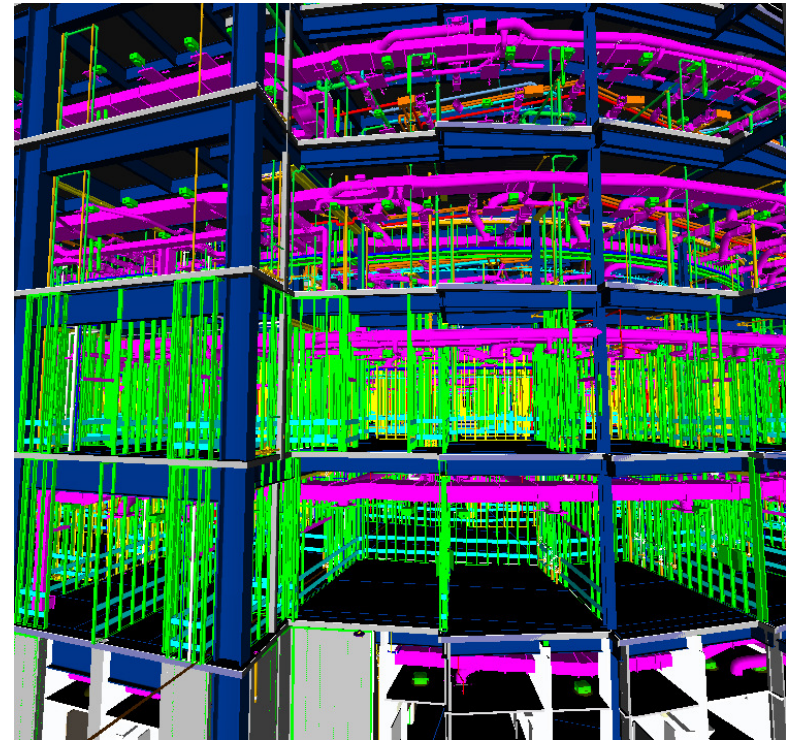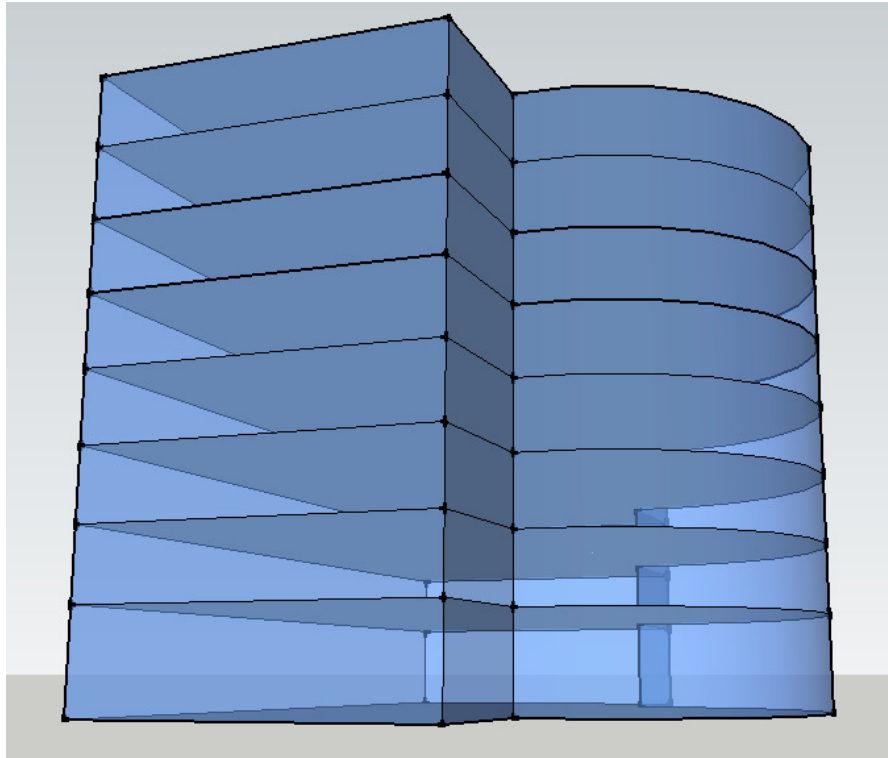# WHAT IS THIS THING CALLED LOD?
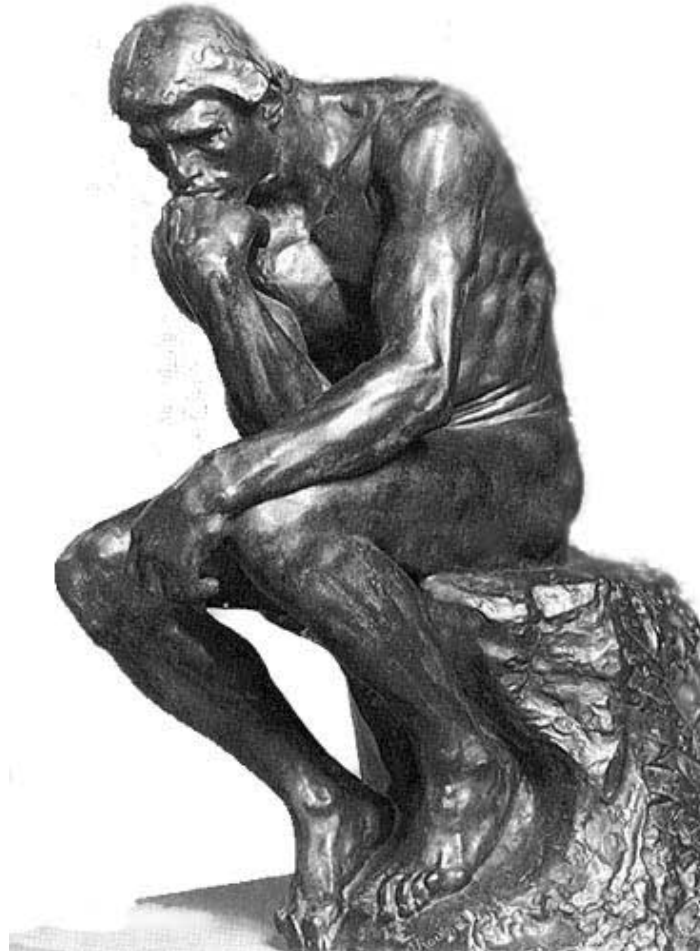
Problem: How can We Define a BIM?

Problem: How can We Define a BIM?

- What is the owner expecting when they ask for "BIM" on a project?
- How much information needs to be in a model?
- How much effort will it take (how do I price it?)
- How do I know I'm meeting my deliverables?
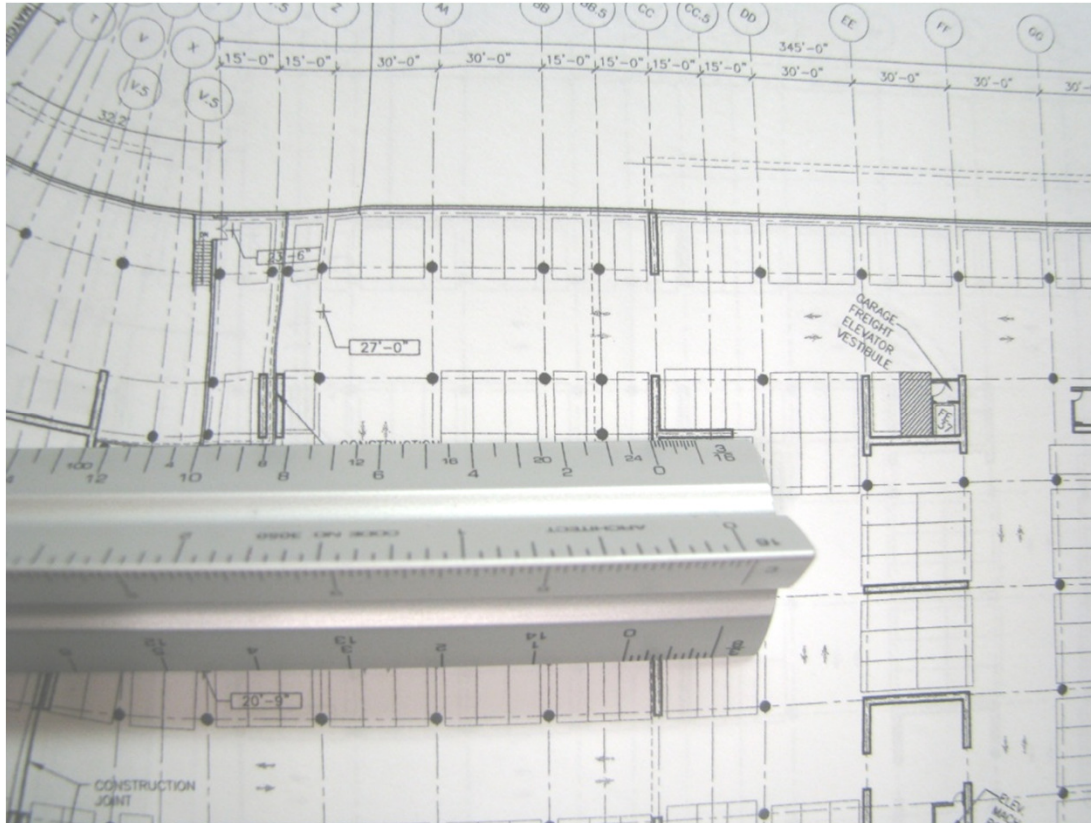- Who's going to rely on it for what?

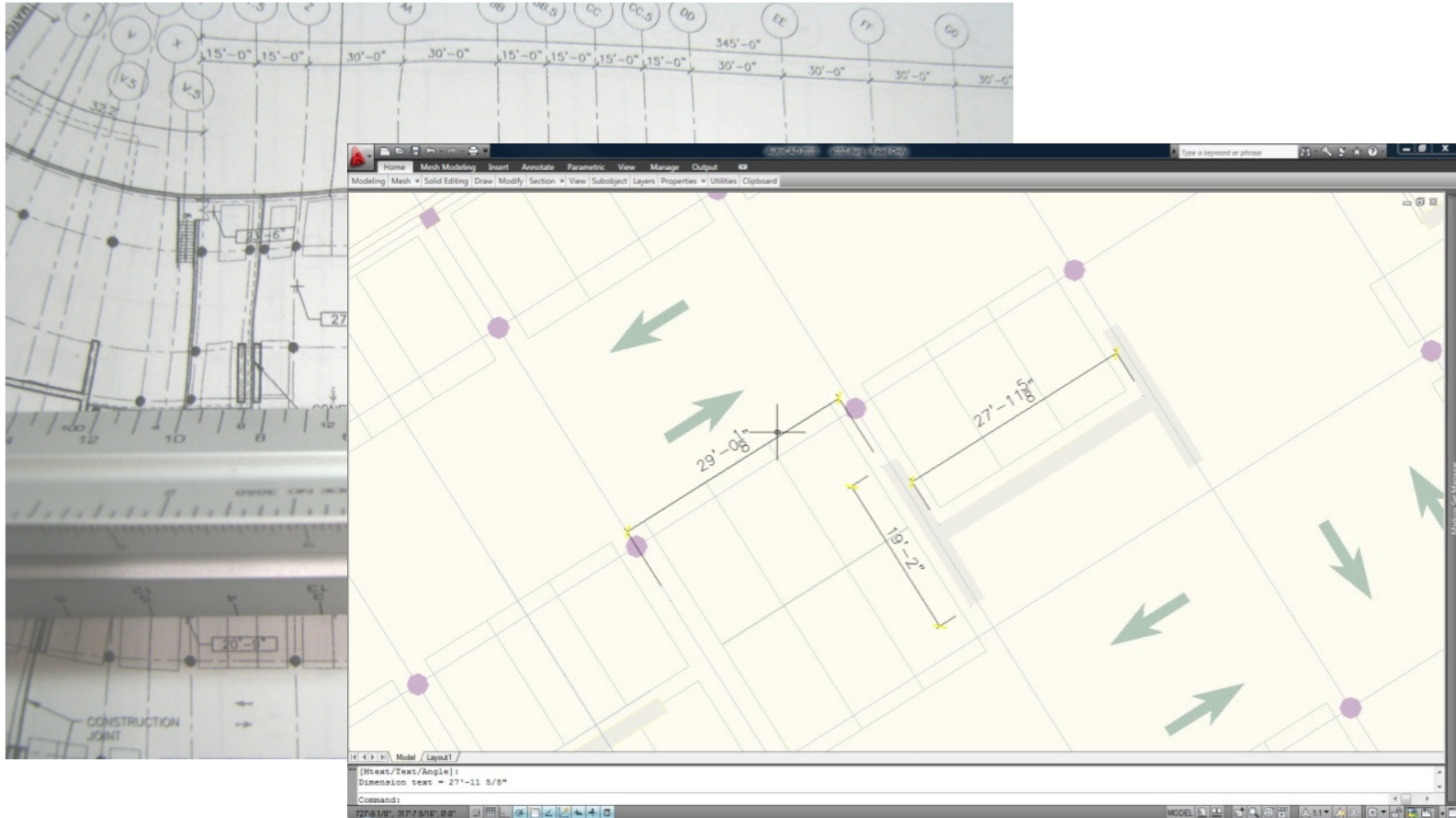# We Never Had this Problem with Paper Drawings – Why Now?

Paper vs. BIM

Precision

Paper vs. BIM

Precision
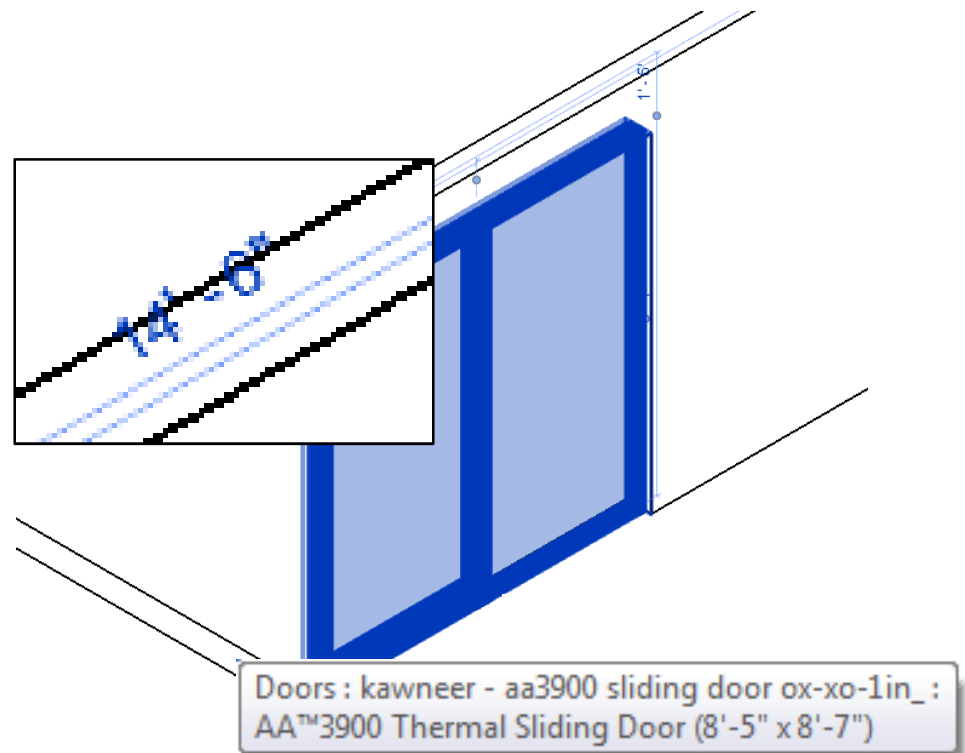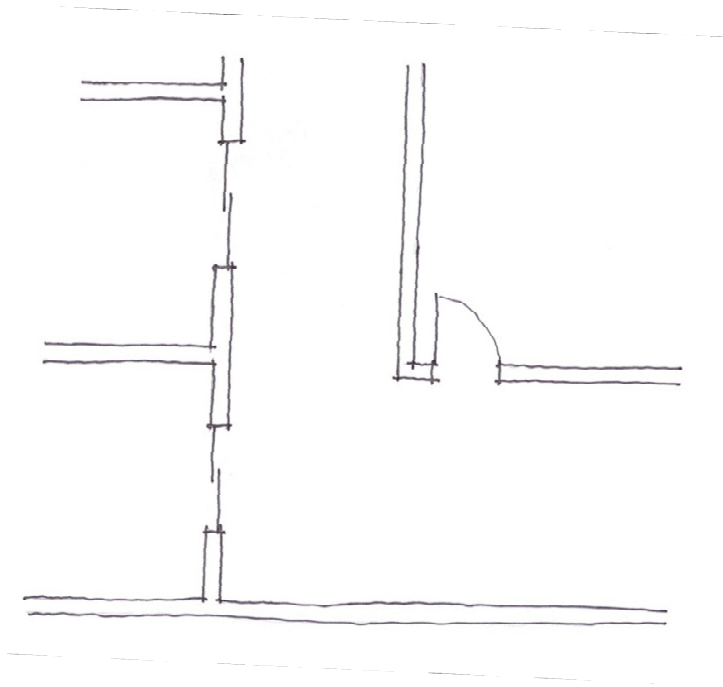
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Paper vs. BIM

- Visual cues about state of development
- BIMs often carry unintended information

Doors : kawneer - aa3900 sliding door ox-xo-1in_ :
AA™3900 Thermal Sliding Door (8'-5" x 8'-7")

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-Use Approach:

Some of it's not reliable so only rely on
- *what I say you can,*
- *for the purposes I say you can,*
- *to the degree of precision I say you can.*

Model Progression Spec
Level of *Detail*

Model Development Spec
Level of *Development*

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 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 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 Definitions

LOD 100
 Conceptual

Steel Braced Frame
$20-26 /sf
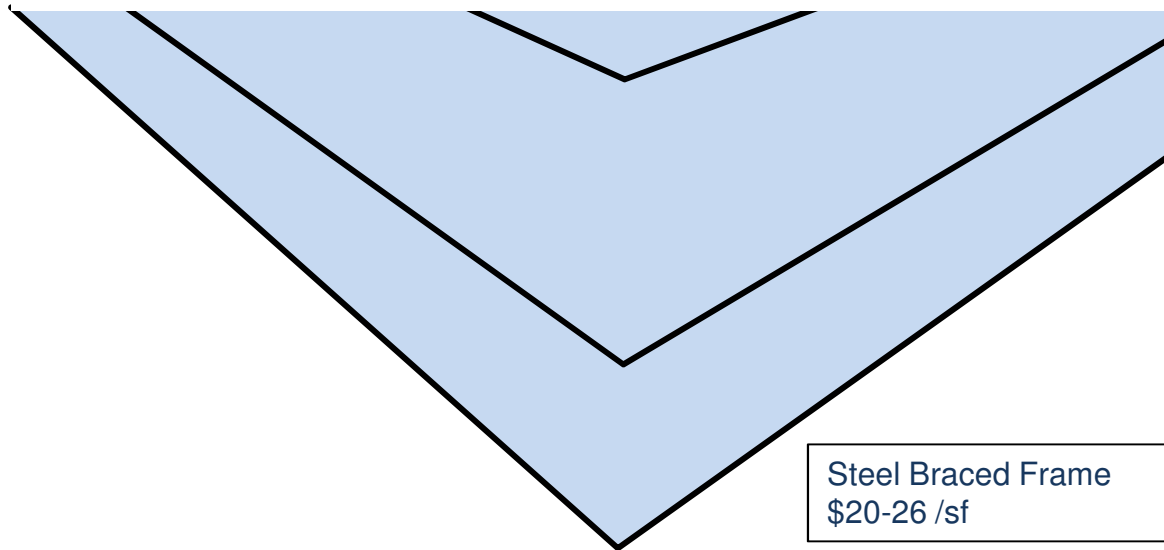
LOD Definitions

LOD 100 → LOD 200
Conceptual Generic
Placeholders

LOD Definitions

LOD 100 → LOD 200 → LOD 300
Conceptual   Generic   Specific
             Placeholders Assemblies

LOD Definitions

LOD 100 → LOD 200 → LOD 300 → LOD 400
Conceptual   Generic   Specific   Details
              Placeholders   Assemblies

Level of Development vs. Level of Detail

Level of **Detail** – What it looks like

Level of **Development** – How much it's been thought through

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?

AIA / AGC BIMForum LOD Specification

www.bimforum.org/lod

AIA / AGC BIMForum LOD Specification

- It's a dictionary
- The project team writes the story

www.bimforum.org/lod

Clarifications

- LOD does not equate to a design phase
- There's no such thing as an LOD ### model

| § 3.3 Model Element Table					Schematic Design			Design Development			Foundation Permit			Steel Tower Package			Construction Documents					
Model Elements Utilizing CSI UniFormat™					LOD	MEA	Notes	LOD	MEA	Notes	LOD	MEA	Notes	LOD	MEA	Notes	LOD	MEA	Notes	LOD	MEA	Notes
A	SUBSTRUCTURE	A10	Foundations	A1010	Standard Foundations																	
				A1010.2	Foundation Walls	NM			200	E		300	E					300	E				
				A1010.3	Perimeter Drainage	NM			200	E		200	E					300	E				
				A1010.4	Perimeter Insulation	NM			100	A		200	E					100	A				
				A1020	Special Foundations																		
				A1020.1	Pile Foundations	NM			200	E		300	E					300	E				
				A1020.2	Grade Beams	NM			200	E		300	E					300	E				
				A1030	Slab on Grade																		
				A1030.1	Standard Slabs on Grade	NM			200	E		300	E					300	E				
				A1030.6	Under-Slab Drainage	NM			100	A		200	E					300	E				
B	SHELL	B10	Superstructure	B1010	Floor Construction																	
				B1010.2	Upper Floor Framing	100			200	E					300	E		300	E				
				B1010.9	Fireproofing	100			100	A					100	E		100	A				
				B1020	Roof Construction																		
				B1020.2	Roof Framing	100			200	E					300	E		300	E				
				B1020.9	Fireproofing	100			100	A					100	E		100	A				
		B20	Exterior Enclosure	B2010	Exterior Walls	200	A		300	A								300	S				
				B2020	Exterior Windows	200	A		200	A								300	S				
				B2030	Exterior Doors	200	A		200	A								300	S				
		B30	Roofing	B3010	Roof Coverings	200	A		200	A								300	GC				
C	INTERIORS	C10	Interior Construction	C1010	Partitions	200			300	A								300	A				
				C1020	Interior Doors	200			200	A								300	A				
				C1030	Fittings	100			200	A								200	A				
		C20	Stairs	C2010	Stair Construction	100			200	A								200	S				
				C2020	Stair Finishes	NM			NM	A								100	A				
		C30	Interior Finishes	C3010	Wall Finishes	NM			NM	A								100	A				
				C3020	Floor Finishes	NM			NM	A								100	A				
				C3030	Ceiling Finishes	NM			NM	A								100	A				

HOW DO WE AGREE TO IT?
AIA DOCUMENTS

AIA Digital Practice Documents
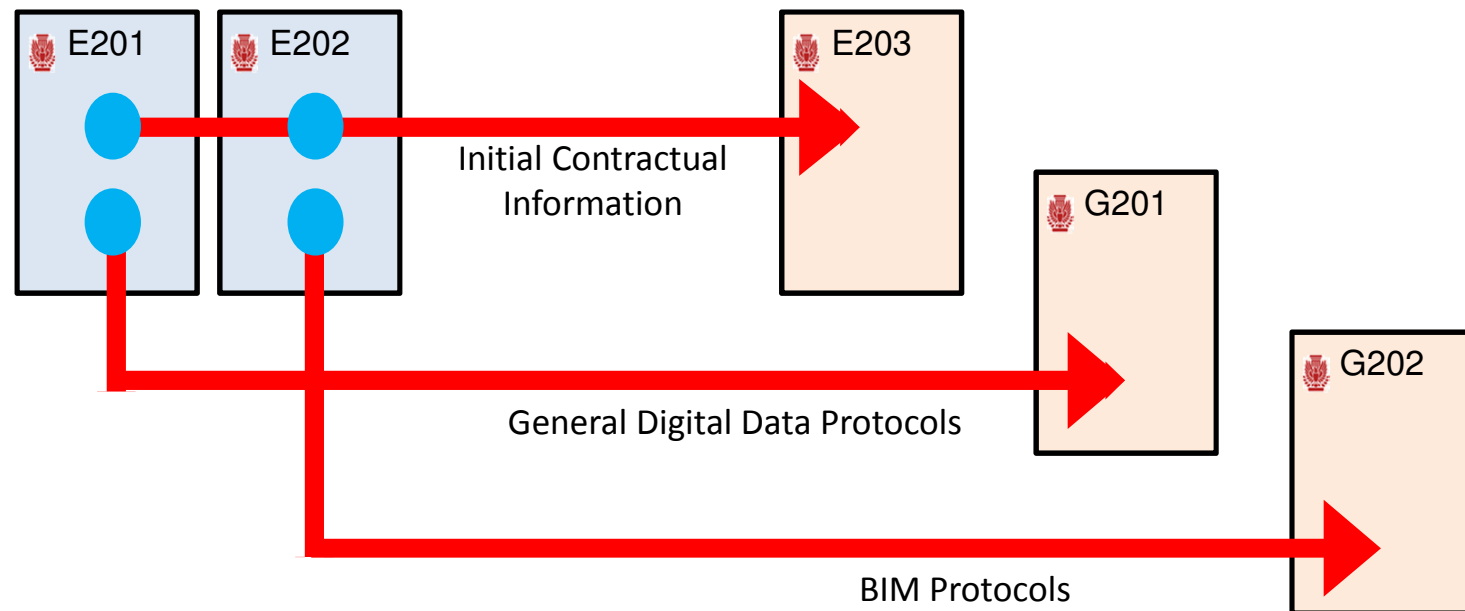
E203 Flowdown
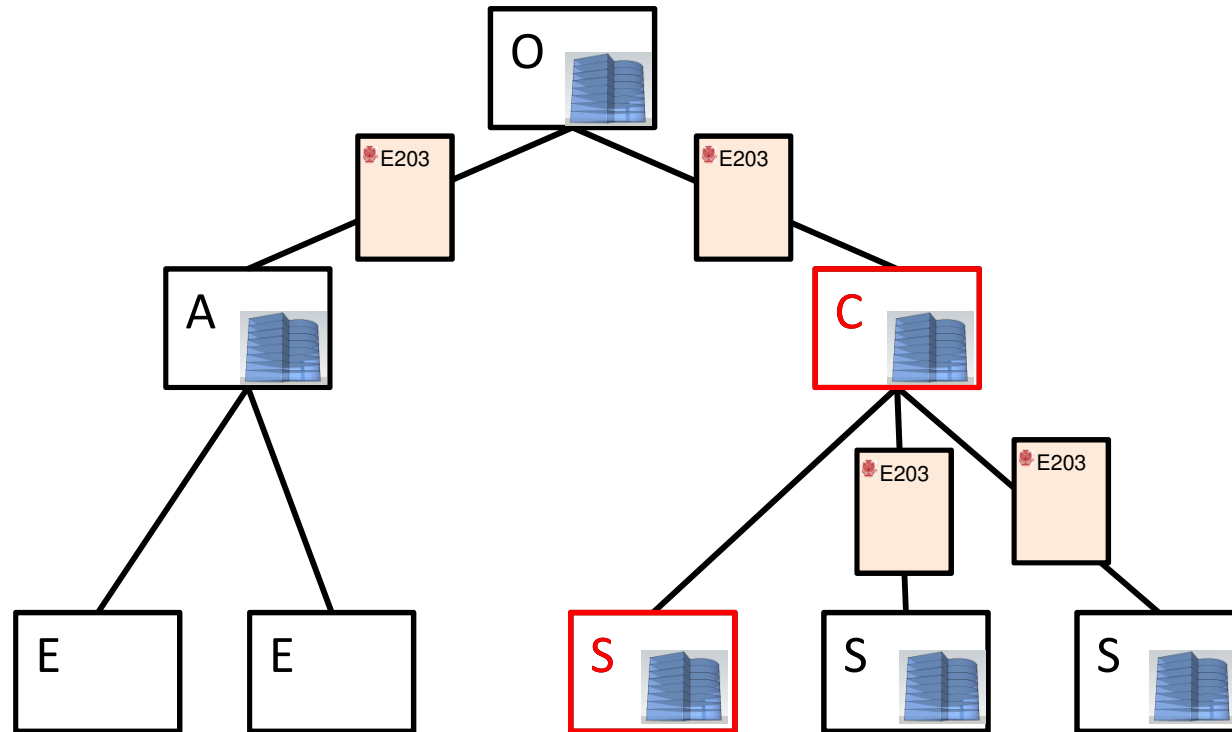
E203 – 2013 Article 4 BIM

✓ Establishes BIM expectations

    ✓Internal use only without sharing expectation **_vs._** sharing with other Project Participants with expectation of reliance

ARTICLE 4 BUILDING INFORMATION MODELING PROTOCOLS

§ 4.1 If the Parties indicate in Section 3.1 that Building Information Modeling will be used on the Project, specify below the extent to which the Parties intend to utilize Building Information Modeling and identify the provisions of this Article 4 governing such use:

☐ The Parties shall utilize Building Information Modeling on the Project for the sole purpose of fulfilling the obligations set forth in the Agreement without an expectation that the Model will be relied upon by the other Project Participants. Unless otherwise agreed in writing, any use of, transmission of, or reliance on the Model is at the receiving Party's sole risk. The remaining sections of this Article 4 shall have no force or effect.

☐ The Parties shall develop, share, use and rely upon the Model in accordance with Sections 4.2 through 4.10 of this Exhibit.

E203 – 2013 Article 4 (Cont.)

✓Identify anticipated BIM uses

§ 4.2 Anticipated Building Information Modeling Scope. Indicate below the portions of the Project for which Modeling will be used and the anticipated Project Participant responsible for that Modeling.

Project Portion for Modeling	Responsible Project Participant

§ 4.3 Anticipated Model Authorized Uses. Indicate below the anticipated Authorized Uses of the Model for the Project, which Authorized Uses will be agreed upon by the Project Participants and further described for each LOD in G202–2013.

§ 4.4 Ancillary Modeling Activities. Indicate additional Modeling activities agreed upon by the Parties, but not to be included in AIA Document G202–2013, if any.
(Describe any Modeling activities, such as renderings, animations, performance simulations, or other similar use, including the anticipated amount and scope of any such Modeling activities.)

WHAT'S IT GOOD FOR?

What's it Good for?

In general:

- Define models – deliverables, milestones, information exchanges
- Define Authorized Uses - enables reliance

What's it Good for?

Specific:

- Mapping firm standards – defines *your* "business as usual"
- Defining information exchanges in a BxP
- Scoping modeling effort
- Focusing the modeling effort
- Developing a baseline design schedule
- Defining use-case milestones
- Setting milestones based on standard workflow
- Determining workflow based on milestone dates
- Defining a design/build bridging package
- Defining a design architect – executive architect handoff package

Take-Aways

- LOD is a language.

- LOD allows us to specify milestones, deliverables, information exchanges, etc. with a high degree of clarity.

- LOD allows us to use models for transmitting information reliably and safely.

Just to clarify…

DETAIL = How much information has been modeled

DEVELOPMENT = The degree to which a modeled element and attached information has been thought through

Just to clarify…

DETAIL = How much information has been modeled

DEVELOPMENT = The degree to which *project team members may rely on the information when using the model*
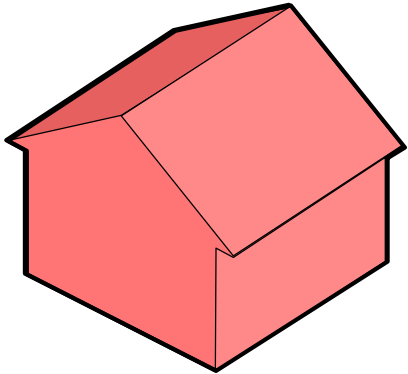
Just to clarify…

DETAIL = Input

DEVELOPMENT = Reliability

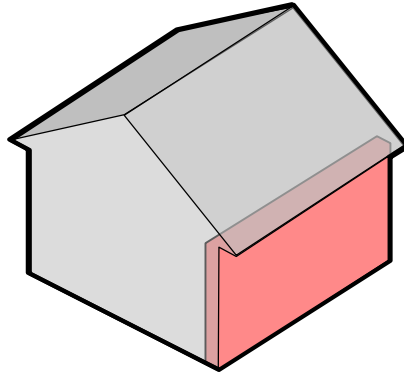*How does this affect implementation of the LOD concept…?*
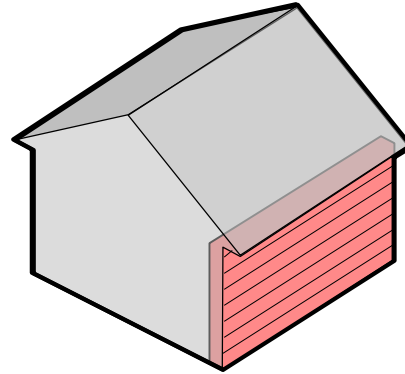
The LOD "Language"

LOD 100
MASSING

LOD 200
GENERIC
ASSEMBLIES

LOD 300
SPECIFIED
ASSEMBLIES

LOD 400
DETAILED
COMPONENTS

"ESTIMATE IT"

"SPECIFY IT"

"BID IT"

"BUILD IT"

LOD 350
ACTUAL
ASSEMBLIES
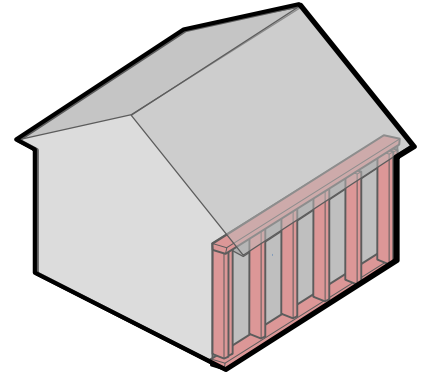
"BUY IT"

An Example of LOD

100 = Cost assumption or simple object (*light fixture*)

200 = Generic type (*pendant*)

300 = Design specified, lamping/lumens, *preferred* model

350 = Actual model, Nuvo Lighting 60-590

400 = All mounting/installation detail

How do you use the LOD Spec?

```
Owner/
Architect
Agreement
```
→
```
BIM/
Digital Data
Exhibit
(AIA E203)
```
→
```
BIM
Protocol
Form
(AIA G202)
```

Details of BIM uses
'BIM Execution Plan'

```
Owner/
Contractor
Agreement
```
→

'Executive Summary'
Select BIM uses
Rely on model?

```
Model
Element
Table
```
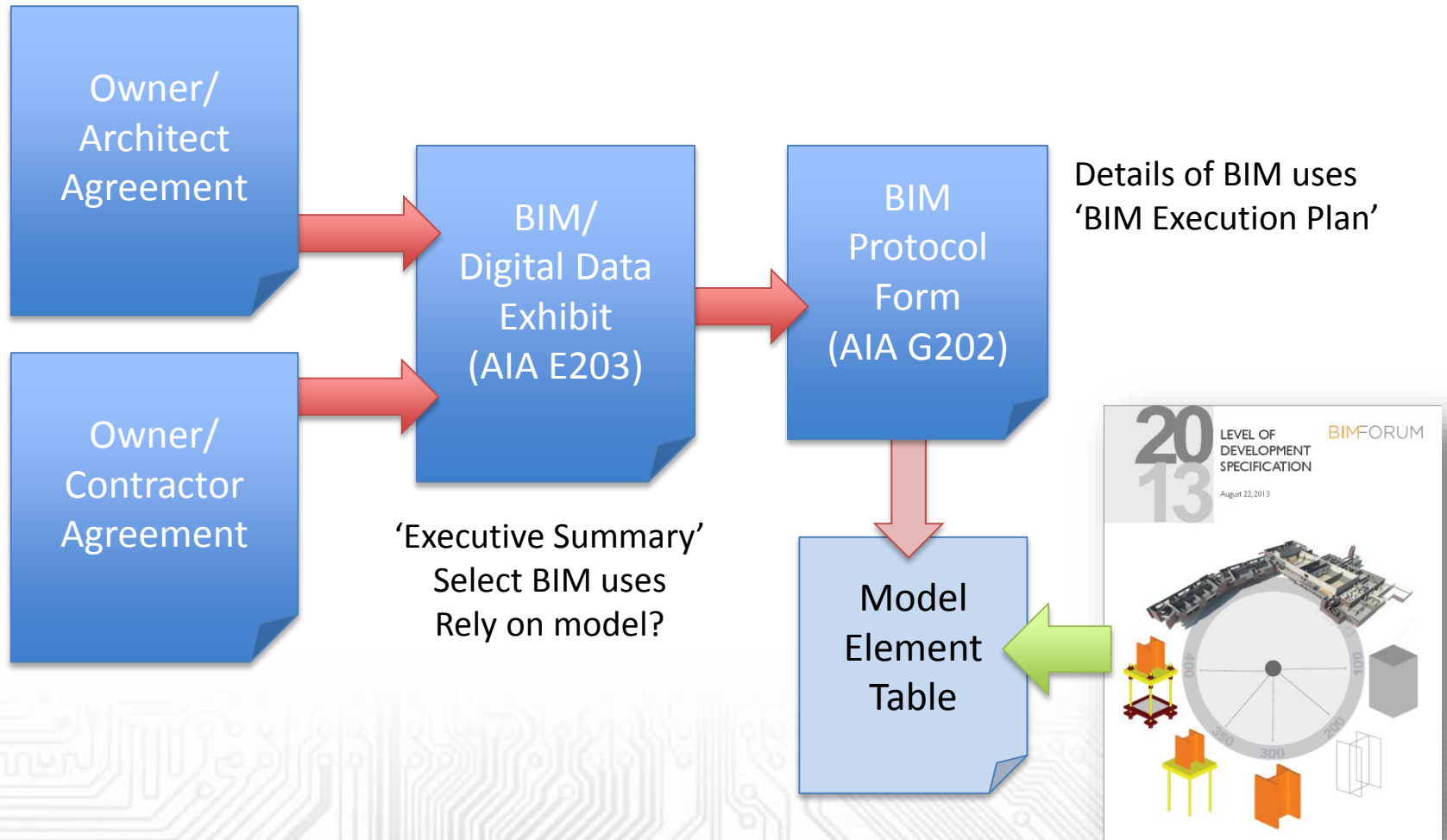
PRACTICAL EXAMPLES

US Army Corps of Engineers ®

Minimum Modeling Matrix (M3)
Document Release: 20120913

Level	Element ID	LOD	DESIGN MODEL (CONSTRUCTION DOCUMENTS) GRADE (CD)	RECORD MODEL (AS-BUILTS) GRADE (AB)	FOR AGENCY OR CO NOT A CONTRA Primary Discipline (This will allow design team to identify discipline specific areas of content)
Level 2	_Furnishings_	○	○	○	Interiors
Level 3	**Fixed Furnishings**	●	●	●	Interiors
Level 4	**Fixed Art**	100	B	B+	Interiors
Level 4	**Window Treatments**	200	B	B+	Interiors
Level 4	**Casework**	300	A	A+	Interiors
Level 4	**Fixed Multiple Seating**	200	A	A+	Interiors
Level 4	**Other Fixed Furnishings**	200	A	A+	Interiors

HOK's Minimum Modeling

Architecture

	Schematic Design or Concept Design	Design Development or Developed Design	Construction Doc's or Technical Design
Shared coordinates	Establish survey point, shared coordinates	Verify coordinates with deliverables	Verify coordinates with deliverables
Levels	Finish floors, roof, parapets	Interstitial levels, loading docks	Coordinate levels with structural model
Toposurface	--	TBD	TBD
Area measurement	Gross areas	Net areas as required	Net areas as required
Rooms	LOD200 Establish link w/ dRofus	LOD200	LOD200
Walls, interior	LOD200	LOD300 Finalize types & fire rating	LOD300
Walls, exterior	LOD100	LOD200	LOD300
Windows	LOD200	LOD200	LOD300
Doors	LOD100	LOD200	LOD300
Louvers	--	LOD200	LOD300
Ceilings	--	LOD200	LOD300
Stairs	LOD100	LOD200	LOD300

	D	CD		
	Final	50%	90%	Final
	●	●	●	●
	●	●	●	●
	○	○	●	●
	○	●	●	●
	○	●	●	●
	○	●	●	●
	○	●	●	●
	○	●	●	●
	○	●	●	●
	○	●	●	●

Notes

		D	CD		
Project Notes - general & material related		○	○	●	●	●
Exterior Enclosure Notes		○	○	●	●	●
Design Criteria - loads, movements, energy, fire ratings & separations		○	○	●	●	●
Key Notes						
Coordinate Keynotes with Master Keynote Listing Sheets				●	●	●

HOK's Minimum Modeling
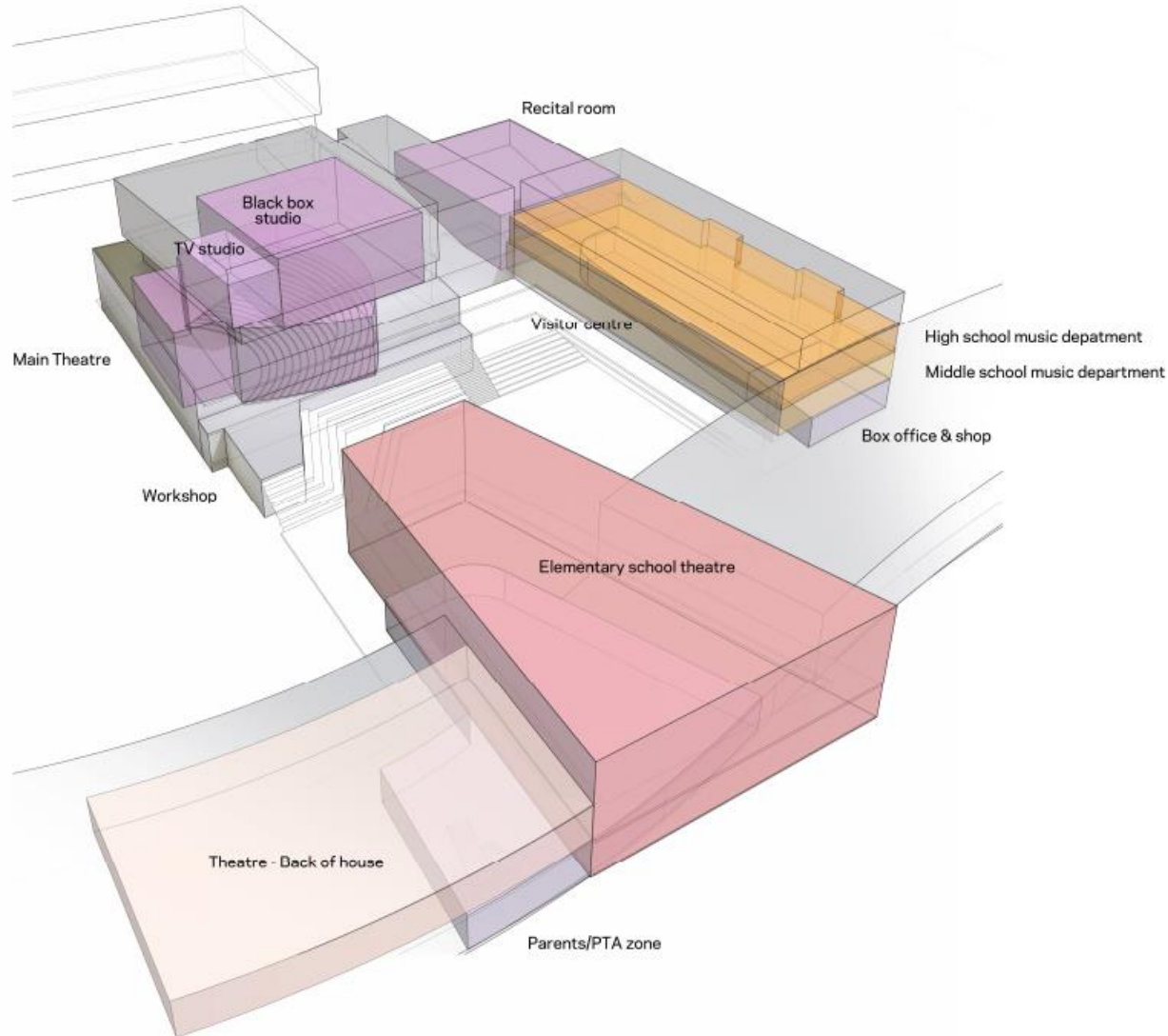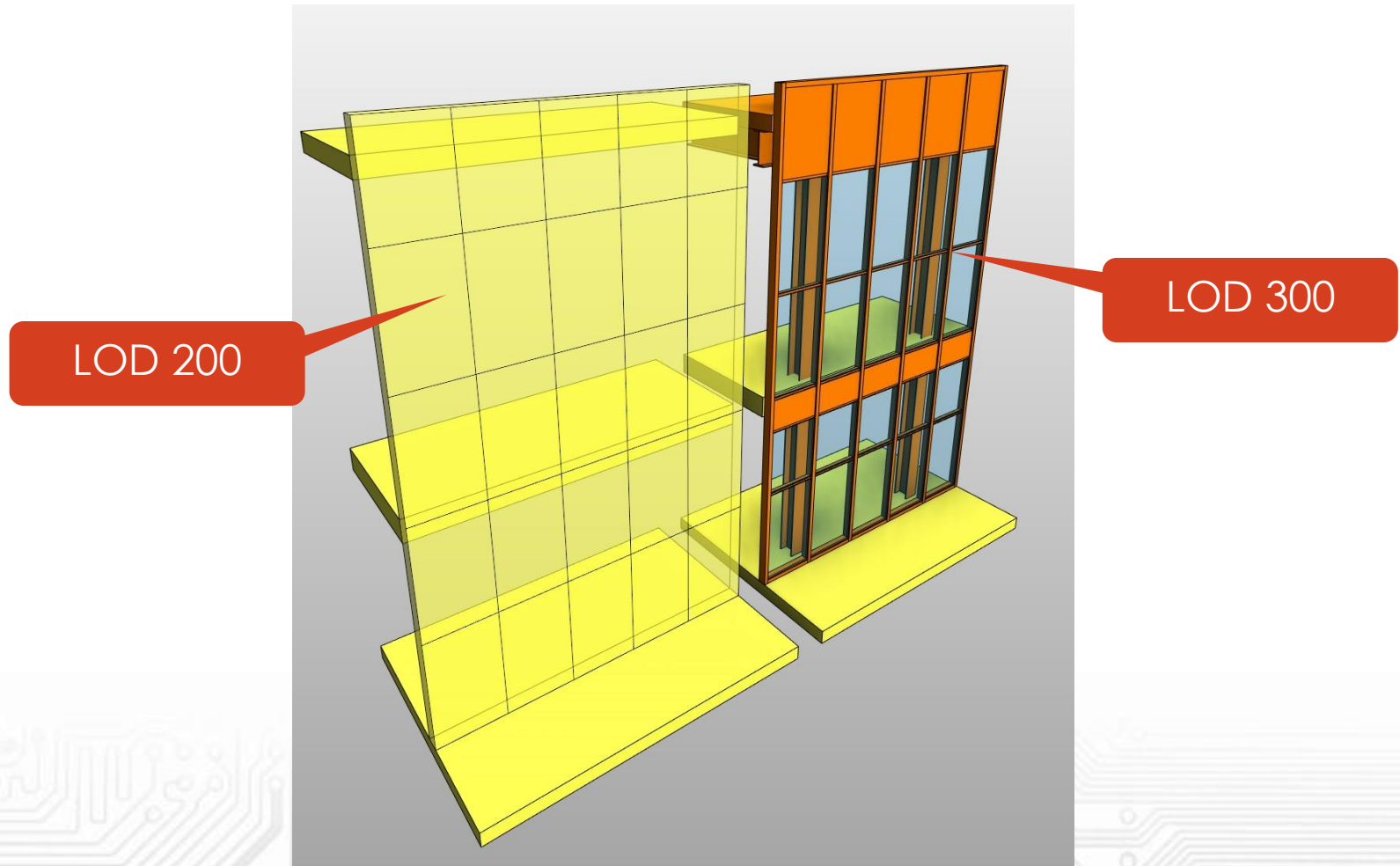
HOK's Minimum Modeling
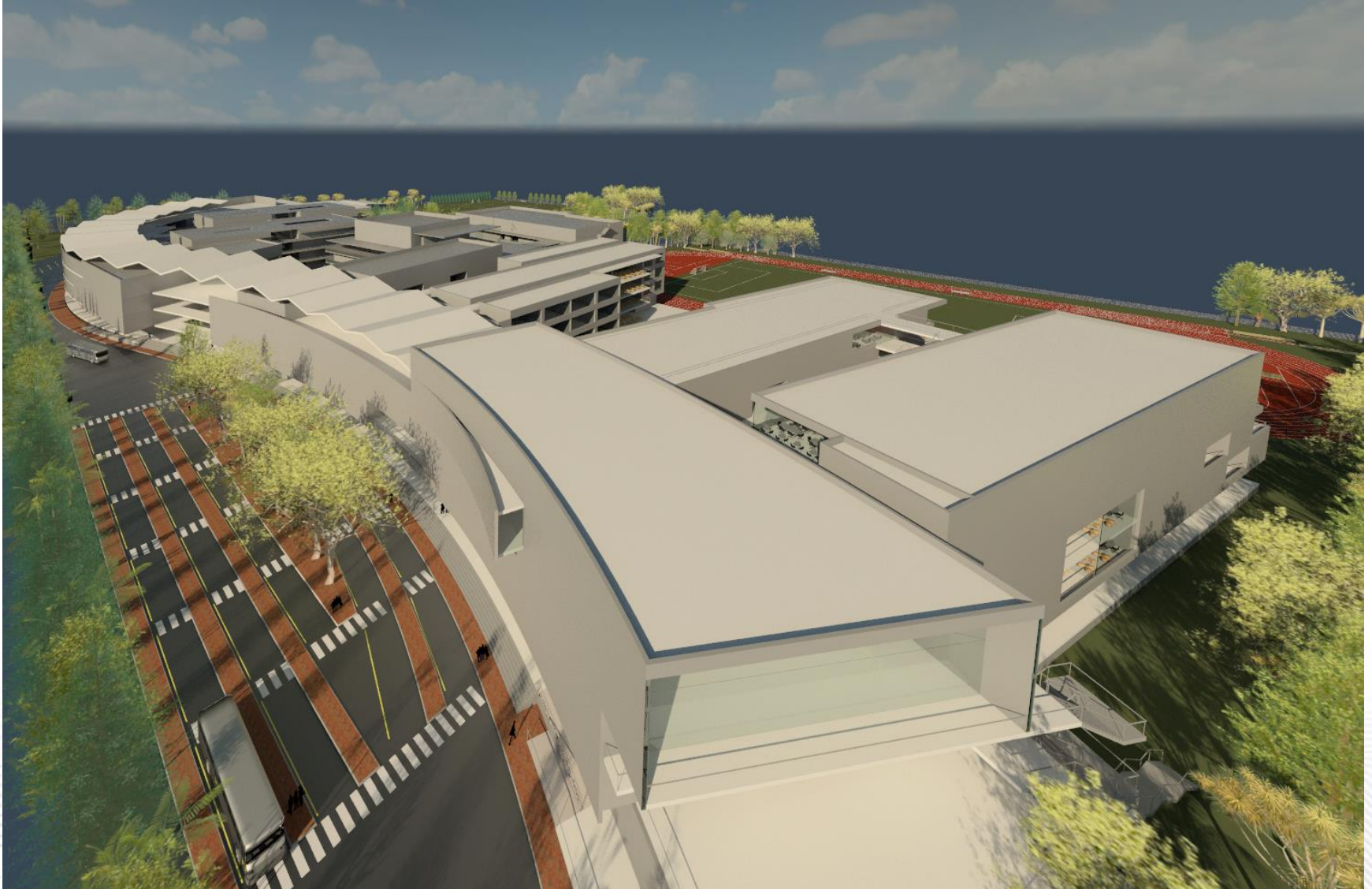
Applying LOD

Schematic Design Model
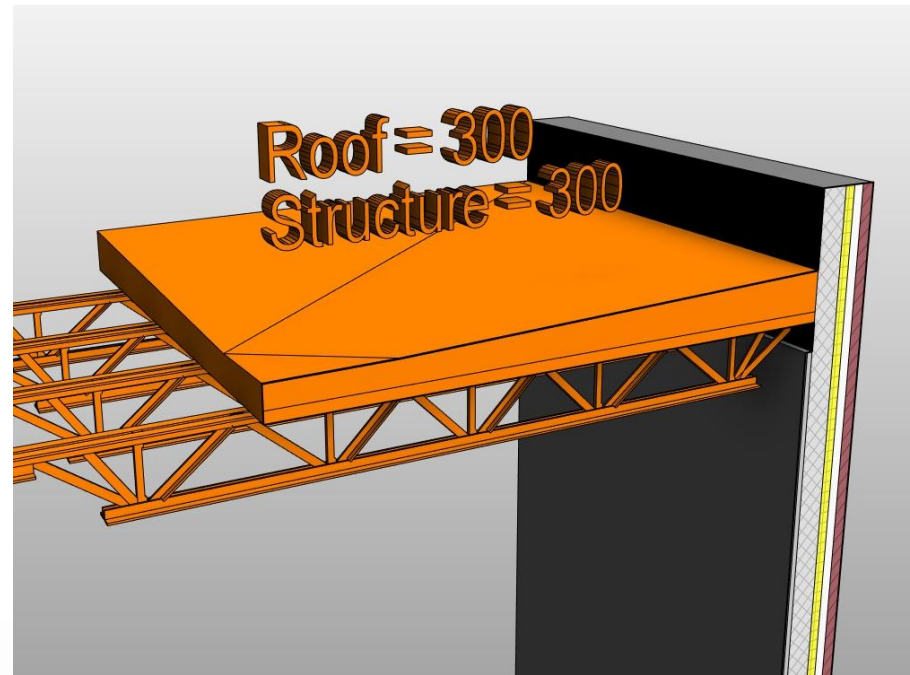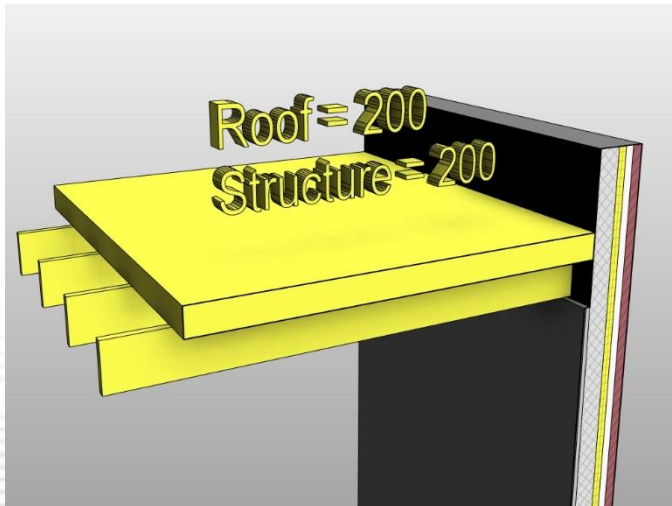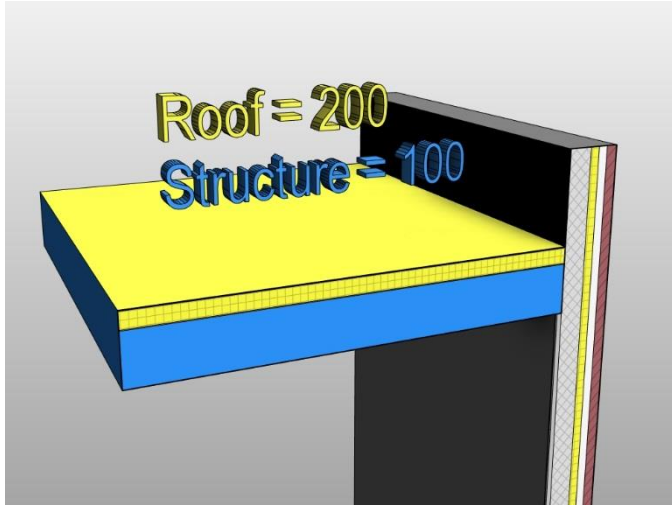
LOD 200

LOD 300

LOD 100

LOD 350

Construction Document Model

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Applying LOD

LOD 200

LOD 300

Applying LOD

Visual Quality Control

Basic Wall
Interior - 138mm Partition (1-hr)

Walls (1)   Edit Type

Structural
Dimensions
Identity Data
Phasing
Other
LOD Required
LOD Provided   200

LOD 200
Provided

LOD 300
Provided
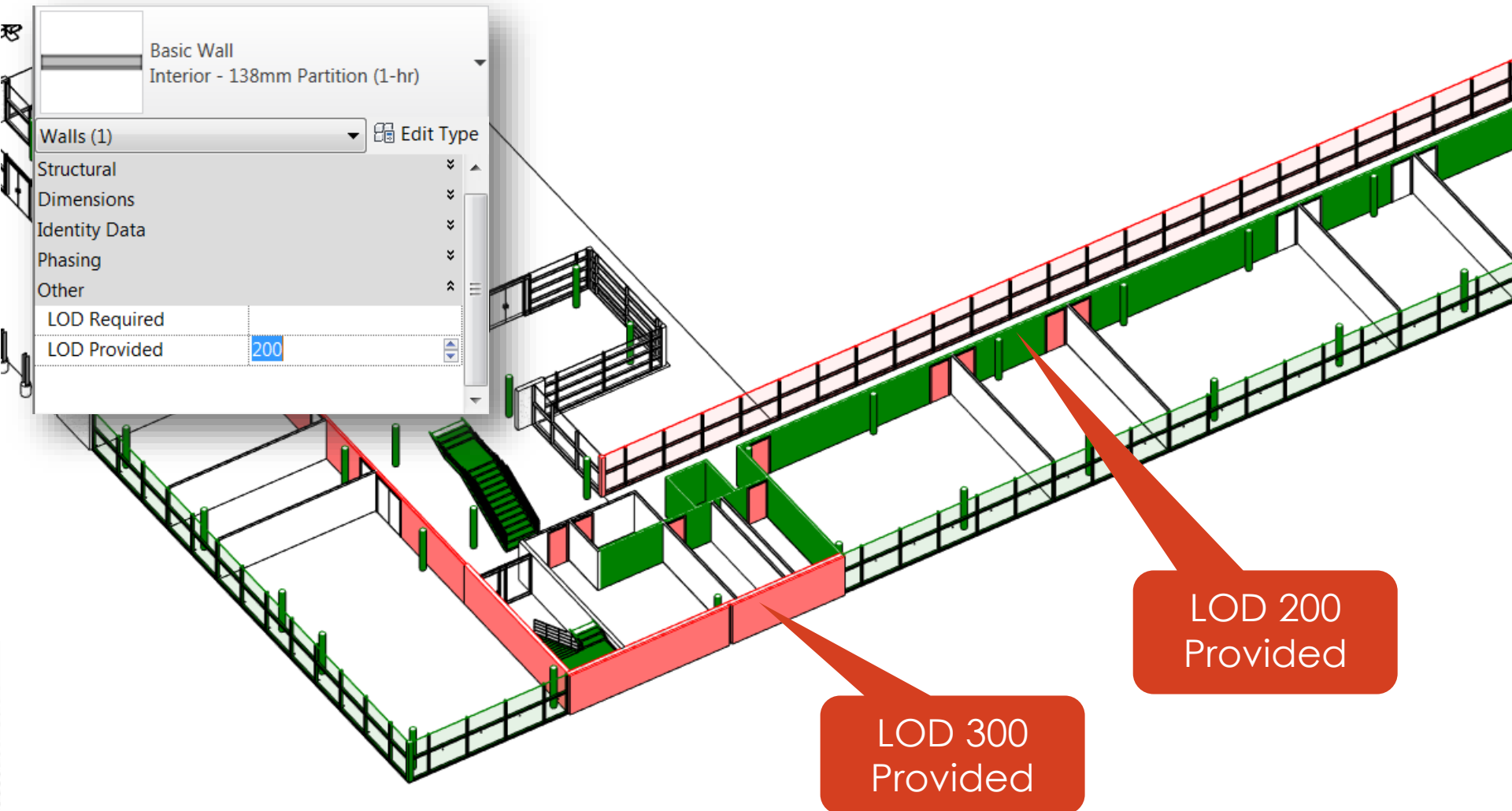
Verifying LOD

- An organization principle
  - Walls, doors...
  - Uniformat, Omniclass...
- Two measurable parameters:
  - LOD Required
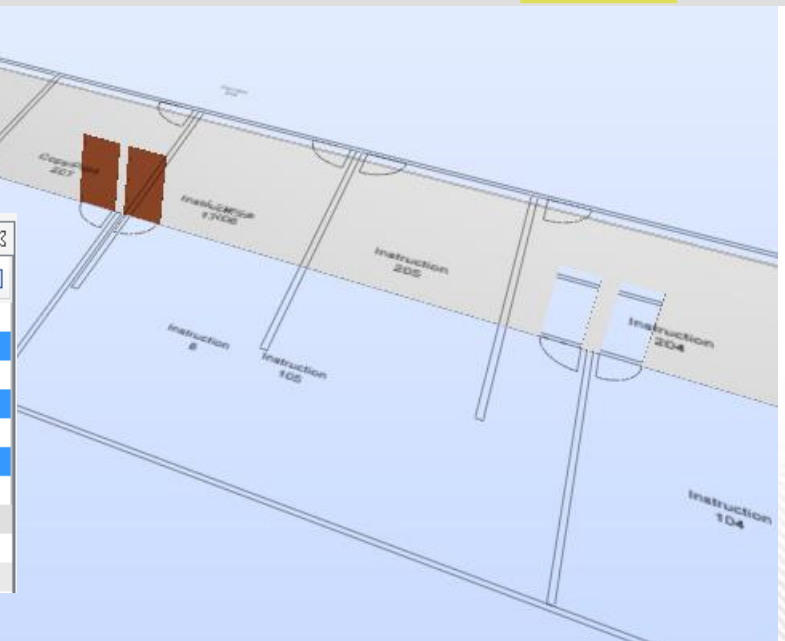 - LOD Provided

LOD Required < = > LOD Provided

Verifying LOD

Implementation Considerations

- Setting & managing expectations

- Aligning with your design methods

- Avoid redundant modeling
  - Address separation of complex assemblies

Objectives

- Value & ROI
- Project Examples
- Design Workflows
- Project Schedule

Incentive to Participate

<u>Project Team</u>

- Quantify difference between firm's Standard of Care & project scope
  - Add service for additional work

- Reduce over-modeling & parallel modeling by project team

- Drives increased collaboration

- Clearly identifies design liability

- Owner asks them to

What about the Architect?

- Track Internal Standards
  - QA/QC for Project & BIM managers
  - Reduce over-development of models
- Model Completeness
  - What is completed? What still needs development?
  - Designer/Engineer added/leaves, which system is complete?
  - Manager wants to view progress, estimate time remaining
- Differentiate BIM abilities from competition
- Less liability for the model, Specified-Use Approach

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Why does the owner care?

- Describe owner requirements

- Effective handovers

- Clearly identifies where information is

- Reduce over-modeling &parallel modeling

- Schedule improvements

- Communication

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Project Examples

	Standard			Standard			Standard			Use Case		
	100% SD			100% DD			100% CD			QTO		
										100% CD & PERMIT		
	Date			Date			Date			Date		
LOD	MEA	Notes	LOD	MEA	Notes	LOD	MEA	Notes	LOD	MEA	Notes
N/M	E		200	X	A/E		300	X	E		300	E

| 200 | A | | 200 | | A | | 300 | X | A | | 300 | A | |

| E | 20 | 10 | 2 | | | X | Fixed Casework |

D	50	20	1	10	X	Receptacles - Wall	D5020110	N/M		200	X	A/E	300	X	A/E	300	A/E
D	50	20	1	20	X	Switches - Wall	D5020120	N/M		200	X	E	300	X	E	300	E
D	50	20	2	10	X	Lighting - Fluorescent	D5020210	N/M		200	X	E	300	X	E	300	E
D	50	20	2	20	X	Lighting - Incandescent	D5020220	N/M		200	X	E	300	X	E	300	E
D	50	20	2	30	X	Lighting - High Intensity	D5020230	N/M		200	X	E	300	X	E	300	E
					X	Low-Voltage wiring systems				100	X	E -tbd	200	X	E-tbd	200	E- tbd
					X	Communications and Security equipment				100	X	E -tbd	200	X	E-tbd	200	E- tbd
D	50	30	3		X	Telephone Systems	D5030300										
D	50	30	7		X	Fire Alarm Systems	D5030700										
D	50	30	8		X	Security & Detection Systems	D5030800										
D	50	90	2		X	Emergency Light & Power Systems	D5090200	N/M		100		E	100		E	100	E
E	10	10	9		X	Other Commercial Equipment	E1010900	N/M		200	X	A	200		A	200	A
E	10	20	5		X	Audio-visual Equipment	E1020500	N/M		200	X	A	200		A	200	A
E	10	20	8	10	X	Medical Furniture & Equipment	E1020810	N/M		200	X	A	300	X	A	300	A
E	10	20	9		X	Other Institutional Equipment	E1020900	N/M		200	X	A	200		A	200	A
E	10	90	3	20	X	Food Service - Appliances & Equipment	E1090320	N/M		200	X	A	200		A	200	A
E	10	90	6		X	Window Washing Equipment	E1090600	N/M		100		A	200		A	200	A
E	20	10	1		X	Fixed Artwork	E2010100	N/M		100	X	A/O	100		A/O	100	A/O
E	20	10	2		X	Fixed Casework	E2010200	200	A	200		A	300	X	A	300	A
E	20	10	3	10	X	Window Treatments - Blinds	E2010310	N/M		100	X	A	100		A	100	A
E	20	20	2		X	Furniture & Accessories	E2020200	N/M		200	X	A	200		A	200	A
F	20	10	1		X	Building Interior Demolition	F2010100	100	A	100		A	100		A	100	A

DBB Project – QTO for bidding process

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Project Examples

Package release milestones

- Using LOD to document what is reliable in the model when

Design Assist – Coordination and As-Built

In-Model Workflow

Image courtesy of: Abel Cornwell - Autodesk

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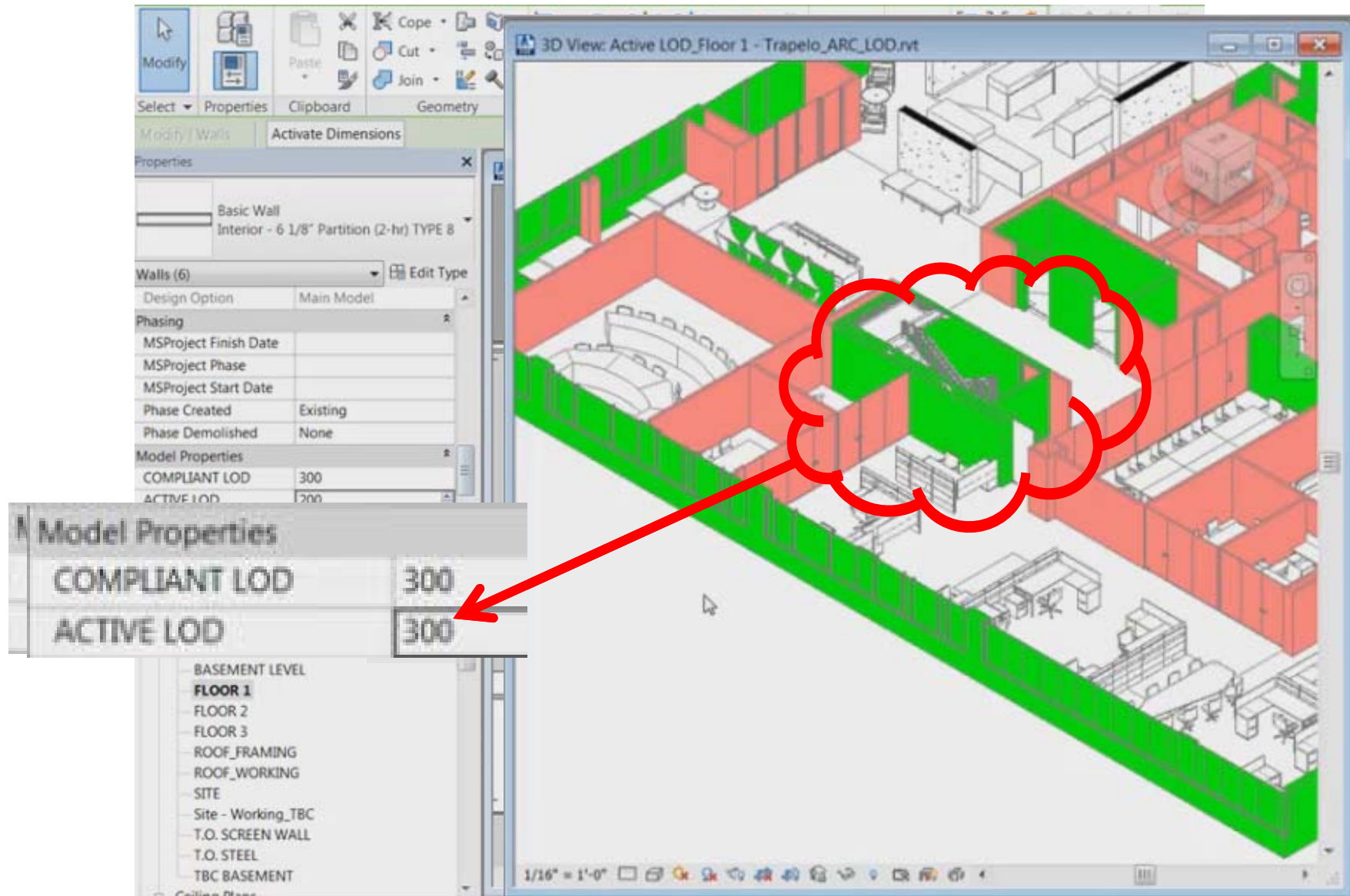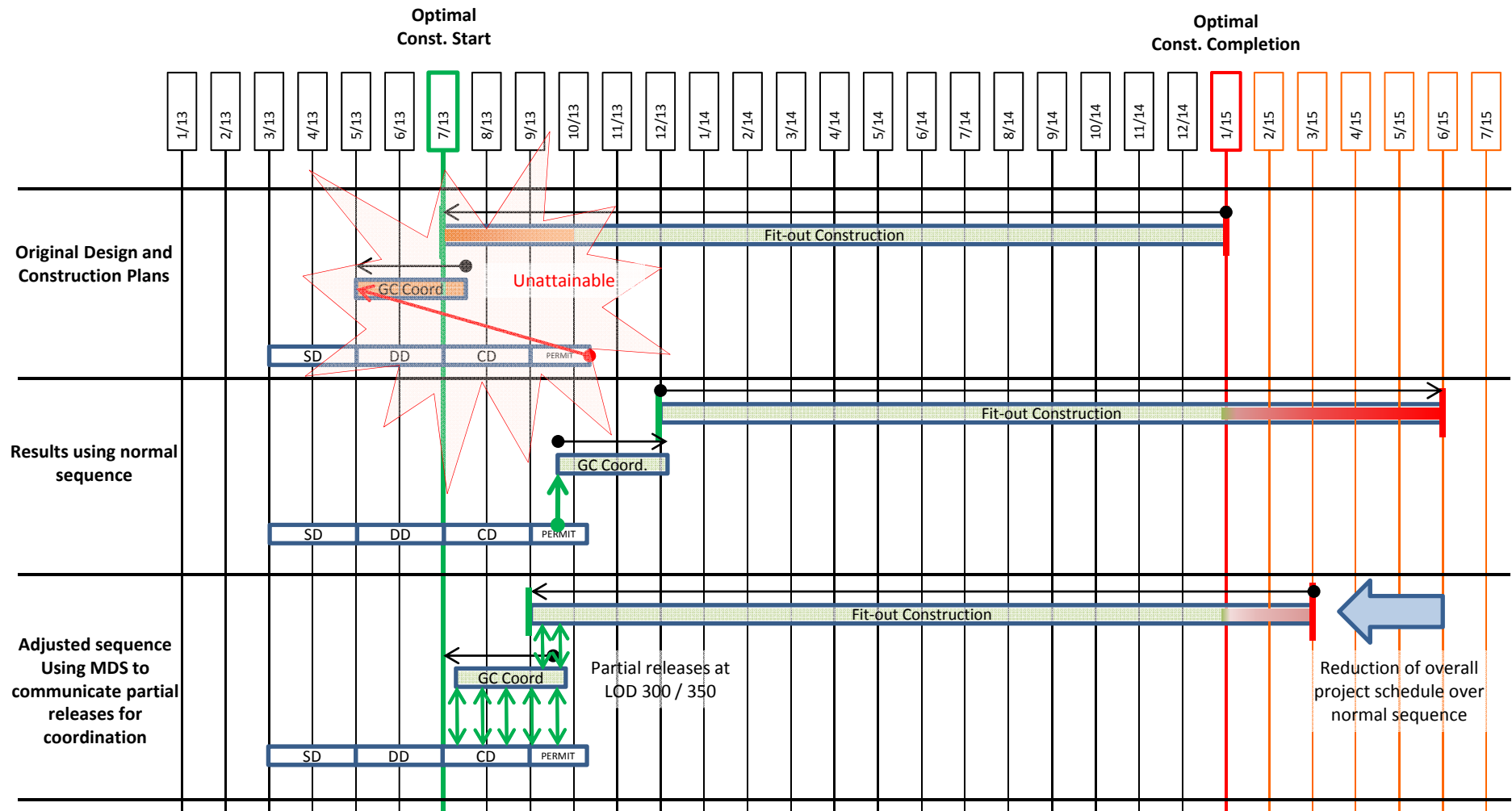
In-Model Workflow

Advantages

- QA/QC
- Reduce over-modeling & parallel modeling
- Model Completeness
- Clearly identifies design liability
- **Communication**

Image courtesy of: Abel Cornwell - Autodesk

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Schedules

Take-Aways

- Minimal impact on workflow
- Value & ROI for your firm & the owner
- Improve your project communication

Call to Action

- Try the AIA G202 & E203 on a project
- Document your firms LOD for delivery milestones and use it for internal QA/QC
- Introduce a client to the process and the benefits