, contracting and manufacturing communities.

Progress has been made in recent years to standardize light gauge steel framing by the Steel Stud Manufacturers Association. One of the most substantial results of this organization’s efforts has been the introduction of a universal designation system for light gauge framing members, which has replaced the use of individual manufacturer’s proprietary nomenclature and regional references to cold-formed members. Simply put, gauges have been replaced by mil thicknesses, and alpha nomenclature for flange widths is now stated in mathematical equivalents. Additionally, the SSMA requires all of its members to meet minimum requirements for engineering properties, making all member-manufactured components equal.

This system now allows specifiers and designers to refer to products in a generic manner that applies to all manufacturers and geographic regions, thus eliminating much confusion among all parties involved. Most important, this system has been accepted and adopted by the cold-formed steel framing manufacturers and contractors, and the system is beginning to enjoy acceptance in the design community.

The designs of this type of construction should be prescriptive based, with the products, processes, means and methods accurately called out within the contract documents, or performance based, where the contractor bidding and performing the work has some latitude regarding the design. A combination of these formats is acceptable and frequently used; however, all three are often incorrectly applied to the specifications and/or design, which leads to confusion for contractors. This is a result of a combination of factors such as deficient and/or contradictory information within and between the documents, a lack of understanding of the systems and methods, and improper coor-
dination between the specifier, architect and structural engineer. This is further complicated by the “fast track” nature of construction today. Ultimately, such confusion leads to cost overruns for owners and contractors, project delays and the inability for companies to fairly compete.

When considering or evaluating which design should be utilized or exists on a project, attention should be given to the language in the American Institute of Architects AIA Document A201, General Conditions of the Contract for Construction. This states: “3.12.10 The Contractor shall not be required to provide professional services which constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor’s responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such service or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by other, shall bear such professional’s written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Subparagraph 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.”

Also, the 2003 International Building Code states the following: “106.1 Submittal documents. Construction documents, special inspection and structural observation programs and other data shall be submitted in one or more sets with each application for a permit. The construction documents shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed. Where special conditions exist, the building official is authorized to require additional construction documents to be prepared by a registered design professional.”

Within a prescriptively designed project, the specifications outline the usage of the light gauge framing by calling out the acceptable manufacturers, reference standards, desired galvanized coating(s) and accessories. The yield strength of steel, thickness in mils, member depth, flange width(s) and spacing
required, as determined by the structural engineer, should be indicated on the structural drawings in the sections and general notes. This information should also be included within the body of the specification. The architectural drawings should reflect and support this information as well.

Another desirable means of sizing members can be to provide a wall, limiting height or member schedule in lieu of or in addition to the information in the sections, details, notes and specifications. Other components that complete a Steel framing system such as bridging, clip angles, web stiffeners, fasteners and other accessories should be both specified and indicated on the drawings as to size, metal thickness, location, spacing and application.

All these methods should use the SSMA designations wherever applicable. Where such SSMA references do not exist, specific items with equivalent properties should be listed as well.

The prescriptively based format is unique to each project, and the structural engineer and/or architect has full responsibility for the design. Because of this, shop drawings are not necessary and submittals are limited to providing manufacturer’s standard literature and, in some cases, certificates to verify that the proper steel strength and coatings have been provided. An alternative to this approach is for the design team to provide completed shop drawings from the manufacturer or an engineer specializing in light gauge steel framing in addition to or to supplement the architectural and structural drawings.

Regardless of which of the processes above is used, the contractor installing the work is accountable for supplying the appropriate materials and correct installation per the documents. This exact method of light gauge steel framing design, although rarely utilized, is the most economical, fair and least complicated of the three types of designs.

Similar to a prescriptively designed project, within a performance design, the specifications indicate the acceptable manufacturers and reference standards, any desired deviations from manufacturer’s typical products, or minimal requirements such as thickness or yield strength, stud width or spacing to accommodate other requirements such as insulation R-values.

For the contractor to properly determine the correct metal thickness, member and flange width(s) and spacing required, all performance criteria must be included in the design specifications. These consist of snow, wind and live loads, where applicable, and the deflection criteria. The performance requirements should be in accordance with the applicable codes and industry standards. These codes and standards must be included in the contract documents.

The SSMA publishes limiting heights based on common loads and deflection criteria in numerous tables. Similar tables are also presented by steel framing manufacturers in their literature. When these common criteria are shown in the specifications, contractors can easily select the proper member sizes, thicknesses, widths and spacing from these tables to develop an estimate for a performance design.

When confronted with uncommon or excessive criteria, a contractor must consult outside services or manufacturers’ engineering services during the bid process to properly size members, or round up to the next highest common standard within the tables, thereby increasing the cost of construction. The duration allowed for the bidding process today rarely allows for sufficient outside engineering consultation, and, if time does allow, this additional effort more often than not results in a noncompetitive estimate by the contractor gaining information that is not reflected in the documents.

When this performance process is properly applied to a project, the successful bidder, once awarded the project, provides standard literature, fully detailed shop drawings and calculations by an engineer properly registered within the project’s jurisdiction, completing the performance design process.

This format enables an owner to benefit from the value of light gauge systems, to gain the advantage of a contractor’s experience, expertise and ingenuity, and to have an installer with the responsibility of design. Due to the freedom available within these systems and this method, the performance method should be used only in markets where there are known, capable contractors, and avoided on public works projects.

As the description suggests, combination designs are a merger of the two systems described above. When utilized correctly, this method can be used to the advantage and financial benefit of all interested parties. Contract documents can be prescriptive in nature but allow the bidders to provide an economical light gauge steel framing system, realize a competitive advantage by using their expertise and resources, and offer the owner and/or contractor “value engineering.”
The combination design method also allows the design professional(s) reassurance that the integrity of the intended design is maintained by contractors providing either placement or full-engineered shop drawings from the manufacturer or an outside engineering source. However, to properly provide such a design, all required design criteria, standards and intent need to be clearly shown on the contract documents. In addition to this, when the work is a combination of prescriptive and performance designs, the division of responsibilities must be very clear and properly coordinated between the structural drawings, architectural drawings and project specifications. Conflicts of any kind will often lead to items being priced by multiple bidders, causing increased costs to the project or, worse yet, have these same items missed altogether.

An additional issue in this regard is the “acceptability” of any submitted value engineering items. It does the bidder no good to win the project based on the savings from several VE items, only to have them arbitrarily rejected by the general contractor, architect or engineer-of-record. In short, when investigating VE options, it pays to make sure that the contractor(s), architect and engineer are all on the same side of the issue ahead of time.

In summary, steel framing projects can save money for all parties involved, provided that the design professional provides the contractor with correct and complete design specifications and/or criteria, depending on whether the design is prescriptive based, performance based or a combination of both. When the design professional provides incomplete or inaccurate design specifications or criteria, the steel framing contractor is forced to perform duties that cost everyone time and money, and may be a violation of statutory requirements.

To properly design, specify, estimate and construct a cold formed Steel framing project, the following documents need to be reviewed:

- C754 — Specifications for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- C955 — Specification of Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
- C1007 — Specification for the Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
- C1513-01 — Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
- A1003/A1003M-02a — Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

About the Author
The AWCI Interior & Exterior Steel Framing Committee is part of the Construction Technology Council of the Association of Wall and Ceiling Industries—International. AWCI publishes several documents and provides technical support to their membership and the construction industry. AWCI’s CTC pro-
vides input to many related industry and standards writing organizations.

AWCI’s CTC is composed of AWCI contractor, supplier, staff, professional and other association members who meet semi-annually and work throughout the year to provide these services.

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