# Building Information Modeling: A Design Engineer's Perspective

A Presentation to the

PTI Technical Conference & Exhibition

By

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# Topics for Today

- How BIM is being routinely used to deliver structural designs TODAY.
- Pitfalls and Lessons Learned
- Benefits Observed from Modeling

# BIM TODAY

- Concrete Structures Primarily Modeled for:
  - Construction Documents Preparation
  - Clash Detection

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# BIM TODAY

- What are we modeling during the design process?
  - Typically geometry for concrete structures
- Not routinely modeled:
  - Embedded reinforcing
  - Small penetrations (for pipe sleeves, etc.)
  - Structural actions: moments, shears, deflections
  - Material properties such as F'c, Fy
- Concrete BIM models not typically used for shop drawing preparation (except formwork), conveying structural analysis results, or bidding assistance.

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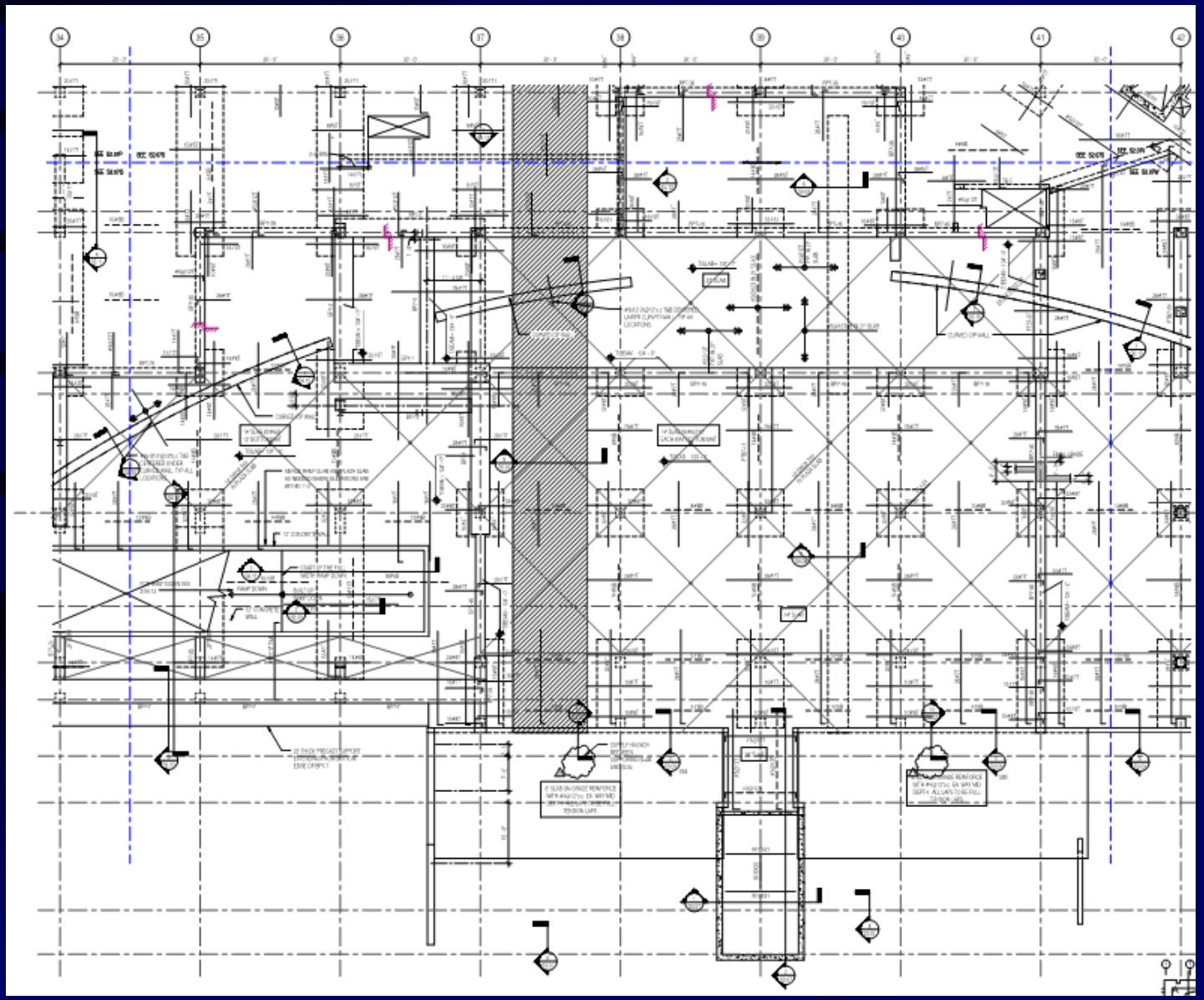
# BIM TODAY

- Level of modeled precision varies by contract & by client
  - AIA G202 Project BIM Protocol Form

**BIM Model Element Table**
**Level of Detail Provided By Cagley & Associates**

| Model Element | Concept Design | Schematic Design | Design Development | Construction Documents | Notes |
|---|---|---|---|---|---|
| **Description** | **LOD** | **LOD** | **LOD** | **LOD** | |
| **Primary Structural Element** | | | | | |
| Beams - Horizontal Openings thru Beam Web | NIC | NIC | NIC | NIC | |
| Bearing Walls - Masonry or Concrete | 100 | 100 | 200 | 300 | |
| Bearing Walls - Openings | NIC | 100 | 200 | 300 | Wall Openings larger than 24" wide |
| Bearing Walls - Wood or Metal Stud | 100 | 100 | 200 | 300 | |
| Columns - Concrete | 100 | 100 | 200 | 300 | |
| Columns - Sloping | NIC | 100 | 200 | 300 | |
| Columns - Steel | 100 | 100 | 200 | 300 | |
| Columns - Steel Base Plates | NIC | NIC | NIC | NIC | |
| Concrete - Basement Wall shelf Elevations | NIC | NIC | 100 | 300 | Brick shelf / ledge elevations TBD by the Arch. |

# Construction Document Prep



# Drawing Creation from Model

- Floor plans – created by cutting horizontal sections
- Details-  can be created by creating viewing boxes
- Schedules- geometry can be auto generated, but reinforcing entries are manual or spreadsheet driven

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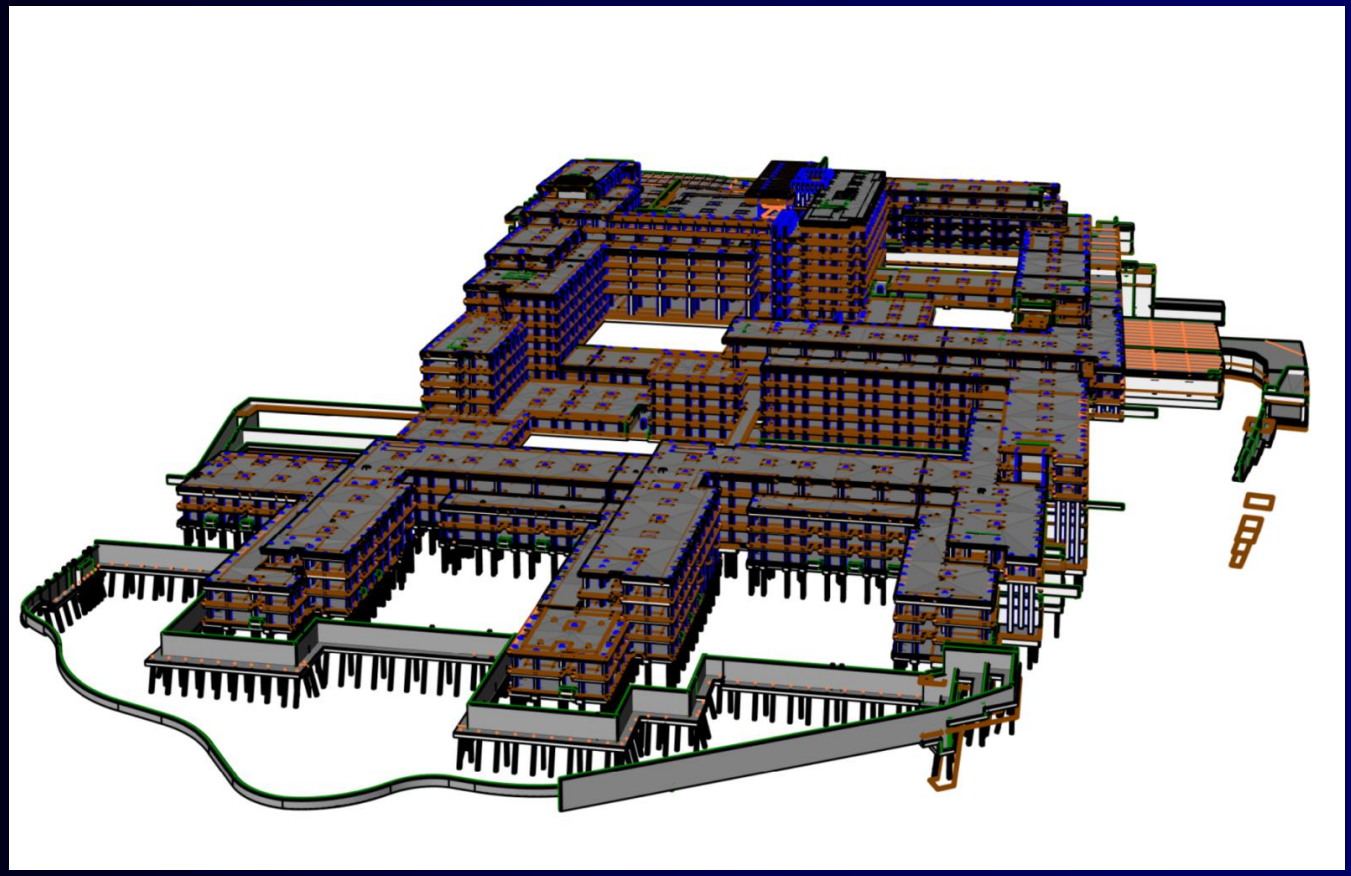

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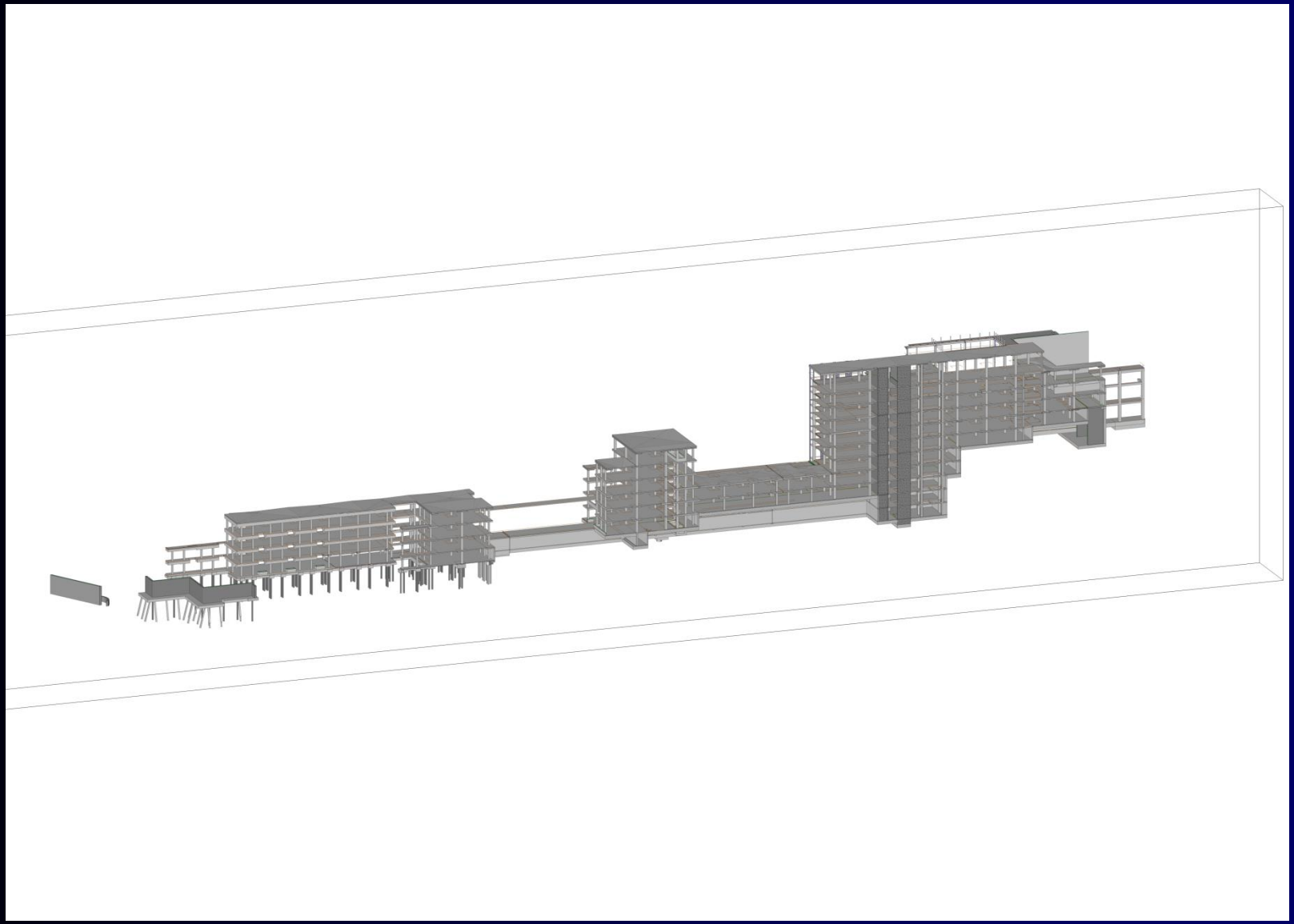

Structural BIM Full Building Section

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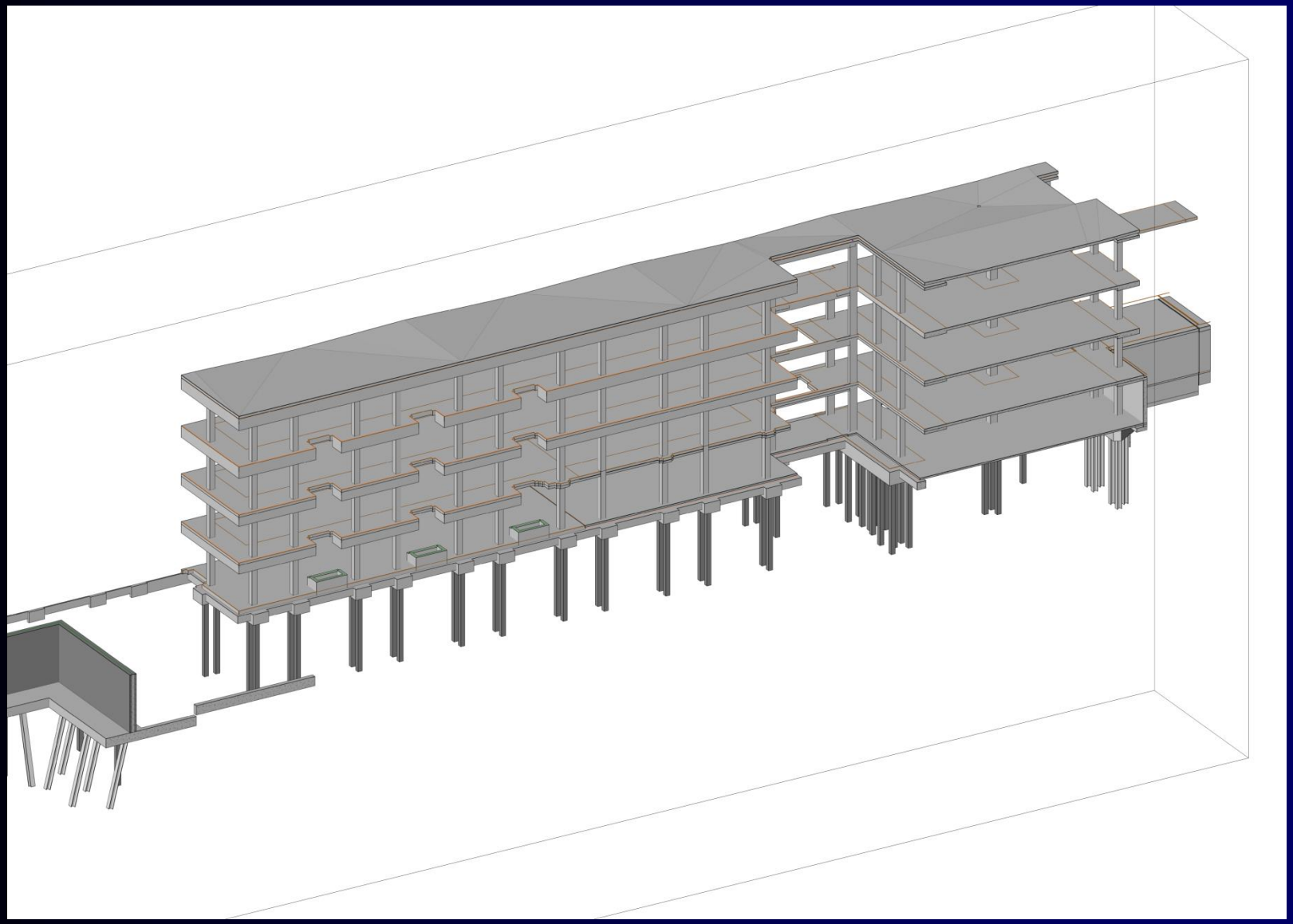

Structural BIM Partial Building Section

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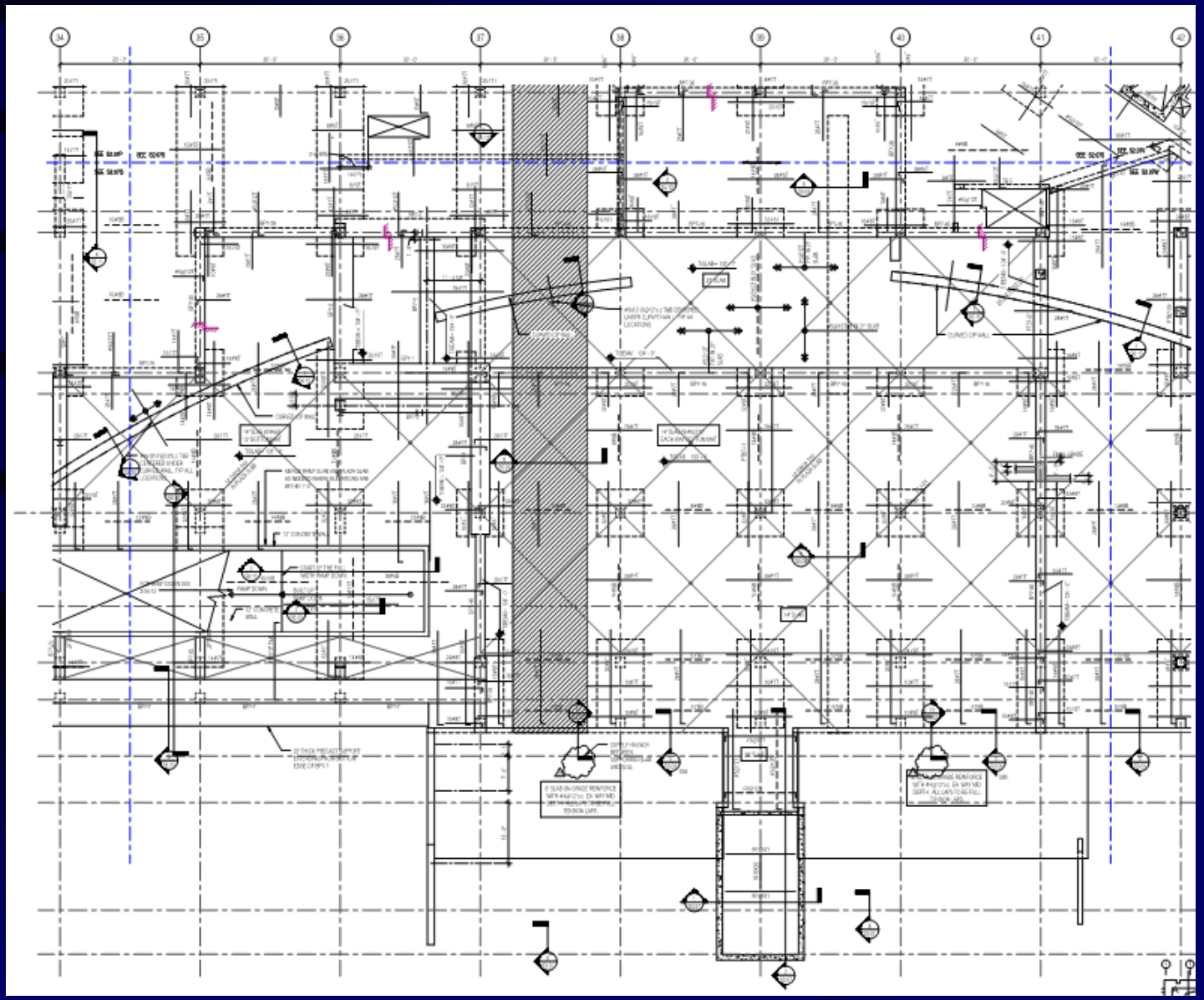
# Construction Document Prep



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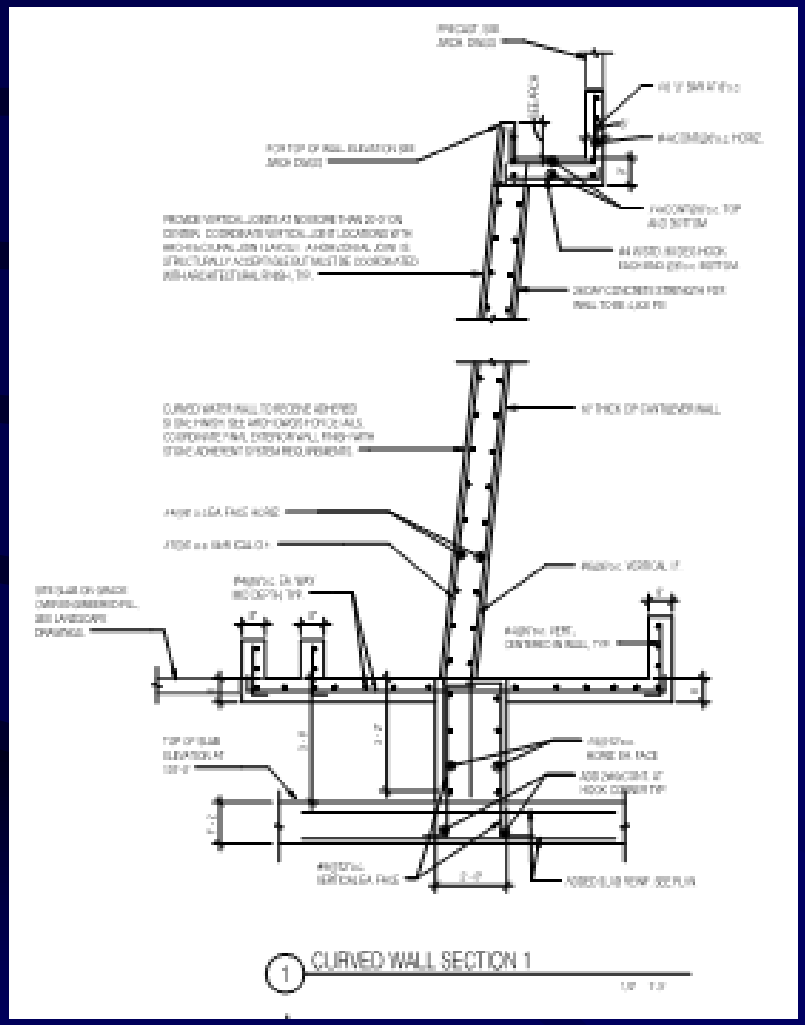

# Clash Detection

- Each discipline creates their own model
- Periodically merged
  - Conflicts are identified for resolution by the party responsible for that element taking the lead.

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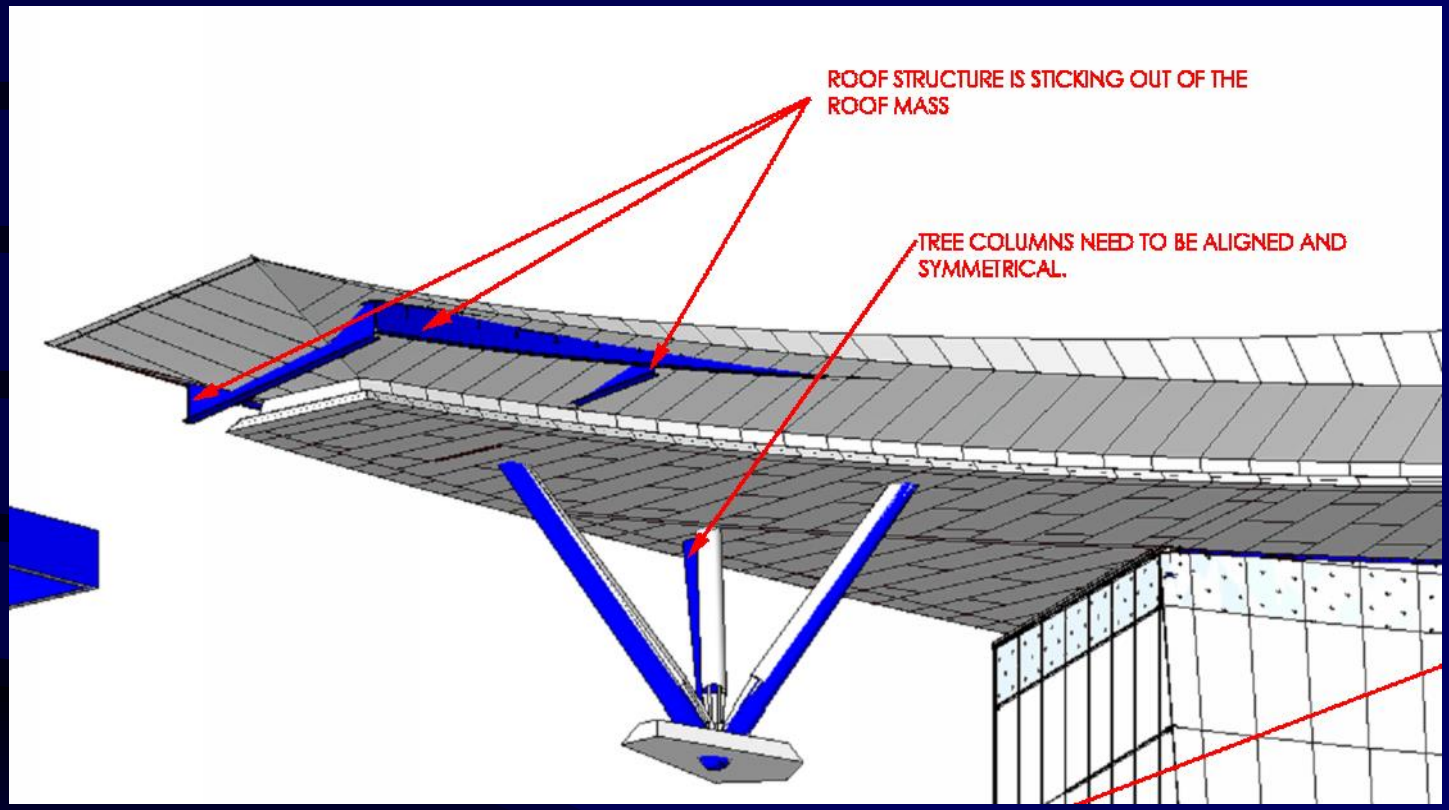
# Clash Detection

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# Pitfalls/Minefields/Warnings…

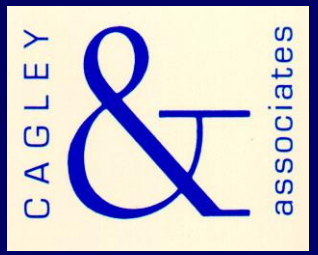
- Understand what you are committing to ***prior to negotiating your deal***
  - Understand the architect's expectations
    - Who owns the slab edge
    - How do you treat typical details
  - LOD beyond 300 adds time and $$$
- Communicate with contractors about expectations/limitations of design model

# More Lessons Learned

- Every project needs a BIM Champion for the project duration
- BIM Models are NOT the construction documents
  - Architects tend to rely on the models
  - Still need to produce proper plans and specs

# Observed Benefits

- Increased Productivity
  - Designs executed more efficiently
  - Increased Staff flexibility
  - Enhanced ability to react to changes
- Better documents, better projects
  - Fewer problems, less conflict
  - Less time wasted during CA fixing someone else's problems



# Observed Benefits

$$$$$$

# Questions??