

Defining Level of Development Specifying BIM Deliverables

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HOK

Level of Development

AIA Document E202™ – 2008

Building Information Modeling Protocol Exhibit

This Exhibit is incorporated into the accompanying agreement (the "Agreement") dated the _____ day of _____, 20____ (In words, indicate day, month and year.)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

BETWEEN

(Name, address and contact information, including electronic addresses)

AND

(Name, address and contact information, including electronic addresses)

for the following Project:
(Name and location or address)

TABLE OF ARTICLES

- 1 GENERAL PROVISIONS
- 2 PROTOCOL
- 3 LEVEL OF DEVELOPMENT
- 4 MODEL ELEMENTS

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 This Exhibit establishes the protocols, expected levels of development, and authorized uses of Building Information Models on this Project and assigns specific responsibility for the development of each Model Element to a defined Level of Development at each Project phase. Where a provision in this Exhibit conflicts with a provision in the Agreement into which this Exhibit is incorporated, the provision in this Exhibit will prevail.

§ 1.1.1 The parties agree to incorporate this Exhibit by reference into any other agreement for services or construction for the Project.

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§ 4.3 Model Element Table

Identify (1) the LOD required for each Model Element at the end of each phase, and (2) the Model Element Author (MEA) responsible for developing the Model Element to the LOD identified.

Insert abbreviations for each MEA identified in the table below, such as "A – Architect," or "C – Contractor."

NOTE: LODs must be adapted for the unique characteristics of each Project.

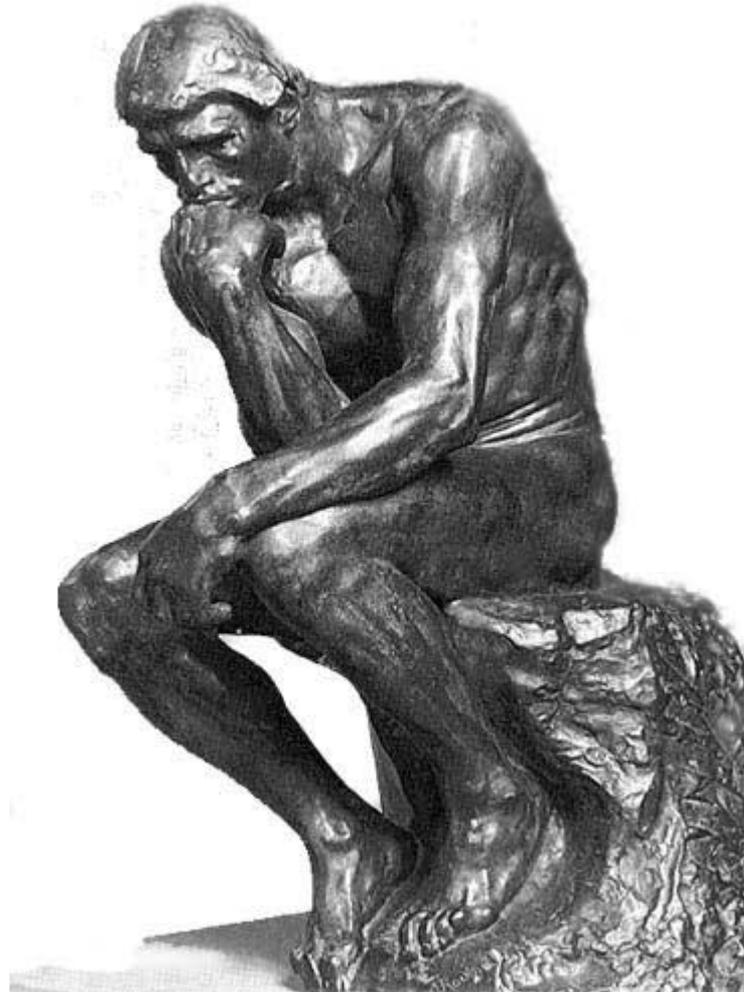
						Conceptualization		Criteria Design		Detailed Design		Implementation Documents		Construction		Note Number (See 4.4)			
Model Elements Utilizing CSI UniFormat™						LOD	MEA	LOD	MEA	LOD	MEA	LOD	MEA	LOD	MEA	LOD	MEA		
A	SUBSTRUCTURE	A10 Foundations	A1010	Standard Foundations	100		200		300		400		500						
			A1020	Special Foundations	100		100		300		400		500						
			A1030	Slab on Grade	100		200		300		400		500						
	A20 Basement Construction	A2010	Basement Excavation	100		200		300		300		500							
		A2020	Basement Walls	100		200		300		300		400		500					
B	SHELL	B10 Superstructure	B1010	Floor Construction	100		200		300		300		500						
			B1020	Roof Construction	100		200		300		300		500						
	B20 Exterior Enclosure	B2010	Exterior Walls	100		200		300		400		500							
		B2020	Exterior Windows	100		200		300		400		500							
		B2030	Exterior Doors	100		200		300		400		500							
	B30 Roofing	B3010	Roof Coverings	100		200		300		300		500							
		B3020	Roof Openings	100		200		300		300		500							
	C	INTERIORS	C10 Interior Construction	C1010	Partitions	100		200		300		400		500					
				C1020	Interior Doors	100		200		300		400		500					

Problem: How can We Define a BIM?

- What is the owner expecting when they ask for “BIM” on a project?
- How much effort will it take (how do I price it?)
- How do I know I’m meeting my deliverables?
- Who’s going to rely on it for what?
- GIGO

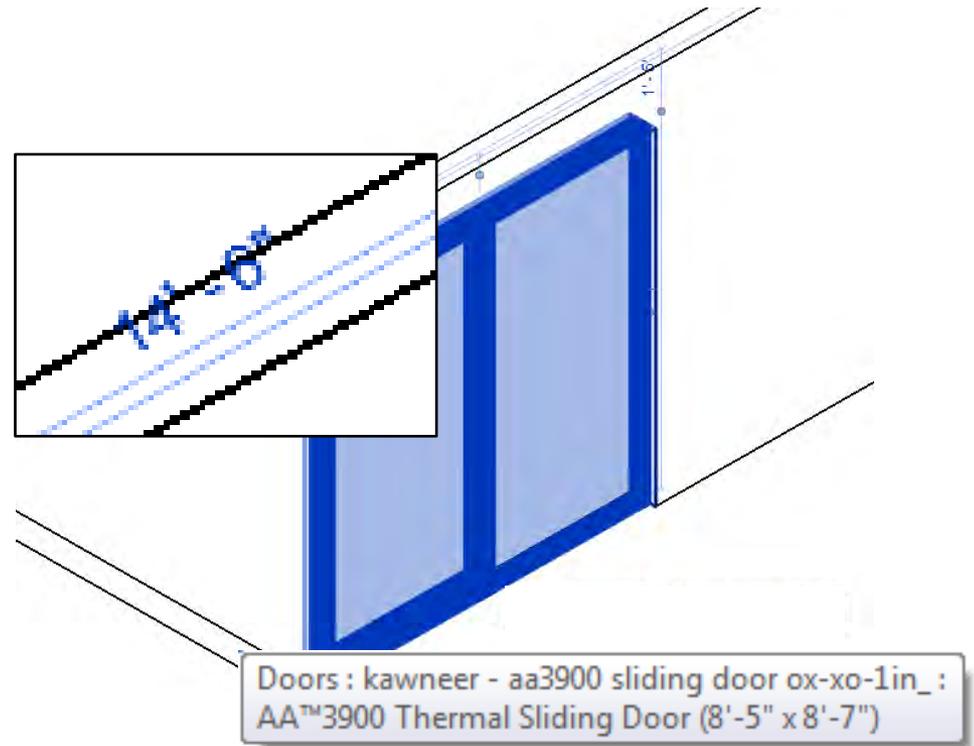
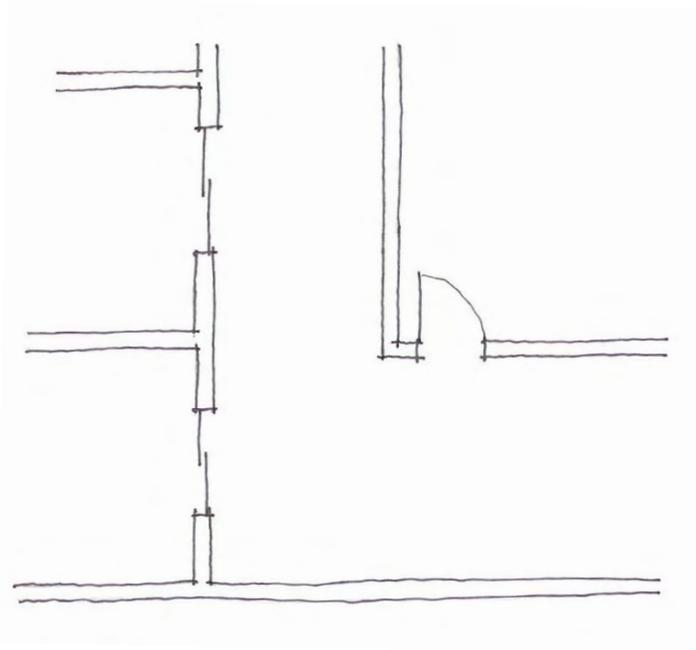


We Never Had this Problem with Paper Drawings – Why Now?



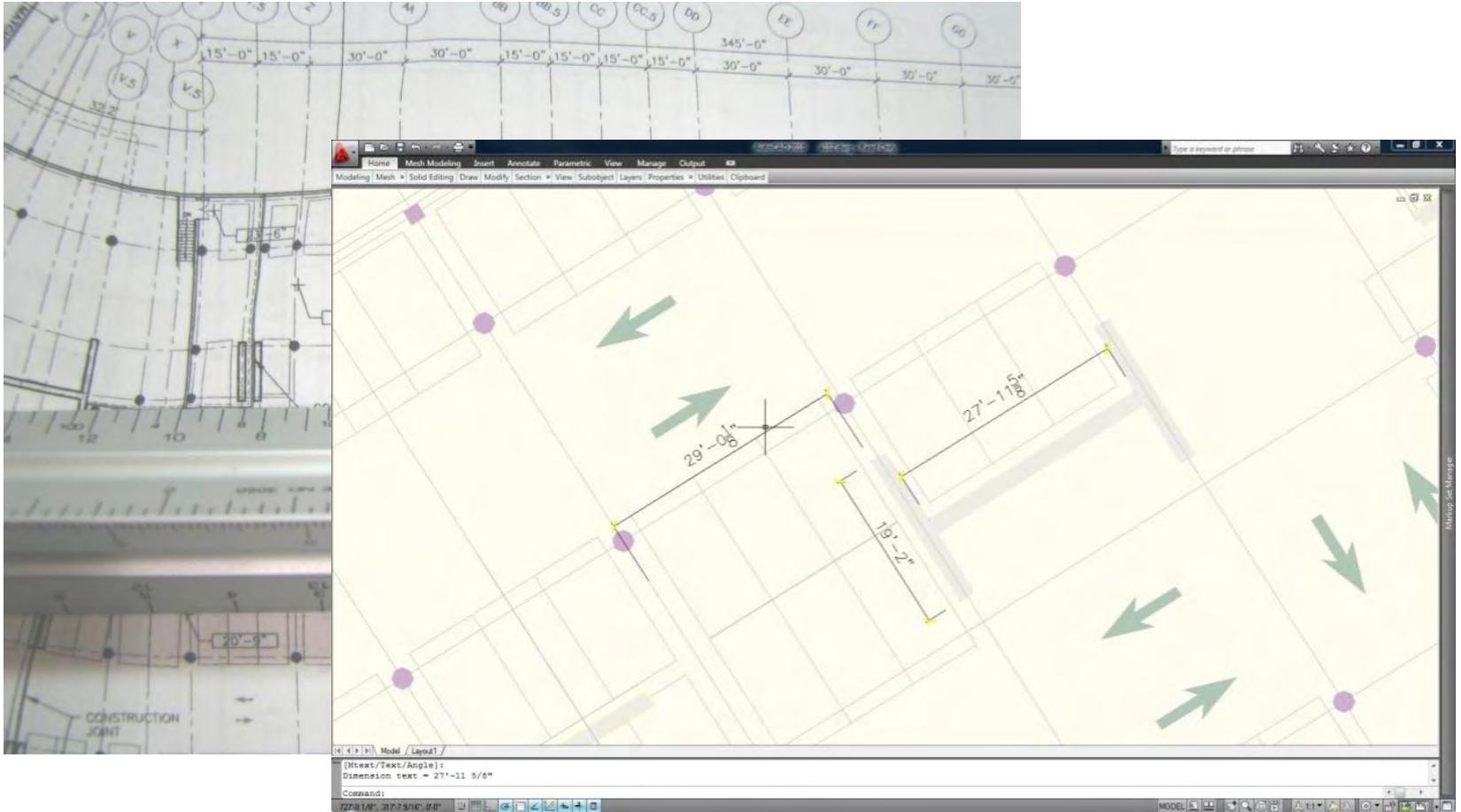
Paper vs. BIM

Visual cues about state of development



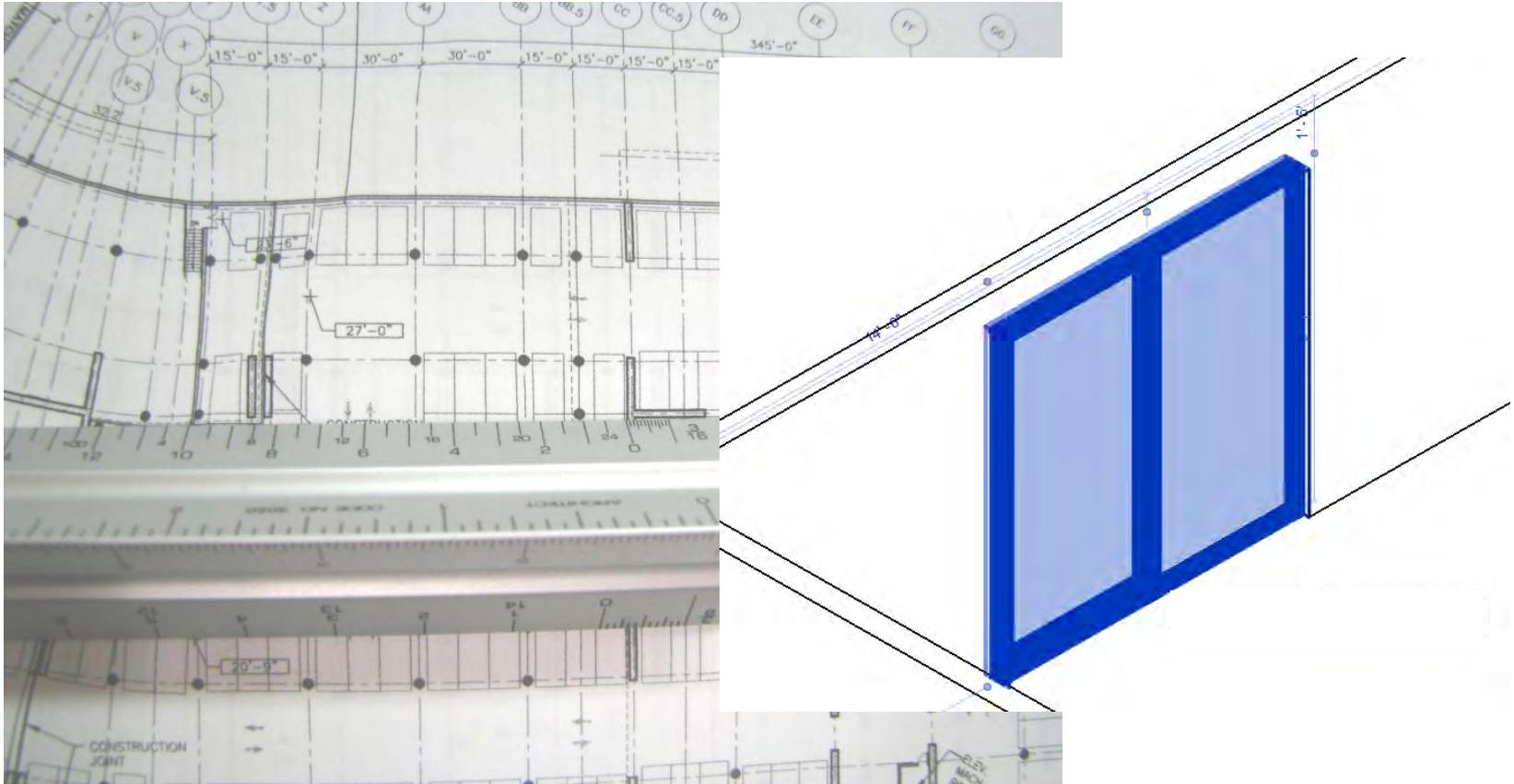
Paper vs. BIM

Precision



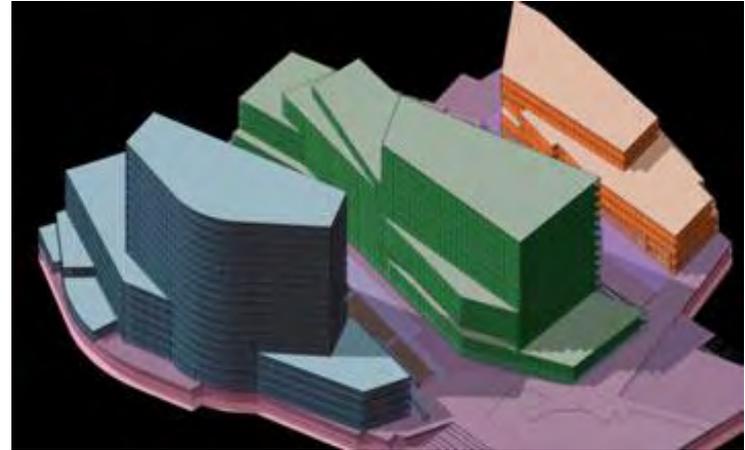
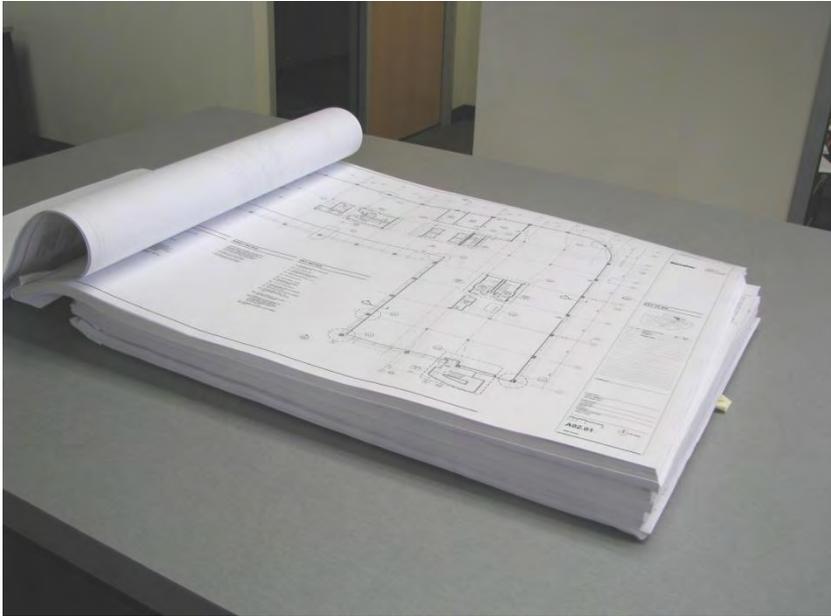
Paper vs. BIM

All information is vetted



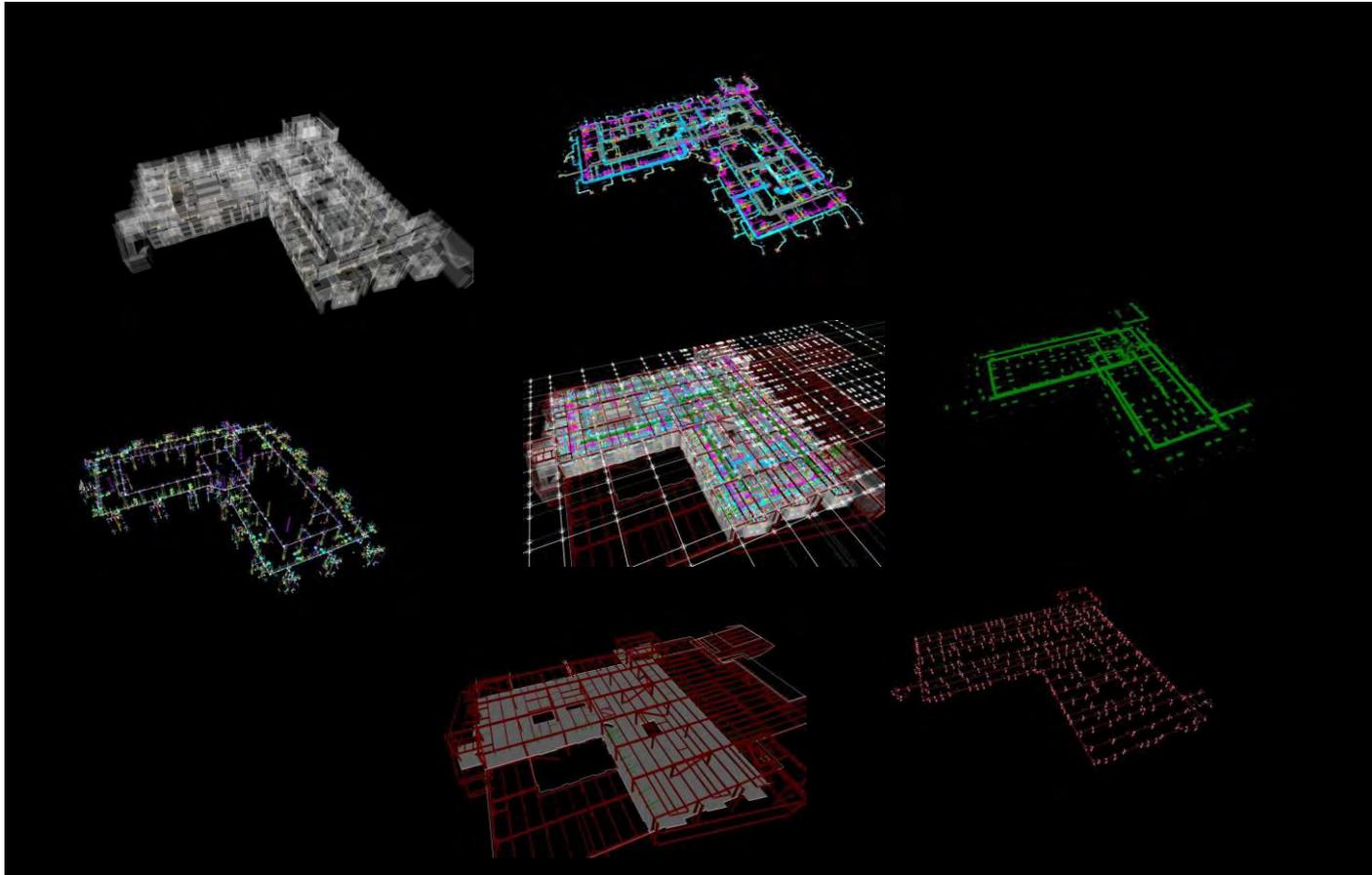
Paper vs. BIM

Deliverables



Paper vs. BIM

Federated models – who's responsible for what when?



Response?

The Disclaimer:

This model looks great so you can look at it but you can't use it for anything or rely on it for anything which includes, but is not limited to, everything.

If you use it for anything anyway then you have to pay my lawyers anything they want if I get sued for anything related to your use of the model for anything.

Have a nice day.

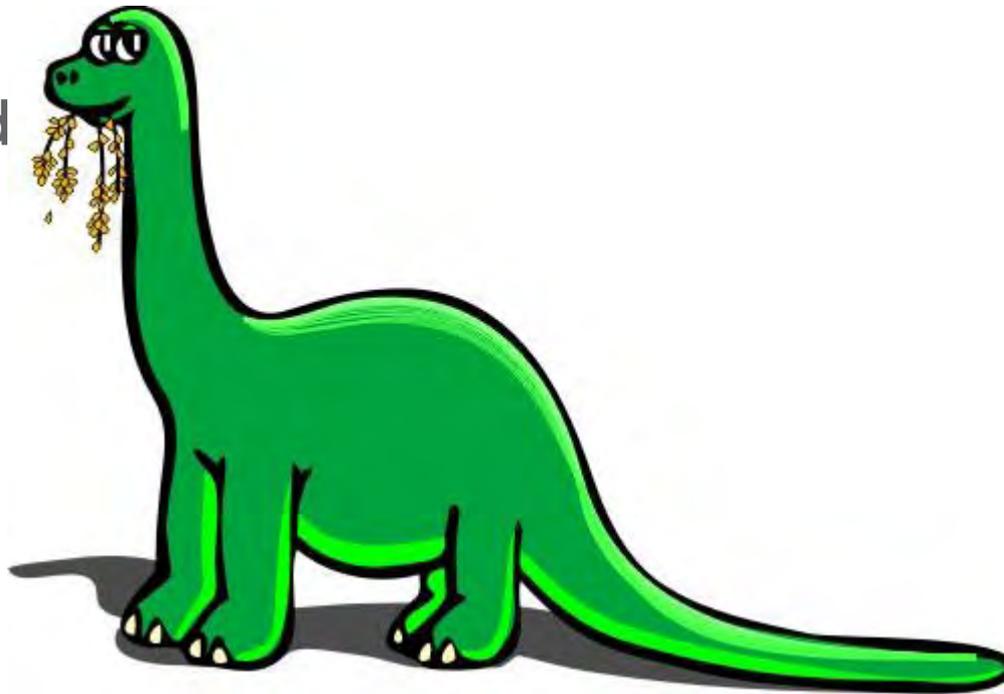
Response?

Disclaimer Approach:

Some of it's not reliable so don't rely on any of it.

Specified

Some



What I say you can.

The Model Progression Spec

AIA Document E202™ – 2008
Building Information Modeling Protocol Exhibit

THE AMERICAN INSTITUTE OF ARCHITECTS

		Level of Development - Geometrical Representation														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	Level 10	Level 11	Level 12	Level 13	Level 14	Level 15
1	Use/Form	Use/Form	Omit/class													
2	Shell															
3	Superstructure															
4	Exterior Vertical Enclosures															
5	Exterior Windows															

Definitions & Spec

LOD Definitions

- 100 Conceptual.** The Model Element may be graphically represented in the Model with a symbol or other generic representation, but does not satisfy the requirements for LOD 200. Information related to the Model Element (i.e. cost per square foot, tonnage of HVAC, etc.) can be derived from other Model Elements.
- 200 Generic Placeholders.** 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.
- 300 Specific Assemblies.** 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.
- 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.

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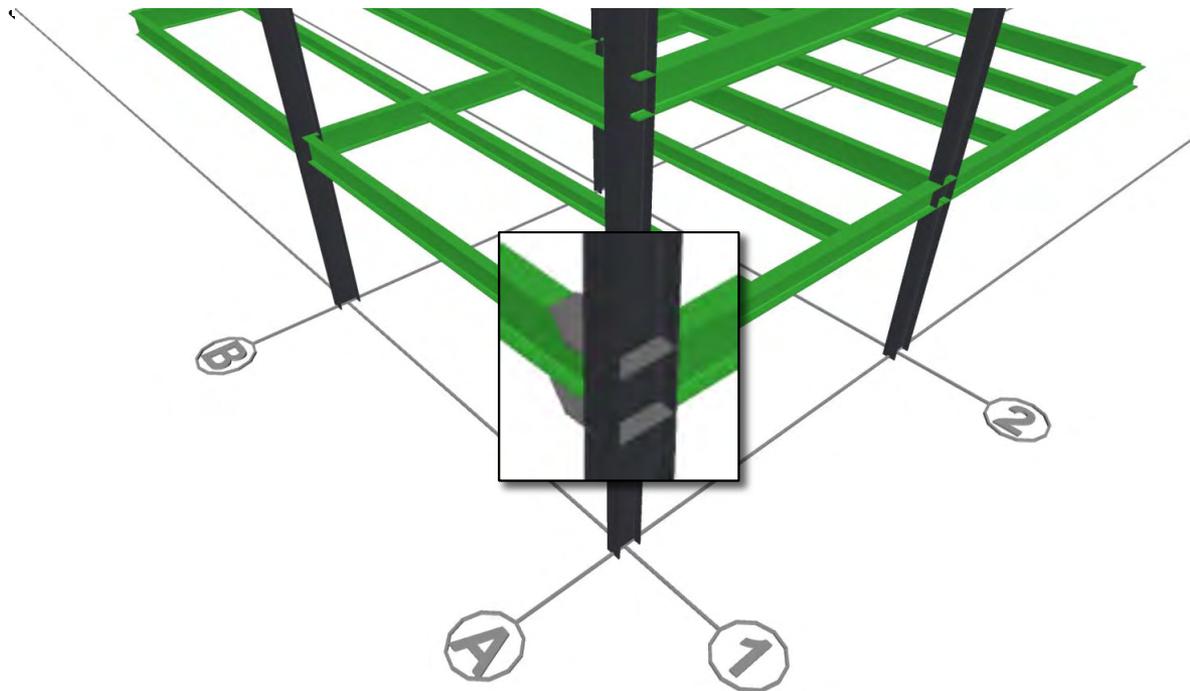
LOD Definitions

→ LOD 100
Conceptual

→ LOD 200
Generic
Placeholders

→ LOD 300
Specific
Assemblies

→ LOD 400
Details



Level of Development vs. Level of Detail

Level of **Det**

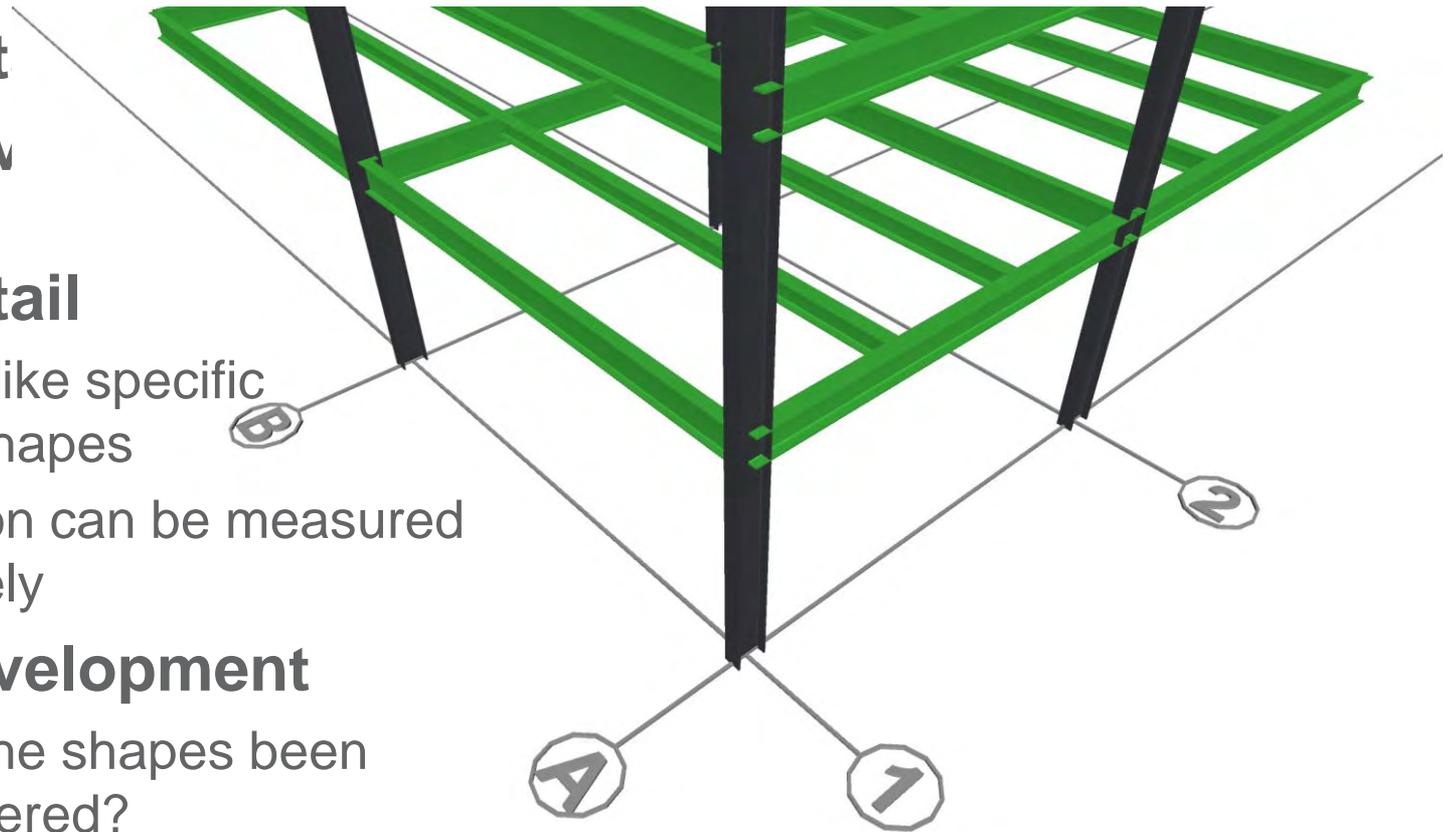
Level of **Dev**

Level of **Detail**

- Looks like specific steel shapes
- Location can be measured precisely

Level of **Development**

- Have the shapes been engineered?
- Are they in the final locations?



LOD Definitions

- 100** Estimate it.
- 200** Specify it.
- 300** Buy it.
- 400** Build/Install it.
- 500** Operate it.

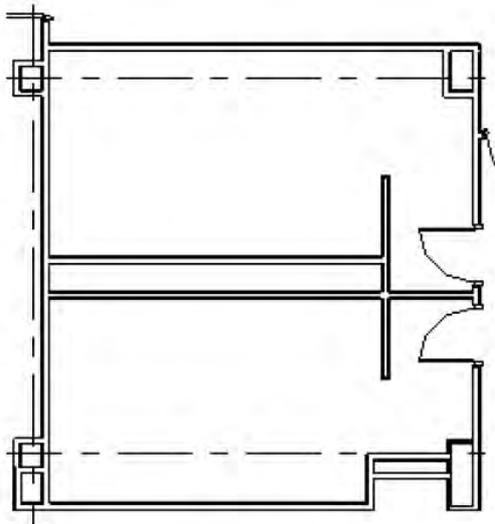
DETAIL = Input*

DEVELOPMENT = Reliability

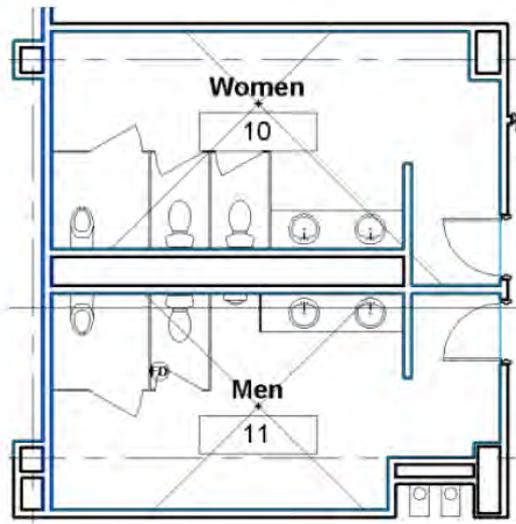
** Usually more Input than Reliability*

Use of LODs

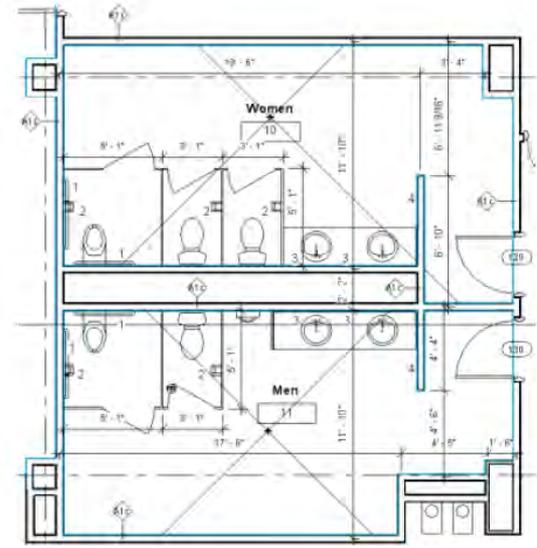
- No correspondence with design phase
- No such thing as an “LOD ### model”



Level 100 Floor Plan



Level 200 Floor Plan



Level 300 Floor Plan

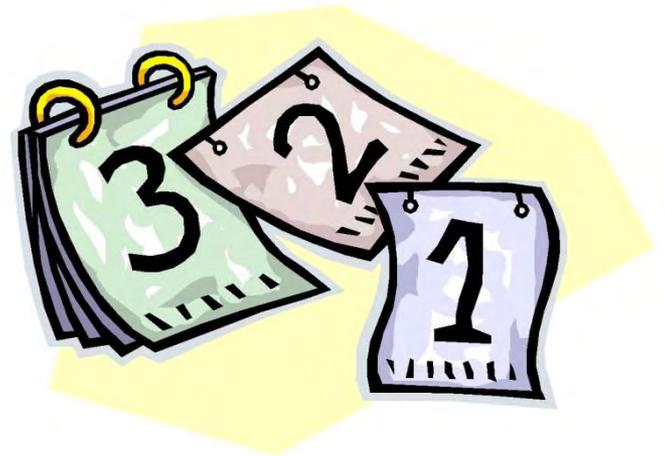
Use of LODs

- Use LODs with a model disclaimer?
- Authorized Uses? (in AIA E202)
 - Within Integrated Project Delivery
 - Traditional delivery methods



LOD Catalog: History

- AIA + AGC BIMForum working group
 - Signed MOU using same definitions, develop together
- Launched early 2011
- Bi-weekly meetings
- Meeting with BIMForum Technology Subforum
 - Supporting LOD implementation in software



LOD Catalog: Purpose

- Stakeholder expectations
 - Design team (INPUT)
 - Fabricators, builders, owners... (RELIABILITY)
- Facilitate sharing of model information
- Solving the 'garbage in, garbage out' problem
- Submit as a standard – NBIMS?



LOD Catalog: The Team

Core Team:

- Jim Bedrick
- Jan Reinhardt – Adept Proj. Del.
- Will Ikerd – Ikerd Consulting
- James Vandezande – HOK
- Bob Middlebrooks – Autodesk
- David Francis – Southland Ind.
- Dmitri Alferieff – AGC
- Marcel Broekmaat – Vico Software
- Mike Bomba – AIA
- Ricardo Khan – Mortenson
- Rodd Merchant – JE Dunn
- Ron Dellaria – Astorino
- Walt Cichonski – LF Driscoll



+17 other members

Sub-Groups:

- Chairs are
1 designer + 1 builder

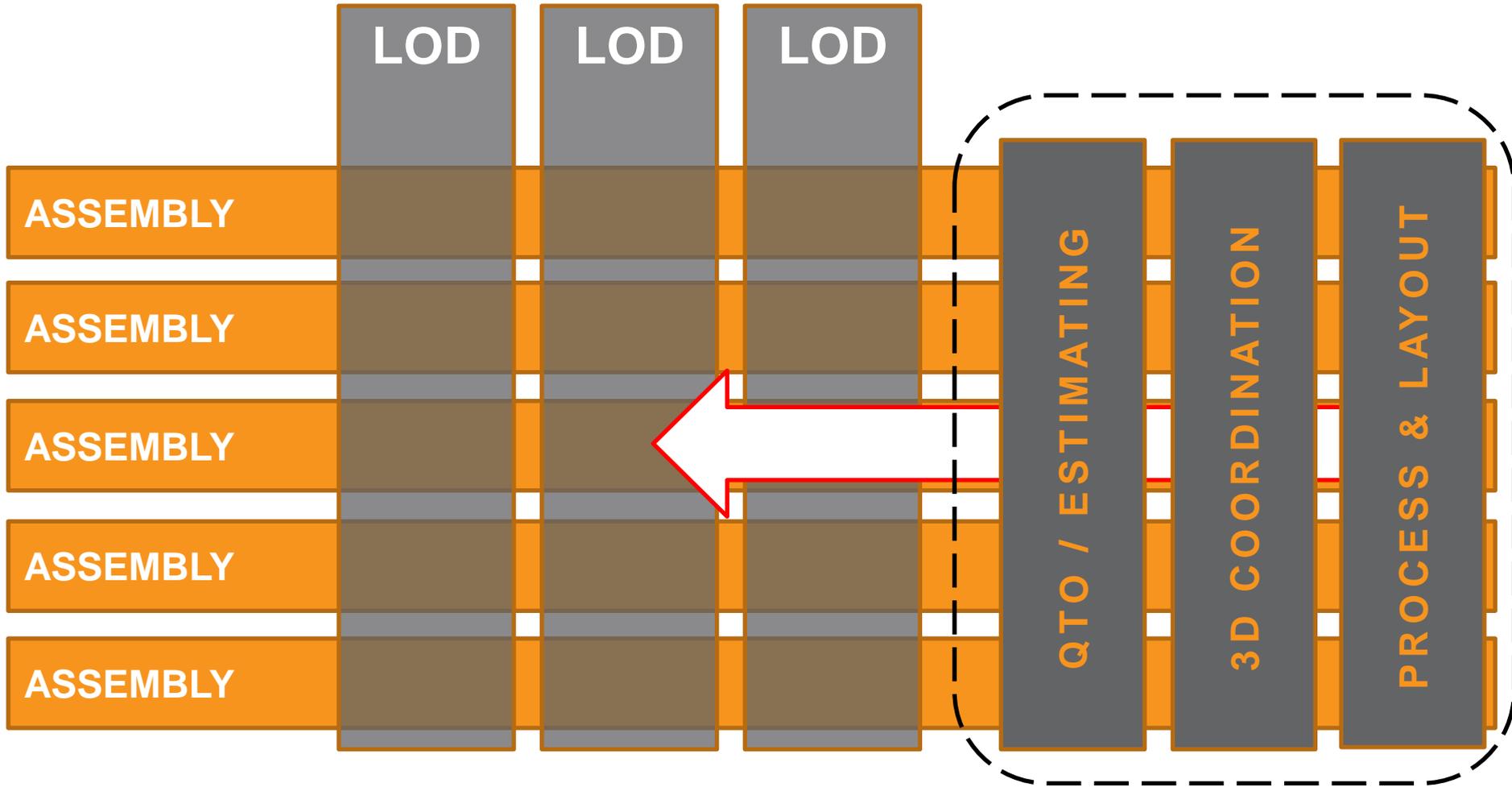
Categories:

- Sub/Super-Structure
- Exterior Enclosure
- Interior Construction
- M/E/P

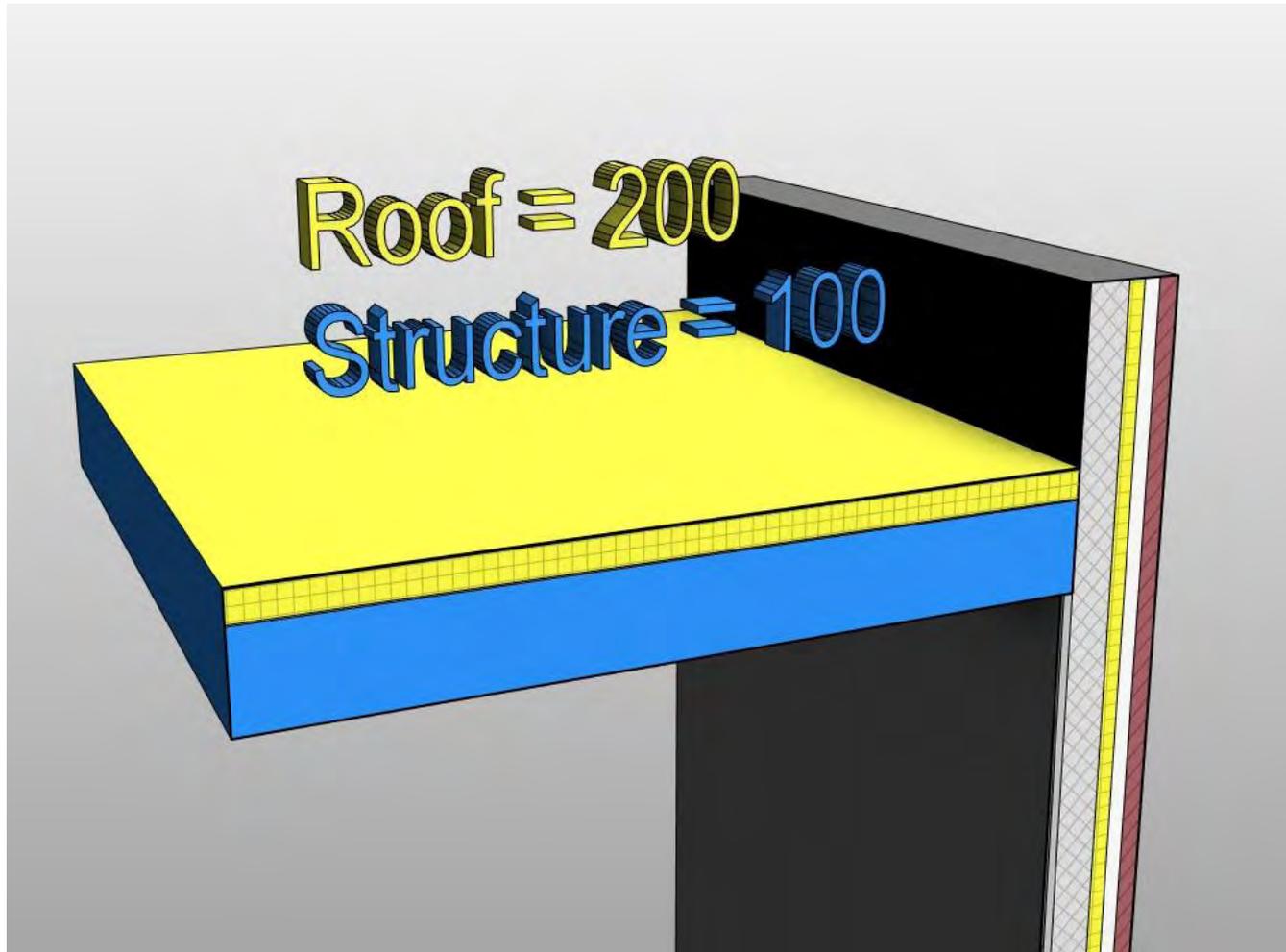
LOD Catalog: Progress

- Refining overall definitions
- Assessing downstream uses:
 - QTO / Estimating
 - 3D Coordination
 - 3D Control and Planning (Layout)
- Catalog development:
 - Descriptive input requirements
 - Information requirements (IFC reference)
 - Graphic/model examples

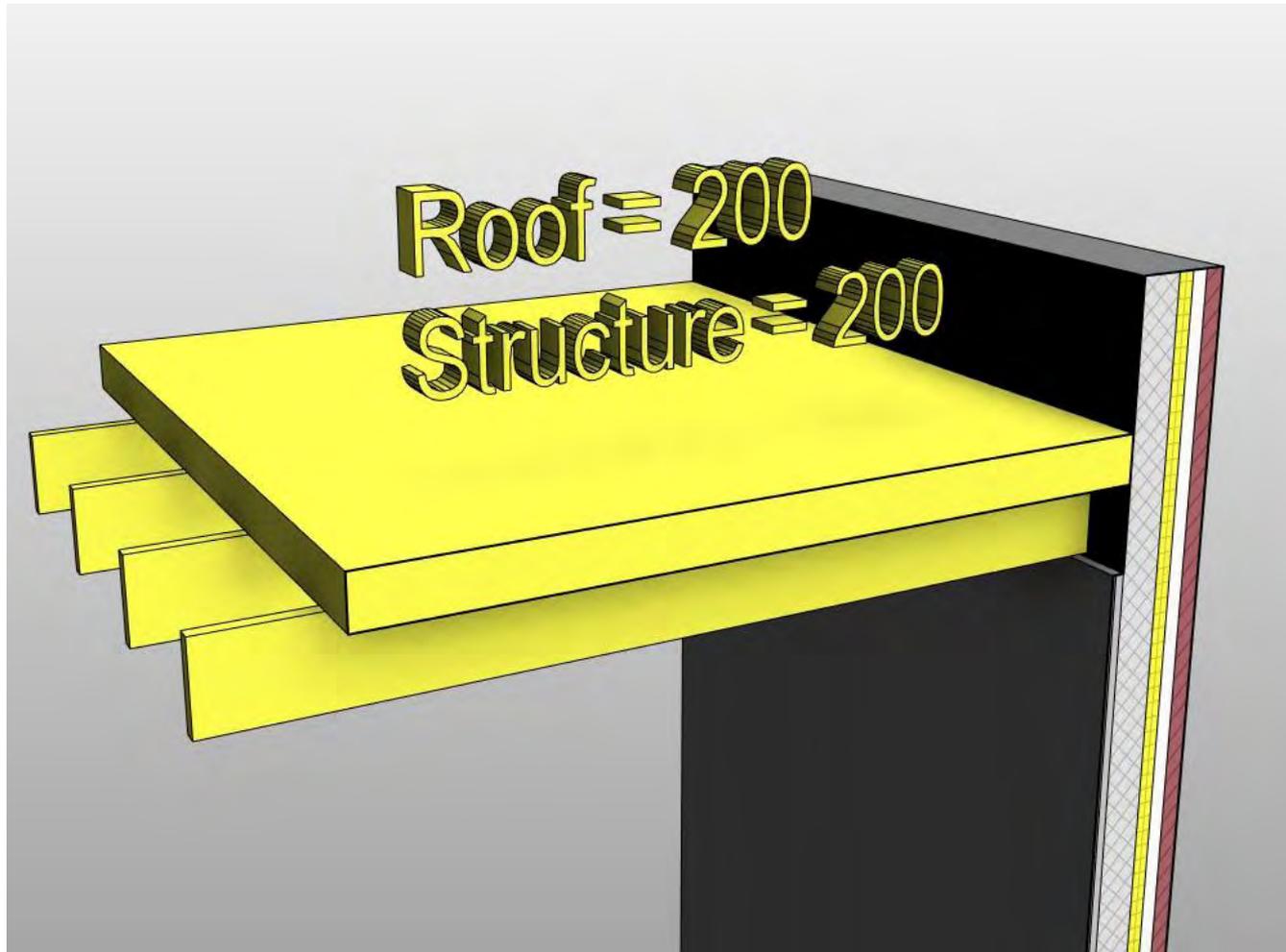
LOD Catalog: Progress



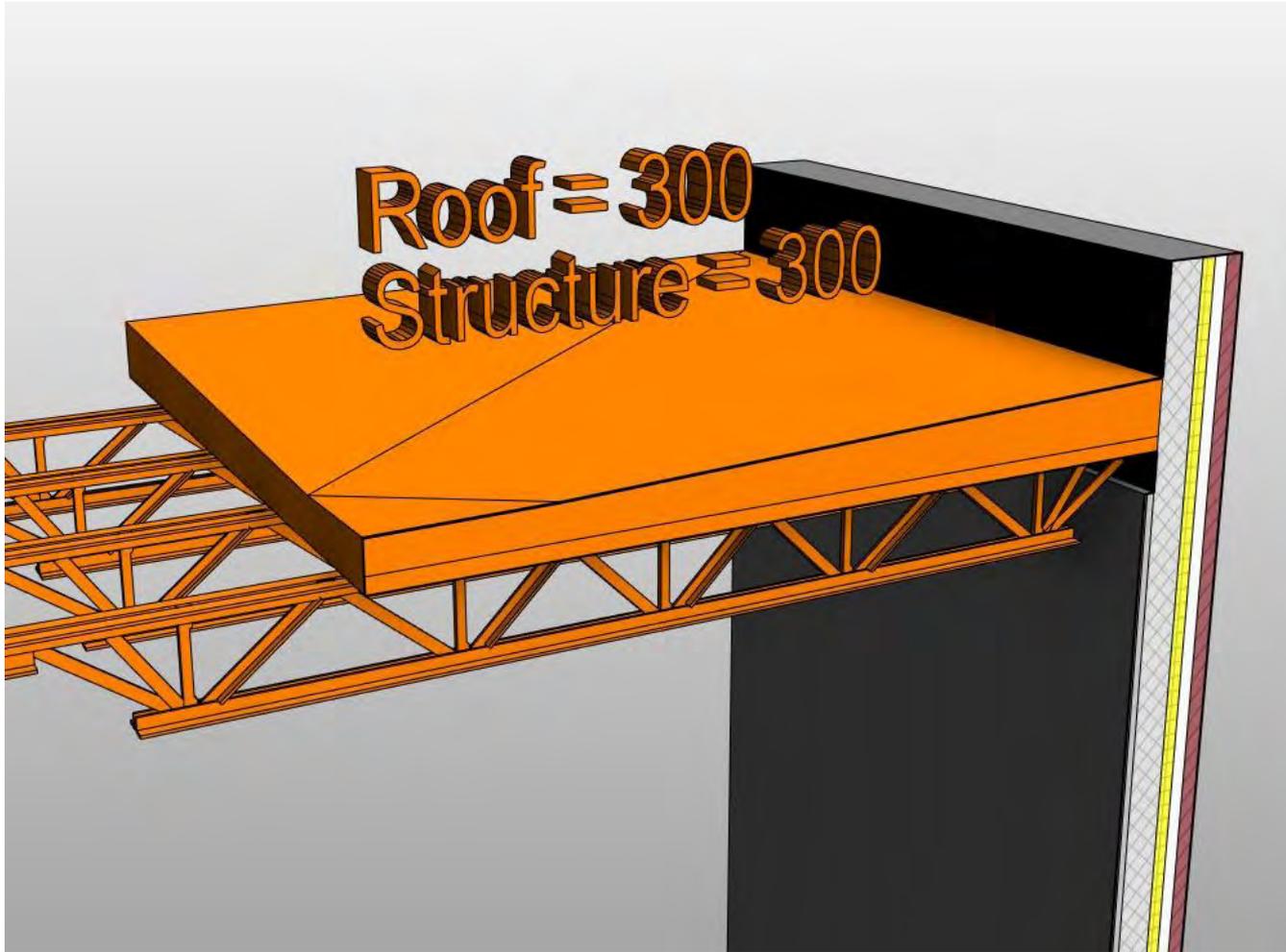
LOD Catalog: Current Examples



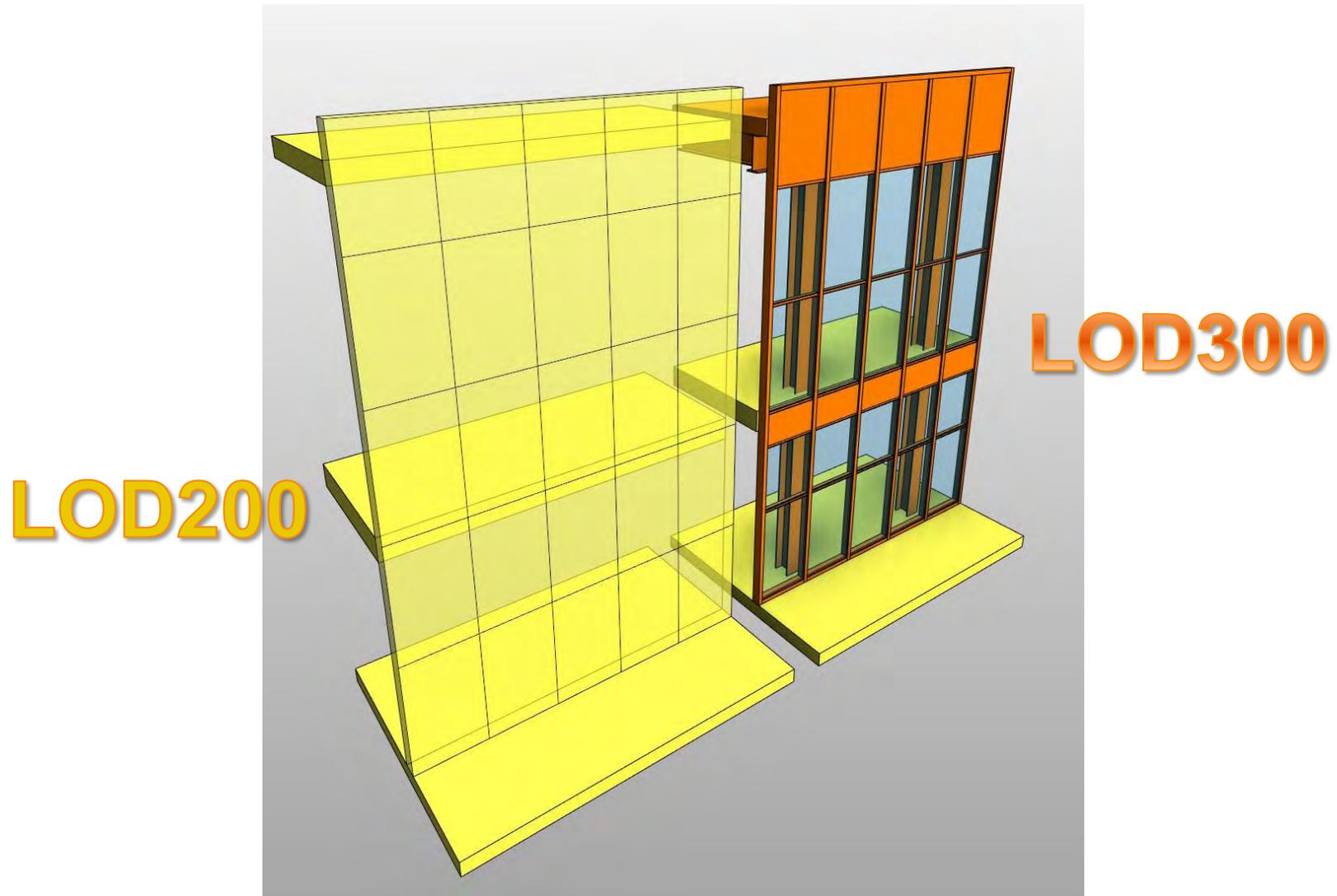
LOD Catalog: Current Examples



LOD Catalog: Current Examples

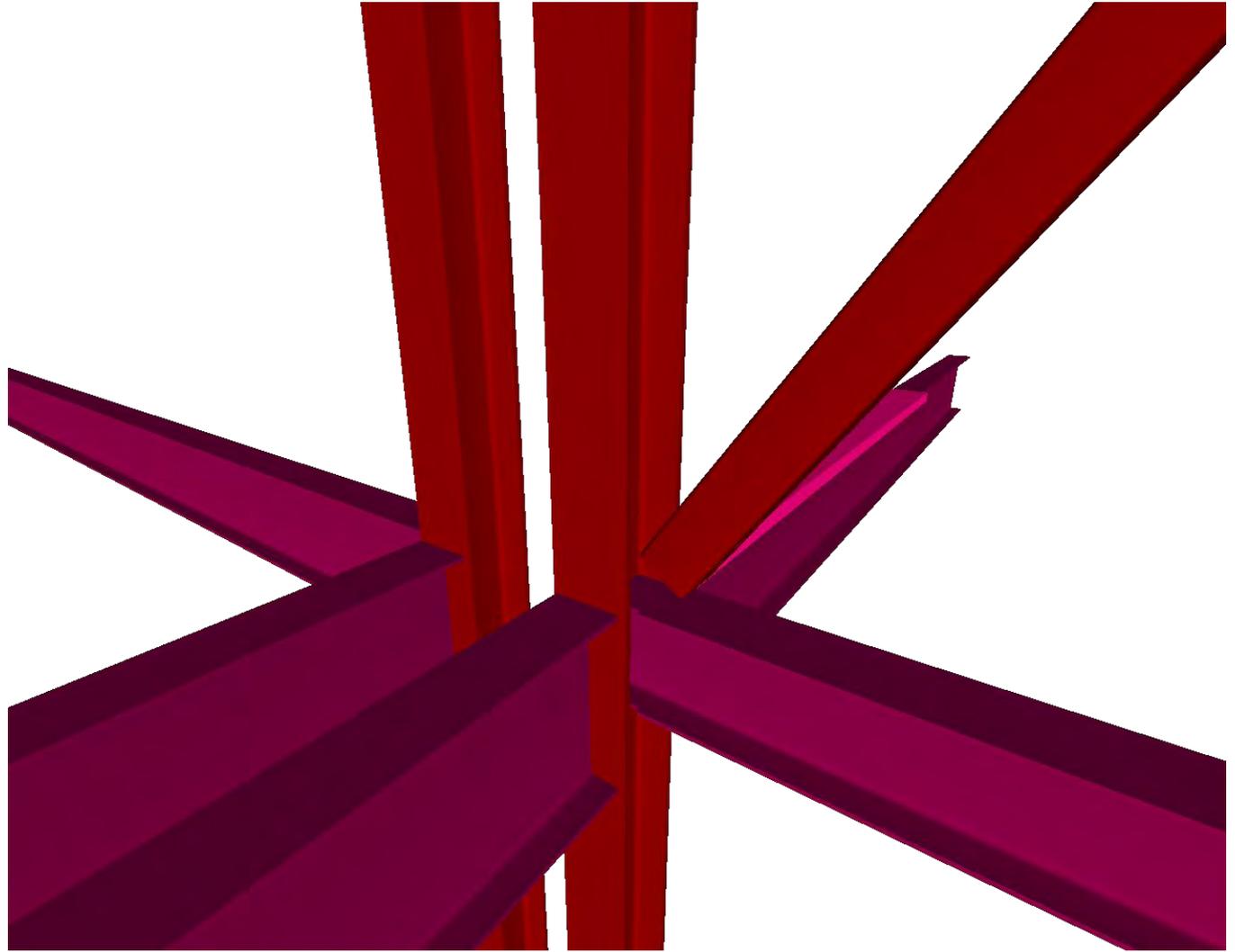


LOD Catalog: Current Examples



LOD Catalog: Current Examples

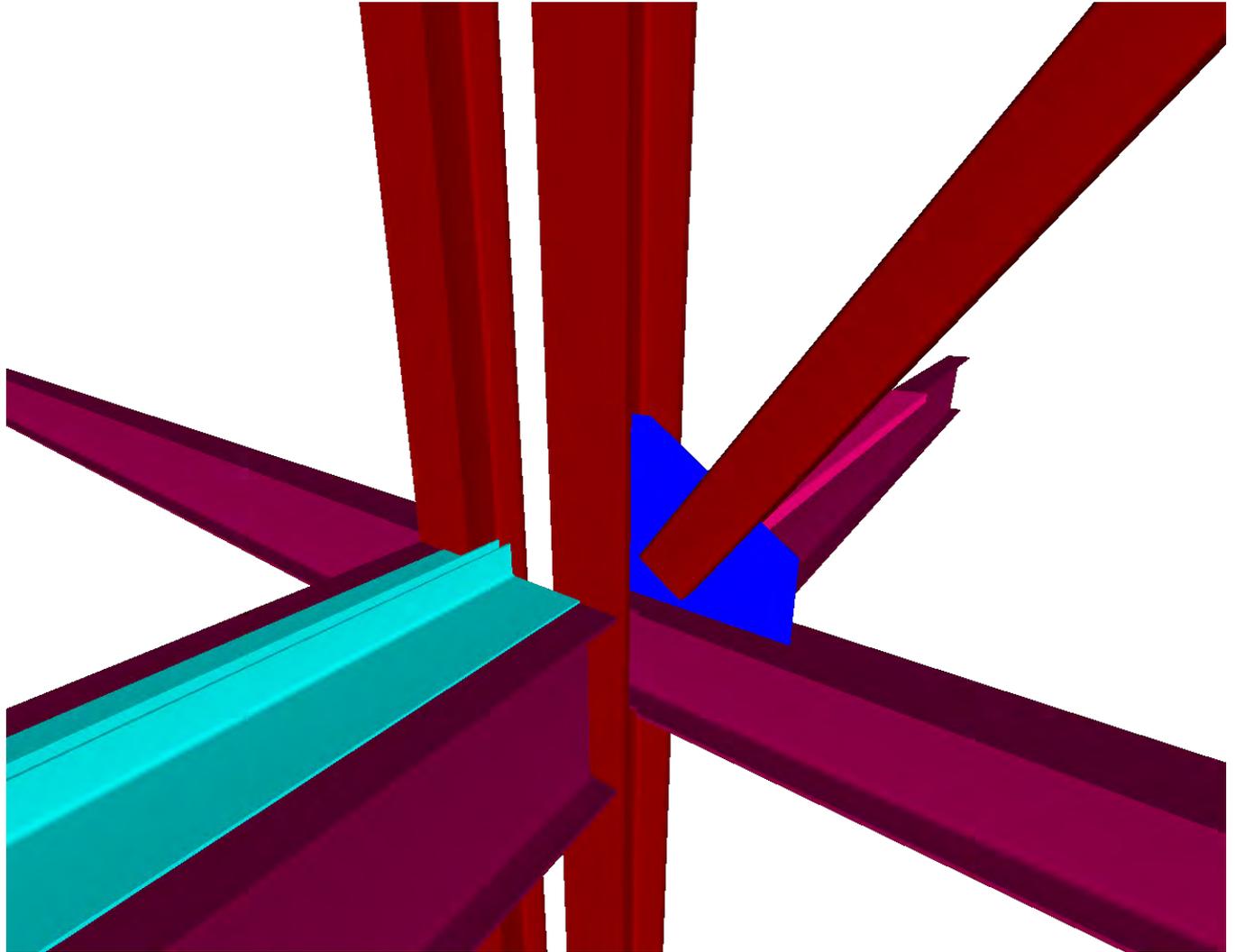
- LOD 300



IKERD CONSULTING

LOD Catalog: Current Examples

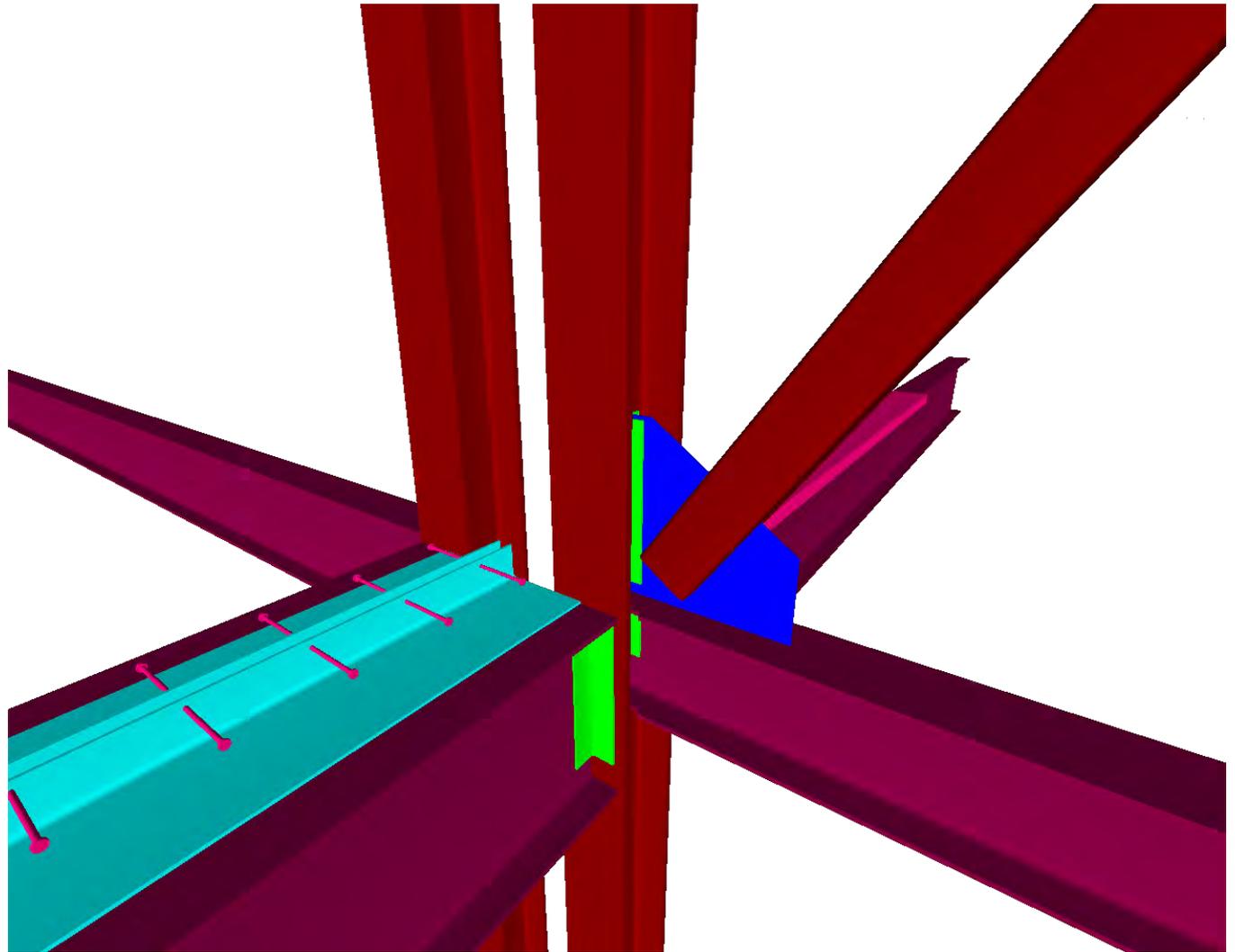
- LOD 350



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LOD Catalog: Current Examples

- LOD 400



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LOD Catalog: Current Examples

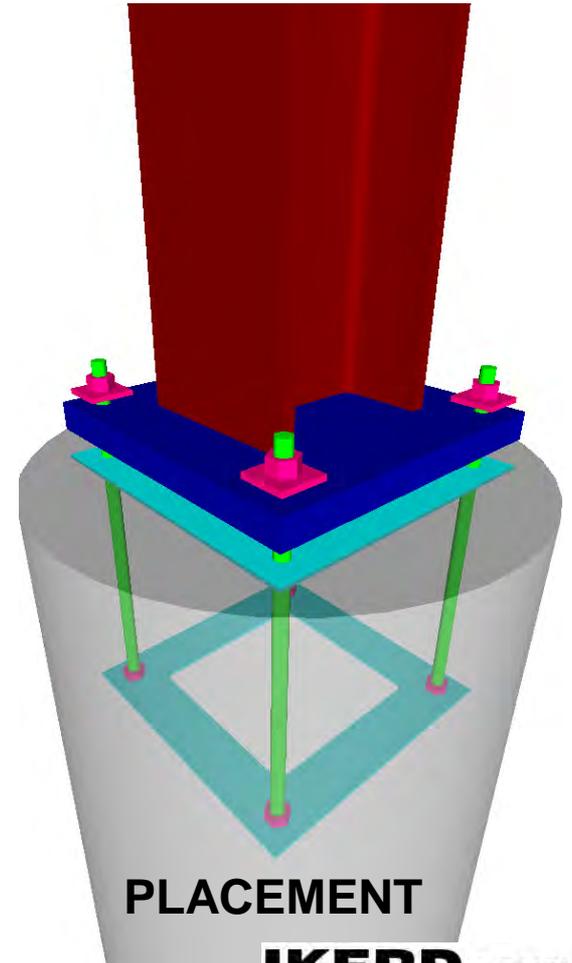
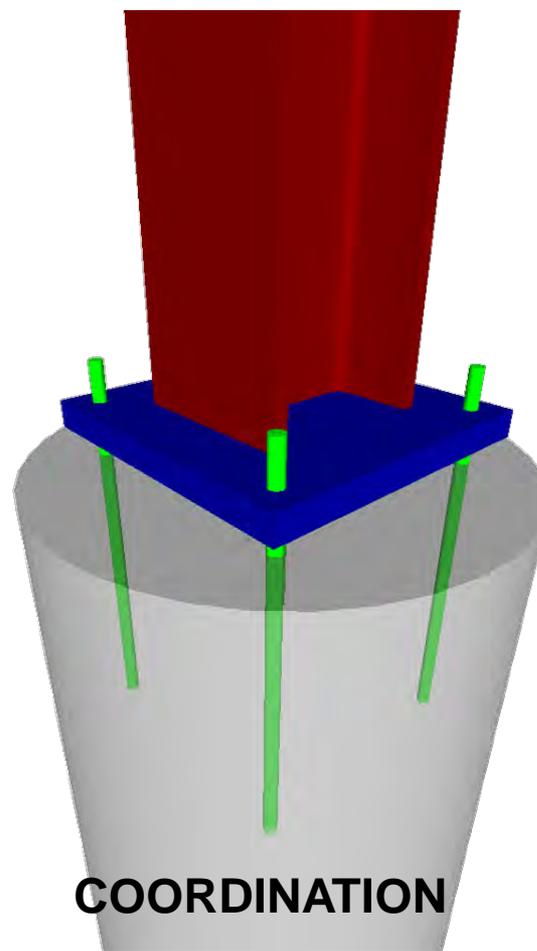
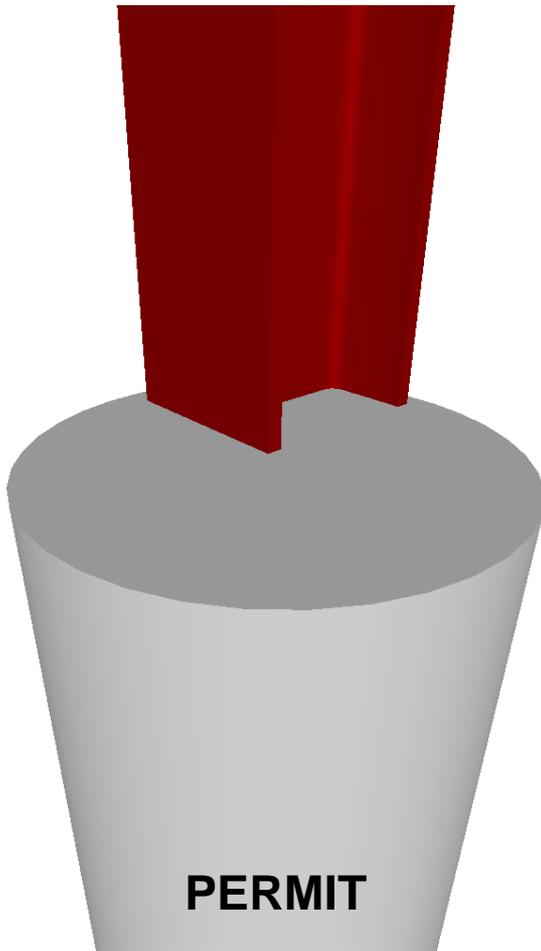
300



350



400



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LOD Catalog: Next Steps

- Delivery format for catalog
- LOD500
 - Record Model vs. As-Built?
- Operations & Maintenance
 - Integration with CAFM platform?

Discussion



Working Group Co-Chairs

System	Designer	Builder
Sub/Super-Structure	Will Ikerd wikerd@ikerd.com	Rodd Merchant Rodd.Merchant@jedunn.com
Exterior Enclosure	James Vandezande james.vandezande@hok.com	Walt Cichonski wcichons@lfdiscoll.com
Interior Construction	Ron Dellaria RDellaria@Astorino.com	Rick Kahn Ricardo.Khan@mortenson.com
M/E/P	Bob Middlebrooks Robert.middlebrooks@autodesk.com	David Francis davidf@southlandind.com