conference preview

WHAT MAKES A GOOD DESIGN DRAWING?

Clearly defining the relevant parameters and components is a good place to start.

BY DARREN HARTMAN AND ROB SCHOEN

THE TOPIC OF WHAT MAKES a good design drawing has been talked about quite heavily now for a number of years.

Those of us that grew up in the business at the end of the traditional "old school" mentality of steel construction have observed the birth and accelerated growth rate of the "new school" approach. And when it comes to what makes good design drawings, most people always refer their argument back to the *Code of Standard Practice*. We want to rely on this code because it is the document we all refer to and lean on as the operating guide that we all steer our ships at sea with. It defines design responsibility, suitability, adequacy and legality. It describes in detail what is needed in order to have adequate and complete bids.

To quote from the code: "The contract documents provide complete structural steel design plans clearly showing the work to be performed and giving the size, section, material grade and the location of all members, floor levels, column centers and offsets, camber of members, with sufficient dimensions to convey accurately the quantity and nature of the structural steel to be furnished."

"Project specifications vary greatly in complexity and completeness. There is a benefit to the owner if the specifications leave the contractor reasonable latitude in preforming his work. However, critical requirements affecting the integrity of the structure necessary to protect the owner's interest must be covered in the contract documents."

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It goes on to actually give a checklist of what the contract documents should include.

If we were to come up with a Top 10 list of items that most of us believe to be mission-critical, it would likely include the following:

1. A clear definition of design codes (i.e., seismic requirements, how detailing is impacted and which version of the AISC *Manual* the design is based on).
2. Provide the reactions on the design drawings, not just an arbitrary uniform load of full capacity statements (is this based on ASD or LRFD?). State whether connection design is a requirement of the fabricator/detailer and then define the loads; don't just put 50% UDL.
3. Provide a clear definition of lateral system components and the load paths (axial drag struts, transfer forces, etc.) and define whether the moment connections are part of the lateral system or are gravity moments.
4. Clearly define any CVN requirements.
5. Framing considerations: Avoid acute angles and weird skewed connections and account for some erection efficiency. Shallow members should not carry deeper members, and beams and braces should go to column centers.
6. Consider tolerances (long slots at connections to embeds, short slots at beam-to-beam connections, when to use girt and purlin connections and when to use shims).
7. Bolt types and sizes. We should not be detailing and constructing ¾-in., ⅞-in., 1-in. and 1⅛-in. and 1¼-in. bolts all on the same same job. This is not value engineering. In addition, properly define SC connections vs. bearing connections.
8. Properly define all edge of slab conditions, including interior and roof openings, any frames that may be required, etc. This also means properly defining slab thicknesses and properly denoting slab thickness changes or steps.
9. Define all painted steel, intumescent painted steel, galvanized steel and fireproofed steel. There are four AESS classifications, not just one.
10. Properly dimension all members, with all top of steel (TOS) notations for elevations, ridge lines, eaves, etc.

Today, the contract documents or design drawings we get are not typically 100% issued for construction. They are more in the range of 50% to 70% in order to try to get a jump on mill orders. Coupled with an engineer's Revit IFC or Tekla model, this is the new school delivery method we have come to expect and accept as the new standard.

Between 2D and 3D

The old school mentality dictated that because we did not have 3D models, the design team had to communicate the design in such a way in the 2D world so that detailers fabricators and erectors could accurately bid, build and perform a job with completeness. This meant providing accurate section cuts and details on design documents It meant providing all dimensions especially edge of slab, inside faces of walls, locating all non-grid steel and roof opening frames, sizes and locations before the job was detailed and fabricated and all other dimensions required to do our job and alleviate the need to write hundreds—and on some jobs, thousands—of RFIs, ASIs, etc., that somehow have become the norm and the accepted practice of today.

We are expected to write lots of RFIs, but we bid jobs as though the design documents are complete. This is all done because we have come to accept the current global market—and at the end of the day money still rules the world. Even today, you still run across people that tell you the cheapest price does not always get the job. Quality is what they are willing to pay for. The problem is that they have to get the job first. If getting the job means that budgets get sliced and diced, it is hard to stay in business if you get a job and then turn around and sublet a portion of the job for more than your budget dictates, for the sake of quality.

The question, then, is where is the happy medium in terms of price vs. quality vs. standards vs. what makes a good design drawing?

The key is developing your system to have your pricing be competitive yet not sacrifice quality and still get the job done in the time frame that is wanted. We should foster good relationships within our community to work with others who believe in these same core principles and ideals and team up or partner with these companies. We should not lose our old school foundation and core beliefs or sacrifice lessons learned for the sake of the new school mentality of cheapest price wins regardless of quality. ■

*This article is a preview of Session N6 "What Makes a Good Design Drawing?" at NASCC: The Steel Conference, taking place March 25-27 in Nashville. Learn more about the conference at **www.aisc.org/nascc**.*