

Implementation of Building Information Modeling in Light Steel Framed Buildings

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- **Portions of this presentation have been produced using material from:**
 - National BIM Standard – United States (NBIMS)
 - British Standards Institution (BSI)
 - BuildingSMART Alliance
 - BIM Forum
 - BuildSteel.org
 - VTT Technical Research Centre of Finland Ltd

1. What is BIM?

2. BIM Maturity Levels

3. Benefits of BIM

4. VDC Processes & Requirements

5. BIM Levels of Development

6. BIM in Light Steel Framing

7. Software Solutions

8. SteelSmart® Framing (Hands-on)

- **Definition**

- The National Building Information Model Standard Project Committee defines BIM as:
- Building Information Modeling (BIM) is a digital representation of physical and functional characteristics of a facility. A BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle; defined as existing from earliest conception to demolition.

- **Practically**

- BIM is an essential value creating collaboration through the entire life-cycle of a construction in a collaborative 3D environment built on models and intelligent parametric structured data.

Just 3D CAD...

BIM

- All project data is stored in the single environment
- When dimension values change, the objects associated to dimensions are changed

CAD

- Stores and retrieves project data from multiple files
- Dimensions only display the distance between two entities

Just a new technology application...

BIM

- Uses system of categories and subcategories to organize information
- Creates own intelligent parametric objects & quickly customize the existing ones

CAD

- Uses traditional 2D/3D drafting capabilities
- Can't create own intelligent parametric objects or layers

The future...
...it's here &
essential!

BIM

- Provides access to single file and multiple users with the possibility of defining ownership for some elements or areas.
- Multiple design view with a flexible interface
- Detail library & material Takeoff functionalities

CAD

- One person at a time can access and work on a file
- Single design view

- **Why Essential?**

- Buildings cost more than they should to design, build and sustain and they take too long to deliver. In a recent study by the National Institute of Standards and technology (NIST) inadequate interoperability in the U.S. Capital Facilities industry was identified as an additional cost of \$15.8B annually

- **BIM...**

- Improves Collaboration between stakeholders/Participants
- Provides more accurate fundamental information to support decision making
- Provide a standard way of storing information so that it survives the test of time

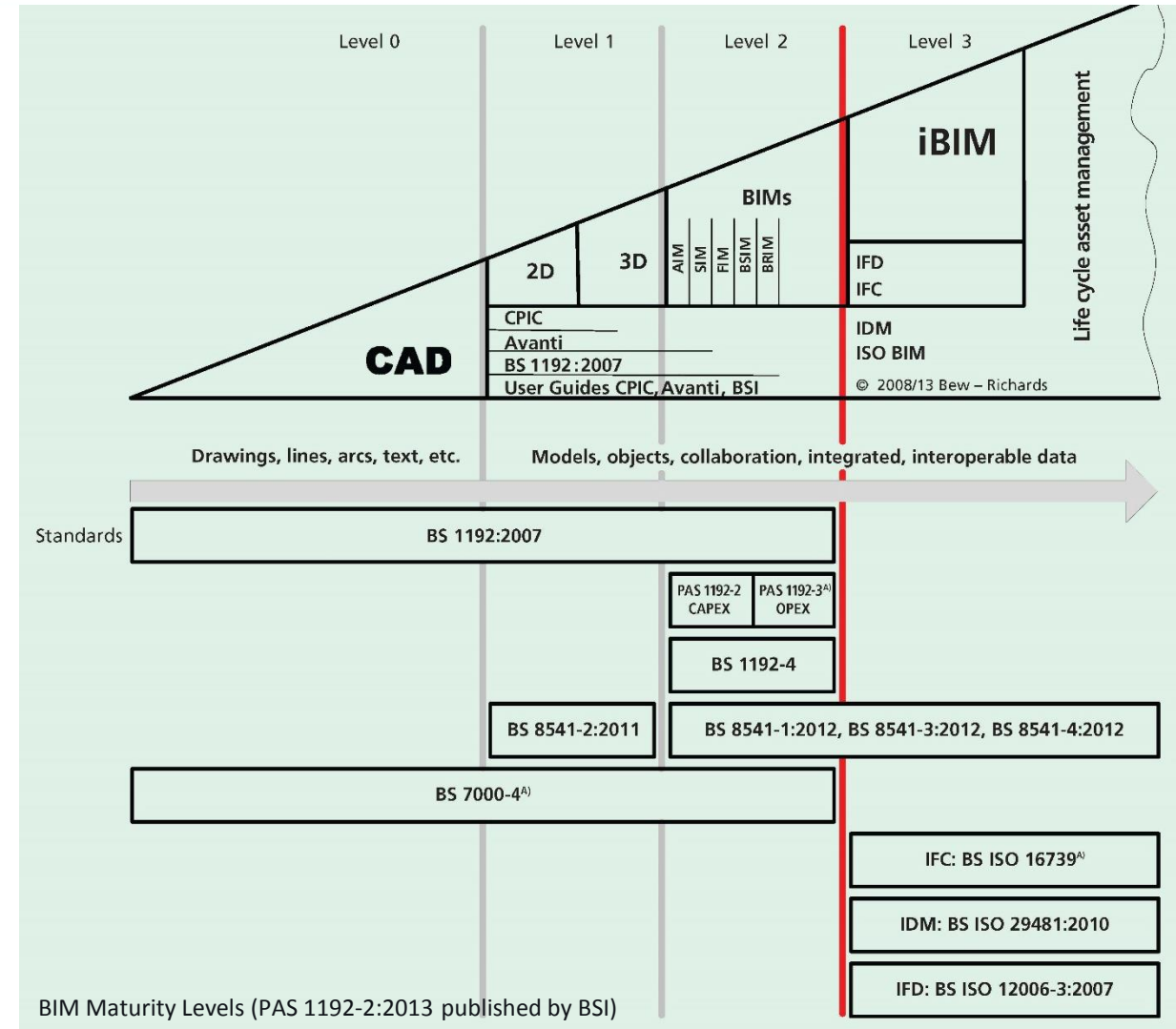
- **Result.... Savings in COST & TIME**

• BIM Level 0

- No Collaboration
- 2D CAD drafting
- Output distributed via paper or electronic prints

• BIM Level 1

- 3D CAD for Concept
- 2D CAD drafting for documentation & production
- Sharing via Common Data Environment



- **BIM Level 2**

- All Parties use their own 3d Models
- Design information shared through a common file format. Each party can combine that data with their own model to make a federated BIM model, and carry out checks on it
- Any CAD software used must be capable of exporting common file formats such as IFC (Industry Foundation Class) or COBie (Construction Operations Building Information Exchange)
- This is the current standard

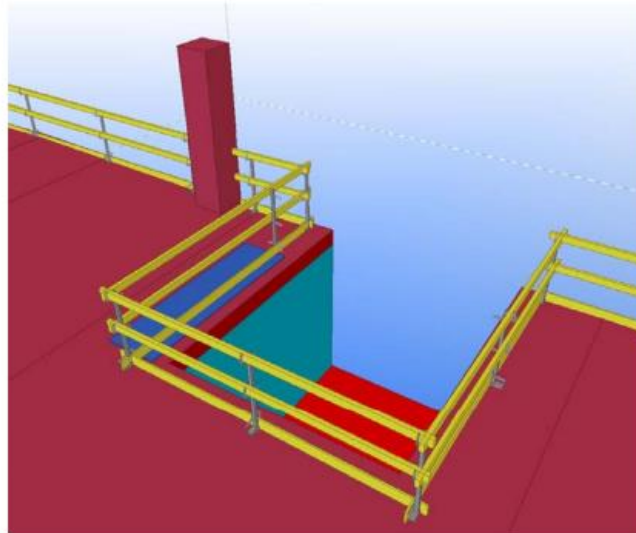
- **BIM Level 3**

- This is the Future. Full collaboration between all disciplines using a Single Shared Project Model
- Model Held in a centralized Virtual Space. All parties can access and modify the same model
- Removes final layer of conflicting information
- Known as “Open BIM”

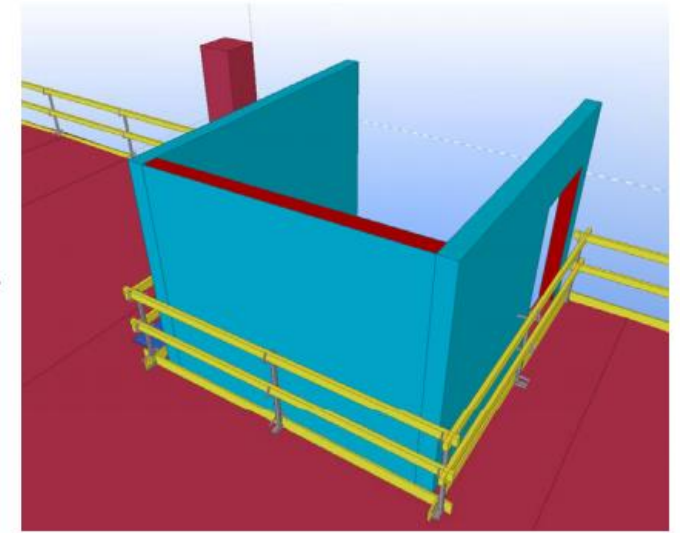
- Better collaboration
- Reduced rework
- Reduced safety risks
- Reduced waste

BIM-based falling prevention planning in Pilot 1,

(underground floors: railings to be installed to cast in place vaults)



Railings are located far enough from the slab edge to leave room for installation of wall elements.



No need to remove the guardrail until the wall elements have been assembled
-> risk of falling from heights is eliminated

Excerpt from Report on BIM-based safety Management by VTT Technical Research center of Finland

- **Definition**

- VDC is the management of integrated multi-disciplinary performance models of design-construction projects, including the product (i.e., facilities), work processes and organization of the design - construction - operation team in order to support explicit and public business objectives.

- **BIM Execution Plans (BXP)**

- Stakeholders/Contacts/Responsibilities
- Model Management – Origin and Grid system, Tolerances, Units, Floor Elevations, Quality Control
- Modeling Procedures/Guidelines, LOD, File naming, File formats
- Coordination guidelines – Kick-off, Coordination meetings, Clash detection Reports, Model Sign-off
- Project Deliverables

Definition

- The Level of Development (LOD) Specification is a reference that enables practitioners in the AEC Industry to specify and articulate with a high degree of clarity the content and reliability of Building Information Models (BIMs) at various stages in the design and construction process
- The LODs are not defined by design phases. Rather, design phase completion, as well as any other milestone or deliverable, can be defined through the LOD language.
- The LOD Specification is organized by CSI Uniformat 2010

Part I: Element Geometry

- Part I consists of narrative descriptions and illustrations of specific model elements at each LOD. Part I forms the bulk of the document.

Part II: Associated Attribute Information

- A Workbook that begins with “Model Element Table”.
- Model Element Table references Attribute Tables for various building systems following same CSI Uniformat.

Milestones/Deliverables

Model Elements	SD	DD	CD	Constr. Coord.	Fabrication

PARTICIPATING ORGANIZATIONS

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Attribute Table Example

B – Ext. Glazed Openings														
Baseline	Part 1 - Attribute Description					Part 2 - LOD Profile					Part 3 - Project-Specific Milestones (Examples)			
Additional						100	200	300	350	400	Estimating	Estimating	LEED Cert.	LEED Cert.
Attribute	Data Type	Units	Option Examples	Commentary						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					
Thermal Resistance	Number	R-Value						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 Strengthened, Tempered, Laminated, Bent]											
Glass - Coatings			options, multiple:[Purolytic (hard coat), Sputter (soft coat), Low E, Metallic, Ceramic Frit, Opaci 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]											

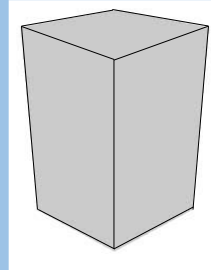
Courtesy BIM forum Levels of Development Specification 2017

LOD Definition

It's the agreed upon level of development of information and detailing inside a BIM model which enhances the accuracy & facilitates the building operation Dimensions (4D,5D,6D) BIM.

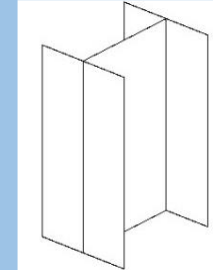
LOD 100

- Description: Generic Column Element
- Width: 12"
- Depth: 12"
- Height: 10'



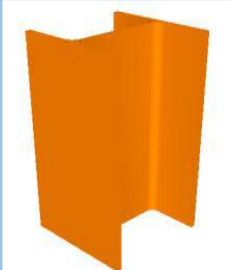
LOD 200

- Description: Wide Flange Steel Column
- Width: 12"
- Depth: 12"
- Height: 10'



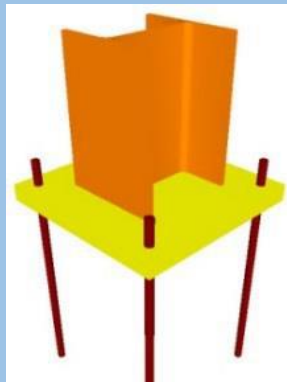
LOD 300

- Description: W12x72
- Width: 12.04"
- Depth: 12.25"
- Height: 10'-6"
- Location: 12 @ C1



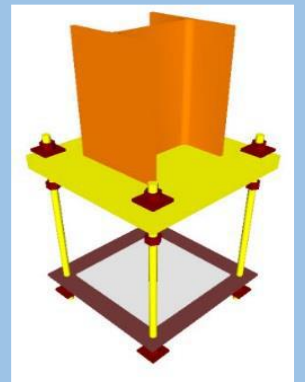
LOD 350

- Description: W12x72
- Width: 12.04"
- Depth: 12.25"
- Height: 10'-6"
- Location: 12 @ C1
- Base Plate: 18"x18"x3/4" w/ (4) 3/4" anchors



LOD 400

- Description: W12x72
- Width: 12.04"
- Depth: 12.25"
- Height: 10'-6"
- Location: Grid line 12 @ Grid line C1
- Base Plate: (BP1) 18"x18"x3/4"
- Column Connection: 1/2" Fillet weld all around
- Anchorage: (4) 3/4" Anchor rods – 9" Embed - leveling nuts



Courtesy BIM forum Levels of Development Specification 2017

LOD 100

Solid mass model representing overall building volume; or, schematic wall elements that are not distinguishable by type or material.

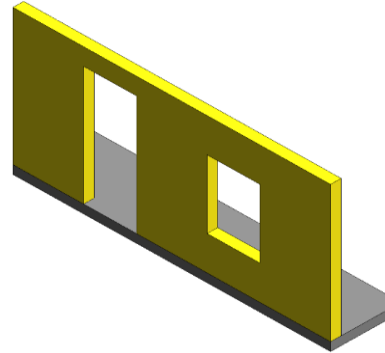
Assembly depth/thickness and locations still flexible.

LOD 200

Generic wall objects separated by type of material (e.g. brick wall vs. terracotta).

Approximate overall wall thickness represented by a single assembly.

Layouts and locations still flexible.

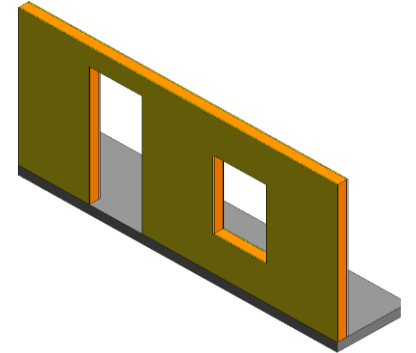


LOD 300

Generic wall objects separated by type of material (e.g. brick wall vs. terracotta).

Approximate overall wall thickness represented by a single assembly.

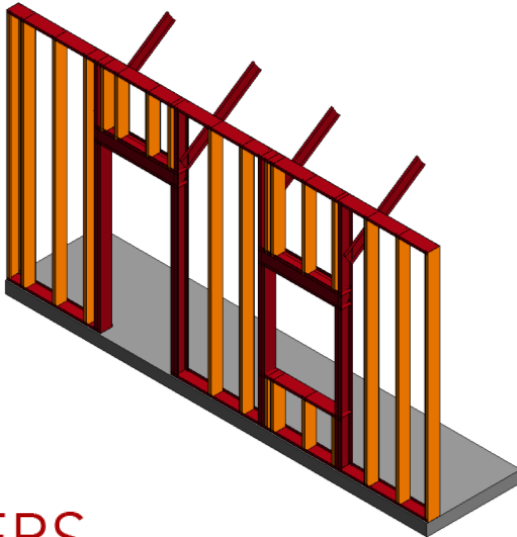
Layouts and locations still flexible.



LOD 350

Cold formed metal framing is developed with sufficient elements to support detailed interface coordination with other systems such as MEP.

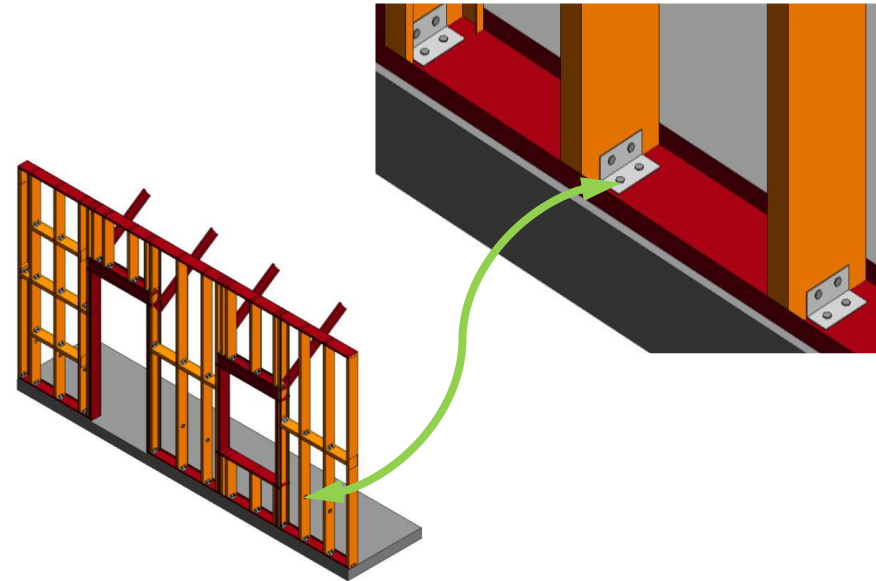
Openings modeled with support framing around openings



LOD 400

Cold formed metal framing is developed with sufficient elements that support the fabrication of the CFMF system.

Connection content is developed in the wall elements. This includes but is not limited to fasteners, clips, and other related hardware.



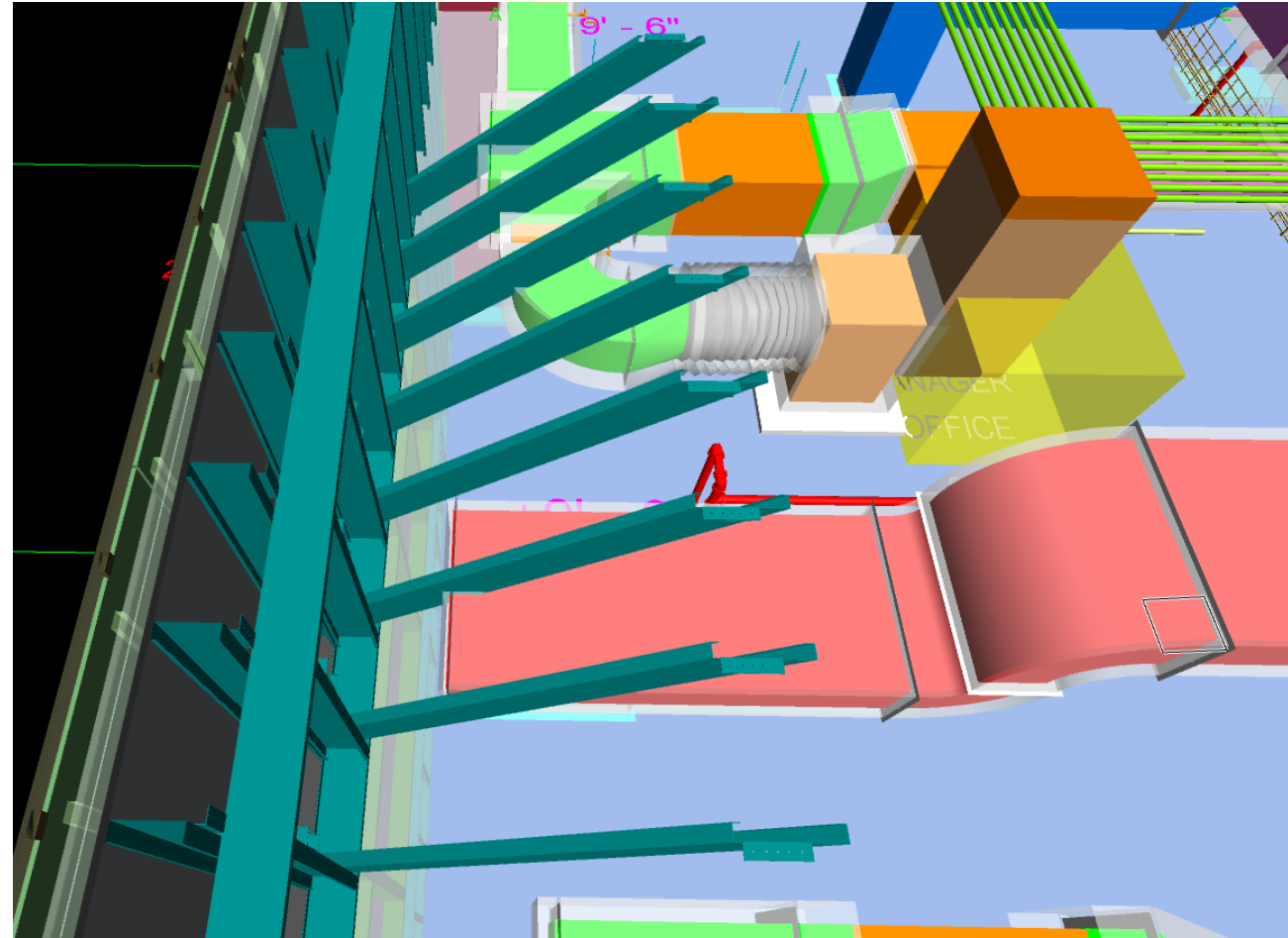
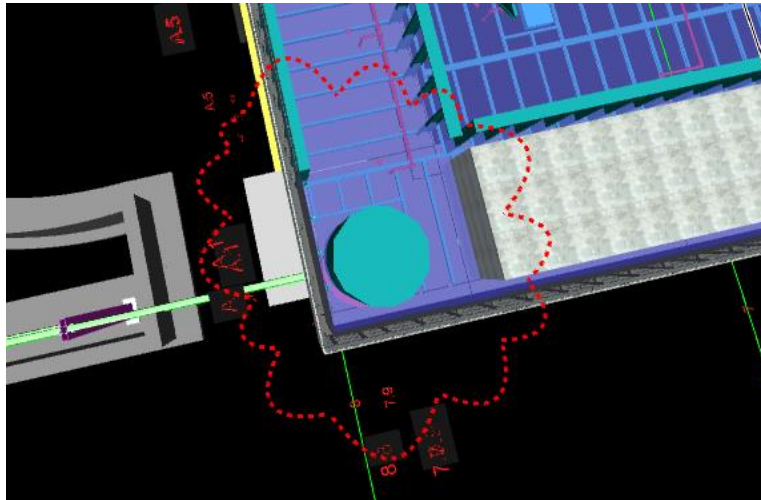
- **Why BIM in Light steel Framing?**

- Accurate Design/Modeling. Building on outputs of Design Process
- Reduce RFIs

Clarify Ambiguities early on.

Point out potential design conflicts.

Better Communication



- Why BIM in Light steel Framing?
 - Material Take-Ofs. Minimizing waste

ID	QTY	Length	Usage
1	600S152-54x11.50 kN	15	10.95'
2	600S152-54x11.50 kN	7	1' 10.15"
3	600S152-54x11.50 kN	8	1' 11.50"
4	600S152-54x11.50 kN	2	2' 11.15"
5	600S152-54x11.50 kN	1	1' 11.15"
6	600S152-54x11.50 kN	1	1' 13.75"
7	600S152-54x11.50 kN	13	14.4.30'
8	600T125-54, 50 kN	3	4"
9	600T125-54, 50 kN	57	4.10'
10	600T125-54, 50 kN	16	8"
11	600T125-54, 50 kN	8	7.95'
12	600T200-57, 50 kN	2	7.95'
13	600C150x100	26	1.50'
14	600C150x100	1	1.50'
15	600T200-54, 50 kN	1	4.5.15'
16	600T200-54, 50 kN	3	5.15'
17	600T200-54, 50 kN	1	6.77'
18	600T200-54, 50 kN	1	6' 10"
19	600T125-54, 50 kN	1	3.3.15'
20	600T125-54, 50 kN	2	3.5.15'
21	600T125-54, 50 kN	1	5.2.15'
22	600T125-54, 50 kN	1	5.7.17'
23	600T125-54, 50 kN	3	5.7.17'
24	600C150x100	3	5.7.17'
25	600C150x100	3	4.13.10'
26	600C150x100	6	5.7.78"
27	600C150x100	3	5.15.14"
28	600C150x100	3	6' 38"
29	600C150x100	3	6' 9.76"
30	600C150x100	1	14.4.30'
31	600S152-54x11.50 kN	1	14.4.30'
32	600S152-54x11.50 kN	2	14.4.30'
33	600S152-54x11.50 kN	1	11.0.15.15'
34	600S152-54x11.50 kN	1	1' 10.15.15'
35	600S152-54x11.50 kN	1	5' 4.15.15'
36	600T125-54, 50 kN	1	1' 10.15.15'
37	600T125-54, 50 kN	1	5' 4.15.15'
38	600S152-54x11.50 kN	4	---
39	600S152-54x11.50 kN	2	14.4.30'
40	600S152-54x11.50 kN	5	11.5.15'
41	600S152-54x11.50 kN	5	14.4.30'
42	600S152-54x11.50 kN	1	14.4.30'
43	600S152-54x11.50 kN	4	---
44	600C150x100	15	---
45	600S152-54x11.50 kN	2	19.4.15.15'
46	600T125-54, 50 kN	2	19.4.15.15'
47	600T125-54, 50 kN	2	19.4.15.15'
48	600S152-54x11.50 kN	2	19.4.15.15'
49	600S152-54x11.50 kN	4	---
50	600S152-54x11.50 kN	1	1' 10.15.15'
51	600S152-54x11.50 kN	1	8' 10.15.15'
52	600S152-54x11.50 kN	1	8' 10.15.15'
53	600S152-54x11.50 kN	1	19.4.15.15'
54	600S152-54x11.50 kN	1	8' 10.15.15'
55	600T125-54, 50 kN	1	1' 10.15.15'
56	600T125-54, 50 kN	3	5' 4.15.15'
57	600T125-54, 50 kN	2	8' 10.15.15'
58	600T125-54, 50 kN	1	19.4.15.15'
59	600S152-54x11.50 kN	1	19.4.15.15'

NOTE:
PREVIOUSLY ORDERED MATERIAL DO NOT INCLUDE IN THIS ORDER.
* PREVIOUSLY ORDERED MATERIAL DO NOT INCLUDE IN THIS ORDER.

PANEL 213

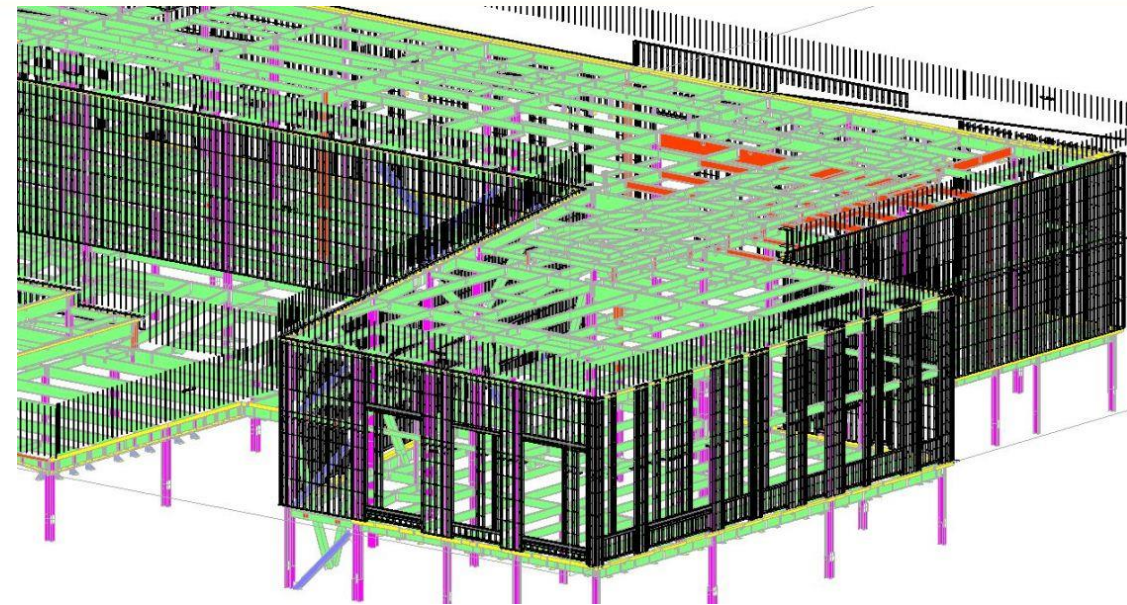
Project Status

FDR ENGINEERS

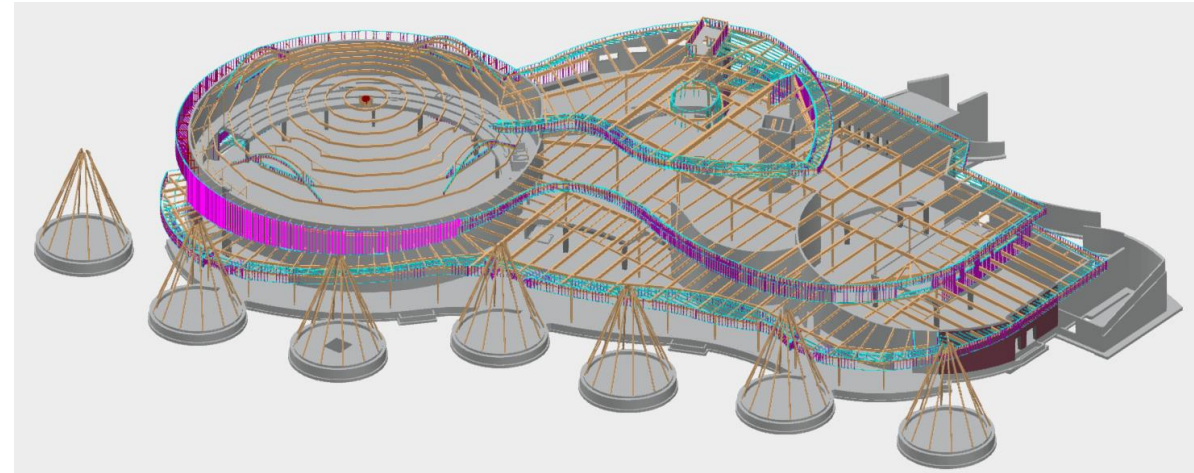
UNIVERSITY AT BUFFALO
BUFFALO, NY

PANEL 213

P213



- Why BIM in Light steel Framing?
 - Material Take-Offs. Minimizing waste



Place of Gathering - Top Fascia_12272017.xlsx - Excel

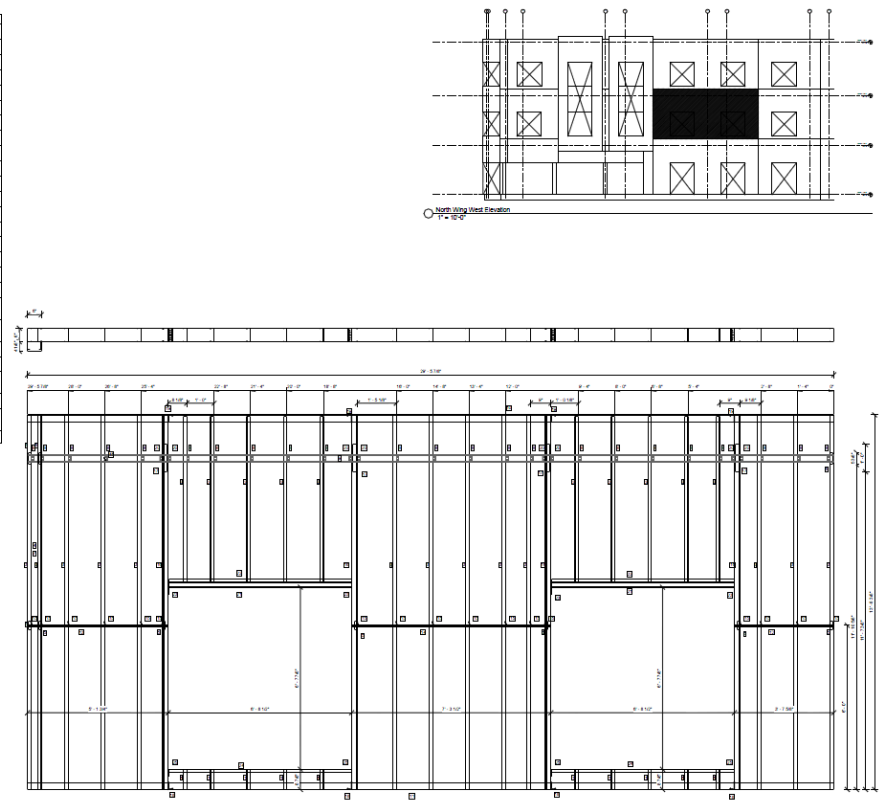
Family	Type	Comments	Count	Member Length	Total Length
Place of Gathering - Top Fascia					
Standard Stud (R) C (Top Fascia Studs)	600S162-43mil, 33 ksi	Place of Gathering - Top Rotunda Fascia	100	7'-2 1/2"	720'-10"
Standard Stud (R) C (Top Fascia Studs)	600S162-43mil, 33 ksi	Place of Gathering - Top Rotunda Fascia	100	7'-9"	775'-4 5/8"
600S162-43mil, 33 ksi: 200					1,496'-2 5/8"
Standard Track® (Top track - Radius)	600T125-43, 33 ksi	Place of Gathering - Top Rotunda Fascia	1	232'-0"	232'-0"
600T125-43, 33 ksi: 1					232'-0"
StiffClip® LB	StiffClip® LB600	Place of Gathering - Top Rotunda Fascia	300		0"
StiffClip® LB600: 300					0"
2x2 18 Ga. Angle (Obtuse)	2x2 18 Ga. Angle (Obtuse)	Place of Gathering - Top Rotunda Fascia	100	1'-4"	133'-4"
2x2 18 Ga. Angle (Obtuse): 100					133'-4"

- Why BIM in Light steel Framing?
 - Fabrication Drawings for Panelized Construction



#	Type	Qty	Length	Usage
1	600S162-88mil, 50 ksi	10	8 1/2"	Studs
2	600S162-88mil, 50 ksi	10	6' 5/8"	Studs
3	600S162-88mil, 50 ksi	13	13' 7 15/16"	Studs
4	600S350-54mil, 50 ksi	1	13' 7 15/16"	Studs
5	600T125-88, 50 ksi	7	4 1/8"	Cap Track
6	600T125-88, 50 ksi	3	5 1/4"	Cap Track
7	600T125-88, 50 ksi	1	13' 7 15/16"	Cap Track
8	DrirTrak® DTSLB600	23	--	Bypass Clips
9	DrirTrak® DTSLB600	1	29' 5 13/16"	Bypass Clips
10	600T300-88, 50 ksi	1	29' 5 13/16"	Top Track
11	600T300-88, 50 ksi	1	29' 5 13/16"	Bottom Track
12	Cold-Rolled Channel	1	2' 7 9/16"	Bridging Member
13	Cold-Rolled Channel	1	2' 1 11/16"	Bridging Member
14	Cold-Rolled Channel	1	2' 3 1/2"	Bridging Member
15	BridgeClip®	18	--	Bridging Clips
16	600JAM250-88, 50ksi	4	13' 7 15/16"	Window Jamb Section
17	600T200-88, 50 ksi	4	1"	Window Jamb Cap Track
18	SstClip® CL600-88	4	--	Window Jamb Base Clip
19	SstClip (R) CL 600-88 - HOW	4	--	Window Jamb Top Clip
20	DrirTrak® DTSLB600	8	--	Window Jamb Bypass Clips
21	600JAM250-88, 50ksi	2	6' 8 3/16"	Window Header Section
22	600T125-43, 33 ksi	2	6' 8 3/16"	Window Header Section
23	SstClip® AL600	4	--	Window Header Connection to Jamb
24	600T125-43, 33 ksi	2	6' 8 3/16"	Window Sill Section
25	SstClip® AL600	4	--	Window Sill Connection to Jamb

PANEL 132 Materials List



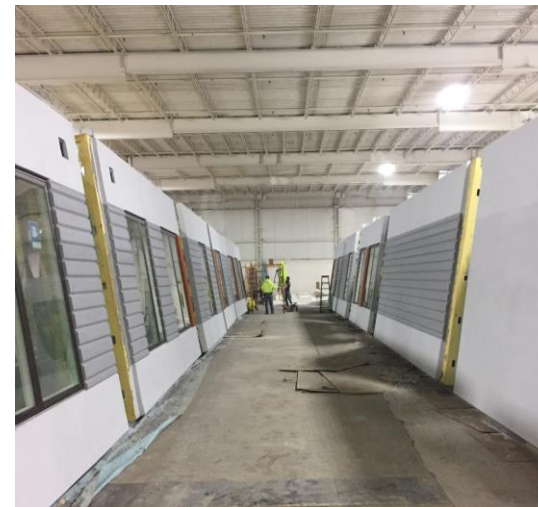
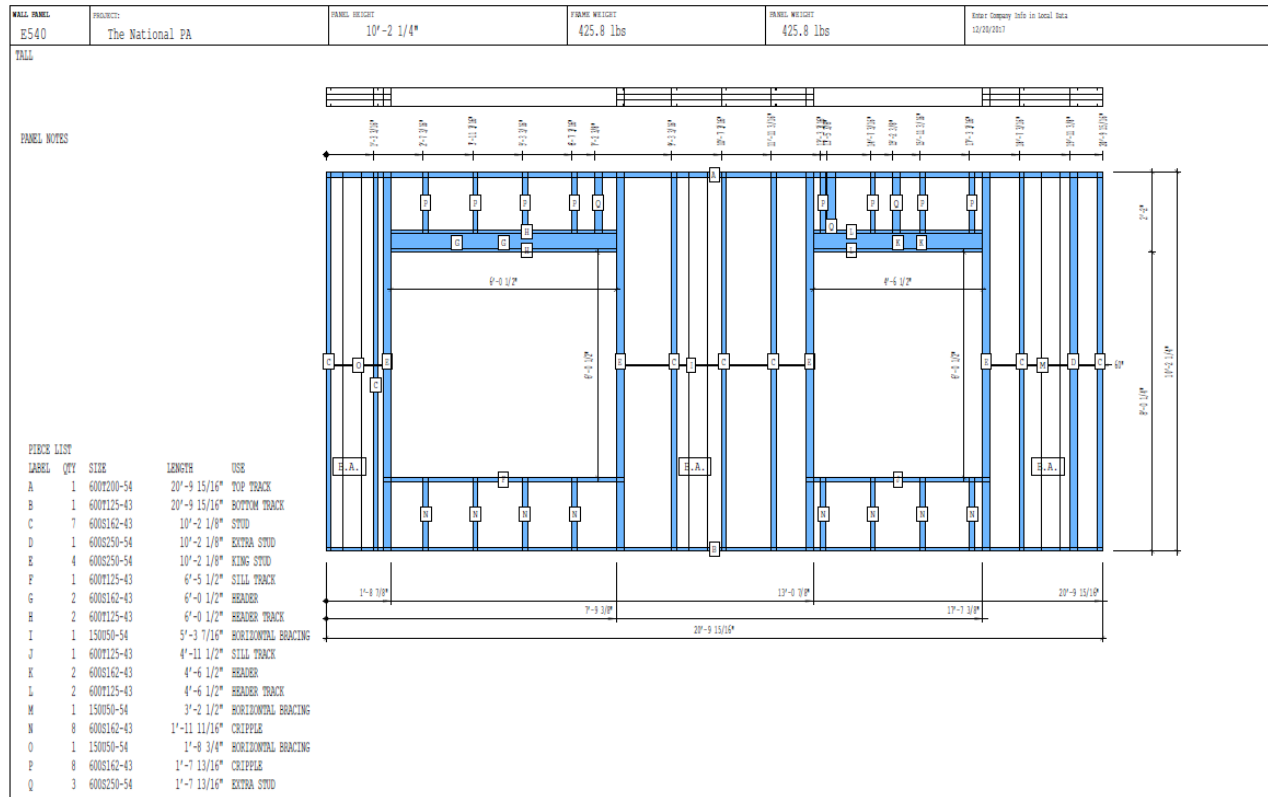
LOWRY SKILLED NURSING FACILITY
DENVER, CO

PANEL 132

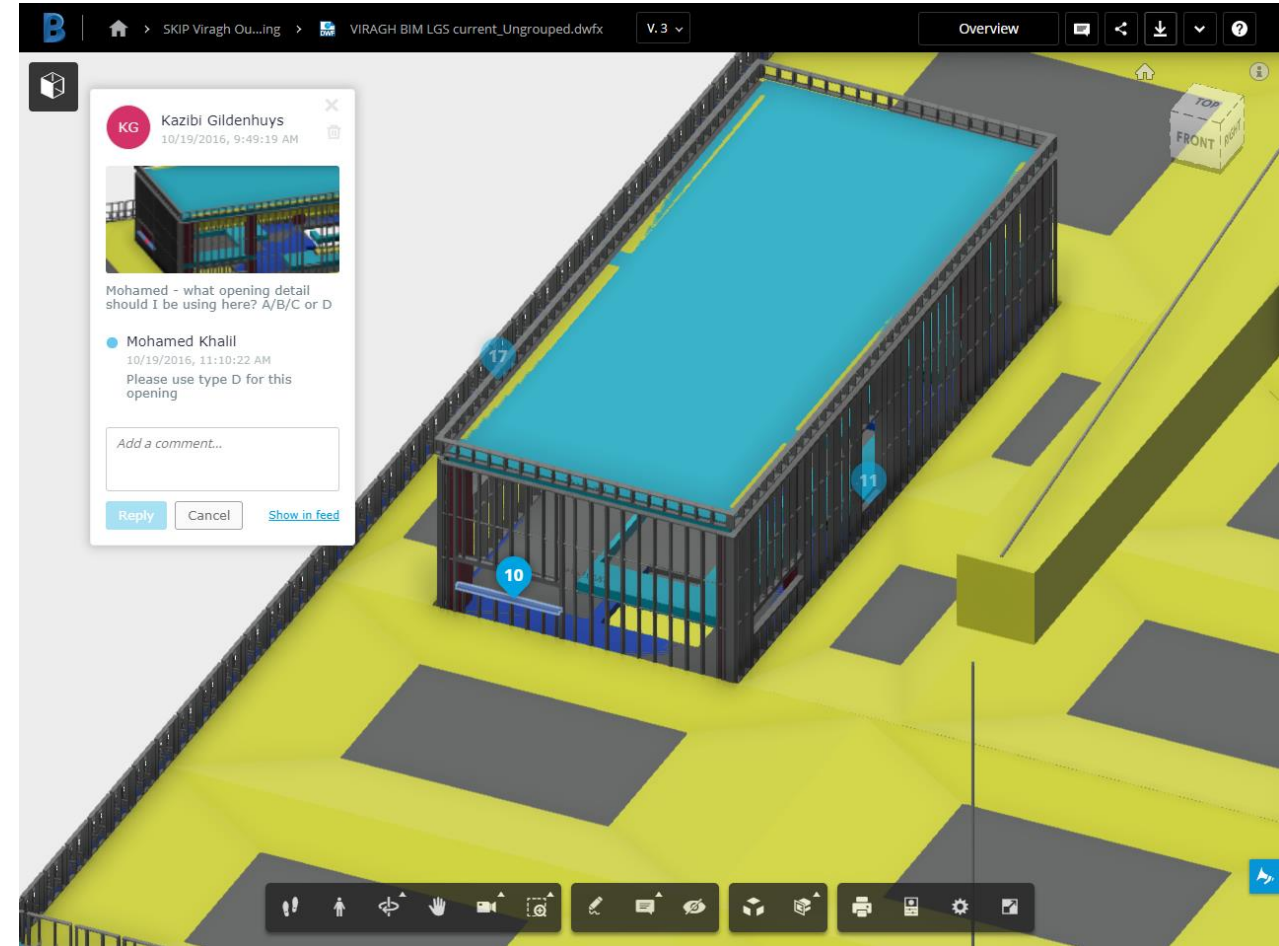
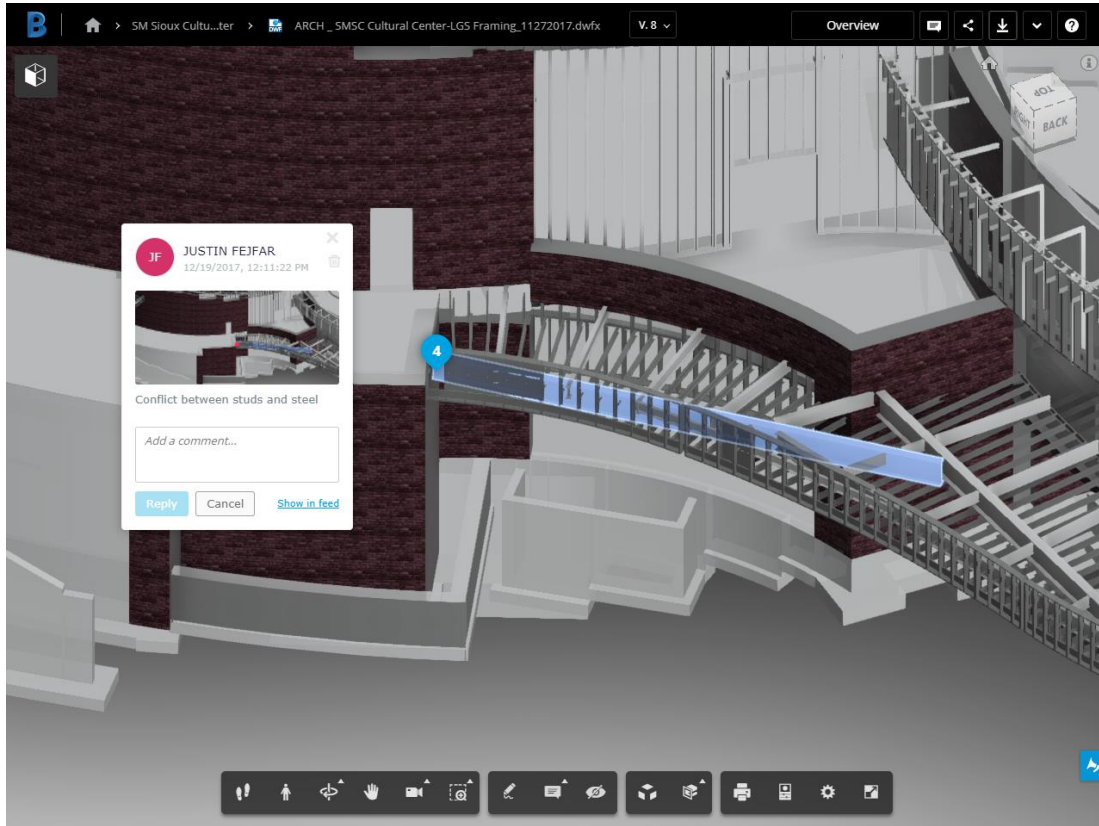
DESIGNED BY: [blank]
DRAWN BY: [blank]
CHECKED BY: [blank]
DATE: 10/20/17

Draw: L57.P132

- Why BIM in Light steel Framing?
 - Fabrication Drawings for Panelized Construction



- Why BIM in Light steel Framing?
 - Cloud Sharing/Collaboration/Communication



- **Stand-Alone applications**
 - Vertex BD
- **Revit-Based Add-ins**
 - Structsoft MWF Pro
 - AGA-CAD Metal framing tools
 - ASI's SteelSmart® Frammer
- **Collaboration/Sharing Software**
 - Autodesk A360
 - Navisworks
 - BIM 360 Glue

THANK YOU!