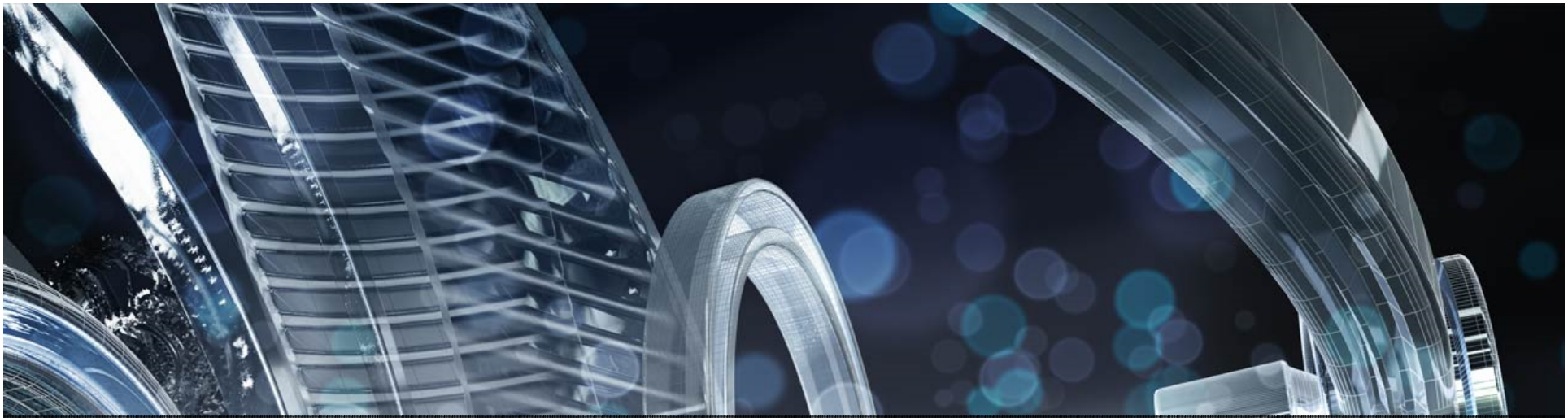


# Top 10 Tips for Building Plumbing Models for Design and Coordination | Autodesk® Revit® MEP

**IKERD Consulting LLC: Will Ikerd** PE, LEED AP, Principal – Speaker
**IKERD Consulting LLC**: **Joseph Powell** Project Engineer – Co-Speaker

Autodesk University

# Class Summary

This class will provide an in-depth discussion of best practices for building a design model for use in both 2D construction documentation and 3D trade coordination. As more projects are designed in 3D from the beginning, architectural, structural, and other trade models can be used by MEP designers when laying out their systems. We will address the how and why of making a model for both documentation creation and 3D coordination in step-by-step descriptions of best practices based on real-world examples where this workflow has been successful.

This is not a entry level Revit Picks & Clicks Class. It will address big picture concepts for Plumbing.

# Learning Objectives

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

- Describe the three major elements in team collaboration (origin, names and folders).
- Understand Level Of Development (LOD) and how can it help me and how far should you model.
- Define the key element that should go into project general notes and specifications.
- Use Revit MEP for 2D documentation with a focus on preparing them for 3D coordination.
- Know the keys to model setup for a successful 3D coordination.

# IKERD CONSULTING

- Started in 2003 by Brenda Ikerd
- 3 Areas of Focus:
  - Virtual Design & Construction with BIM
  - Technology Implementation
  - Areas: MEP, Structural, Energy, Enclosures, Civil

BIMFORUM

Chair the Designers Subforum

Co-Chair of the SEI – CASE Joint Committee on BIM

Chair Sub-Committee on Dev., Soft. & Train.

Committee member of IT Committee

Focused on BIM & IPD in Steel

American Concrete Institute

ACI Committee 131 Building Information Modeling

International Facility Management Association

Consultant Member focused on BIM for FM

# IKERD CONSULTINGS TOP TEN LIST FOR PLUMBING

1. BIM EXICUTION PLAN (HAVE ONE)
2. BIG 3: Coordinates
3. BIG 3: Names
4. BIG 3: LOD
5. IT STARTS WITH A GOOD STRUCURAL MODEL
6. You can sleeve structure, think about it (and ask)?
6. MAKE THE WEDDING CAKE DIAGRAM FOR SPACE (POWER POINT ?)
7. THINK THOUGH LONG SLOPING RUNDS WITH STRUCURE.
8. KNOW ABOUT LASERSCANNING
9. DUCT IS TPICALLY CHEAPER TO MODIFY THAN FITTINGS

# BIM EXECUION PLAN

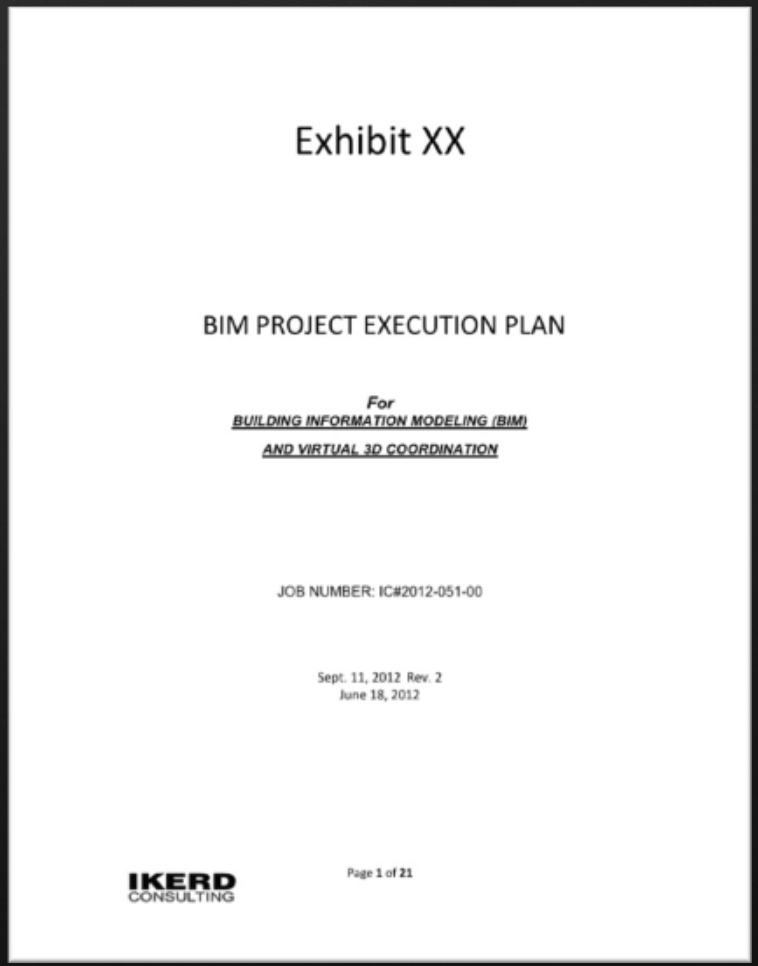


Exhibit XX

BIM PROJECT EXECUTION PLAN

*For*
***BUILDING INFORMATION MODELING (BIM)***
***AND VIRTUAL 3D COORDINATION***

JOB NUMBER: IC#2012-051-00

Sept. 11, 2012 Rev. 2
June 18, 2012

IKERD CONSULTING

Page 1 of 21

# Level Of Development

# LOD TABLE

| Level of Develoment - Geometrical Representation | | | | | |
|---|---|---|---|---|---|
| LOD definitions per AIA/BIMforum agreement July 2011 | | | | | |
| **100**<br>**Conceptual** | **200**<br>**Generic Placeholders** | **300**<br>**Specific Assemblies** | **350**<br>**Enhanced Assemblies**<br>**(Beyond Permit Information)** | **400**<br>**Detailed Assemblies** | **500**<br>**As-built** |
| Information related to the Model Element (i.e. cost per square foot, tonnage of HVAC, etc.) can be derived from other Model Elements represented in the Model and other Project data. The Model Element, however, is not necessarily individually represented within the Model. | The Model Element is graphically represented within the Model as a generic system, object, or assembly with approximate quantities, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element. | The Model Element is graphically represented within the Model as a specific system, object or assembly accurate in terms of quantity, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element. This level would define the material specifications. | *The Model Element is graphically represented within the Model as a specific system WITH additional enhanced model content and information beyond the permit drawing LODv 300. This LODv would include model information for elements that is beyond permit drawing level but less than fabrication level information. MEP needs space olders for trade coordination.* | The Model Element is graphically represented within the Model as a specific system, object or assembly that is accurate in terms of size, shape, location, quantity, and orientation with detailing, fabrication, assembly, and installation information. Non-graphic information may also be attached to the Model Element. | The Model Element is an as-constructed representation accurate in terms of size, shape, location, quantity, and orientation. Non-geometric information may also be attached to the Model Elements. |
| | | **This has to be a naragive of sleve locations must be given with the model.** | **We need different set of rules for high siesmic sones for modeling.** | | |

# LOD 100

The Model Element may be graphically represented in the **Model with a symbol, but does not have any indication of actual physical geometry.** Information related to the Model Element (i.e. cost per square foot, tonnage of HVAC, etc.) can be derived from other Model Elements represented in the Model and other Project data.

# LOD 200

The Model Element is graphically represented within the Model as a **generic system, object, or assembly with approximate quantities, size, shape, location, and orientation.** Non-graphic information may also be attached to the Model Element.

# LOD 300

- The Model Element is graphically represented within the **Model as a specific system, object or assembly accurate in terms of quantity, size, shape, location, and orientation.** Non-graphic information may also be attached to the Model Element.

# LOD 350: Assemblies for Coordination

- NEW!
- The Model Element is graphically represented within the Model with the detail necessary for cross-trade coordination and construction layout.

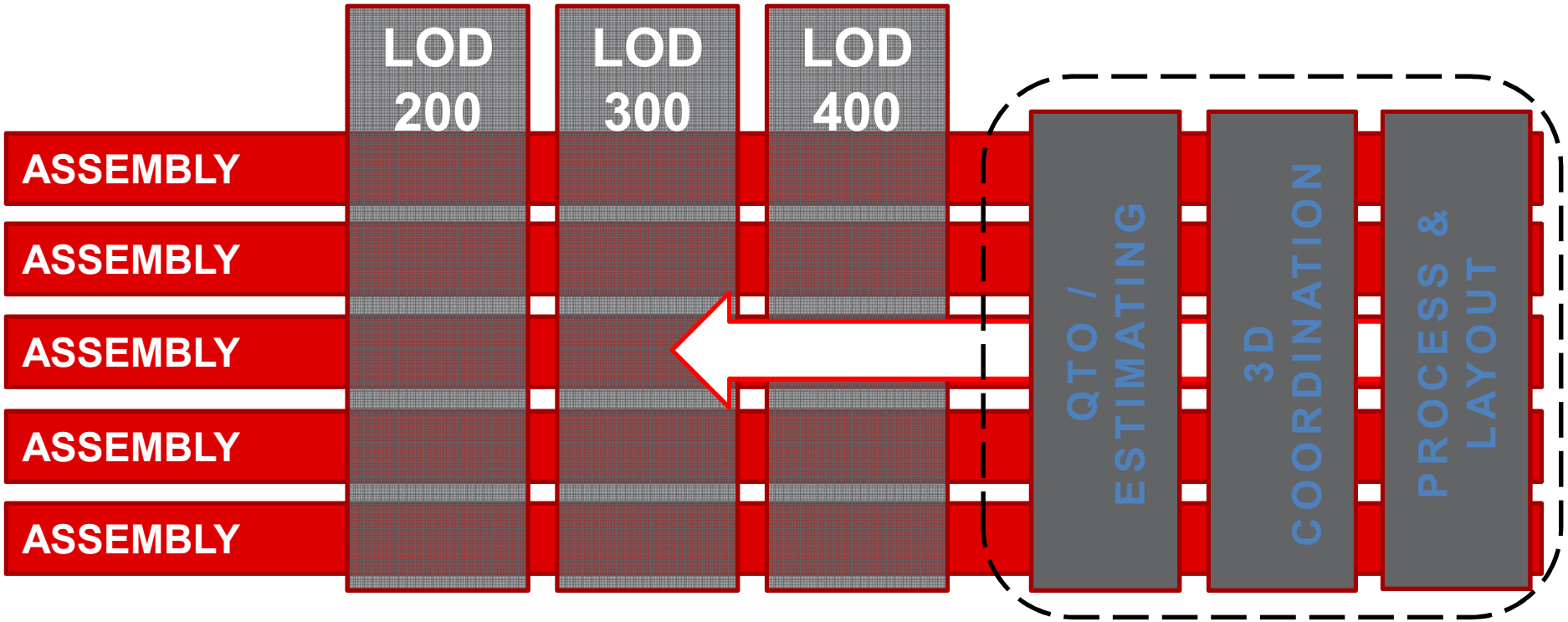
# LOD 400: Detailed Assemblies

- The Model Element is graphically represented within the Model as a specific system, object or assembly that is accurate in terms of size, shape, location, quantity, and orientation **with detailing, fabrication, assembly, and installation information.** Non-graphic information may also be attached to the Model Element.

# LOD 500 As-built

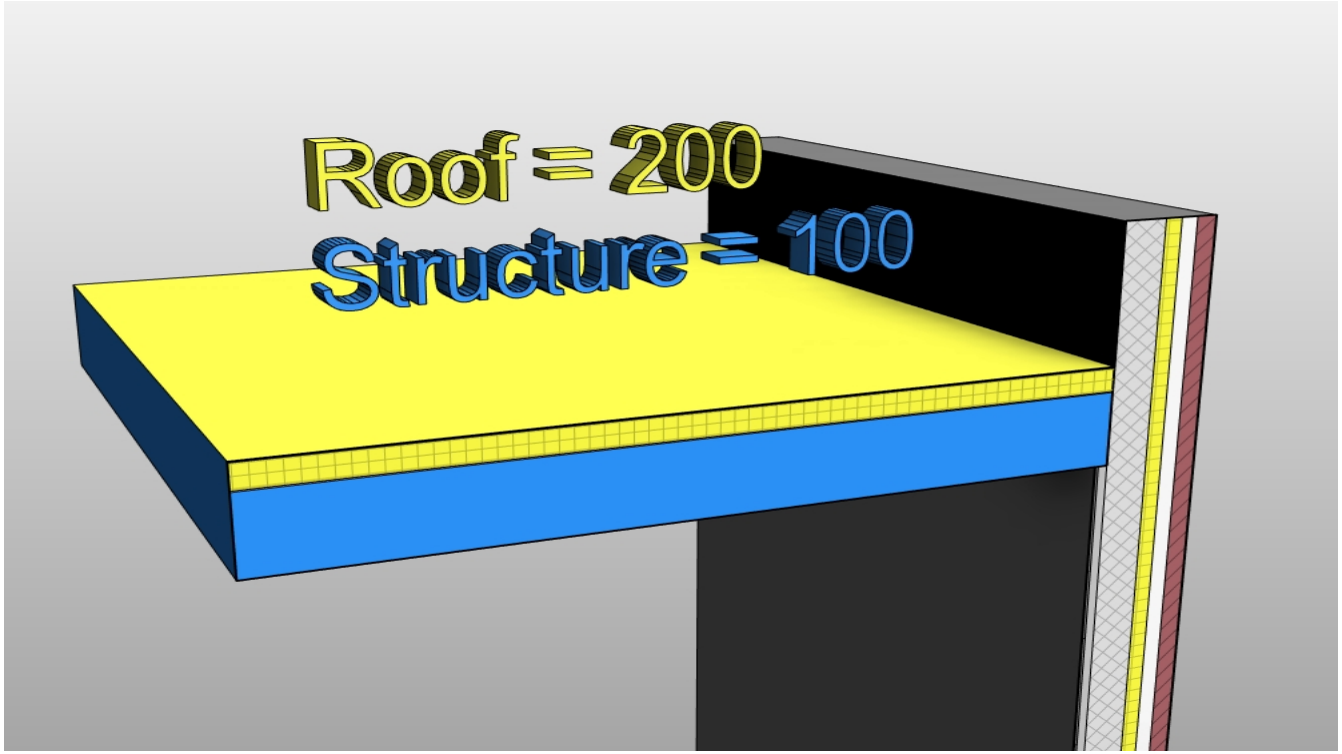
- The **Model Element is an as-constructed representation** accurate in terms of size, shape, location, quantity, and orientation. **Non-geometric information may also be attached to the Model Elements.**

# LOD Catalog: Progress

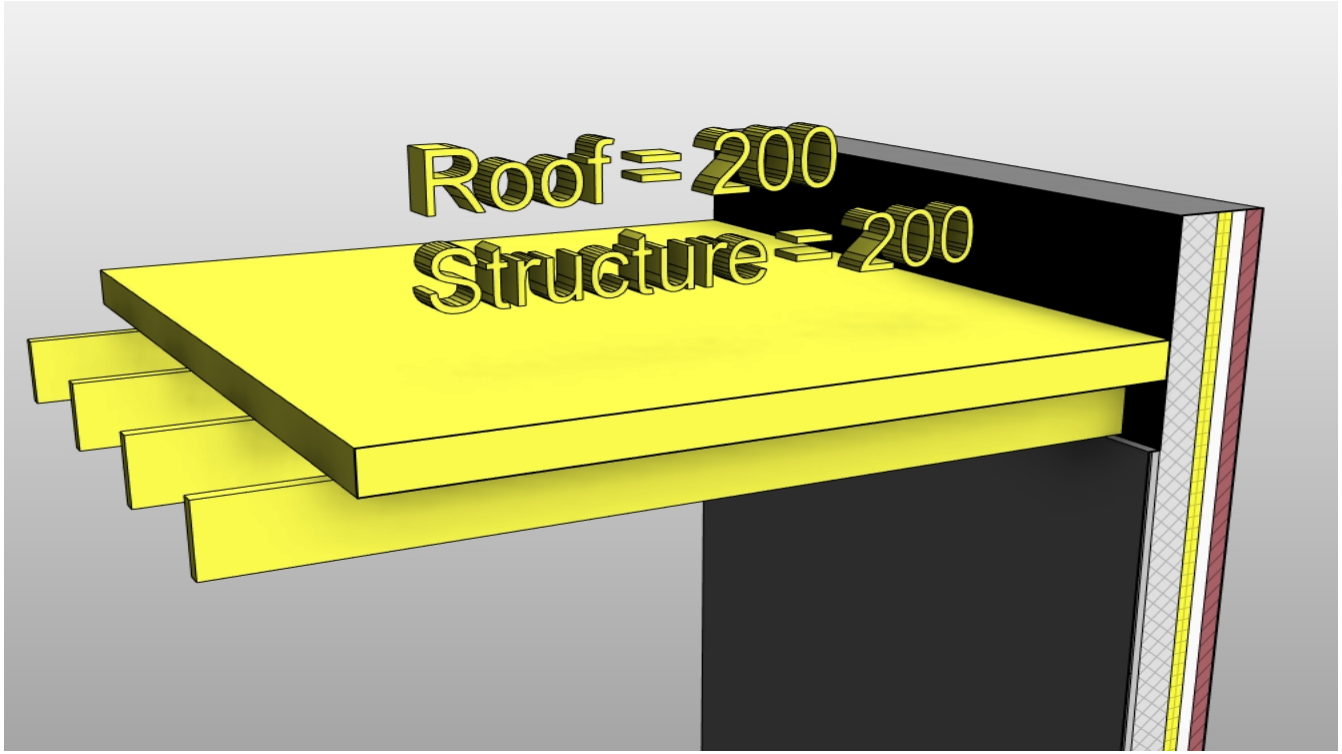


# Examples

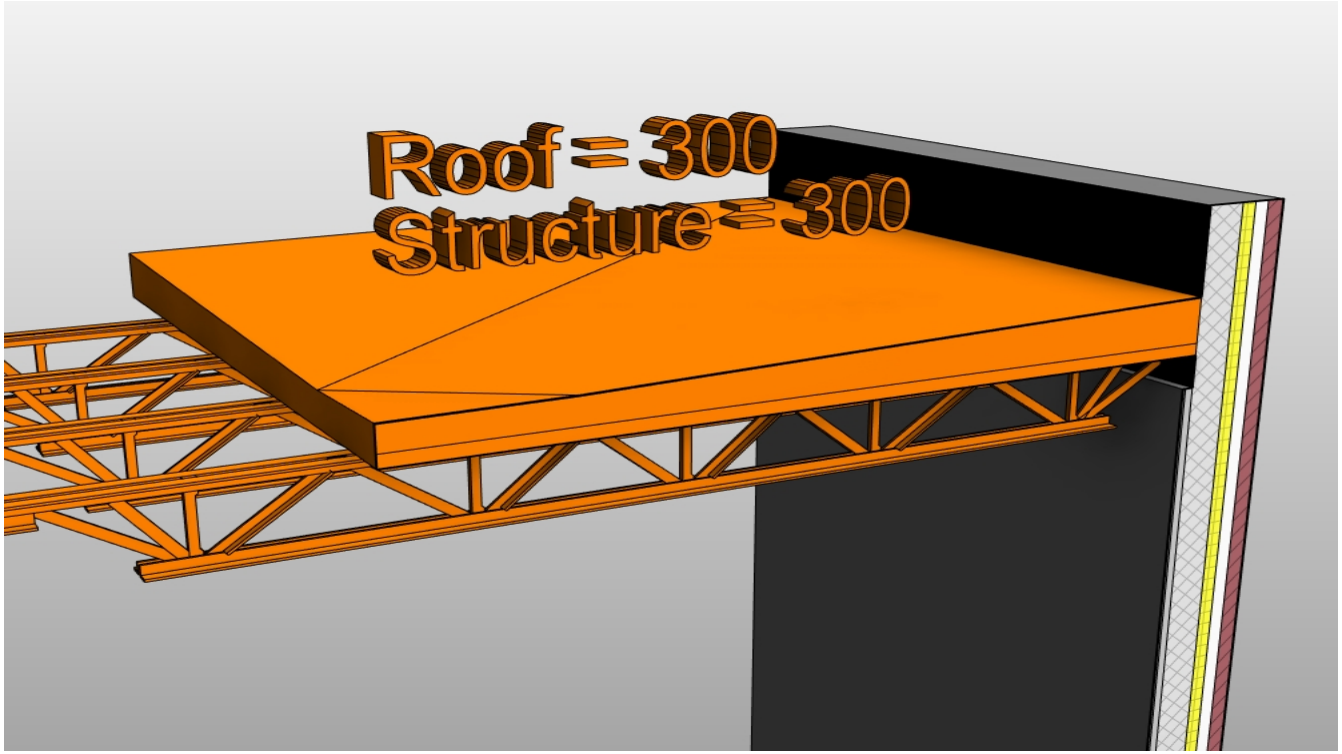
# LOD Catalog: Current Examples



# LOD Catalog: Current Examples

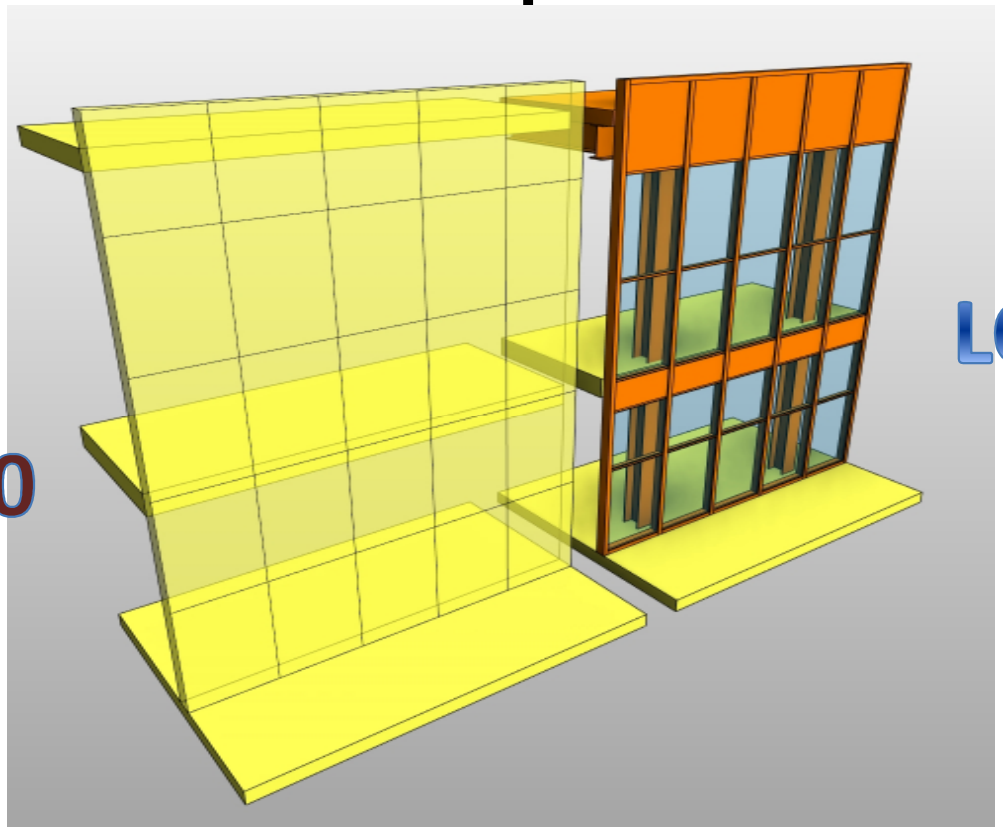


# LOD Catalog: Current Examples

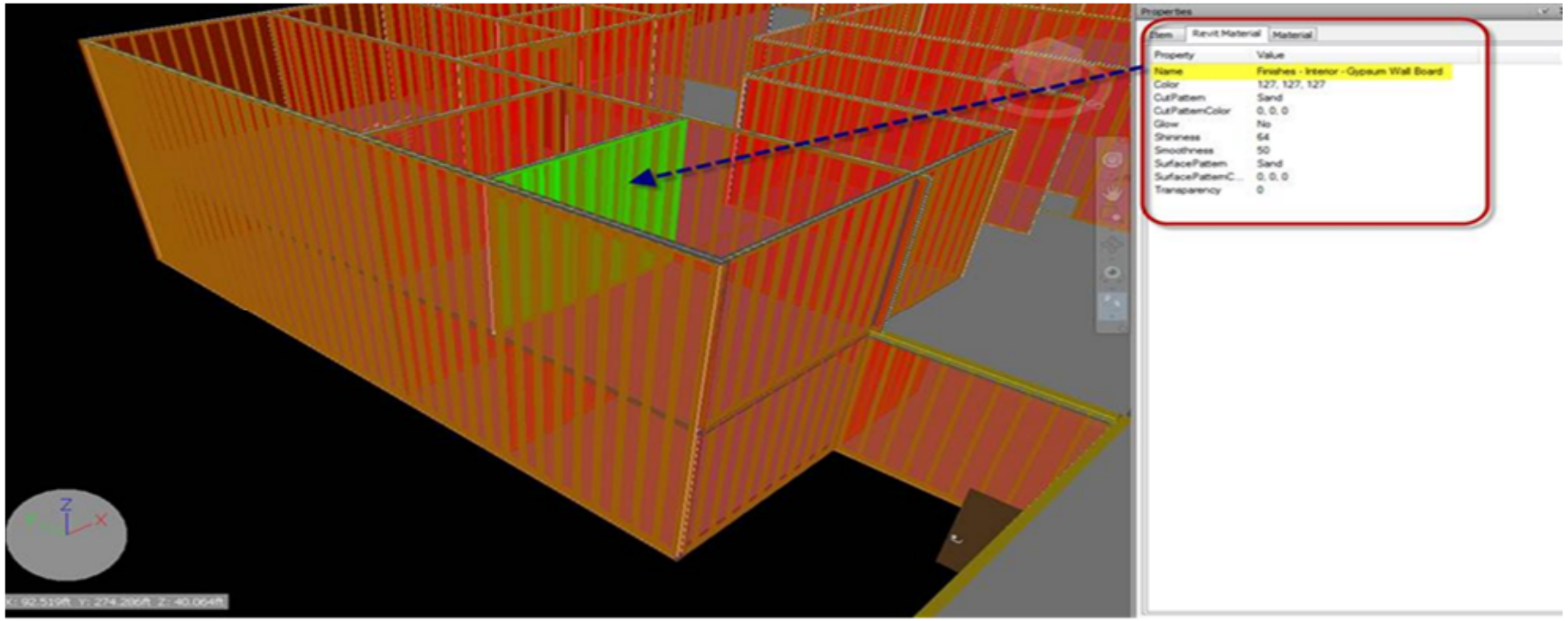


# LOD Catalog: Current Examples

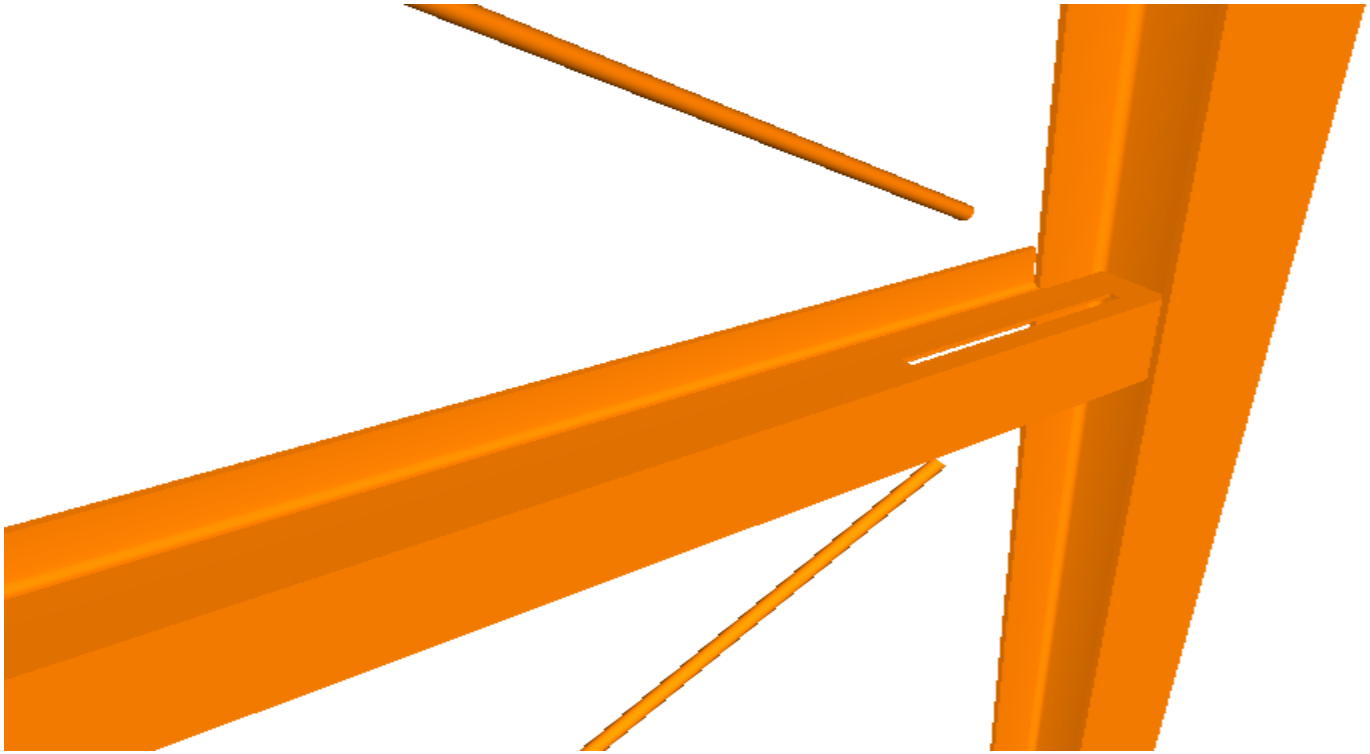
LOD200



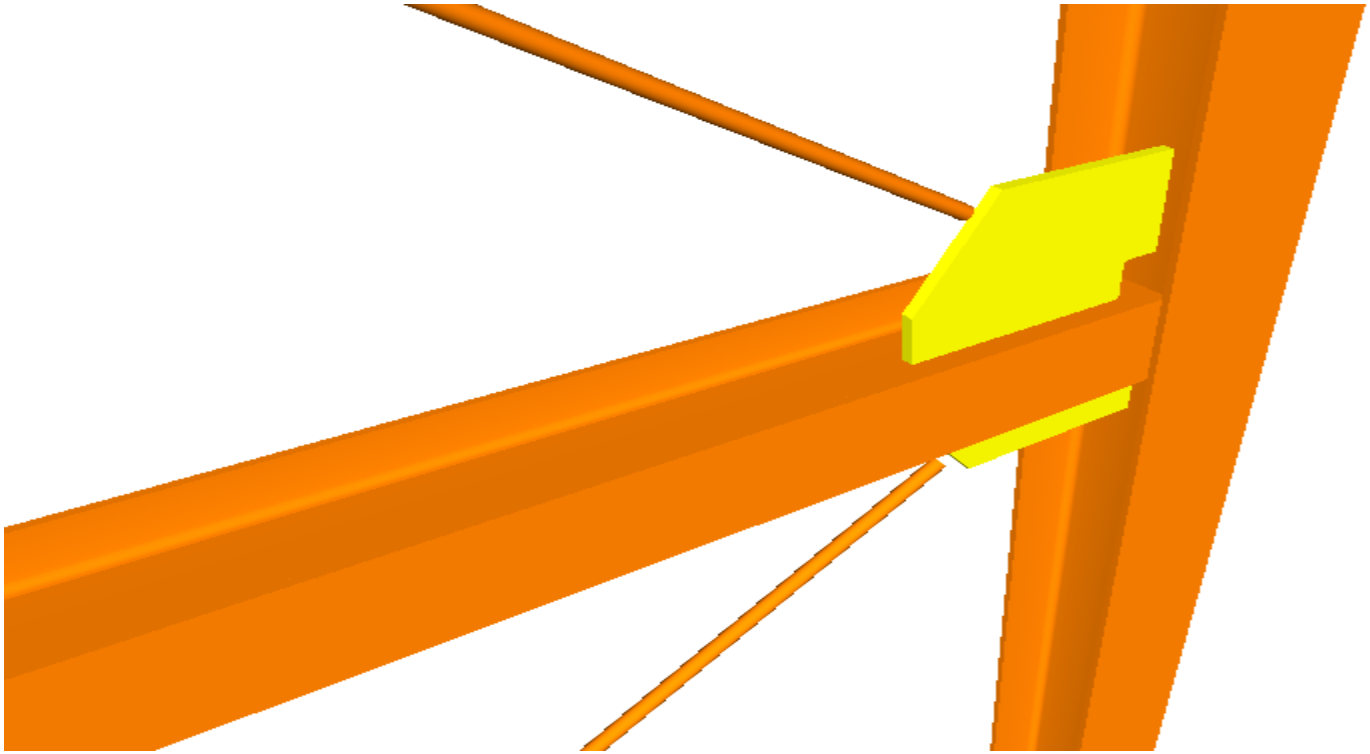
LOD300



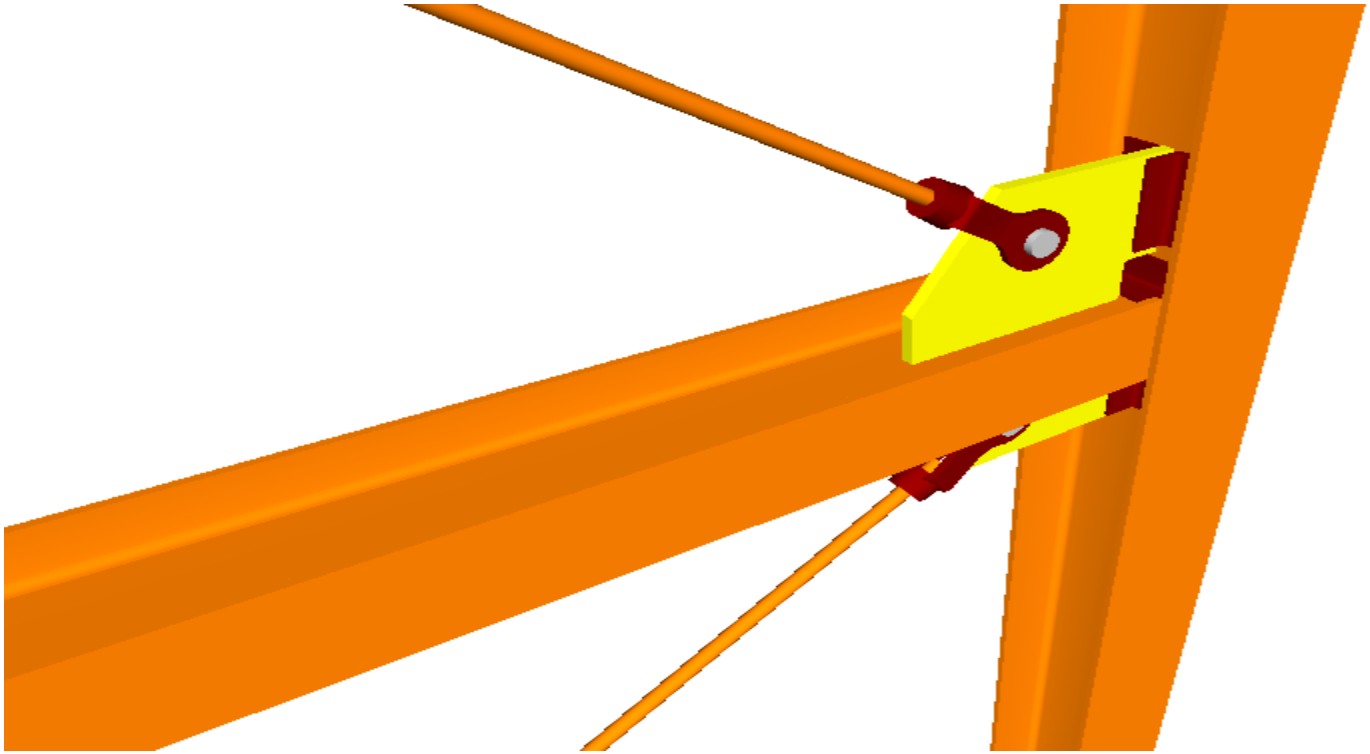
# BRACE LOD 300

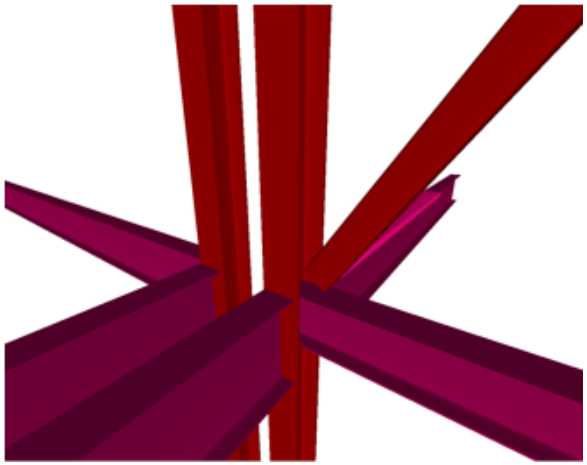


# BRACE LOD 350

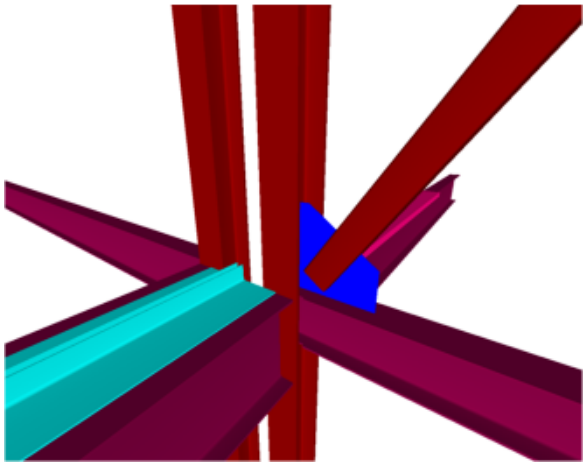


# BRACE LOD 400

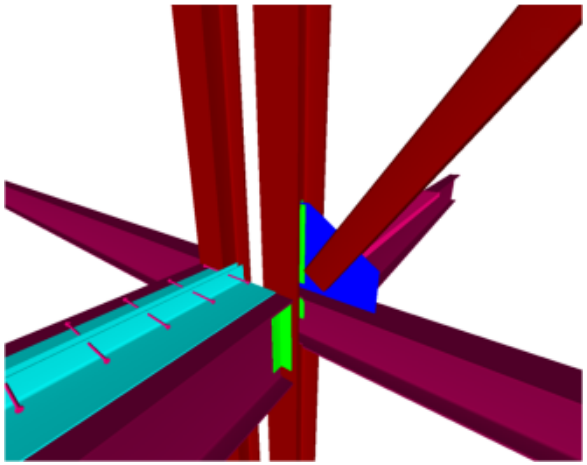




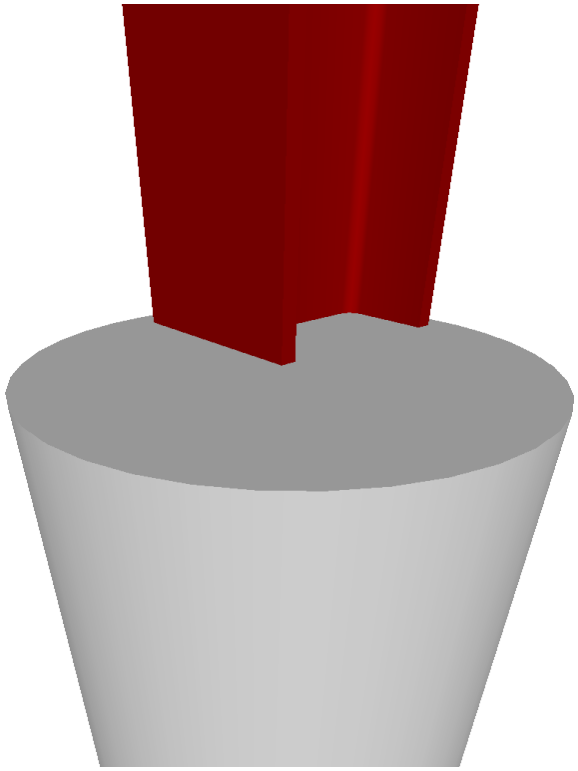
300



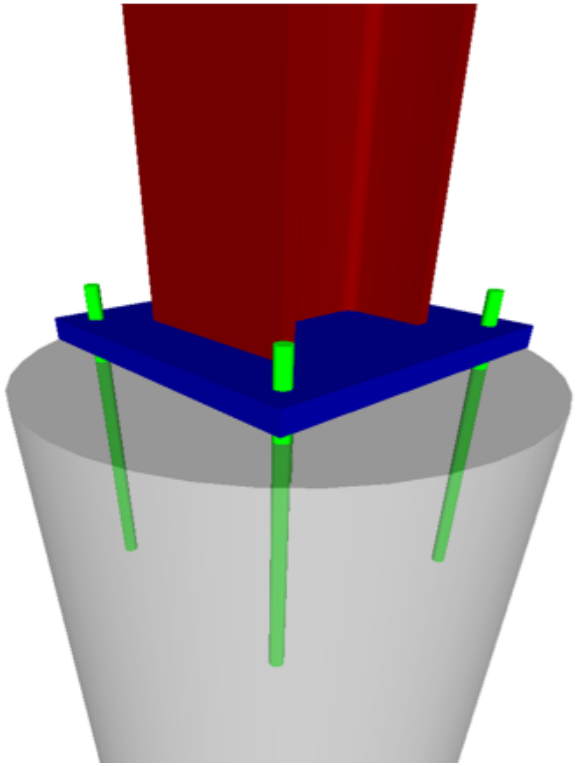
**350**



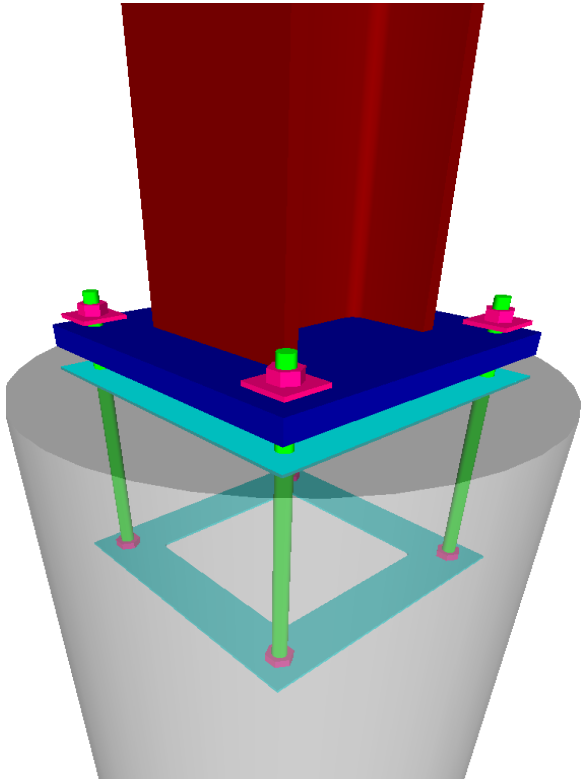
400



300

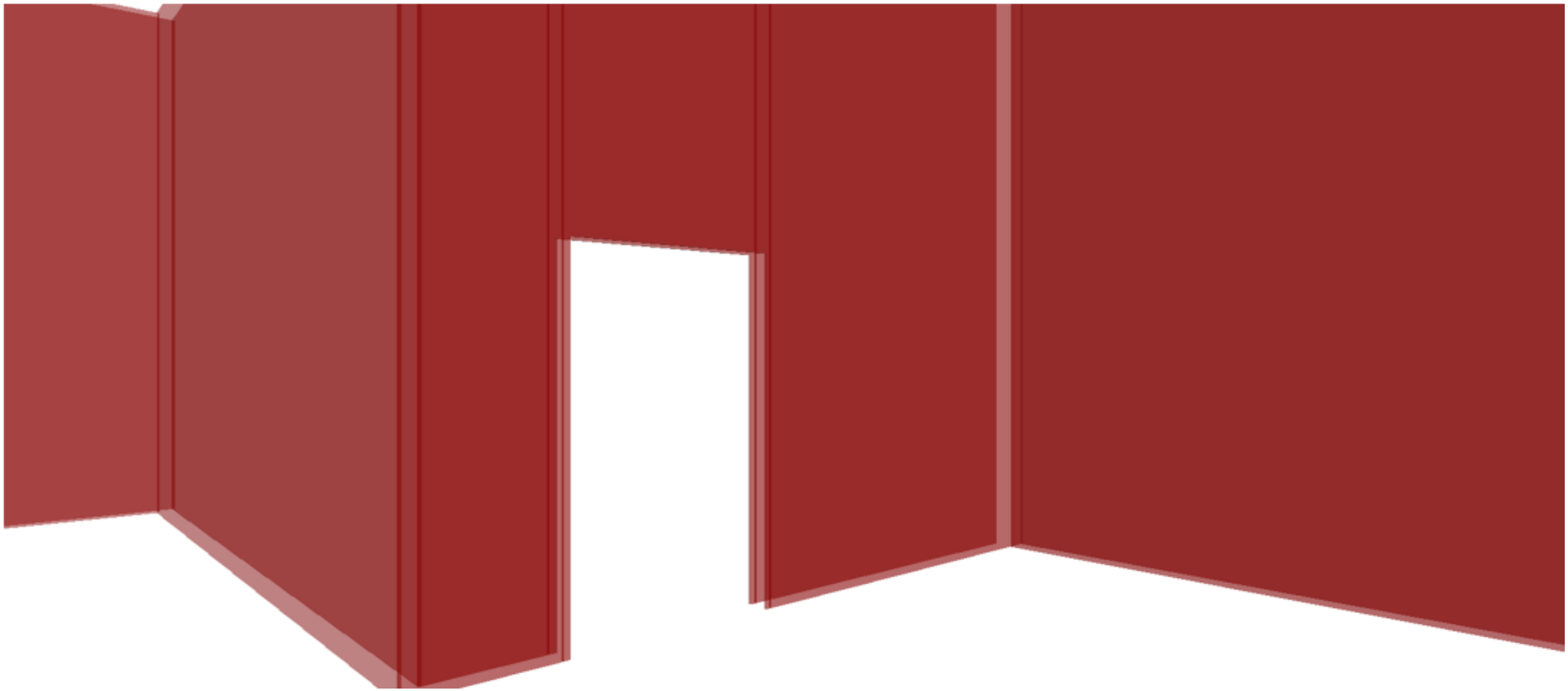


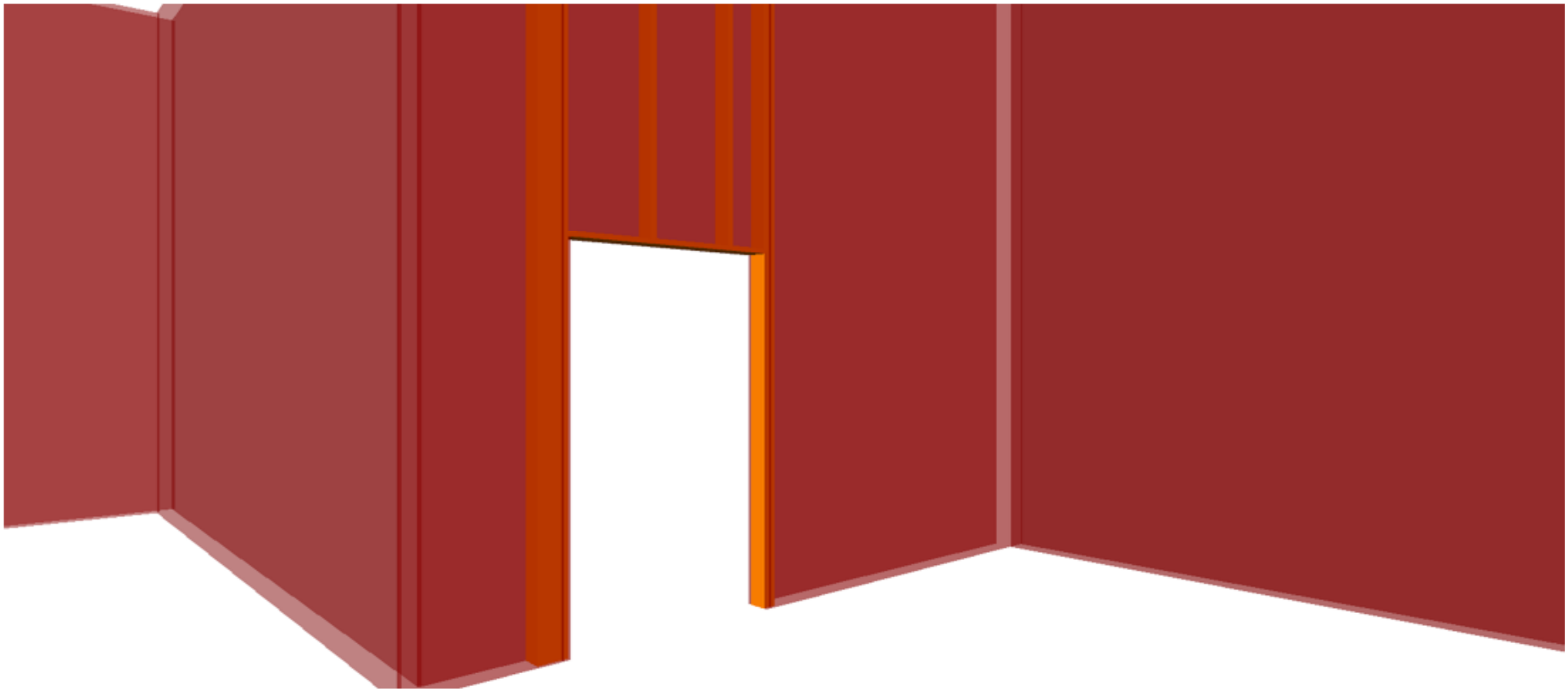
**350**

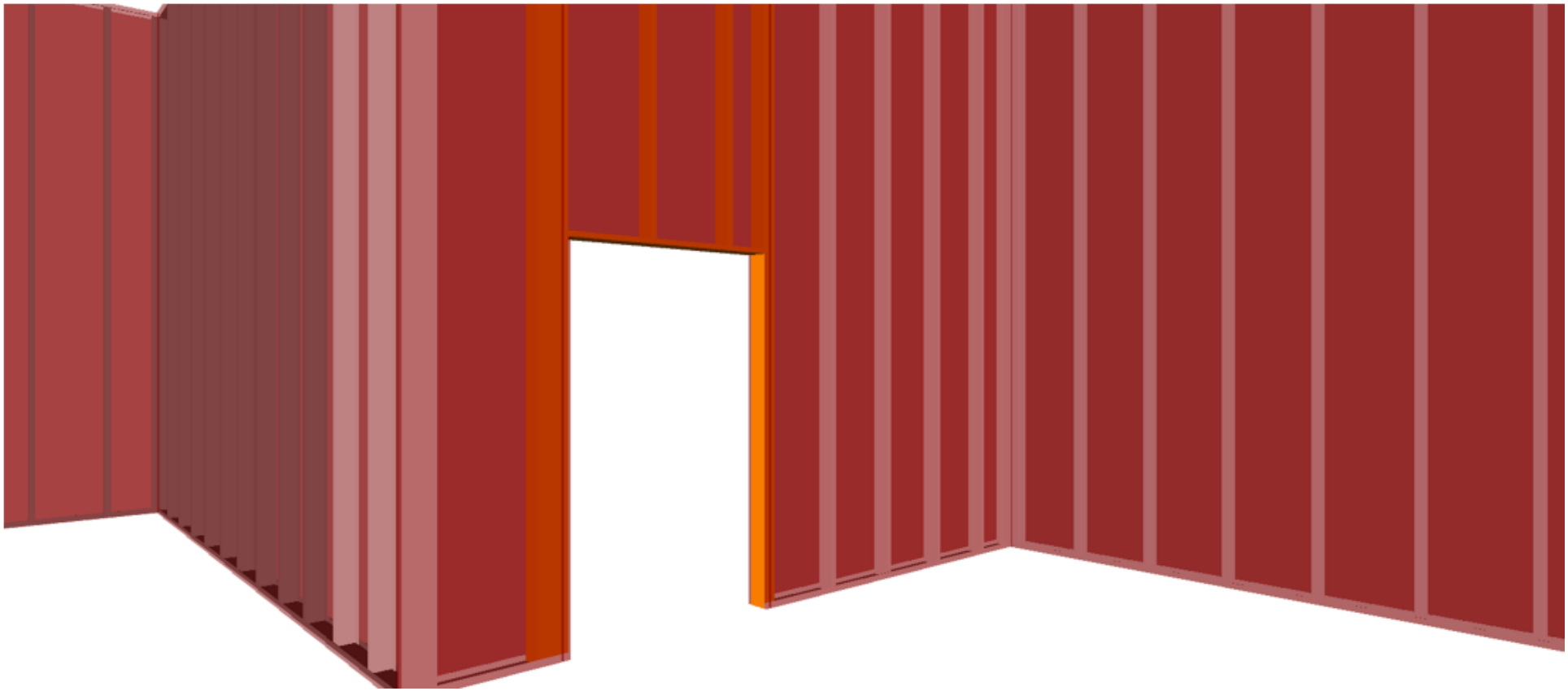


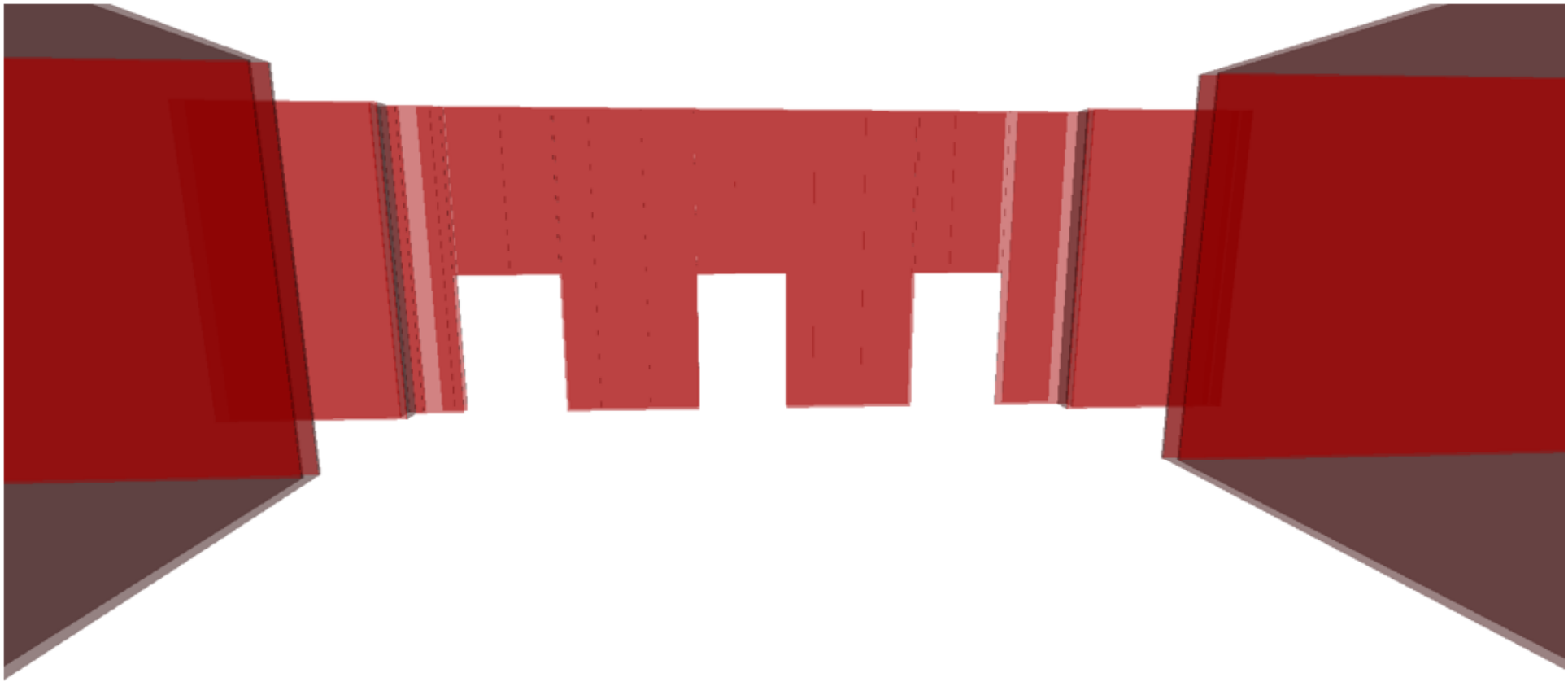
400

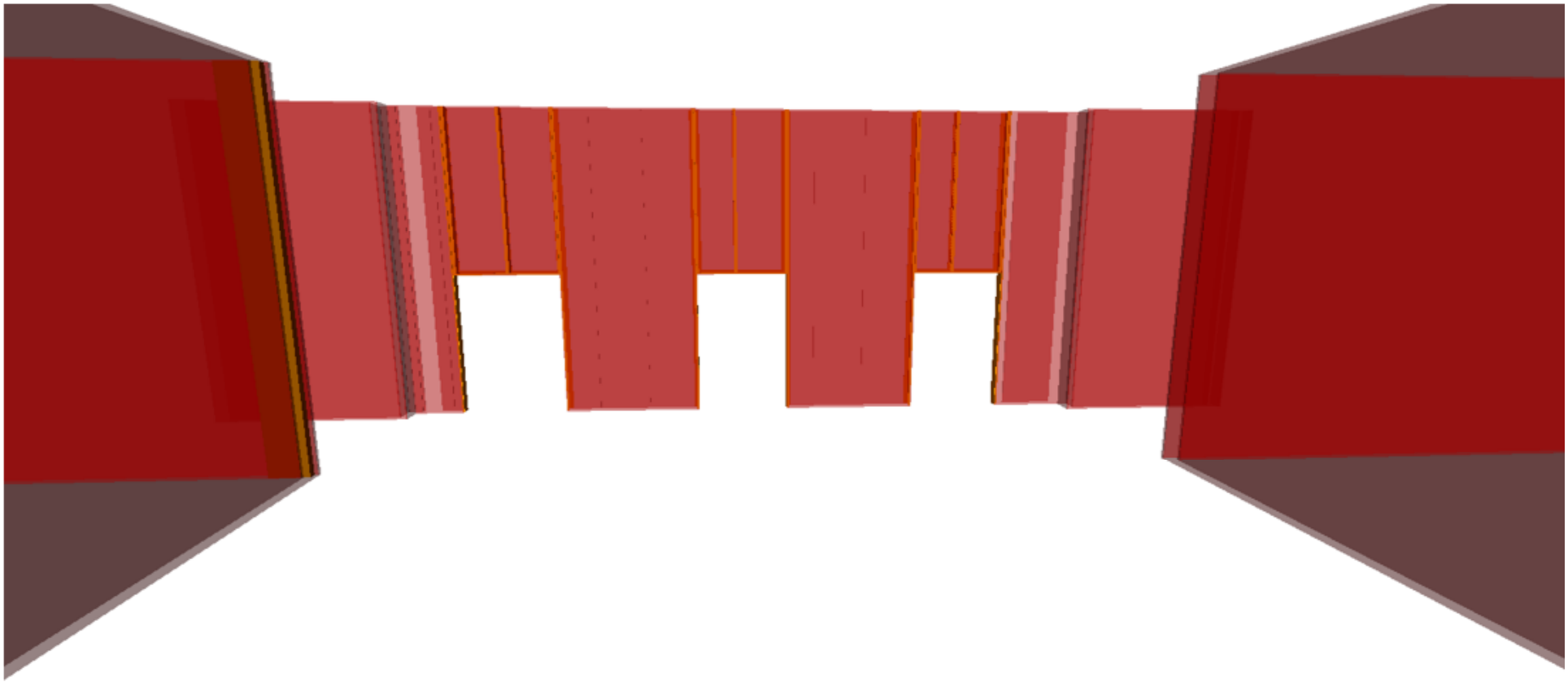
IKERD CONSULTING

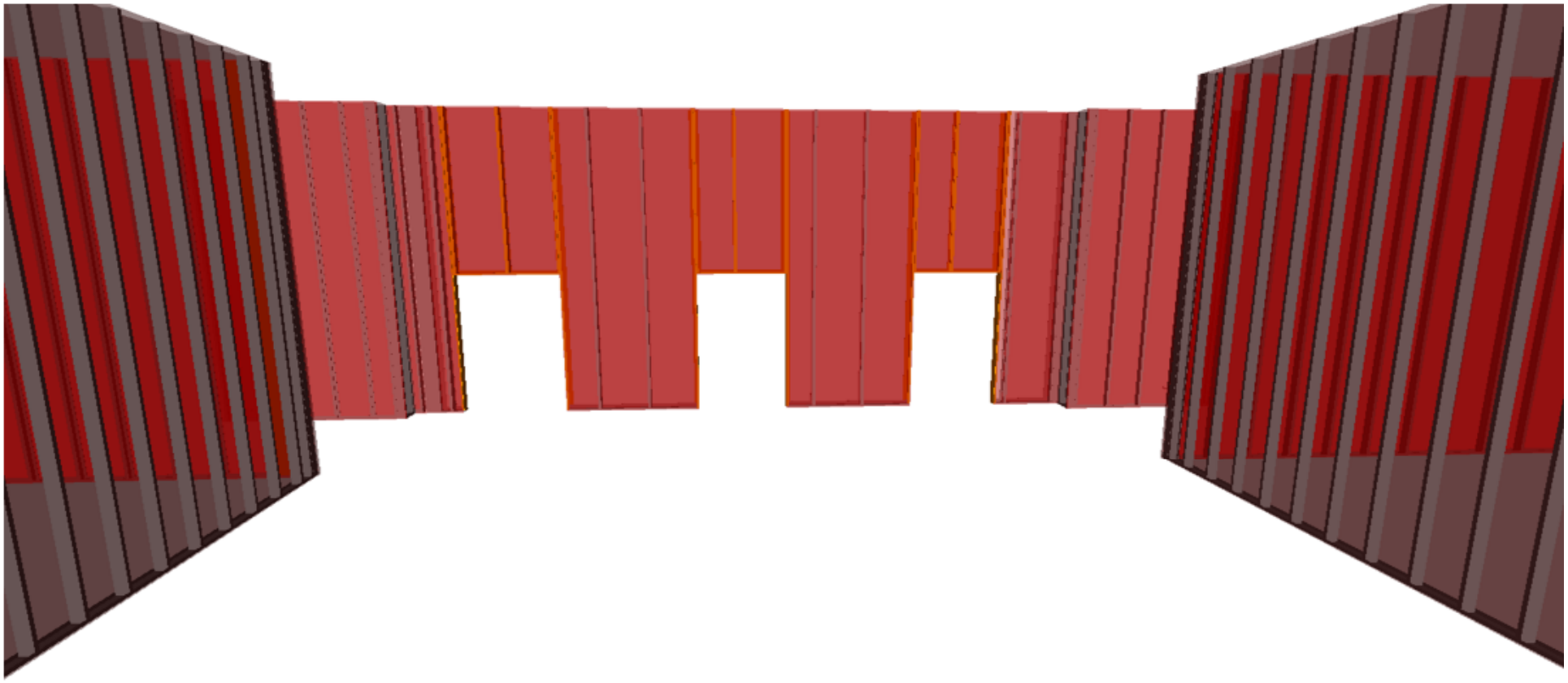








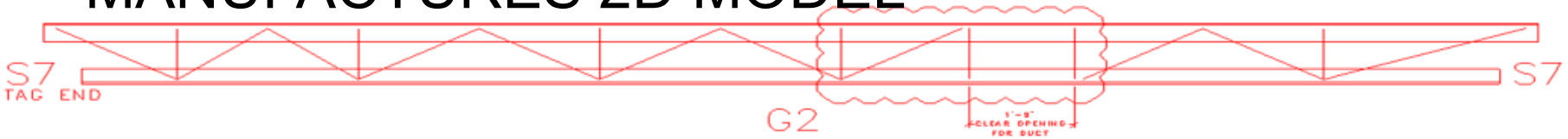




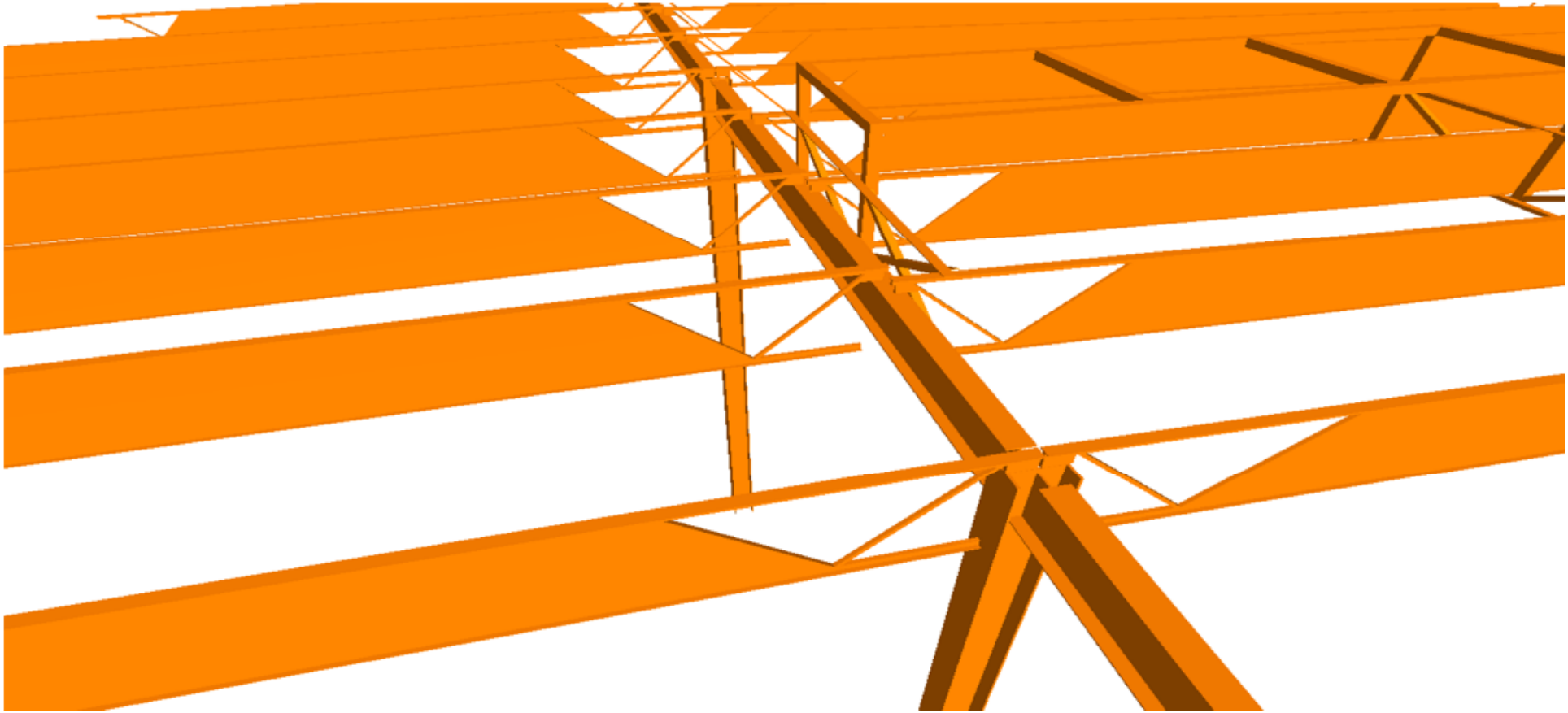
# PRECISION? vs. ACCURACY?

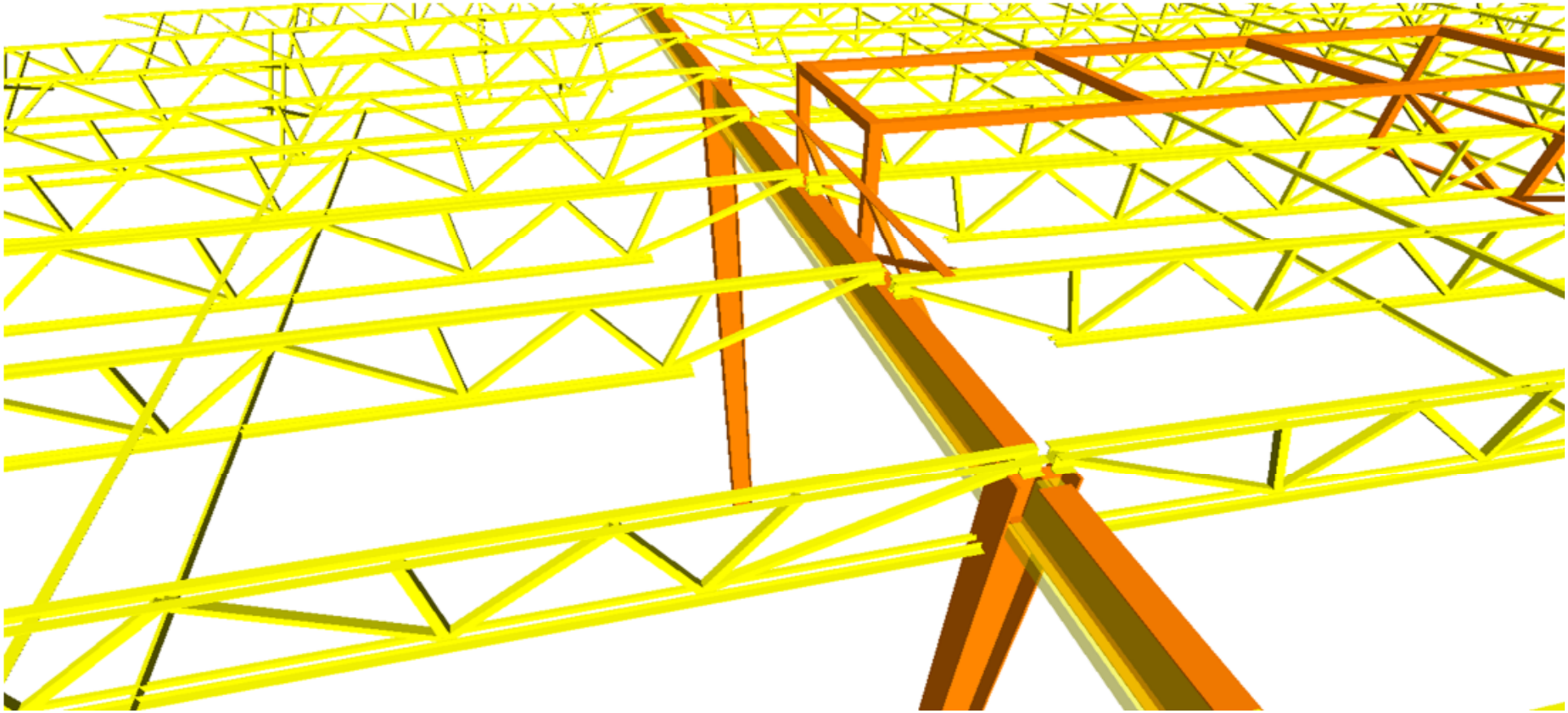
## LOD 300 GENERIC BIM MODEL

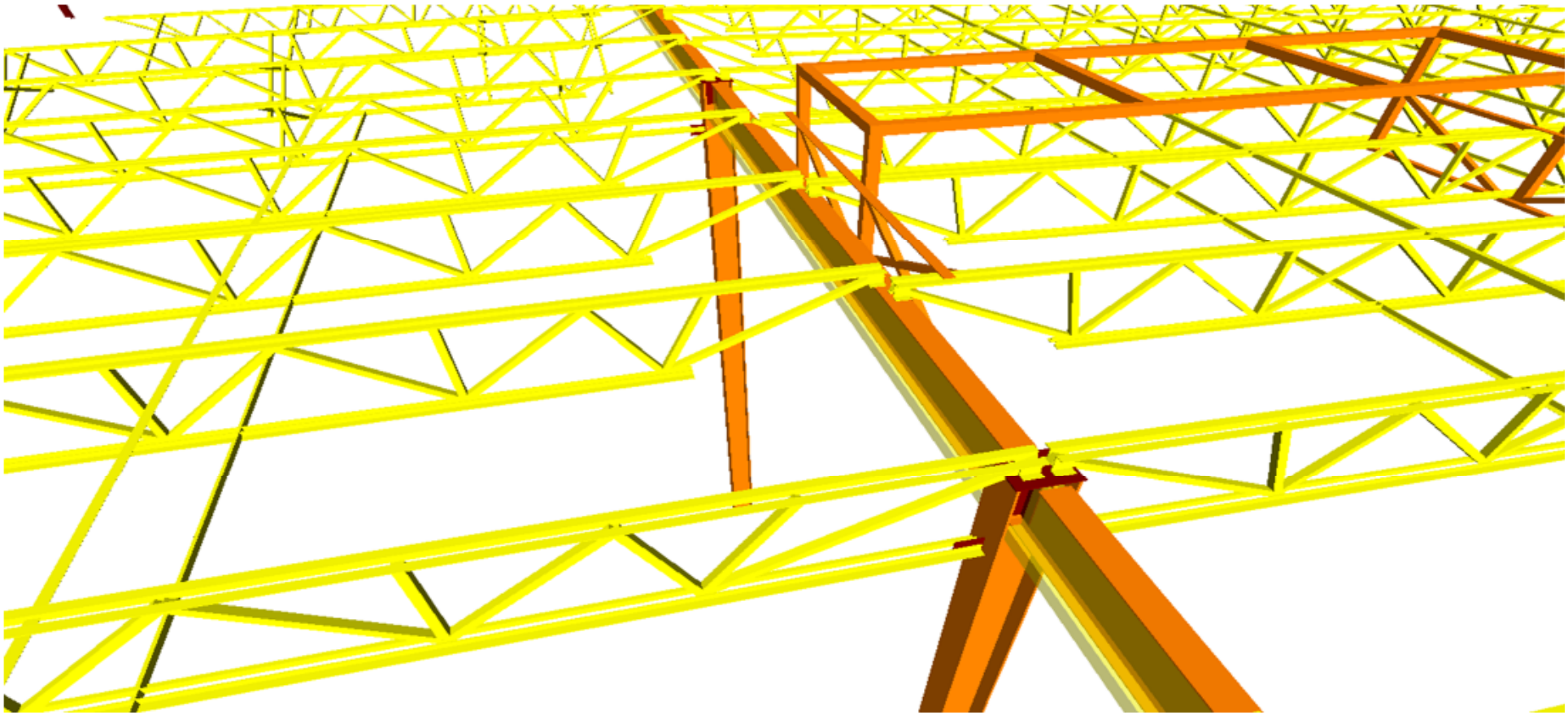
## MANUFACTURES 2D MODEL




## LOD 350 CUSTOM MODEL

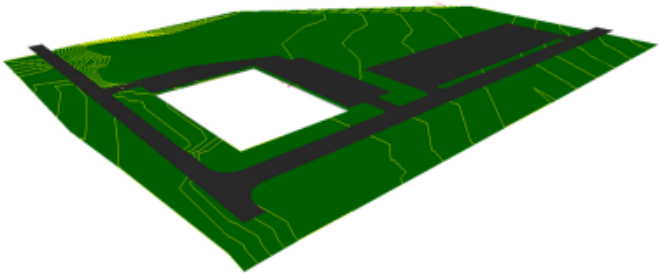


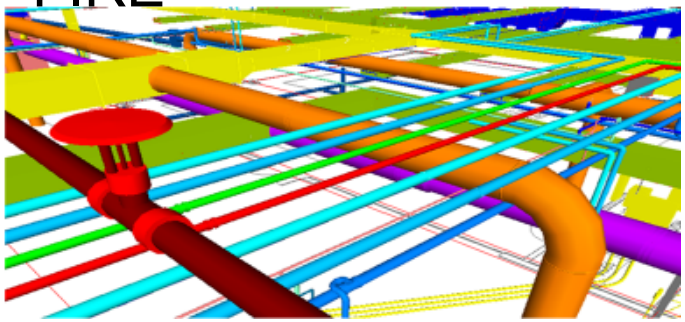


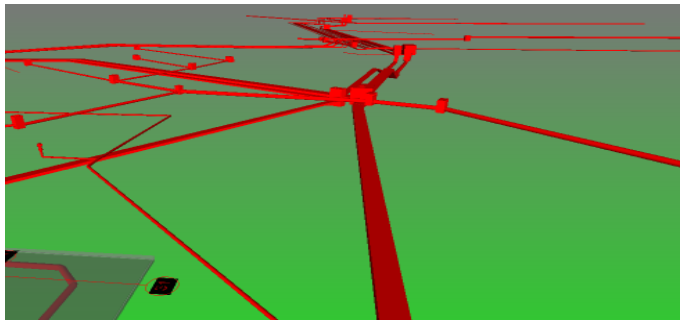


# Other Disciplines Must Have Comparable LOD !

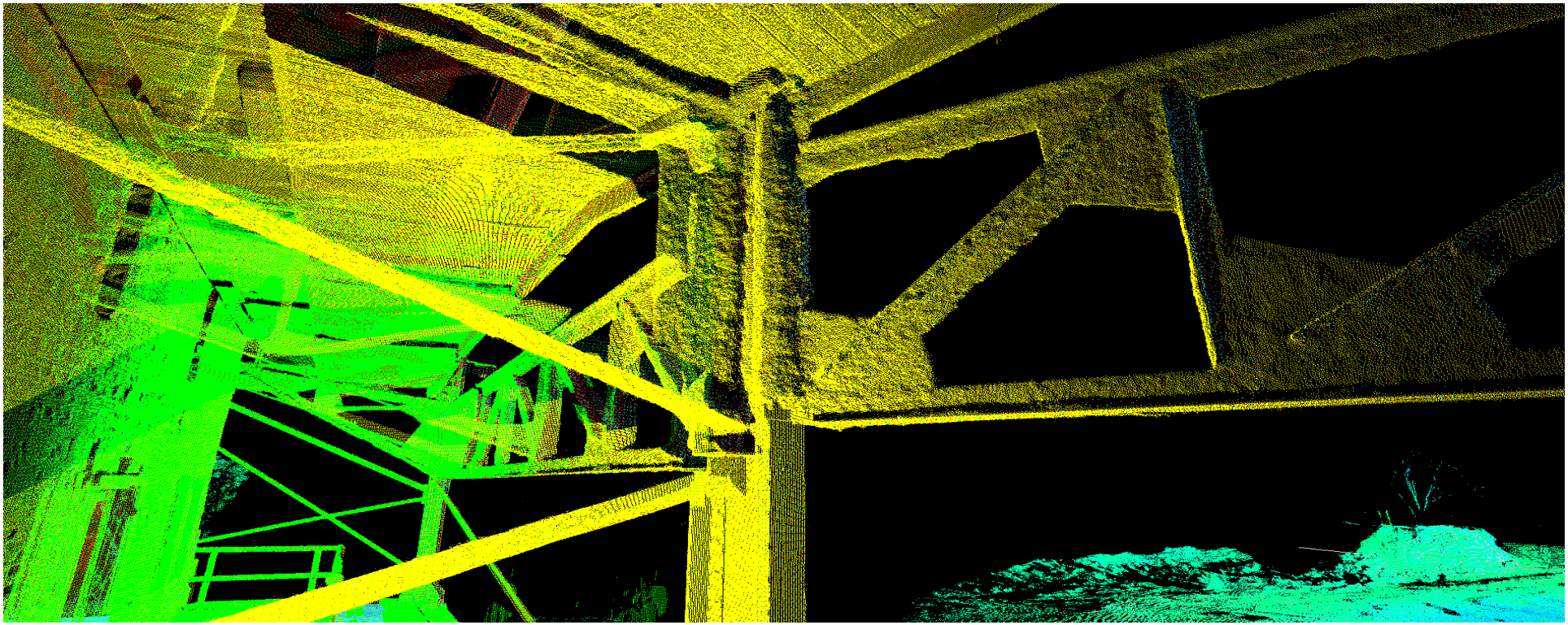
- ARCHITECTURAL
- CIVIL
- MECHANICAL
- ELECTRICAL
- PLUMBING
- FIRE

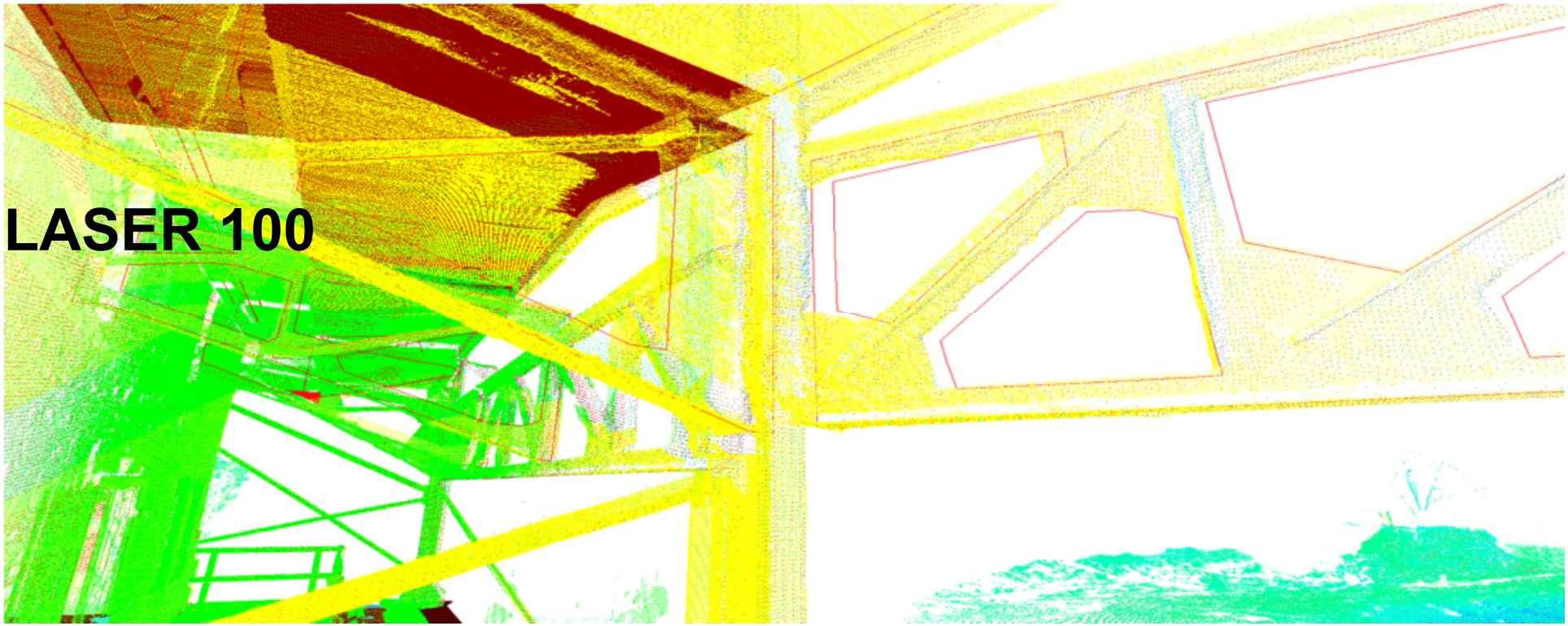




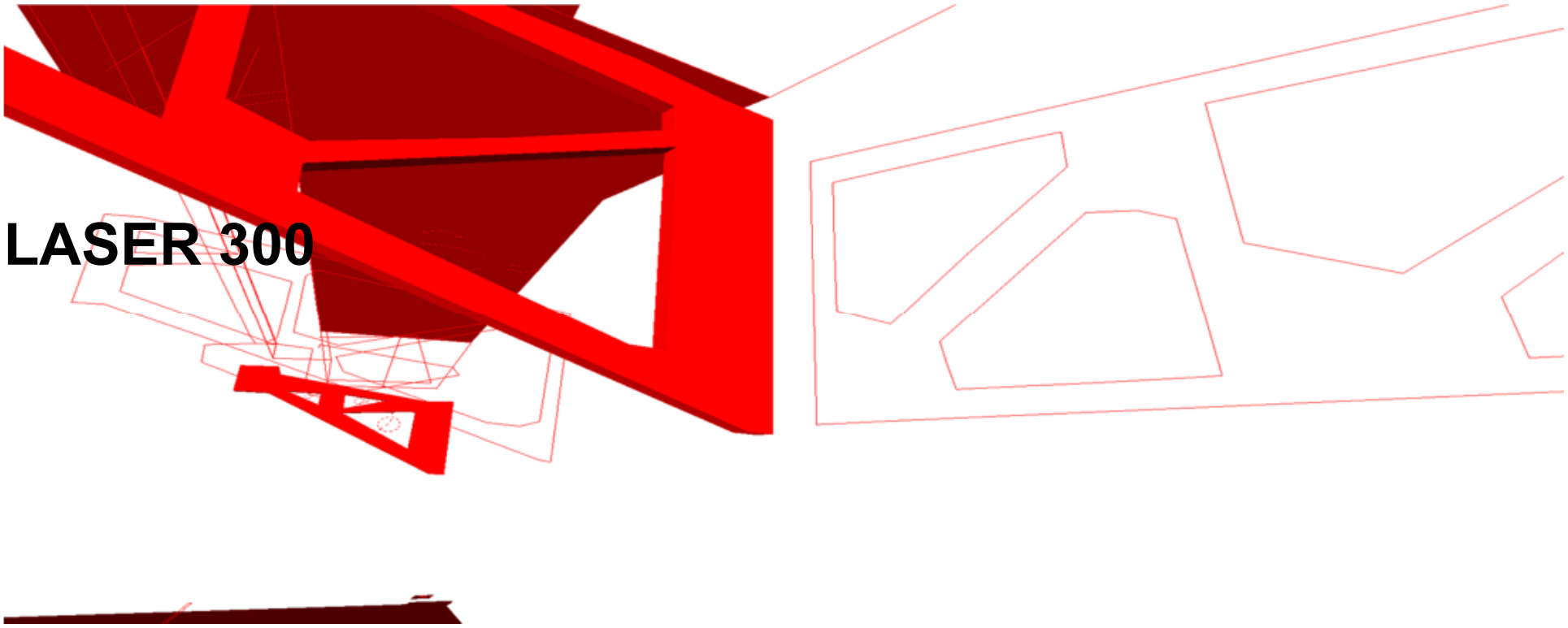


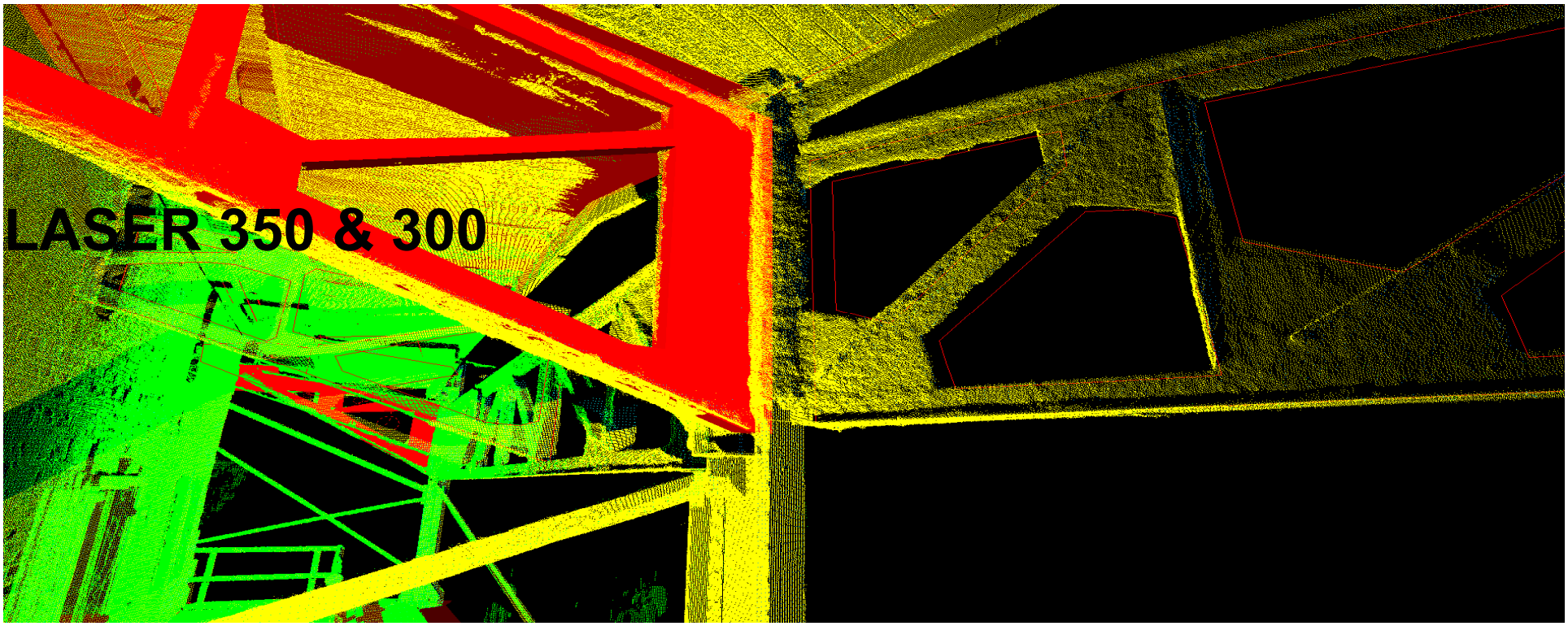
# LASER 350

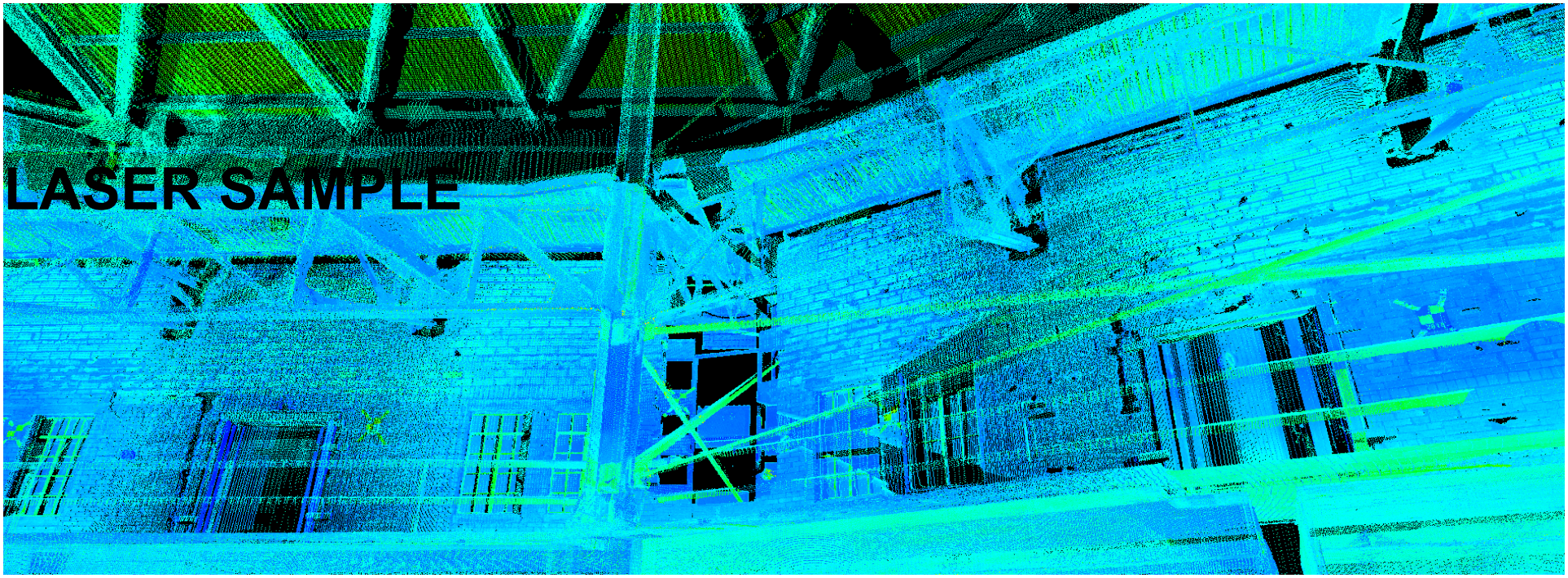


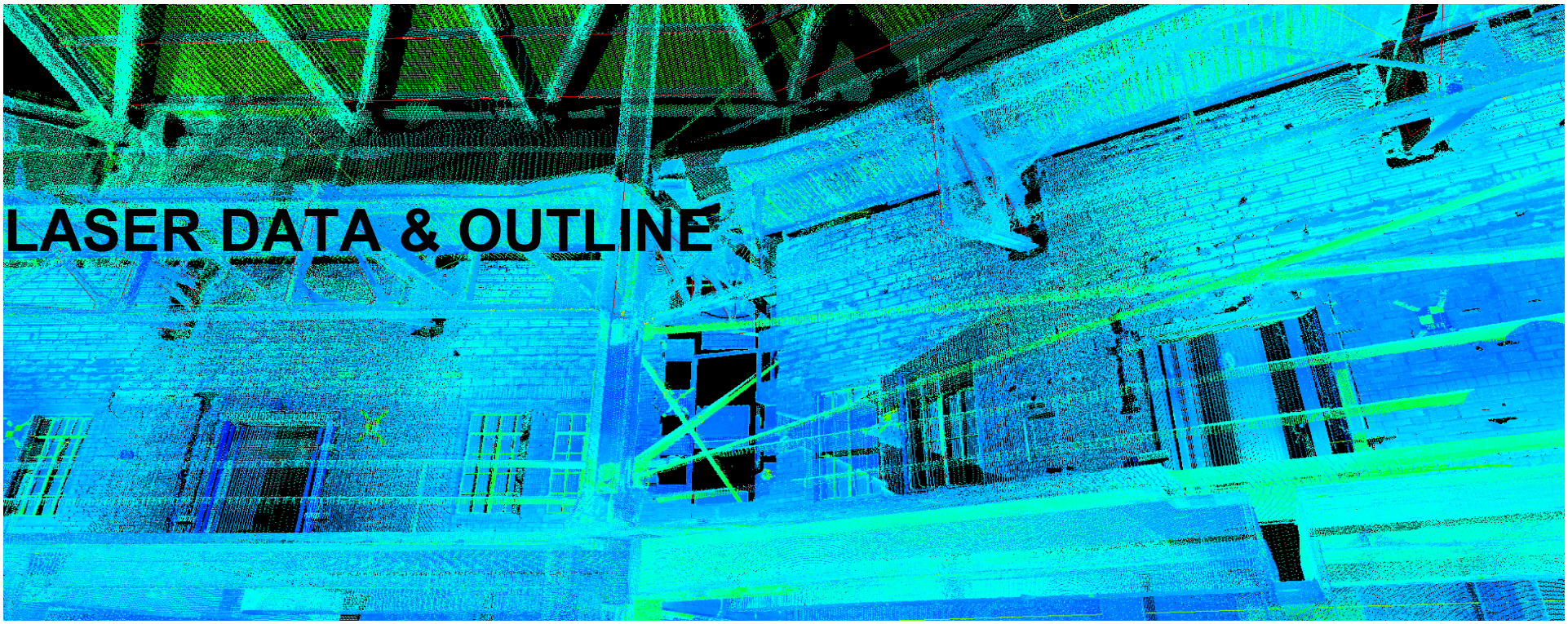


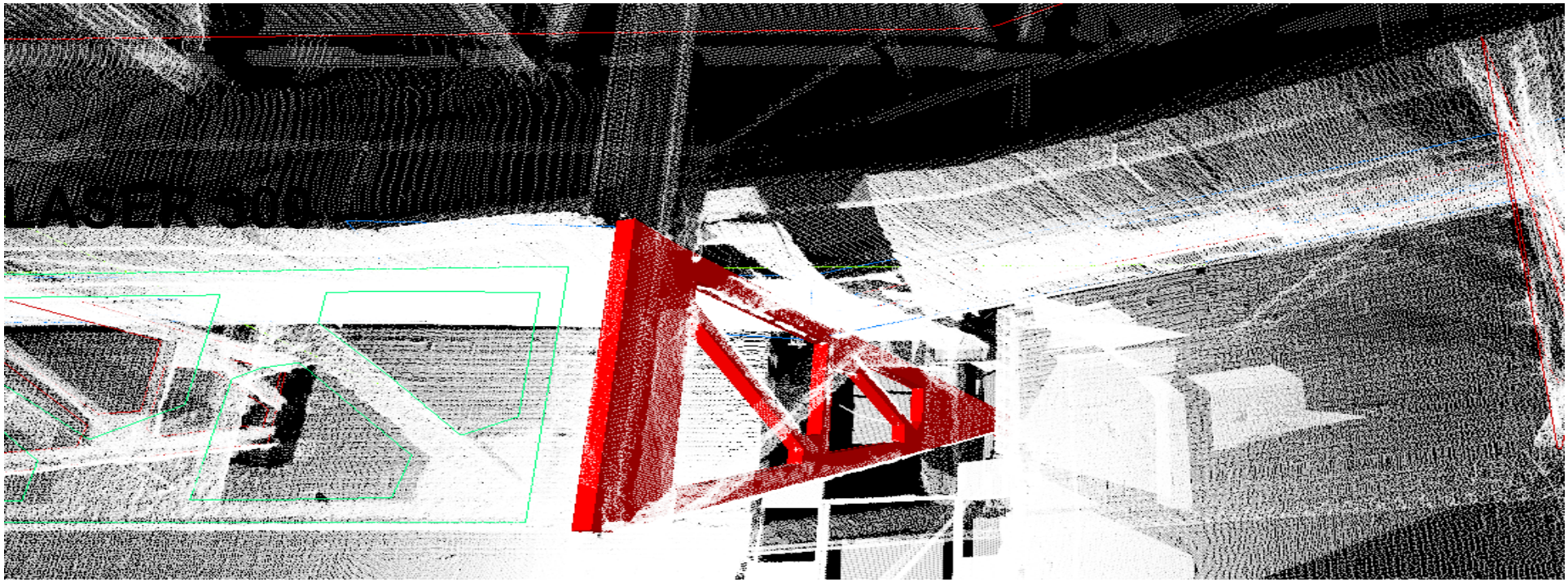
# LASER 300





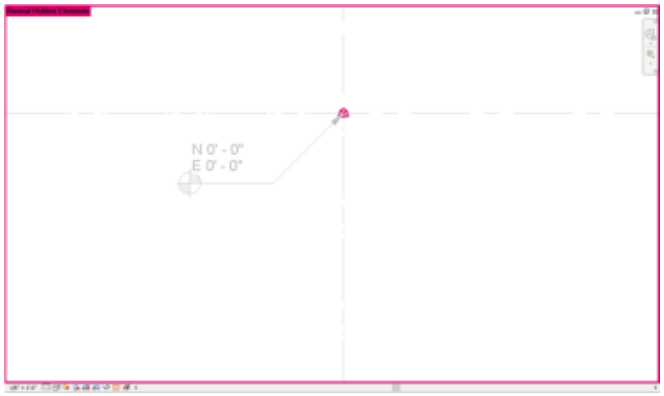


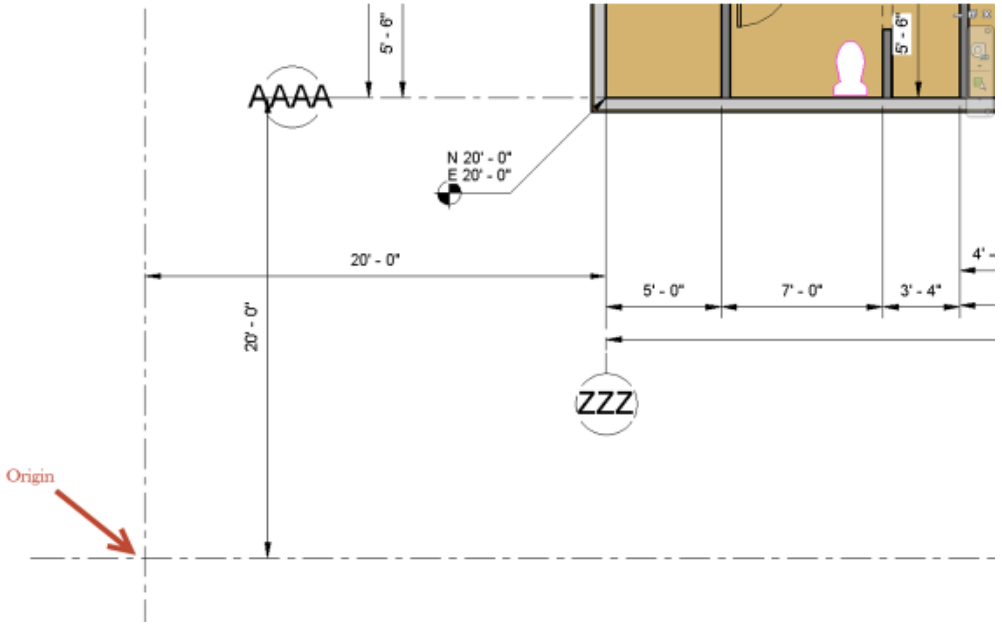




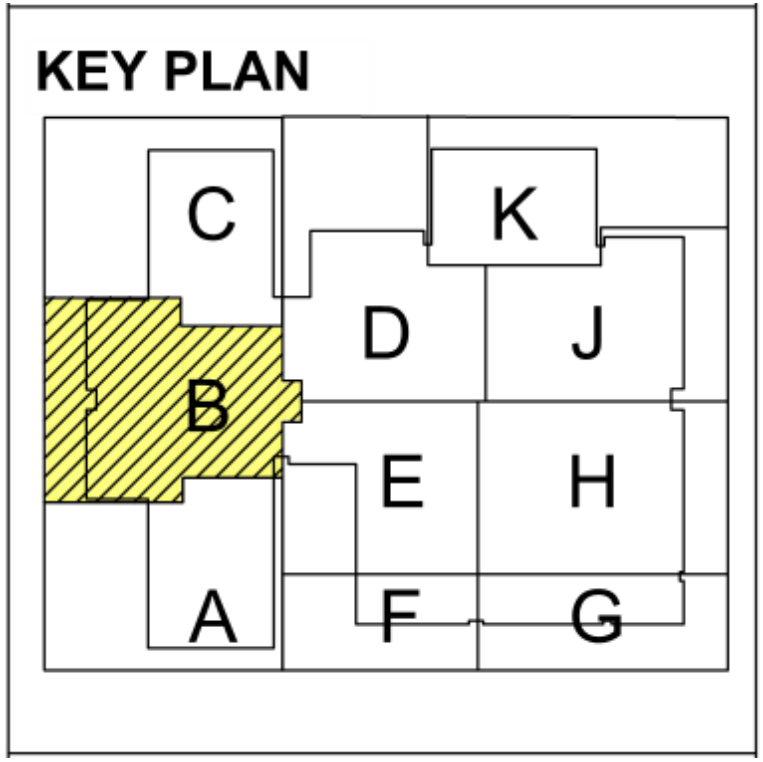
# Set Coord

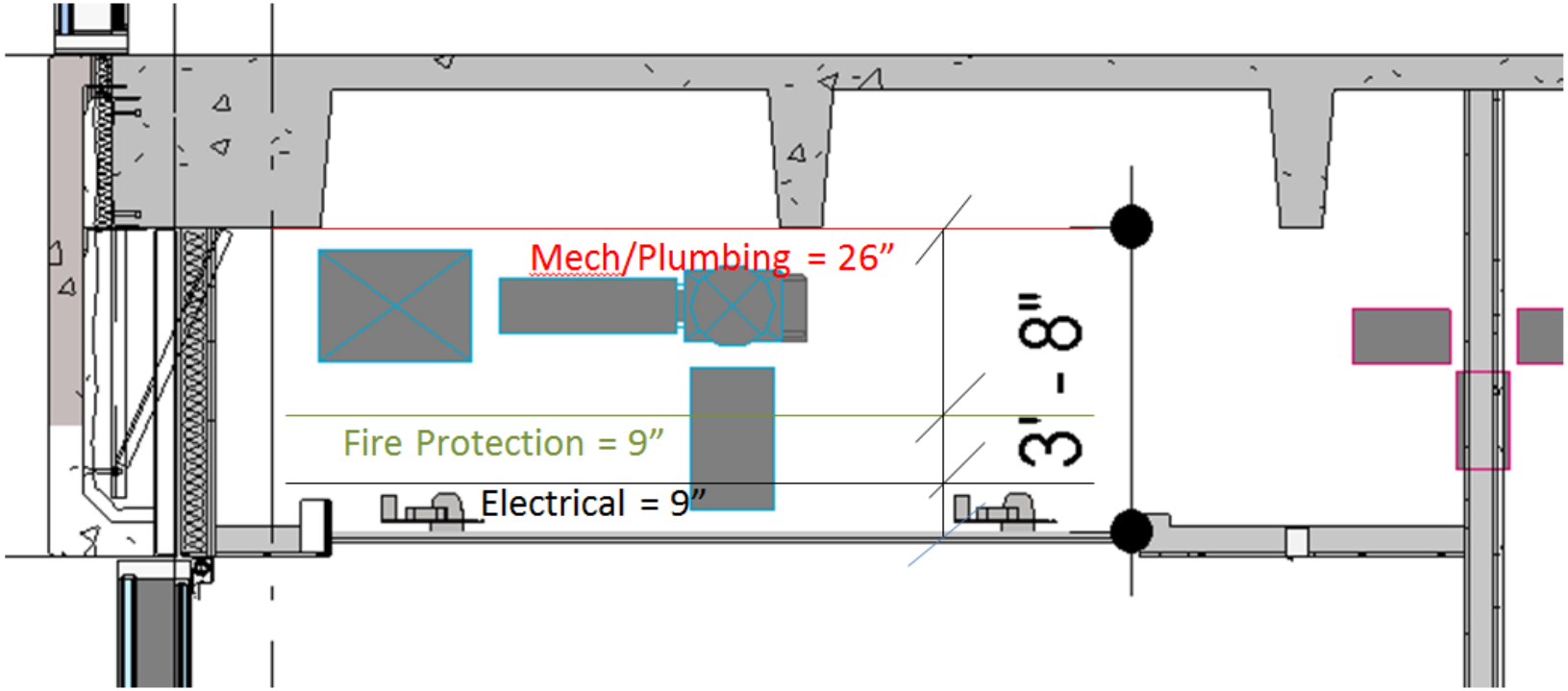
# Define A Clear Project Coordinate System



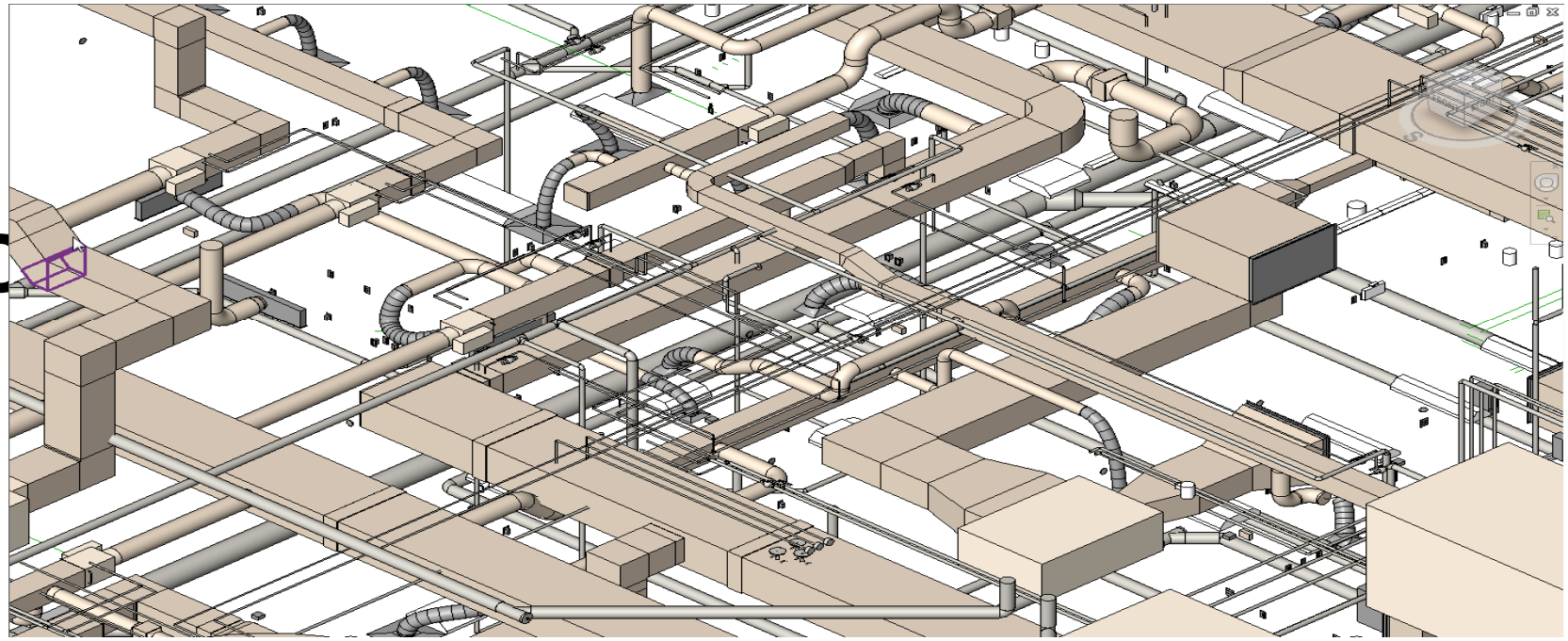



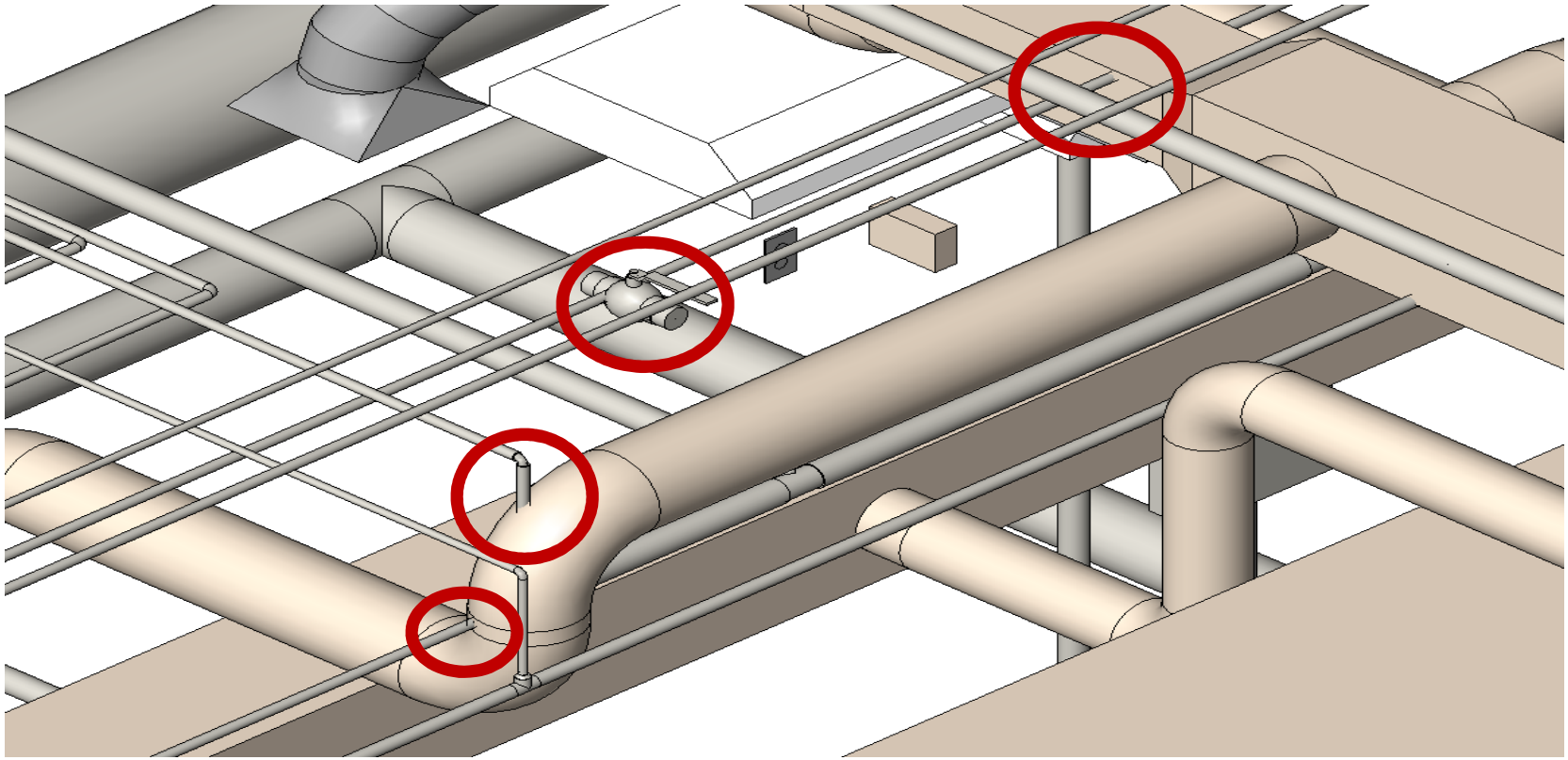
# Zone The Space

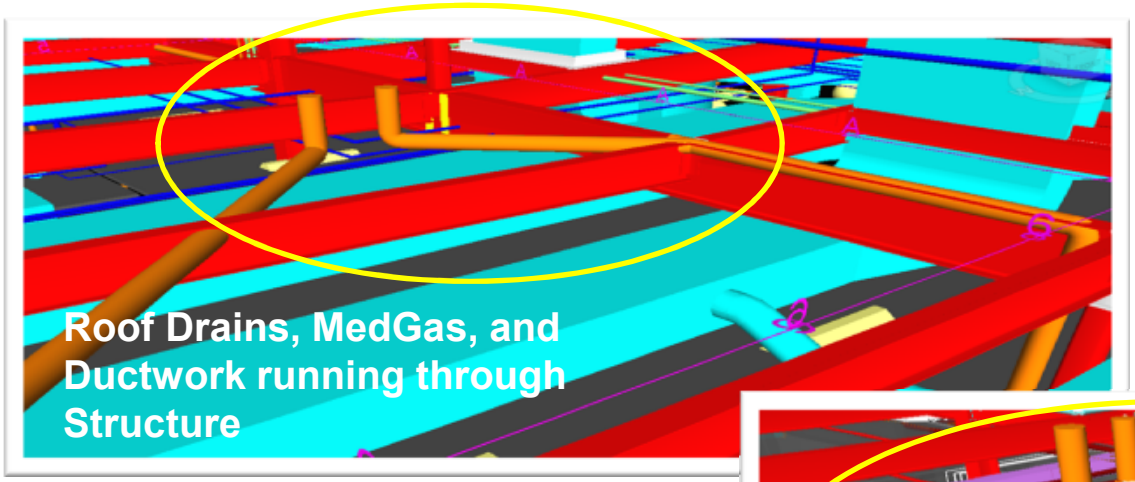




# Case Study of Designers Model

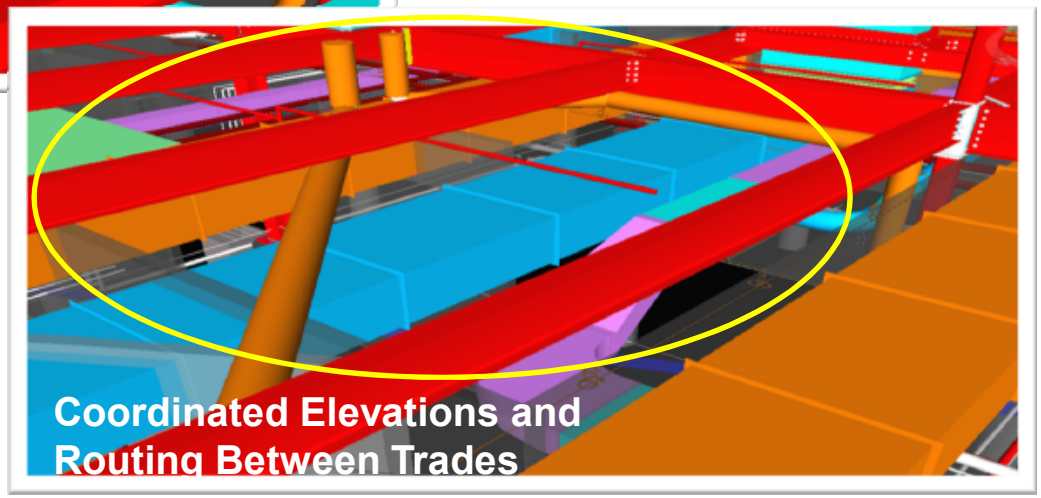


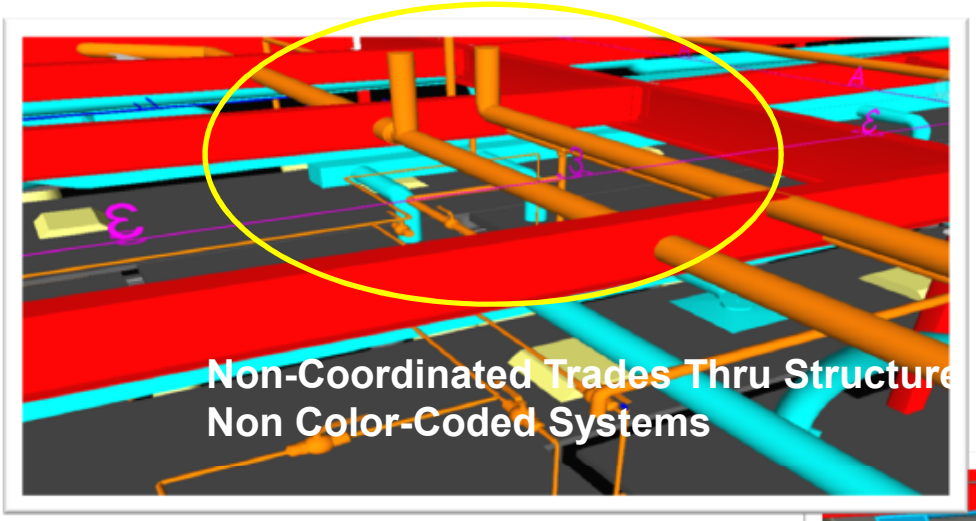





BEFORE

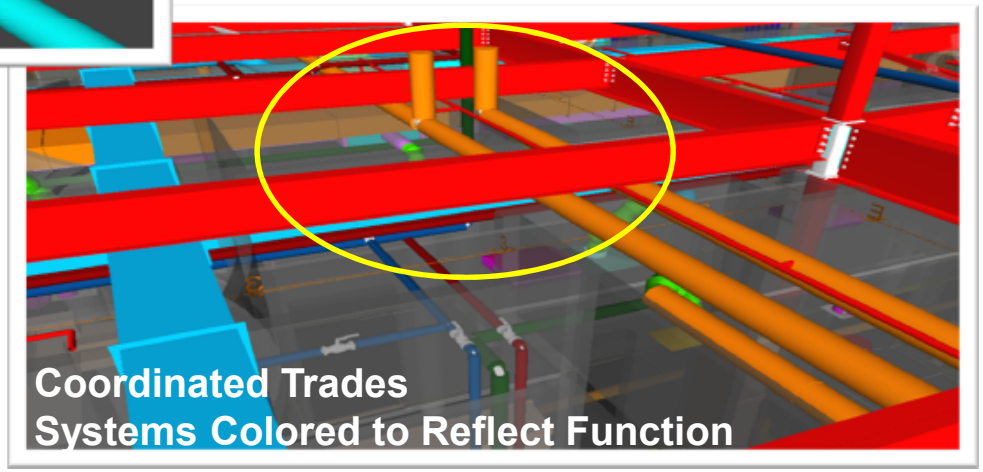
AFTER

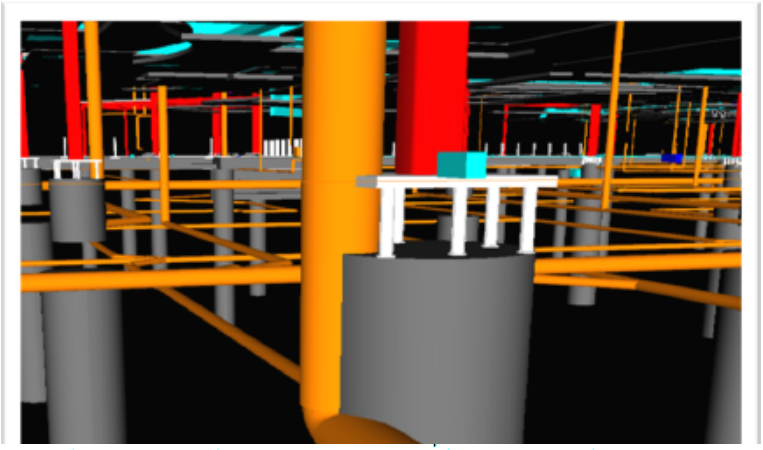




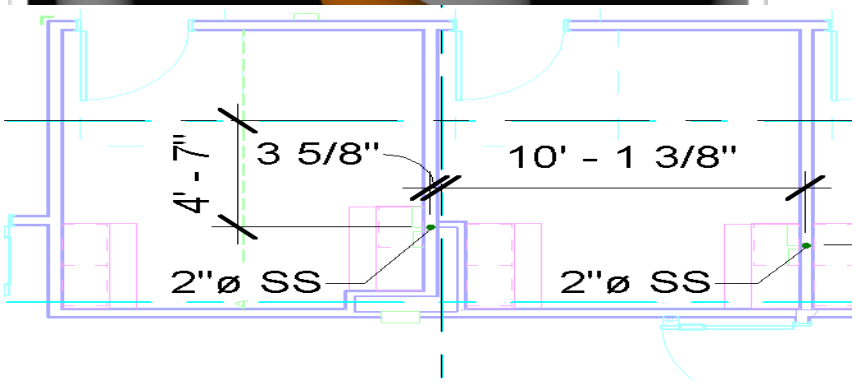

BEFORE

AFTER

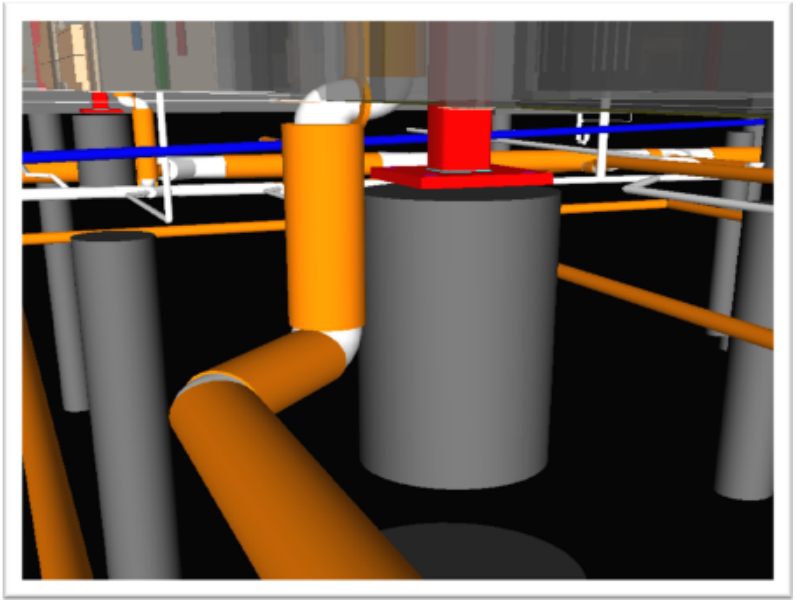


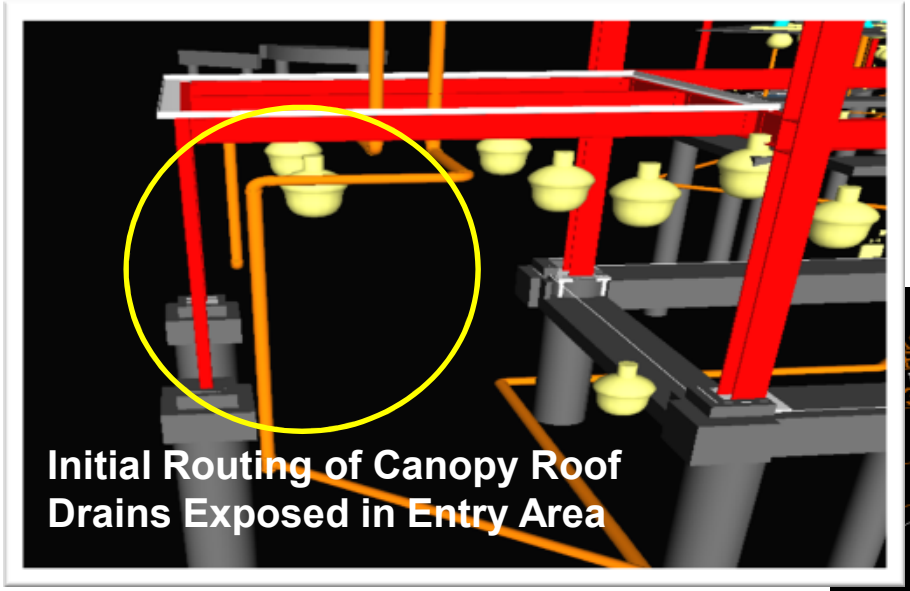


BEFORE



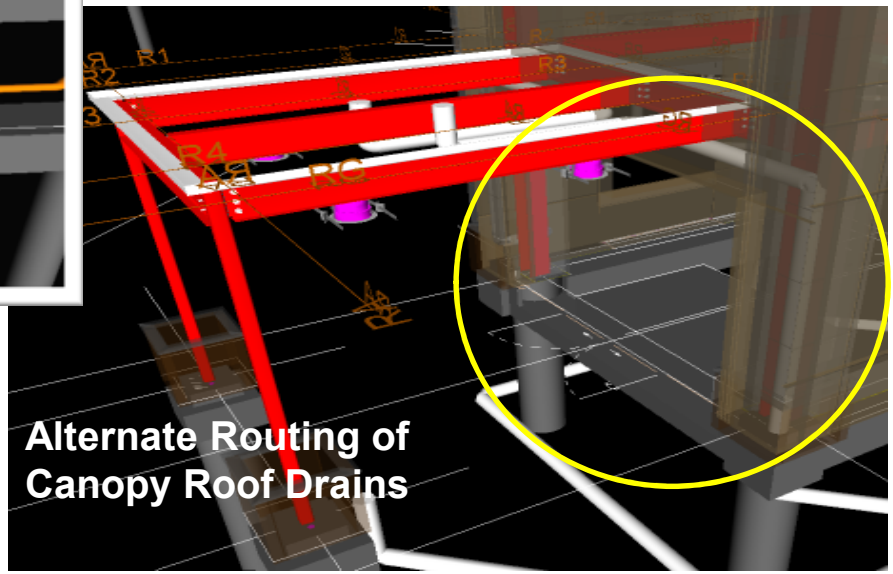

AFTER



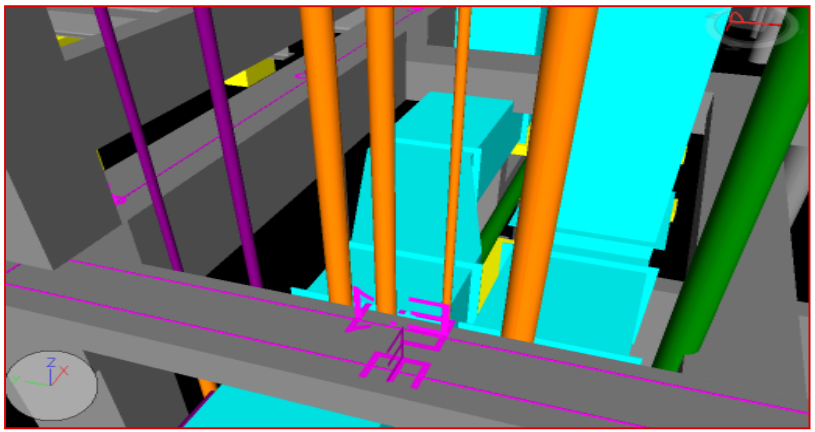



BEFORE

AFTER

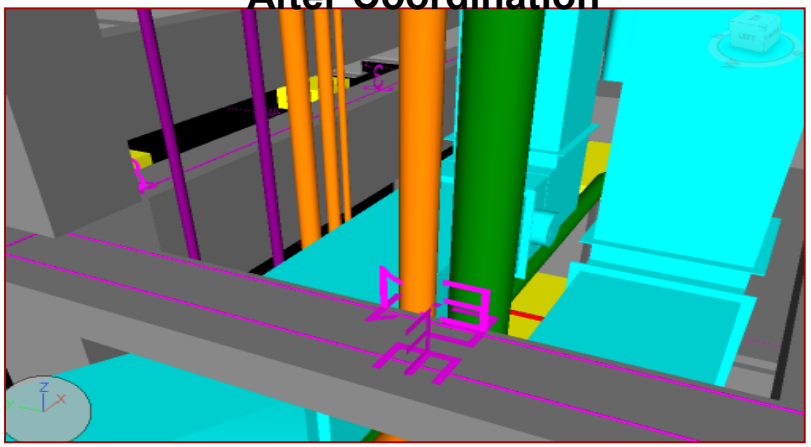


# Clash Examples

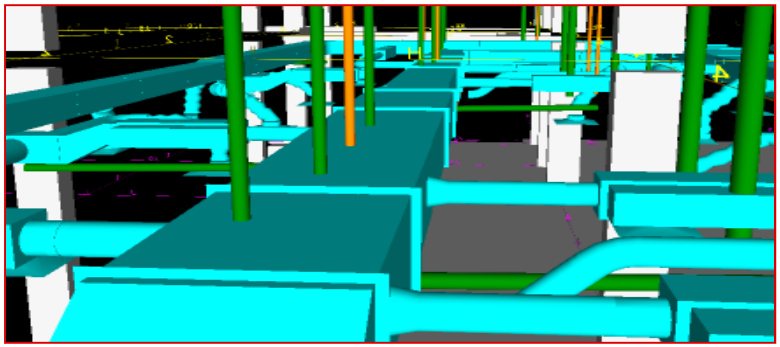


Before Coordination

After Coordination

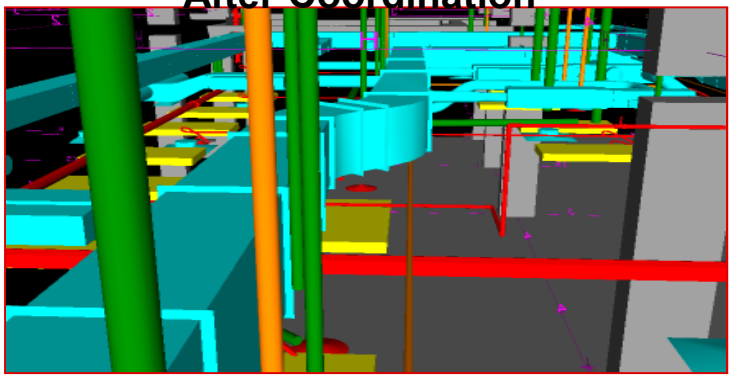


# Clash Examples



Before Coordination

After Coordination



# Folder Structure

# NAMING CONVENTIO FOR COORDIATION

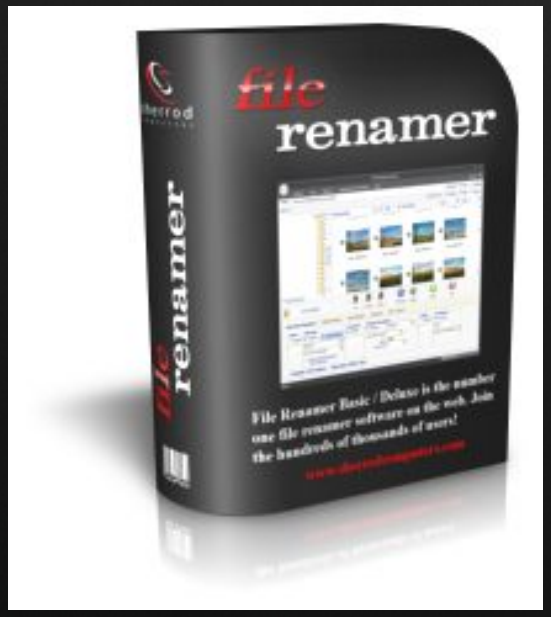
Example file name for a project

Project: **DF37_FEDM_TRADE_P0A_L01_050_2012-06-15**

| | | |
|---|---|---|
| DF37 | 4 letter acronym for the job name: | |
| ARCH | 4 letter acronym for the discipline: | |
| | ARCH: | Architecture |
| | STRL: | Structural |
| | MECH: | Mechanical Only |
| | ELEC: | Electrical Only |
| | ELTS: | Light Fixtures |
| | EPWR: | Electrical Power |
| | PLUM: | Plumbing Only |
| | GPIP: | Gravity Piping |
| | PPIP: | Pressure Piping |
| | TELE: | Telephone / Data (Cable Tray) |
| | FIRE: | Fire Protection |
| | MASN: | Masonry |
| | LDAR: | Laser Scanning Data |
| | PNEU: | Pneumatic Tubing |
| | MTPN: | Metal Panels |
| | CFMF: | Cold Form Metal Framing & Sheathing |
| | WTPR: | Waterproofing |
| | STLM: | Structural Steel |
| | DWAC: | Drywall / Acoustical |
| | MFCL: | Metal Framing Channel |
| | MDEQ: | Medical Equipment |
| | KTEQ: | Kitchen Equipment |
| | FEDM: | Federate Model - Composite of 2+ BIMs |
| ACMEC | 5 letter acronym for the firm. (ACME Company) | |
| P0A | Phase of the model | |
| L01 | Zone of the model | |
| 030 | The model is approximately 30% complete for that level | |
| YYYY-MM-DD | Date of export & upload of that zone of the model. | |

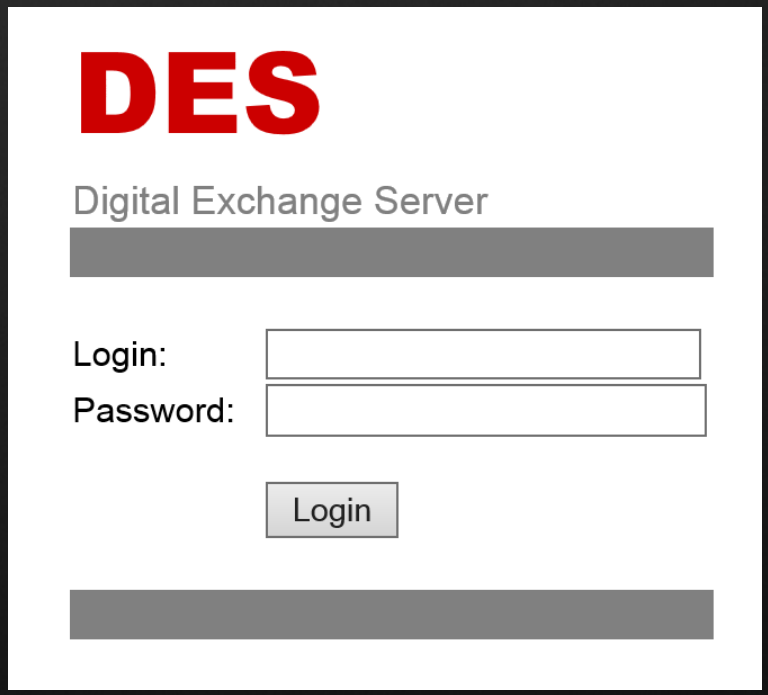
# Naming Convention

# Folder Structure w/ Navisworks




NAVIS COORDINATION
- NWF-WORKING-FILE.nwf
  - SOURCE
    - FILE-1.NWC
    - FILE-2.NWC
    - FILE-3.NWC
    - FILE-4.NWC
  - ARCHIVE
    - YYYY-MM-DD_Review-01
      - FILE-1_YYYY-MM-DD.NWC
      - FILE-2_YYYY-MM-DD.NWC
      - FILE-3_YYYY-MM-DD.NWC
      - FILE-4_YYYY-MM-DD.NWC
    - YYYY-MM-DD_Review-02
      - FILE-1_YYYY-MM-DD.NWC
      - FILE-2_YYYY-MM-DD.NWC
      - FILE-3_YYYY-MM-DD.NWC
      - FILE-4_YYYY-MM-DD.NWC

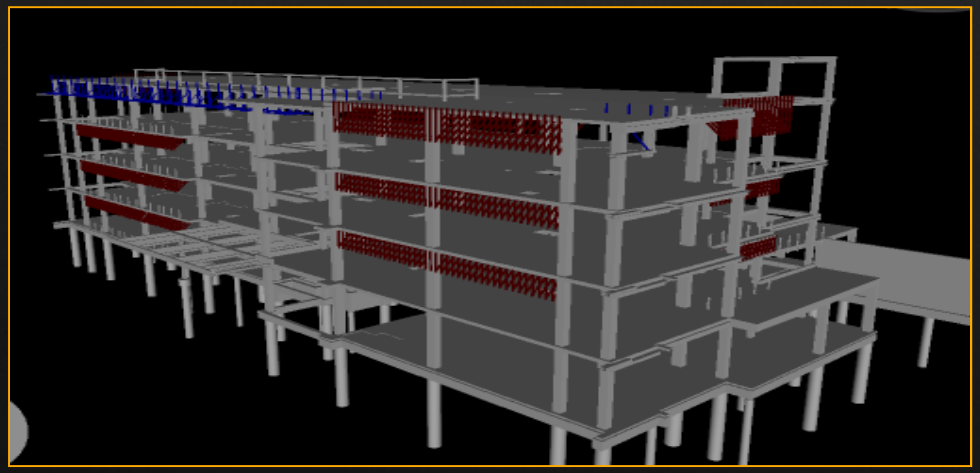
# Web Solution that Support Navisworks

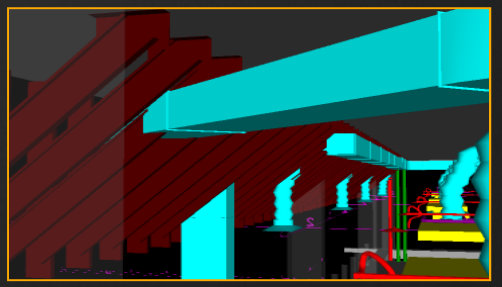


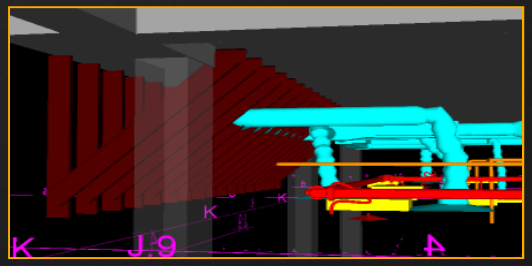
# Solid Structural Model

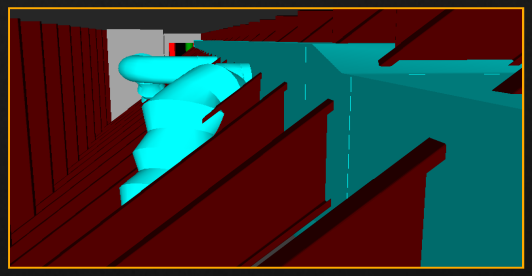
# Additional Coord.

- Light Gauge Window Framing was added

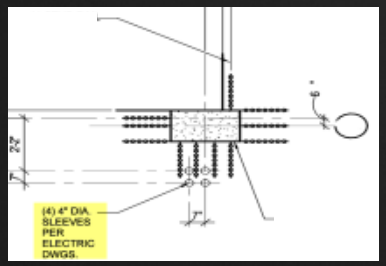


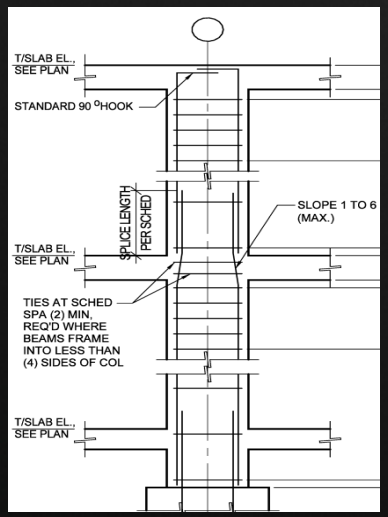


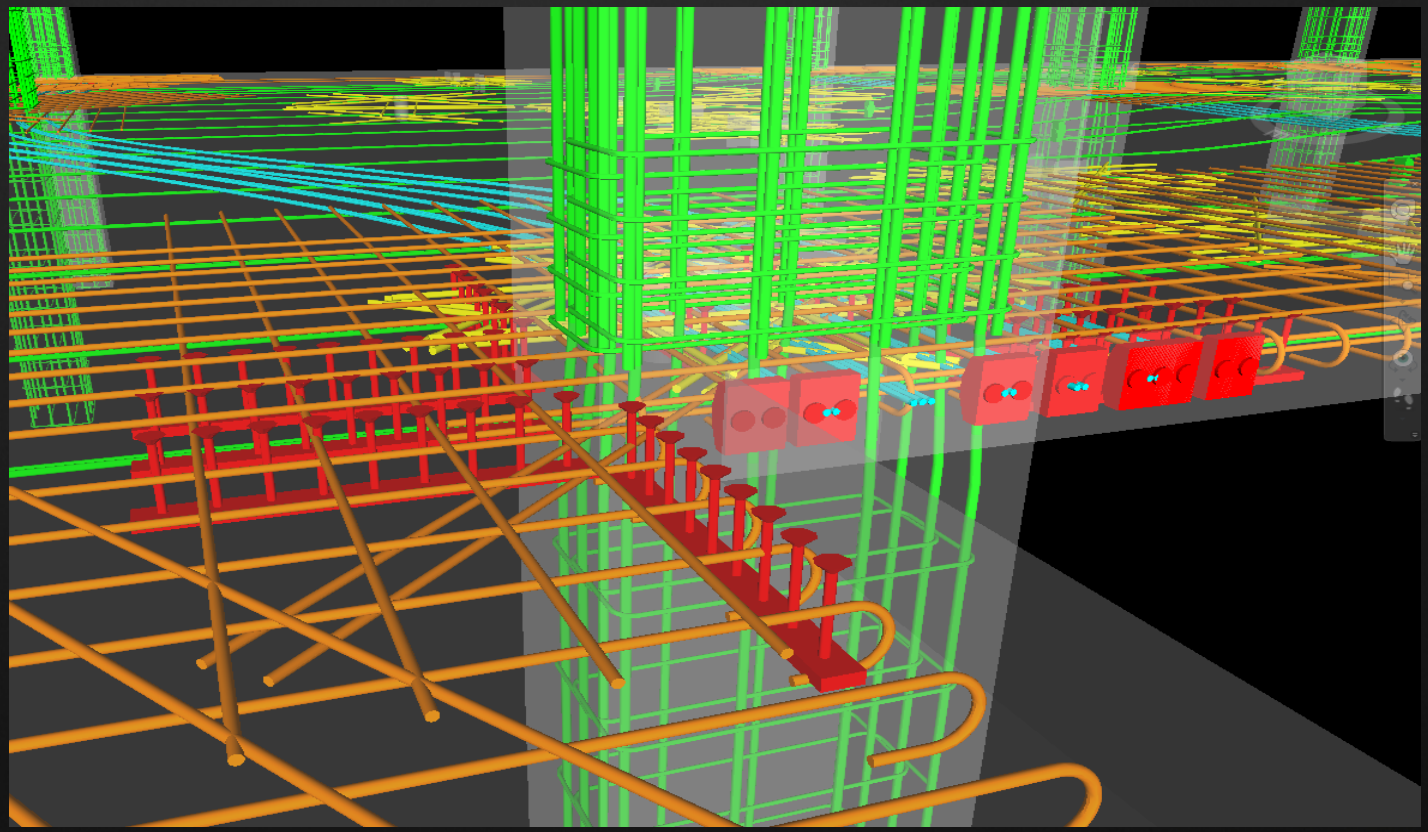


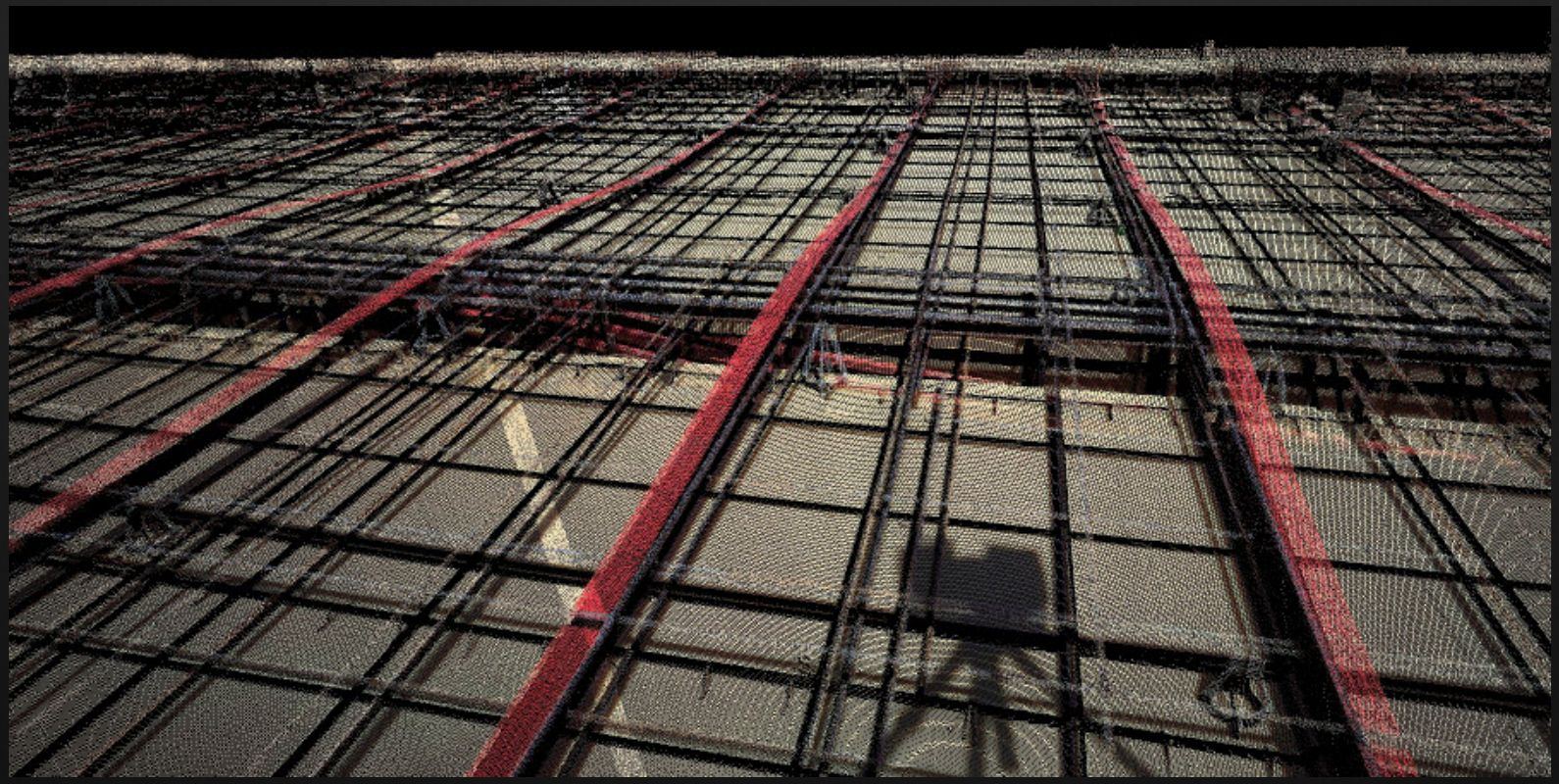
# 350 LOD EXAMPLE: “BIM” TYP. DETAIL?



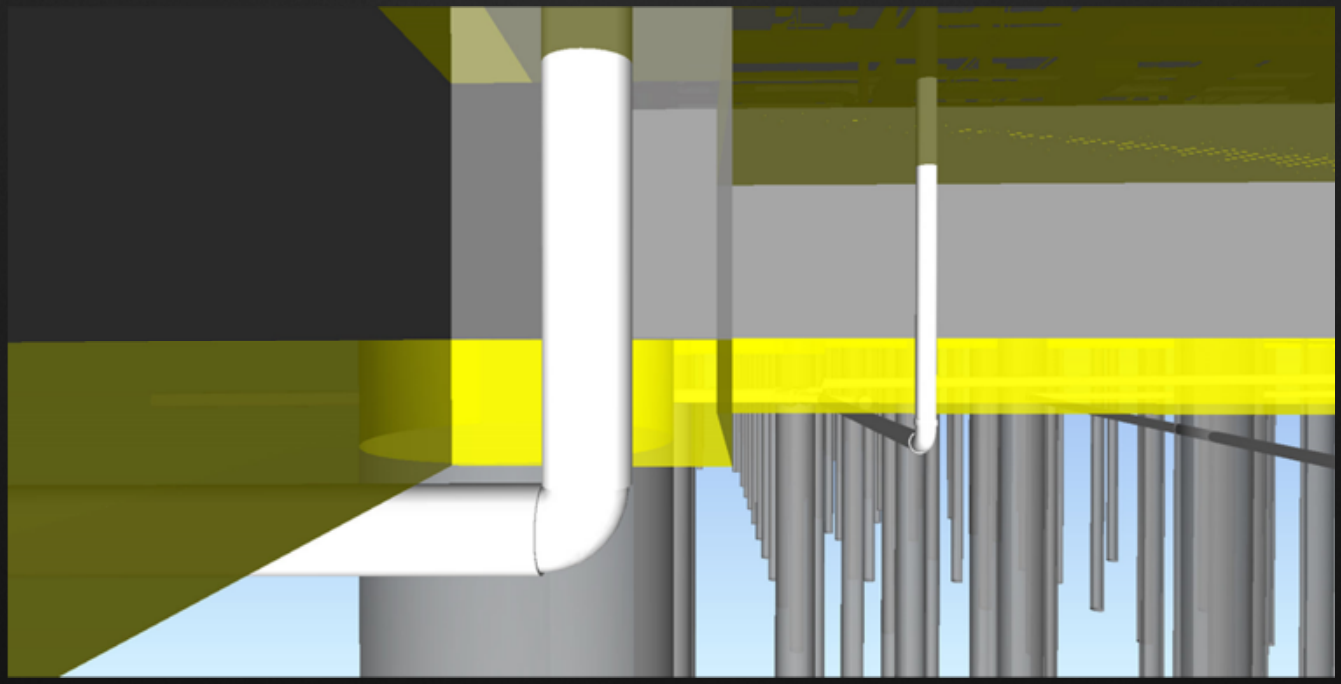



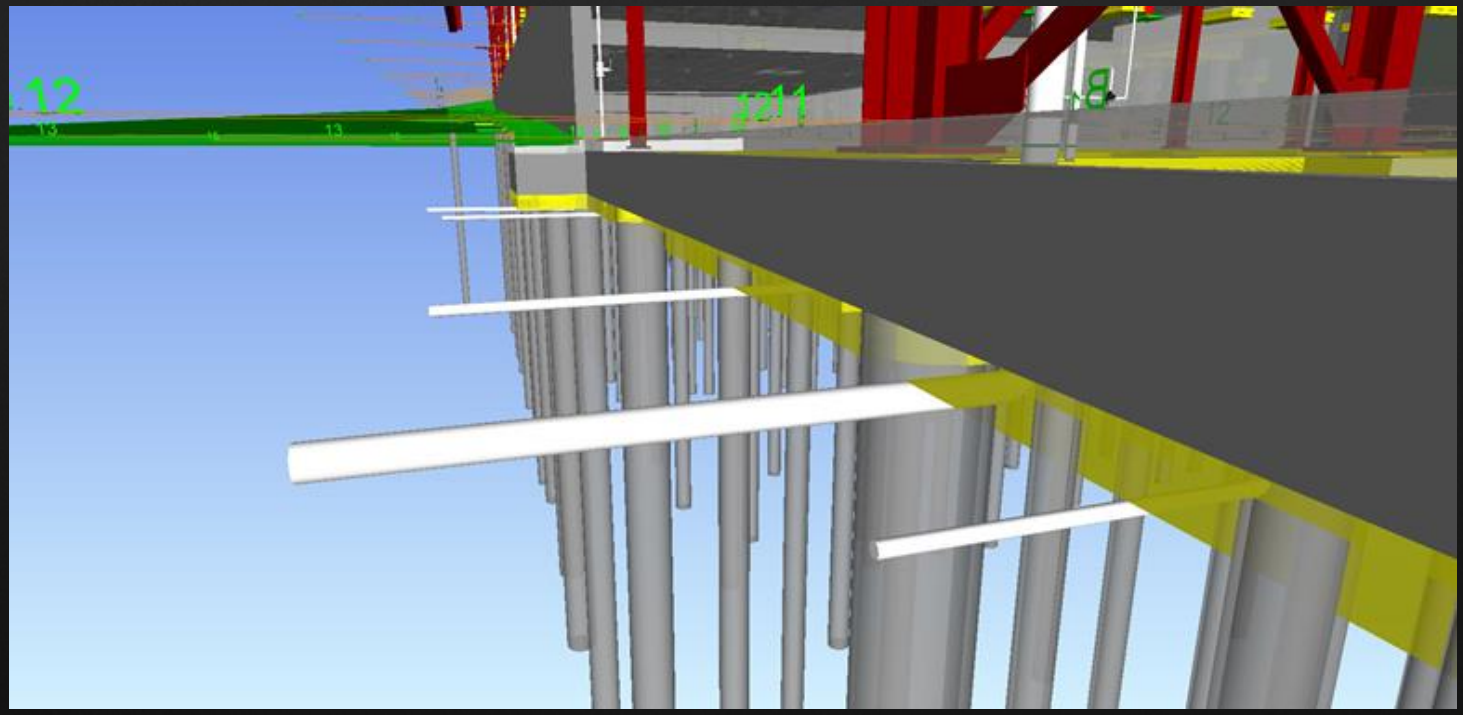
# Laser Scanner



Autodesk University

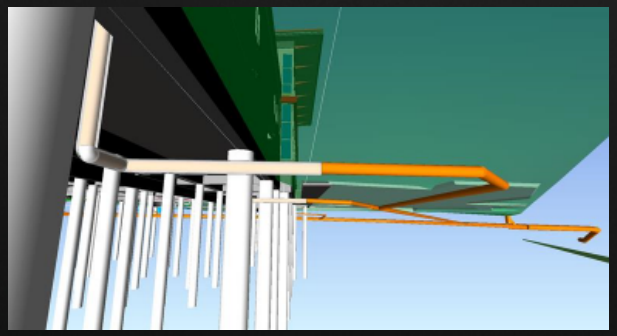


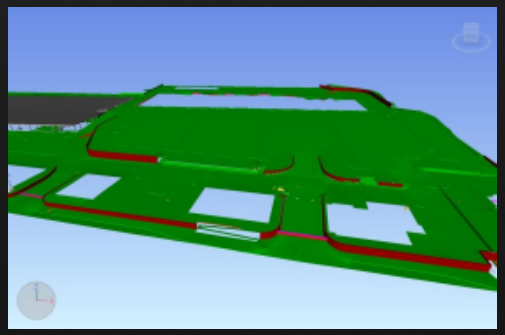
Autodesk University




Autodesk University

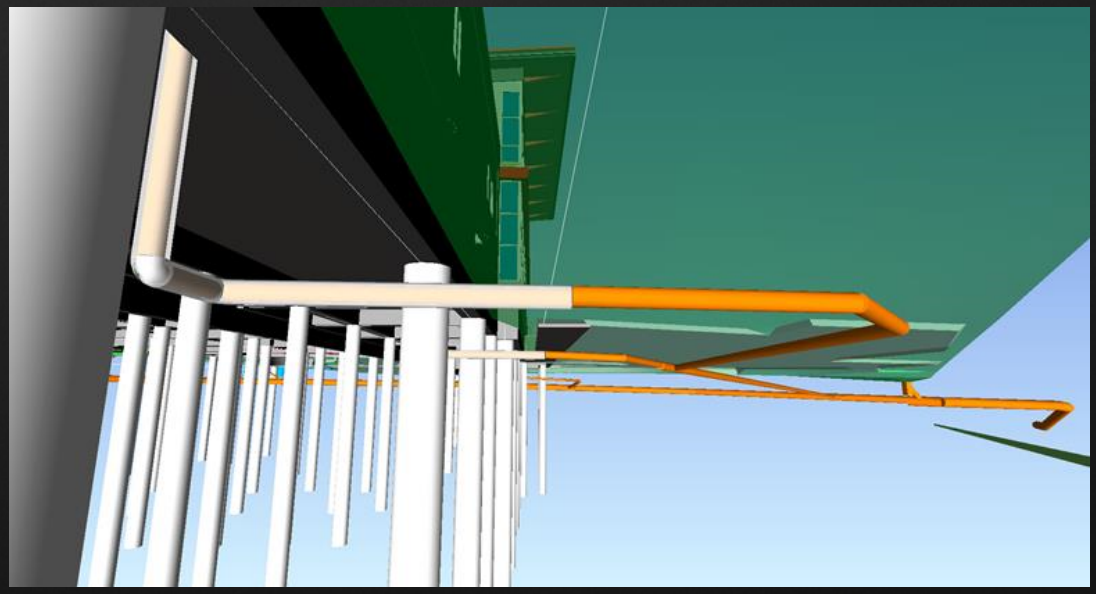
# Integrate Civil Content





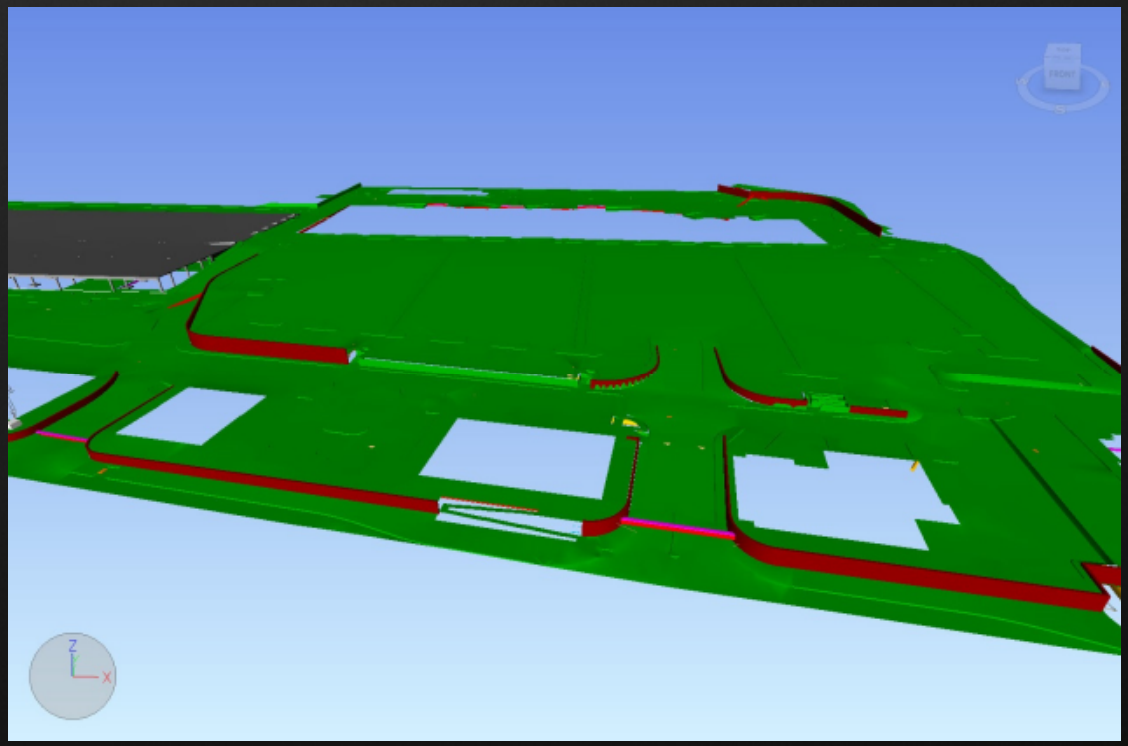
# Invert Elevation 5 feet from building

1. Keep it flexible during design.
2. Keep civil line lower, they can drop in the field.

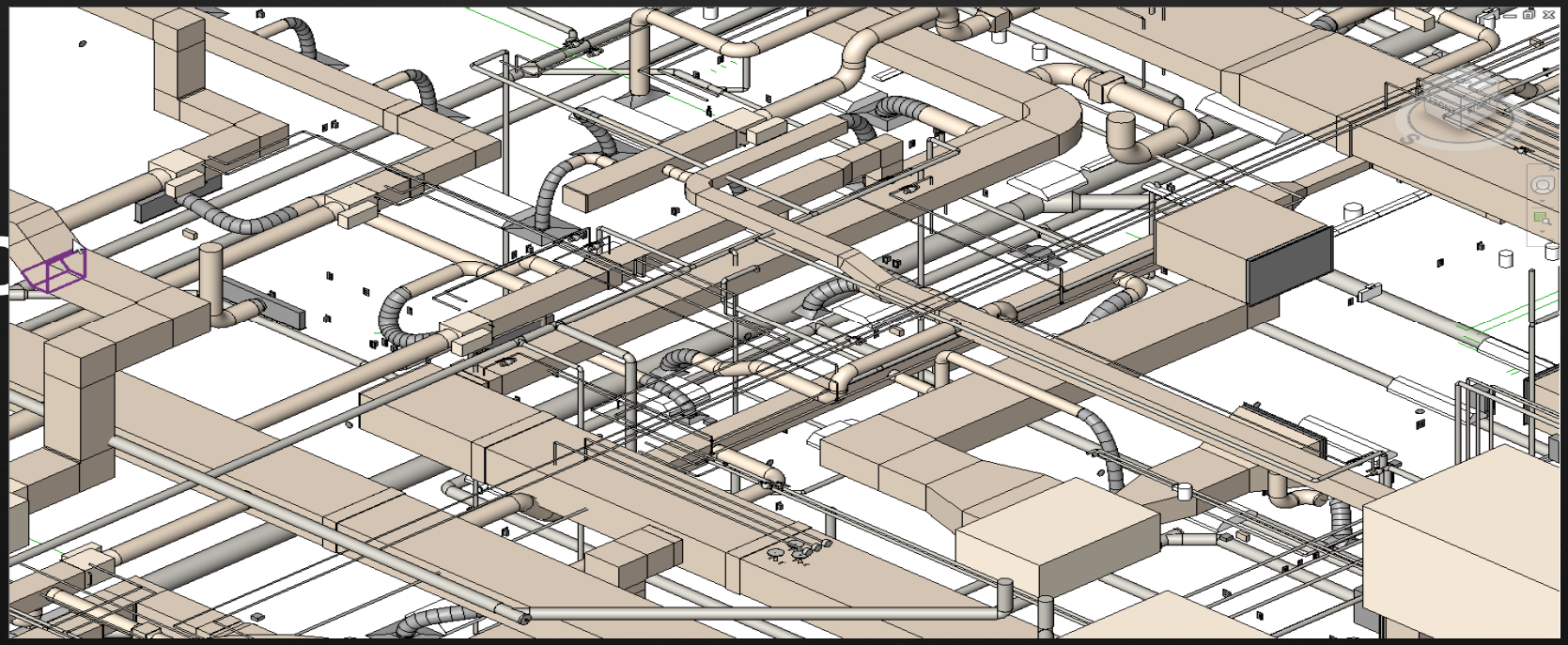


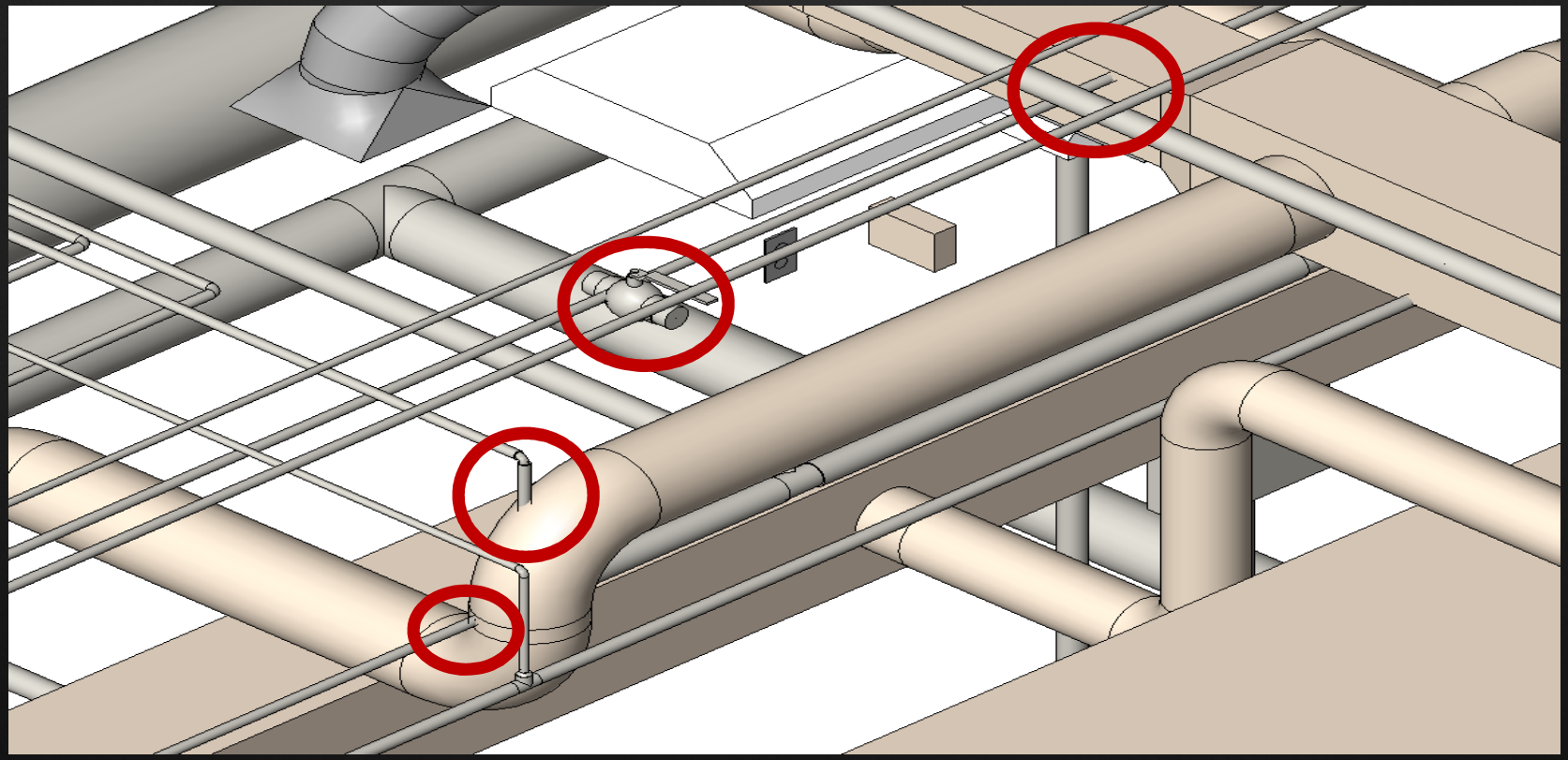
# Surfaces

1. Consider Civil 3D
2. Use Navisworks to bring it together.
3. Have Civil use the project local coordinate points when exporting.

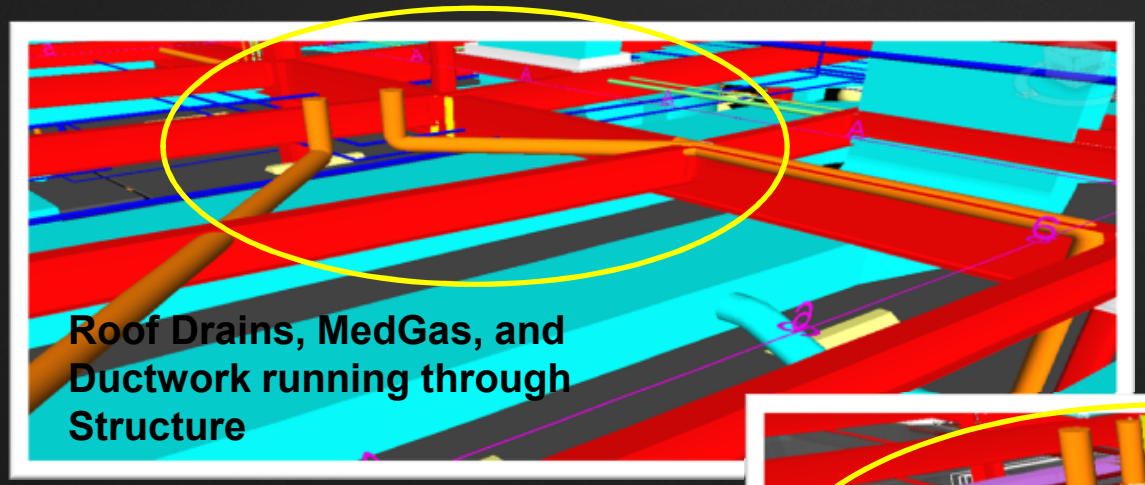


# Case Study of Designers Model



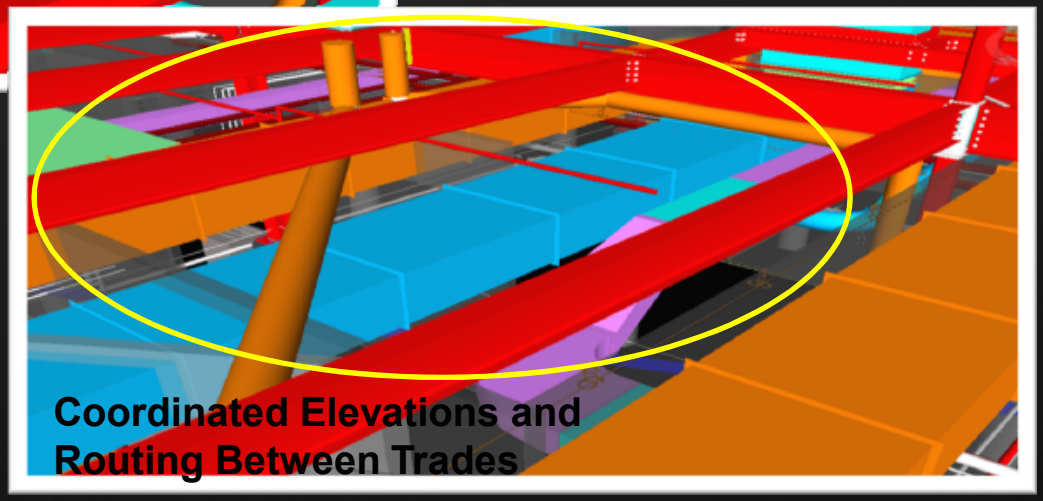


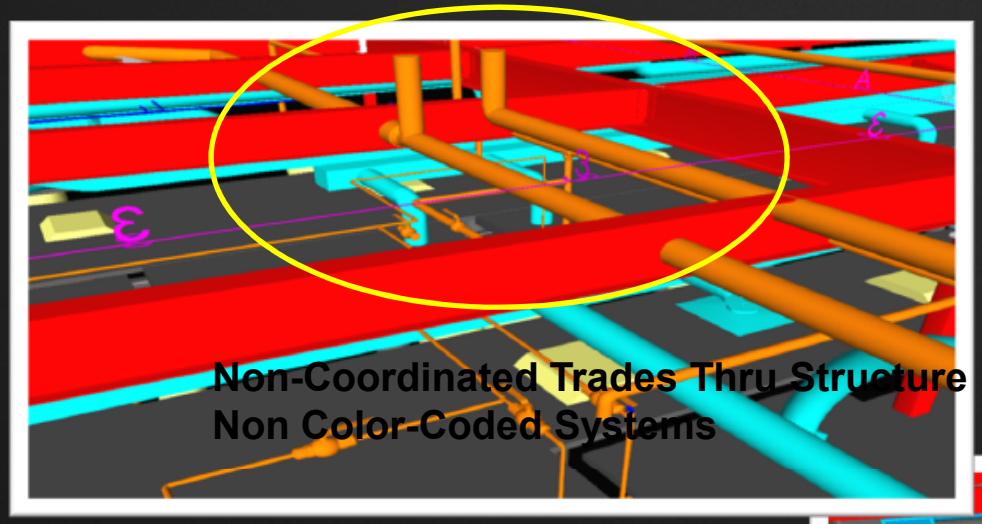
Autodesk University




BEFORE

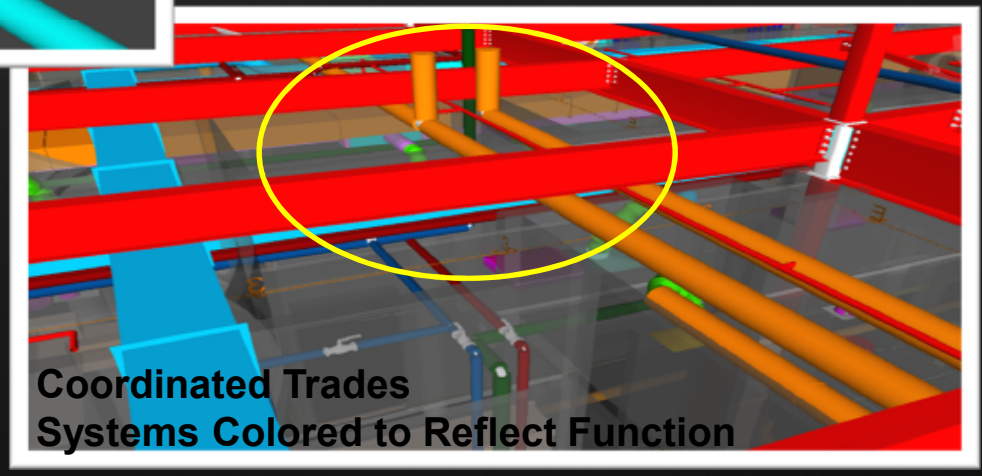
AFTER

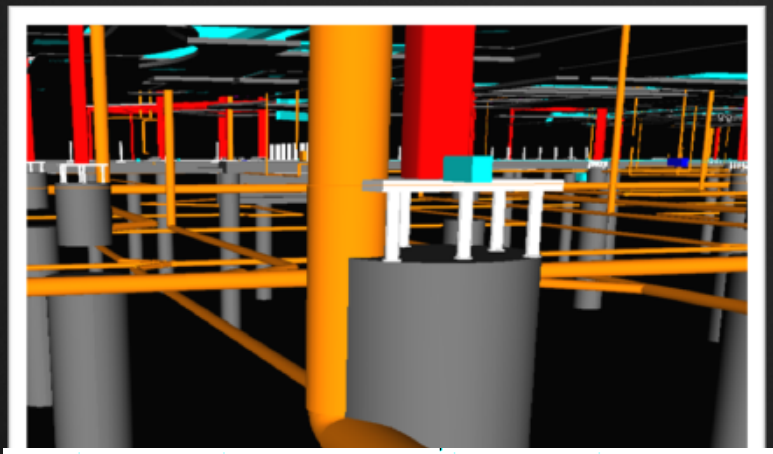





BEFORE

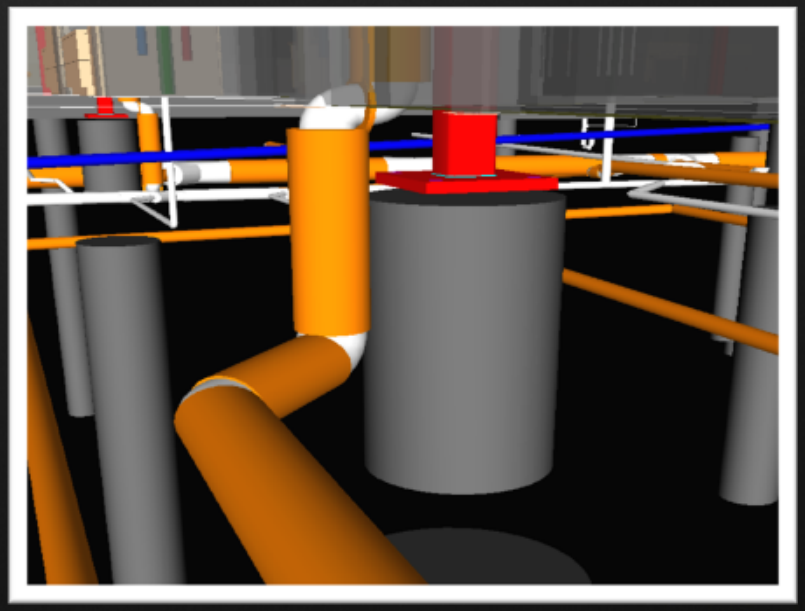
AFTER

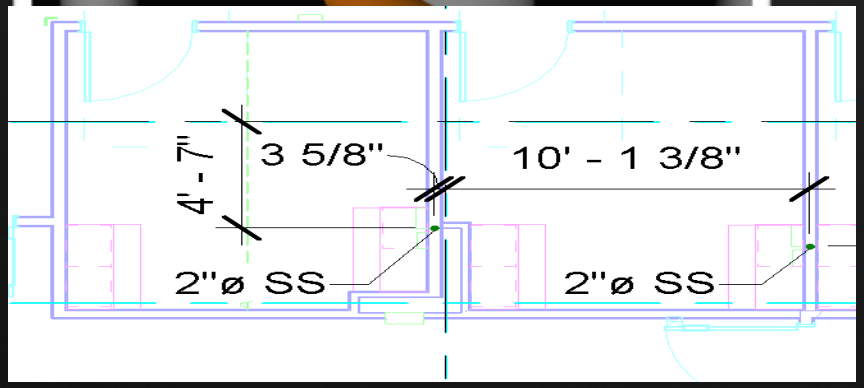


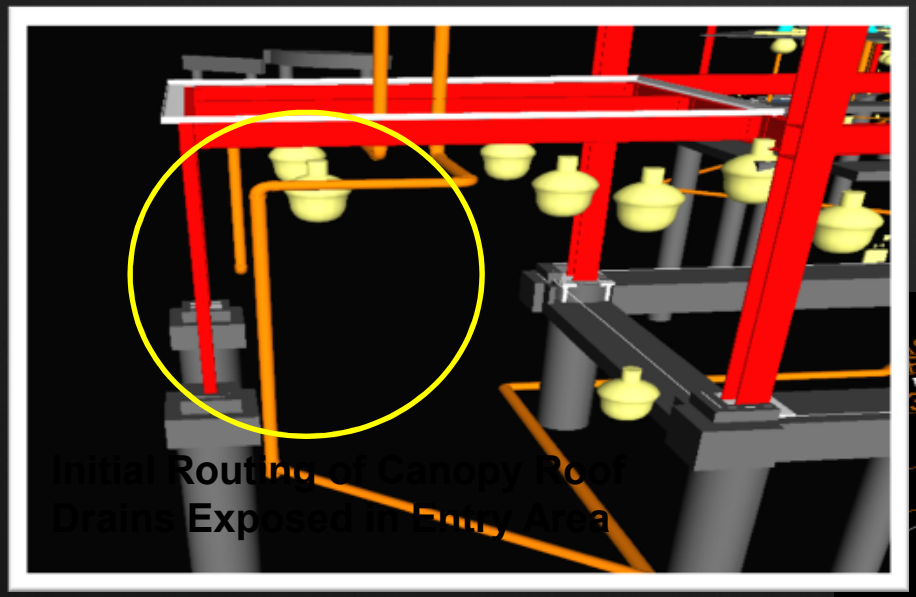


BEFORE

AFTER



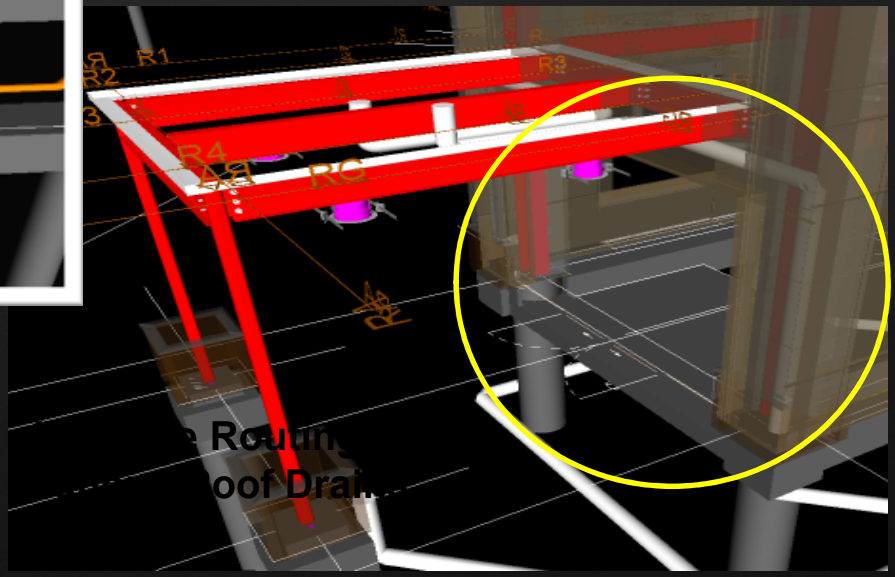




BEFORE

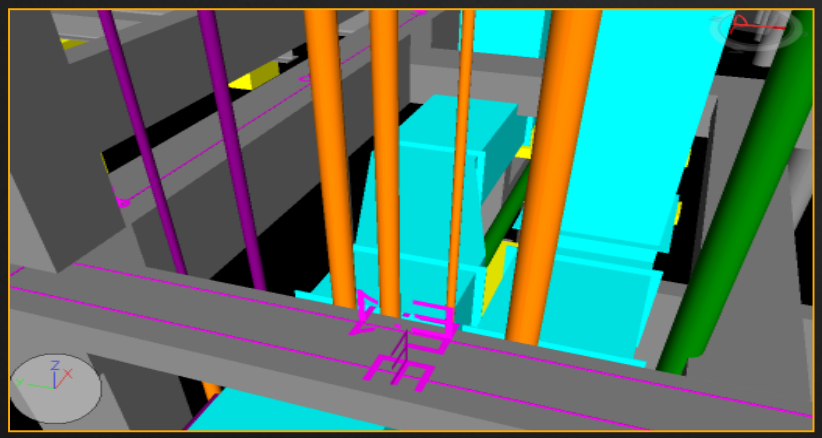
Initial Routing of Canopy Roof Drains Exposed in Entry Area

AFTER



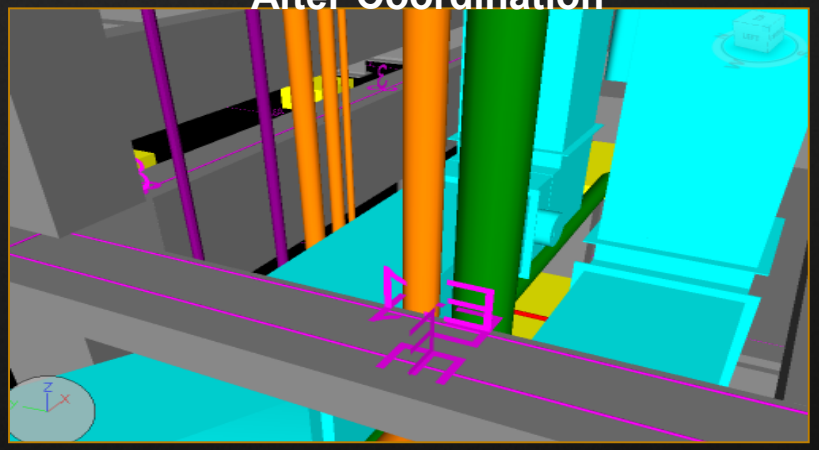
Autodesk University

# Clash Examples

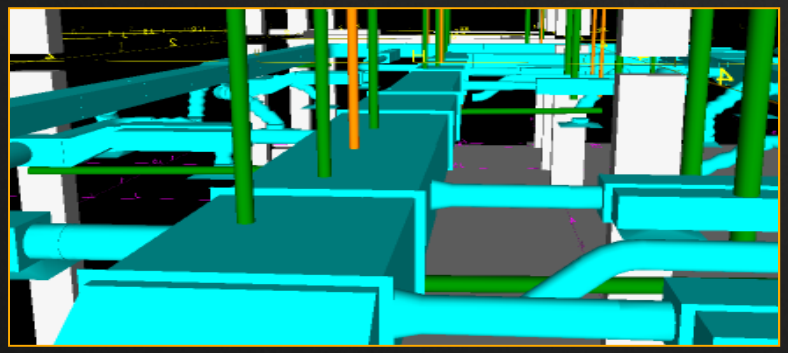


Before Coordination

After Coordination

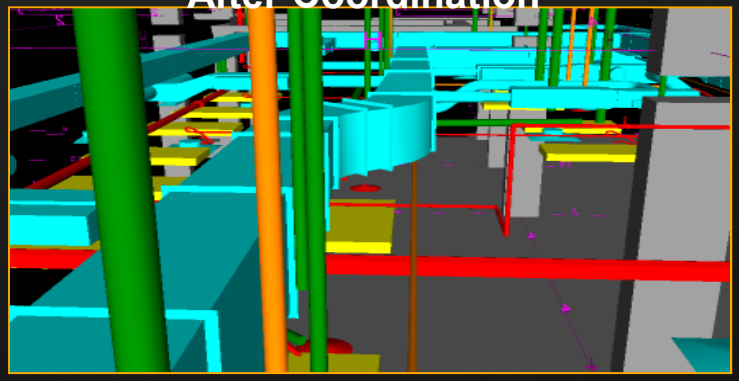


# Clash Examples

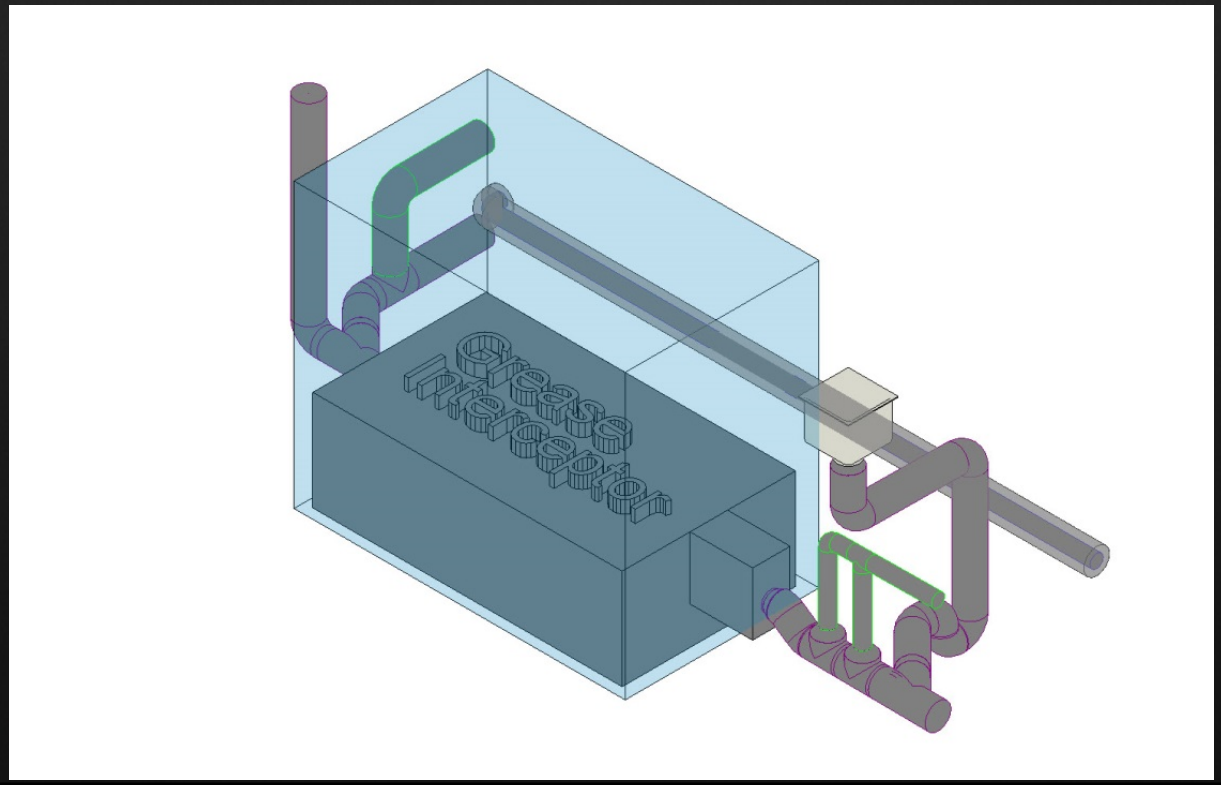


Before Coordination

After Coordination

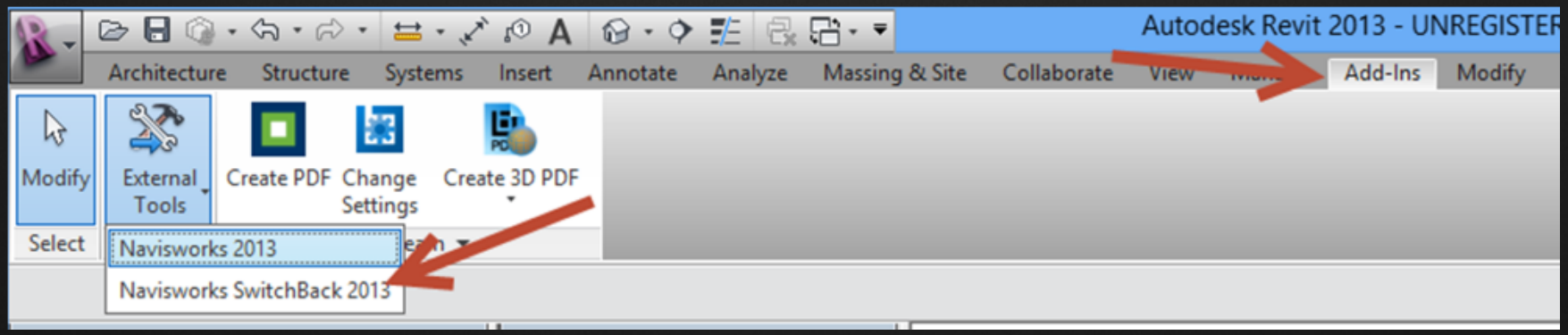


# Families



# Use Switch Back

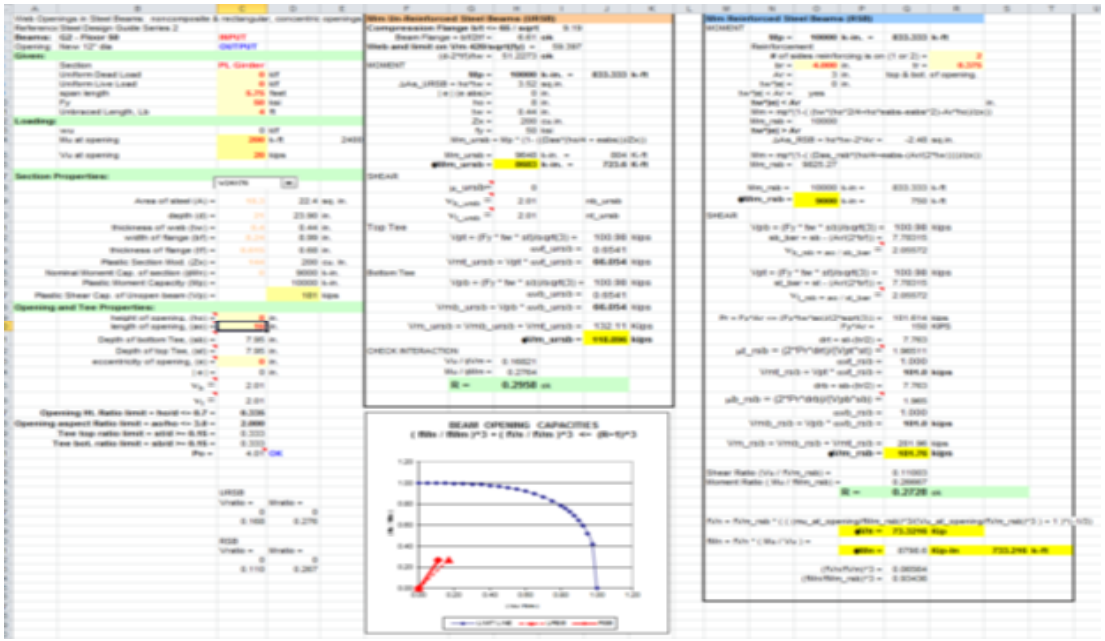
# SwitchBack 2013



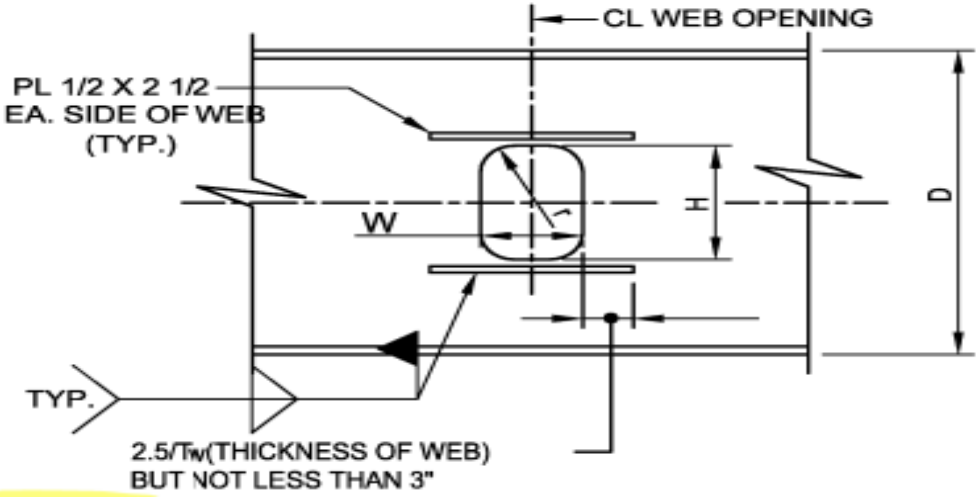
# Beam Openings

- Beam Penetrations

# Web Openings, Not New To the Industry
# Common Guide provided by the Steel Industry

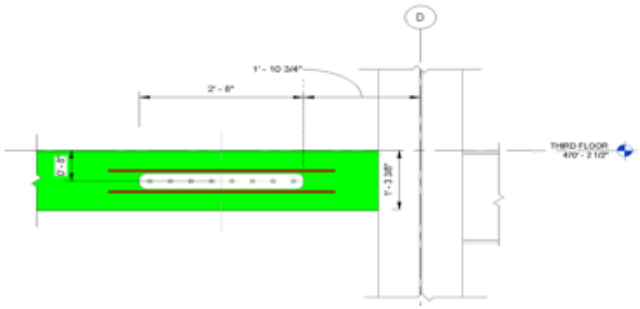



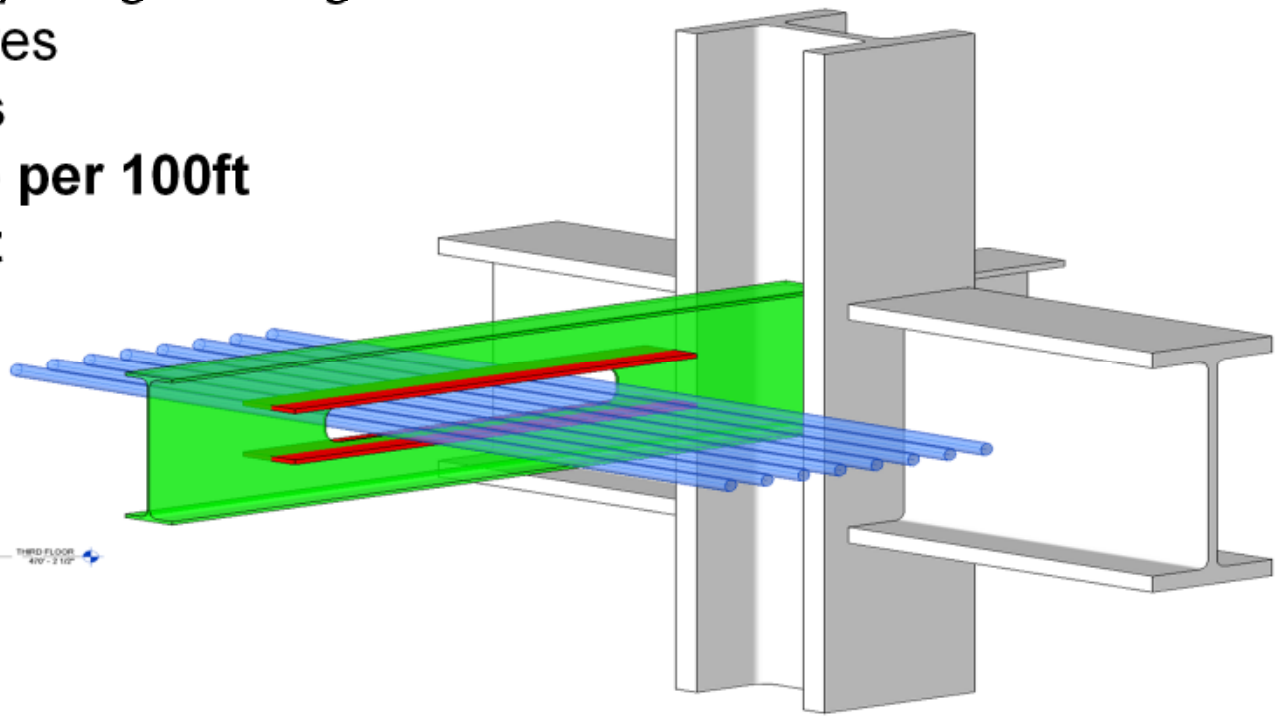
# Typical Detail – Beam Openings



# MED GAS

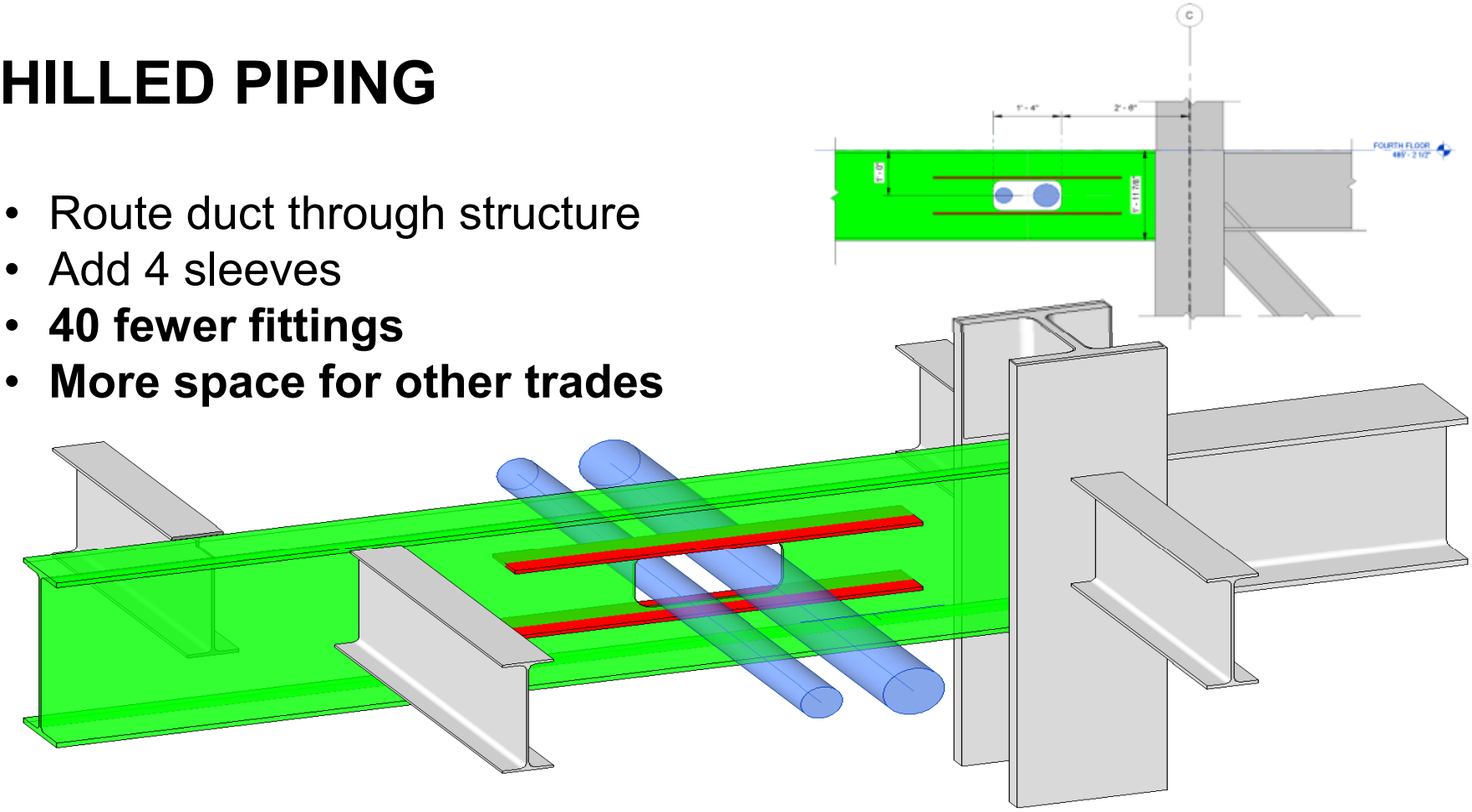
- Run medical gas pipe high through beams
- Add 12 beam sleeves
- **112 Fewer Fittings**
- **Saved 10ft of pipe per 100ft**
- **Saved 1.8 fitting/ft**



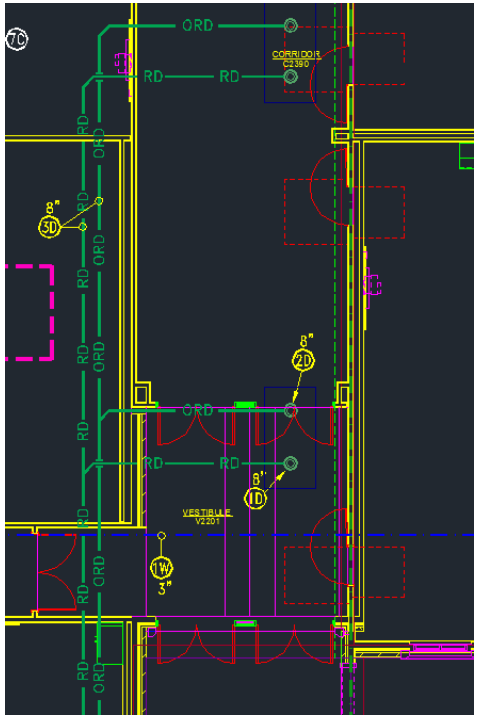


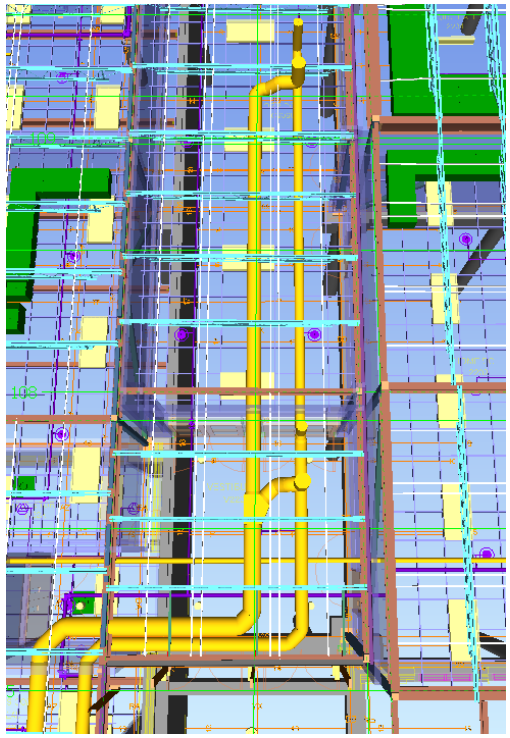
# CHILLED PIPING

- Route duct through structure
- Add 4 sleeves
- **40 fewer fittings**
- **More space for other trades**



# Longest Run: Model largest (Diameter) sloped plumbing first



## Conclusion: Q & A | AU@IKERD.com

MP 3872 Plumbing Top 10 Tips

- If you feel we could **improve**,
- *please take a moment to personally let me know.*
- *AU@IKERD.com*

- If you think we did a **good job**,
- *please let Autodesk know with the speaker evaluation.*