Best Practices for Fabrication Model Review
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Special Thanks
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  - President & Owner, Virtual Steel Technologies
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- Chris Harms
  - Owner & Vice President, H&R Detailing
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Learning Objectives

• Understand the basics of model based review
• Explore the benefits of model based review
• Discuss the evolution of review processes
• Explore changing model content
Traditional Shop Drawing Review
Fabrication Model Review
Fabrication Model Review
Fabrication Model Review – Benefits

• If starting from design BIM
  o  Faster startup
  o  Fewer RFIs
• Increased quality
  o  Reviewing the source data that drives fabrication
  o  Comprehensive and accurate review
  o  3D, to scale
  o  Audit trails – date, time, author
• Reduced review time per submittal
  o  30% to 50%
• Ability to isolate, visualize, and filter any attribute
  o  Sequencing
  o  Hold and fabrication status
  o  Various components such as moment frames, AESS, galvanized
Fabrication Model Review – Specification Section 051200

D. Fabrication Model: Show all information necessary for the fabrication and erection of structural steel members in an intelligent 3D detailing model.

1. A single model shall be created and maintained in one of the following software systems (during bidding, indicate software system to be utilized):
   a. SDS/2 Detailing (version 7.3 or later) for review and action via SDS/2 Approval.
   b. Tekla Structures (version 19.0 or later) for review and action via Tekla Structures with Construction Viewer licensing.

2. Model origin point and coordinate system shall match Project's as represented by the Design Team's Revit models.

3. Submittal of model shall be as follows:
   a. Submit full model at each submittal.
   b. Model shall be maintained and updated with changes and revisions.
   c. Format:
      1) For review and action: Native file format of software system.
      2) For ancillary review and coordination: IFC (with review and approval metadata) and Navisworks NWC where possible.

4. Any 2D images (Fabrication and Erection Shop Drawings) necessary to augment the model shall be generated from and be embedded into the model in either Portable Document Format or a format native to the modeling software system. The 2D images shall be accessible from or cross-referenced to the modeled members.

5. Submittal Action (i.e. approval status) will be set in the model for each piece member, with any comments located on the piece, unless comments are too extensive requiring them to be conveyed on the 2D image.
6. In addition to the information necessary for fabrication and erection, the following metadata shall be populated and maintained in the model and associated with modeled members:
   a. Sequence.
   b. Hold.
   c. Revision.
   d. Submitted for Approval.
   e. Approval Status.
   f. Requests for Information.
   g. Fabricator Verification Requests.
   h. Notes to Reviewer.
   i. Additional metadata as determined during Pre-Detailing Meeting.

7. Prepare detailing in accordance with AISC 303, AISC 325, and AISC 360. Prepare the model to LOD 400 with the exception that welds are not required to be modeled.
   a. Include details of cuts, cope, connections, access holes, splices, camber, holes, stiffeners, double plates, and other pertinent data such as surface preparation and AESS category.
   b. Include items embedded in concrete.
   c. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
   d. Identify type, size, and length of shear connectors on composite framing and distinguish between shop and field installed shear connectors.
   e. Identify members and connections of the seismic-load-resisting system.
   f. If welds are modeled, identify Demand Critical Welds.

8. Provide copy of approved Fabrication Model to Owner's Testing and Inspecting Agency prior to fabrication and erection of structural steel framing.
   a. Provide native file format of software system and IFC.
Fabrication Model Review – Specification Section 051200

C. Pre-Detailing Meeting: At least 30 days prior to first submittal, conduct meeting at Project site to comply with requirements in Division 01 Section "Project Meetings."

1. Require representatives of each entity directly concerned with structural steel detailing and submittals to attend, including the following:
   a. Contractor’s superintendent.
   b. Detailer
   c. Fabricator.
   d. Contractor’s delegated design engineer for connections.
   e. Technical support representative for Fabrication Model software vendor.
   f. Owner’s Structural Engineer Consultant.
   g. Owner’s Testing and Inspecting Agency.

2. Review methods and procedures related to structural steel detailing and submittals including, but not limited to, the following:
   a. Connection design.
   b. Fabrication Model coordinates and general setup.
   c. Fabrication Model metadata.
   d. Fabrication Model submittal, review, and return procedures.
Digital Roundtripping Process – Original

- Architect
- SidePlate Systems
- Revit Structure
- SDS/2 Detailing
- SidePlate Systems Connection Engineer
- Buzzsaw
- SDS/2 Approval
- Bluebeam Studio
- Navisworks
- Buzzsaw
- XML
- PDF
- Native
- PDF
- IFC
- Native

SidePlate Systems
Connection Engineer

Architect
Fabrication Model Review Growth – AISC Surveys

Survey of Structural Engineers
Shop Drawing Approval Methods, 2012

- Model only
- PDF and Model
- PDF only
- PDF and Paper
- Paper only

Industry Technology Survey, 2016

- Sending or sharing a model
- Via email
- Via FTP site
- Via project hosted website
- Via mail/hardcopy
Global Modeling Process – Evolution

• Federated model
  o Initiated from design models/CAD
  o Cloud-based solution

• Real-time
  o Detailing
  o Approval
  o Collaboration
Global Modeling – What Else is Changing?

• Inclusion of multiple sources of data
  o BIM / CAD / Point Clouds
  o Design
  o Trades
Global Modeling – What Else is Changing?

- Inclusion of all miscellaneous steel
  - Stairs
  - Handrails
  - Ladders
Global Modeling – What Else is Changing?

• Inclusion of additional elements
  o Field welding
  o Reinforcing
    ▪ DBAs
    ▪ Shear studs
  o Elements of concrete and CMU
  o Smart Tags
    ▪ Masonry anchors
Global Modeling – Benefits

• All of the benefits of Digital Roundtripping

  *Plus*

• Elimination of “transmitting” delays
• Amalgamation of data sources to enhance review quality
• Instant facilitation of minor changes eliminating the need to re-submit
• Additional review cycle time reductions
• Reduction or elimination of RFIs and costly steel change orders
Why Evolve? Practicality!

• The current process of generating the steel fabrication package is rooted in and handcuffed by an outdated set of procedures and protocols that hampers today’s efficient technology

• A paradigm shift to leverage new efficiencies enabled by technology
  o Eliminate the duplication of effort during the 3D-2D-3D recreation of data
  o Significantly reduce the amount of information that needs to be checked during review

• The process is the solution
Thank You