

# REVIEWING Shop Drawings

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A leading engineer gives his approach to the shop drawing review process, based on standard AIA documents and the AISC *Code of Standard Practice*.

**T**he review and approval of shop drawings is a careful and methodical process. After “checking” structural steel shop drawings for nearly 30 years, I have developed my approach to the procedure, based on the one that is described in the AIA *General Conditions of the Contract of Construction* as follows:

“4.2.7: The Architect will review and approve or take other appropriate action

*upon the Contractor’s submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract documents. The Architect’s action will be taken with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time in the Architect’s professional judgment to permit adequate*

*review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract documents. The Architect’s review of the Contractor’s submittals shall not relieve the Contractor of the obligations under Paragraphs 3.3, 3.5 and 3.12. The Architect’s review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect’s approval of a specific item shall not indicate approval of an assembly of which the item is a component.”*

Also, the AISC *Code of Standard Practice* provides that shop-drawing review is a “confirmation that the Fabricator has correctly interpreted the Contract documents in the preparation of the submittals...”

In this context, the goal of the review is clear: to check for conformity with the structural design as expressed in the contract documents. The primary way to ensure this is to establish that the detailer understands project requirements and has applied them to the shop and erection drawings in a clear and orderly way. Given this, when I begin a review, my first activity is to examine the submittal’s overall appearance and content by paging through it.

Next, I compare the erection plans with the structural framing plans, eval-

## Definitions from the AISC Code of Standard Practice

**Contract documents.** The documents that define the responsibilities of the parties that are involved in bidding, fabricating and erecting structural steel. These documents normally include the design drawings, the specifications and the contract.

**Design drawings.** The graphic and pictorial portions of the contract documents showing the design, location and dimensions of the work. These documents generally include plans, elevations, sections, details, schedules diagrams and notes.

**Embedment Drawings.** Drawings that show the location and placement of items that are installed to receive structural steel.

**Erection Bracing Drawings.** Drawings that are prepared by the erector to illustrate the sequence of erection, any requirements for temporary supports, and the requirements for raising, bolting and/or welding. These drawings are in addition to the erection drawings.

**Erection Drawings.** Field-installation or member-placement drawings that are prepared by the fabricator to show the location and attachment of the individual shipping pieces.

**Shop Drawings.** Drawings of the individual structural-steel shipping pieces to be produced in the fabrication shop.

uating member sizes, building-grid labels and dimensions, and top-of-steel elevations. I review the fieldwork details, and compare them to the structural drawings. I review any notes on the erection drawings as they relate to the drawing notes and project specifications. I also respond to any questions that the detailer has written on the shop and erection drawings. Some detailers (or project requirements) do not allow this form of question and response, but it is common on small- to intermediate-size projects. Usually the next drawings to be reviewed are the embedment plans and associated piece drawings. These are reviewed against the design drawings for such things as anchor rod diameters, other anchor diameters, materials, arrangements and embedments. Since embedded material falls outside the scope of the typical detailer's requirement to "develop" connections, deviations from the contract documents are rare, but this must be established in the review.

Lastly, the review of the shop drawings for the individual shipping pieces begins. As the *Code of Standard Practice* states, the detailer's responsibility is "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 the fit-up of parts in the field." Just as the fabricator is not required to discover errors or discrepancies in the contract documents, it is not the reviewer's responsibility to find errors or discrepancies in the detailer's work beyond what is appropriate to the goal of establishing conformity to the contract documents.

Also, just as the detailer finds and reports discrepancies in the contract documents, the reviewer can find errors in the detailer's work which are beyond the reviewer's scope. These discrepancies are reported with the understanding that the reviewer has not used this depth of scrutiny throughout the review.

In reviewing the piece drawings, the beginning sheets are reviewed in greater detail to establish a sense of the detailer's approach to the job and the detailer's grasp of the construction document's requirements. The following is a list of items that must be reviewed in detail:

- Member size and material specification
- Piece mark, plan location and base length
- Camber, if any
- Surface preparation and coating, if any
- Connections
  - Geometry and layout
  - Bolt sizes, type and material specification
  - Hole sizes, types
  - Masking for SC-type connections
  - Weld geometry, fillet size and length, PJP and CJP
  - Connection types
  - Connection material specifications
  - Copes and edge distances
  - Bolt and weld material strengths, specifications
- Stiffeners
- Openings for other trades

The *Code of Standard Practice* requires that the EOR's review of the Shop Drawings provides confirmation that the EOR has "reviewed and ap-

proved the Connection details shown on the Shop and Erection Drawing," submitted in accordance with the requirements of the contract documents. The *Code* requires that the connections be fully designed in the contract documents; or, that information as to restricted connection types, and connection loads (shears, moments, axial forces and transfer forces) is provided so the detailer can "select and complete" appropriate connection details. To satisfy this requirement the reviewer might have to make some shorthand calculations to determine if the project requirements have been met. Since the approaches given in the *Code of Standard Practice* limit the detailer to AISC-tabulated connections, the process of confirming that the detailer understands the loads and tabulated connection resistances should only take a few in-depth reviews. However, the reviewer should be alert to special conditions, such as deep copes or top and bottom copes, that could affect connection strength. The shop drawing review process also allows the reviewer to reconfirm that the connection requirements specified are appropriate for the piece in question.

Lastly, any corrections must be transferred to all of the submitted copies. This is not an idle activity. It gives the reviewer another chance to look through the entire submittal. Per the *Code of Standard Practice*, each sheet must be individually marked with its disposition. ★

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