Improving Your Deliverables with Revit® Structure and SDS/2 Connect

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Class summary

Model accuracy is vital to Building Information Modeling (BIM) projects, and connections are a critical component of making the model accurate. This class features real-world case studies from engineering companies who have incorporated SDS/2 Connect into their Revit Structure workflow. Highlights include how companies employ SDS/2 Connect as a way to keep the project schedule on track while providing project owners with the ability to secure more competitive bids, use the connection design functionality to avoid erection clashes during the design phase of the project, and create a more valuable deliverable for the owner and architect.

Key learning objectives

At the end of this class, you will be able to:

- Understand a real-life workflow for model transfers sent from engineers to the manufacturers via the Revit Structure model
- Learn how connection design can incorporate erection clash avoidance into the design phase with your Revit Structure model
- Gain knowledge from a real-life user; how using SDS/2 Connect has improved their delivery process
- Hear two case studies about the implementation process of SDS/2 Connect model round-tripping and connection design in Revit.

Introduction to SDS/2 Connect

Who We Are

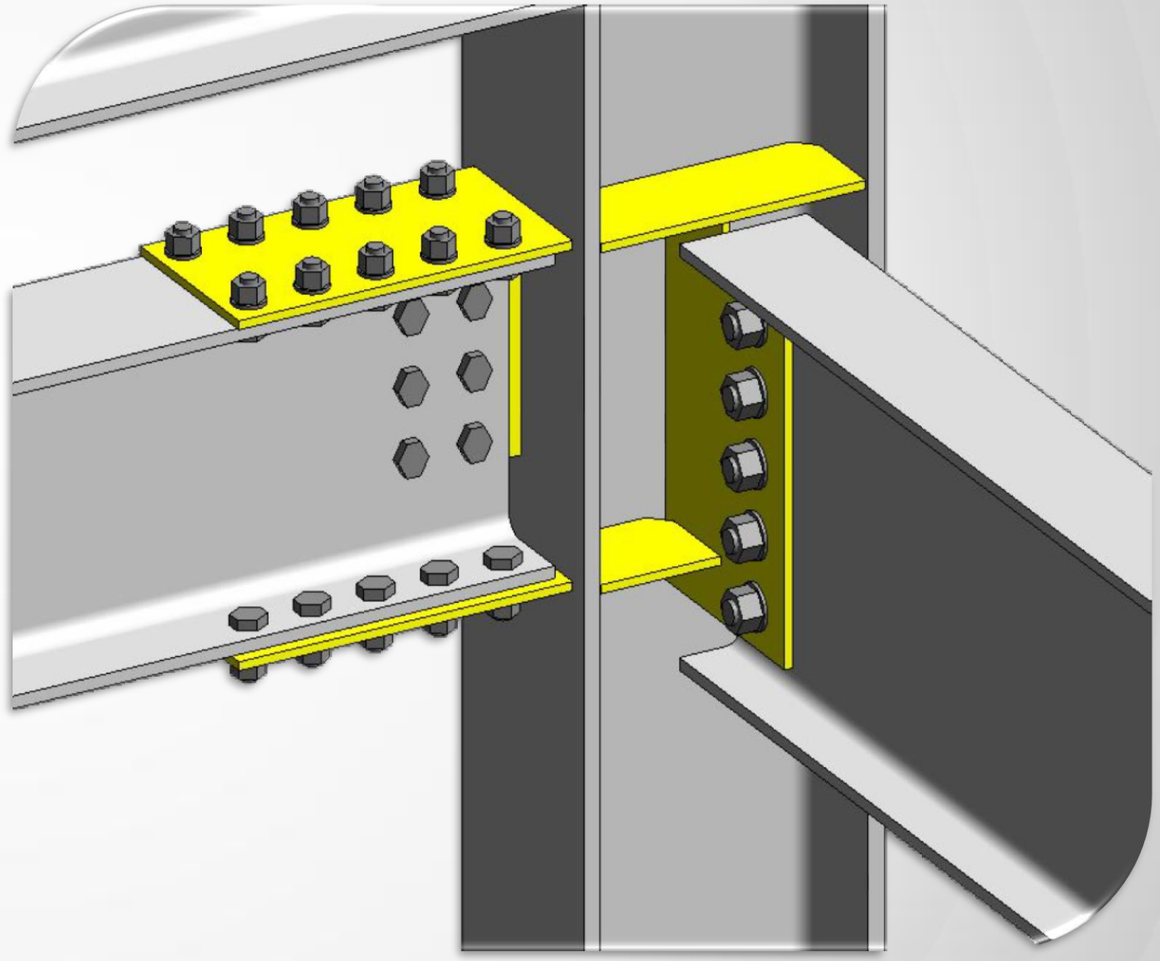
- Design Data
  - Software developer of SDS/2 Software solutions for 32 years
  - SDS/2 Detailing software
    - Connection design
    - Steel detailing
    - Steel fabricating
    - Steel erection
  - SDS/2 Connect
    - Connection Design
    - Revit Model Round-tripping with SDS/2 Detailing

SDS/2 Connect

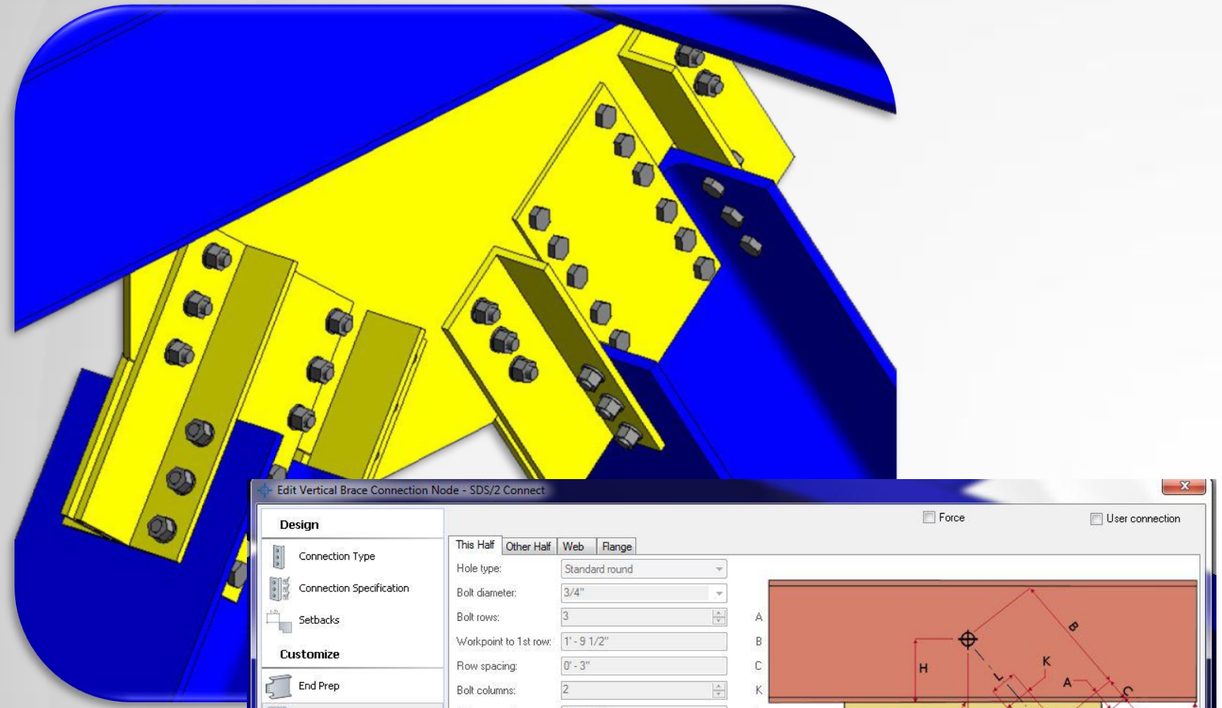
- Revit Structure Add-in
  - Implements SDS/2 connection design functionality within the Revit Structure environment
  - Enables API-based transfer of design model from Revit Structure to SDS/2 Detailing software used by fabricators/detailers
    - With or without connections
    - Can help fast track the steel detailing/fabrication process

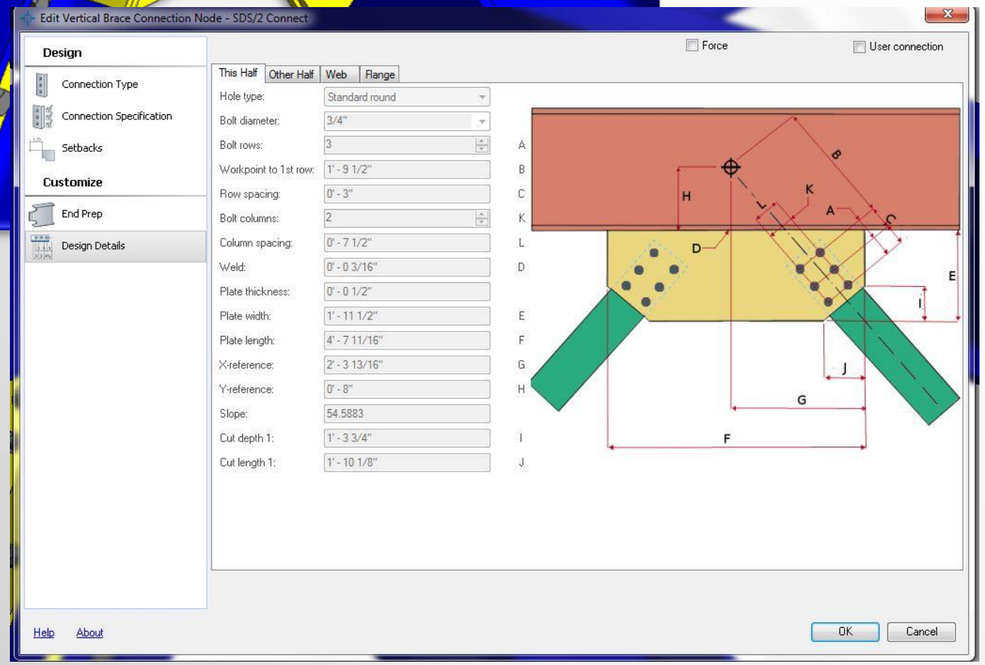
Connection Design with SDS/2 Connect

- Code based connection design
  - US, Canadian, Australian
  - European code coming in 2015 version
- Fit-up and Constructability checks
  - Bolt clearances
  - Framing conditions



Connection Design with SDS/2 Connect





- Automatic Connections
- Loads
- Connection adjustments
- Constructability
  - (no audio for this video)
- User Connections

Model Transfer with SDS/2 Connect

- Simple import or export with the plug-in is FREE.
- Round-tripping would require purchase to maximize benefits
- Video
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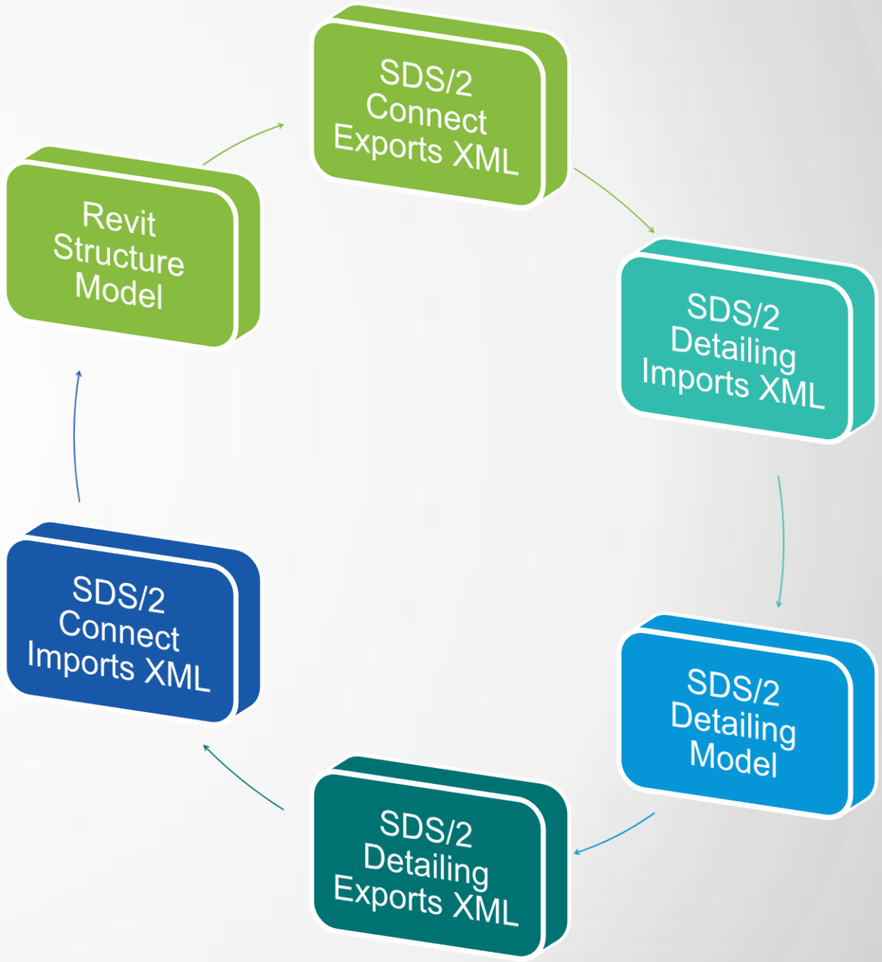
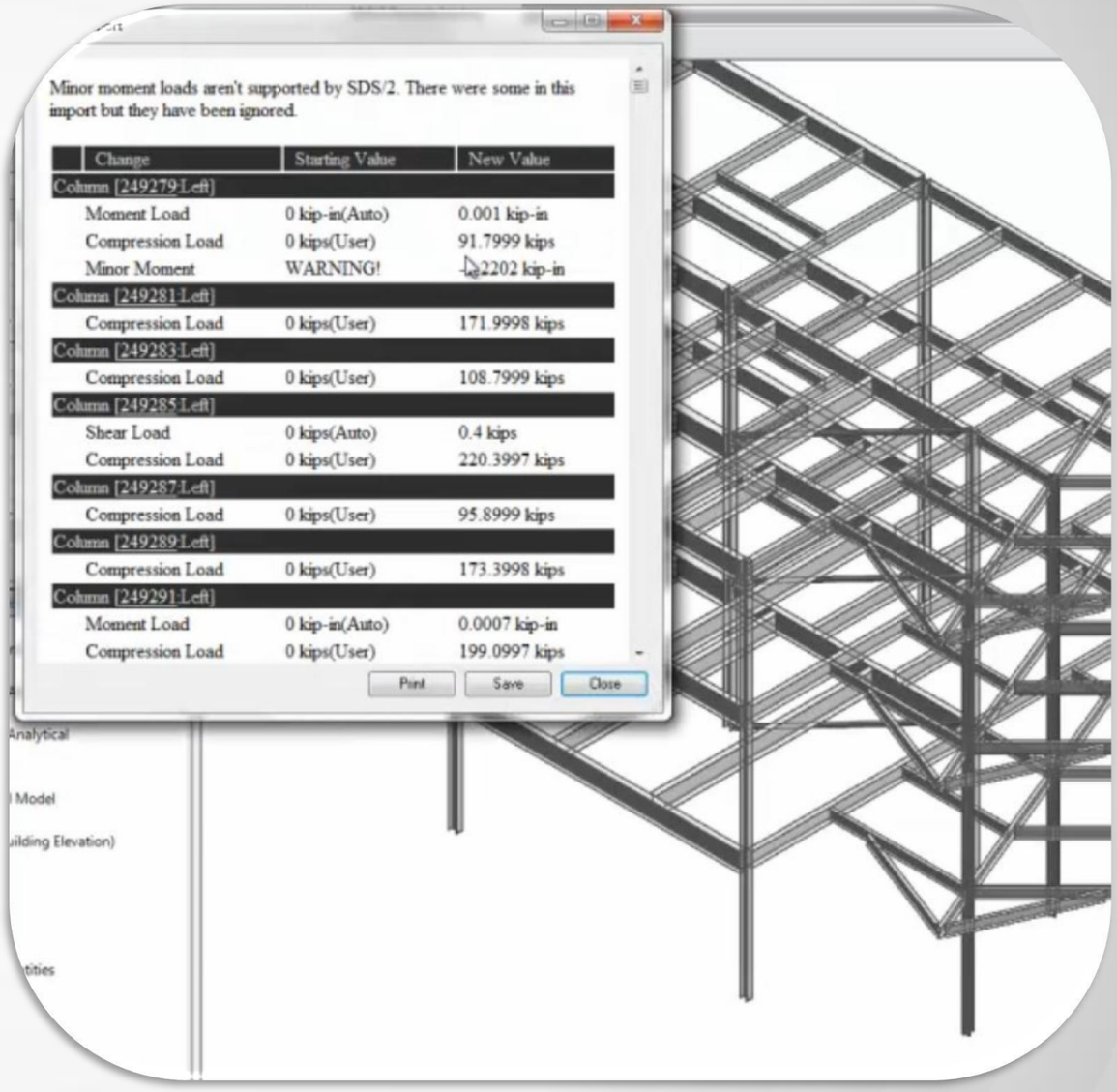


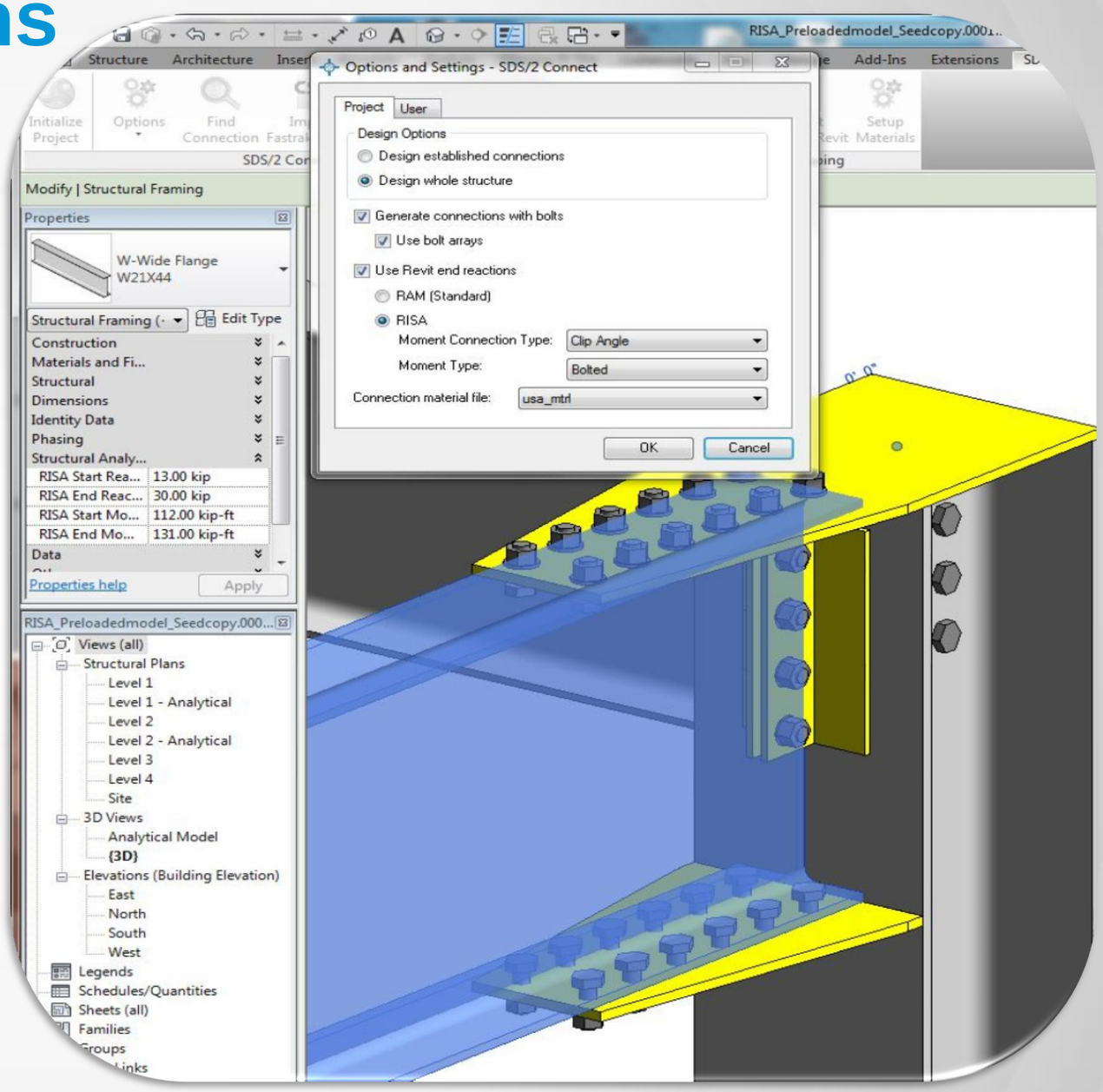
SDS/2 Connect Integrations

- Integration with CSC Fastrak to apply design loads to connections
- Video



SDS/2 Connect Integrations

- Use RAM and RISA-3D loads for connection design
  - Options settings in SDS/2 Connect allow you to choose how to read the loads



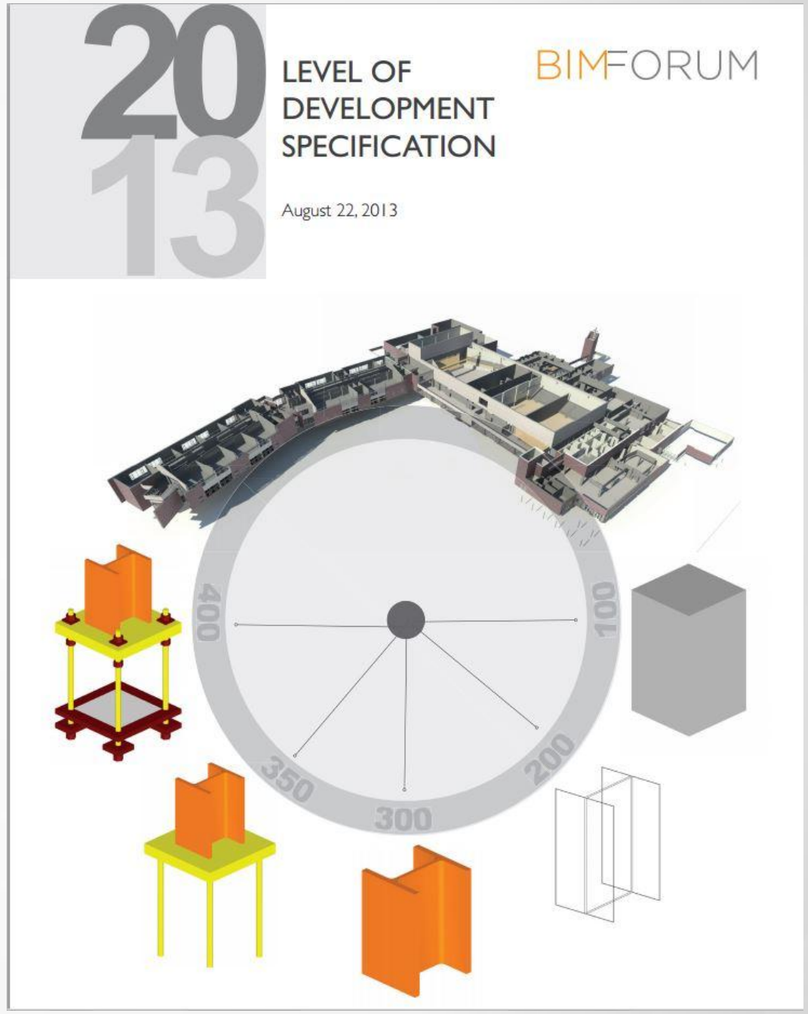
Case Study One:
Oregon Military Depot

Oregon Military Depot

- Military project
  - Pilot project for requiring LOD 400 deliverables
- KPFF Consulting Engineers – Portland office
  - Engineer of Record
  - First project to submit LOD 400 Revit Structure model
    - Design-Bid-Build
    - LOD 400 requirements have been updated since this project
- Software Used:
  - Revit Structure 2012
  - SDS/2 Connect 2012

Oregon Military Depot—LOD 400

- To meet LOD requirements KPFF
  - Included connection materials in their Revit model
  - Wanted to control connection materials in the Revit model
    - SDS/2 Connect was the most efficient way for them to do this at the time



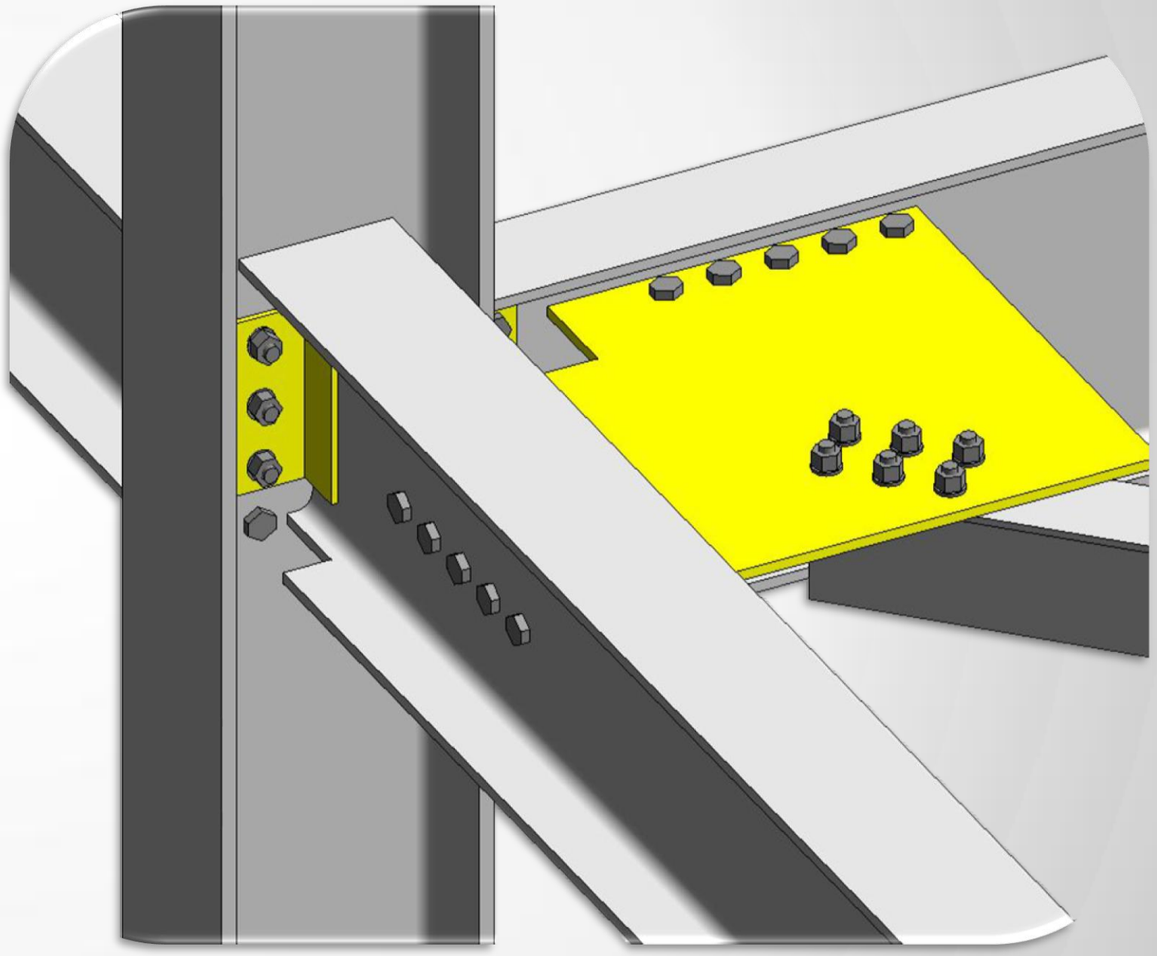
http://bimforum.org/wp-content/uploads/2013/08/2013-LOD-Specification.pdf

Oregon Military Depot—Connection Design

- Using SDS/2 Connect, KPFF designers were able to include within their Revit model:
  - Connection materials
    - Plates
    - Angles
    - Bolts
  - Connection design calculations
  - Connection sketches based on actual connections
    - Instead of “typical” situations

Oregon Military Depot—Connection Design

- Connection material in the model enabled designers to see potential field clashes
  - Designed connections to prevent erection issues
  - Reduced the number RFIs the detailer would have had



Oregon Military Depot—Design-Bid-Build

- LOD 400 Contract documents were completed using Revit Structure
  - KPFF is aided in reaching LOD 400 in Revit by SDS/2 Connect
- Completed LOD 400 CDs are delivered to fabricator/detailer
  - Schuff Steel won the bid on this project

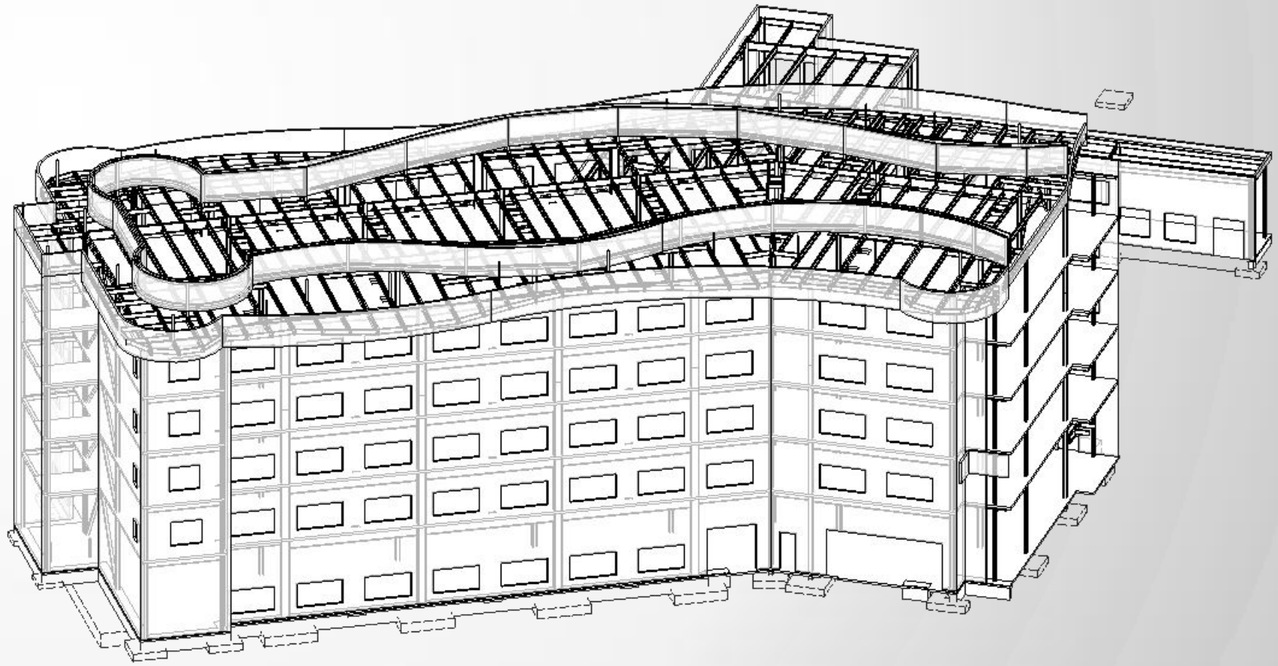
Oregon Military Depot—Design-Bid-Build

- As a Design-Bid-Build project there was less opportunity to influence the downstream use of SDS/2 which would have streamlined the detailing process
- How?
  - SDS/2 Connect add-in only exports connections to SDS/2 Detailing
    - Schuff Steel does not use SDS/2 Detailing software and were not able to take advantage of the connection design done by KPFF
    - Manual re-input would have been required to duplicate the connections dictated by KPFF on this project

Oregon Military Depot—Benefits of SDS/2 Connect

- Ability to show designed connections in Revit
  - Accessibility of connection sketches
  - Automation of connection design calculations
- Ability to see and avoid erection clashes during the design phase
  - Designed with clash prevention in mind
  - Helped KPFF design a better structure

Case Study Two:
Twin Arrows Phase II



Twin Arrows-Phase II

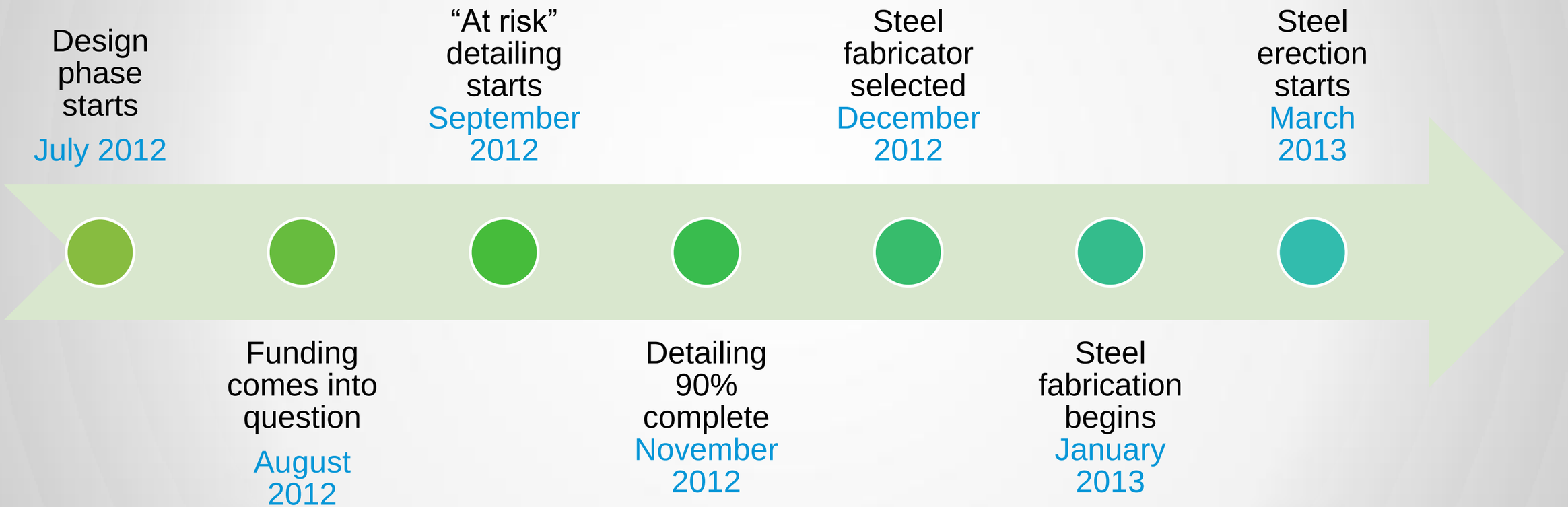
- A Native-American gaming and hospitality project
- Project funding came into question during design
- Chavez-Grieves (C-G) detailed the project “at risk”
  - Kept project on schedule
  - Enabled Hunt Construction to get competitive bids
  - Didn’t have to commit to a fabricator before funding was settled

Twin Arrow-Phase II

- General Contractor: Hunt Construction
- Engineer: Chavez-Grieves Consulting Engineers
- Detailer: Chavez-Grieves Consulting Engineers

- Software Used:
  - Revit Structure 2012
  - SDS/2 Connect 2012
  - SDS/2 Detailing v 7.2

Twin Arrows – Project Timeline



Twin Arrows – Funding

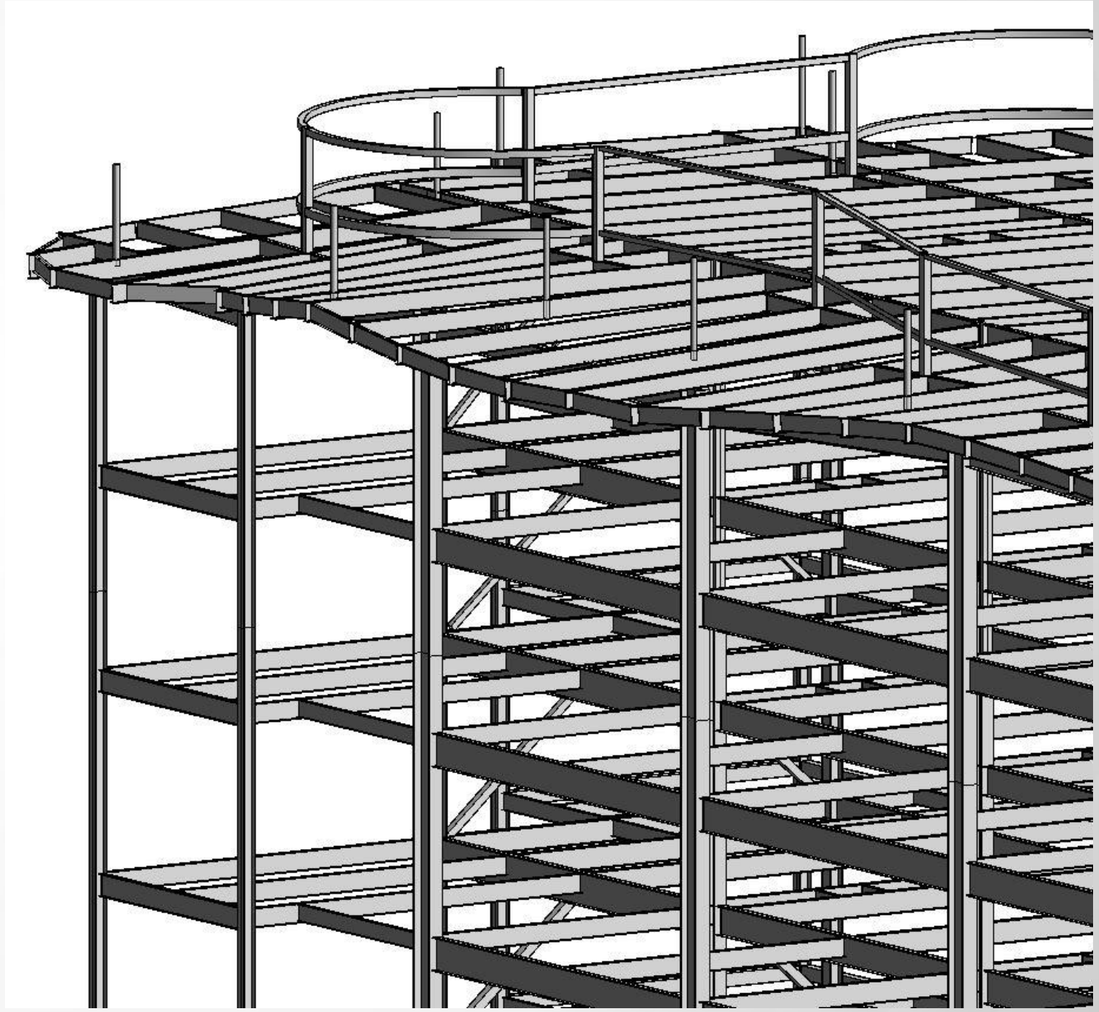
- Project funding came into question while C-G was in the design process
- In order to keep the project going, C-G detailed the project “at risk”
  - Developed detail drawings in parallel with design drawings
  - Marked advantage for time critical projects
  - C-G has both engineers and detailers in-house

Twin Arrows – Detailing

- September 2012
  - Design model completed and checked for accuracy in Revit
  - Transfer Revit Structure model to SDS/2 Detailing via SDS/2 Connect
  - Detailer begins with structural model
    - Saves 40 man-hours of input with the model transfer
      - Complicated geometry of roof input one-time in Revit
      - Reduced the number of RFIs that would have come from drawing set only
    - Connections designed and applied with SDS/2 Detailing
    - Miscellaneous steel input in SDS/2 Detailing

Twin Arrows – Detailing

- No official RFIs were issued for the steel
  - RFI process remained in-house as questions between coworkers
  - Shaved an enormous amount of time off the detailing process



Twin Arrows – Detailing

- November 2012
  - Detailing was 90% complete
  - Hunt Construction started bid process for steel fabricator
    - Bids became more competitive
    - Based on Contract Documents and 90% shop drawings
  - Enabled Hunt Construction to get a better price for the owner
- Normally steel detailing would just begin at this point.

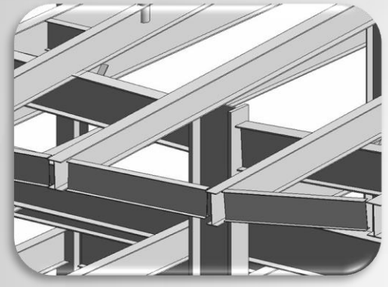
Twin Arrows – Fabrication

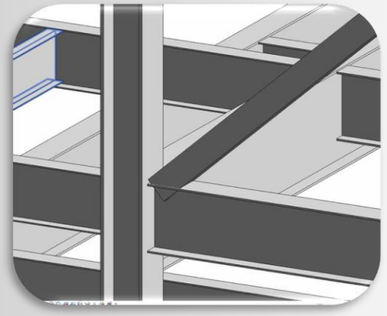
- December 2012
  - Able Steel Fabricators of Mesa, AZ selected as fabricator
  - C-G incorporated Able Steel's shop spec for last 10% of detailing
    - Naming conventions
      - i.e. piece marking
    - Sequencing
    - CNC considerations

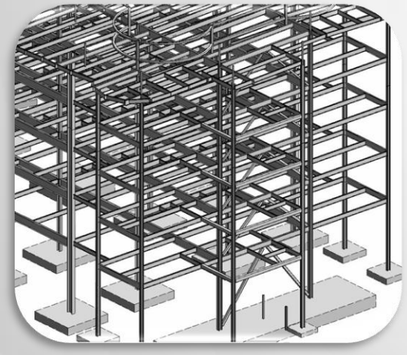
Twin Arrows - Fabrication

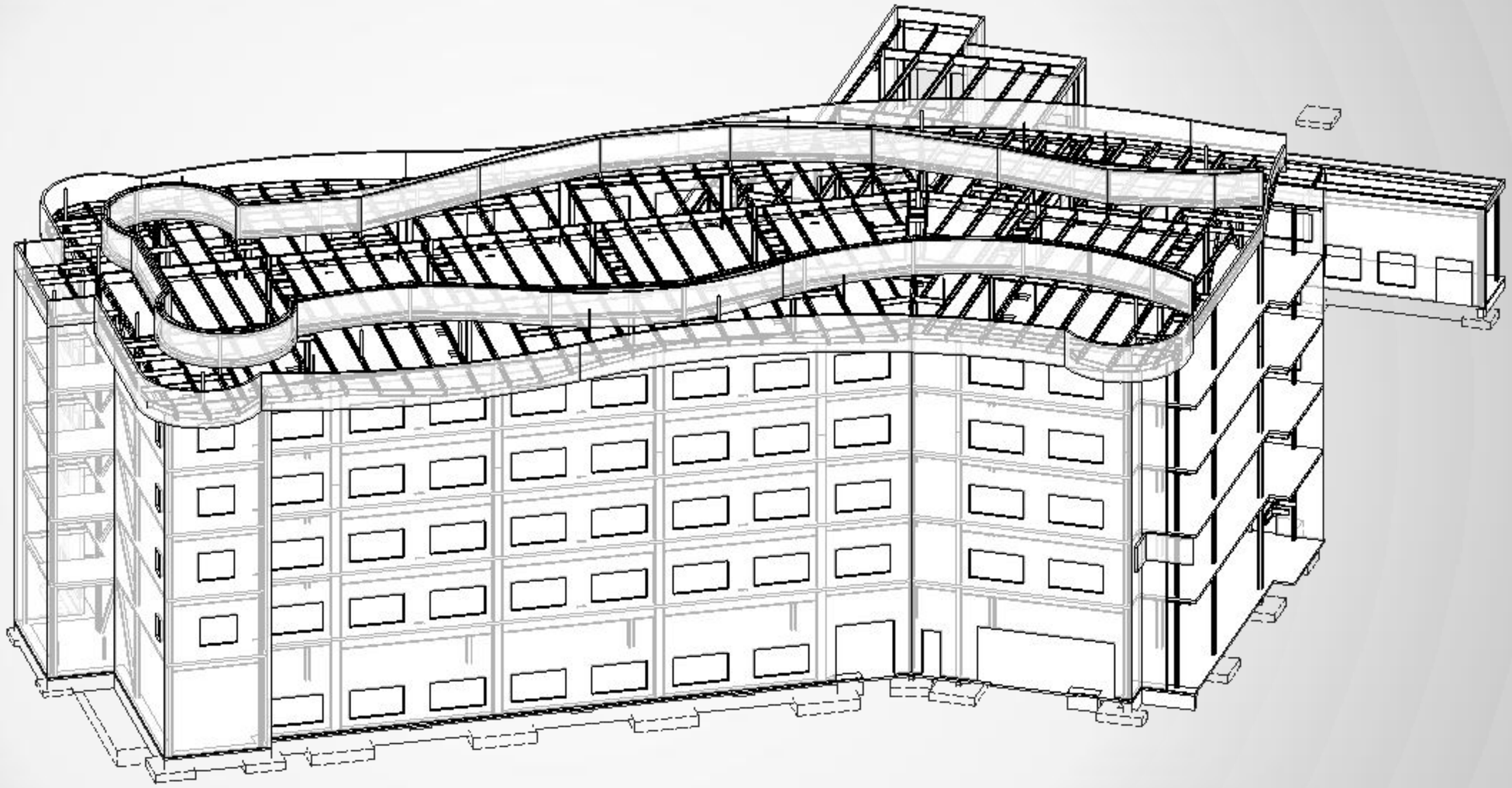
- January 2013
  - Able Steel can begin fabricating
  - 3 months shaved off timeline by delivering shops with CDs
- March 2013
  - Steel erection begins

Twin Arrows – Revit Model

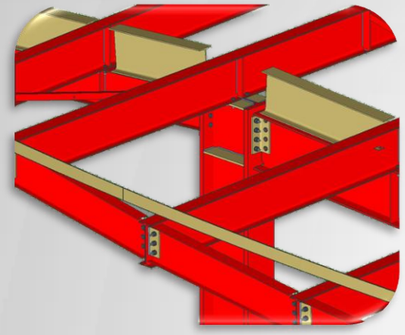


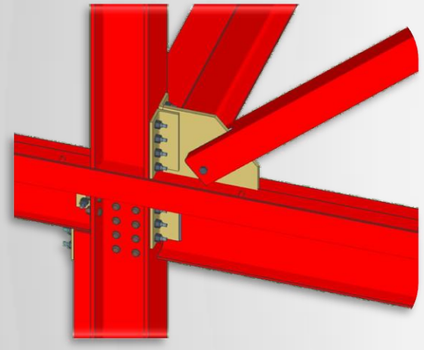


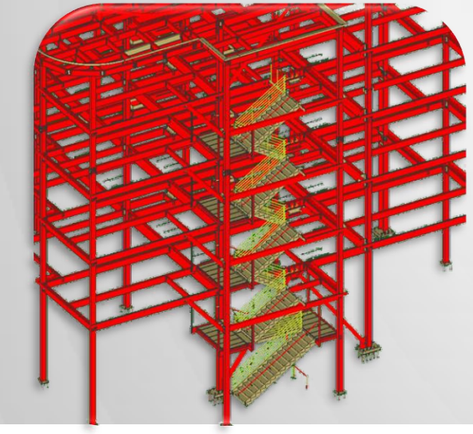




Twin Arrows – SDS/2 Steel Detailing Model



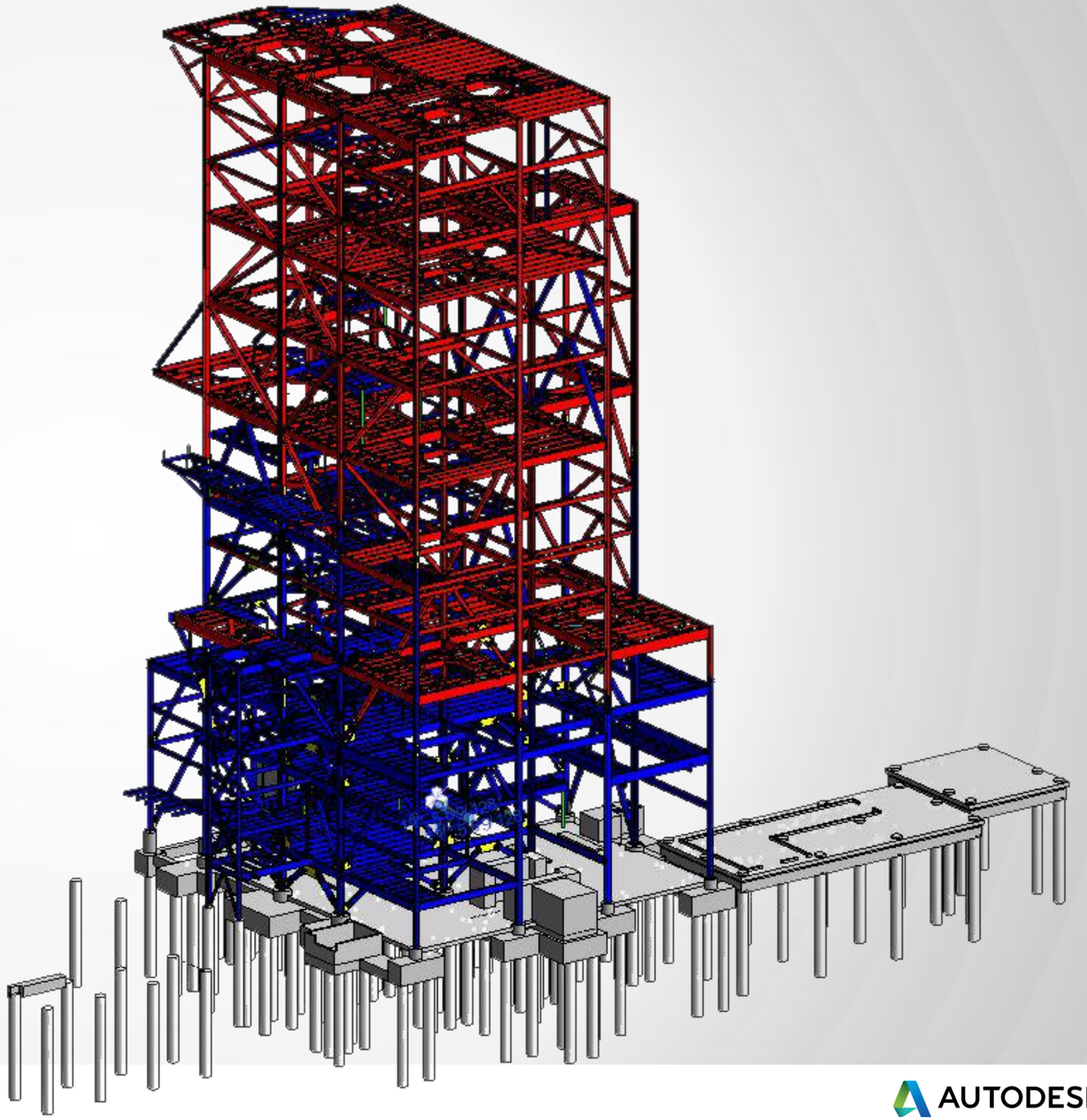




Twin Arrows – Benefits of SDS/2 Connect

- “At risk” detailing approached enabled C-G to keep project alive
  - Model transfer saved time on input
  - Kept project schedule from slipping while searching out funding
  - Helped eliminate detailer’s RFIs by transferring an accurate Revit model

Case Study Three: FLS-Ash Grove



FLS-Ash Grove

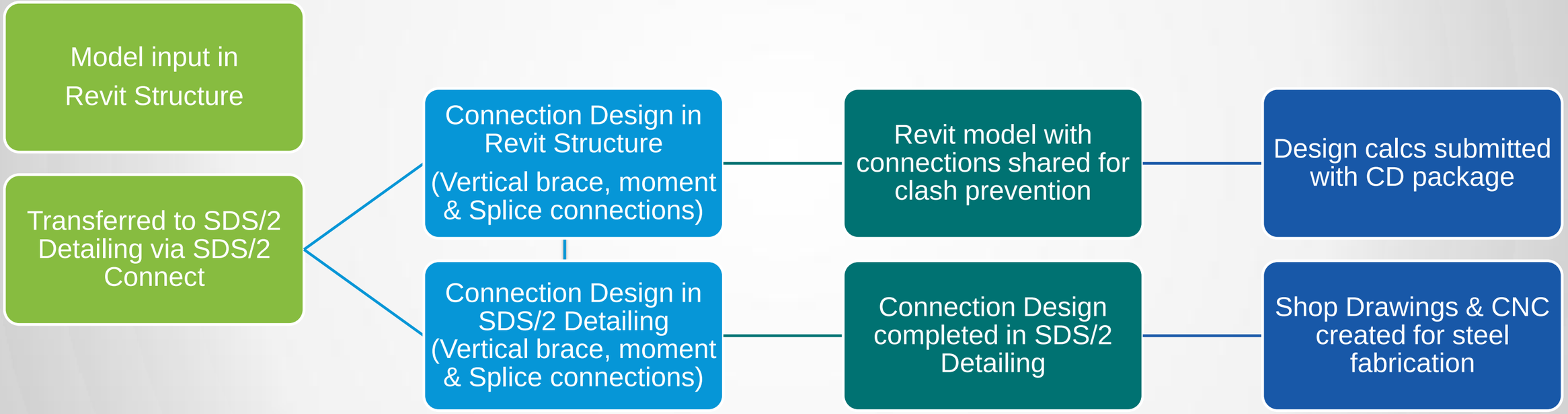
- Heavy Industrial Cement Manufacturing Plant
  - Pre-Heat Tower
  - Located in Midlothian, TX
  - 3400 tons of steel
  - Steel structure is 250 ft tall
    - With all equipment, stands 340 ft
    - 20 ft diameter duct work
  - C14x730 center column
    - Largest commercially rolled steel section in US
  - Still under construction

FLS-Ash Grove

- Engineer:
- Steel Detailer: Williams Steel
- Fabricator: Williams Steel

- Software Used:
  - Revit Structure 2013
  - SDS/2 Connect 2013
  - SDS/2 v. 7.3

FLS-Ash Grove – Project work process

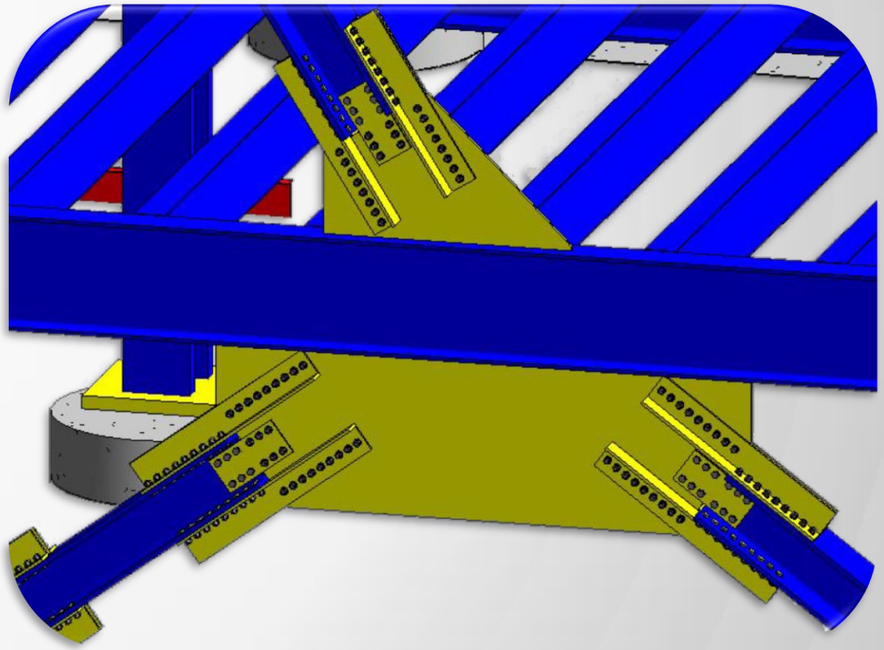


FLS-Ash Grove – Model Transfer

- Designer input 100% of the structural steel in the Revit model
  - Accuracy counts!
  - Important for set up to match in SDS/2 Connect and SDS/2 Detailing
- SDS/2 Connect XML file from Revit model populated the detailer's model in SDS/2 Detailing
  - Speedier than IFC
  - Contains more detailed steel information

FLS-Ash Grove – Connection Design

- Connection Design was done in tandem
  - Engineer & detailer input connections simultaneously in Revit and SDS/2 Detailing
  - Connection design focus:
    - Large vertical brace connections
      - Gussets averaged 6’x4’
    - Large column splices
      - Splices design for W14x730s to W14x665s
    - Moment connections

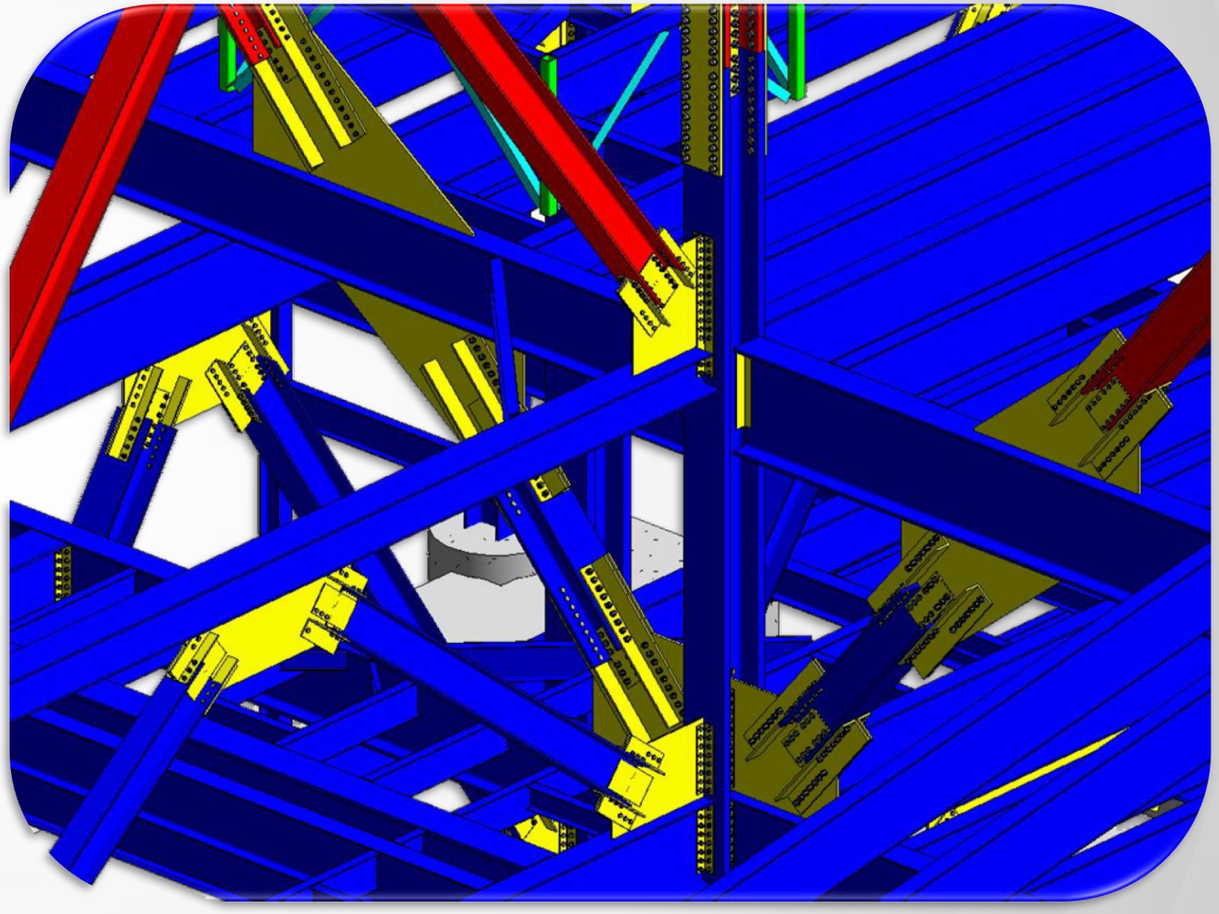


FLS-Ash Grove – Connection Design

- After this point the engineer's model (Revit) and detailer's model (SDS/2) have two different purposes
  - Revit model
    - Clash prevention with other disciplines
    - Contract Docs
  - SDS/2 model
    - Complete connection design
    - Shop drawings
    - CNC

FLS-Ash Grove – Connection Design (Revit)

- Revit model with vertical braces connections is shared with design team
  - Used to avoid interferences during design for:
    - Pipes
    - Cable trays
    - Large equipment



FLS-Ash Grove – Model Usage (Revit)

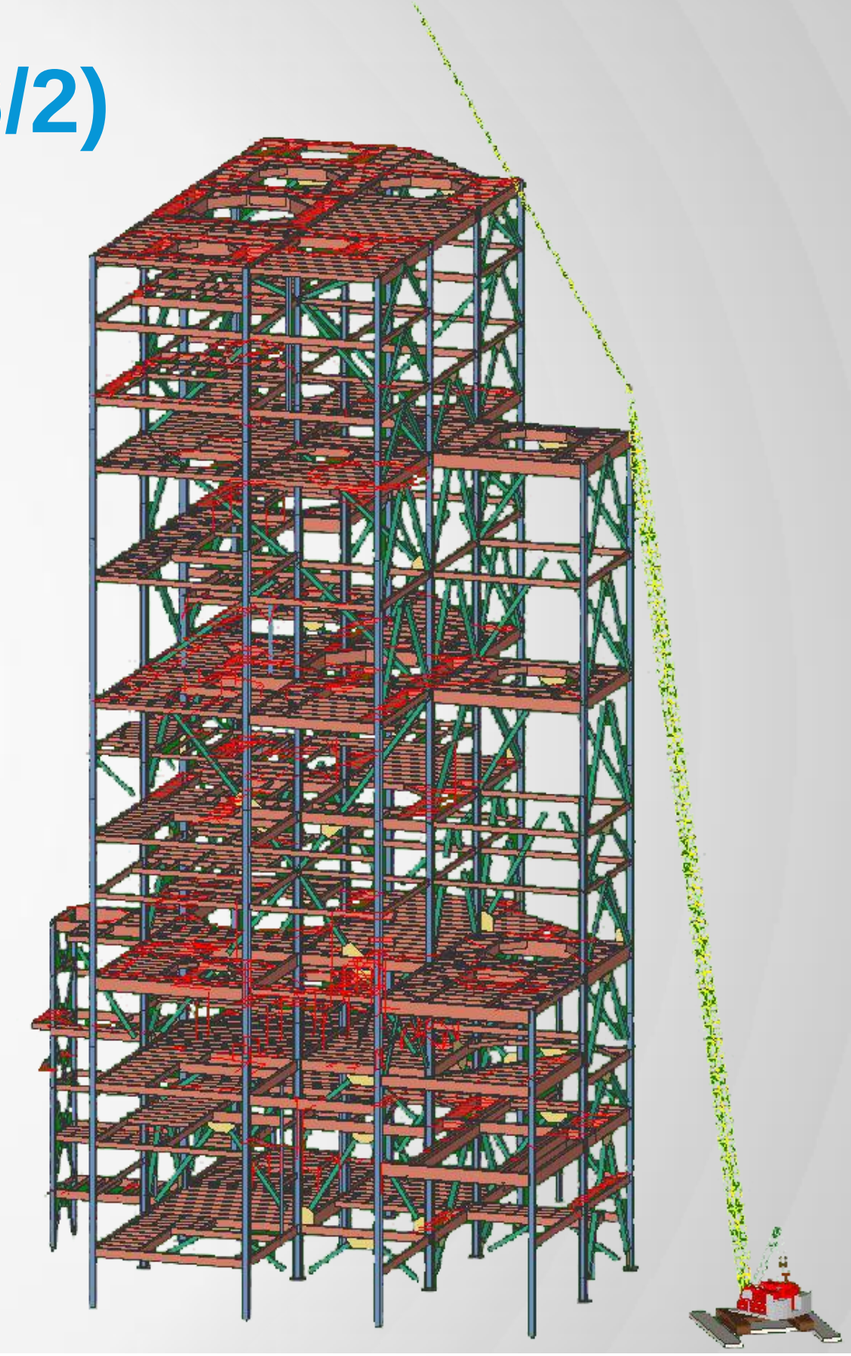
- Contract Documents are prepared for delivery
  - Connection design calculations for early designed connections are printed from SDS/2 Connect
  - Sections from Revit model are created to show connection sketches to GC and owner

FLS-Ash Grove – Connection Design (SDS/2)

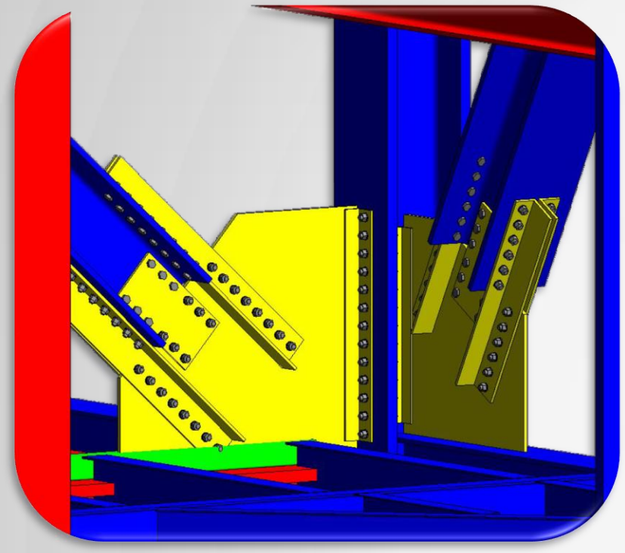
- SDS/2 Detailing model is used to complete connection design on the structure
  - Girders
  - In-fill beams, etc.
- Miscellaneous steel added to the model and connected
  - Handrail
  - Ladders
  - Supports

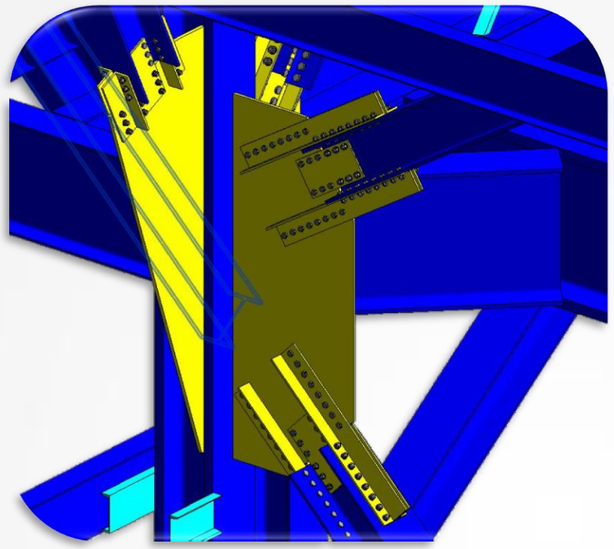
FLS-Ash Grove – Model Usage (SDS/2)

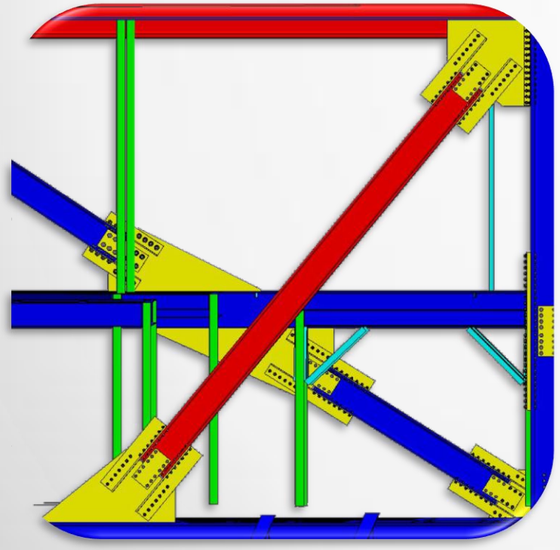
- SDS/2 model created:
  - Shop drawings
    - Details
    - Erection views
    - Submaterial drawings
  - CNC files
  - Reports
    - Material summaries
    - Bolt lists, etc.
  - Determined crane reach for steel on construction site

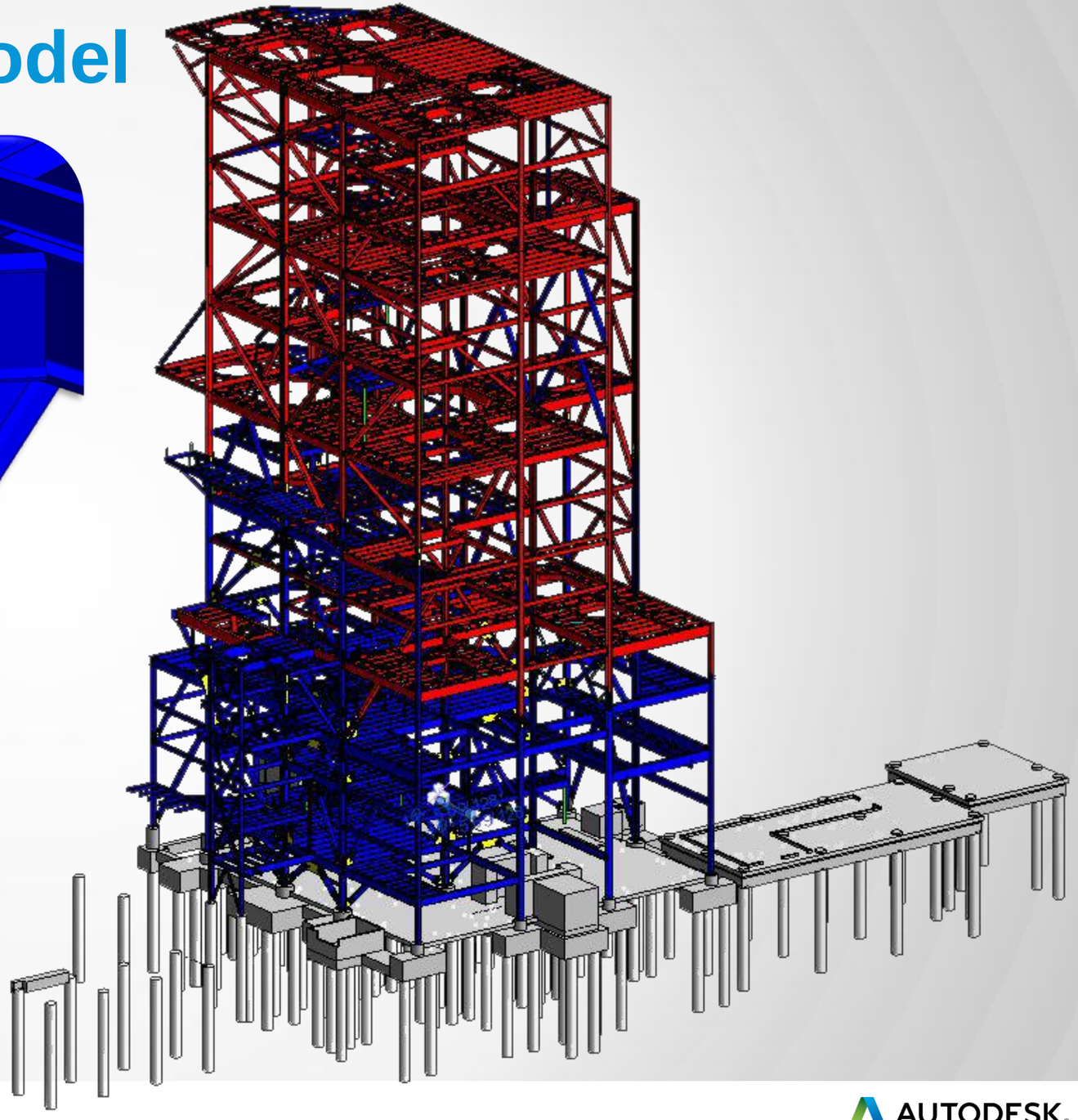


FLS-Ash Grove – Revit Model

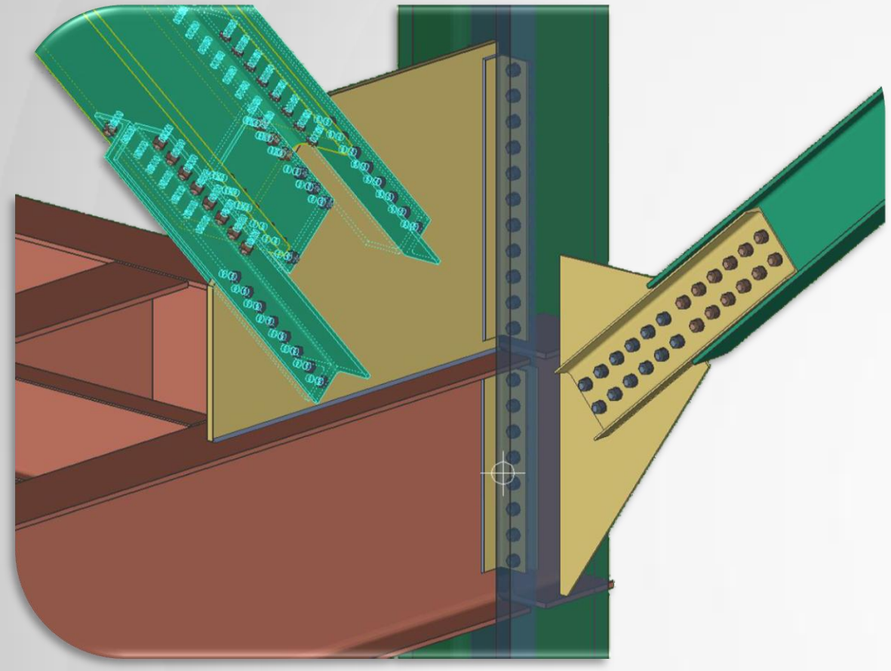


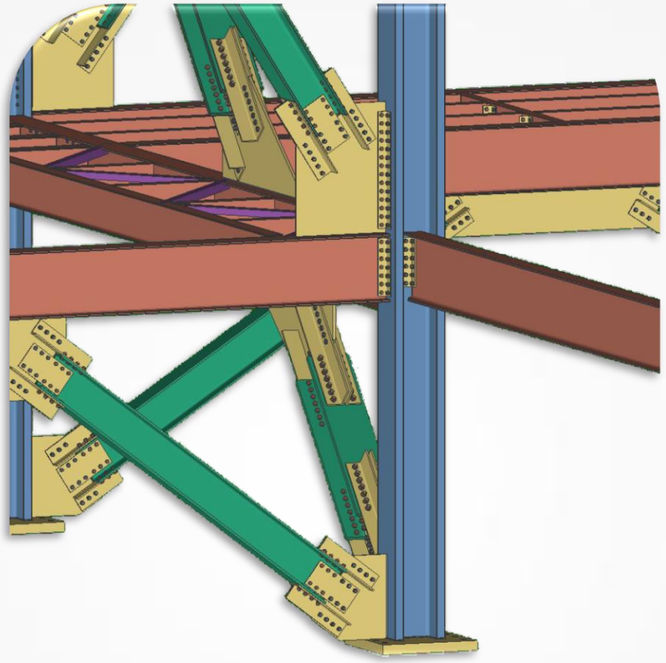


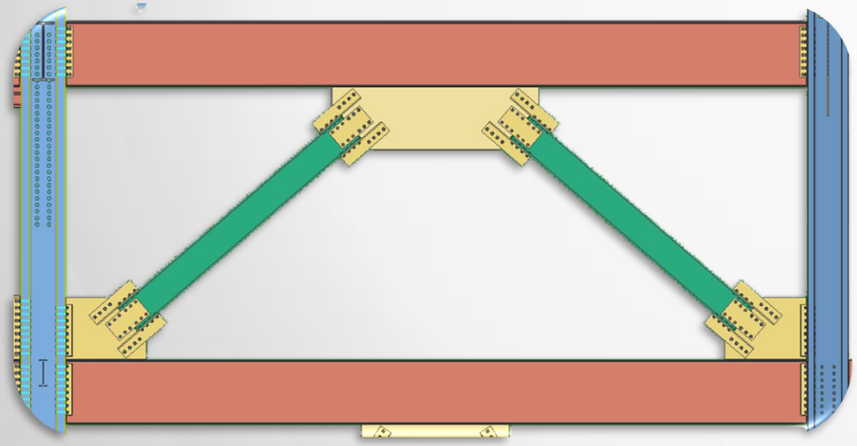


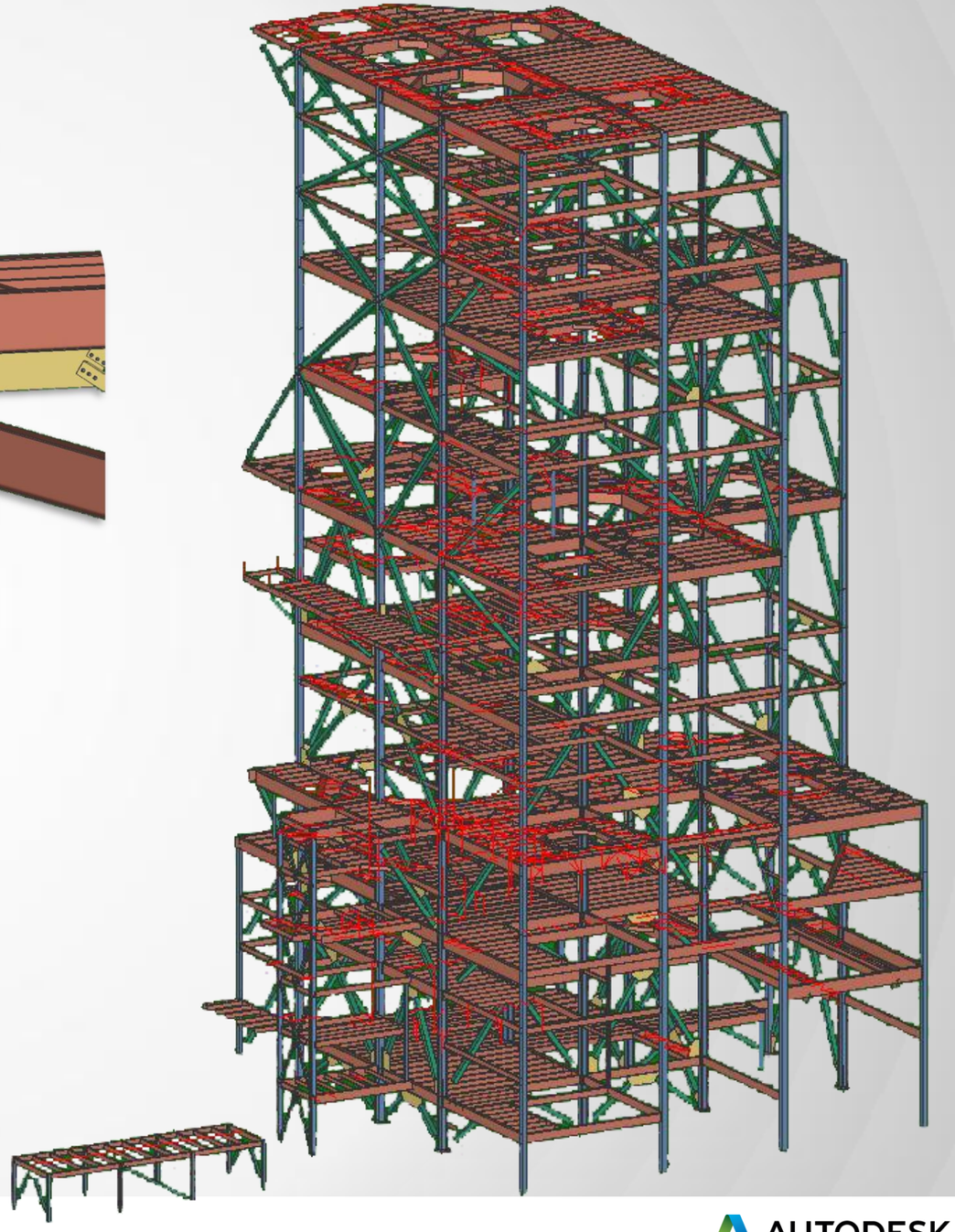


FLS-Ash Grove – SDS/2 Model









FLS-Ash Grove – Benefits of SDS/2 Connect

- Ability to have critical connections in the Revit model that could be shared for:
  - Clash prevention in tight spaces for mechanical design
  - Live sections for GC and owner
  - Design calculations that were submitted with CDs

SDS/2 Connect

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