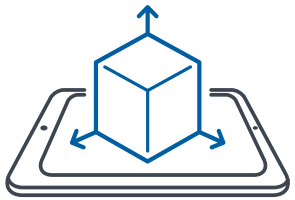
OBO LOD & MMDR Training

PROJECT MANAGERS AND AE COURSE

Embassy AFTER Next
LEAD THE WAY /// SET THE PACE



DEPARTMENT OF STATE
Building Information Management

Overview

On most projects OBO requires the AEs to generate the 2D submittal drawings from Building Information Models (BIMs) – designing with BIM has some huge advantages over designing in two dimensions, including:

- Better visualization of the facility throughout the design process
- Better collaboration between disciplines
- Better coordination of the drawings
- Better integration of schedules
- More consistency in expectations for each design stage.

Overview

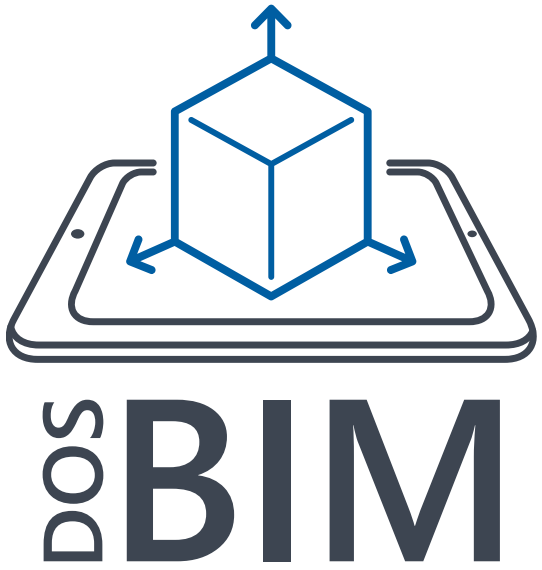
- In order for OBO to reap the most benefit from BIM it is necessary for OBO Project Managers and AEs to understand some basics of the process.
- This course overviews the fundamentals and concepts that OBO Project Managers and AEs should know in order to better manage the BIM process

Learning Objectives

1. Describe general LOD concepts, framework, and logic at a practical level.
2. Describe the problems the LOD Framework solves.
3. Describe the evolution of the LOD Framework as an industry standard.
4. Efficiently find needed information in the *LOD Specification* (*LOD Spec*)
5. Understand OBO's Minimum Modeling and Data Requirements (MMDR).
6. Describe the impact of the LOD framework on the reliability of models.
7. Be able to evaluate design review submittals for compliance with modeling requirements.

Agenda

1. What is Level of Development?
2. What problems does it solve?
3. Evolution of LOD as an industry standard
4. Tour of the BIMForum LOD Spec
5. Introduction to OBO's Minimum Modeling and Data Requirements (MMDR)
6. How it all fits together
7. LOD and reliability of models
8. LOD and design review



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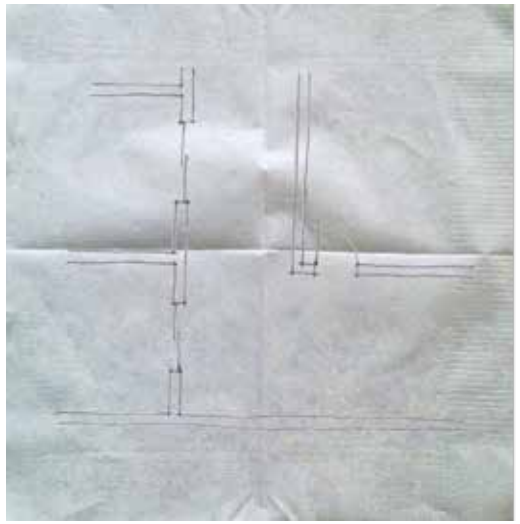
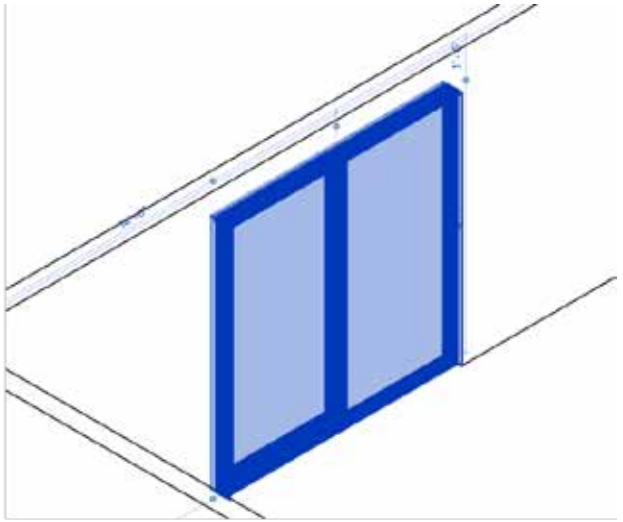
What is Level of Development (LOD)?

LOD Framework – Why do we Need it?

Designers use models to generate the drawings required in the design submittals – in a model or the drawings it generates it is often impossible to tell where an element is along the path from concept to precise definition by its appearance. Placeholders often show more detail then the designer has finalized and although they appear precise their location may be approximate.

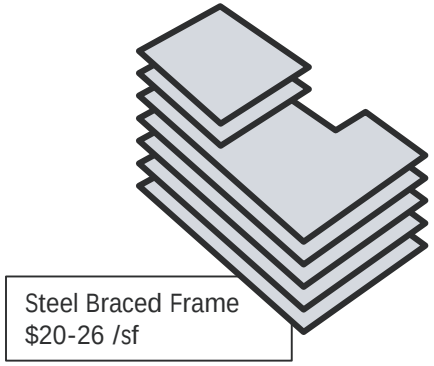




LOD Framework

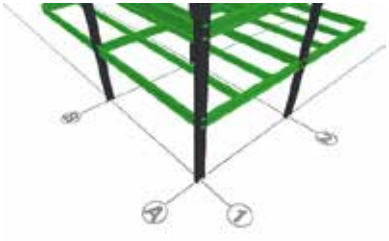
While various systems progress along the path from concept to precise definition at different rates (e.g. structure is often finalized while casework is still at a conceptual stage) most tend to pass through several common milestones:

Conceptual



Generic Placeholders

Specific Assemblies



Details

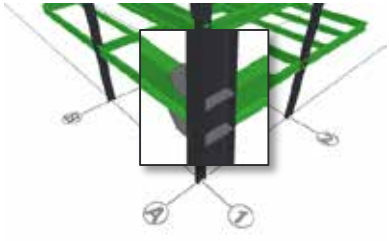
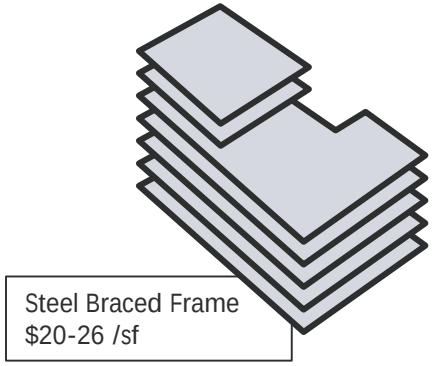


Image source: Webcor Builders

LOD Framework

The American Institute of Architects (AIA) developed definitions for these milestones for its *E202-2008 Building Information Modeling Protocol Exhibit* and then updated them for its *G202-2013 Building Information Modeling Protocol Form*, designating them as Level of Development (LOD) 100 through 400:

Conceptual

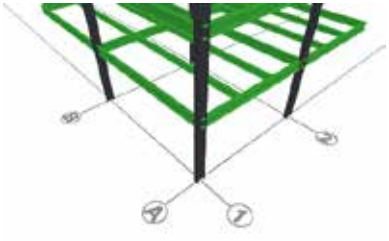


100

Generic Placeholders

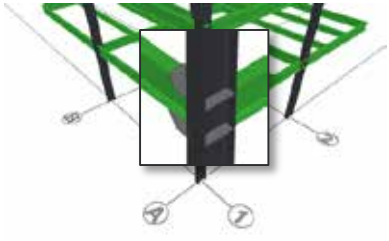
200

Specific Assemblies



300

Details

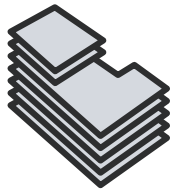


400

Image source: Webcor Builders

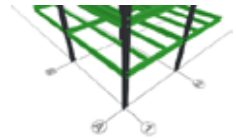
LOD Definitions

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.

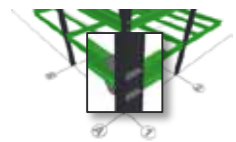
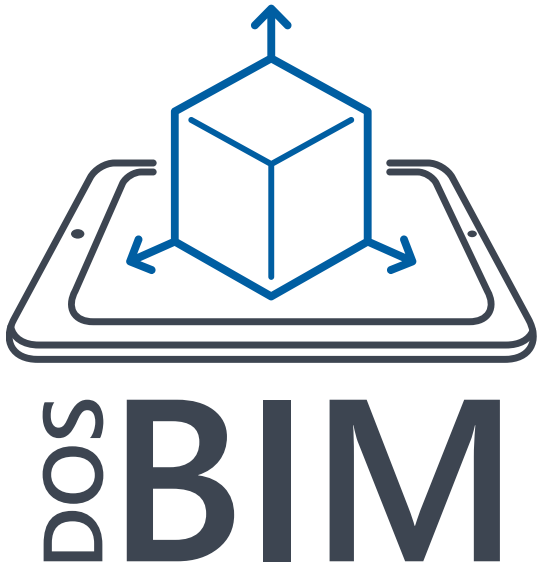


Image source
Webcor Builders

See Module 120.2 for an in-depth discussion of the LOD Framework



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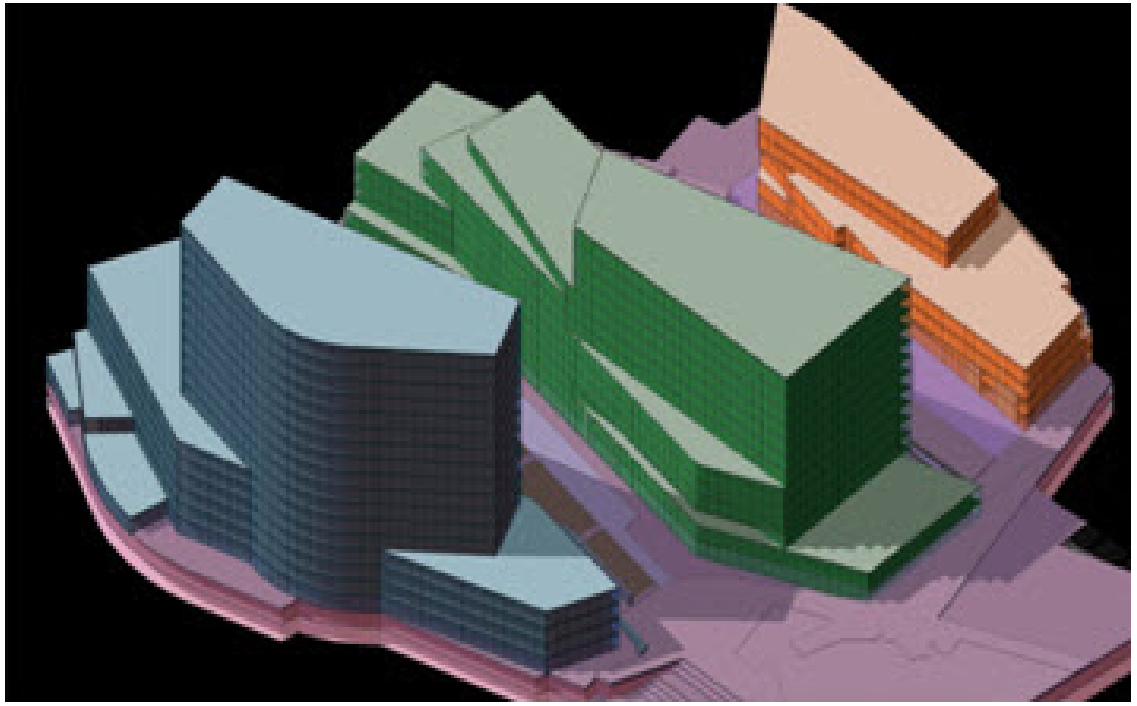
What Problems does LOD Solve?

Advantages – BIM

Designing with BIM has some huge advantages over designing in two dimensions, but there are some challenges – the LOD framework was developed to address them.

Which one is a BIM?



Challenges – BIM

- How can the Owner get the BIM(s) it wants?
- How can the Owner evaluate BIM deliverables?
- How does the model author know it is meeting its deliverables?

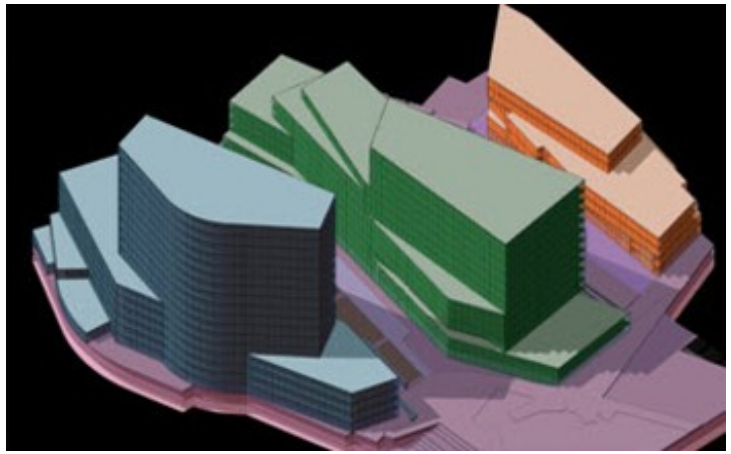


Image source: SOM

Practices – BIM

- How much effort will it take (What is a reasonable price?)
- How much information needs to be in a model and when?
- Which model uses are supported?
- Who's going to rely on it for what?

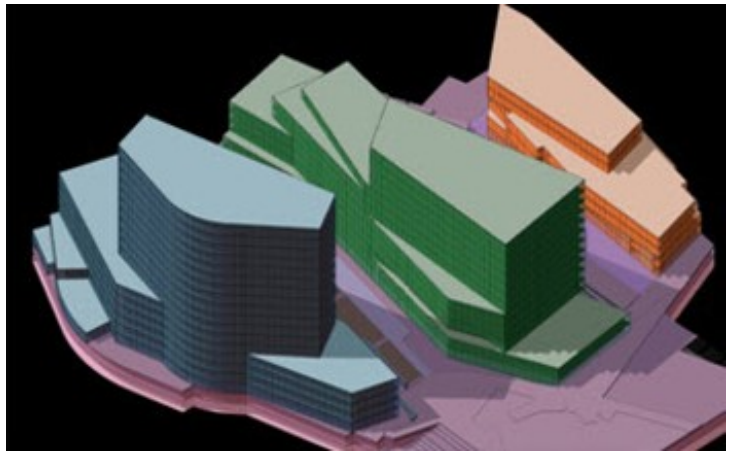
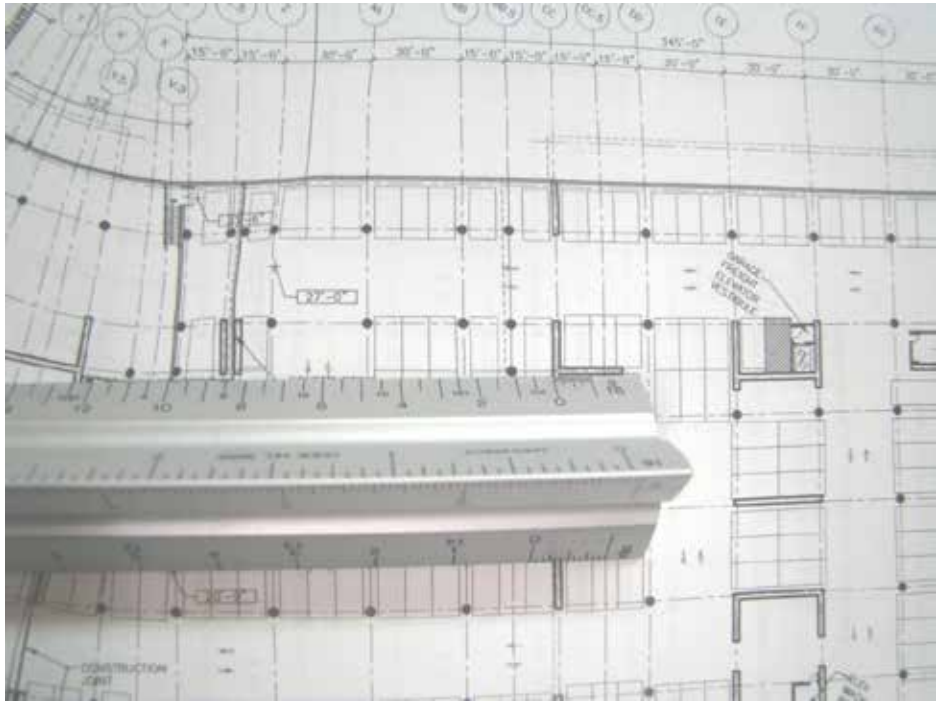


Image source: SOM

Paper vs. BIM

Precision



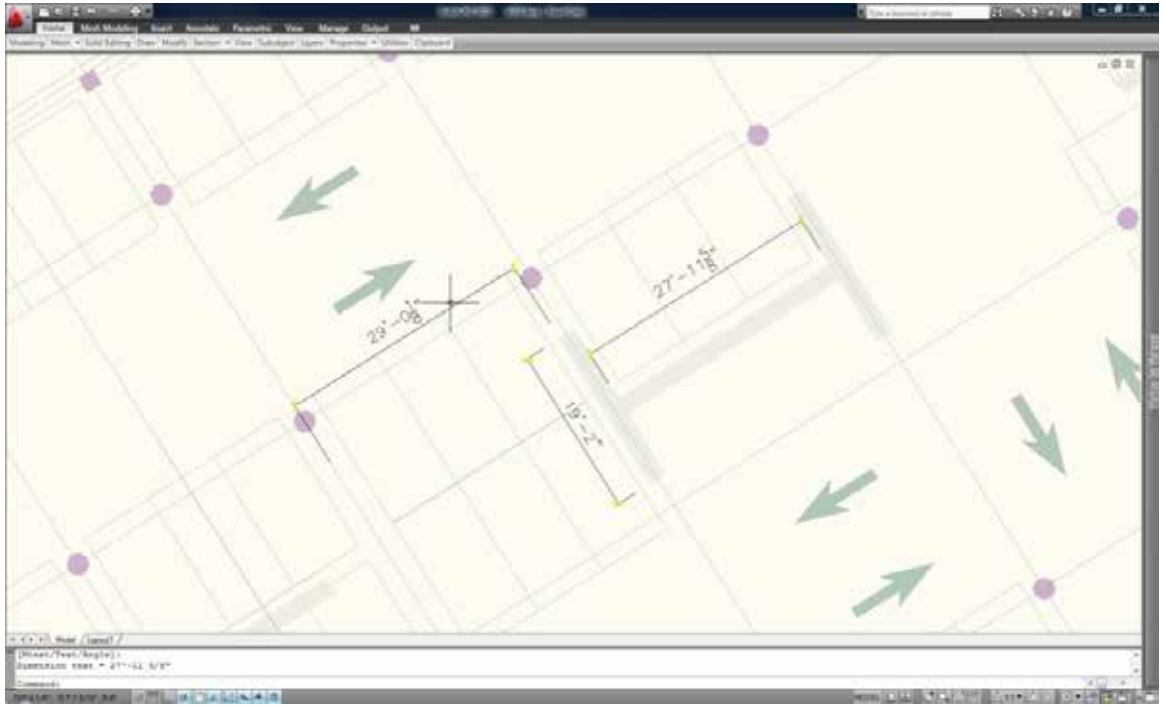


Image source: Webcor Builders

With paper drawings we can't measure with the precision necessary for construction purposes, so we must rely on called-out dimensions. With CAD or BIM, we can measure, but the element may not be in exactly the right place.

Paper vs. BIM

Deliverables

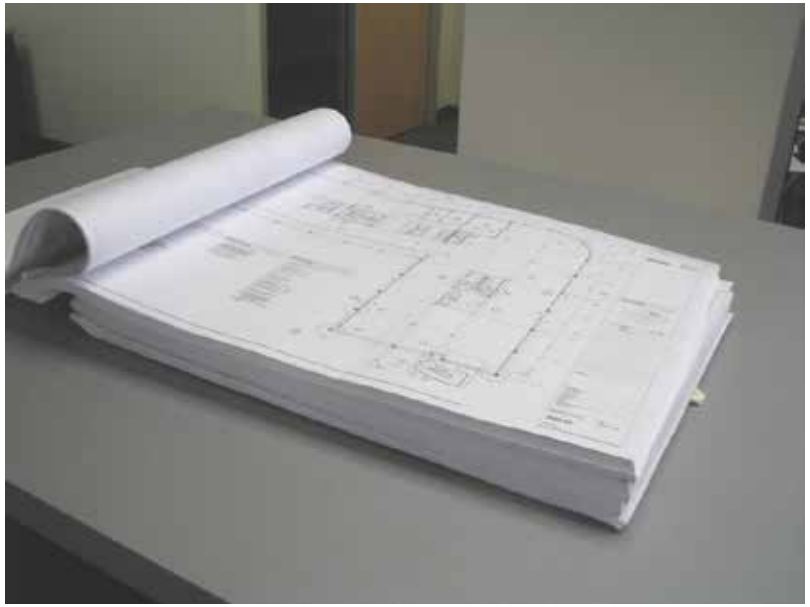


Image source: Webcor Builders

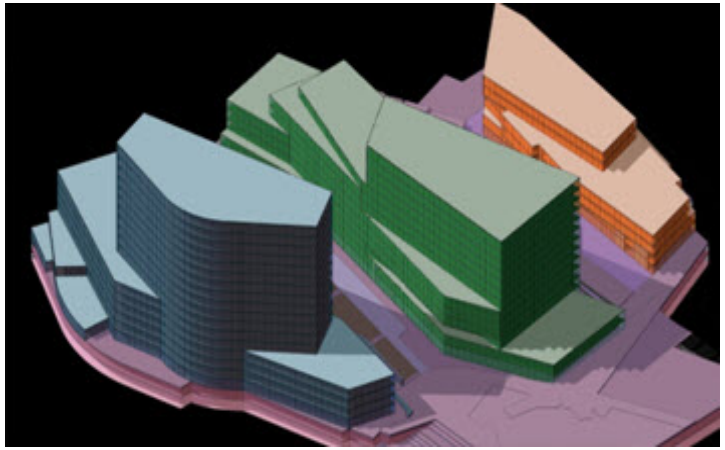


Image source: SOM

We're familiar with the set of paper drawings needed for various purposes, but we may not know what models are required.

Paper vs. BIM

All Information is Vetted

The architect made a conscious effort to call out the floor elevation at a specific point. In a BIM the elevation can be measured at any point, but if, for example, the floor is sloped but modeled as flat the measurement will often be wrong.

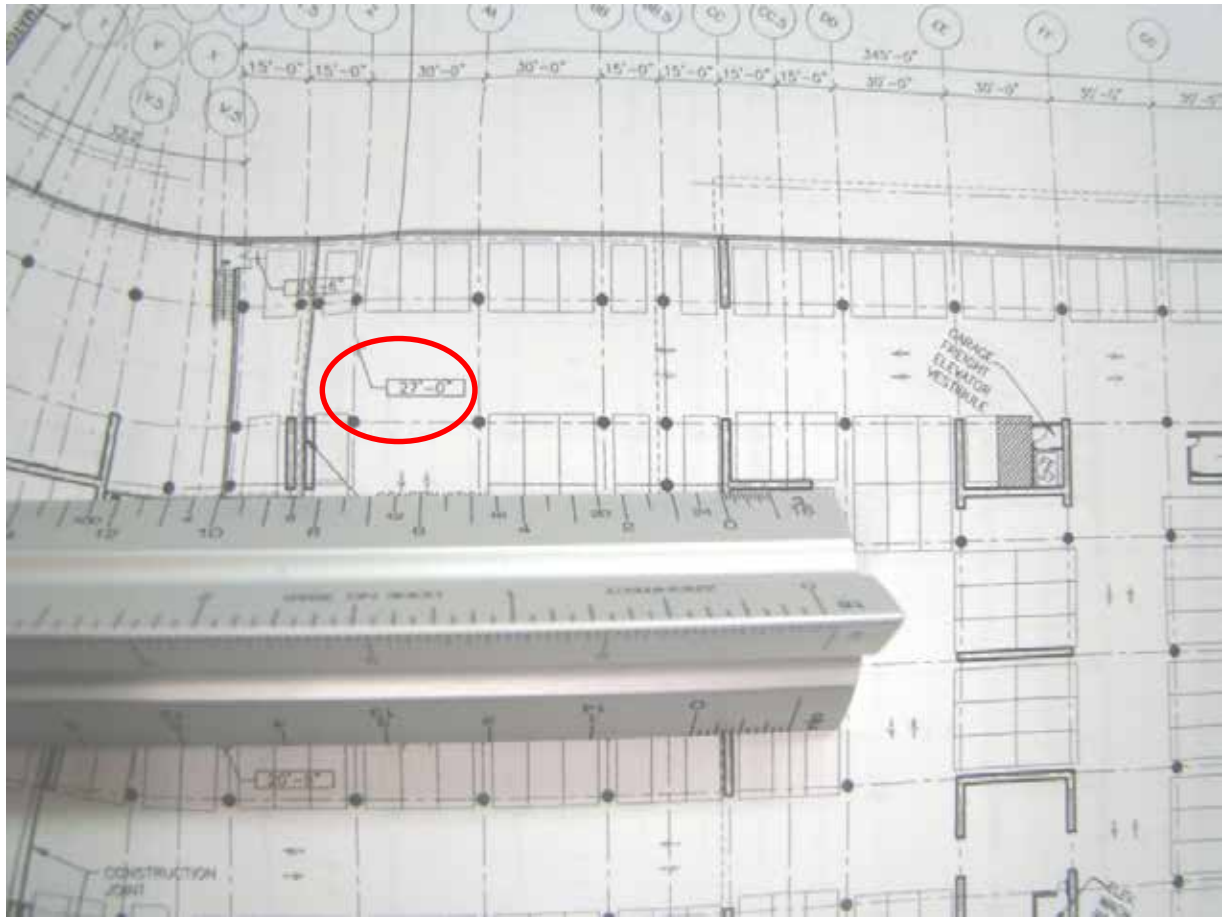
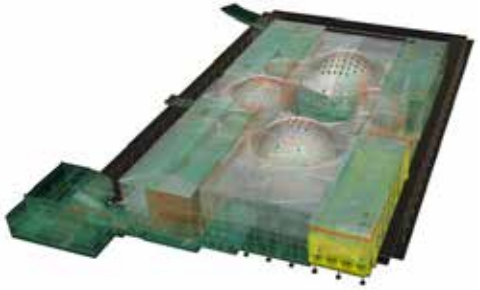


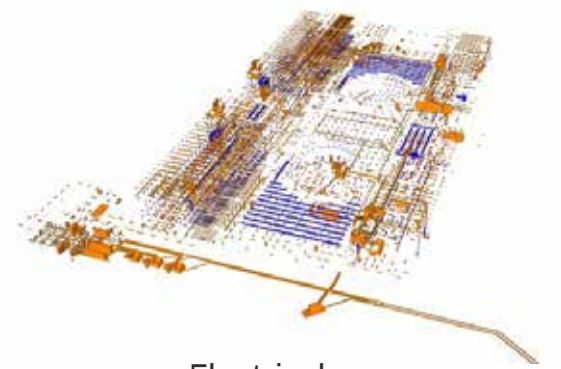
Image source: Webcor Builders

Paper vs. BIM

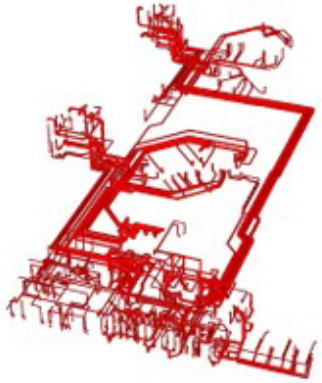
Federated models – who's responsible for what when?



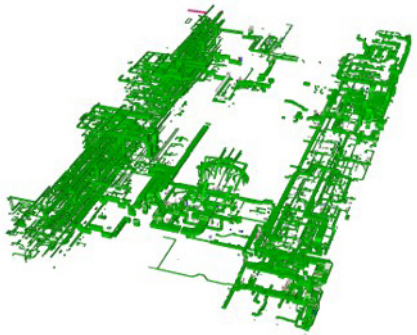
Architectural/Structural



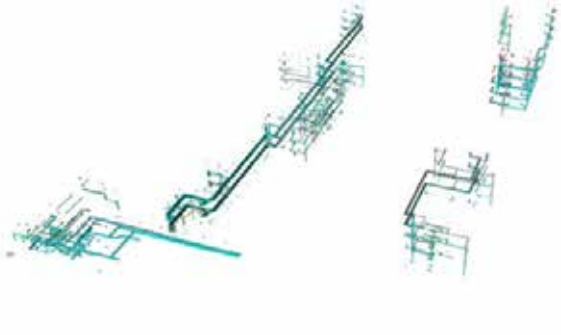
Electrical



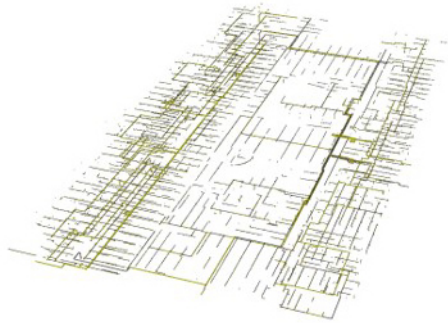
Life Support



Mechanical



Plumbing



Fire Protection

Images source: Webcor Builders

Paper vs. BIM

Over-detailing

Often people model things simply because they can, regardless of whether it's needed. Sometimes details like those shown are necessary, but often they're a waste of time and money.

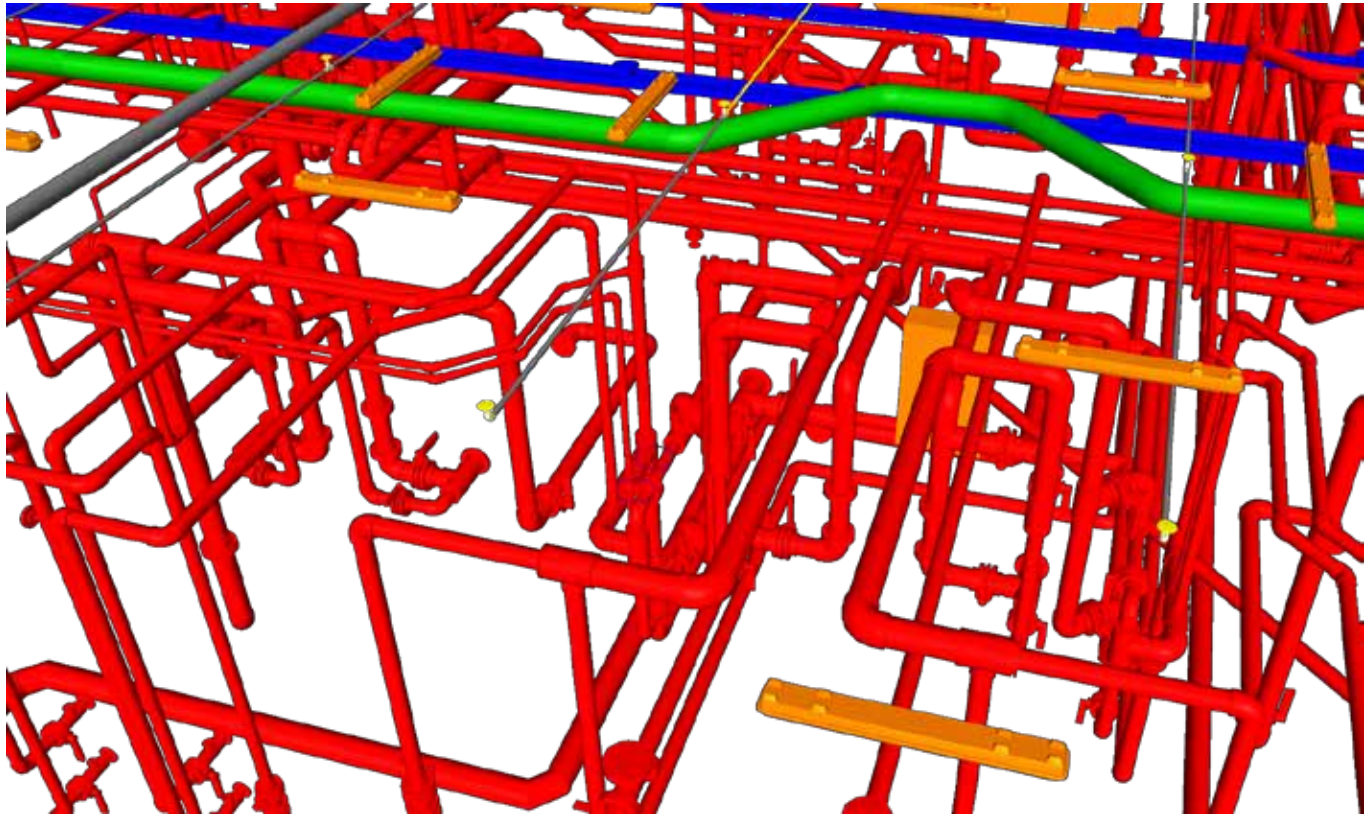
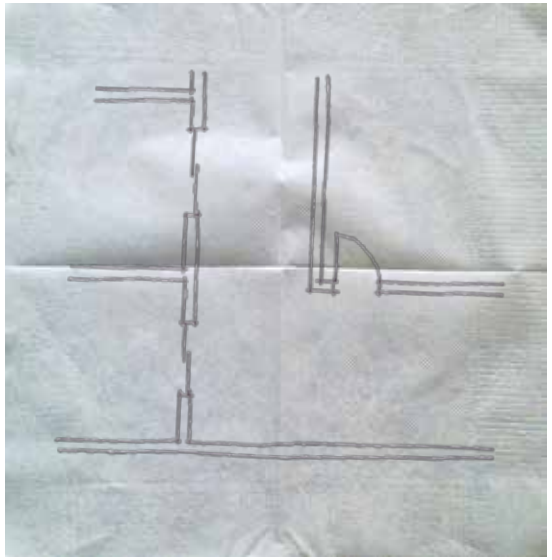


Image source: Webcor Builders

Paper vs. BIM

Visual cues about state of development

In a napkin sketch we know everything is approximate, but a BIM can look like the illustration on the right whether it's early Schematic Design or 100% CD. The LOD framework provides for more accurate interpretation of models and the drawings they generate.



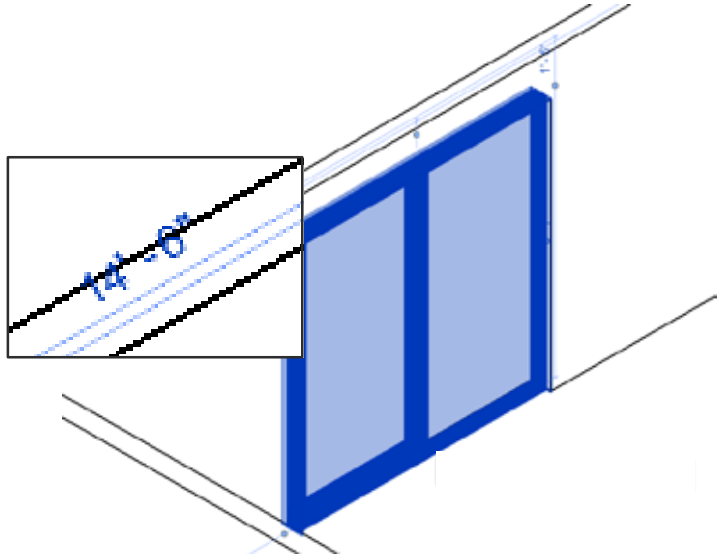


Image source: Webcor Builders

Common Industry Response to these Challenges

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.

Industry Response to these Challenges

Disclaimer Approach:

Some of the information is not reliable so don't rely on any of it.

Specified-Use Approach:

Some of the information is 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.*

The disclaimer approach negates much of BIM's utility as a communication, coordination, and collaboration tool, and therefore much of the potential benefit to design quality and submittal consistency and clarity.

So the AIA developed the specified-use approach. If the model author must tell users specifically what they can rely on no unintended information or precision can be used.

Industry Response to these Challenges

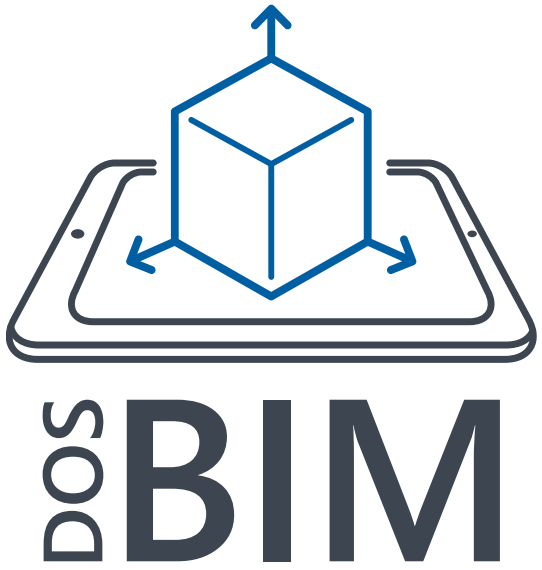
The LOD framework is the embodiment of the specified-use approach. By following the LOD profiles laid out in OBO's Minimum Modeling and Data Requirement AEs are better focused on the information required at the current submittal.

By understanding the LOD framework OBO reviewers have a better picture of the information presented in the submittal and understanding of what to focus on in their reviews.

What's the LOD Framework Good for?

OBO's MMDR specifies Level of Development (rather than Level of Detail) because it indicates the reliability of model elements. The LOD framework is used to:

- Define deliverables by concisely specifying their content.
- Define milestones by specifying the degree of completeness of the design of various systems and components.
- Define information exchanges by concisely specifying the content of a model.
- Enable reliance by specifying the level of precision of models element by element.
- Enables reviewers to focus on the appropriate stage of the design regardless of over-detailed placeholders.



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Evolution of LOD as an Industry Standard

Level of *Detail*

The Level of Detail concept was first developed by Graphisoft to define requirements for its own modeling teams.

Graphisoft first developed the idea of Level of Detail to specify models for their in-house modeling team.

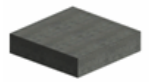
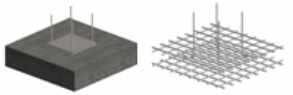
Pad Footing	LoD 100	LoD 200	LoD 300 …
Model	N/A		
Estimating	**Recipe based takeoff** Foundation Conceptual ls or $/ sf	**Model based takeoff** •Formwork •Concrete Reinforcing •4000 psi Concrete	**Model based takeoff** •Formwork # of form uses •Grade of steel •# of rebar mats •Mat bar size •Bar spacing •Accelerator
Scheduling	**Master Task** Foundations	**Master Tasks** •Form Pad Footing •Reinforce Pad Footing •Pour Pad Footing	**Micro Management** •Prep •Set Anchor Bolts/Embeds •Formwork •Reinforcement •Place & Finish
Procurement	N/A	Purchase Order Subcontracts	Purchase Order Subcontracts
Fabrication	N/A	Tolerance	•Formwork design •Anchor bolts and embeds •Reinforcing Steel

Image source: Graphisoft

Level of *Development*

In developing the *E202-2008 Building Information Modeling Protocol Exhibit* the AIA adapted the concept to a contractual environment, morphing it into Level of Development.

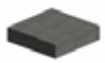
Pad Footing	LoD 100	LoD 200	LoD 300 ...
Model	N/A		
Estimating	**Recipe based takeoff** Foundation Conceptual ls or $/ sf	**Model based takeoff** •Formwork •Concrete Reinforcing •4000 psi Concrete	**Model based takeoff** •Formwork # of form uses •Grade of steel •# of rebar mats •Mat bar size •Bar spacing •Accelerator
Scheduling	**Master Task** Foundations	**Master Tasks** •Form Pad Footing •Reinforce Pad Footing •Pour Pad Footing	**Micro Management** •Prep •Set Anchor Bolts/Embeds •Formwork •Reinforcement •Place & Finish
Procurement	N/A	Purchase Order Subcontracts	Purchase Order Subcontracts
Fabrication	N/A	Tolerance	•Formwork design •Anchor bolts and embeds •Reinforcing Steel

Image source: Graphisoft

AIA Document E202™ – 2008

Building Information Modeling Protocol Exhibit

§ 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.

Model Elements Utilizing CSI UniFormat™					Conceptualization LOD	Conceptualization MEA	Criteria Design LOD	Criteria Design MEA	Detailed Design LOD	Detailed Design MEA	Implementation Documents LOD	Implementation Documents MEA	Construction LOD	Construction MEA	LOD	MEA	Note Number (See 4.4)
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		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				

Image source: American Institute of Architects

Level of *Development* vs. Level of *Detail*

Level of **Detail** addresses what an element looks like. But you can't tell from appearance how well the element has been developed.

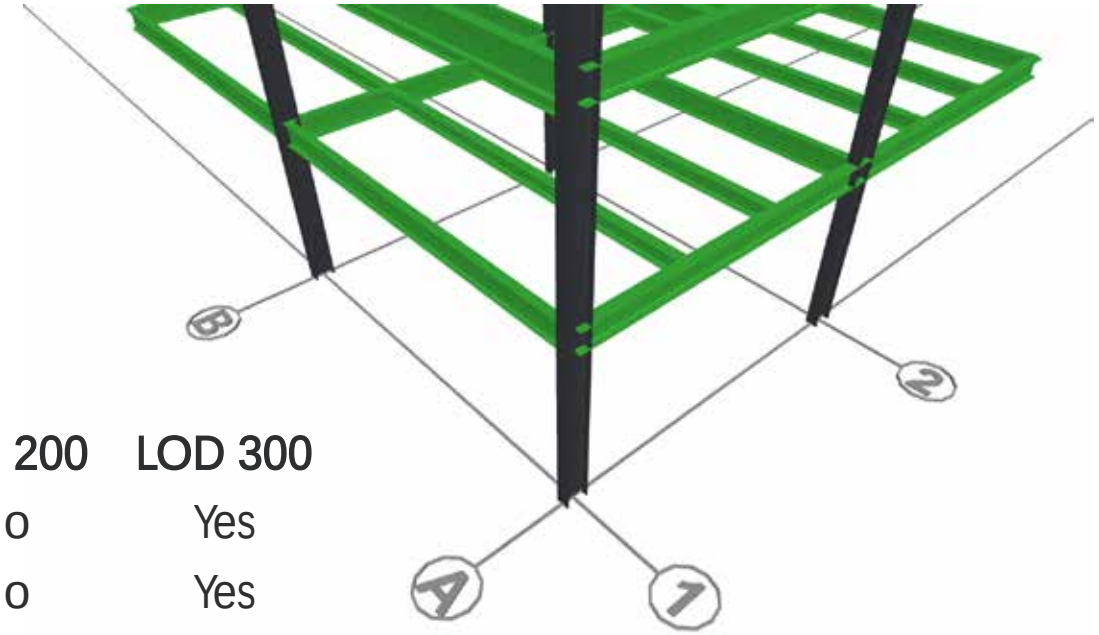
Level of **Development** addresses how much the element has been thought through.

Level of **Detail**

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

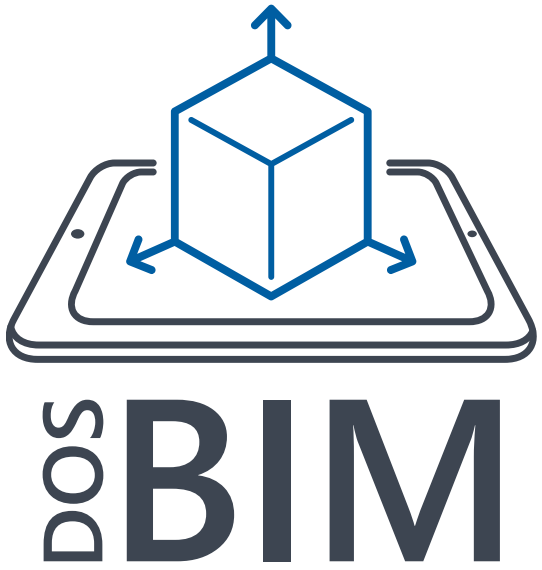
Level of **Development**

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



LOD 200	LOD 300
No	Yes
No	Yes

Image source: Webcor Builders

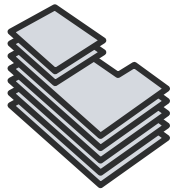


OBO LOD & MMDR Training – Project Manager and AE Course

Tour of the BIMForum LOD Spec

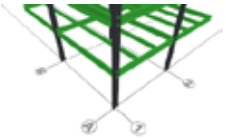
Level of Development (LOD) Definitions

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.

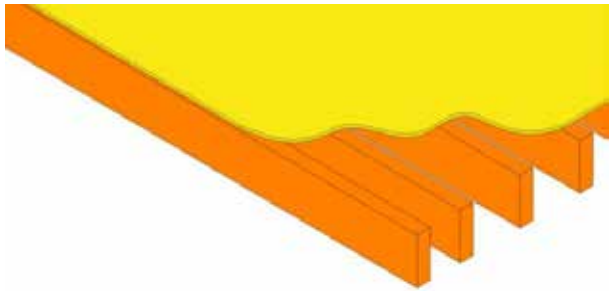


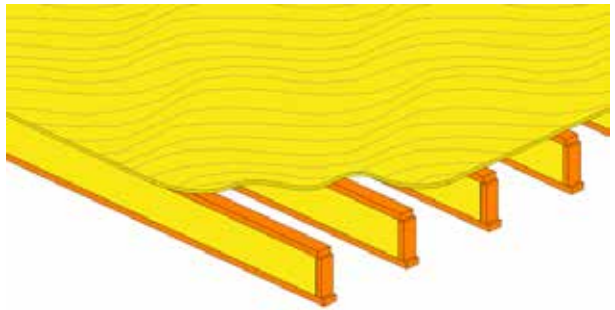
400 Detailed Assemblies. The Model Element is graphically represented within the Model as a specific system, object or assembly in terms of size, shape, location, quantity, and orientation with detailing, fabrication, assembly, and installation information. Non-graphic information may also be attached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

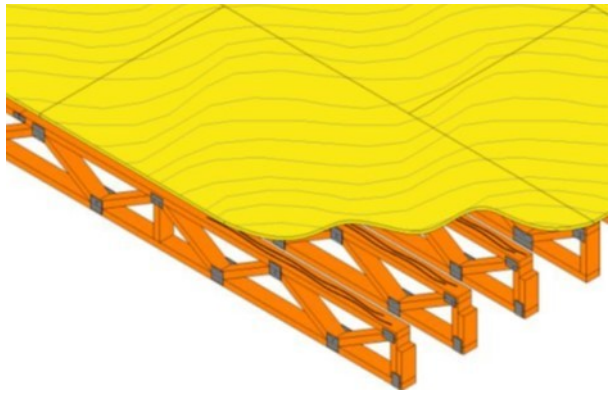
Image source
Webcor Builders

BIMForum LOD Specification

Practitioners found that the basic LOD definitions could be widely interpreted – e.g. does a truss modeled at LOD 300 include the flanges modeled as separate elements? The web?



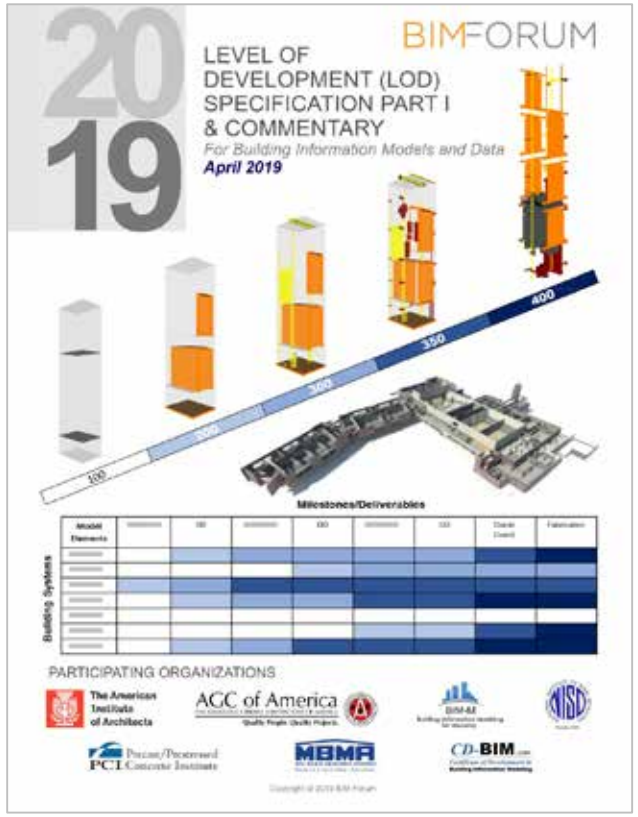


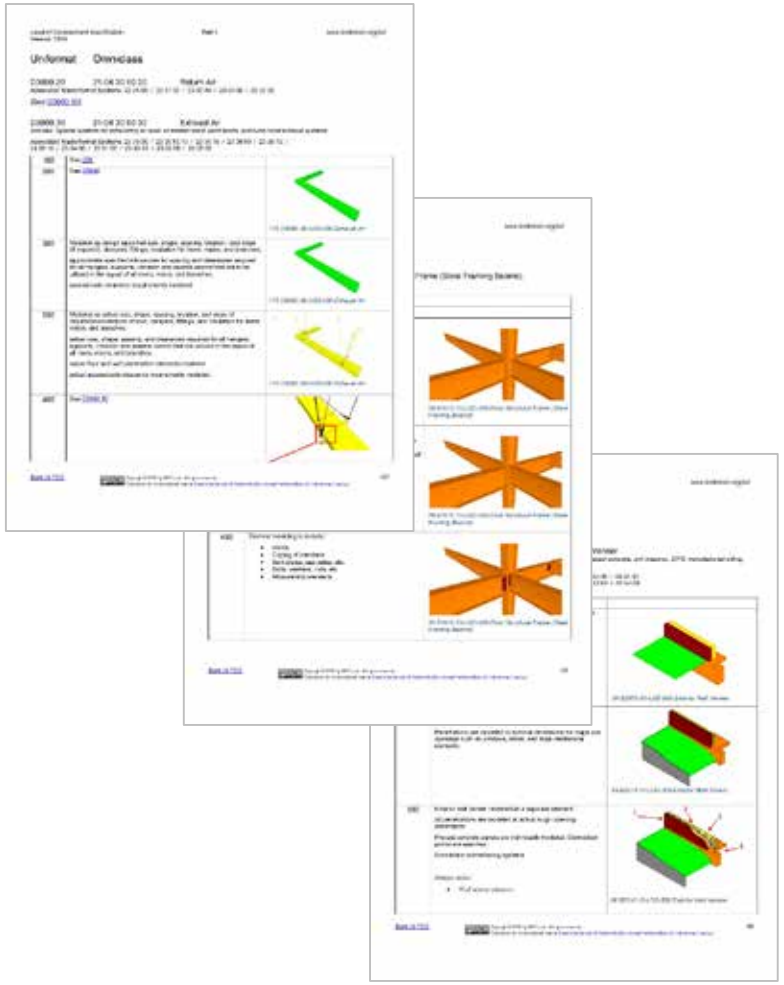


BIMForum LOD Specification

- This reduced their usefulness in communicating model requirements and reliability outside a single firm. So the American Institute of Architects (AIA) and the Associated General Contractors of America (AGC) executed an agreement which licensed the BIMForum, an interdisciplinary organization supported by both, to use the AIA definitions in a publication that would concisely interpret them for some 400 building assemblies and components.
- The BIMForum convened a working group comprising designers and builders from all major disciplines to develop these interpretations.

BIMForum LOD Specification





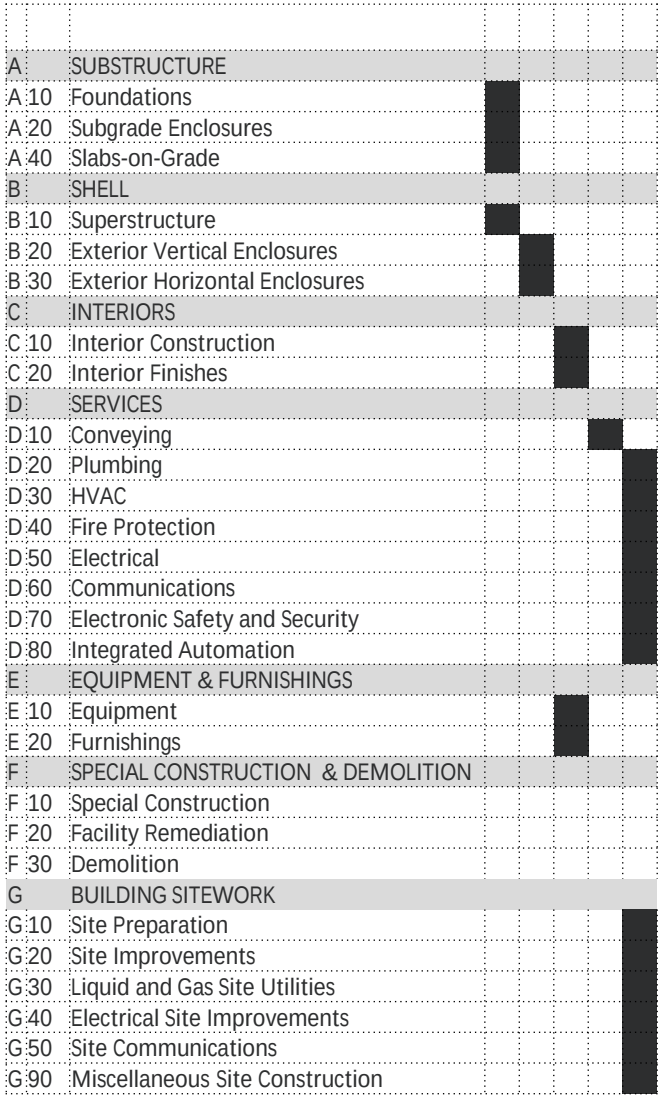
www.bimforum.org/lod

Image source: BIMForum

The *BIMForum LOD Specification* shows examples with descriptions and graphics of some 400 building assemblies and components at all LODs.

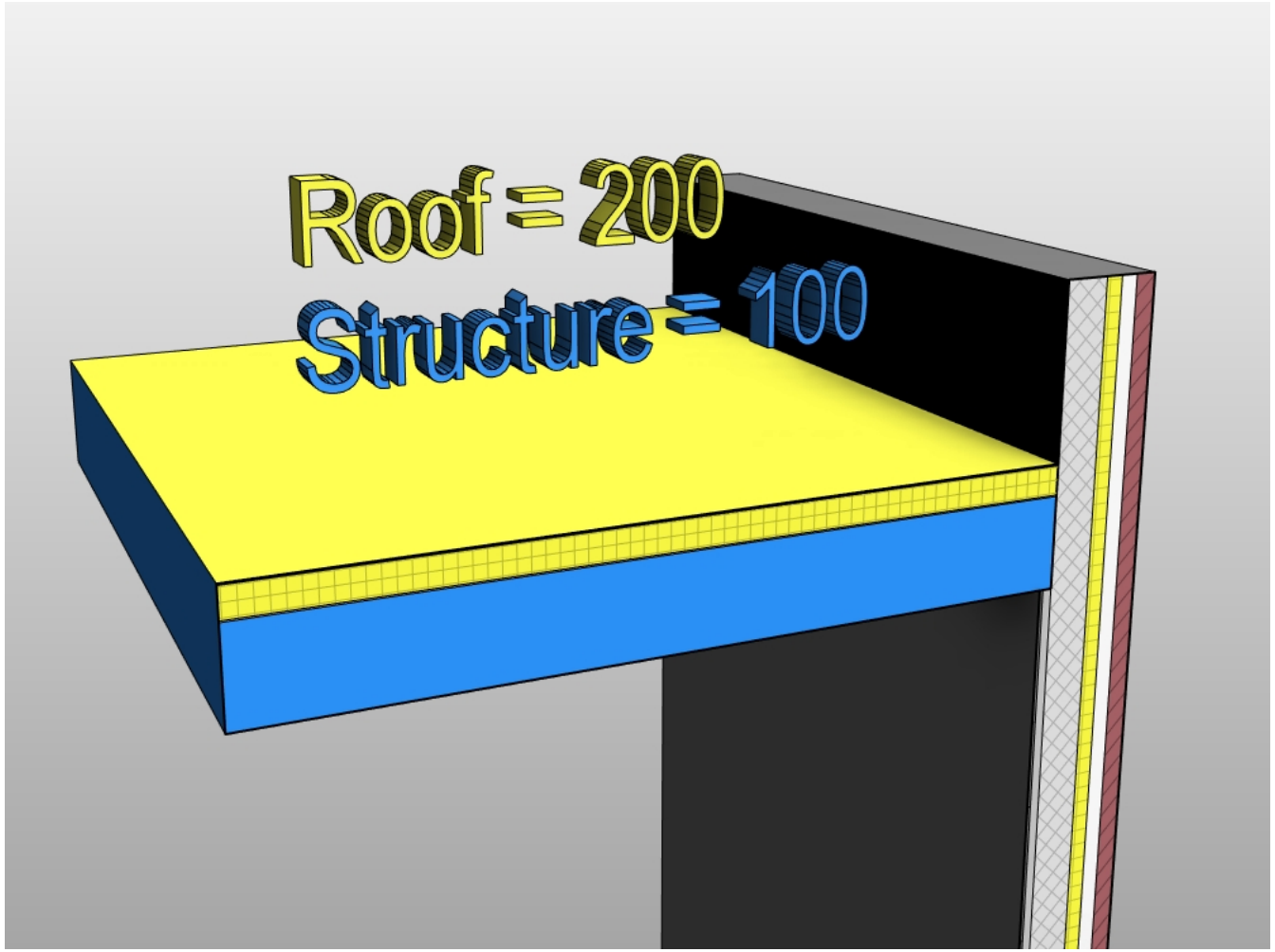
The specification's broad industry acceptance makes it extremely useful in communicating model and drawing requirements.

Creation Process – Domain Groups

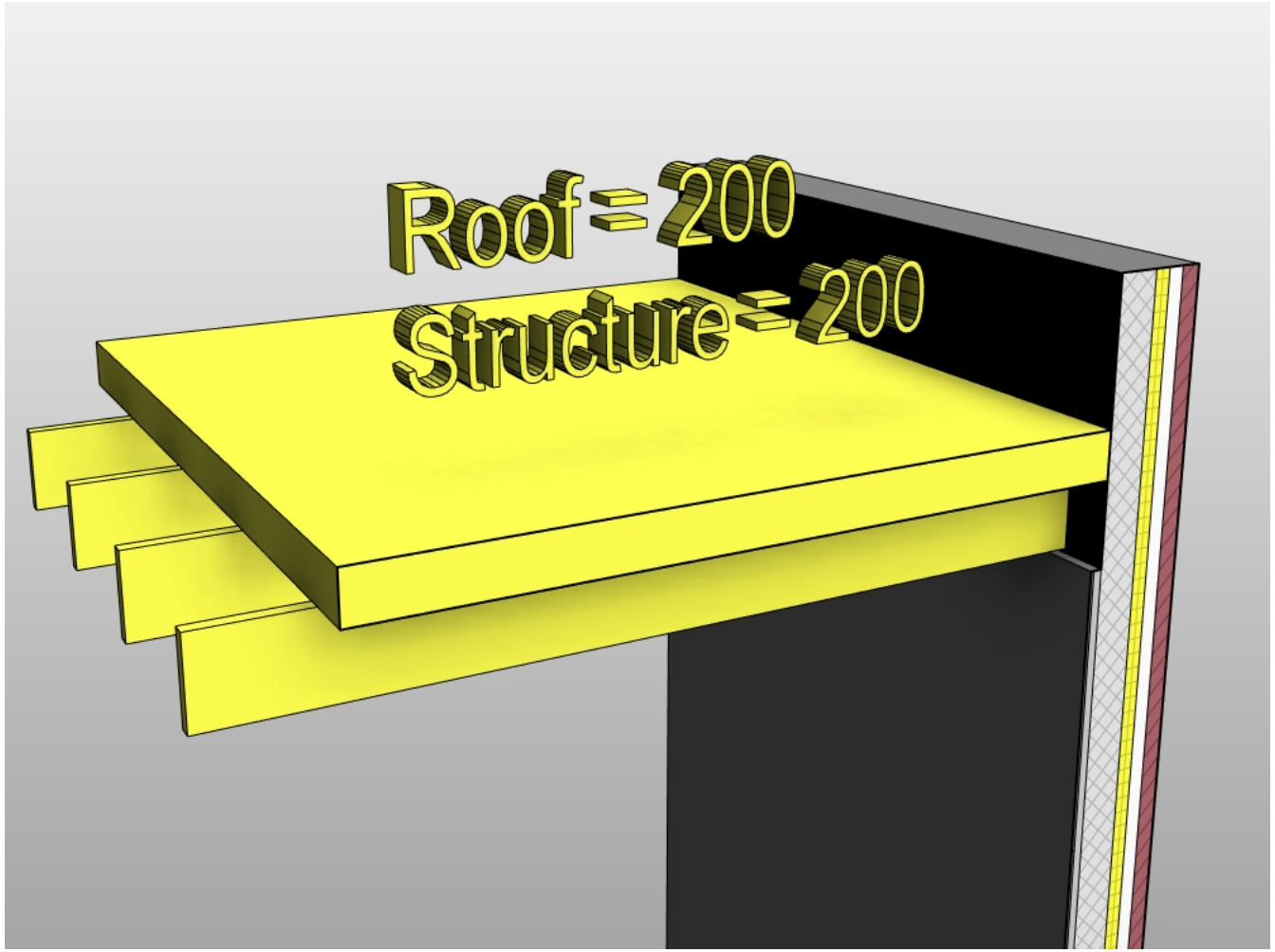


Systems	Designer	Builder
Structural	Will Ikerd, PE, LEED AP Ikerd Consulting	David Merrifield Steel Fab, Inc.
Skin	James Vandezande AIA HOK	Walt Cichonski L F Driscoll
Interior	Ron Dellaria, RA, CSI Cannon	Brian Filkins Beck
Conveying	Ron Dellaria, RA, CSI Cannon	Ken Flannigan Kone
Services	Birgitta Foster VDCO Tech	David Francis Murray Company
Civil	Jake Fears Wier and Associates	Gregg Madsen Wier and Associates

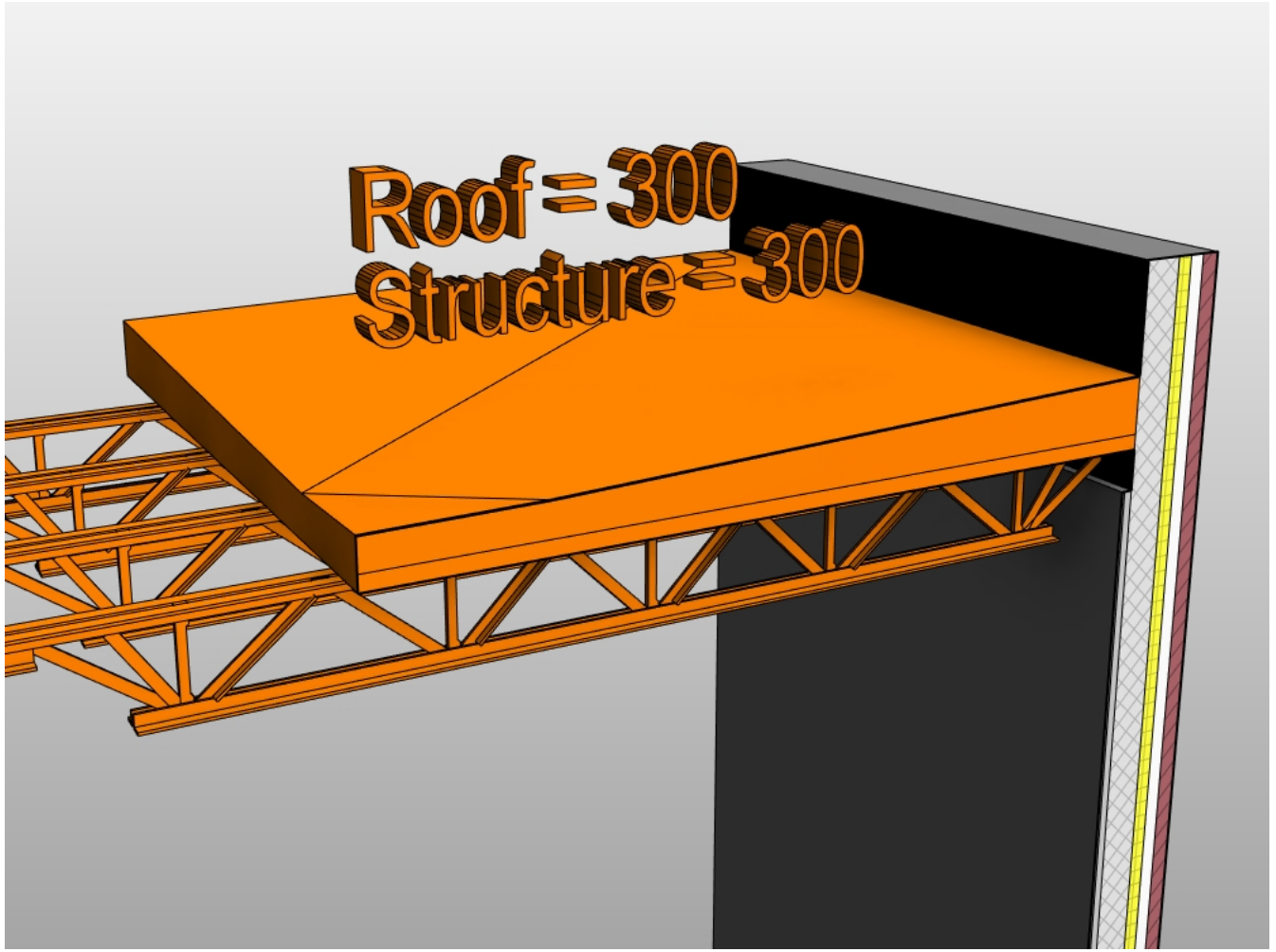
LOD Definitions



LOD Definitions



LOD Definitions



LOD Definitions

LOD 300

The BIMForum LOD Spec working group found that there was need for an intermediate LOD between 300 and 400 to define geometry for coordination between building elements without needing to develop a full fabrication-level model element.

This illustration shows a steel connection at LOD 300.

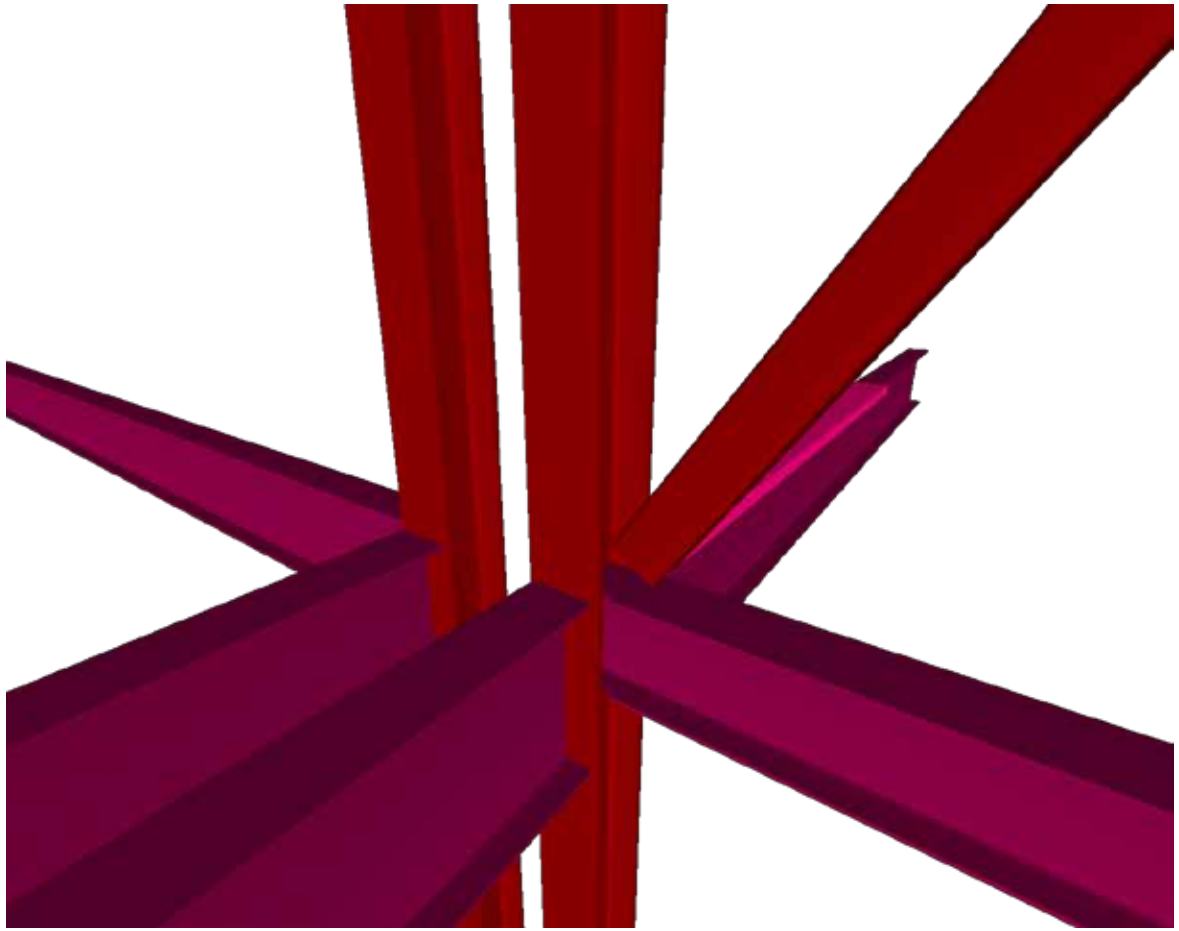


Image source: Ikerd Consulting

LOD Definitions

LOD 400

At LOD 400 full fabrication detail is shown – gusset plates, clip angles, studs, etc.

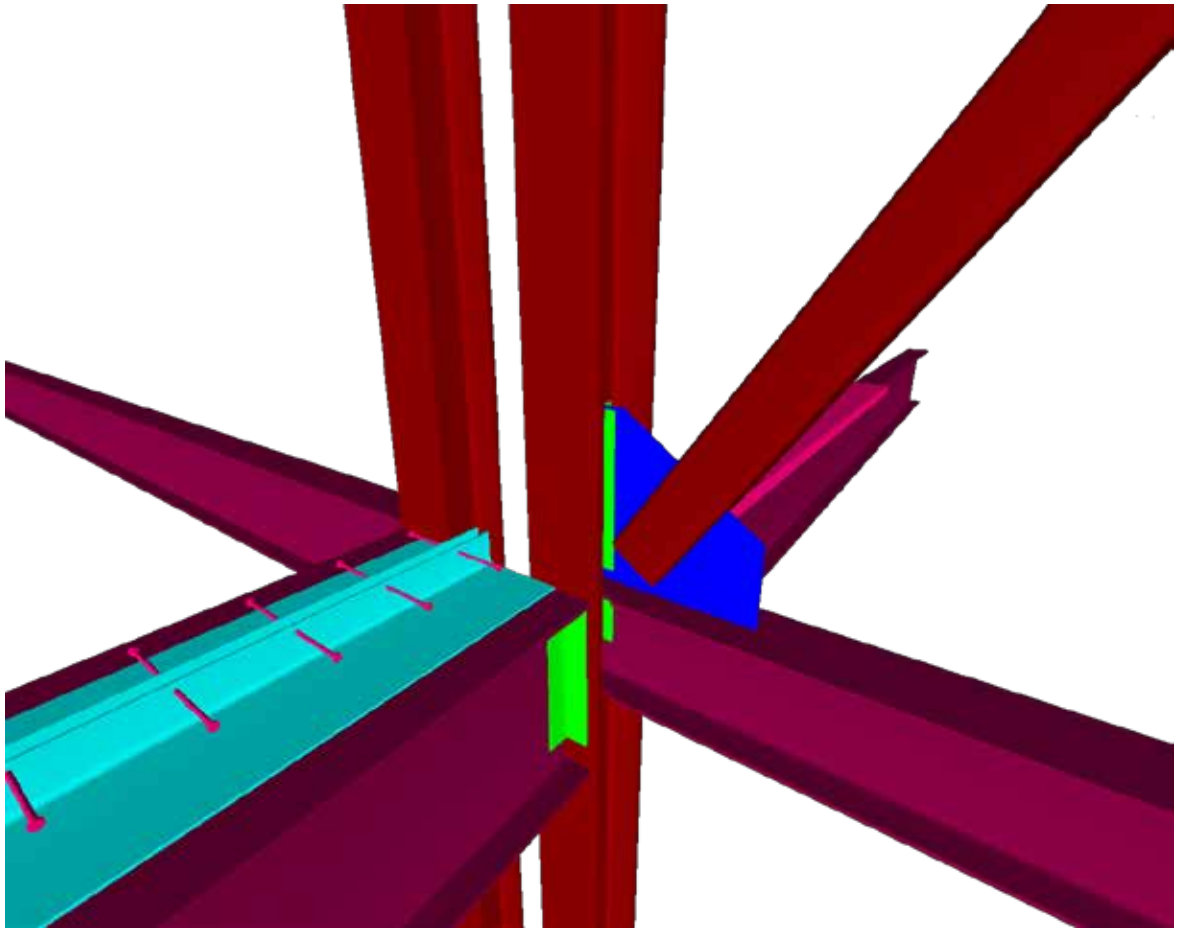


Image source: Ikerd Consulting

LOD Definitions

LOD 350

For most construction purposes LOD 400 shows more detail than is useful, so LOD 350 was developed. Here the clip angles and studs have been removed, but the gusset plates and slab-edge angle remain – they are often needed for coordination in tight locations.

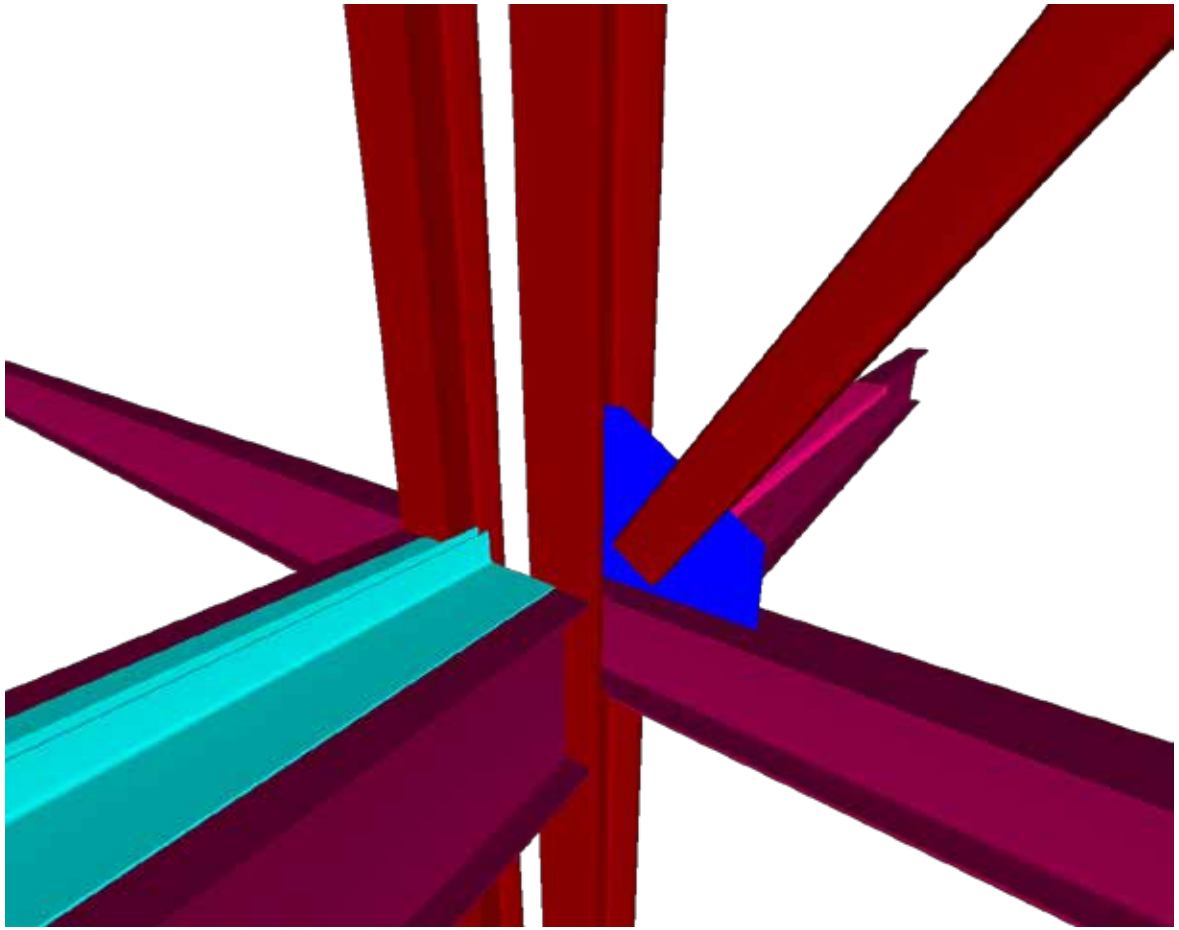


Image source: Ikerd Consulting

Level of Development (LOD) Definitions

LOD 350 is LOD 300 plus interfaces with other building systems:

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.

350 **Specific Assemblies with Interfaces.** The Model Element is graphically represented within the Model as a specific system, object, or assembly in terms of quantity, size, shape, orientation, and **interfaces with other building systems**. Non-graphic information may also be attached to the Model Element.

BIMForum Interpretations

The BIMForum working group developed basic interpretations of the AIA definitions, the most important being the interpretation of LOD 300.

The spec states that the quantity, size, shape, location, and orientation of an LOD 300 element as designed *can be measured directly from the model* without referring to non-modeled information such as notes or dimension call-outs.

Organization of the LOD Spec

The Spec contains specific definitions of over 400 systems and assemblies at each LOD.

It is organized according to the Construction Specification Institute's (CSI) Uniformat 2010 rather than the more familiar Masterformat – the 50-division Framework by which construction specifications are organized – for the following reasons:

- Masterformat is trade based. Many elements in a BIM represent work by multiple trades – e.g. an exterior wall modeled as one element.
- Uniformat is system-based, so the breakdown is very similar to the breakdown of model elements.
- Note that many current model authoring tools come out-of-the-box with fields pre-populated with the Uniformat 2010 classification of the element.

Organization of the Spec

Uniformat 2010 Breakdown

Uniformat 2010 is broken down into 7 major divisions:

A	SUBSTRUCTURE
B	SHELL
C	INTERIORS
D	SERVICES
E	EQUIPMENT & FURNISHINGS
F	SPECIAL CONSTRUCTION & DEMOLITION
G	BUILDING SITEWORK

Organization of the Spec

Omniclass designations are also included in the LOD Spec

CSI also publishes Omniclass, a more internationally accepted framework based on ISO 12006-2, that contains multiple tables that organize construction information according to multiple logical approaches. Omniclass Table 21 corresponds one-to-one with Uniformat 2010, with a slightly different numbering format.

Organization

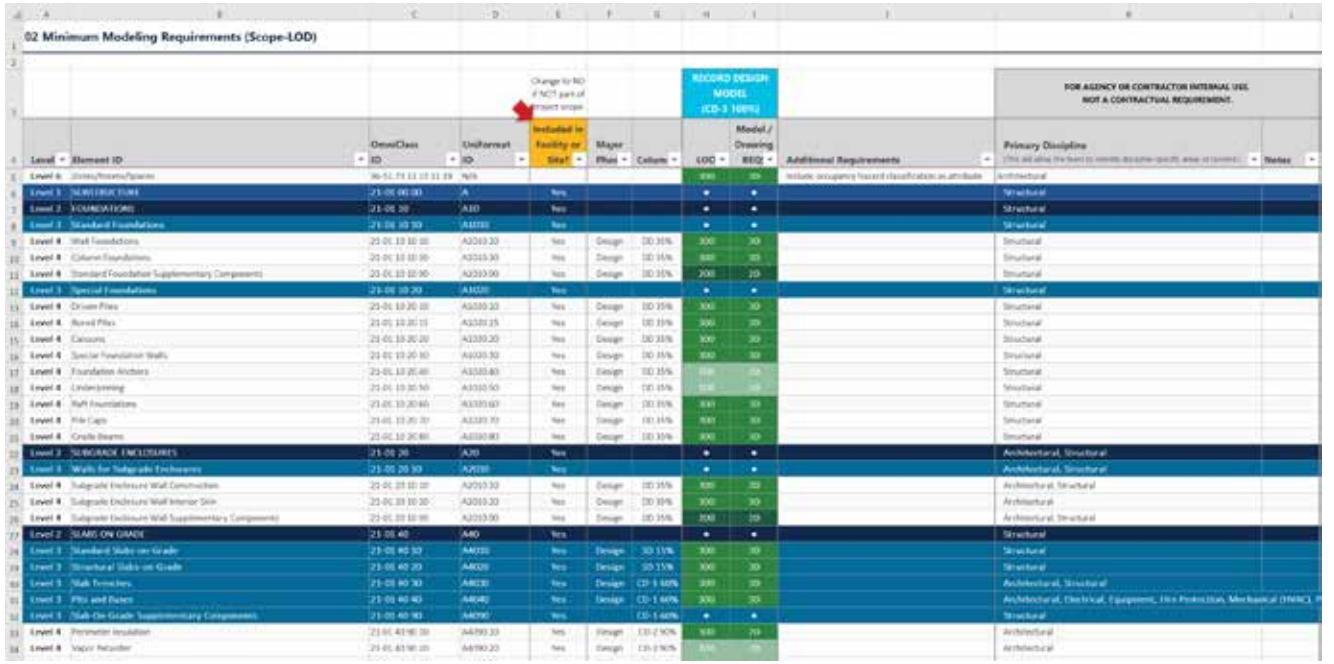
- Part I contains narrative descriptions of the LOD interpretations as well as graphic examples.
- Over 400 building systems and assemblies are represented here.

Organization

Part II – Model Development Specification

- Provides a spreadsheet for specification of models at various design milestones, for specific information exchanges, and for asset data
- OBO's Minimum Modeling and Data Requirements (MDMR) is an adaption of this format configured for OBO use

											SD			DD			CD		
											Date			Date			Date		
	UniFormat Level				Use on this project														
	1	2	3	4			Relevant Attribute Tables	LOD	MEA	Notes	LOD	MEA	Notes	LOD	MEA	Notes	LOD	MEA	Notes
95	B	30	80	.10		Exterior Ceilings													
96	B	30	80	.20		Exterior Soffits													
97	B	30	80	.30		Exterior Bulkheads													
98	C					INTERIORS													
99	C	10				Interior Construction													
100	C	10	10			Partitions	C - Partitions												
101	C	10	10	.10		Interior Fixed Partitions	A, B Cold Formed Metal Framing; A, B Wood; A, B Masonry												
102	C	10	10	.20		Interior Glazed Partitions													
103	C	10	10	.40		Interior Demountable Partitions													
104	C	10	10	.50		Interior Operable Partitions													
105	C	10	10	.70		Interior Screens													
106	C	10	10	.90		Interior Partitions Supplementary Components													
107	C	10	20			Interior Windows	C – Int. Windows												
108	C	10	20	.10		Interior Operating Windows													
109	C	10	20	.20		Interior Fixed Windows													
110	C	10	20	.50		Interior Special Function Windows													



Modifications of the LOD Spec and the MMDR

Note that in order to maintain its usefulness as a reference standard the *LOD Specification, Part I*, may not be modified.

The MMDR, however, is a template and will be configured by OBO for each project. Once finalized by OBO, the requirements stated in the MMDR become contractual.

Anatomy of Part I

From Uniformat 2010

Omniclass Number

Uniformat Number

Description

Associated Masterformat Sections

Modeling Requirements

Graphic Examples

Level of Development Specification
Version: 2019

Part I

www.bimforum.org/lod

Uniformat	Omniclass	
B1010.10.11	21-02 10 10 10 11	Precast Structural Inverted T Beam (Concrete)

Includes: Structural elements required for support of floor construction within basements and above grade. Includes columns, girders, beams, trusses, joists. Includes cast-in-place concrete, precast concrete, unit masonry, metal framed, and wood framed systems. Includes framed and sleeved openings for services.Includes Floor Construction Supplementary Components as appropriate.

Associated Masterformat Sections: 03 30 00 / 03 40 00 / 04 20 00 / 05 10 00 / 05 20 00 05 21 23 / 05 42 00 / 05 44 00 / 06 11 00 / 06 13 00 / 06 13 26 / 06 17 33 / 06 17 36 06 17 53 / 06 18 13 / 06 18 16 / 06 50 00

100	See B10
200	Element modeling to include: • Type of structural concrete system • Approximate geometry (e.g. depth) of structural elements

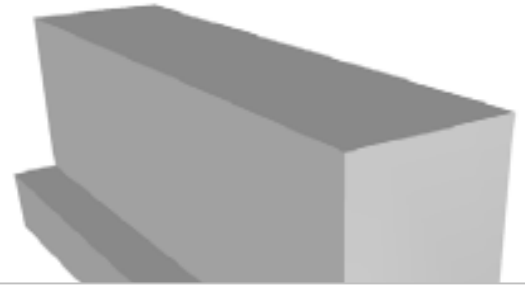


Image source: BIMForum

Exercise

- What system/LOD would you specify to get accurate rough openings in interior walls?
- What system/LOD would you specify to get roof trusses with accurate profiles and panel points?

BIMForum LOD Specification

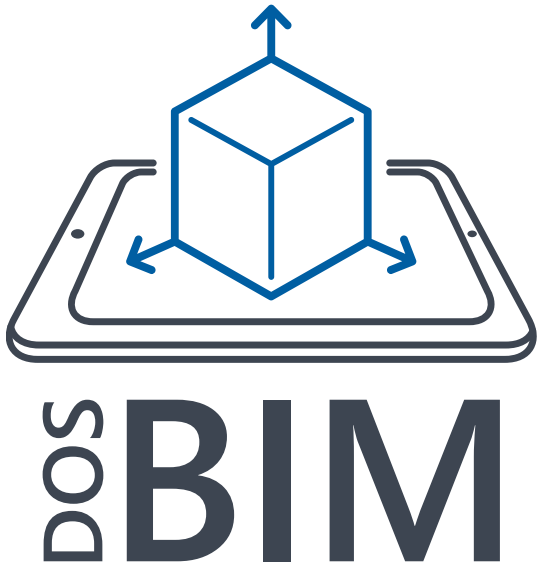
www.bimforum.org/lod

Image source: BIMForum

- The Spec is not a set of requirements
- It's a framework that provides a language for setting requirements
- The user sets requirements by developing the MMDR – see Module 120.4

BIMForum LOD Specification

Due to its inclusion of broad interdisciplinary input the LOD Spec has gained wide industry acceptance. In its effort to align with industry standards OBO has adopted this specification to define its use of the LOD framework.



OBO LOD & MMDR Training – Project Manager and AE Course

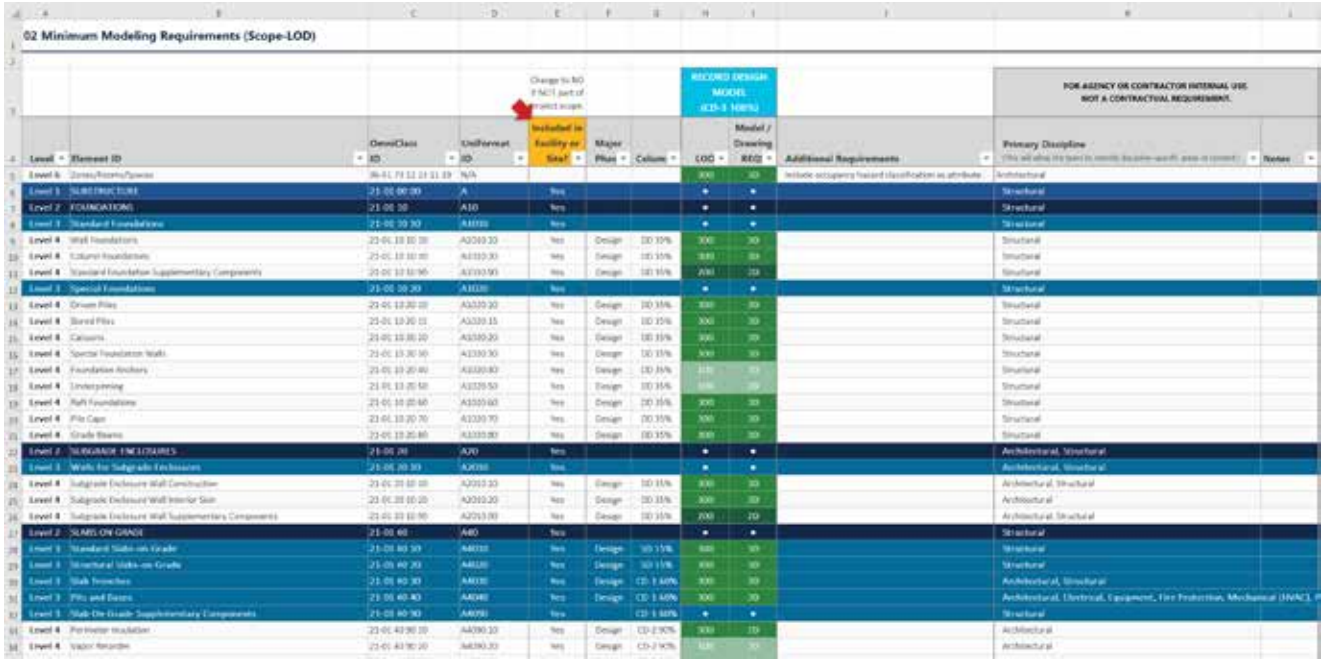
Introduction to OBO's Minimum Modeling and Data Requirements (MMDR)

The MMDR Workbook

- OBO's Minimum Modeling and Data Requirements (MMDR) sets standards for the content of the AEs' models and the drawings and schedules generated from them for the design submittals. The workbook includes 6 tabs.
  - **Tab 1: Instructions**, shown here. This tab includes instructions for use of the workbook in defining model requirements and capturing data.
  - **Tab 6: Definitions and Glossary**. Provides a reference for terms used in the workbook. This tab states that the *BIMForum LOD Spec version 20*19 will be used.

The MMDR Workbook

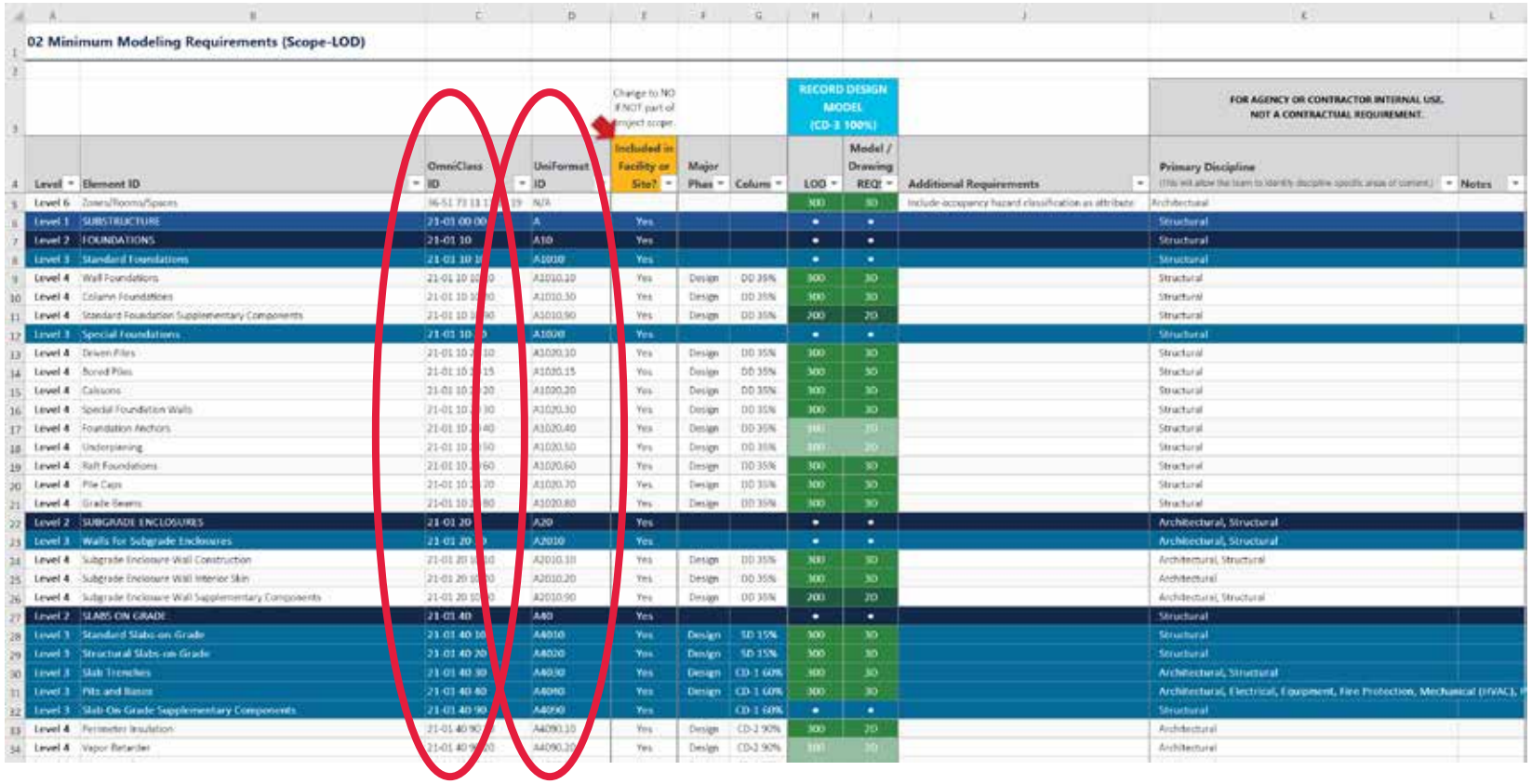
- Tab 2 is an expansion and replacement of OBO's previous Minimum Modeling Requirement (MMR).
- The MMR addressed model geometry in detail. It only indicated whether or not data was required for a particular element. In addition to the geometry requirements the MMDR sets requirements for *what* data is required.
- The next slides show the function of each column.


02 Minimum Modeling Requirements (Scope-LOD)

Level	Element ID	OmniClass ID	UniFormat ID	Included in Facility or Site?	Major Plan	Column	LOD	Model / Drawing REQ	Additional Requirements	Primary Discipline	Notes
Level 0	Zones/Rooms/Spaces	36-61 79 11 11 11 19	N/A				300	30	Include occupancy hazard classification as attribute	Architectural	
Level 1	SUBSTRUCTURE	21-01 00 00	A	Yes			•	•		Structural	
Level 2	FOUNDATIONS	21-01 10	A10	Yes			•	•		Structural	
Level 3	Standard Foundations	21-01 10 30	A1030	Yes			•	•		Structural	
Level 4	Wall Foundations	21-01 10 10 10	A1030.10	Yes	Design	10-15%	300	30		Structural	
Level 4	Column Foundations	21-01 10 10 30	A1030.30	Yes	Design	10-15%	300	30		Structural	
Level 4	Standard Foundation Supplementary Components	21-01 10 10 90	A1030.90	Yes	Design	10-15%	200	20		Structural	
Level 3	Special Foundations	21-01 10 20	A1020	Yes			•	•		Structural	
Level 4	Driven Piles	21-01 10 20 10	A1020.10	Yes	Design	10-15%	300	30		Structural	
Level 4	Bored Piles	21-01 10 20 15	A1020.15	Yes	Design	10-15%	300	30		Structural	
Level 4	Caissons	21-01 10 20 20	A1020.20	Yes	Design	10-15%	300	30		Structural	
Level 4	Spector Foundation Walls	21-01 10 20 30	A1020.30	Yes	Design	10-15%	300	30		Structural	
Level 4	Foundation Anchors	21-01 10 20 40	A1020.40	Yes	Design	10-15%	300	30		Structural	
Level 4	Underpinning	21-01 10 20 50	A1020.50	Yes	Design	10-15%	300	30		Structural	
Level 4	Raft Foundations	21-01 10 20 60	A1020.60	Yes	Design	10-15%	300	30		Structural	
Level 4	Pile Caps	21-01 10 20 70	A1020.70	Yes	Design	10-15%	300	30		Structural	
Level 4	Grade Beams	21-01 10 20 80	A1020.80	Yes	Design	10-15%	300	30		Structural	
Level 2	SUBGRADE ENCLOSURES	21-01 20	A20	Yes			•	•		Architectural, Structural	
Level 3	Walls for Subgrade Enclosures	21-01 20 10	A2010	Yes			•	•		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Construction	21-01 20 10 10	A2010.10	Yes	Design	10-15%	300	30		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Interior Skin	21-01 20 10 20	A2010.20	Yes	Design	10-15%	300	30		Architectural	
Level 4	Subgrade Enclosure Wall Supplementary Components	21-01 20 10 90	A2010.90	Yes	Design	10-15%	200	20		Architectural, Structural	
Level 2	SLABS ON GRADE	21-01 40	A40	Yes			•	•		Structural	
Level 3	Standard Slabs-on-Grade	21-01 40 10	A4010	Yes	Design	10-15%	300	30		Structural	
Level 3	Structural Slabs-on-Grade	21-01 40 20	A4020	Yes	Design	10-15%	300	30		Structural	
Level 3	Slab Trenches	21-01 40 30	A4030	Yes	Design	CD-1 60%	300	30		Architectural, Structural	
Level 3	Pits and Bases	21-01 40 40	A4040	Yes	Design	CD-1 60%	300	20		Architectural, Electrical, Equipment, Fire Protection, Mechanical (HVAC), P	
Level 3	Slab On Grade Supplementary Components	21-01 40 90	A4090	Yes		CD-1 60%	•	•		Structural	
Level 4	Perimeter Insulation	23-01 40 90 10	A4090.10	Yes	Design	CD-2 90%	300	20		Architectural	
Level 4	Vapor Retarders	23-01 40 90 20	A4090.20	Yes	Design	CD-2 90%	300	30		Architectural	

The MMDR Workbook

- **Col. C & D – Omniclass/Uniformat ID:** Defined in the Construction Specification Institute's (CSI) Omniclass Table 21 and Uniformat 2010.

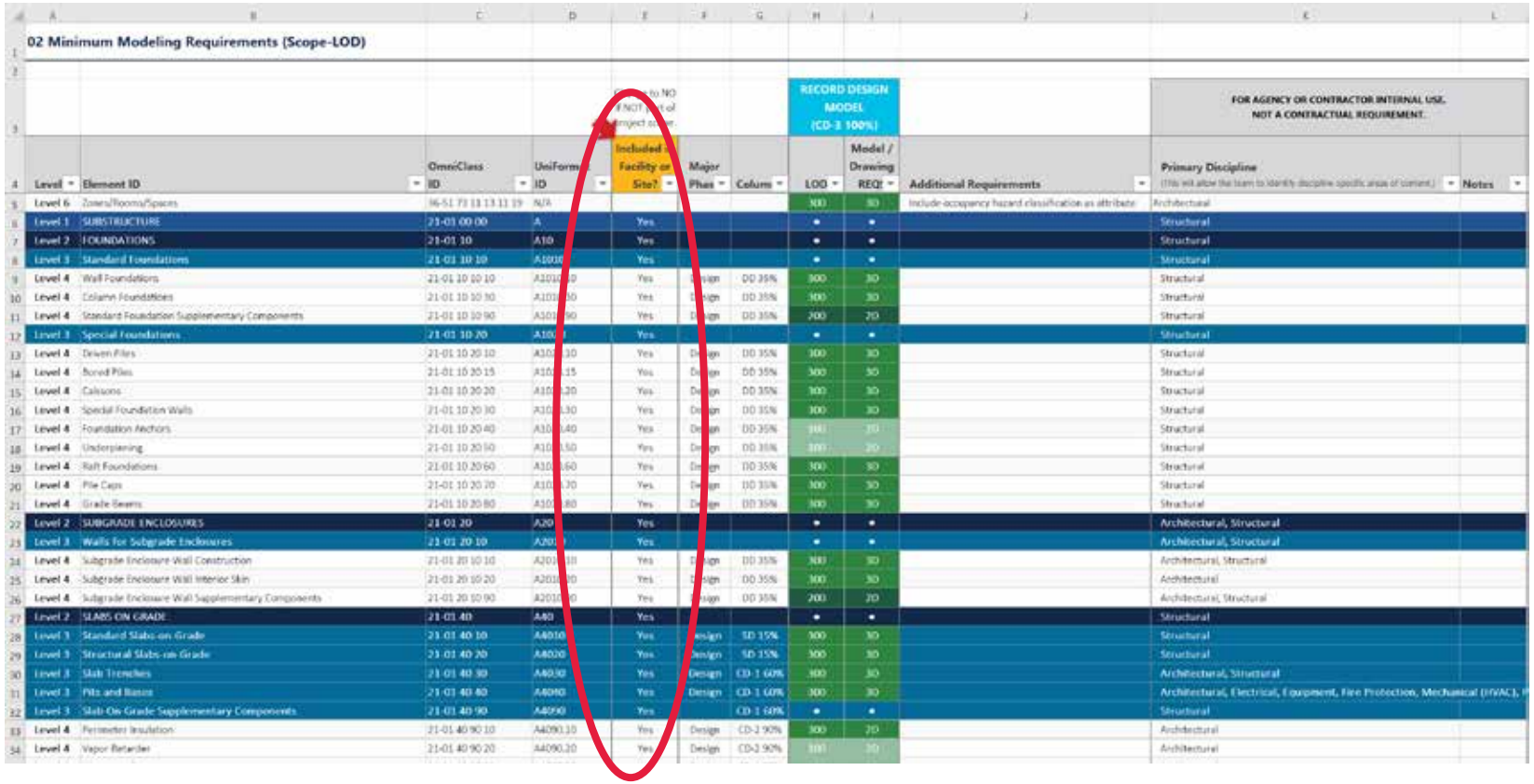


02 Minimum Modeling Requirements (Scope-LOD)

Level	Element ID	OmniClass ID	UniFormat ID	Included in Facility or Site?	Major Phas	Colum	RECORD DESIGN MODEL (CD-3 100%) LOD	Model / Drawing REQ	Additional Requirements	FOR AGENCY OR CONTRACTOR INTERNAL USE. NOT A CONTRACTUAL REQUIREMENT. Primary Discipline	Notes
Level 6	Zones/Rooms/Spaces	16-51 73 13 19	N/A				300	3D	Include occupancy hazard classification as attribute	Architectural	
Level 1	SUBSTRUCTURE	21-01 00 00	A	Yes			•	•		Structural	
Level 2	FOUNDATIONS	21-01 10	A10	Yes			•	•		Structural	
Level 3	Standard Foundations	21-01 10 10	A1010	Yes			•	•		Structural	
Level 4	Wall Foundations	21-01 10 10 30	A1010.10	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Column Foundations	21-01 10 10 50	A1010.30	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Standard Foundation Supplementary Components	21-01 10 10 90	A1010.90	Yes	Design	DD 35%	200	2D		Structural	
Level 3	Special Foundations	21-01 10 20	A1020	Yes			•	•		Structural	
Level 4	Driven Piles	21-01 10 20 10	A1020.10	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Bored Piles	21-01 10 20 15	A1020.15	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Caissons	21-01 10 20 20	A1020.20	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Special Foundation Walls	21-01 10 20 30	A1020.30	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Foundation Anchors	21-01 10 20 40	A1020.40	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Underpinning	21-01 10 20 50	A1020.50	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Raft Foundations	21-01 10 20 60	A1020.60	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Pile Caps	21-01 10 20 70	A1020.70	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Grade Beams	21-01 10 20 80	A1020.80	Yes	Design	DD 35%	300	3D		Structural	
Level 2	SUBGRADE ENCLOSURES	21-01 20	A20	Yes			•	•		Architectural, Structural	
Level 3	Walls for Subgrade Enclosures	21-01 20 10	A2010	Yes			•	•		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Construction	21-01 20 10 10	A2010.10	Yes	Design	DD 35%	300	3D		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Interior Skin	21-01 20 10 20	A2010.20	Yes	Design	DD 35%	300	3D		Architectural	
Level 4	Subgrade Enclosure Wall Supplementary Components	21-01 20 10 90	A2010.90	Yes	Design	DD 35%	200	2D		Architectural, Structural	
Level 2	SLABS ON GRADE	21-01 40	A40	Yes			•	•		Structural	
Level 3	Standard Slabs-on-Grade	21-01 40 10	A4010	Yes	Design	SD 15%	300	3D		Structural	
Level 3	Structural Slabs-on-Grade	21-01 40 20	A4020	Yes	Design	SD 15%	300	3D		Structural	
Level 3	Slab Trenches	21-01 40 30	A4030	Yes	Design	CD-1 60%	300	3D		Architectural, Structural	
Level 3	Pits and Bases	21-01 40 40	A4040	Yes	Design	CD-1 60%	300	3D		Architectural, Electrical, Equipment, Fire Protection, Mechanical (HVAC),	
Level 3	Slab-On-Grade Supplementary Components	21-01 40 90	A4090	Yes		CD-1 60%	•	•		Structural	
Level 4	Perimeter Insulation	21-01 40 90 10	A4090.10	Yes	Design	CD-2 90%	300	2D		Architectural	
Level 4	Vapor Retarder	21-01 40 90 20	A4090.20	Yes	Design	CD-2 90%	300	3D		Architectural	

The MMDR Workbook

- **Col. E – Included in Facility or Site:** A "Yes" in this column indicates a contractual obligation to model the element per the requirements specified in this spreadsheet.



02 Minimum Modeling Requirements (Scope-LOD)

Level	Element ID	OmniClass ID	UniFormat ID	Included in Facility or Site?	Major Phas	Colum	RECORD DESIGN MODEL (CD-3 100%) LOD	Model / Drawing REQ	Additional Requirements	FOR AGENCY OR CONTRACTOR INTERNAL USE. NOT A CONTRACTUAL REQUIREMENT. Primary Discipline	Notes
Level 6	Zones/Rooms/Spaces	16-51 73 13 13 11 19	N/A				300	30	Include occupancy hazard classification as attribute	Architectural	
Level 1	SUBSTRUCTURE	21-01 00 00	A	Yes			•	•		Structural	
Level 2	FOUNDATIONS	21-01 10	A10	Yes			•	•		Structural	
Level 3	Standard Foundations	21-01 10 10	A1010	Yes			•	•		Structural	
Level 4	Wall Foundations	21-01 10 10 10	A1010.10	Yes	Design	DD 35%	300	30		Structural	
Level 4	Column Foundations	21-01 10 10 30	A1010.30	Yes	Design	DD 35%	300	30		Structural	
Level 4	Standard Foundation Supplementary Components	21-01 10 10 90	A1010.90	Yes	Design	DD 35%	200	20		Structural	
Level 3	Special Foundations	21-01 10 20	A1020	Yes			•	•		Structural	
Level 4	Driven Piles	21-01 10 20 10	A1020.10	Yes	Design	DD 35%	300	30		Structural	
Level 4	Bored Piles	21-01 10 20 15	A1020.15	Yes	Design	DD 35%	300	30		Structural	
Level 4	Caissons	21-01 10 20 20	A1020.20	Yes	Design	DD 35%	300	30		Structural	
Level 4	Special Foundation Walls	21-01 10 20 30	A1020.30	Yes	Design	DD 35%	300	30		Structural	
Level 4	Foundation Anchors	21-01 10 20 40	A1020.40	Yes	Design	DD 35%	300	30		Structural	
Level 4	Underpinning	21-01 10 20 50	A1020.50	Yes	Design	DD 35%	300	30		Structural	
Level 4	Raft Foundations	21-01 10 20 60	A1020.60	Yes	Design	DD 35%	300	30		Structural	
Level 4	Pile Caps	21-01 10 20 70	A1020.70	Yes	Design	DD 35%	300	30		Structural	
Level 4	Grade Beams	21-01 10 20 80	A1020.80	Yes	Design	DD 35%	300	30		Structural	
Level 2	SUBGRADE ENCLOSURES	21-01 20	A20	Yes			•	•		Architectural, Structural	
Level 3	Walls for Subgrade Enclosures	21-01 20 10	A2010	Yes			•	•		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Construction	21-01 20 10 10	A2010.10	Yes	Design	DD 35%	300	30		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Interior Skin	21-01 20 10 20	A2010.20	Yes	Design	DD 35%	300	30		Architectural	
Level 4	Subgrade Enclosure Wall Supplementary Components	21-01 20 10 90	A2010.90	Yes	Design	DD 35%	200	20		Architectural, Structural	
Level 2	SLABS ON GRADE	21-01 40	A40	Yes			•	•		Structural	
Level 3	Standard Slabs-on-Grade	21-01 40 10	A4010	Yes	Design	SD 15%	300	30		Structural	
Level 3	Structural Slabs-on-Grade	21-01 40 20	A4020	Yes	Design	SD 15%	300	30		Structural	
Level 3	Slab Trenches	21-01 40 30	A4030	Yes	Design	CD-1 60%	300	30		Architectural, Structural	
Level 3	Pits and Bases	21-01 40 60	A4060	Yes	Design	CD-1 60%	300	30		Architectural, Electrical, Equipment, Fire Protection, Mechanical (HVAC),	
Level 3	Slab On Grade Supplementary Components	21-01 40 90	A4090	Yes		CD-1 60%	•	•		Structural	
Level 4	Perimeter Insulation	21-01 40 90 10	A4090.10	Yes	Design	CD-2 90%	300	20		Architectural	
Level 4	Vapor Retarder	21-01 40 90 20	A4090.20	Yes	Design	CD-2 90%	300	30		Architectural	

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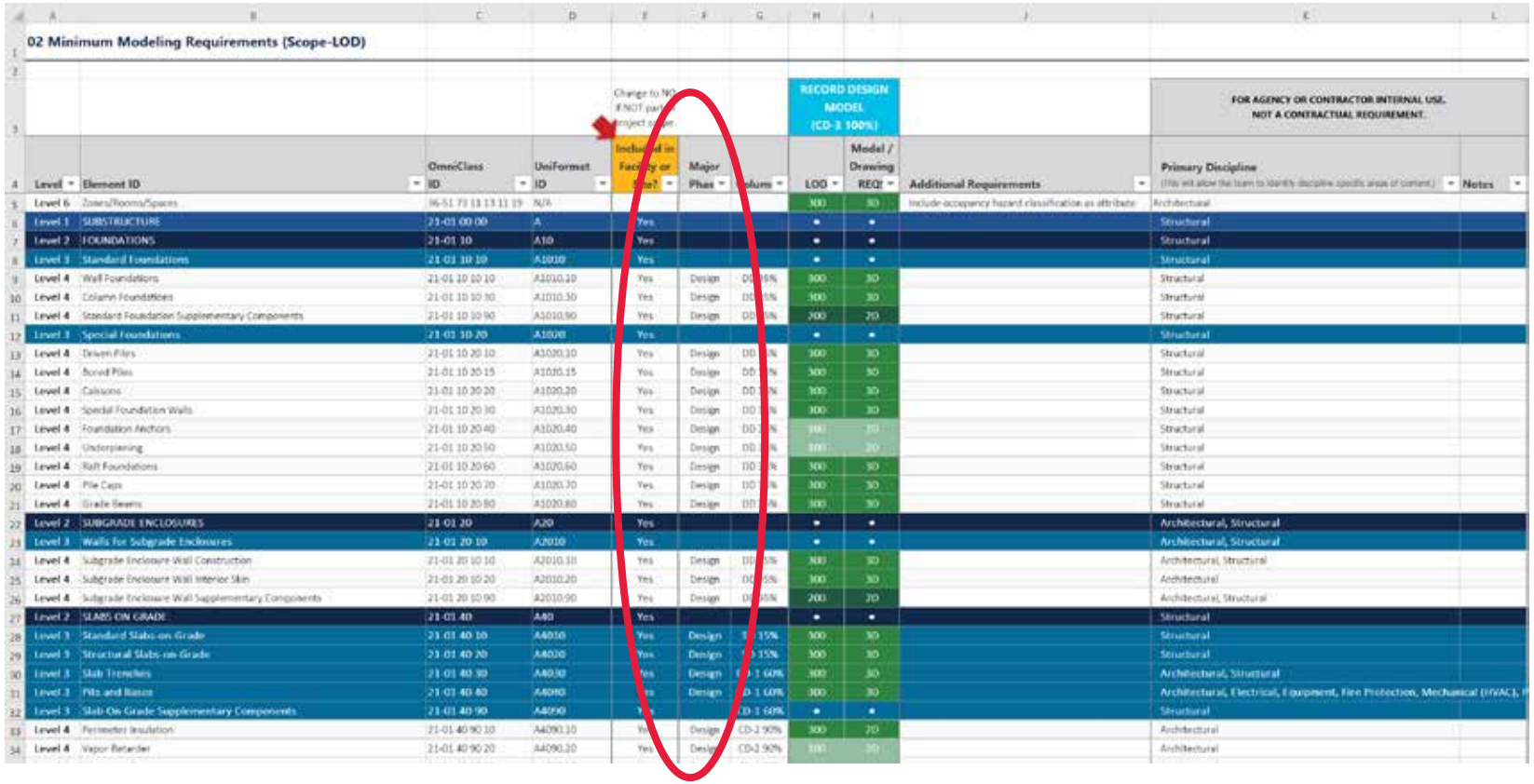
- **Col. F – Major Phase:** Design or Construction



02 Minimum Modeling Requirements (Scope-LOD)

Level	Element ID	OmniClass ID	UniFormat ID	Included in Facility or Site?	Major Phase	Column	LOD	Model / Drawing REQ	Additional Requirements	Primary Discipline	Notes
				Change to NO if NOT part of project scope			RECORD DESIGN MODEL (CD-3 100%)			FOR AGENCY OR CONTRACTOR INTERNAL USE. NOT A CONTRACTUAL REQUIREMENT.	
Level 6	Zones/Rooms/Spaces	46-51 73 13 13 11 19	N/A				300	30	Include occupancy hazard classification as attribute	Architectural	
Level 1	SUBSTRUCTURE	21-01 00 00	A	Yes			•	•		Structural	
Level 2	FOUNDATIONS	21-01 10	A10	Yes			•	•		Structural	
Level 3	Standard Foundations	21-01 10 10	A1010	Yes			•	•		Structural	
Level 4	Wall Foundations	21-01 10 10 10	A1010.10	Yes	Design	DD 95%	300	30		Structural	
Level 4	Column Foundations	21-01 10 10 30	A1010.30	Yes	Design	DD 95%	300	30		Structural	
Level 4	Standard Foundation Supplementary Components	21-01 10 10 90	A1010.90	Yes	Design	DD 95%	200	20		Structural	
Level 3	Special Foundations	21-01 10 20	A1020	Yes			•	•		Structural	
Level 4	Driven Piles	21-01 10 20 10	A1020.10	Yes	Design	DD 95%	300	30		Structural	
Level 4	Bored Piles	21-01 10 20 15	A1020.15	Yes	Design	DD 95%	300	30		Structural	
Level 4	Caissons	21-01 10 20 20	A1020.20	Yes	Design	DD 95%	300	30		Structural	
Level 4	Special Foundation Walls	21-01 10 20 30	A1020.30	Yes	Design	DD 95%	300	30		Structural	
Level 4	Foundation Anchors	21-01 10 20 40	A1020.40	Yes	Design	DD 95%	300	30		Structural	
Level 4	Underpinning	21-01 10 20 50	A1020.50	Yes	Design	DD 95%	300	20		Structural	
Level 4	Raft Foundations	21-01 10 20 60	A1020.60	Yes	Design	DD 95%	300	30		Structural	
Level 4	Pile Caps	21-01 10 20 70	A1020.70	Yes	Design	DD 95%	300	30		Structural	
Level 4	Grade Beams	21-01 10 20 80	A1020.80	Yes	Design	DD 95%	300	30		Structural	
Level 2	SUBGRADE ENCLOSURES	21-01 20	A20	Yes			•	•		Architectural, Structural	
Level 3	Walls for Subgrade Enclosures	21-01 20 10	A2010	Yes			•	•		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Construction	21-01 20 10 10	A2010.10	Yes	Design	DD 95%	300	30		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Interior Skin	21-01 20 10 20	A2010.20	Yes	Design	DD 95%	300	30		Architectural	
Level 4	Subgrade Enclosure Wall Supplementary Components	21-01 20 10 90	A2010.90	Yes	Design	DD 95%	200	20		Architectural, Structural	
Level 2	SLABS ON GRADE	21-01 40	A40	Yes			•	•		Structural	
Level 3	Standard Slabs-on-Grade	21-01 40 10	A4010	Yes	Design	CD-2 95%	300	30		Structural	
Level 3	Structural Slabs-on-Grade	21-01 40 20	A4020	Yes	Design	CD-2 95%	300	30		Structural	
Level 3	Slab Trenches	21-01 40 30	A4030	Yes	Design	CD-1 60%	300	30		Architectural, Structural	
Level 3	Pits and Bases	21-01 40 40	A4040	Yes	Design	CD-1 60%	300	30		Architectural, Electrical, Equipment, Fire Protection, Mechanical (HVAC),	
Level 3	Slab-On-Grade Supplementary Components	21-01 40 90	A4090	Yes		CD-1 60%	•	•		Structural	
Level 4	Perimeter Insulation	21-01 40 90 10	A4090.10	Yes	Design	CD-2 90%	300	20		Architectural	
Level 4	Vapor Retarder	21-01 40 90 20	A4090.20	Yes	Design	CD-2 90%	300	30		Architectural	

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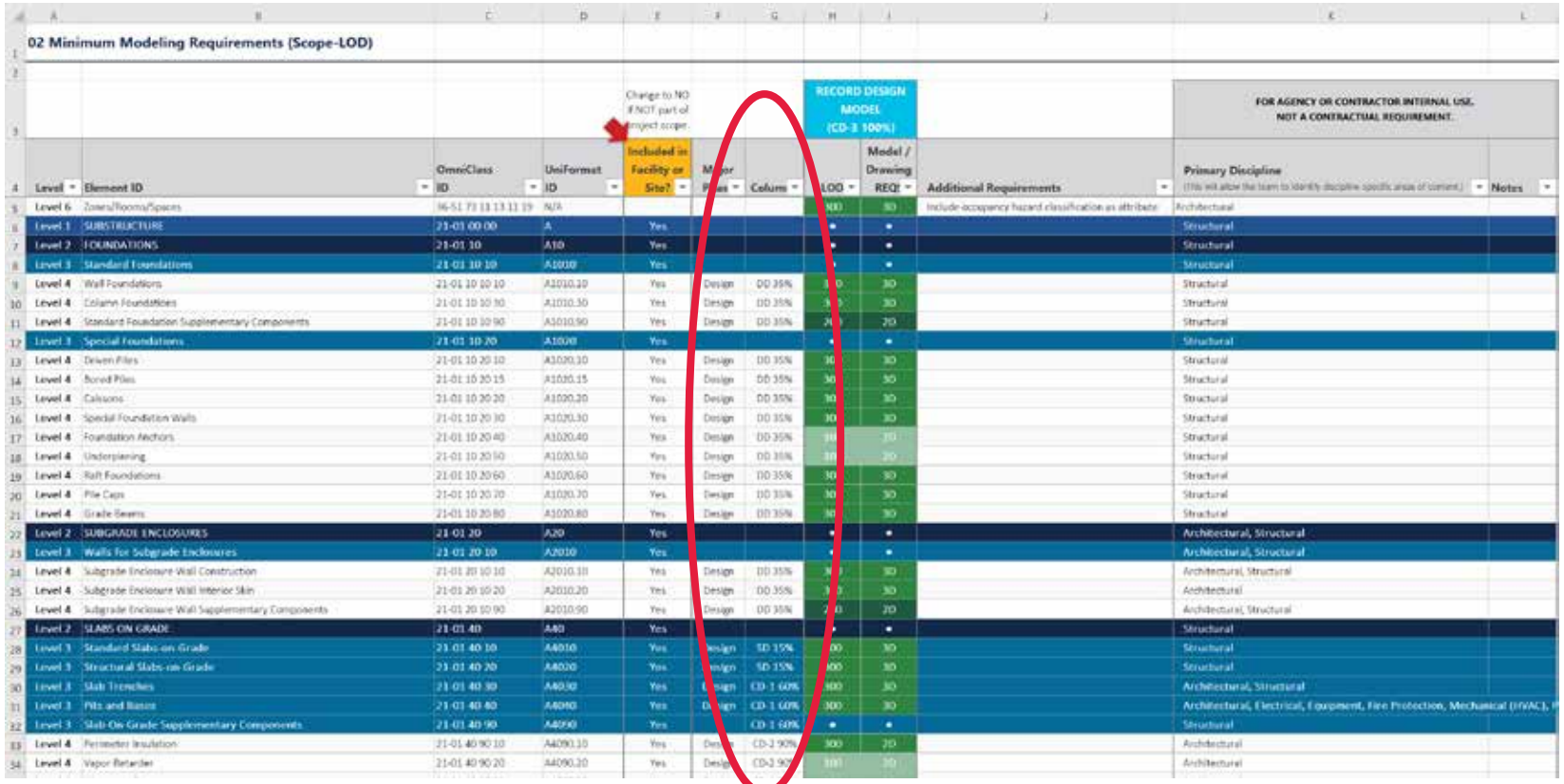
- **Col. G –Minor Phase:** The phase designations here are as defined for OBO's Integrated Design Review (IDR) process. The entries in Columns F and G indicate the phase at which the element must first be modeled. Note that for phases prior to CD-3 the LOD of an element may be lower than the final LOD specified in Col. H.



02 Minimum Modeling Requirements (Scope-LOD)

	Level	Element ID	OmniClass ID	UniFormat ID	Included in Facility or Site?	Minor Phase	Column	LOD	Model / Drawing REQ	Additional Requirements	Primary Discipline	Notes
					Change to NO if NOT part of project scope.			RECORD DESIGN MODEL (CD-3 100%)			FOR AGENCY OR CONTRACTOR INTERNAL USE. NOT A CONTRACTUAL REQUIREMENT.	
5	Level 6	Zones/Rooms/Spaces	16-51 73 13 13 11 19	N/A				300	30	Include occupancy hazard classification as attribute	Architectural	
6	Level 1	SUBSTRUCTURE	21-01 00 00	A	Yes			•	•		Structural	
7	Level 2	FOUNDATIONS	21-01 10	A10	Yes			•	•		Structural	
8	Level 3	Standard Foundations	21-01 10 10	A1010	Yes			•	•		Structural	
9	Level 4	Wall Foundations	21-01 10 10 10	A1010.10	Yes	Design	DD 35%	300	30		Structural	
10	Level 4	Column Foundations	21-01 10 10 30	A1010.30	Yes	Design	DD 35%	300	30		Structural	
11	Level 4	Standard Foundation Supplementary Components	21-01 10 10 90	A1010.90	Yes	Design	DD 35%	200	200		Structural	
12	Level 3	Special Foundations	21-01 10 20	A1020	Yes			•	•		Structural	
13	Level 4	Driven Piles	21-01 10 20 10	A1020.10	Yes	Design	DD 35%	300	300		Structural	
14	Level 4	Bored Piles	21-01 10 20 15	A1020.15	Yes	Design	DD 35%	300	300		Structural	
15	Level 4	Caissons	21-01 10 20 20	A1020.20	Yes	Design	DD 35%	300	300		Structural	
16	Level 4	Special Foundation Walls	21-01 10 20 30	A1020.30	Yes	Design	DD 35%	300	300		Structural	
17	Level 4	Foundation Anchors	21-01 10 20 40	A1020.40	Yes	Design	DD 35%	300	200		Structural	
18	Level 4	Underpinning	21-01 10 20 50	A1020.50	Yes	Design	DD 35%	300	200		Structural	
19	Level 4	Raft Foundations	21-01 10 20 60	A1020.60	Yes	Design	DD 35%	300	300		Structural	
20	Level 4	Pile Caps	21-01 10 20 70	A1020.70	Yes	Design	DD 35%	300	300		Structural	
21	Level 4	Grade Beams	21-01 10 20 80	A1020.80	Yes	Design	DD 35%	300	300		Structural	
22	Level 2	SUBGRADE ENCLOSURES	21-01 20	A20	Yes			•	•		Architectural, Structural	
23	Level 3	Walls for Subgrade Enclosures	21-01 20 10	A2010	Yes			•	•		Architectural, Structural	
24	Level 4	Subgrade Enclosure Wall Construction	21-01 20 10 10	A2010.10	Yes	Design	DD 35%	300	300		Architectural, Structural	
25	Level 4	Subgrade Enclosure Wall Interior Skin	21-01 20 10 20	A2010.20	Yes	Design	DD 35%	300	300		Architectural	
26	Level 4	Subgrade Enclosure Wall Supplementary Components	21-01 20 10 90	A2010.90	Yes	Design	DD 35%	200	200		Architectural, Structural	
27	Level 2	SLABS ON GRADE	21-01 40	A40	Yes			•	•		Structural	
28	Level 3	Standard Slabs-on-Grade	21-01 40 10	A4010	Yes	Design	SD 15%	300	300		Structural	
29	Level 3	Structural Slabs-on-Grade	21-01 40 20	A4020	Yes	Design	SD 15%	300	300		Structural	
30	Level 3	Slab Trenches	21-01 40 30	A4030	Yes	Design	CD-1 60%	300	300		Architectural, Structural	
31	Level 3	Pits and Bases	21-01 40 60	A4060	Yes	Design	CD-1 60%	300	300		Architectural, Electrical, Equipment, Fire Protection, Mechanical (HVAC),	
32	Level 3	Slab-On-Grade Supplementary Components	21-01 40 90	A4090	Yes		CD-1 60%	•	•		Structural	
33	Level 4	Perimeter Insulation	21-01 40 90 10	A4090.10	Yes	Design	CD-2 90%	300	200		Architectural	
34	Level 4	Vapor Retarder	21-01 40 90 20	A4090.20	Yes	Design	CD-2 90%	300	300		Architectural	

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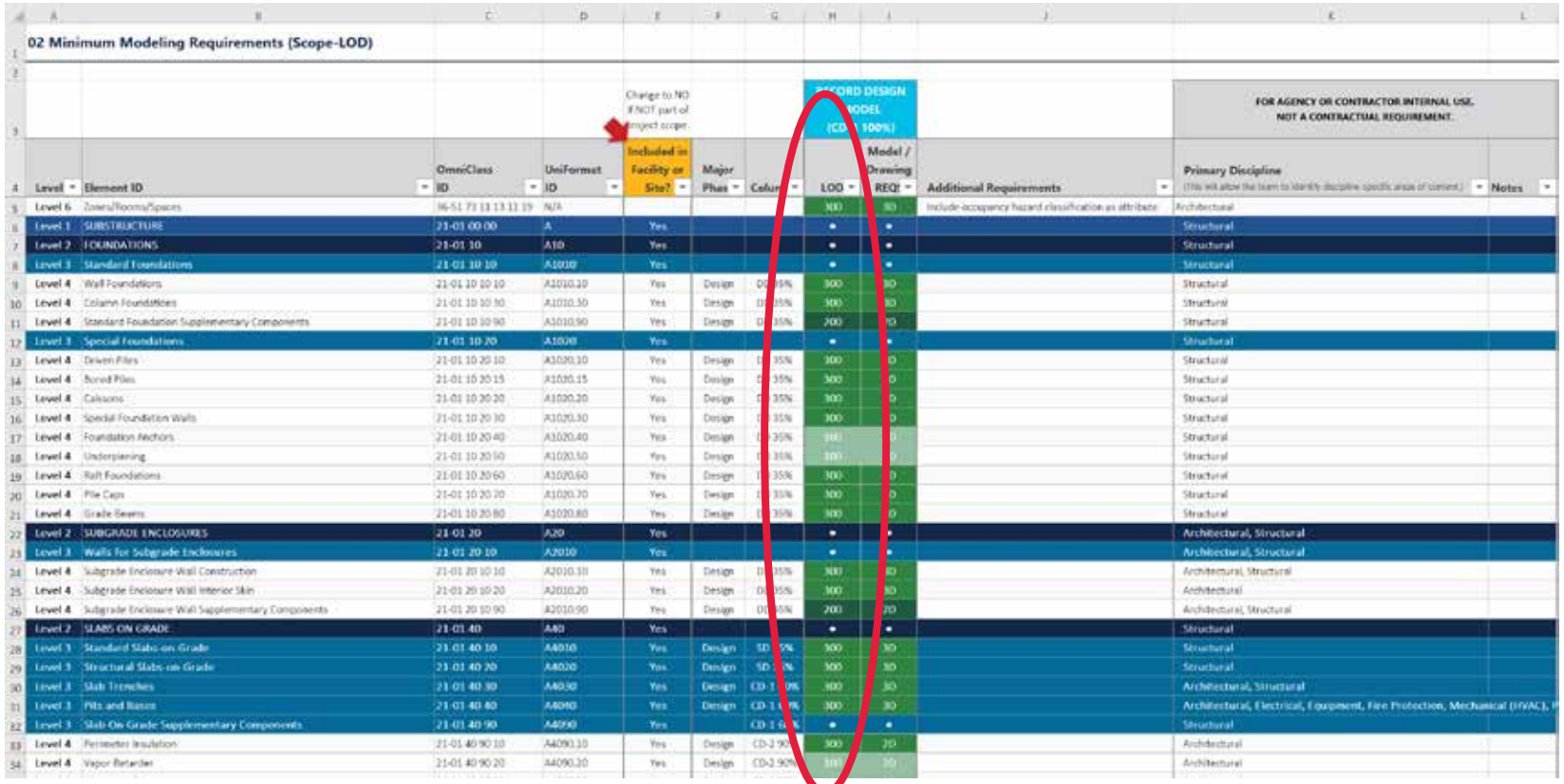
- **Col. H – LOD:** The *final* LOD (as defined by the *BIMForum LOD Spec*) for the CD-3 deliverable. Col. H is pre-populated with typical default values but these should be reviewed and adjusted as appropriate by the OBO team.



02 Minimum Modeling Requirements (Scope-LOD)

Level	Element ID	OmniClass ID	UniFormat ID	Included in Facility or Site?	Major Phas	Colum	LOD	Model / Drawing REQ	Additional Requirements	Primary Discipline	Notes
Level 6	Zones/Rooms/Spaces	16-51 73 13 13 11 19	N/A				300	30	Include occupancy hazard classification as attribute	Architectural	
Level 1	SUBSTRUCTURE	21-01 00 00	A	Yes			•	•		Structural	
Level 2	FOUNDATIONS	21-01 10	A10	Yes			•	•		Structural	
Level 3	Standard Foundations	21-01 10 10	A1010	Yes			•	•		Structural	
Level 4	Wall Foundations	21-01 10 10 10	A1010.10	Yes	Design	D	300	30		Structural	
Level 4	Column Foundations	21-01 10 10 30	A1010.30	Yes	Design	D	300	30		Structural	
Level 4	Standard Foundation Supplementary Components	21-01 10 10 90	A1010.90	Yes	Design	D	200	20		Structural	
Level 3	Special Foundations	21-01 10 20	A1020	Yes			•	•		Structural	
Level 4	Driven Piles	21-01 10 20 10	A1020.10	Yes	Design	D	300	0		Structural	
Level 4	Bored Piles	21-01 10 20 15	A1020.15	Yes	Design	D	300	0		Structural	
Level 4	Caissons	21-01 10 20 20	A1020.20	Yes	Design	D	300	0		Structural	
Level 4	Special Foundation Walls	21-01 10 20 30	A1020.30	Yes	Design	D	300	0		Structural	
Level 4	Foundation Anchors	21-01 10 20 40	A1020.40	Yes	Design	D	300	0		Structural	
Level 4	Underpinning	21-01 10 20 50	A1020.50	Yes	Design	D	300	0		Structural	
Level 4	Raft Foundations	21-01 10 20 60	A1020.60	Yes	Design	D	300	0		Structural	
Level 4	Pile Caps	21-01 10 20 70	A1020.70	Yes	Design	D	300	0		Structural	
Level 4	Grade Beams	21-01 10 20 80	A1020.80	Yes	Design	D	300	0		Structural	
Level 2	SUBGRADE ENCLOSURES	21-01 20	A20	Yes			•	•		Architectural, Structural	
Level 3	Walls for Subgrade Enclosures	21-01 20 10	A2010	Yes			•	•		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Construction	21-01 20 10 10	A2010.10	Yes	Design	D	300	30		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Interior Skin	21-01 20 10 20	A2010.20	Yes	Design	D	300	30		Architectural	
Level 4	Subgrade Enclosure Wall Supplementary Components	21-01 20 10 90	A2010.90	Yes	Design	D	200	20		Architectural, Structural	
Level 2	SLABS ON GRADE	21-01 40	A40	Yes			•	•		Structural	
Level 3	Standard Slabs-on-Grade	21-01 40 10	A4010	Yes	Design	SD	300	30		Structural	
Level 3	Structural Slabs-on-Grade	21-01 40 20	A4020	Yes	Design	SD	300	30		Structural	
Level 3	Slab Trenches	21-01 40 30	A4030	Yes	Design	CD-1	300	30		Architectural, Structural	
Level 3	Pits and Bases	21-01 40 60	A4060	Yes	Design	CD-1	300	30		Architectural, Electrical, Equipment, Fire Protection, Mechanical (HVAC),	
Level 3	Slab-On-Grade Supplementary Components	21-01 40 90	A4090	Yes		CD-1	•	•		Structural	
Level 4	Perimeter Insulation	21-01 40 90 10	A4090.10	Yes	Design	CD-2	300	20		Architectural	
Level 4	Vapor Retarder	21-01 40 90 20	A4090.20	Yes	Design	CD-2	300	30		Architectural	

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- **Col. H – LOD:** The *final* LOD (as defined by the *BIMForum LOD Spec*) for the CD-3 deliverable. Col. H is pre-populated with typical default values but these should be reviewed and adjusted as appropriate by the OBO team.
  - Note that elements in a model and the drawing set it generates will be at various LODs. While in a CD model or drawing set many components will be modeled with elements at LOD 300, in many cases LOD 200 elements (generic placeholders) or even LOD 100 (symbols, information attached to other elements) are sufficient.
  - Note also that LOD 300 is usually as high as AEs will go, since often LOD 350 and 400 require craft or trade knowledge.
  - The *LOD Specification* is revised annually, but all versions are kept available on the BIMForum website. Tab 6 of the MMDR, "Definitions & Glossary," specifies the 2019 version.

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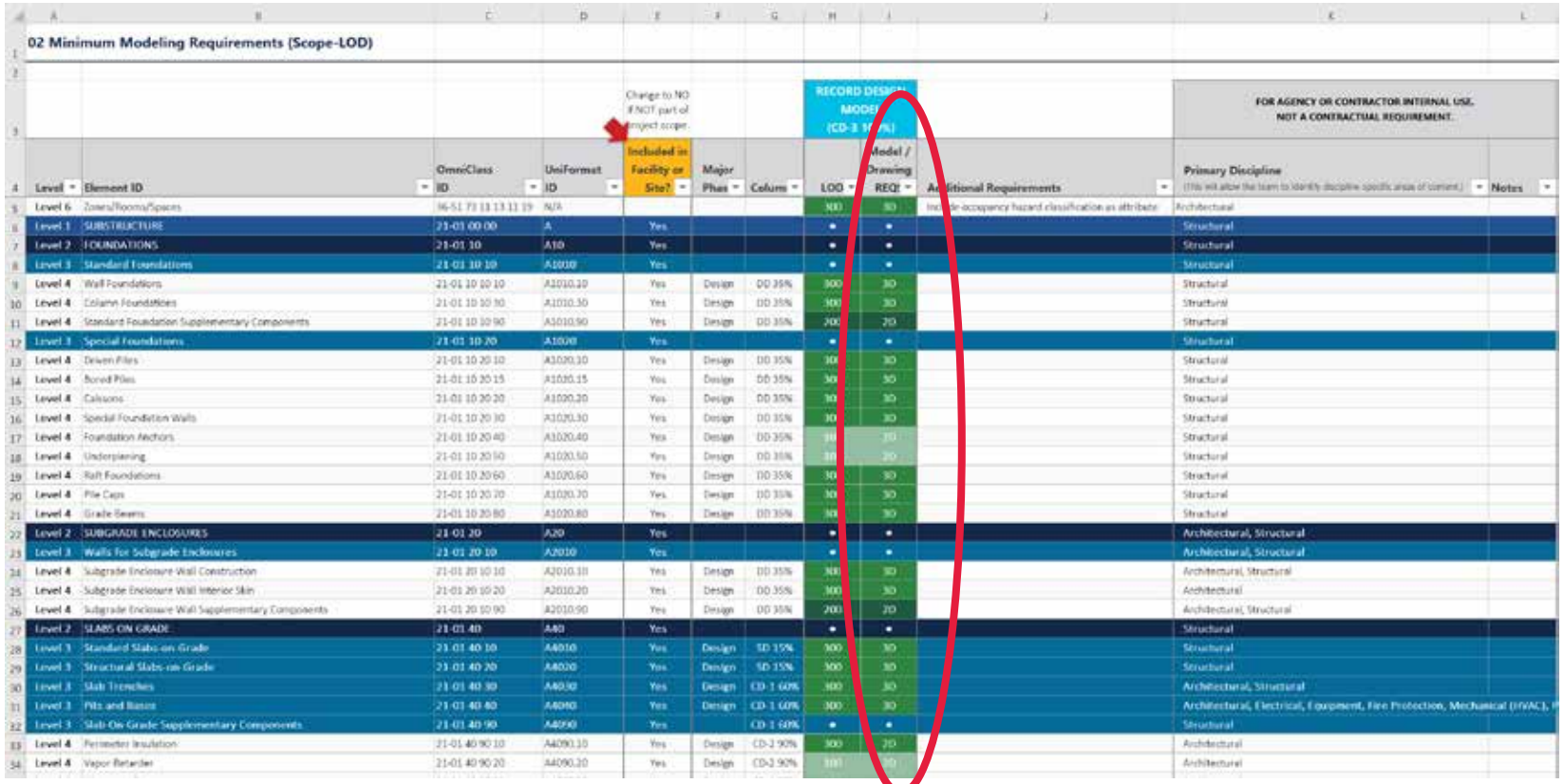
- **Col. I – Model/Drawing Reqs:** This column indicates whether the element must be modeled in 3 dimensions (3D) or may be shown by linework (2D) as shown in slide 6.



02 Minimum Modeling Requirements (Scope-LOD)

Level	Element ID	OmniClass ID	UniFormat ID	Included in Facility or Site?	Major Phas	Colum	LOD	Model / Drawing REQ	Additional Requirements	Primary Discipline	Notes
Level 6	Zones/Rooms/Spaces	16-51 73 13 13 11 19	N/A				300	3D		Architectural	
Level 1	SUBSTRUCTURE	21-01 00 00	A	Yes			•	•		Structural	
Level 2	FOUNDATIONS	21-01 10	A10	Yes			•	•		Structural	
Level 3	Standard Foundations	21-01 10 10	A1010	Yes			•	•		Structural	
Level 4	Wall Foundations	21-01 10 10 10	A1010.10	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Column Foundations	21-01 10 10 30	A1010.30	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Standard Foundation Supplementary Components	21-01 10 10 90	A1010.90	Yes	Design	DD 35%	200	2D		Structural	
Level 3	Special Foundations	21-01 10 20	A1020	Yes			•	•		Structural	
Level 4	Driven Piles	21-01 10 20 10	A1020.10	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Bored Piles	21-01 10 20 15	A1020.15	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Caissons	21-01 10 20 20	A1020.20	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Special Foundation Walls	21-01 10 20 30	A1020.30	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Foundation Anchors	21-01 10 20 40	A1020.40	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Underpinning	21-01 10 20 50	A1020.50	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Raft Foundations	21-01 10 20 60	A1020.60	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Pile Caps	21-01 10 20 70	A1020.70	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Grade Beams	21-01 10 20 80	A1020.80	Yes	Design	DD 35%	300	3D		Structural	
Level 2	SUBGRADE ENCLOSURES	21-01 20	A20	Yes			•	•		Architectural, Structural	
Level 3	Walls for Subgrade Enclosures	21-01 20 10	A2010	Yes			•	•		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Construction	21-01 20 10 10	A2010.10	Yes	Design	DD 35%	300	3D		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Interior Skin	21-01 20 10 20	A2010.20	Yes	Design	DD 35%	300	3D		Architectural	
Level 4	Subgrade Enclosure Wall Supplementary Components	21-01 20 10 90	A2010.90	Yes	Design	DD 35%	200	2D		Architectural, Structural	
Level 2	SLABS ON GRADE	21-01 40	A40	Yes			•	•		Structural	
Level 3	Standard Slabs-on-Grade	21-01 40 10	A4010	Yes	Design	SD 15%	300	3D		Structural	
Level 3	Structural Slabs-on-Grade	21-01 40 20	A4020	Yes	Design	SD 15%	300	3D		Structural	
Level 3	Slab Trenches	21-01 40 30	A4030	Yes	Design	CD-1 60%	300	3D		Architectural, Structural	
Level 3	Pits and Bases	21-01 40 60	A4060	Yes	Design	CD-1 60%	300	3D		Architectural, Electrical, Equipment, Fire Protection, Mechanical (HVAC),	
Level 3	Slab-On-Grade Supplementary Components	21-01 40 90	A4090	Yes		CD-1 60%	•	•		Structural	
Level 4	Perimeter Insulation	21-01 40 90 10	A4090.10	Yes	Design	CD-2 90%	300	2D		Architectural	
Level 4	Vapor Retarder	21-01 40 90 20	A4090.20	Yes	Design	CD-2 90%	300	2D		Architectural	

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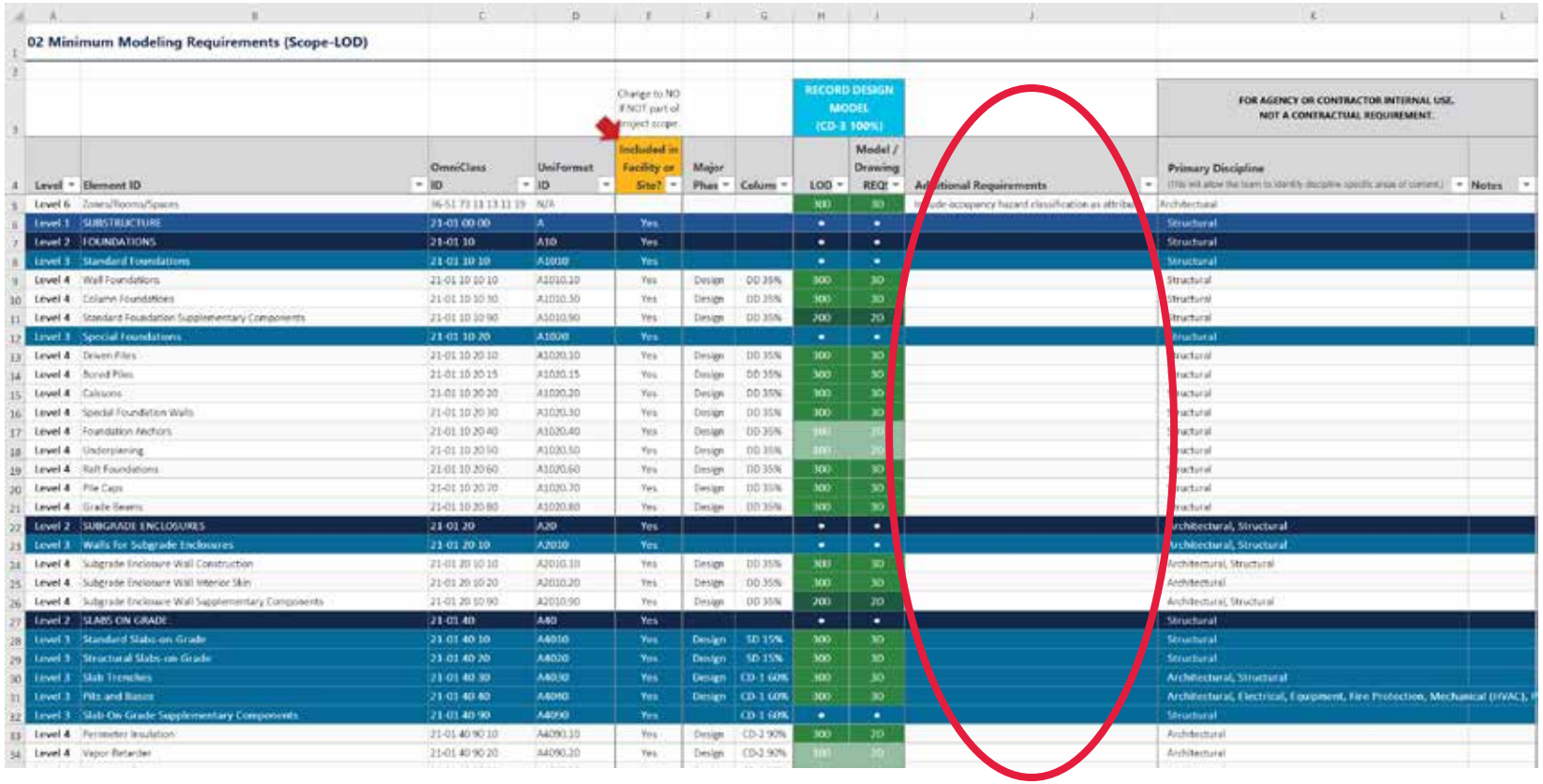
- **Col. J – Additional Requirements:** Requirements that are in addition to those defined in the BIMForum LOD Specification.

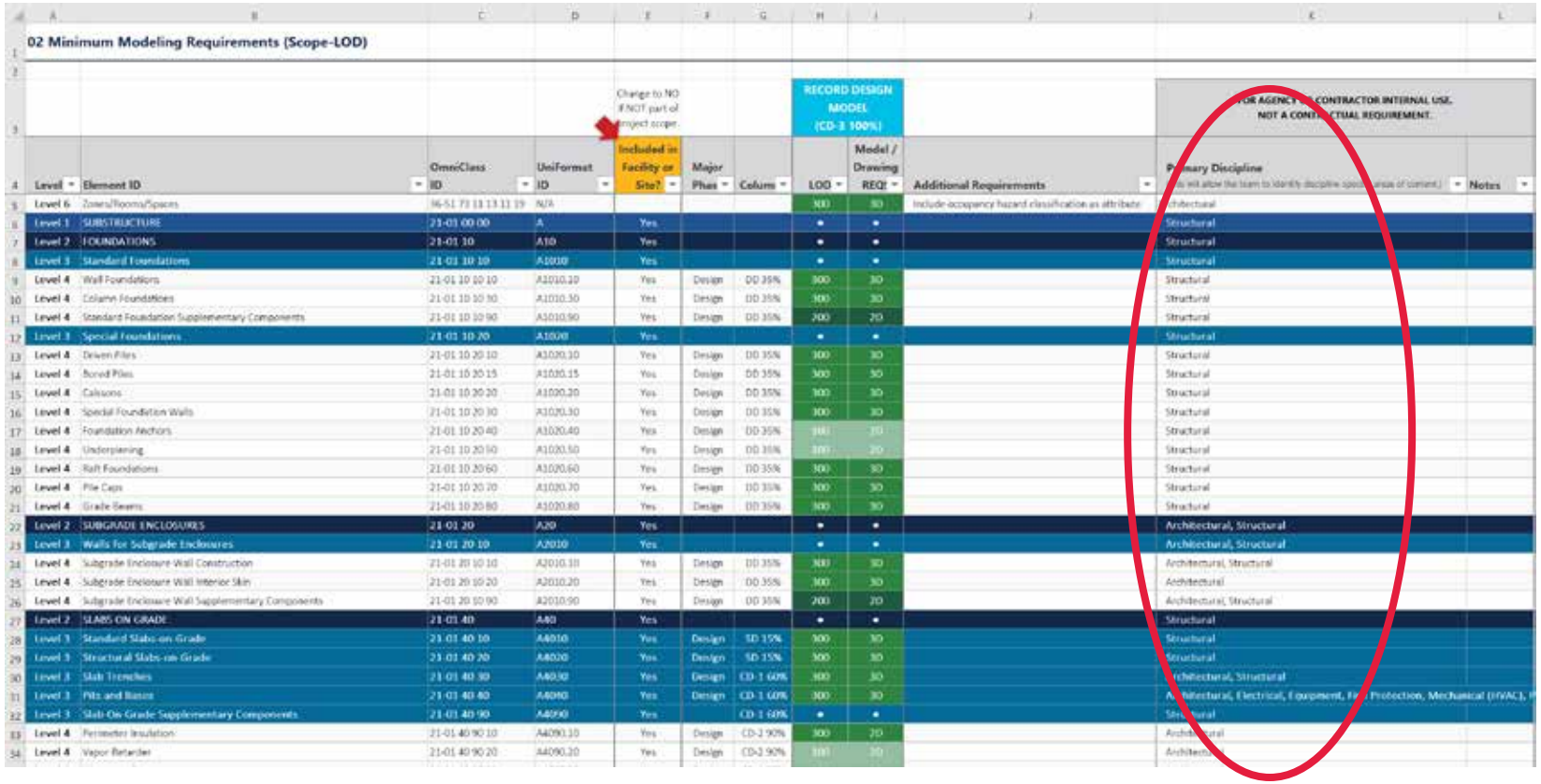


02 Minimum Modeling Requirements (Scope-LOD)

Level	Element ID	OmniClass ID	UniFormat ID	Included in Facility or Site?	Major Phas	Colum	RECORD DESIGN MODEL (CD-3 100%) LOD	Model / Drawing REQ	Additional Requirements	FOR AGENCY OR CONTRACTOR INTERNAL USE. NOT A CONTRACTUAL REQUIREMENT. Primary Discipline	Notes
Level 6	Zones/Rooms/Spaces	16-51 73 13 13 11 19	N/A				300	30		Architectural	
Level 1	SUBSTRUCTURE	21-01 00 00	A	Yes			•	•		Structural	
Level 2	FOUNDATIONS	21-01 10	A10	Yes			•	•		Structural	
Level 3	Standard Foundations	21-01 10 10	A1010	Yes			•	•		Structural	
Level 4	Wall Foundations	21-01 10 10 10	A1010.10	Yes	Design	DD 35%	300	30		Structural	
Level 4	Column Foundations	21-01 10 10 30	A1010.30	Yes	Design	DD 35%	300	30		Structural	
Level 4	Standard Foundation Supplementary Components	21-01 10 10 90	A1010.90	Yes	Design	DD 35%	200	20		Structural	
Level 3	Special Foundations	21-01 10 20	A1020	Yes			•	•		Structural	
Level 4	Driven Piles	21-01 10 20 10	A1020.10	Yes	Design	DD 35%	300	30		Structural	
Level 4	Bored Piles	21-01 10 20 15	A1020.15	Yes	Design	DD 35%	300	30		Structural	
Level 4	Caissons	21-01 10 20 20	A1020.20	Yes	Design	DD 35%	300	30		Structural	
Level 4	Special Foundation Walls	21-01 10 20 30	A1020.30	Yes	Design	DD 35%	300	30		Structural	
Level 4	Foundation Anchors	21-01 10 20 40	A1020.40	Yes	Design	DD 35%	300	30		Structural	
Level 4	Underpinning	21-01 10 20 50	A1020.50	Yes	Design	DD 35%	300	30		Structural	
Level 4	Raft Foundations	21-01 10 20 60	A1020.60	Yes	Design	DD 35%	300	30		Structural	
Level 4	Pile Caps	21-01 10 20 70	A1020.70	Yes	Design	DD 35%	300	30		Structural	
Level 4	Grade Beams	21-01 10 20 80	A1020.80	Yes	Design	DD 35%	300	30		Structural	
Level 2	SUBGRADE ENCLOSURES	21-01 20	A20	Yes			•	•		Architectural, Structural	
Level 3	Walls for Subgrade Enclosures	21-01 20 10	A2010	Yes			•	•		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Construction	21-01 20 10 10	A2010.10	Yes	Design	DD 35%	300	30		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Interior Skin	21-01 20 10 20	A2010.20	Yes	Design	DD 35%	300	30		Architectural	
Level 4	Subgrade Enclosure Wall Supplementary Components	21-01 20 10 90	A2010.90	Yes	Design	DD 35%	200	20		Architectural, Structural	
Level 2	SLABS ON GRADE	21-01 40	A40	Yes			•	•		Structural	
Level 3	Standard Slabs-on-Grade	21-01 40 10	A4010	Yes	Design	SD 15%	300	30		Structural	
Level 3	Structural Slabs-on-Grade	21-01 40 20	A4020	Yes	Design	SD 15%	300	30		Structural	
Level 3	Slab Trenches	21-01 40 30	A4030	Yes	Design	CD-1 60%	300	30		Architectural, Structural	
Level 3	Pits and Bases	21-01 40 60	A4060	Yes	Design	CD-1 60%	300	30		Architectural, Electrical, Equipment, Fire Protection, Mechanical (HVAC),	
Level 3	Slab-On-Grade Supplementary Components	21-01 40 90	A4090	Yes		CD-1 60%	•	•		Structural	
Level 4	Perimeter Insulation	21-01 40 90 10	A4090.10	Yes	Design	CD-2 90%	300	20		Architectural	
Level 4	Vapor Retarder	21-01 40 90 20	A4090.20	Yes	Design	CD-2 90%	300	30		Architectural	

The MMDR Workbook

- **Col. K – Primary Discipline:** The discipline (e.g. architect, mechanical engineer) with primary responsibility for modeling the element. Note that this is not a contractual requirement and may vary from one project to another.

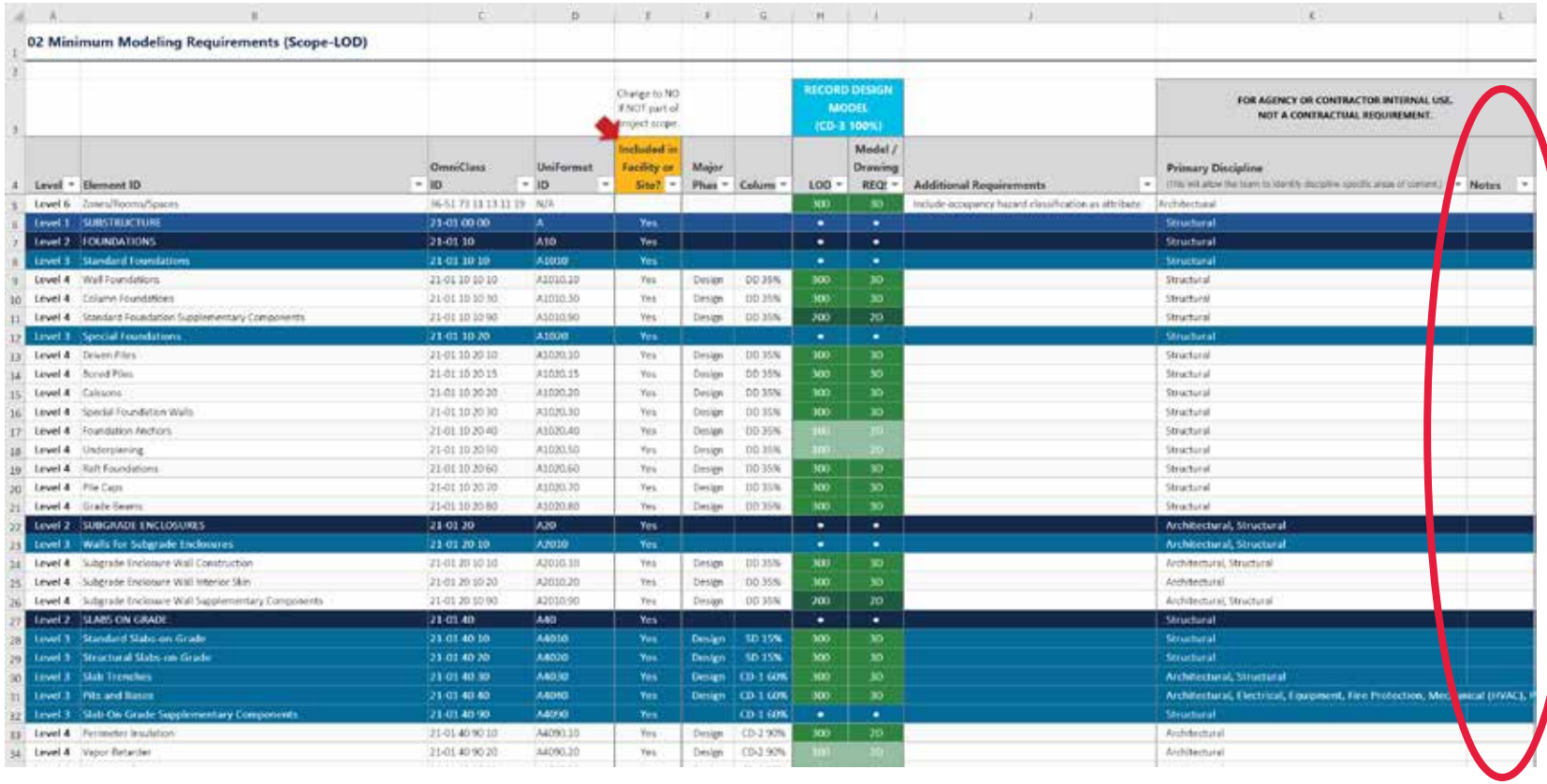


02 Minimum Modeling Requirements (Scope-LOD)

Level	Element ID	OmniClass ID	UniFormat ID	Included in Facility or Site?	Major Phas	Colum	LOD	Model / Drawing REQ	Additional Requirements	Primary Discipline	Notes
Level 6	Zones/Rooms/Spaces	16-51 73 13 13 11 19	N/A				300	30	Include occupancy hazard classification as attribute	Architectural	
Level 1	SUBSTRUCTURE	21-01 00 00	A	Yes			•	•		Structural	
Level 2	FOUNDATIONS	21-01 10	A10	Yes			•	•		Structural	
Level 3	Standard Foundations	21-01 10 10	A1010	Yes			•	•		Structural	
Level 4	Wall Foundations	21-01 10 10 10	A1010.10	Yes	Design	DD 35%	300	30		Structural	
Level 4	Column Foundations	21-01 10 10 30	A1010.30	Yes	Design	DD 35%	300	30		Structural	
Level 4	Standard Foundation Supplementary Components	21-01 10 10 90	A1010.90	Yes	Design	DD 35%	200	20		Structural	
Level 3	Special Foundations	21-01 10 20	A1020	Yes			•	•		Structural	
Level 4	Driven Piles	21-01 10 20 10	A1020.10	Yes	Design	DD 35%	300	30		Structural	
Level 4	Bored Piles	21-01 10 20 15	A1020.15	Yes	Design	DD 35%	300	30		Structural	
Level 4	Caissons	21-01 10 20 20	A1020.20	Yes	Design	DD 35%	300	30		Structural	
Level 4	Special Foundation Walls	21-01 10 20 30	A1020.30	Yes	Design	DD 35%	300	30		Structural	
Level 4	Foundation Anchors	21-01 10 20 40	A1020.40	Yes	Design	DD 35%	300	30		Structural	
Level 4	Underpinning	21-01 10 20 50	A1020.50	Yes	Design	DD 35%	300	30		Structural	
Level 4	Raft Foundations	21-01 10 20 60	A1020.60	Yes	Design	DD 35%	300	30		Structural	
Level 4	Pile Caps	21-01 10 20 70	A1020.70	Yes	Design	DD 35%	300	30		Structural	
Level 4	Grade Beams	21-01 10 20 80	A1020.80	Yes	Design	DD 35%	300	30		Structural	
Level 2	SUBGRADE ENCLOSURES	21-01 20	A20	Yes			•	•		Architectural, Structural	
Level 3	Walls for Subgrade Enclosures	21-01 20 10	A2010	Yes			•	•		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Construction	21-01 20 10 10	A2010.10	Yes	Design	DD 35%	300	30		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Interior Skin	21-01 20 10 20	A2010.20	Yes	Design	DD 35%	300	30		Architectural	
Level 4	Subgrade Enclosure Wall Supplementary Components	21-01 20 10 90	A2010.90	Yes	Design	DD 35%	200	20		Architectural, Structural	
Level 2	SLABS ON GRADE	21-01 40	A40	Yes			•	•		Structural	
Level 3	Standard Slabs-on-Grade	21-01 40 10	A4010	Yes	Design	SD 15%	300	30		Structural	
Level 3	Structural Slabs-on-Grade	21-01 40 20	A4020	Yes	Design	SD 15%	300	30		Structural	
Level 3	Slab Trenches	21-01 40 30	A4030	Yes	Design	CD-1 60%	300	30		Architectural, Structural	
Level 3	Pits and Bases	21-01 40 60	A4060	Yes	Design	CD-1 60%	300	30		Architectural, Electrical, Equipment, Fire Protection, Mechanical (HVAC),	
Level 3	Slab-On-Grade Supplementary Components	21-01 40 90	A4090	Yes		CD-1 60%	•	•		Structural	
Level 4	Perimeter Insulation	21-01 40 90 10	A4090.10	Yes	Design	CD-2 90%	300	20		Architectural	
Level 4	Vapor Retarder	21-01 40 90 20	A4090.20	Yes	Design	CD-2 90%	300	30		Architectural	

The MMDR Workbook

- **Col. L – Notes:** Space for desired information not covered elsewhere. Entries in this column are not contractual requirements.

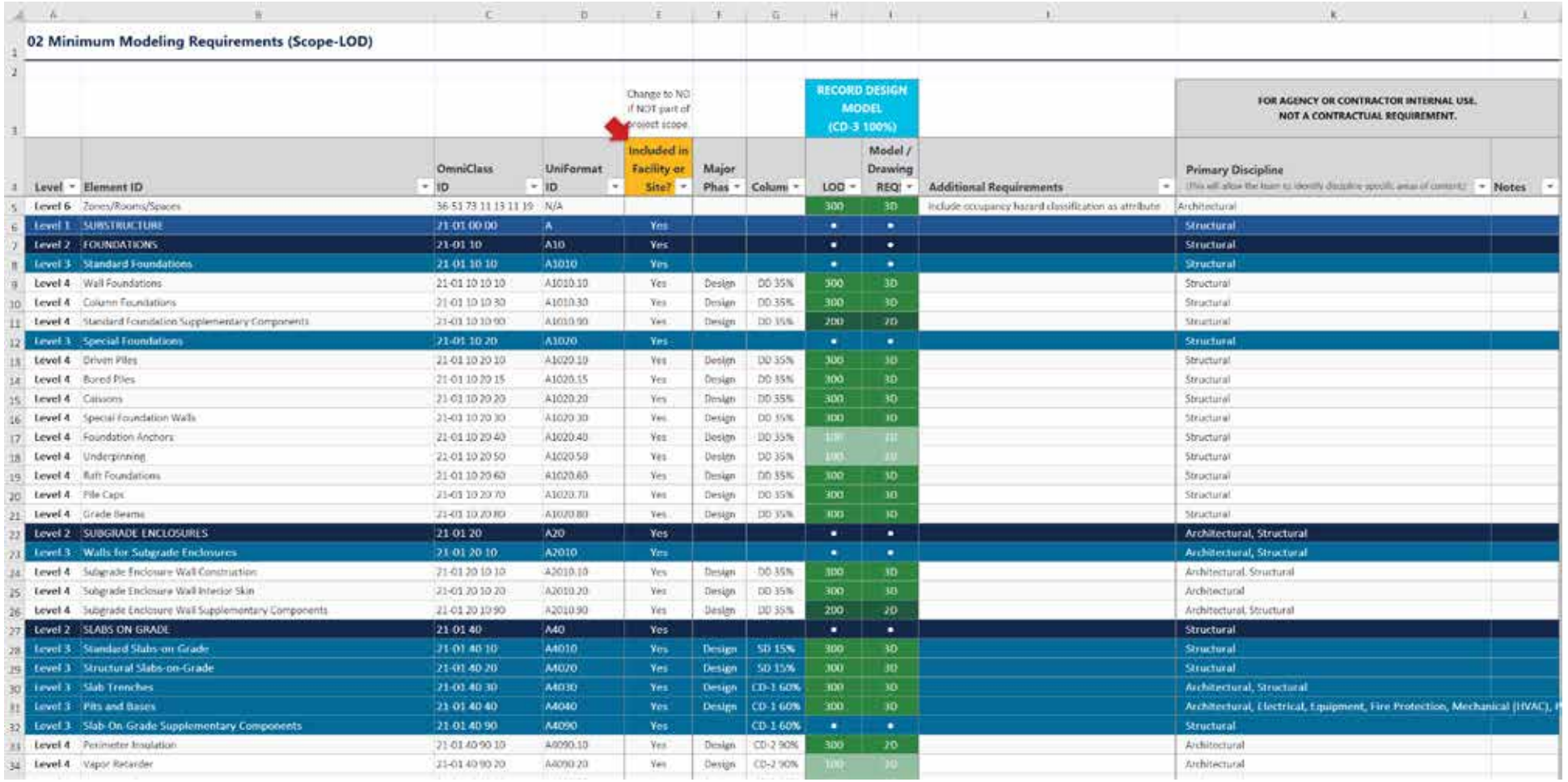


02 Minimum Modeling Requirements (Scope-LOD)

				Change to NO if NOT part of project scope.			RECORD DESIGN MODEL (CD-3 100%)			FOR AGENCY OR CONTRACTOR INTERNAL USE. NOT A CONTRACTUAL REQUIREMENT.		
	Level	Element ID	OmniClass ID	UniFormat ID	Included in Facility or Site?	Major Phas	Column	LOD	Model / Drawing REQ	Additional Requirements	Primary Discipline	Notes
5	Level 6	Zones/Rooms/Spaces	46-51 73 13 13 11 19	N/A				300	3D	Include occupancy hazard classification as attribute	Architectural	
6	Level 1	SUBSTRUCTURE	21-01 00 00	A	Yes			•	•		Structural	
7	Level 2	FOUNDATIONS	21-01 10	A10	Yes			•	•		Structural	
8	Level 3	Standard Foundations	21-01 10 10	A1010	Yes			•	•		Structural	
9	Level 4	Wall Foundations	21-01 10 10 10	A1010.10	Yes	Design	DD 35%	300	3D		Structural	
10	Level 4	Column Foundations	21-01 10 10 30	A1010.30	Yes	Design	DD 35%	300	3D		Structural	
11	Level 4	Standard Foundation Supplementary Components	21-01 10 10 90	A1010.90	Yes	Design	DD 35%	200	2D		Structural	
12	Level 3	Special Foundations	21-01 10 20	A1020	Yes			•	•		Structural	
13	Level 4	Driven Piles	21-01 10 20 10	A1020.10	Yes	Design	DD 35%	300	3D		Structural	
14	Level 4	Bored Piles	21-01 10 20 15	A1020.15	Yes	Design	DD 35%	300	3D		Structural	
15	Level 4	Caissons	21-01 10 20 20	A1020.20	Yes	Design	DD 35%	300	3D		Structural	
16	Level 4	Special Foundation Walls	21-01 10 20 30	A1020.30	Yes	Design	DD 35%	300	3D		Structural	
17	Level 4	Foundation Anchors	21-01 10 20 40	A1020.40	Yes	Design	DD 35%	300	3D		Structural	
18	Level 4	Underpinning	21-01 10 20 50	A1020.50	Yes	Design	DD 35%	300	3D		Structural	
19	Level 4	Raft Foundations	21-01 10 20 60	A1020.60	Yes	Design	DD 35%	300	3D		Structural	
20	Level 4	Pile Caps	21-01 10 20 70	A1020.70	Yes	Design	DD 35%	300	3D		Structural	
21	Level 4	Grade Beams	21-01 10 20 80	A1020.80	Yes	Design	DD 35%	300	3D		Structural	
22	Level 2	SUBGRADE ENCLOSURES	21-01 20	A20	Yes			•	•		Architectural, Structural	
23	Level 3	Walls for Subgrade Enclosures	21-01 20 10	A2010	Yes			•	•		Architectural, Structural	
24	Level 4	Subgrade Enclosure Wall Construction	21-01 20 10 10	A2010.10	Yes	Design	DD 35%	300	3D		Architectural, Structural	
25	Level 4	Subgrade Enclosure Wall Interior Skin	21-01 20 10 20	A2010.20	Yes	Design	DD 35%	300	3D		Architectural	
26	Level 4	Subgrade Enclosure Wall Supplementary Components	21-01 20 10 90	A2010.90	Yes	Design	DD 35%	200	2D		Architectural, Structural	
27	Level 2	SLABS ON GRADE	21-01 40	A40	Yes			•	•		Structural	
28	Level 3	Standard Slabs-on-Grade	21-01 40 10	A4010	Yes	Design	SD 15%	300	3D		Structural	
29	Level 3	Structural Slabs-on-Grade	21-01 40 20	A4020	Yes	Design	SD 15%	300	3D		Structural	
30	Level 3	Slab Trenches	21-01 40 30	A4030	Yes	Design	CD-1 60%	300	3D		Architectural, Structural	
31	Level 3	Pits and Bases	21-01 40 40	A4040	Yes	Design	CD-1 60%	300	3D		Architectural, Electrical, Equipment, Fire Protection, Mechanical (HVAC),	
32	Level 3	Slab-On-Grade Supplementary Components	21-01 40 90	A4090	Yes		CD-1 60%	•	•		Structural	
33	Level 4	Perimeter Insulation	21-01 40 90 10	A4090.10	Yes	Design	CD-2 90%	300	2D		Architectural	
34	Level 4	Vapor Retarder	21-01 40 90 20	A4090.20	Yes	Design	CD-2 90%	300	3D		Architectural	

LOD Logic

Elements are not all modeled at the same LOD.

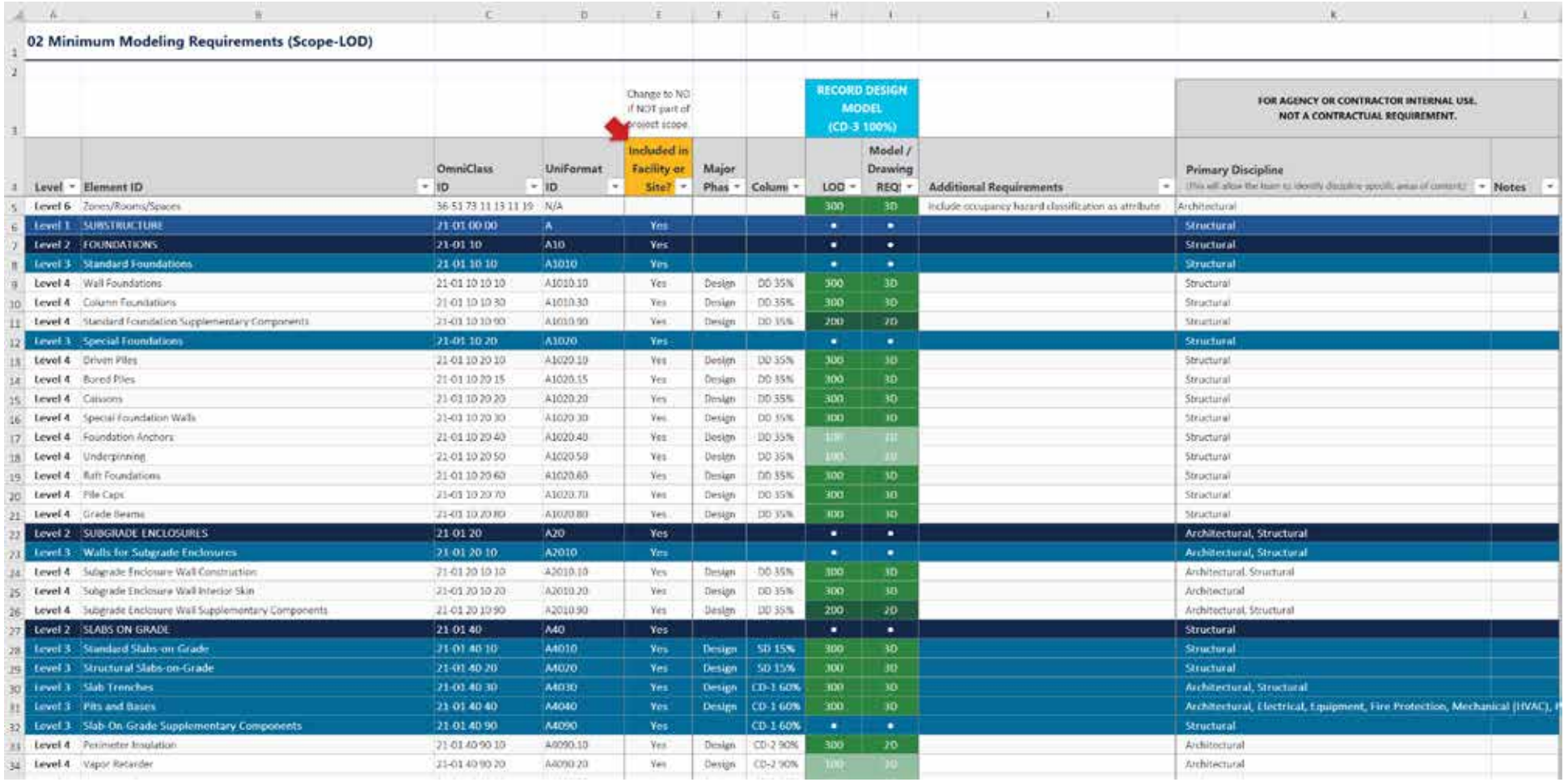


02 Minimum Modeling Requirements (Scope-LOD)

Level	Element ID	OmniClass ID	UniFormat ID	Included in Facility or Site? (Change to NO if NOT part of project scope)	Major Phas	Colum	RECORD DESIGN MODEL (CD-3 100%) LOD	Model / Drawing REQ	Additional Requirements	FOR AGENCY OR CONTRACTOR INTERNAL USE. NOT A CONTRACTUAL REQUIREMENT. Primary Discipline	Notes
Level 6	Zones/Rooms/Spaces	36-51 73 11 13 11 19	N/A				300	3D	Include occupancy hazard classification as attribute	Architectural	
Level 1	SUBSTRUCTURE	21-01 00 00	A	Yes			•	•		Structural	
Level 2	FOUNDATIONS	21-01 10	A10	Yes			•	•		Structural	
Level 3	Standard Foundations	21-01 10 10	A1010	Yes			•	•		Structural	
Level 4	Wall Foundations	21-01 10 10 10	A1010.10	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Column Foundations	21-01 10 10 30	A1010.30	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Standard Foundation Supplementary Components	21-01 10 10 90	A1010.90	Yes	Design	DD 35%	200	2D		Structural	
Level 3	Special Foundations	21-01 10 20	A1020	Yes			•	•		Structural	
Level 4	Driven Piles	21-01 10 20 10	A1020.10	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Bored Piles	21-01 10 20 15	A1020.15	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Caissons	21-01 10 20 20	A1020.20	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Special Foundation Walls	21-01 10 20 30	A1020.30	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Foundation Anchors	21-01 10 20 40	A1020.40	Yes	Design	DD 35%	100	1D		Structural	
Level 4	Underpinning	21-01 10 20 50	A1020.50	Yes	Design	DD 35%	100	1D		Structural	
Level 4	Raft Foundations	21-01 10 20 60	A1020.60	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Pile Caps	21-01 10 20 70	A1020.70	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Grade Beams	21-01 10 20 80	A1020.80	Yes	Design	DD 35%	300	3D		Structural	
Level 2	SUBGRADE ENCLOSURES	21-01 20	A20	Yes			•	•		Architectural, Structural	
Level 3	Walls for Subgrade Enclosures	21-01 20 10	A2010	Yes			•	•		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Construction	21-01 20 10 10	A2010.10	Yes	Design	DD 35%	300	3D		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Interior Skin	21-01 20 10 20	A2010.20	Yes	Design	DD 35%	300	3D		Architectural	
Level 4	Subgrade Enclosure Wall Supplementary Components	21-01 20 10 90	A2010.90	Yes	Design	DD 35%	200	2D		Architectural, Structural	
Level 2	SLABS ON GRADE	21-01 40	A40	Yes			•	•		Structural	
Level 3	Standard Slabs-on-Grade	21-01 40 10	A4010	Yes	Design	SD 15%	300	3D		Structural	
Level 3	Structural Slabs-on-Grade	21-01 40 20	A4020	Yes	Design	SD 15%	300	3D		Structural	
Level 3	Slab Trenches	21-01 40 30	A4030	Yes	Design	CD-1 60%	300	3D		Architectural, Structural	
Level 3	Pits and Bases	21-01 40 40	A4040	Yes	Design	CD-1 60%	300	3D		Architectural, Electrical, Equipment, Fire Protection, Mechanical (HVAC),	
Level 3	Slab On Grade Supplementary Components	21-01 40 90	A4090	Yes		CD-1 60%	•	•		Structural	
Level 4	Perimeter Insulation	21-01 40 90 10	A4090.10	Yes	Design	CD-2 90%	300	2D		Architectural	
Level 4	Vapor Retarder	21-01 40 90 20	A4090.20	Yes	Design	CD-2 90%	100	1D		Architectural	

LOD Logic

There's no such thing as an LOD ### model.

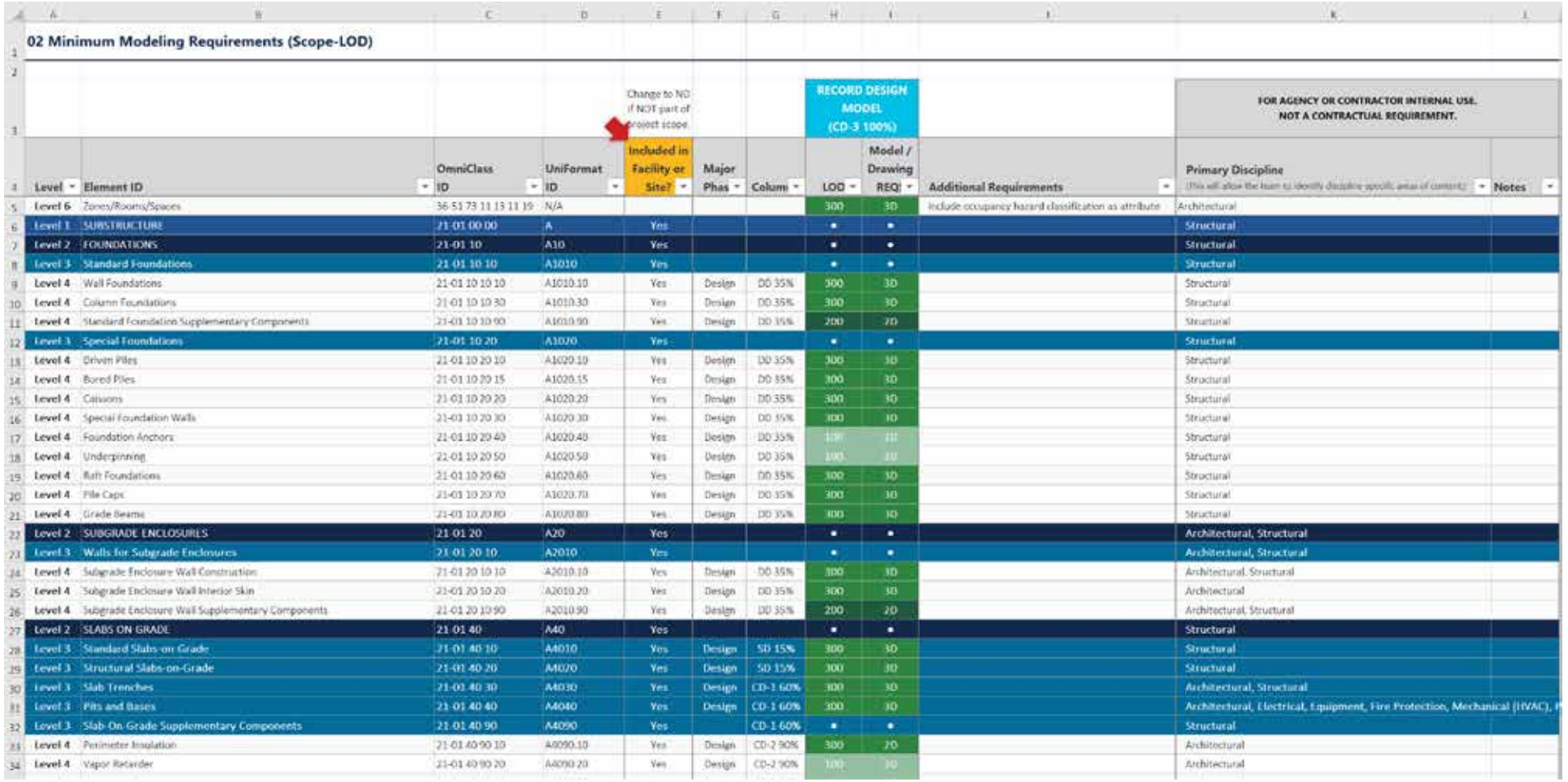


02 Minimum Modeling Requirements (Scope-LOD)

Level	Element ID	OmniClass ID	UniFormat ID	Included in Facility or Site? (Change to NO if NOT part of project scope)	Major Phas	Colum	RECORD DESIGN MODEL (CD-3 100%) LOD	Model / Drawing REQ	Additional Requirements	FOR AGENCY OR CONTRACTOR INTERNAL USE. NOT A CONTRACTUAL REQUIREMENT. Primary Discipline	Notes
Level 6	Zones/Rooms/Spaces	36-51 73 11 13 11 19	N/A				300	3D	Include occupancy hazard classification as attribute	Architectural	
Level 1	SUBSTRUCTURE	21-01 00 00	A	Yes			•	•		Structural	
Level 2	FOUNDATIONS	21-01 10	A10	Yes			•	•		Structural	
Level 3	Standard Foundations	21-01 10 10	A1010	Yes			•	•		Structural	
Level 4	Wall Foundations	21-01 10 10 10	A1010.10	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Column Foundations	21-01 10 10 30	A1010.30	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Standard Foundation Supplementary Components	21-01 10 10 90	A1010.90	Yes	Design	DD 35%	200	2D		Structural	
Level 3	Special Foundations	21-01 10 20	A1020	Yes			•	•		Structural	
Level 4	Driven Piles	21-01 10 20 10	A1020.10	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Bored Piles	21-01 10 20 15	A1020.15	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Caissons	21-01 10 20 20	A1020.20	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Special Foundation Walls	21-01 10 20 30	A1020.30	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Foundation Anchors	21-01 10 20 40	A1020.40	Yes	Design	DD 35%	100	1D		Structural	
Level 4	Underpinning	21-01 10 20 50	A1020.50	Yes	Design	DD 35%	100	1D		Structural	
Level 4	Raft Foundations	21-01 10 20 60	A1020.60	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Pile Caps	21-01 10 20 70	A1020.70	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Grade Beams	21-01 10 20 80	A1020.80	Yes	Design	DD 35%	300	3D		Structural	
Level 2	SUBGRADE ENCLOSURES	21-01 20	A20	Yes			•	•		Architectural, Structural	
Level 3	Walls for Subgrade Enclosures	21-01 20 10	A2010	Yes			•	•		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Construction	21-01 20 10 10	A2010.10	Yes	Design	DD 35%	300	3D		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Interior Skin	21-01 20 10 20	A2010.20	Yes	Design	DD 35%	300	3D		Architectural	
Level 4	Subgrade Enclosure Wall Supplementary Components	21-01 20 10 90	A2010.90	Yes	Design	DD 35%	200	2D		Architectural, Structural	
Level 2	SLABS ON GRADE	21-01 40	A40	Yes			•	•		Structural	
Level 3	Standard Slabs-on-Grade	21-01 40 10	A4010	Yes	Design	SD 15%	300	3D		Structural	
Level 3	Structural Slabs-on-Grade	21-01 40 20	A4020	Yes	Design	SD 15%	300	3D		Structural	
Level 3	Slab Trenches	21-01 40 30	A4030	Yes	Design	CD-1 60%	300	3D		Architectural, Structural	
Level 3	Pits and Bases	21-01 40 40	A4040	Yes	Design	CD-1 60%	300	3D		Architectural, Electrical, Equipment, Fire Protection, Mechanical (HVAC),	
Level 3	Slab On Grade Supplementary Components	21-01 40 90	A4090	Yes		CD-1 60%	•	•		Structural	
Level 4	Perimeter Insulation	21-01 40 90 10	A4090.10	Yes	Design	CD-2 90%	300	2D		Architectural	
Level 4	Vapor Retarder	21-01 40 90 20	A4090.20	Yes	Design	CD-2 90%	100	1D		Architectural	

LOD Logic

LOD is not a value Judgement.

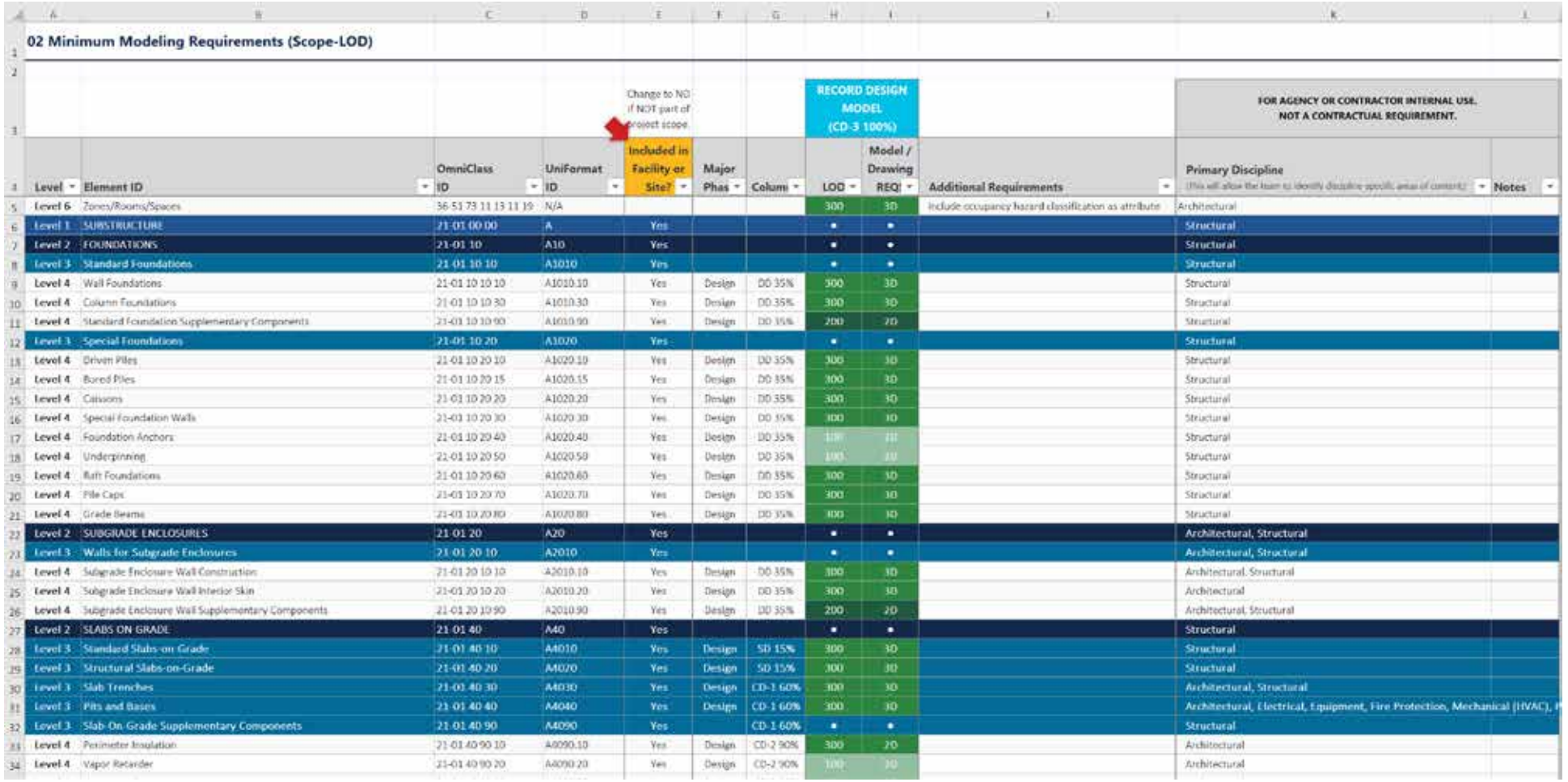


02 Minimum Modeling Requirements (Scope-LOD)

Level	Element ID	OmniClass ID	UniFormat ID	Included in Facility or Site? (Change to NO if NOT part of project scope)	Major Phas	Colum	RECORD DESIGN MODEL (CD-3 100%) LOD	Model / Drawing REQ	Additional Requirements	Primary Discipline (This will allow the team to identify discipline specific areas of content)	Notes
							FOR AGENCY OR CONTRACTOR INTERNAL USE. NOT A CONTRACTUAL REQUIREMENT.				
Level 6	Zones/Rooms/Spaces	36-51 73 11 13 11 19	N/A				300	3D	Include occupancy hazard classification as attribute	Architectural	
Level 1	SUBSTRUCTURE	21-01 00 00	A	Yes			•	•		Structural	
Level 2	FOUNDATIONS	21-01 10	A10	Yes			•	•		Structural	
Level 3	Standard Foundations	21-01 10 10	A1010	Yes			•	•		Structural	
Level 4	Wall Foundations	21-01 10 10 10	A1010.10	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Column Foundations	21-01 10 10 30	A1010.30	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Standard Foundation Supplementary Components	21-01 10 10 90	A1010.90	Yes	Design	DD 35%	200	2D		Structural	
Level 3	Special Foundations	21-01 10 20	A1020	Yes			•	•		Structural	
Level 4	Driven Piles	21-01 10 20 10	A1020.10	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Bored Piles	21-01 10 20 15	A1020.15	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Caissons	21-01 10 20 20	A1020.20	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Special Foundation Walls	21-01 10 20 30	A1020.30	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Foundation Anchors	21-01 10 20 40	A1020.40	Yes	Design	DD 35%	100	3D		Structural	
Level 4	Underpinning	21-01 10 20 50	A1020.50	Yes	Design	DD 35%	100	3D		Structural	
Level 4	Raft Foundations	21-01 10 20 60	A1020.60	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Pile Caps	21-01 10 20 70	A1020.70	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Grade Beams	21-01 10 20 80	A1020.80	Yes	Design	DD 35%	300	3D		Structural	
Level 2	SUBGRADE ENCLOSURES	21-01 20	A20	Yes			•	•		Architectural, Structural	
Level 3	Walls for Subgrade Enclosures	21-01 20 10	A2010	Yes			•	•		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Construction	21-01 20 10 10	A2010.10	Yes	Design	DD 35%	300	3D		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Interior Skin	21-01 20 10 20	A2010.20	Yes	Design	DD 35%	300	3D		Architectural	
Level 4	Subgrade Enclosure Wall Supplementary Components	21-01 20 10 90	A2010.90	Yes	Design	DD 35%	200	2D		Architectural, Structural	
Level 2	SLABS ON GRADE	21-01 40	A40	Yes			•	•		Structural	
Level 3	Standard Slabs-on-Grade	21-01 40 10	A4010	Yes	Design	SD 15%	300	3D		Structural	
Level 3	Structural Slabs-on-Grade	21-01 40 20	A4020	Yes	Design	SD 15%	300	3D		Structural	
Level 3	Slab Trenches	21-01 40 30	A4030	Yes	Design	CD-1 60%	300	3D		Architectural, Structural	
Level 3	Pits and Bases	21-01 40 40	A4040	Yes	Design	CD-1 60%	300	3D		Architectural, Electrical, Equipment, Fire Protection, Mechanical (HVAC),	
Level 3	Slab On Grade Supplementary Components	21-01 40 90	A4090	Yes		CD-1 60%	•	•		Structural	
Level 4	Perimeter Insulation	21-01 40 90 10	A4090.10	Yes	Design	CD-2 90%	300	2D		Architectural	
Level 4	Vapor Retarder	21-01 40 90 20	A4090.20	Yes	Design	CD-2 90%	100	3D		Architectural	

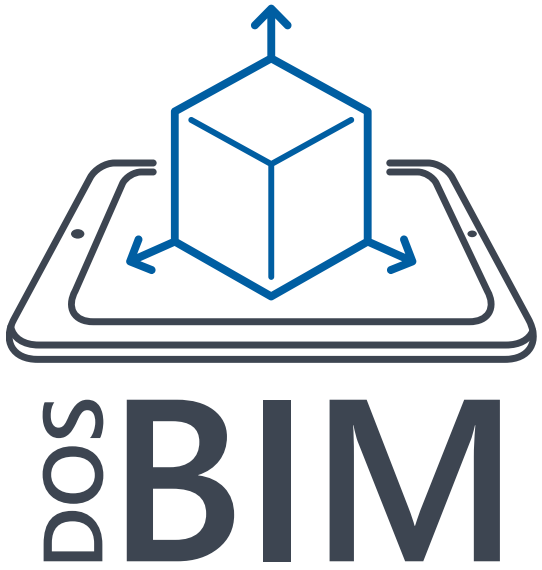
LOD Logic

LOD does not indicate who authors the element.



02 Minimum Modeling Requirements (Scope-LOD)

Level	Element ID	OmniClass ID	UniFormat ID	Included in Facility or Site? (Change to NO if NOT part of project scope)	Major Phas	Colum	RECORD DESIGN MODEL (CD-3 100%) LOD	Model / Drawing REQ	Additional Requirements	FOR AGENCY OR CONTRACTOR INTERNAL USE. NOT A CONTRACTUAL REQUIREMENT. Primary Discipline	Notes
Level 6	Zones/Rooms/Spaces	36-51 73 11 13 11 19	N/A				300	3D	Include occupancy hazard classification as attribute	Architectural	
Level 1	SUBSTRUCTURE	21-01 00 00	A	Yes			•	•		Structural	
Level 2	FOUNDATIONS	21-01 10	A10	Yes			•	•		Structural	
Level 3	Standard Foundations	21-01 10 10	A1010	Yes			•	•		Structural	
Level 4	Wall Foundations	21-01 10 10 10	A1010.10	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Column Foundations	21-01 10 10 30	A1010.30	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Standard Foundation Supplementary Components	21-01 10 10 90	A1010.90	Yes	Design	DD 35%	200	2D		Structural	
Level 3	Special Foundations	21-01 10 20	A1020	Yes			•	•		Structural	
Level 4	Driven Piles	21-01 10 20 10	A1020.10	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Bored Piles	21-01 10 20 15	A1020.15	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Caissons	21-01 10 20 20	A1020.20	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Special Foundation Walls	21-01 10 20 30	A1020.30	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Foundation Anchors	21-01 10 20 40	A1020.40	Yes	Design	DD 35%	100	3D		Structural	
Level 4	Underpinning	21-01 10 20 50	A1020.50	Yes	Design	DD 35%	100	3D		Structural	
Level 4	Raft Foundations	21-01 10 20 60	A1020.60	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Pile Caps	21-01 10 20 70	A1020.70	Yes	Design	DD 35%	300	3D		Structural	
Level 4	Grade Beams	21-01 10 20 80	A1020.80	Yes	Design	DD 35%	300	3D		Structural	
Level 2	SUBGRADE ENCLOSURES	21-01 20	A20	Yes			•	•		Architectural, Structural	
Level 3	Walls for Subgrade Enclosures	21-01 20 10	A2010	Yes			•	•		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Construction	21-01 20 10 10	A2010.10	Yes	Design	DD 35%	300	3D		Architectural, Structural	
Level 4	Subgrade Enclosure Wall Interior Skin	21-01 20 10 20	A2010.20	Yes	Design	DD 35%	300	3D		Architectural	
Level 4	Subgrade Enclosure Wall Supplementary Components	21-01 20 10 90	A2010.90	Yes	Design	DD 35%	200	2D		Architectural, Structural	
Level 2	SLABS ON GRADE	21-01 40	A40	Yes			•	•		Structural	
Level 3	Standard Slabs-on-Grade	21-01 40 10	A4010	Yes	Design	SD 15%	300	3D		Structural	
Level 3	Structural Slabs-on-Grade	21-01 40 20	A4020	Yes	Design	SD 15%	300	3D		Structural	
Level 3	Slab Trenches	21-01 40 30	A4030	Yes	Design	CD-1 60%	300	3D		Architectural, Structural	
Level 3	Pits and Bases	21-01 40 40	A4040	Yes	Design	CD-1 60%	300	3D		Architectural, Electrical, Equipment, Fire Protection, Mechanical (HVAC),	
Level 3	Slab On Grade Supplementary Components	21-01 40 90	A4090	Yes		CD-1 60%	•	•		Structural	
Level 4	Perimeter Insulation	21-01 40 90 10	A4090.10	Yes	Design	CD-2 90%	300	2D		Architectural	
Level 4	Vapor Retarder	21-01 40 90 20	A4090.20	Yes	Design	CD-2 90%	100	3D		Architectural	



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Specification of Asset Data

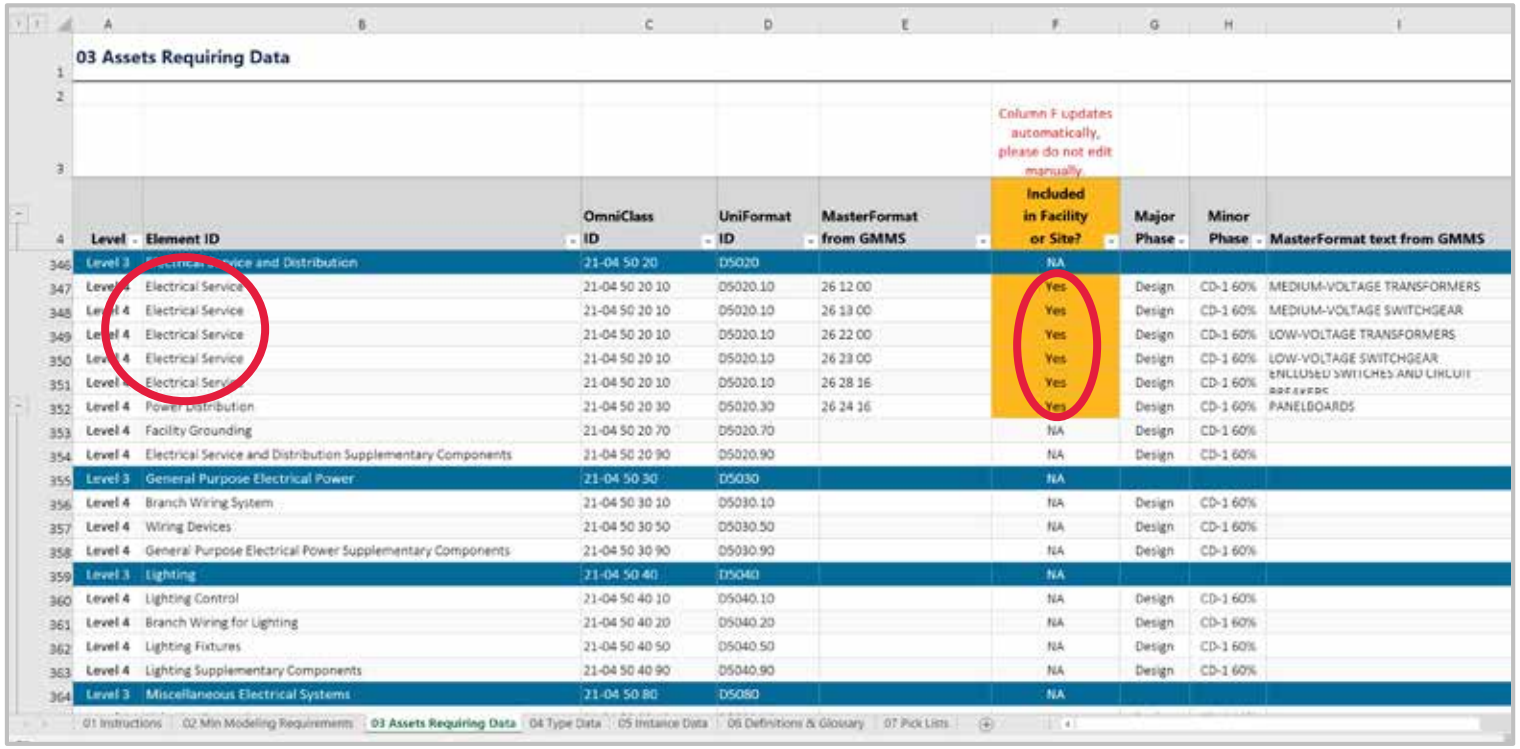
Specification of Asset Data

- In addition to defining modeling requirements, Tab 2 automatically populates Tab 3 with the asset data requirements for the project.

Specification of Asset Data

- In Tab 2, selecting “Yes” in Column E for a line item automatically puts “Yes” in Tab 3, Column F for all items under that Uniformat code that are listed in OBO’s *Global Maintenance Management System* (GMMS).

- Line items with “NA” in Column F are not listed in the GMMS and do not require data.



03 Assets Requiring Data

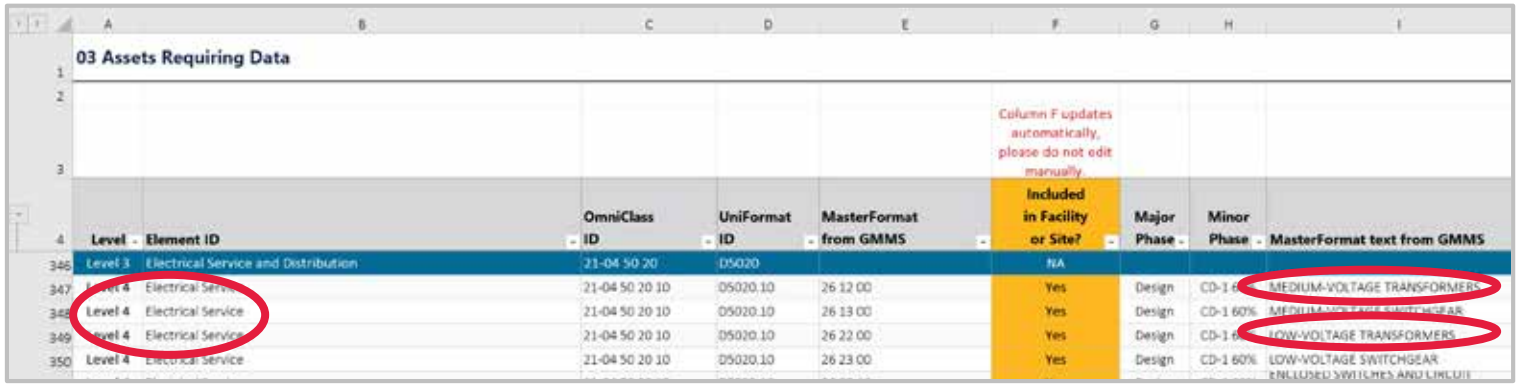
Column F updates automatically, please do not edit manually.

	Level	Element ID	OmniClass ID	UniFormat ID	MasterFormat from GMMS	Included in Facility or Site?	Major Phase	Minor Phase	MasterFormat text from GMMS
346	Level 3	[illegible]ice and Distribution	21-04 50 20	D5020		NA			
347	Level 4	Electrical Service	21-04 50 20 10	D5020.10	26 12 00	Yes	Design	CD-1 60%	MEDIUM-VOLTAGE TRANSFORMERS
348	Level 4	Electrical Service	21-04 50 20 10	D5020.10	26 13 00	Yes	Design	CD-1 60%	MEDIUM-VOLTAGE SWITCHGEAR
349	Level 4	Electrical Service	21-04 50 20 10	D5020.10	26 22 00	Yes	Design	CD-1 60%	LOW-VOLTAGE TRANSFORMERS
350	Level 4	Electrical Service	21-04 50 20 10	D5020.10	26 23 00	Yes	Design	CD-1 60%	LOW-VOLTAGE SWITCHGEAR
351	Level 4	Electrical Service	21-04 50 20 10	D5020.10	26 28 16	Yes	Design	CD-1 60%	ENCLOSED SWITCHES AND CIRCUIT BREAKERS
352	Level 4	Power Distribution	21-04 50 20 30	D5020.30	26 24 16	Yes	Design	CD-1 60%	PANELBOARDS
353	Level 4	Facility Grounding	21-04 50 20 70	D5020.70		NA	Design	CD-1 60%	
354	Level 4	Electrical Service and Distribution Supplementary Components	21-04 50 20 90	D5020.90		NA	Design	CD-1 60%	
355	Level 3	General Purpose Electrical Power	21-04 50 30	D5030		NA			
356	Level 4	Branch Wiring System	21-04 50 30 10	D5030.10		NA	Design	CD-1 60%	
357	Level 4	Wiring Devices	21-04 50 30 50	D5030.50		NA	Design	CD-1 60%	
358	Level 4	General Purpose Electrical Power Supplementary Components	21-04 50 30 90	D5030.90		NA	Design	CD-1 60%	
359	Level 3	Lighting	21-04 50 40	D5040		NA			
360	Level 4	Lighting Control	21-04 50 40 10	D5040.10		NA	Design	CD-1 60%	
361	Level 4	Branch Wiring for Lighting	21-04 50 40 20	D5040.20		NA	Design	CD-1 60%	
362	Level 4	Lighting Fixtures	21-04 50 40 50	D5040.50		NA	Design	CD-1 60%	
363	Level 4	Lighting Supplementary Components	21-04 50 40 90	D5040.90		NA	Design	CD-1 60%	
364	Level 3	Miscellaneous Electrical Systems	21-04 50 80	D5080		NA			

01 Instructions | 02 Min Modeling Requirements | 03 Assets Requiring Data | 04 Type Data | 05 Instance Data | 06 Definitions & Glossary | 07 Pick Lists

Specification of Asset Data

- Tab 3, Column I shows the specific components listed in the GMMS, e.g. transformers.
- Tabs 4 and 5 list the data needed for these components.



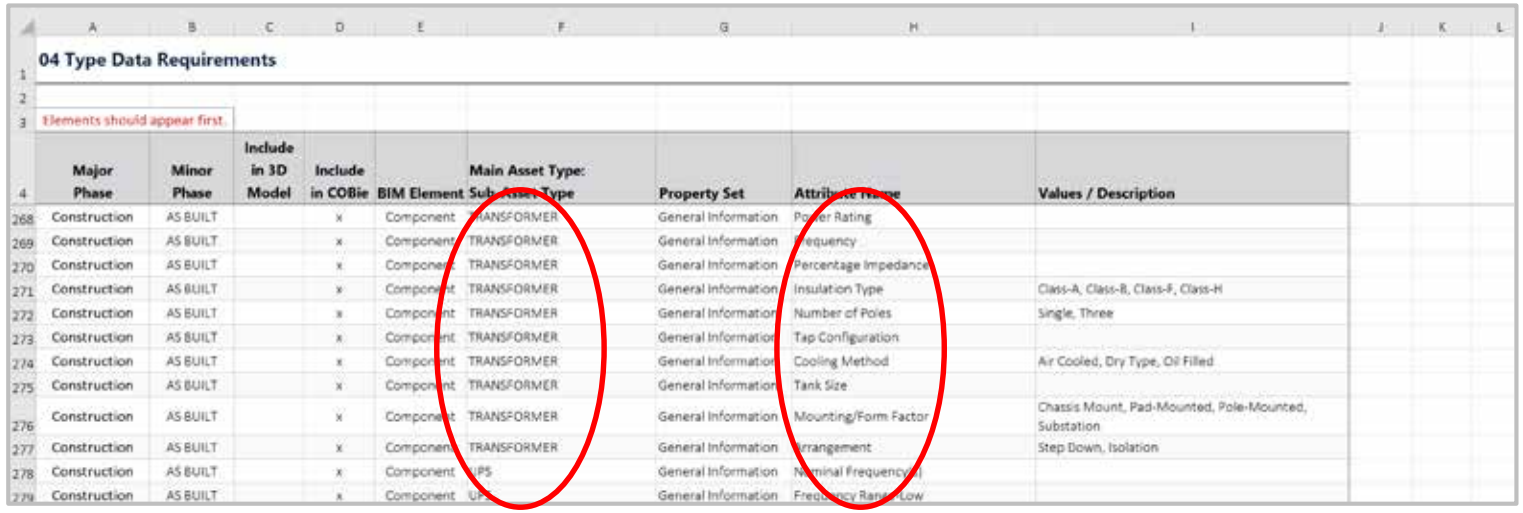
03 Assets Requiring Data

Column F updates automatically, please do not edit manually.

Level	Element ID	OmniClass ID	UniFormat ID	MasterFormat from GMMS	Included in Facility or Site?	Major Phase	Minor Phase	MasterFormat text from GMMS
Level 3	Electrical Service and Distribution	21-04 50 20	D5020		NA			
Level 4	Electrical Service	21-04 50 20 10	D5020.10	26 12 00	Yes	Design	CD-1 60%	MEDIUM-VOLTAGE TRANSFORMERS
Level 4	Electrical Service	21-04 50 20 10	D5020.10	26 13 00	Yes	Design	CD-1 60%	MEDIUM-VOLTAGE SWITCHGEAR
Level 4	Electrical Service	21-04 50 20 10	D5020.10	26 22 00	Yes	Design	CD-1 60%	LOW-VOLTAGE TRANSFORMERS
Level 4	Electrical Service	21-04 50 20 10	D5020.10	26 23 00	Yes	Design	CD-1 60%	LOW-VOLTAGE SWITCHGEAR ENCLOSED SWITCHES AND CIRCUIT

Specification of Asset Data

- Tab 4 lists required Type data for the element – e.g. data required for all transformers in the project.



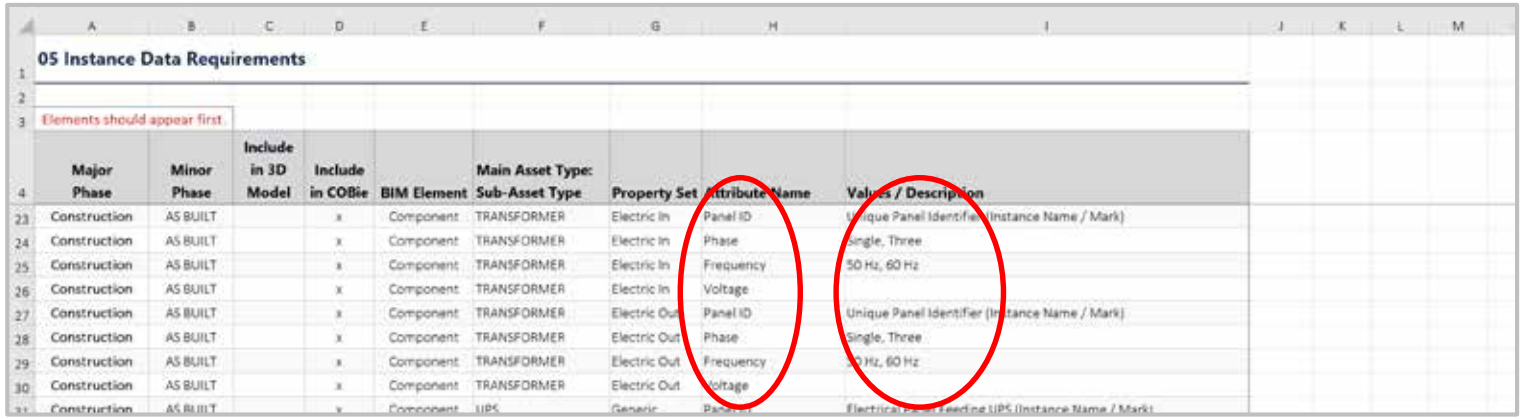
04 Type Data Requirements

Elements should appear first

	Major Phase	Minor Phase	Include in 3D Model	Include in COBie	BIM Element	Main Asset Type: Sub-Asset Type	Property Set	Attribute Name	Values / Description
268	Construction	AS BUILT		x	Component	TRANSFORMER	General Information	Power Rating	
269	Construction	AS BUILT		x	Component	TRANSFORMER	General Information	Frequency	
270	Construction	AS BUILT		x	Component	TRANSFORMER	General Information	Percentage Impedance	
271	Construction	AS BUILT		x	Component	TRANSFORMER	General Information	Insulation Type	Class-A, Class-B, Class-F, Class-H
272	Construction	AS BUILT		x	Component	TRANSFORMER	General Information	Number of Poles	Single, Three
273	Construction	AS BUILT		x	Component	TRANSFORMER	General Information	Tap Configuration	
274	Construction	AS BUILT		x	Component	TRANSFORMER	General Information	Cooling Method	Air Cooled, Dry Type, Oil Filled
275	Construction	AS BUILT		x	Component	TRANSFORMER	General Information	Tank Size	
276	Construction	AS BUILT		x	Component	TRANSFORMER	General Information	Mounting/Form Factor	Chassis Mount, Pad-Mounted, Pole-Mounted, Substation
277	Construction	AS BUILT		x	Component	TRANSFORMER	General Information	Arrangement	Step Down, Isolation
278	Construction	AS BUILT		x	Component	UPS	General Information	Nominal Frequency(s)	
279	Construction	AS BUILT		x	Component	UPS	General Information	Frequency Range Low	

Specification of Asset Data

- Tab 5 lists required Instance data for the element – e.g. data required for each individual transformer in the project.



05 Instance Data Requirements

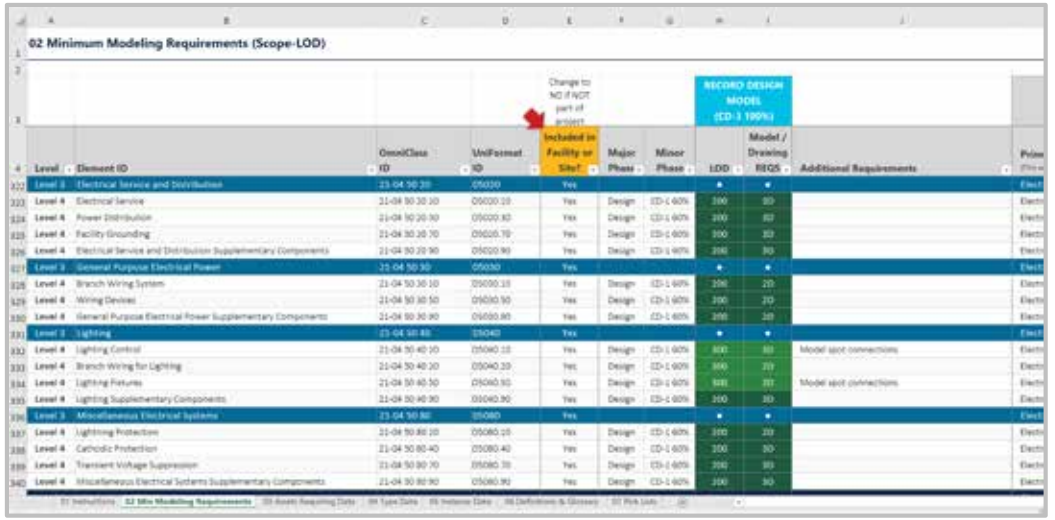
Elements should appear first

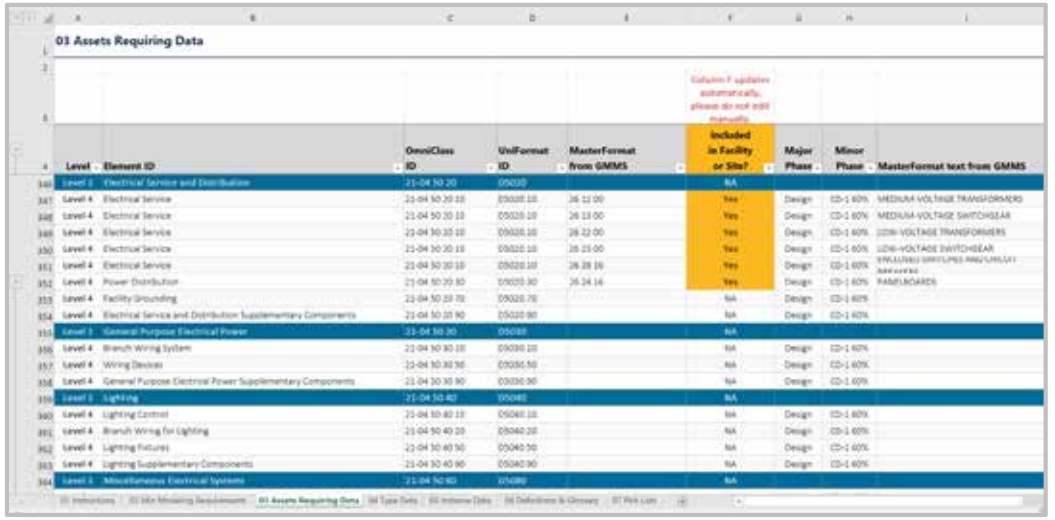
Major Phase	Minor Phase	Include in 3D Model	Include in COBie	BIM Element	Main Asset Type: Sub-Asset Type	Property Set	Attribute Name	Values / Description
Construction	AS BUILT		x	Component	TRANSFORMER	Electric In	Panel ID	Unique Panel Identifier (Instance Name / Mark)
Construction	AS BUILT		x	Component	TRANSFORMER	Electric In	Phase	Single, Three
Construction	AS BUILT		x	Component	TRANSFORMER	Electric In	Frequency	50 Hz, 60 Hz
Construction	AS BUILT		x	Component	TRANSFORMER	Electric In	Voltage	
Construction	AS BUILT		x	Component	TRANSFORMER	Electric Out	Panel ID	Unique Panel Identifier (Instance Name / Mark)
Construction	AS BUILT		x	Component	TRANSFORMER	Electric Out	Phase	Single, Three
Construction	AS BUILT		x	Component	TRANSFORMER	Electric Out	Frequency	50 Hz, 60 Hz
Construction	AS BUILT		x	Component	TRANSFORMER	Electric Out	Voltage	
Construction	AS BUILT		x	Component	UPS	Generic	Panel ID	Electrical Panel Feeding UPS (Instance Name / Mark)

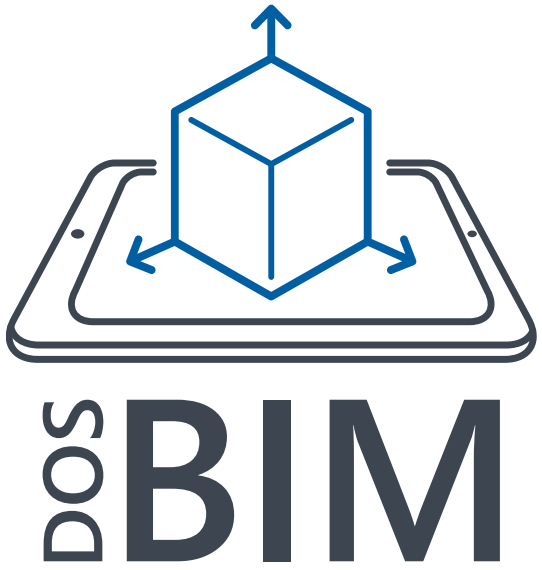
Specification of Asset Data

- Note that a “Yes” in Tab 2, Column E, results in a “Yes” in Tab 3, Column F, for all items listed in the GMMS regardless of their LOD.

- The LOD entries on Tab 2 relate to geometric requirements for element modeling only. Data can be linked to any element of any LOD, even an LOD 100 symbol.







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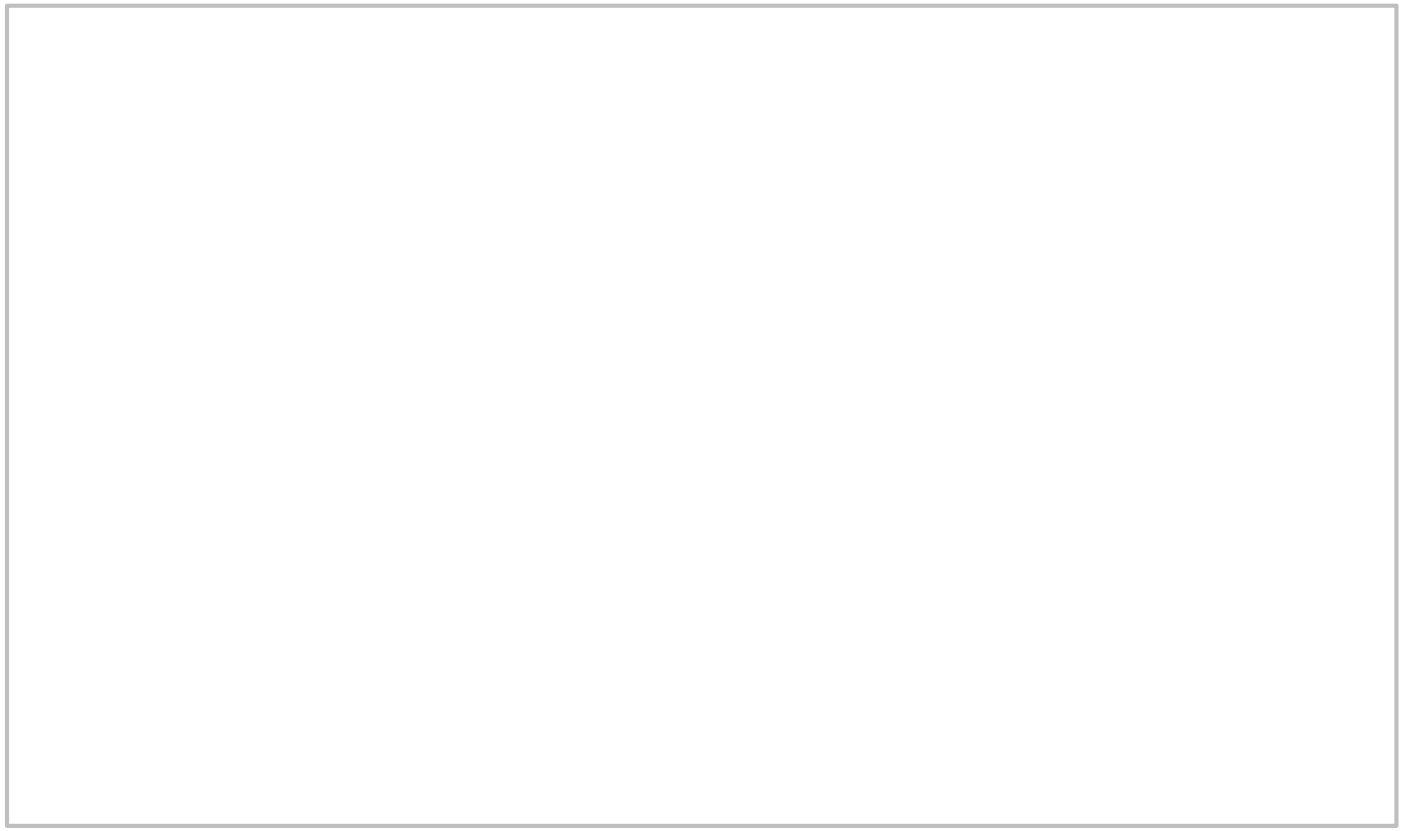
Conceptual Introduction to COBie

(Construction Operations Building information exchange)

The COBie Submittal

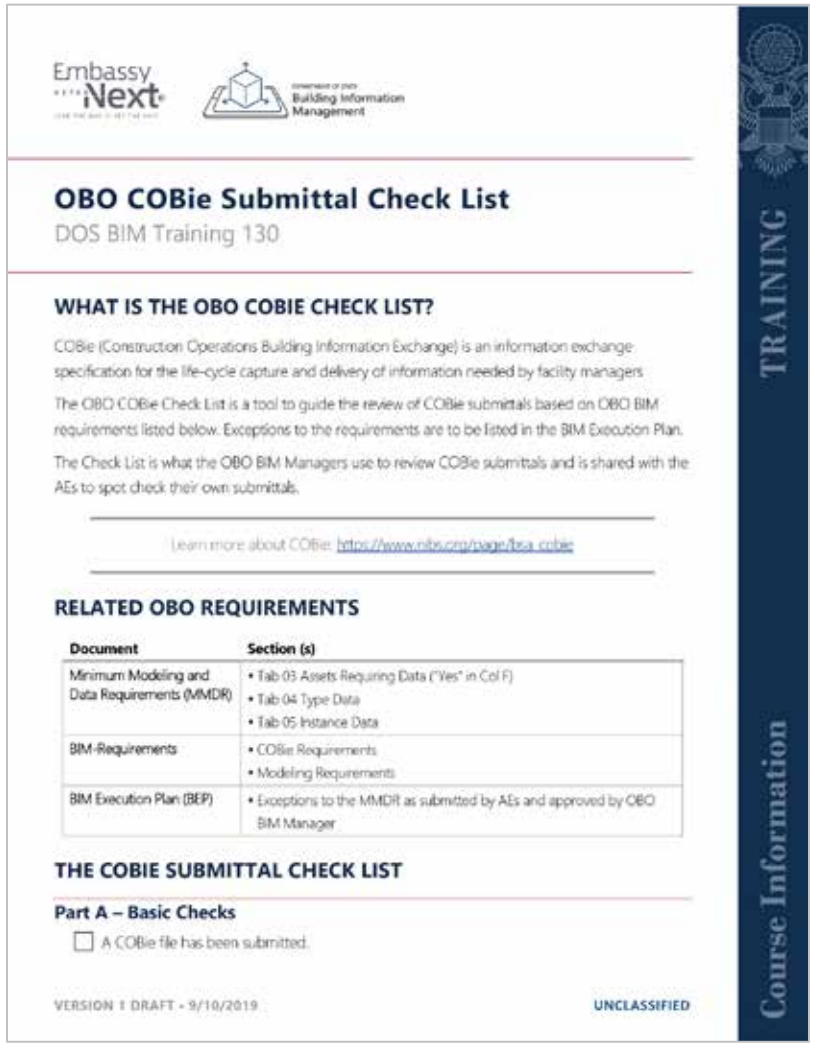
- OBO requires asset data identified in the MMDR to be delivered in a COBie submittal.

- COBie is a standardized format for the collection and transmission of asset data that can be imported into OBO's Maintenance Management and Portfolio Management System.



The COBie Submittal

- OBO provides a checklist to aid reviewers in reviewing COBie submittals and AEs in checking their submittals.
- More about the COBie framework and process can be found at https://www.nibs.org/page/bsa_cobie



Embassy Next

Building Information Management

OBO COBie Submittal Check List

DOS BIM Training 130

WHAT IS THE OBO COBIE CHECK LIST?

COBie (Construction Operations Building Information Exchange) is an information exchange specification for the life-cycle capture and delivery of information needed by facility managers.

The OBO COBie Check List is a tool to guide the review of COBie submittals based on OBO BIM requirements listed below. Exceptions to the requirements are to be listed in the BIM Execution Plan.

The Check List is what the OBO BIM Managers use to review COBie submittals and is shared with the AEs to spot check their own submittals.

Learn more about COBie: https://www.nibs.org/page/bsa_cobie

RELATED OBO REQUIREMENTS

Document	Section (s)
Minimum Modeling and Data Requirements (MMDR)	• Tab 03 Assets Requiring Data ("Yes" in Col F) • Tab 04 Type Data • Tab 05 Instance Data
BIM Requirements	• COBie Requirements • Modeling Requirements
BIM Execution Plan (BEP)	• Exceptions to the MMDR as submitted by AEs and approved by OBO BIM Manager

THE COBIE SUBMITTAL CHECK LIST

Part A – Basic Checks

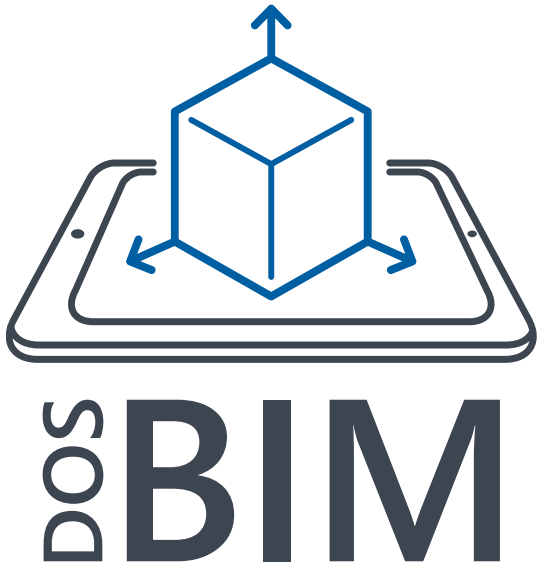
☐ A COBie file has been submitted.

VERSION 1 DRAFT - 9/10/2019

UNCLASSIFIED

TRAINING

Course Information



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How It All Fits Together

How It All Fits Together

- The Project Scope of Work (SOW), BIM Requirements, BEP, and MMDR with the LOD framework form an integrated system with the purpose of making model and drawing requirements more explicit so OBO gets more information when it needs it by:
- Ensuring that the AEs understand precisely what is needed for each design submittal
- Ensuring that OBO's review requirements align with efficient design practice
- Helping the reviewers make better use of their time by focusing their attention on the most important issues at the level of detail appropriate to the current design phase

How It All Fits Together

What to design

Statement of Work

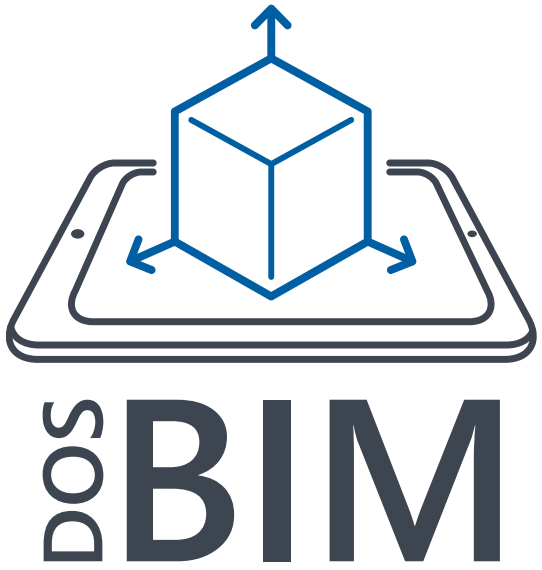
How to model the design

BIM Requirements

MMDR

DOS BIM

Design Submittal Models and Drawings



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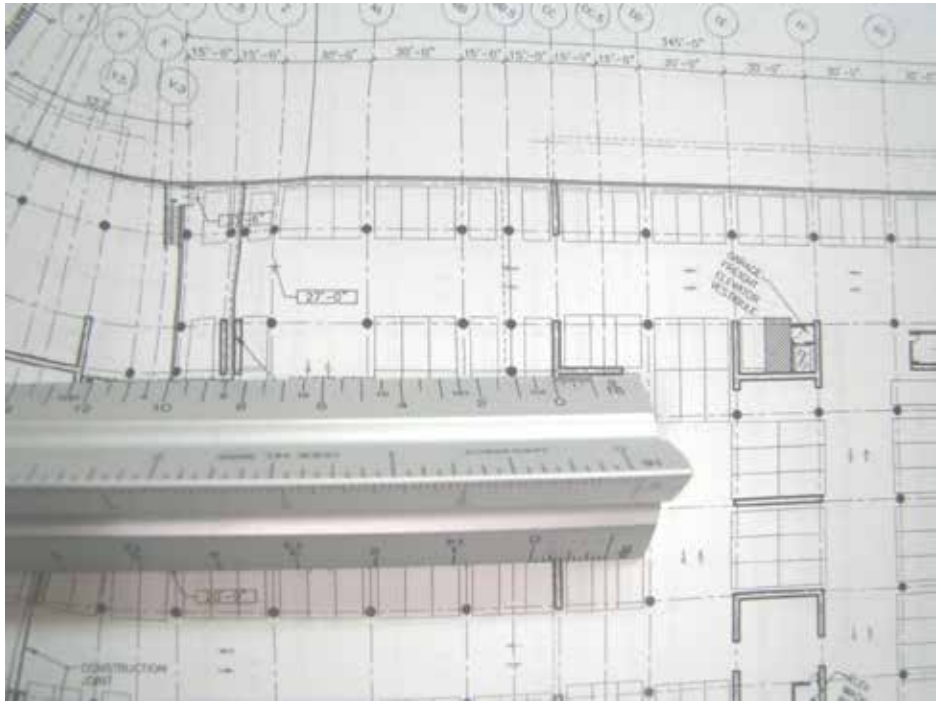
LOD and Reliability of Models

Measuring Drawings or Models

Precision



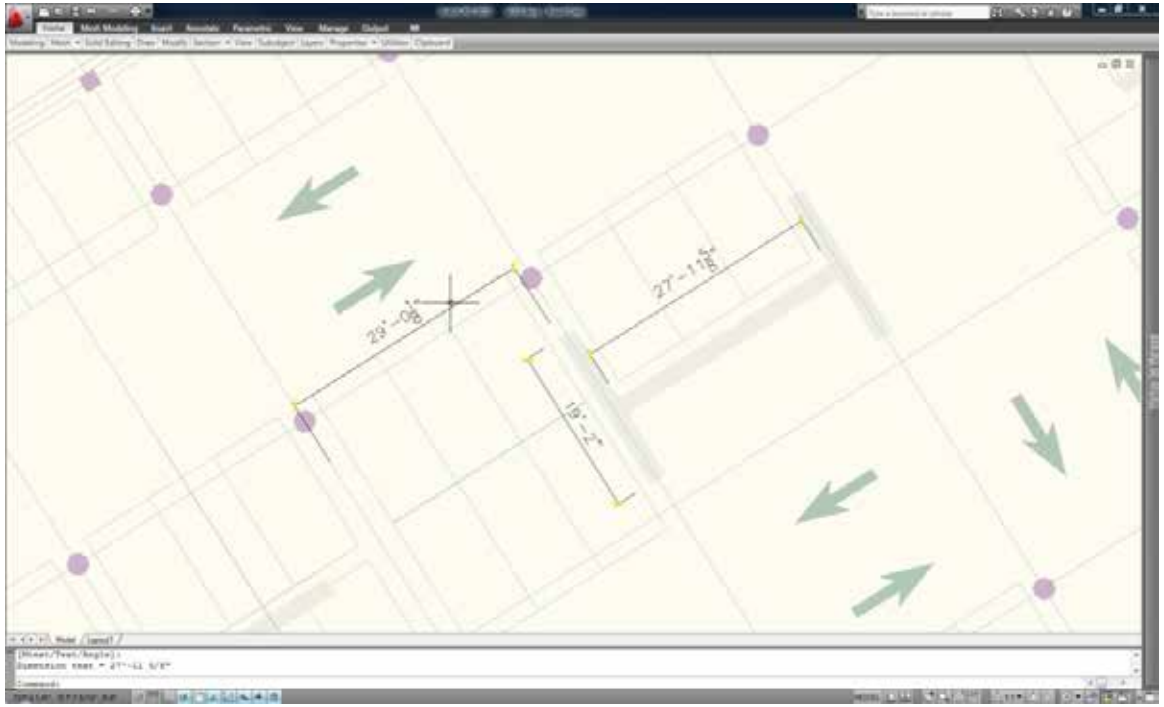


Image source: Webcor Builders

Recall that it's impractical to measure paper drawings, but CAD drawings and BIMs can be measured with extremely high precision. But if the author of the drawing or model doesn't expect someone to measure, elements may not be in precisely the right place.

BIMForum Interpretations

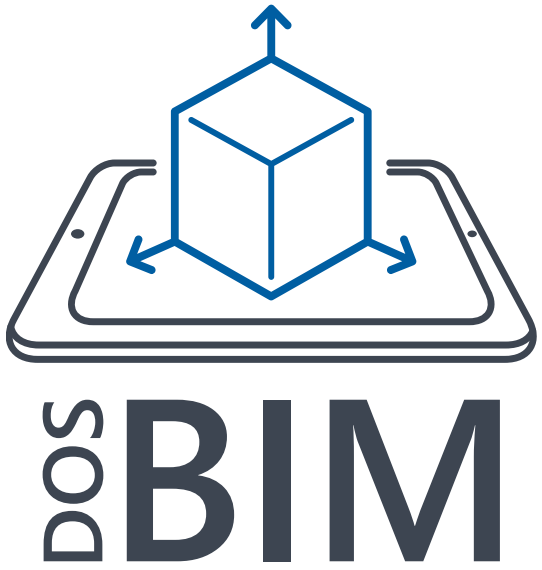
The BIMForum working group developed basic interpretations of the AIA definitions, the most important being the interpretation of LOD 300.

The spec states that the quantity, size, shape, location, and orientation of an LOD 300 element as designed *can be measured directly from the model* without referring to non-modeled information such as notes or dimension call-outs.

Reliance

Thus OBO's MMDR requires that certain model elements be located with sufficient precision that they can be directly measured. This enables several design and construction processes that bring efficiency and reliability to the project, among them:

- Much more effective collaboration between disciplines
- Automated layout processes that significantly reduce time and errors
- Precise coordination of systems in crowded locations, reducing costly rework



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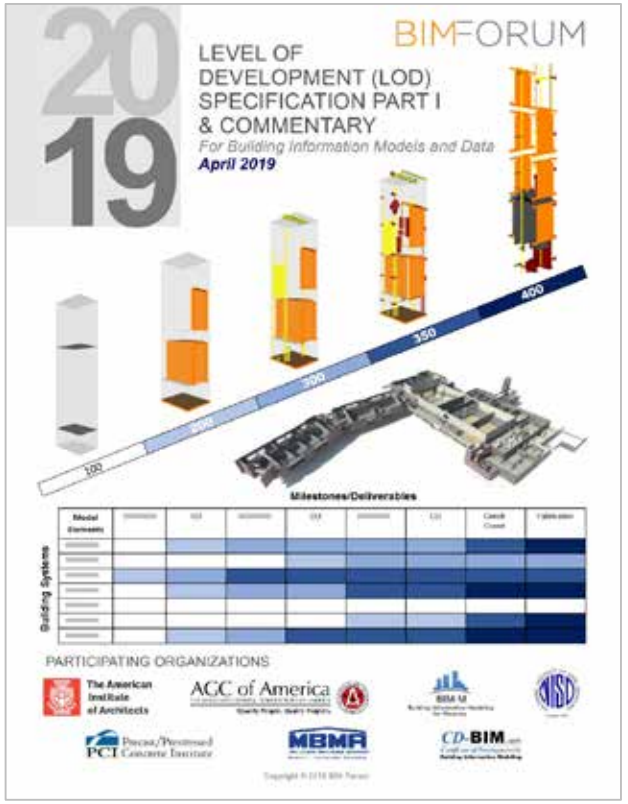
LOD and Design Review

LOD and Project Management

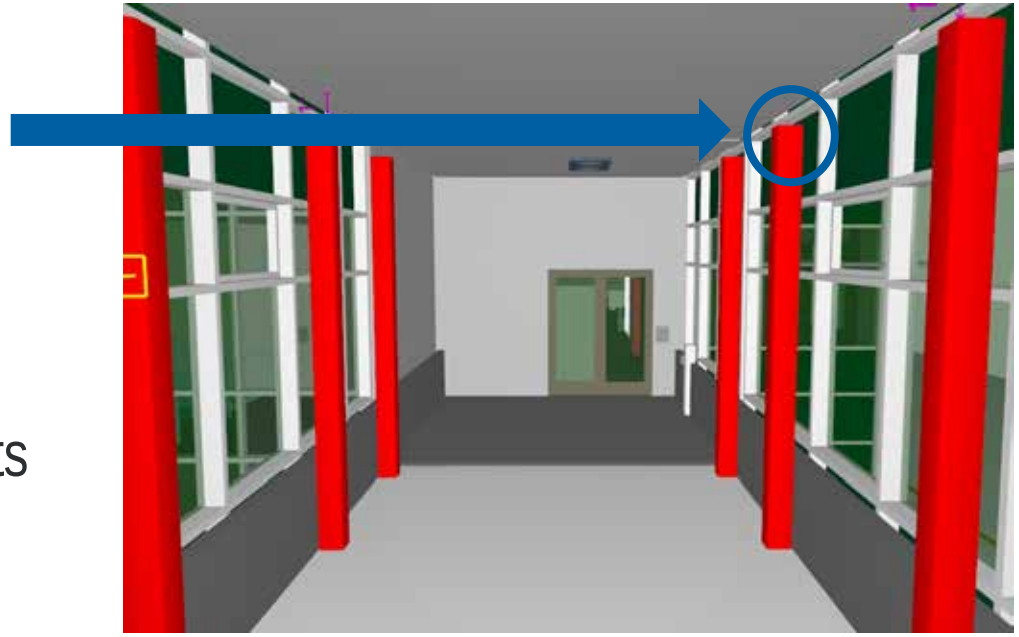
OBO's MMDR supported by the LOD Spec enables concise, objective evaluation of project deliverables.



MMDR Compliance

Example checks for LOD 300

- In a model:
  - Element must have an attribute stating its Uniformat 2010 or Omniclass Table 21 ID.
  - A column must be connected to its floor and the deck above
- In a drawing as well as in a model:
  - A column must indicate its construction.
  - A column must be shown at the intended size and location.

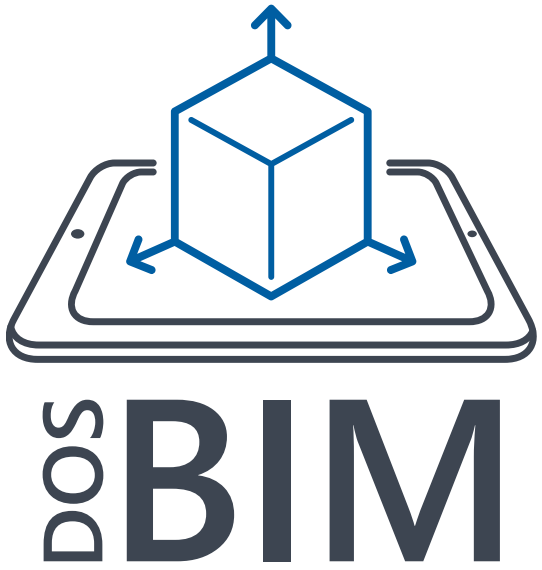


Note that an element can meet all these requirements and still not qualify for LOD 300 if, for example, a column:

- Is not of the construction the design team intends.
- Is not in the exact location the design team intends.

MMDR Compliance

- A model element or its representation in a drawing will meet the requirements for LOD 300 only if it shows the complete and accurate design intent for the represented building component.
- The OBO project management team must confirm that the AEs understand that they must create model elements with the standard of care corresponding to the required LOD.
- For example, an LOD 300 model element, and thus its representation on a drawing, must be located with the same standard of care required for calculation of its layout dimensions.



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Summary

Summary

- The LOD framework is a tool for concisely defining models at the element level.
- It improves efficiency and effectiveness of the BIM process in several ways, some of which are:
  - It enables concise definition of BIM deliverables
  - It enables project team members to rely on each others' models
  - It greatly improves BIM as a coordination and communication tool
- The ***LOD Specification*** greatly improves the usefulness of the LOD framework by providing precise definitions of model elements of over 400 building systems, assemblies, and components at each LOD
- The LOD Specification is a widely-accepted industry standard
- OBO's Minimum Modeling and Data Requirements (MMDR) is a set of modeling requirements stated in system, assembly, and component LOD requirements as defined by the LOD Spec.
- The MMDR supports design and construction project management by enabling clear and objective definition and evaluation of BIM deliverables

Review of Learning Objectives

1. Describe general LOD concepts, framework, and logic at a practical level.
2. Describe the problems the LOD Framework solves.
3. Describe the evolution of the LOD Framework as an industry standard.
4. Efficiently find needed information in the *LOD Specification* (*LOD Spec*)
5. Understand OBO's Minimum Modeling and Data Requirements (MMDR).
6. Describe the impact of the LOD framework on the reliability of models.
7. Be able to evaluate design review submittals for compliance with modeling requirements.

THANK YOU

For more information contact BIM@state.gov

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