FAB22538 Fabrication and BIM Forum
2016 Level Of Development (LOD) Specification

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Principal
Twitter: **Ikerd_com**

Class summary

The presentation will provide an in-depth discussion of fabrication and Level Of Development (LOD) from the 2016 AGC BIM Forum LOD Specification from one of the specifications authors. It will address model elements at the different stages in a building life cycle: Design, Construction and Ownership. The framework of the discussion will consider the LOD Specification that defines models on a scale of 100 to 500 with a particular focus of LOD 350 which the speaker originally authored and introduced to the LOD Specification committee. The content will discuss how structural element models are used by architects, mechanical engineers, construction managers, sub-contractors and fabricators. This will demonstrate how the newly issued LOD Specification can be used to define team expectations of what should be modeled. Practical examples of model detail issues will be shown along with effective approaches to resolve the challenges using the LOD Specification as an early BIM planning tool.

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Key learning objectives

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

1. Define what is Model Element Level Of Development (LOD) for design.
2. Understand what the AGC BIM Forum LOD Specification 2016 is and how you can address LOD in projects with it.
3. Understand how the LOD Specification can be used with design and construction teams to lower risk.
4. Understand why LOD discussions are crucial early on in a project

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Washington University in St. Louis

Mid-90's Graduate Work in
Parametric Structural Engineering
of Buildings with EDI

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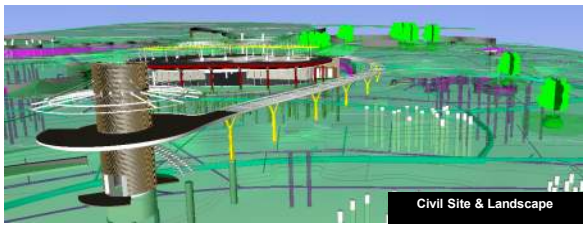

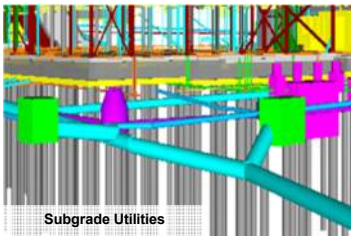

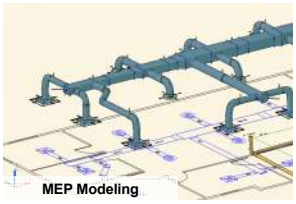

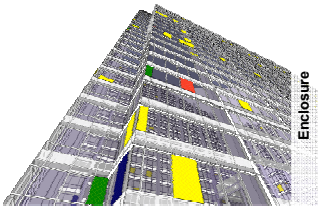

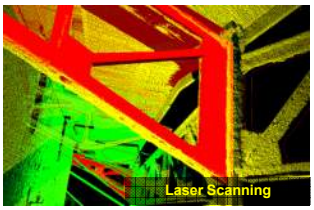

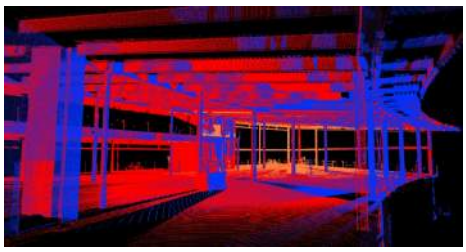

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Level Of Development (LOD)

Major Take Away

"Everything should be made as simple as possible, but not one bit simpler. "

Albert Einstein

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Why LOD?: Model Element Handoffs

There's many a slip between the cup and the lip

BIM Forum Level of Development

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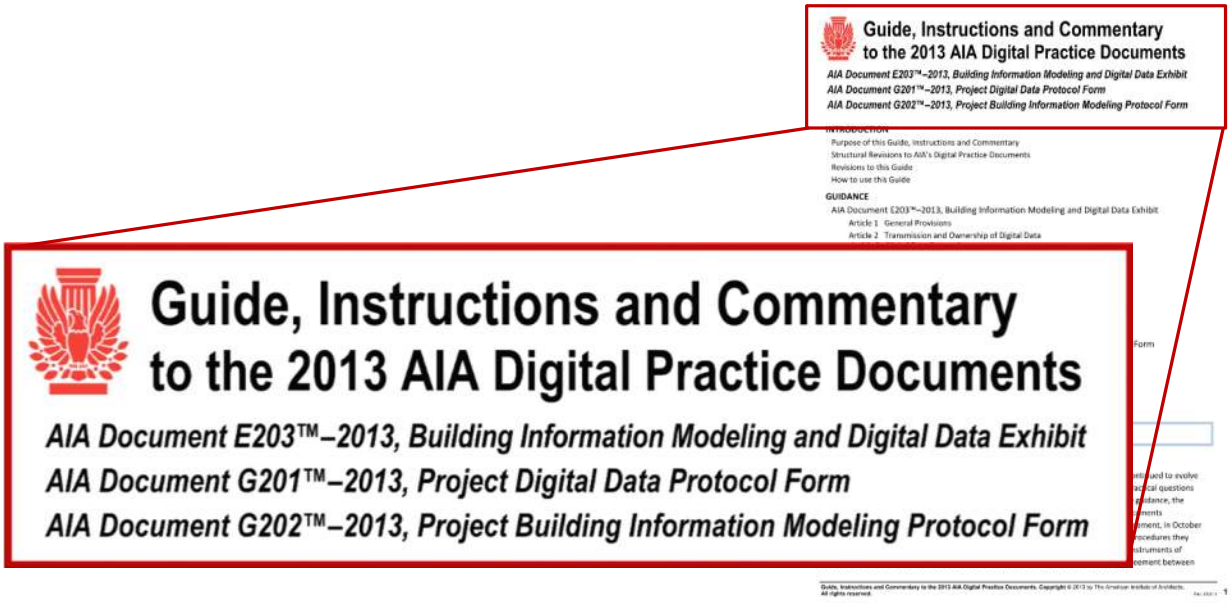
BIMFORUM Level of Development Specification

- Scope cannot address all of BIM
- There is NO LOD of a whole model.
- LOD does not always match design phase.
- **2008** - American Institute of Architects (AIA) First Published definition for 100, 200, 300 & 400 in 2008 E202.
- **2009-10** LOD 350 was authored and first presented at Autodesk University sessions by Ikerd.
- **2011** - BIM Forum LOD Taskforce formed
- **2013** – BIM Forum published the first LOD Spec ratifying LOD 350
- BIM forum LOD Specification is published yearly: ’13, ‘14, ‘15, & ‘16.



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LOD 100

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LOD SPEC. 2016

AIA
G202™-2013

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.

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LOD SPEC. 2016

BIMForum Interpretation: LOD 100 elements are **not geometric representations**. Examples are information attached to other model elements or symbols showing the existence of a component but not its shape, size, or precise location. Any information derived from LOD 100 elements must be considered approximate.

LOD 200

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LOD SPEC. 2016

AIA
G202™-2013

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.

BIMFORUM
LOD SPEC. 2016

BIMForum Interpretation: At this LOD **elements are generic placeholders**. They may be recognizable as the components they represent, or they may be volumes for space reservation. Any information derived from LOD 200 elements must be considered approximate.

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LOD 300

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LOD SPEC. 2016

AIA
G202™-2013

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.

BIMFORUM
LOD SPEC. 2016

BIMForum Interpretation: The quantity, size, shape, location, and orientation of the element as designed can be **measured directly from the model without referring to non-modeled information** such as notes or dimension call-outs.

LOD 350: Detailed Coordination

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LOD SPEC. 2016

BIM FORUM ONLY

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

BIMFORUM
LOD SPEC. 2016

BIMForum Interpretation: Parts necessary for coordination of the element with nearby or attached elements are modeled. These parts will include **such items as supports and connections**. The quantity, size, shape, location, and orientation of the element as designed can be measured directly from the model without referring to non-modeled information such as notes or dimension call-outs.

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LOD 400: Fabrication Assemblies

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LOD SPEC. 2016

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G202™-2013

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.

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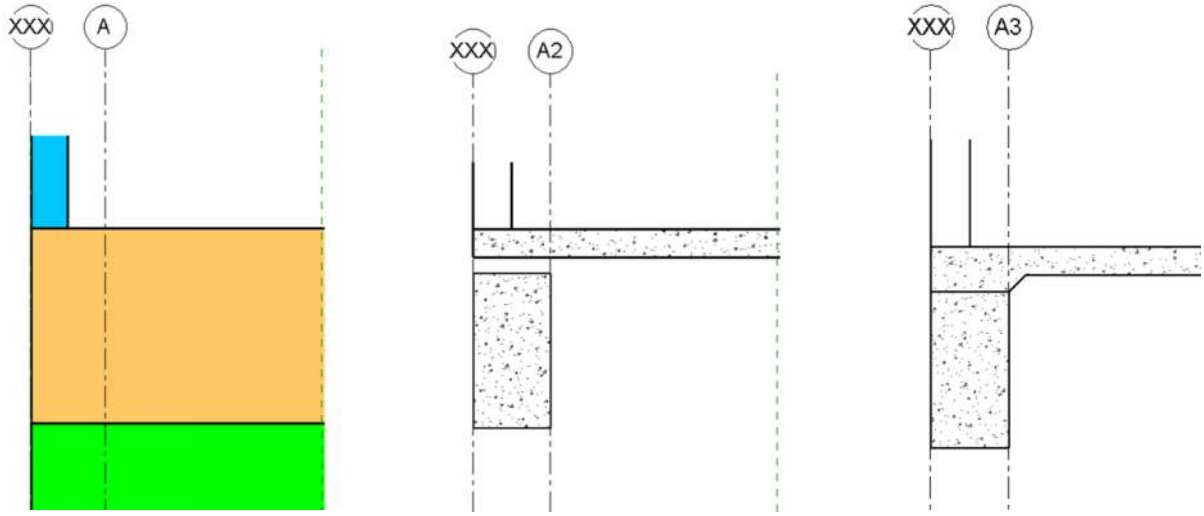
LOD SPEC. 2016

BIMForum Interpretation: An LOD 400 element **is modeled at sufficient detail and accuracy for fabrication of the represented component**. The quantity, size, shape, location, and orientation of the element as designed can be measured directly from the model without referring to non-modeled information such as notes or dimension call-outs.

CONCRETE CAST-IN-PLACE



LOD 200 **LOD 300** **LOD 350**

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WHY LOD 350 – CROSS TRADE COORD.

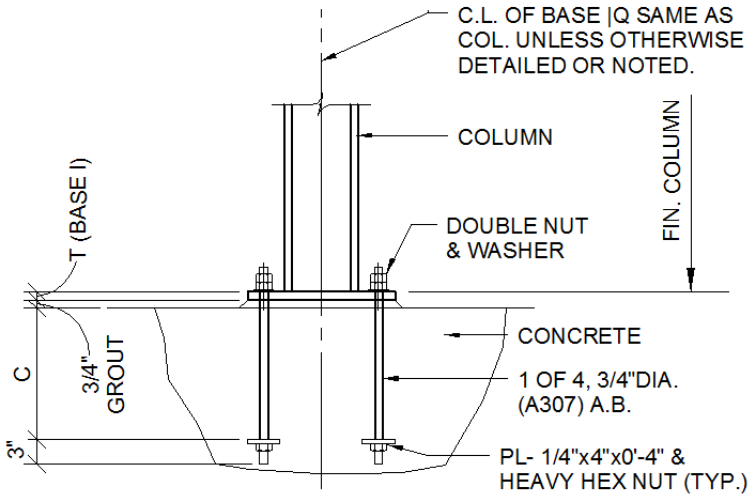
LOD 300
PERMIT

LOD 400
FABRICATED

~20% OF EFFORT

W/ ~80% CONSTRUCTION $$$

Steel Base Plate Design Drawings



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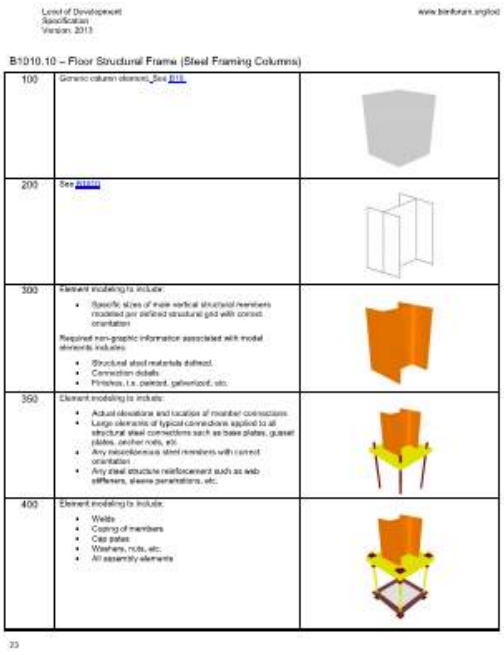
LOD Specificaion



Level of Development Specification Version 2013

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B1010.10 – Floor Structural Frame (Steel Framing Columns)

100	Generic column element. See B10.	
200	See B1010	
300	Element modeling to include: • Specific sizes of main vertical structural members modeled per defined structural grid with correct orientation Required non-graphic information associated with model elements includes: • Structural steel materials defined. • Connection details. • Finishes, i.e. painted, galvanized, etc.	
350	Element modeling to include: • Actual elevations and location of member connections • Large elements of typical connections applied to all structural steel connections such as base plates, gusset plates, anchor rods, etc. • Any miscellaneous steel members with correct orientation • Any steel structure reinforcement such as web stiffners, sleeve penetrations, etc.	
400	Element modeling to include: • Welds • Coping of members • Clip plates • Washers, nuts, etc. • All assembly elements	

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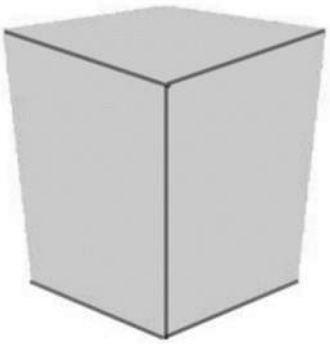
Base Plate LOD 100



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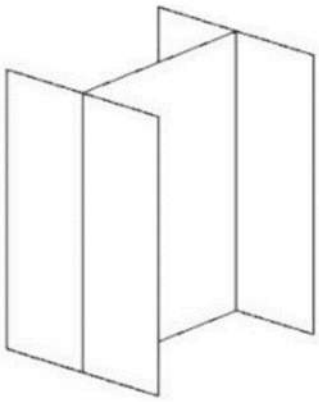
Base Plate LOD 200



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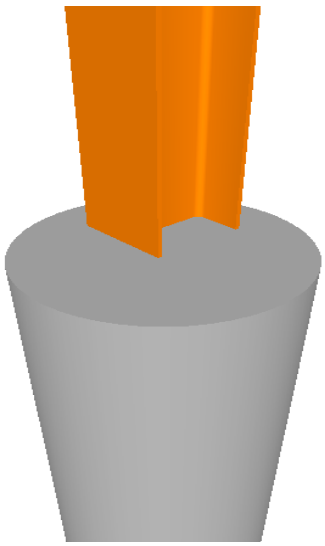
Base Plate LOD 300



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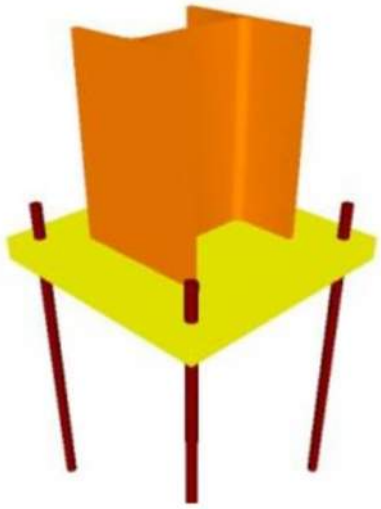
Base Plate LOD 350



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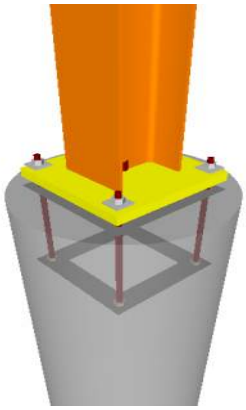
Base Plate LOD 400



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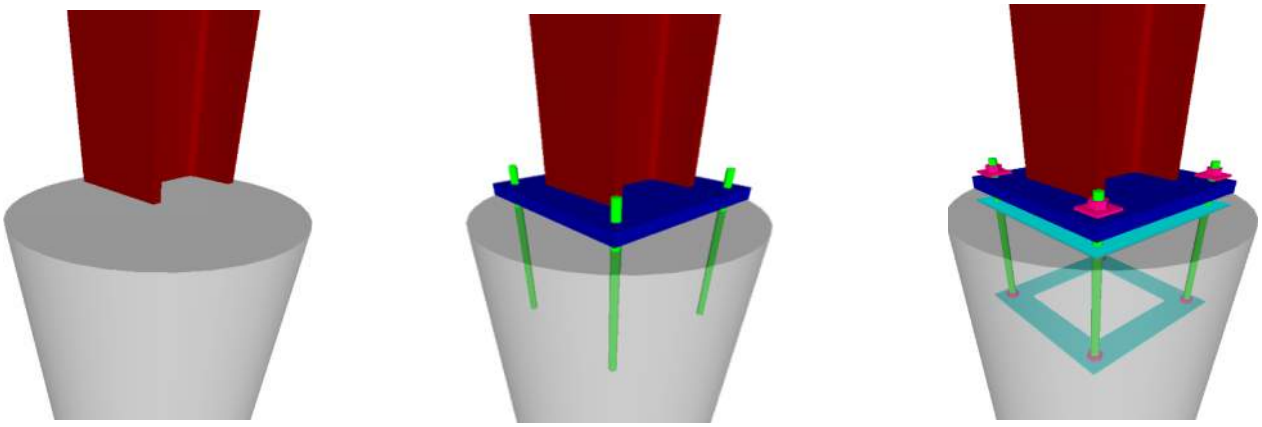
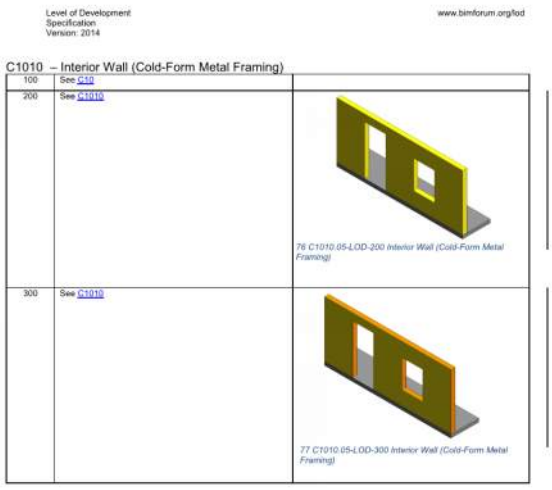
LOD Specification Example

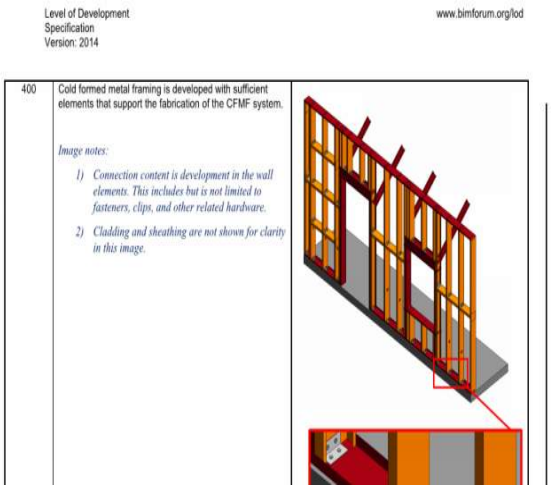
300 → **350** → 400



Images courtesy of IKERD Consulting, LLC

Cold Formed Metal Framing (CFMF) BIM





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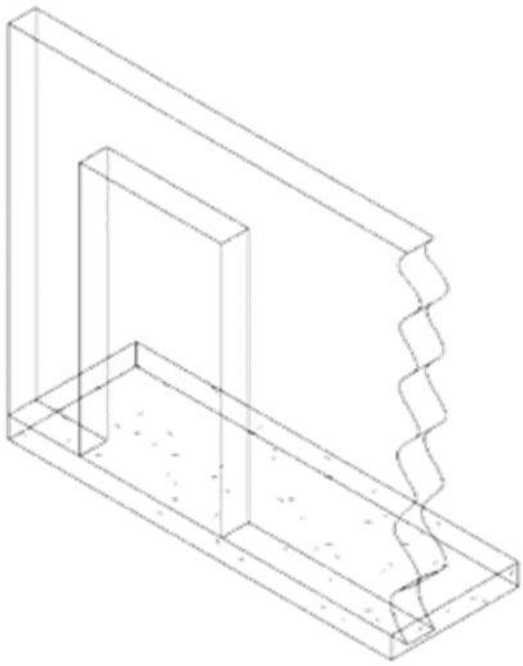
LOD 200



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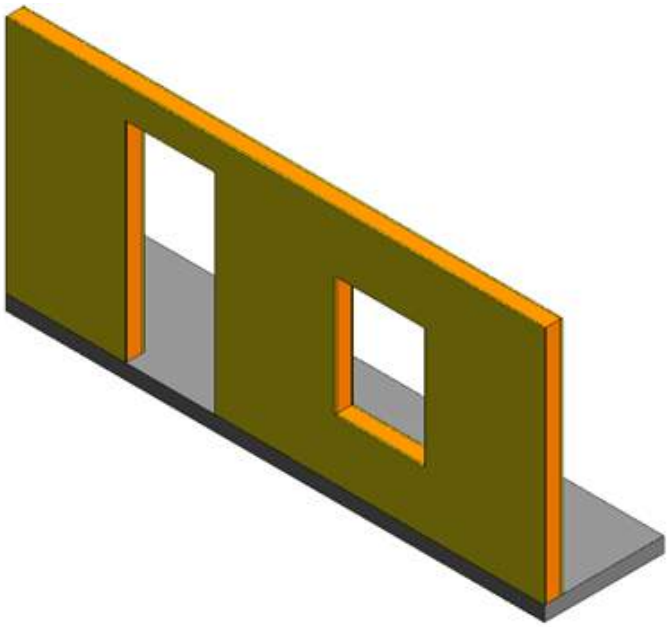
LOD 300



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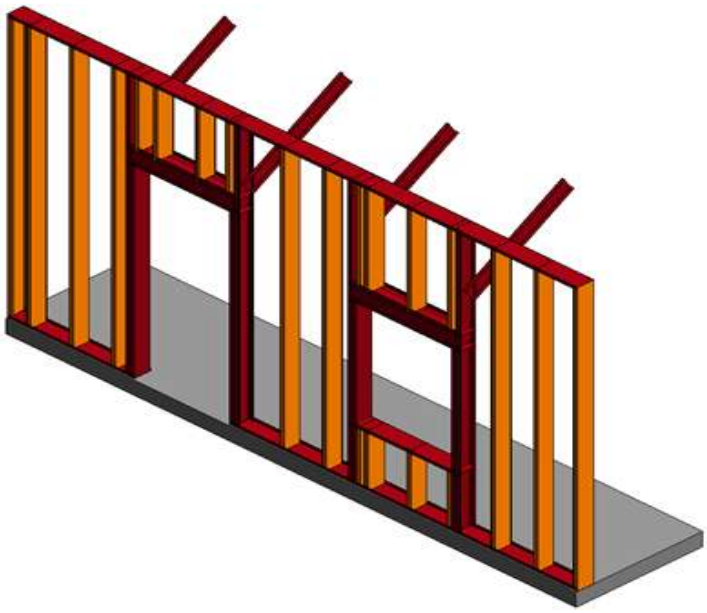
LOD 350



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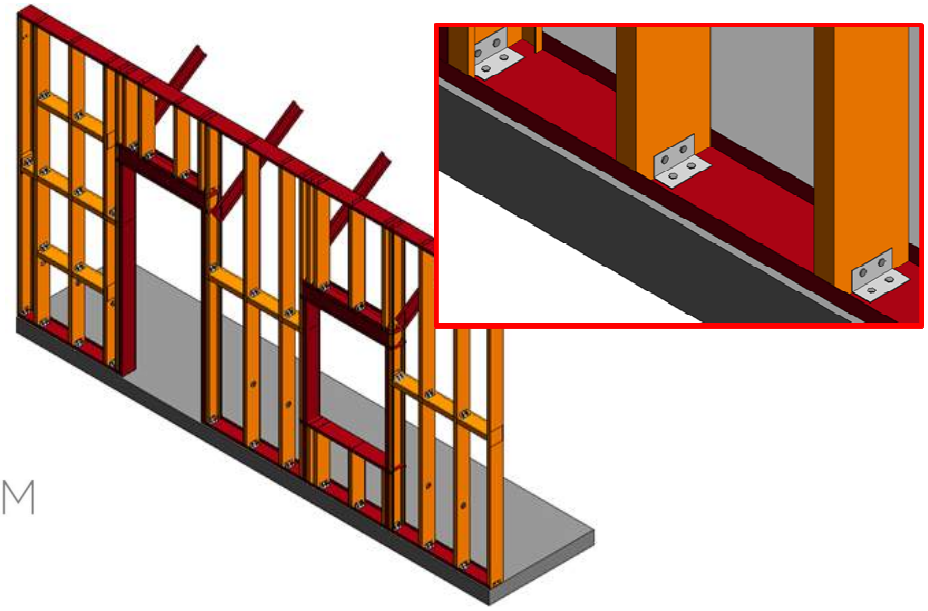
LOD 400



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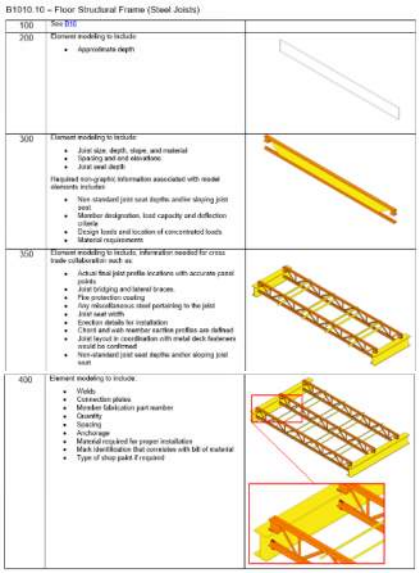
STEEL JOIST INSTITUTE


B1010.10 – Floor Structural Frame (Steel Joists)

100	See B10
200	Element modeling to include: • Approximate depth
300	Element modeling to include: • Joist size, depth, slope, and material • Spacing and end elevations • Joist seat depth Required non-graphic information associated with model elements includes: • Non-standard joist seat depths and/or sloping joist seat • Member designation, load capacity and deflection criteria • Design loads and location of concentrated loads • Material requirements
350	Element modeling to include, information needed for cross trade collaboration such as: • Actual final joist profile locations with accurate panel points • Joist bridging and lateral braces • Fire protection coating • Any miscellaneous steel pertaining to the joist • Joist seat widths • Erection details for installation • Chord and web member outline profiles are defined • Joist layout in coordination with metal deck fasteners would be confirmed • Non-standard joist seat depths and/or sloping joist seat
400	Element modeling to include: • Welds • Connection plates • Member fabrication part number • Quantity • Spacing • Anchorage • Material required for proper installation • Mark identification that correlates with bill of material • Type of shop paint if required

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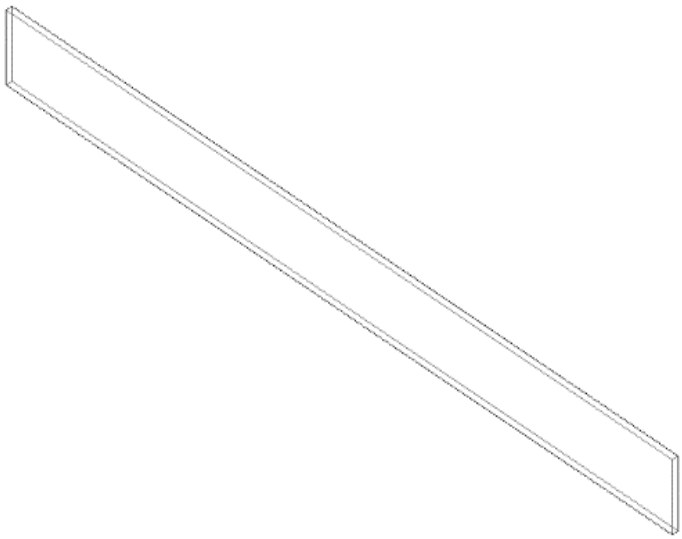
LOD 200



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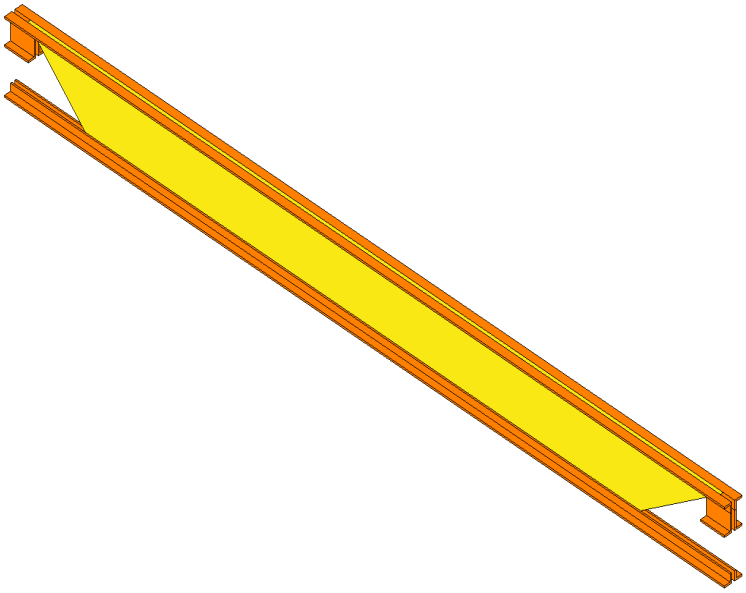

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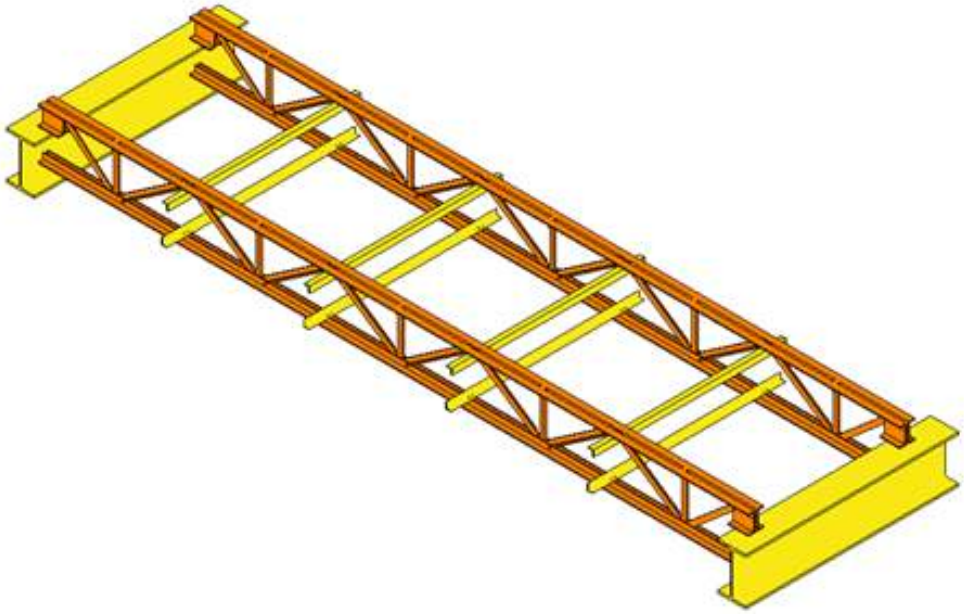

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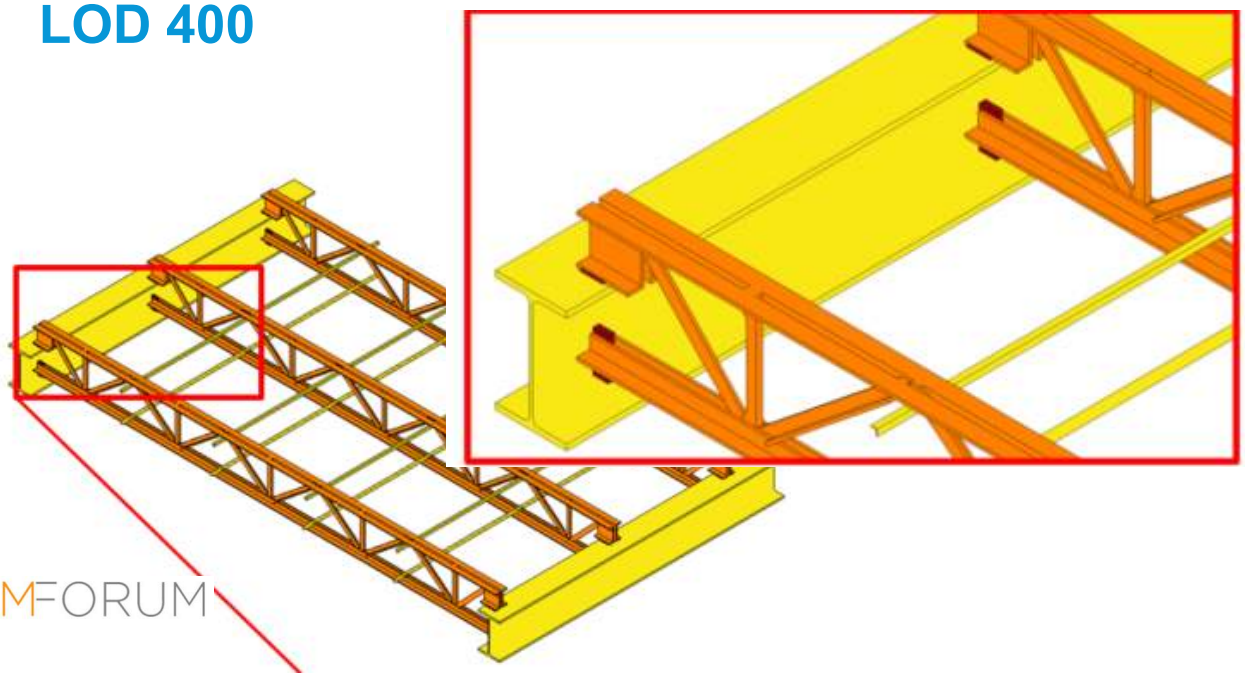

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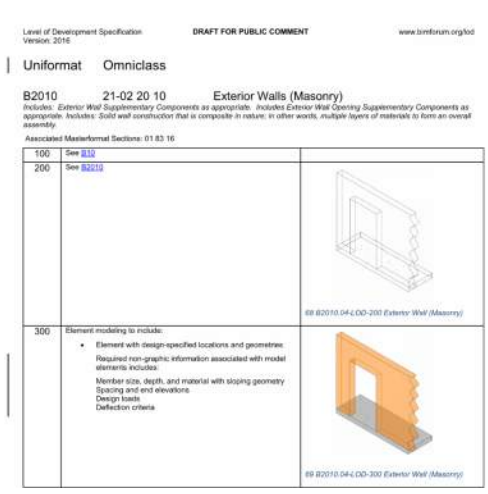
Masonry



Level of Development Specification Version: 2016 **DRAFT FOR PUBLIC COMMENT** www.bimforum.org/lod

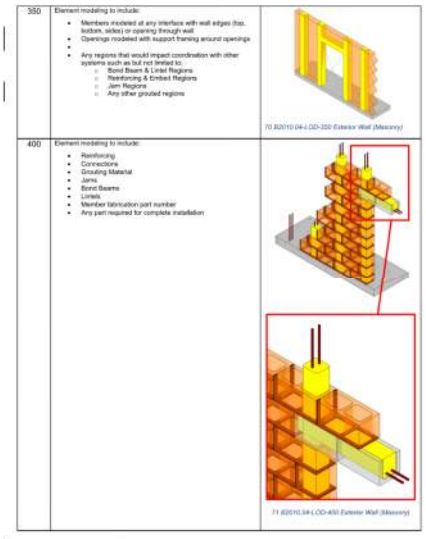
Uniformat Omniclass

B2010 21-02 20 10 Exterior Walls (Masonry)

Includes: Exterior Wall Supplementary Components as appropriate. Includes Exterior Wall Opening Supplementary Components as appropriate. Includes: Solid wall construction that is composite in nature; in other words, multiple layers of materials to form an overall assembly.

Associated Masterformat Sections: 01 83 16

100	See B10	
200	See B2010	69 B2010.04-LOD-200 Exterior Wall (Masonry)
300	Element modeling to include: • Element with design-specified locations and geometries Required non-graphic information associated with model elements includes: Member size, depth, and material with sloping geometry Spacing and end elevations Design loads Deflection criteria	69 B2010.04-LOD-300 Exterior Wall (Masonry)



350	Element modeling to include: • Members modeled at any interface with wall edges (top, bottom, sides) or opening through wall • Openings modeled with support framing around openings • • Any regions that would impact coordination with other systems such as but not limited to: ○ Bond Beam & Lintel Regions ○ Reinforcing & Embed Regions ○ Jam Regions ○ Any other grouted regions	70 B2010.04-LOD-350 Exterior Wall (Masonry)
400	Element modeling to include: • Reinforcing • Connections • Grouting Material • Jams • Bond Beams • Lintels • Member fabrication part number • Any part required for complete installation	71 B2010.04-LOD-400 Exterior Wall (Masonry)

Reference Part II Attribute Tables for non-graphical information

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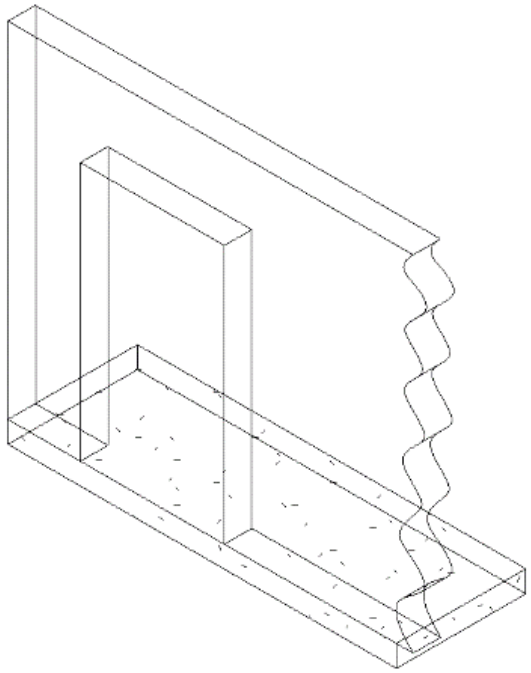
LOD 200



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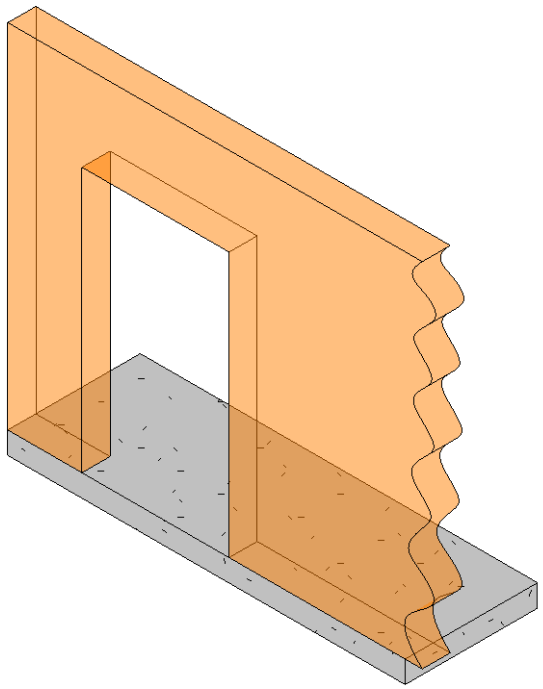
LOD 300



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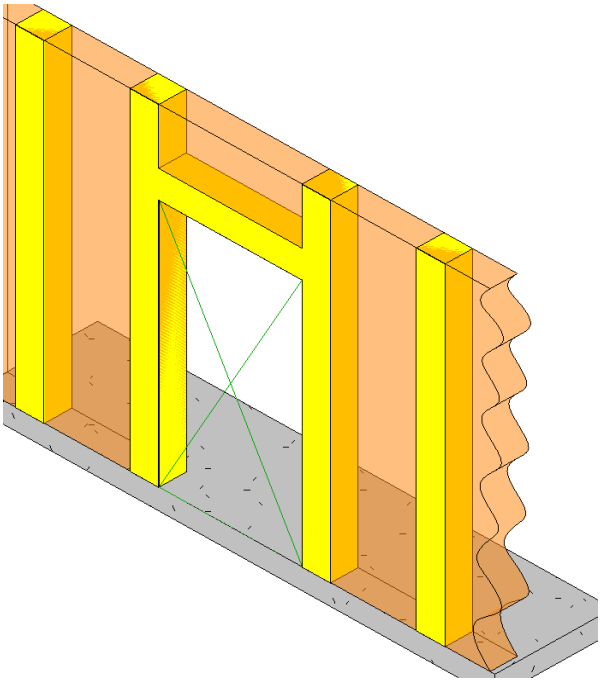
LOD 350



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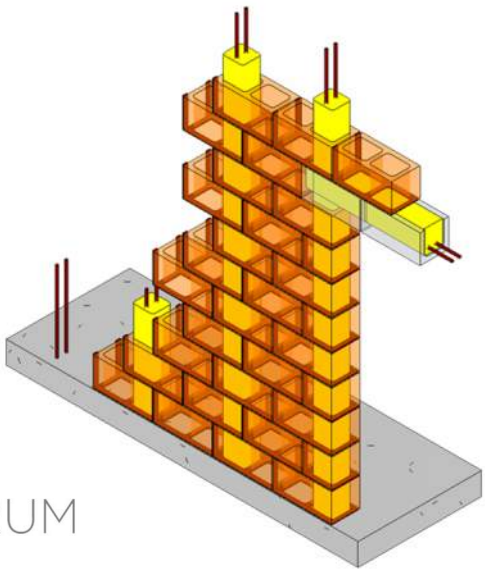
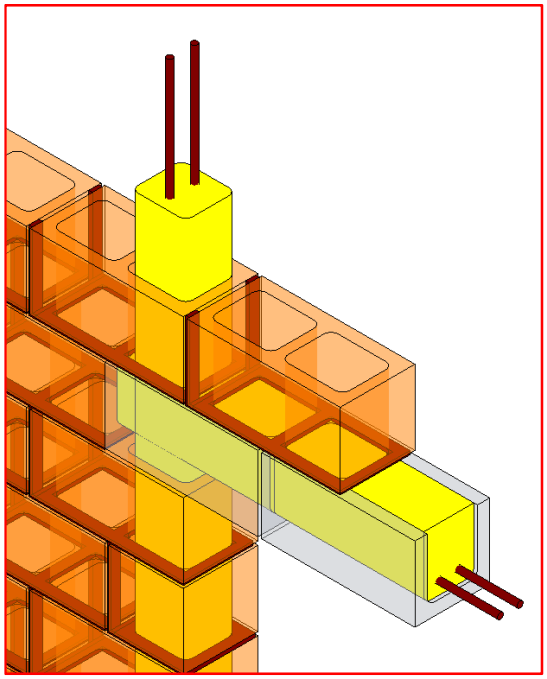
LOD 400





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Precast Structural Double Tee

B1010.20 21-02 10 10 10 Precast Structural Double Tee (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 B10B10	
200	Element modeling to include: • Type of structural concrete system • Approximate geometry (e.g. depth) of structural elements	 *50 B1010.20 – LOD 200 Precast Structural Double Tee (Concrete)*
300	Element modeling to include: • Specific sizes and locations of main concrete structural members modeled per defined structural grid with correct orientation • Concrete defined per spec (strength, air entrainment, aggregate size, etc.) • All sloping surfaces included in model element with exception of elements affected by manufacturer selection	 *51 B1010.20 – LOD 300 Precast Structural Double Tee (Concrete)*
350	Element modeling to include: • Reinforcing Post-tension profiles and strand locations • Reinforcement called out, modeled if required by the BIMXP, typically only in congested areas • Pour joints and sequences to help identify reinforcing lap splice locations, scheduling, etc. • Expansion Joints • Lifting devices • Embeds and anchor rods • Penetrations for items such as MEP • Any permanent forming or shoring components	 *52 B1010.20 – LOD 350 Precast Structural Double Tee (Concrete)*
400	Element modeling to include: • All reinforcement including post tension elements detailed and modeled • Finishes, camber, chamfer, etc.	 *53 B1010.20 – LOD 400 Precast Structural Double Tee (Concrete)*

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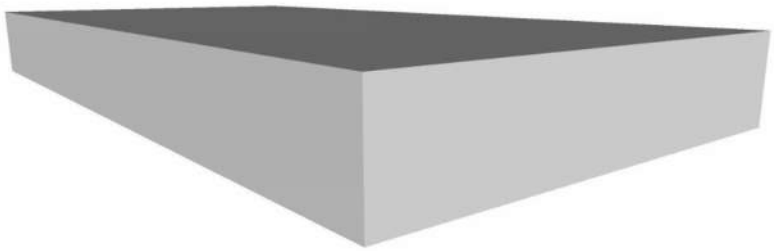
LOD 200



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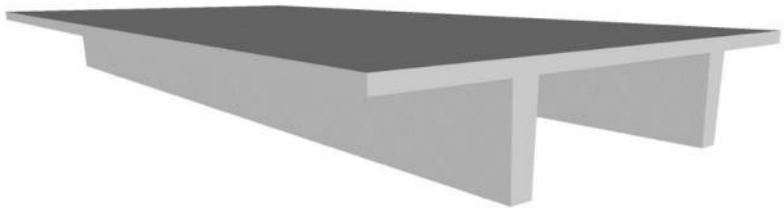
LOD 300



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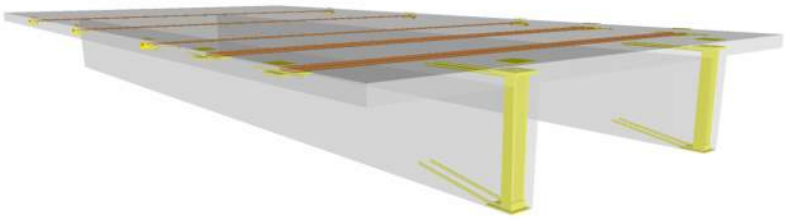
LOD 350



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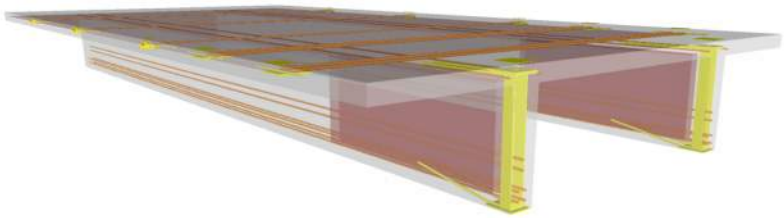
LOD 400



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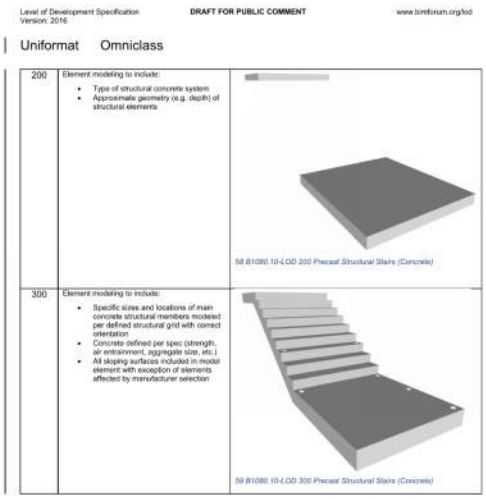
Precast Stairs



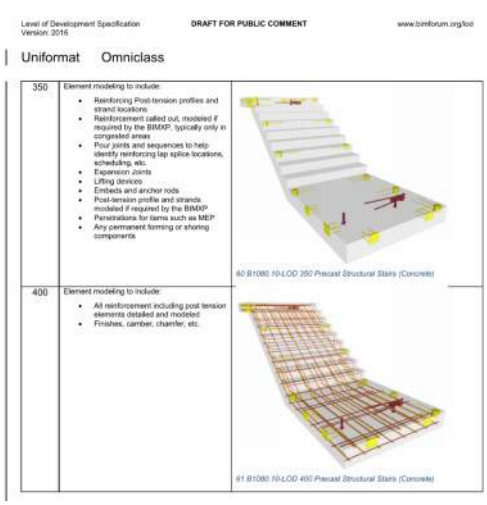
Level of Development Specification
Version: 2016

DRAFT FOR PUBLIC COMMENT

www.bimforum.org/lod

Uniformat Omniclass

200	Element modeling to include: • Type of structural concrete system • Approximate geometry (e.g. depth) of structural elements	50 B1080.10-LOD 200 Precast Structural Stairs (Concrete)
300	Element modeling to include: • Specific sizes and locations of main concrete structural members modeled per defined structural grid with correct orientation • Concrete defined per spec (strength, air entrainment, aggregate size, etc.) • All sloping surfaces included in model element with exception of elements affected by manufacturer selection	59 B1080.10-LOD 300 Precast Structural Stairs (Concrete)



Level of Development Specification
Version: 2016

DRAFT FOR PUBLIC COMMENT

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Uniformat Omniclass

350	Element modeling to include: • Reinforcing Post-tension profiles and strand locations • Reinforcement called out, modeled if required by the BIMXP, typically only in congested areas • Pour joints and sequences to help identify reinforcing lap splice locations, scheduling, etc. • Expansion Joints • Lifting devices • Embeds and anchor rods • Post-tension profile and strands modeled if required by the BIMXP • Penetrations for items such as MEP • Any permanent forming or shoring components	60 B1080.10-LOD 350 Precast Structural Stairs (Concrete)
400	Element modeling to include: • All reinforcement including post tension elements detailed and modeled • Finishes, camber, chamfer, etc.	61 B1080.10-LOD 400 Precast Structural Stairs (Concrete)

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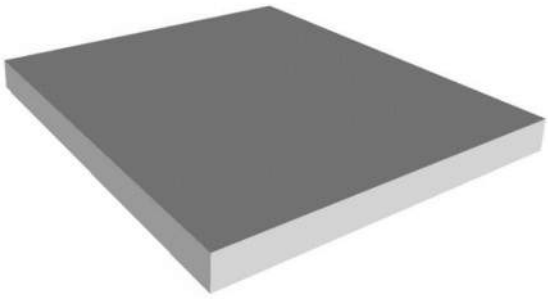
LOD 200



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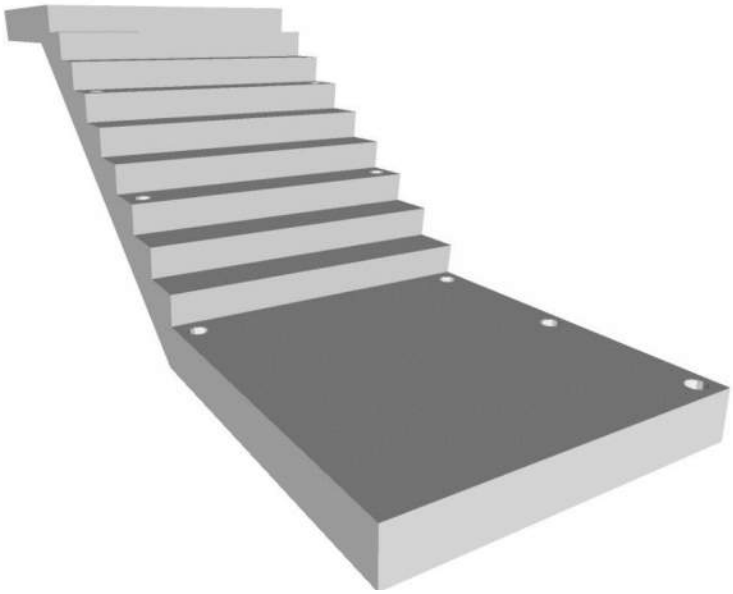
LOD 300



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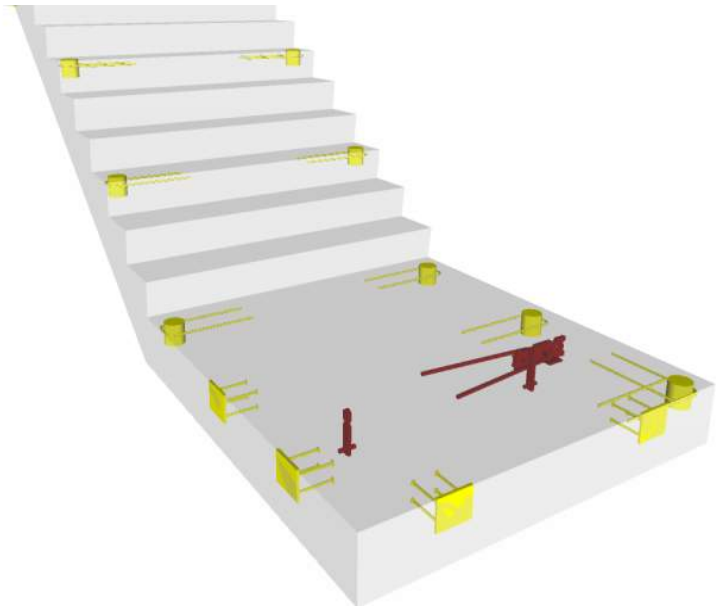
LOD 350



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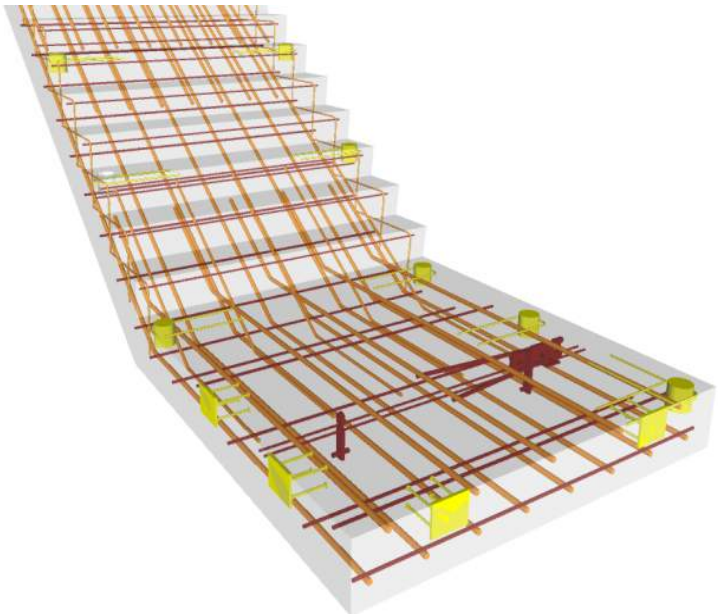
LOD 400



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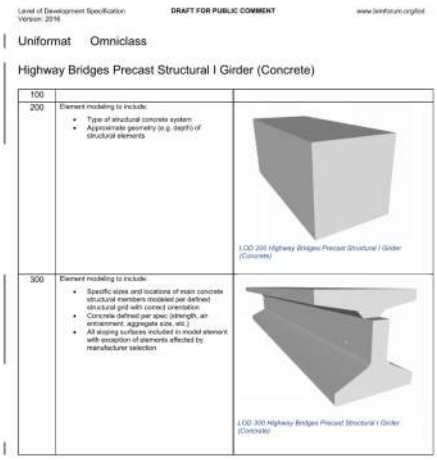
Highway Bridges: Precast Structural Girder

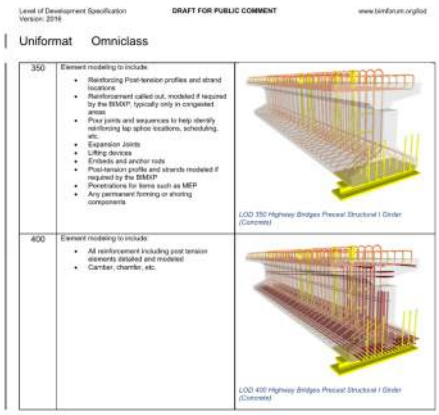


Level of Development Specification DRAFT FOR PUBLIC COMMENT www.bimforum.org/lod
Version: 2016

Uniformat Omniclass

Highway Bridges Precast Structural I Girder (Concrete)

100		
200	Element modeling to include: • Type of structural concrete system • Approximate geometry (e.g. depth) of structural elements	LOD 200 Highway Bridges Precast Structural I Girder (Concrete)
300	Element modeling to include: • Specific sizes and locations of main concrete structural members modeled per defined structural grid with correct orientation • Concrete defined per spec (strength, air entrainment, aggregate size, etc.) • All sloping surfaces included in model element with exception of elements affected by manufacturer selection	LOD 300 Highway Bridges Precast Structural I Girder (Concrete)



Level of Development Specification DRAFT FOR PUBLIC COMMENT www.bimforum.org/lod
Version: 2016

Uniformat Omniclass

350	Element modeling to include: • Reinforcing Post-tension profiles and strand locations • Reinforcement called out, modeled if required by the BIMXP, typically only in congested areas • Pour joints and sequences to help identify reinforcing lap splice locations, scheduling, etc. • Expansion Joints • Lifting devices • Embeds and anchor rods • Post-tension profile and strands modeled if required by the BIMXP • Penetrations for items such as MEP • Any permanent forming or shoring components	LOD 350 Highway Bridges Precast Structural I Girder (Concrete)
400	Element modeling to include: • All reinforcement including post tension elements detailed and modeled • Camber, chamfer, etc.	LOD 400 Highway Bridges Precast Structural I Girder (Concrete)

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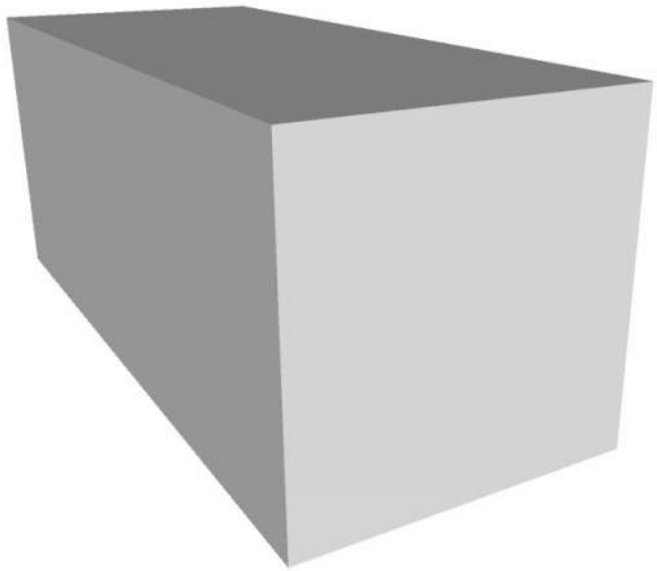
LOD 200



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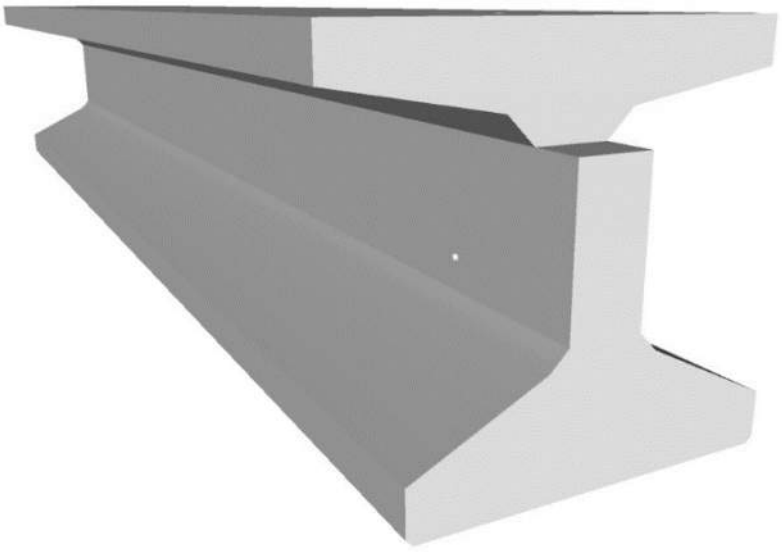
LOD 300



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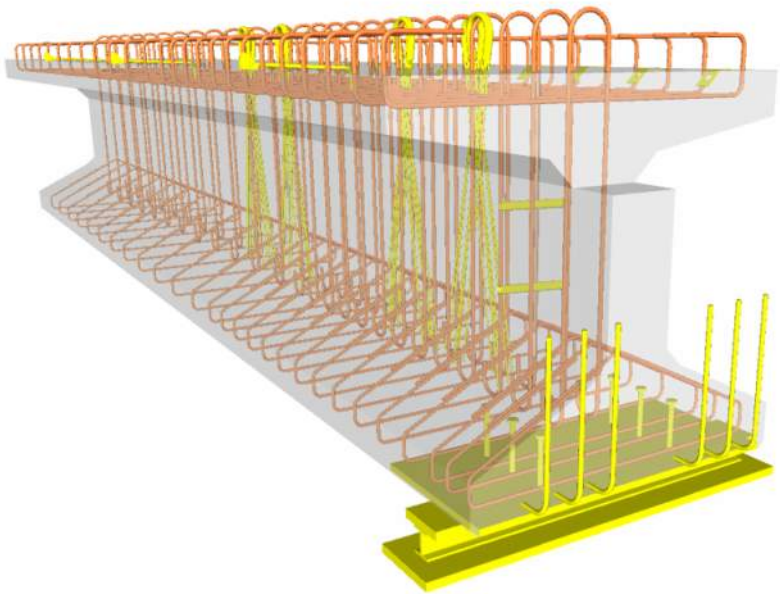
LOD 350



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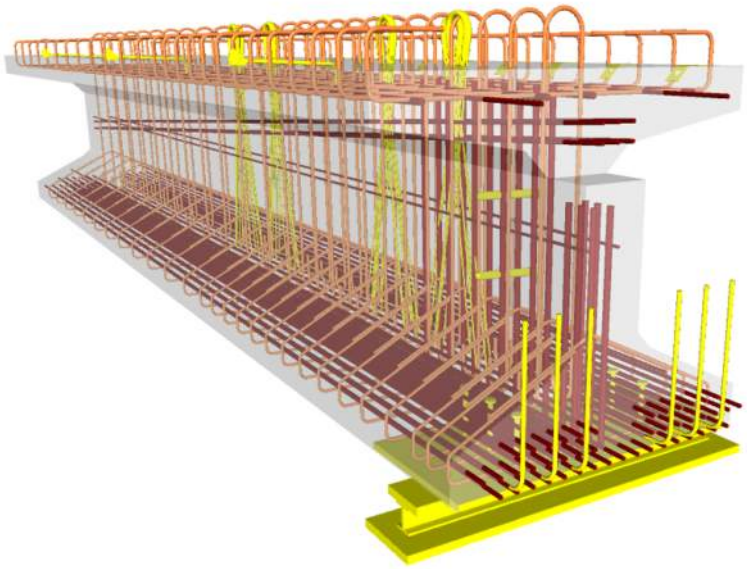
LOD 400



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LOD Specification - Attribute Table

- Contains three categories pertaining to the options for an element
- The Baseline category contains a suggested list of attributes to be populated when no other attributes are known
- The Additional category contains a list of possible attributes to consider
- The last category contains milestones

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LOD Specification - Attribute Table

B – Ext. Glazed Openings												
Baseline	Part 1 - Attribute Description				Part 2 - LOD Profile					Part 3 - Project-Specific Milestones (Examples)			
Additional										Estimating	Estimating	LEED Cert.	LEED Cert
Attribute	Data Type	Units	Option Examples	Commentary	100	200	300	350	400	Est. 1	Bid Pkg.	Check	Submittal
Construction	Text		options [Unitized (combined glass and frame), Stick Built, Structural Glass]			x	x	x	x				
Material	Text		options [Aluminium Framed, Bronze Framed, Stainless Steel Framed, Channel Glass]				x	x	x				
Thermal Resistance	Number	R-Value					x	x	x				
Condensation Resistance			options [yes, no, class]										
Windbourne Debris Resistance		psf											
Wind Load Capacity		psf											
Glazing Method			options [Conventional, Two Sided, Three Sided, Four Sided, Pint Supported]										
Glass - Material			options [Glass, Plastic]										
Glass - Configuration			options [Monolithic, Insulating]										
Glass - Condition			options, multiple [Annealed, Heat Strengthend, Tempered, Laminated, Bent]										
Glass - Coatings			options, multiple [Pyrolytic (hard coat), Sputter (soft coat), Low E, Metallic, Ceramic Frit, Opacl Coat, Digital Printed]										
Glass - Use			options, multiple [Glazing into conventional application, Glazing into structurally glazed application, Mirror, Decorative, Fire Resistant, Hurricane Resistant, Cable Suspended, Switchable Glass, Electronically Controlled switchable Glass, Pressure Resistant, Radiation Resistant, Security, Ballistics										

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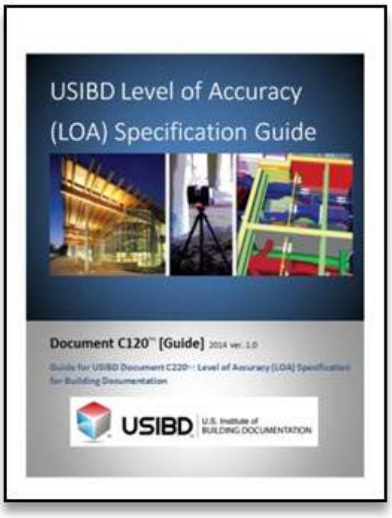

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When is Close Enough, Close Enough?

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Acceptable Forms of Measurement?

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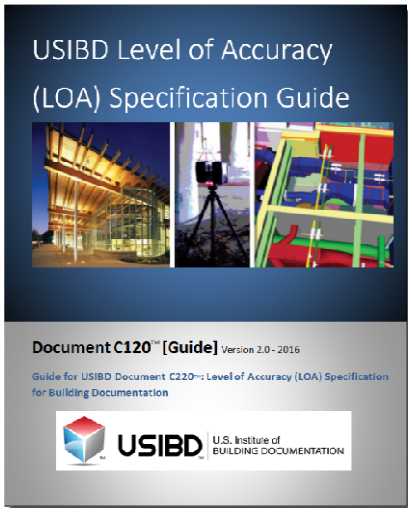
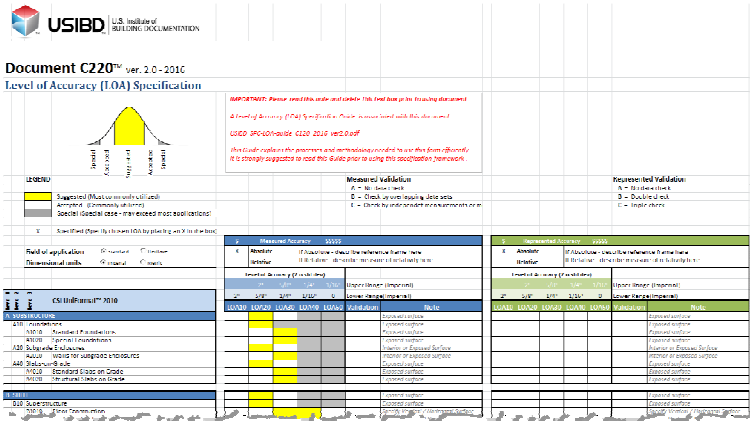
Level of Accuracy Specification





Struggles & Issues

- Unmet Expectations (Procurer's View)

Image Courtesy of CyArk

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Struggles & Issues

- Expectation Management (Provider's View)

Client's Expectation

Client's Budget

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Struggles & Issues

- Speaking Different Languages

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What LOA Does NOT Define

- Targeted audience
- Sensors and data acquisition methods
- Explicit LOA values (only ranges)
- QC procedures (only QA levels)
- Cost-benefit

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USIBD 5 Defined Levels of Accuracy

LOA10 >>> LOA 20 >>> LOA 30 >>> LOA40 >>> LOA50

Low >>> High

Level	Upper Range	Lower Range
LOA10	User defined	5cm *
LOA20	5cm *	15mm *
LOA30	15mm *	5mm *
LOA40	5mm *	1mm *
LOA50	1mm *	0 *

**Specified at the 95 percent confidence level.*

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USIBD LOA Ranges

	Level Of Accuracy				
Upper Range (Imperial)	-	2"	5/8"	1/4"	1/16"
Lower Range (Imperial)	2"	5/8"	1/4"	1/16"	0
Upper Range (Metric)	-	5cm	15mm	5mm	1mm
Lower Range (Metric)	5cm	15mm	5mm	1mm	0
	LOA10	LOA20	LOA30	LOA40	LOA50

In terms of standard deviation (1 Sigma)

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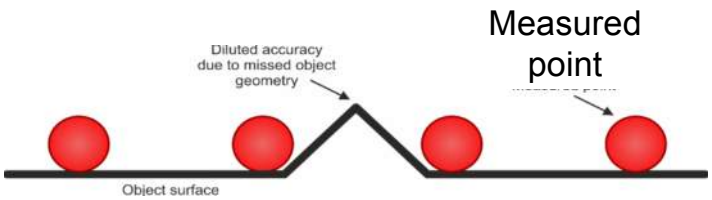
Measured vs. Represented

$	Measured Accuracy	$$$$$	
X	Absolute	If Absolute - describe reference frame here	
	Relative	If Relative - describe measure of relativity here	
Level of Accuracy (2 σ std dev)			
-	2"	5/8"	1/4"	1/16"	Upper Range (Imperial)
2"	5/8"	1/4"	1/16"	0	Lower Range(Imperial)
LOA10	LOA20	LOA30	LOA40	LOA50	

$	Represented Accuracy	$$$$$	
X	Absolute	If Absolute - describe reference frame here	
	Relative	If Relative - describe measure of relativity here	
Level of Accuracy (2 σ std dev)			
-	2"	5/8"	1/4"	1/16"	Upper Range (Imperial)
2"	5/8"	1/4"	1/16"	0	Lower Range(Imperial)
LOA10	LOA20	LOA30	LOA40	LOA50	



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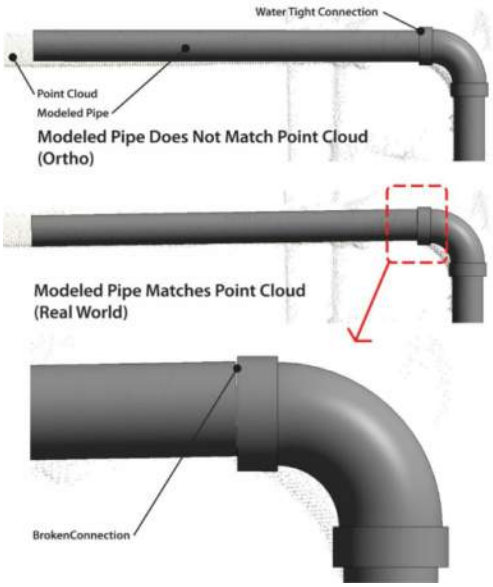
Orthogonal vs. Real World



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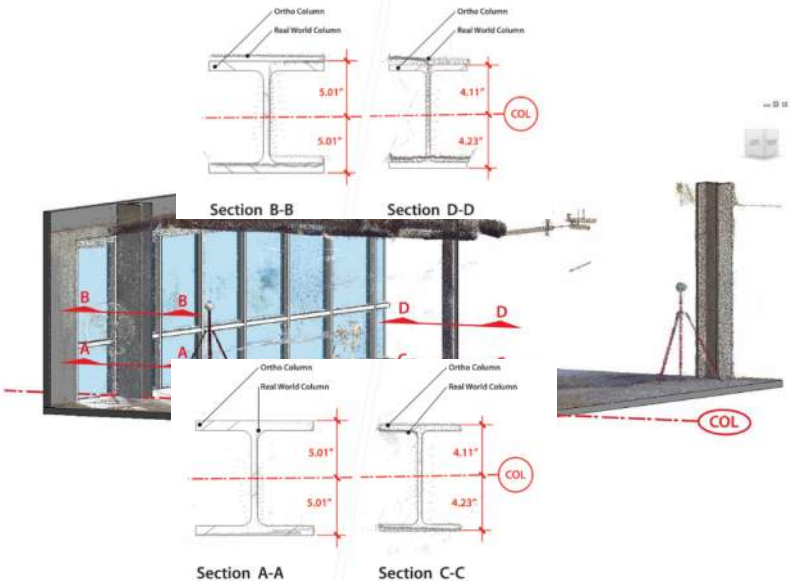
Out-of-plumb Conditions



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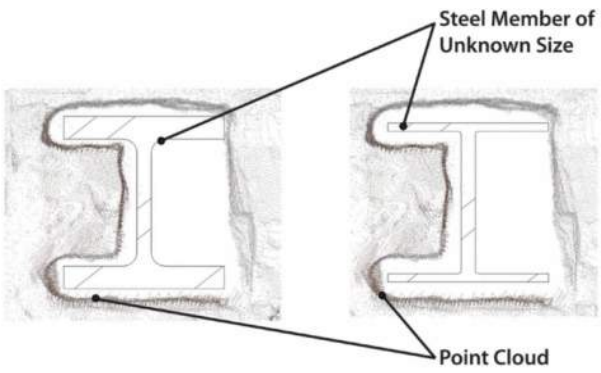
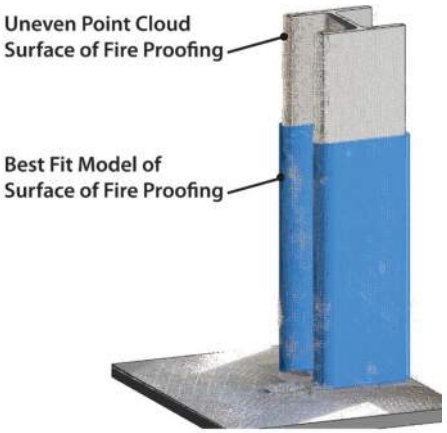
Concealed Conditions & Best Fit





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CSI UniFormat™ 2010

Level 1	Level 2	Level 3	CSI UniFormat™ 2010
A			SUBSTRUCTURE
B			SHELL
C			INTERIORS
D			SERVICES
F			EQUIPMENT & FURNISHINGS
F			SPECIAL CONSTRUCTION & DEMOLITION
G			BUILDING SITEWORK

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CSI UniFormat™ 2010

Level 1	Level 2	Level 3	CSI UniFormat™ 2010
A	SUBSTRUCTURE		
	A10		Foundations
	A20		Subgrade Enclosures
	A40		Slabs-on-Grade
B	SHELL		
	B10		Superstructure
	B20		Exterior Vertical Enclosures
	B30		Exterior Horizontal Enclosures
C	INTERIORS		
	C10		Interior Construction
	C20		Interior Finishes

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CSI UniFormat™ 2010

Level 1	Level 2	Level 3	CSI UniFormat™ 2010
A	SUBSTRUCTURE		
	A10		Foundations
		A1010	Standard Foundations
		A1020	Special Foundations
	A20		Subgrade Enclosures
		A2010	Walls for Subgrade Enclosures
	A40		Slabs-on-Grade
		A4010	Standard Slabs on Grade
		A4020	Structural Slabs on Grade
B	SHELL		
	B10		Superstructure
		B1010	Floor Construction
		B1020	Roof Construction
		B1080	Stairs

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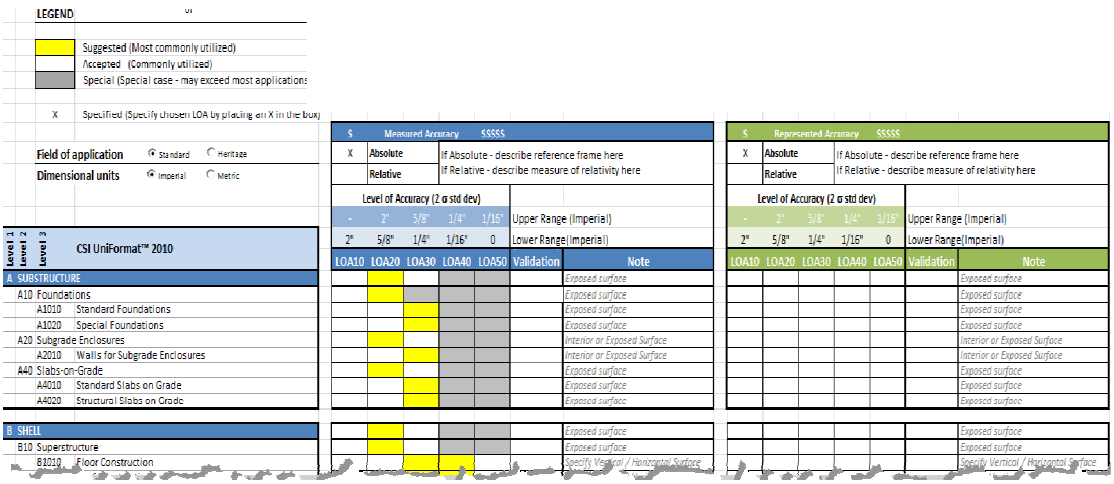
LOA Specification Framework



LEGEND	
	Suggested (Most commonly utilized)
	Accepted (Commonly utilized)
	Special (Special case - may exceed most applications)

X Specified (Specify chosen LOA by placing an X in the box)

Field of application ◉ Standard ○ Heritage

Dimensional units ◉ Imperial ○ Metric

$	Measured Accuracy $$$$$	
X	Absolute	If Absolute - describe reference frame here
	Relative	If Relative - describe measure of relativity here

$	Represented Accuracy $$$$$	
X	Absolute	If Absolute - describe reference frame here
	Relative	If Relative - describe measure of relativity here

Level of Accuracy (2 σ std dev)					
-	2"	5/8"	1/4"	1/16"	Upper Range (Imperial)
2"	5/8"	1/4"	1/16"	0	Lower Range (Imperial)

Level 1	Level 2	Level 3	CSI UniFormat™ 2010	LOA10	LOA20	LOA30	LOA40	LOA50	Validation	Note
A	SUBSTRUCTURE									
	A10		Foundations							
		A1010	Standard Foundations							Exposed surface
		A1020	Special Foundations							Exposed surface
	A20		Subgrade Enclosures							Exposed surface
		A2010	Walls for Subgrade Enclosures							Interior or Exposed Surface
	A40		Slabs-on-Grade							Interior or Exposed Surface
		A4010	Standard Slabs on Grade							Exposed surface
		A4020	Structural Slabs on Grade							Exposed surface
B	SHELL									
	B10		Superstructure							Exposed surface
		B1010	Floor Construction							Exposed surface

Level of Accuracy (2 σ std dev)					
-	2"	5/8"	1/4"	1/16"	Upper Range (Imperial)
2"	5/8"	1/4"	1/16"	0	Lower Range (Imperial)

LOA10	LOA20	LOA30	LOA40	LOA50	Validation	Note
						Exposed surface
						Exposed surface
						Exposed surface
						Exposed surface
						Interior or Exposed Surface
						Interior or Exposed Surface
						Exposed surface
						Exposed surface
						Exposed surface
						Exposed surface
						Exposed surface
						Specify Vertical / Horizontal Surface

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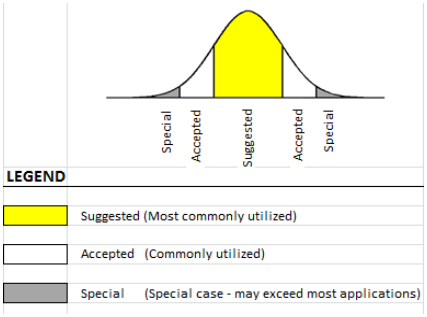
Suggested LOA's



These 'suggested' selections are based on the most common building documentation applications. Specialized applications, such as heritage documentation, plant documentation, etc. may require LOA's other than what are suggested here.

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LOA Validation

Measurement validation

A: No data check

B: Check by overlapping data sets

C: Check by independent measurements or methods

Representation validation

A: No check

B: Double check

C: Triple check

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Specification Schema

Measured Accuracy	Validation	Relative (rel) Absolute (abs)		Represented Accuracy	Validation		Relative (rel) Absolute (abs)
YY	A	rel	-	ZZ	A	-	rel

YY	:	30	Measurement accuracy (standard deviation) of 5 to 15mm
A	:	B	Check by overlapping data sets
rel	:	rel	Relative accuracy (standard deviation) in regards to a reference system
ZZ	:	20	Representation accuracy (standard deviation) of 15 to 50mm
A	:	A	No check of the final representation
rel	:	rel	Relative accuracy (standard deviation) in regards to a reference system

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Specification Schema

Measured Accuracy	Validation	Relative (rel) Absolute (abs)		Represented Accuracy	Validation		Relative (rel) Absolute (abs)
YY	A	rel	-	ZZ	A	-	rel

LOA 30B-rel-20A-rel

YY	:	30	Measurement accuracy (standard deviation) of 5 to 15mm
A	:	B	Check by overlapping data sets
rel	:	rel	Relative accuracy (standard deviation) in regards to a reference system
ZZ	:	20	Representation accuracy (standard deviation) of 15 to 50mm
A	:	A	No check of the final representation
rel	:	rel	Relative accuracy (standard deviation) in regards to a reference system

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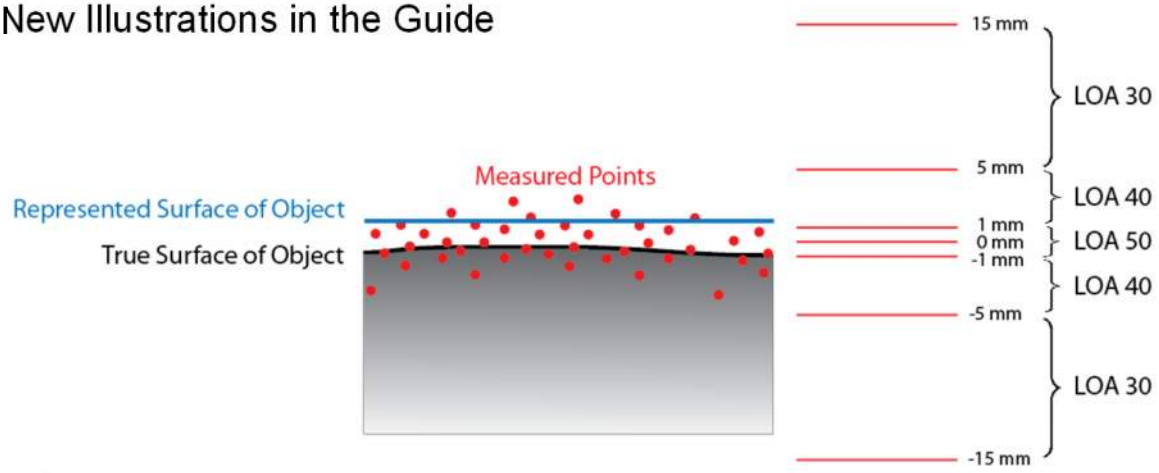
What's New in Version 2.0?

- New Illustrations in the Guide



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What Does The LOA Spec Provide?

- Independent standard
- Easy to use flexible template
- Suggested accuracy levels as a guideline for inexperienced users or when under time constraints
- Distinction between data acquisition and “the model”
- Extensibility for future enhancements
- Metric and imperial values

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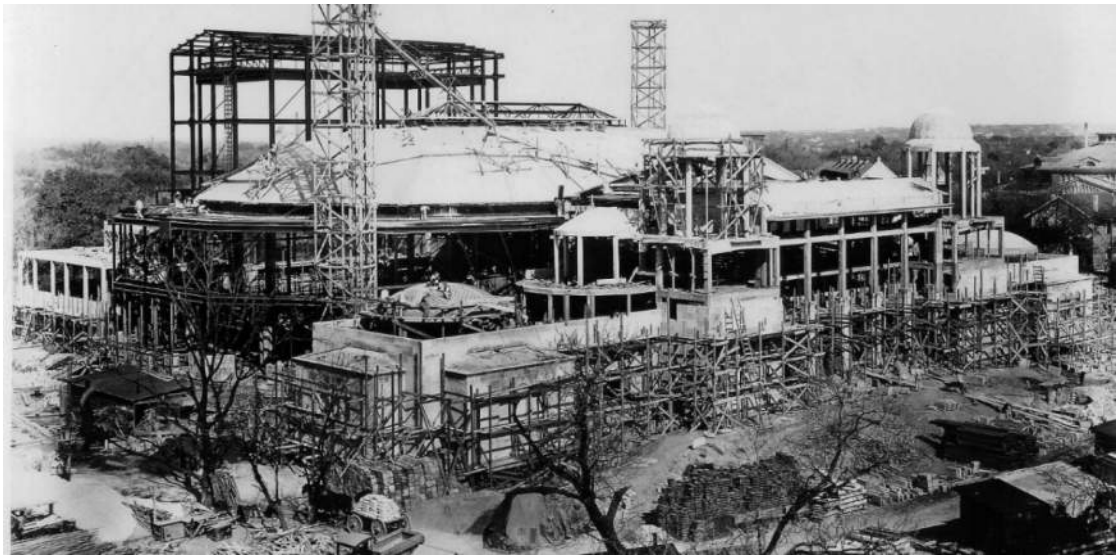
Tobin Center for the Performing Arts



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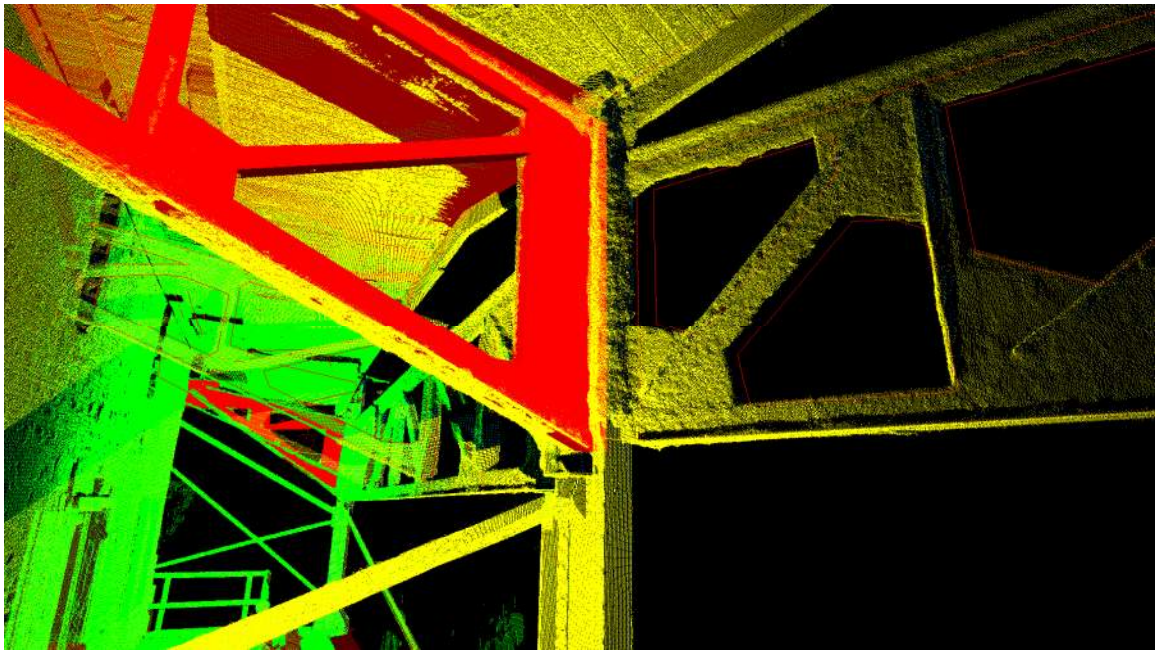

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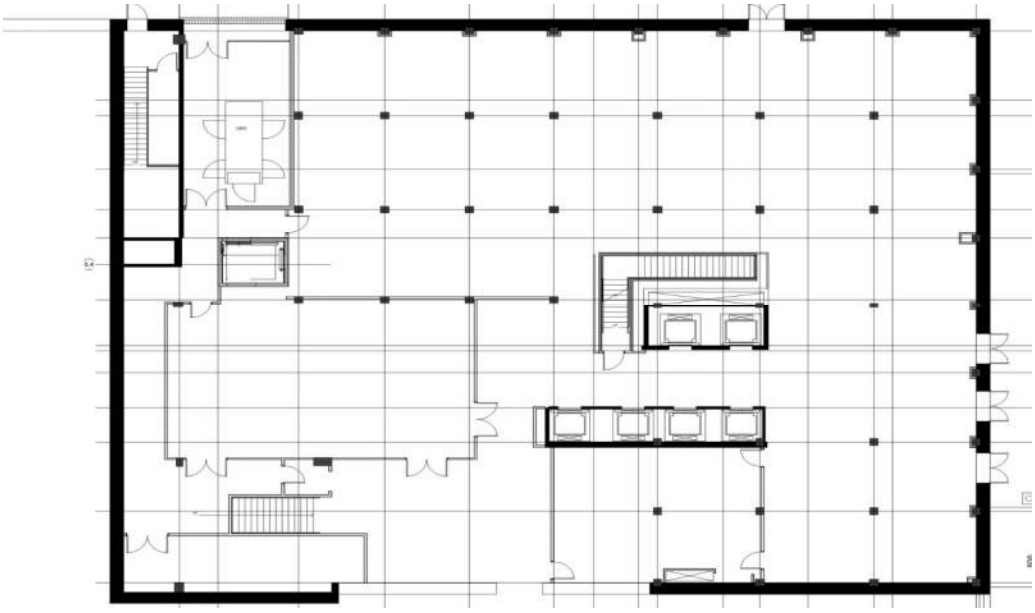

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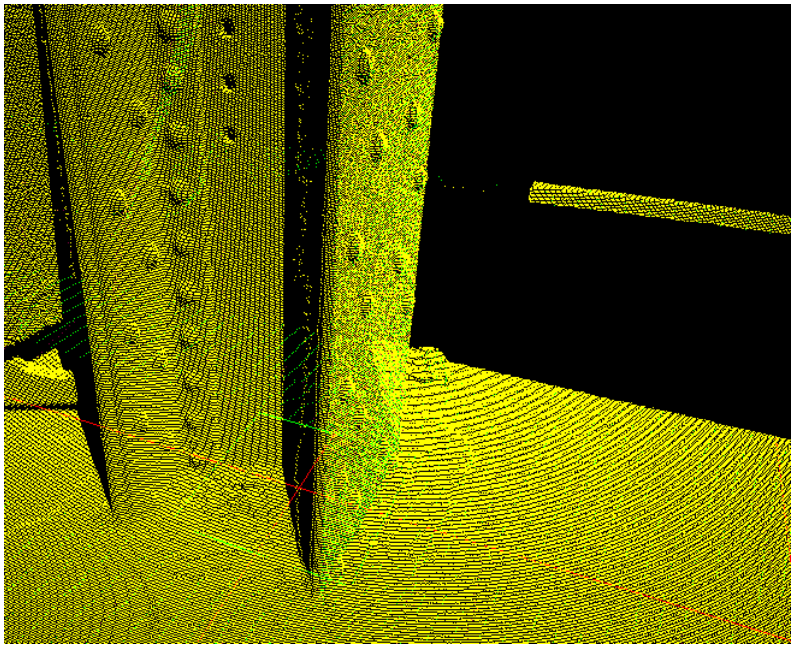

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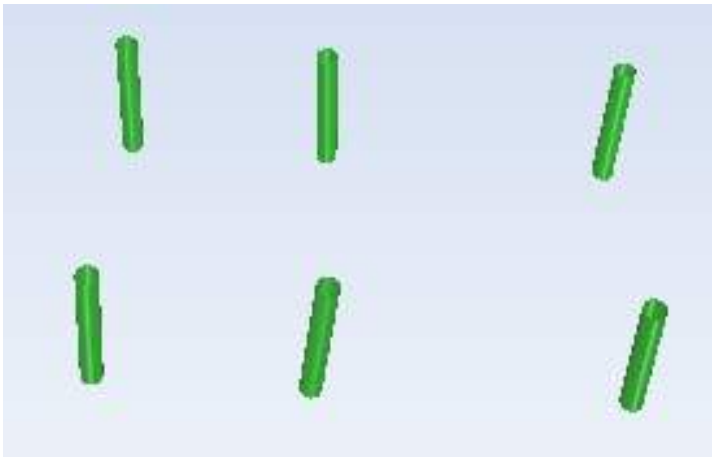

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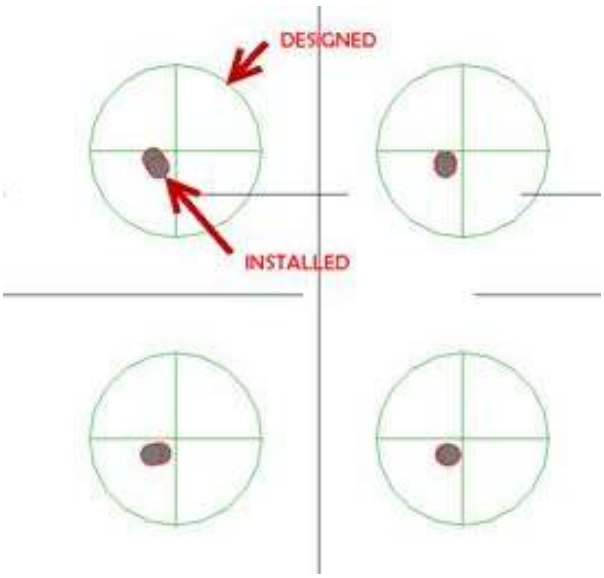

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Design Teams: Examine Your Self

"The unexamined construction documents are not worth constructing."
Ikerd's BIM Corollary for CD from BIM

ὁ. ἀνεξέταστος βίος οὐ βιωτὸς ἀνθρώπῳ

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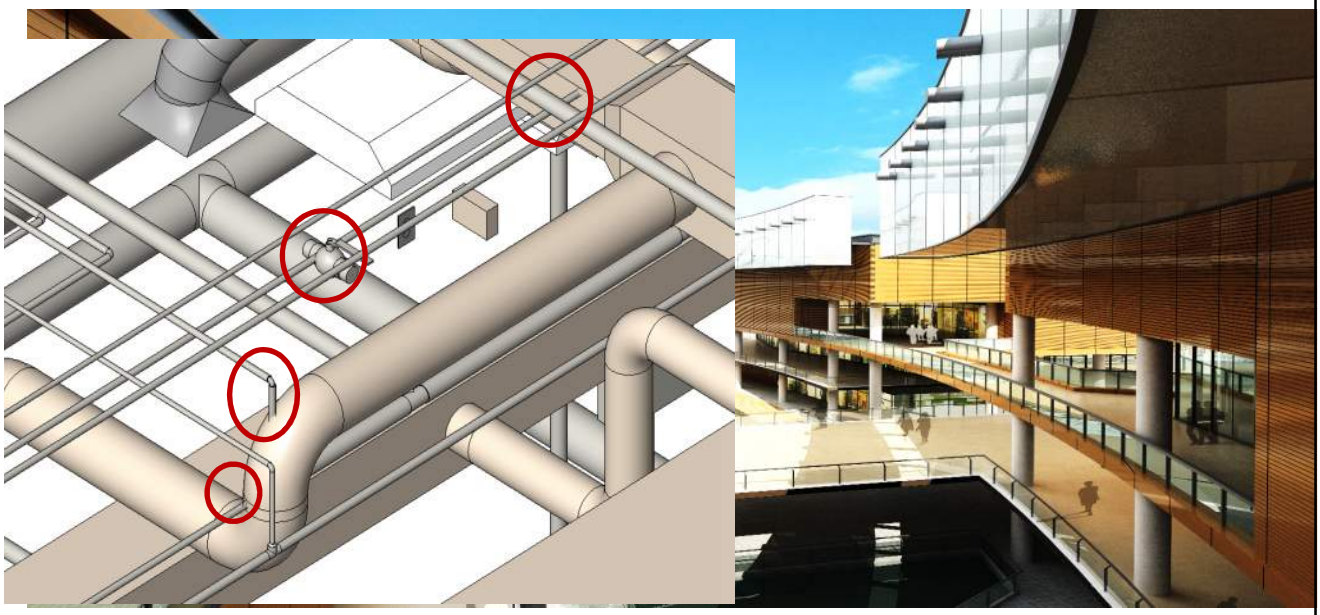

Construction Teams:

"Trust But Verify."

Ronald Reagan

"Trust But Verify."

Ikerd's BIM Corollary for Contractors Receiving Designer Models

"Gipper BIM !!"

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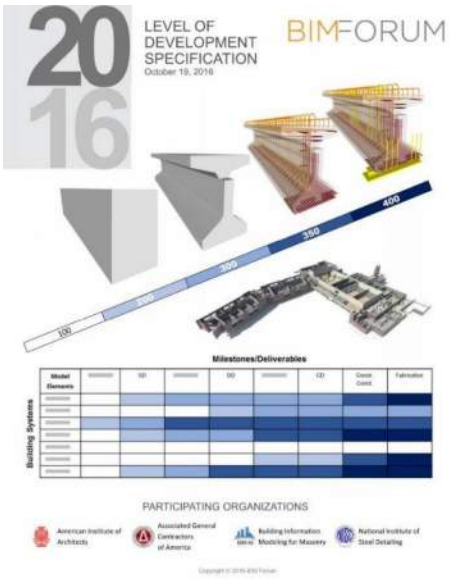


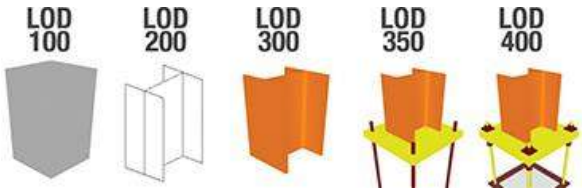
LOD SPECIFIATION TASKFORCE

BIMFORUM

Jim Bedrick, FAIA
BIM Forum

Jan Reinhardt
BIM Forum

- **BIMforum.org/LOD**
- No LOD of whole Model, only Elements
- All delivery methods
- Dictionary for BIM



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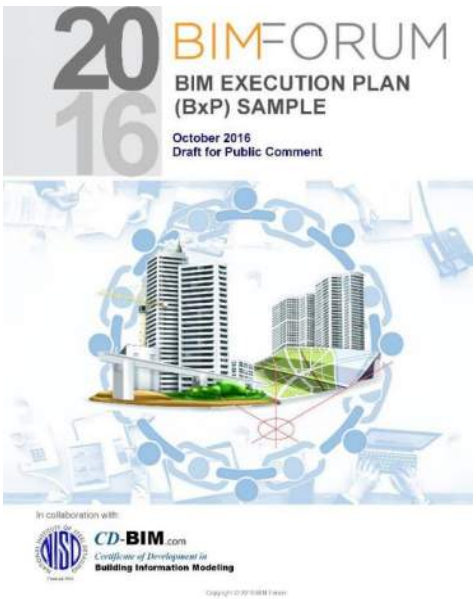

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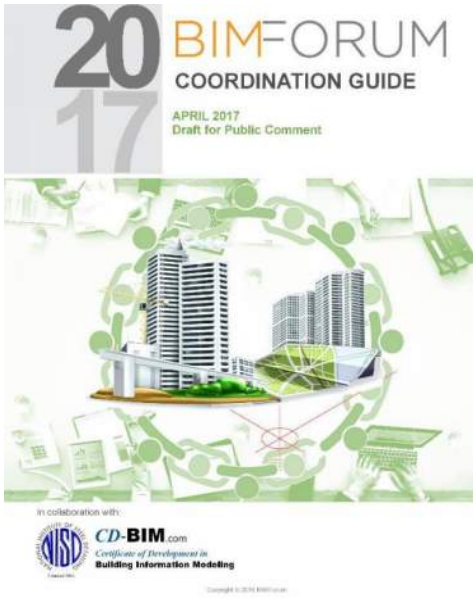

Coordination Guide Taskforce


David Epps


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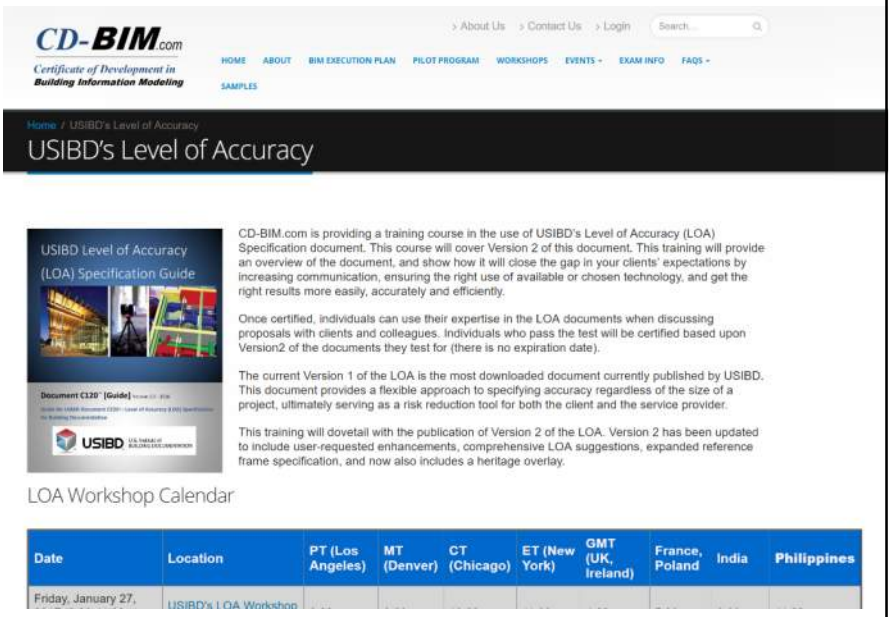

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