

BIM Workflows for the Structural Engineer: Design to Fabrication

Brian E Johnson, PE

Technical Specialist | @bedwardj

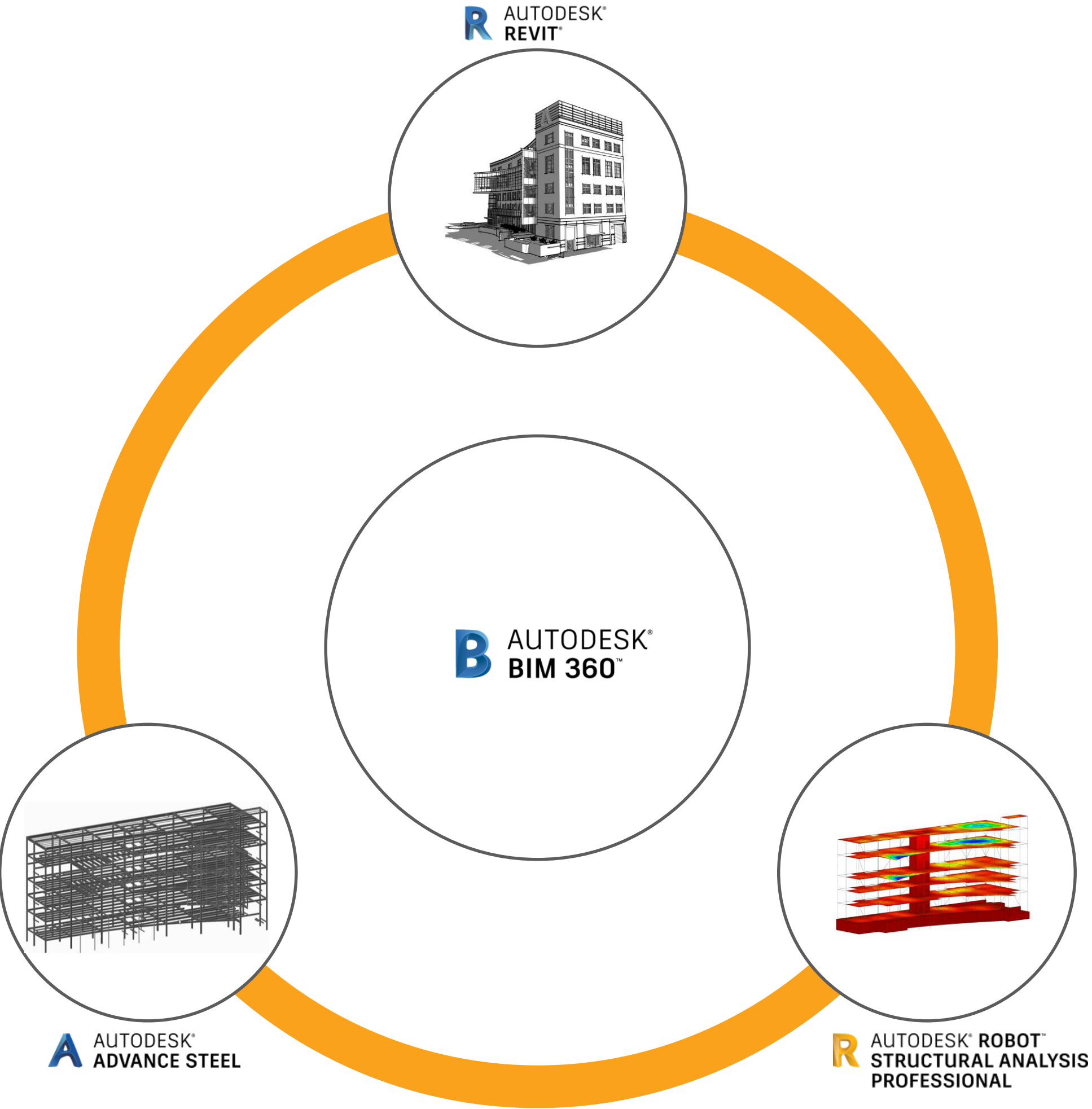


About the speaker

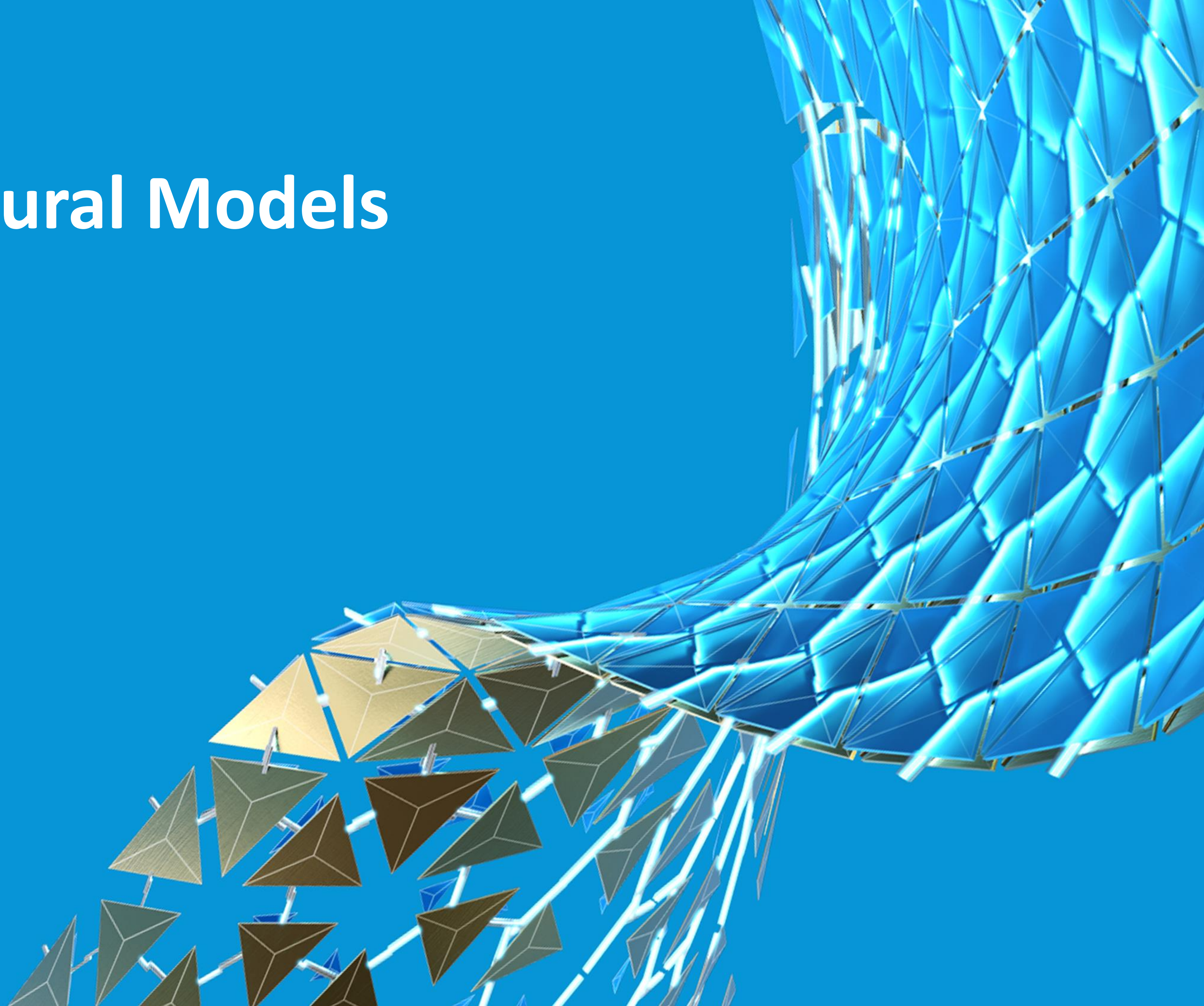
Brian E Johnson, PE

Brian is a Technical Specialist for Autodesk. He is an expert in structural modeling and design using Revit and Robot Structural Analysis. Brian is a licensed structural engineer with over 15 years of building design and consulting experience. During that time he worked as a Project Manager and Principal on a variety of structures. He earned a B.S. in Civil Engineering from the University of Texas at Austin.

Connected Workflow



Linking Structural Models



Download the Addins

[MANAGE.AUTODESK.COM](https://manage.autodesk.com)

Robot Structural Analysis Link for Revit 2021*

Advance Steel Extension for Revit 2019–2021 *[Hotfix 1]*

Revit 2018 Steel Connections

*

Only needed if Robot Structural Analysis Professional is not installed alongside Revit.

[APPS.AUTODESK.COM](https://apps.autodesk.com)

Structural Analysis Toolkit 2018–2020*

Robot-AdvanceSteel Link 2018–2021

Advance Steel 2018 Extension

*

Functionality ships with Revit 2021.

Design with Revit

CREATE/REVISE

CREATE REVIT MODEL

Model primary structural framing in Revit.

Adjust the Analytical Model.

DESIGN

SEND TO RSA PRO

Add loads & adjust properties.

Analyze.

Optimize & code check.

UPDATE

SEND TO REVIT

Backcheck & adjust if needed.

ITERATE

REPEAT

Coordinate design revisions from Client in Revit.

Repeat.

Prepare Sheets.

Design with Advance Steel

CREATE/REVISE

CREATE ADVANCE STEEL MODEL

Model primary structural framing in Advance Steel.

Note the System lines represent the Analytical Model.

DESIGN

SEND TO RSA PRO

Add loads & adjust properties.
Analyze.
Optimize & code check.

UPDATE

SEND TO ADVANCE STEEL
Backcheck & adjust if needed.

ITERATE

REPEAT
Coordinate design revisions from Client in Advance Steel.
Repeat.
Generate Piece Marks.
Process Engineering Drawings.

Fabrication with Advance Steel

CONNECT

MODEL CONNECTIONS IN REVIT

Perform when design is (near) complete.

Optionally, connect in Advance Steel.

CONNECT

SEND TO ADVANCE STEEL

Model connections.

Design joints with loads sent from RSA.

Model miscellaneous steel.

Model plateworks.

DOCUMENT

PREPARE DRAWINGS

Generate Piece Marks.

Create Camera Views.

Process Shop Drawings.

Process Erection Drawings.

DELIVER

FABRICATE

Generate NC files.

Generate BOM lists.

Generate DXFs.

Direction of integration with Autodesk Robot Structural Analysis

☒ Send model

☐ Update model

☐ Update model and results

Type of integration

☒ Direct integration

☐ Send to the intermediate file (.smxx)





Send options




Help OK Cancel

Synchronisation - Connected Frame_clipped_w_base_pl.smlx

Load... Refresh Report... Apply All Actions

Modified 10/28/2020 Loaded 10/29/2020

Element type	Model object	Change	Status
	Beam		<input checked="" type="checkbox"/>
	Beam		<input checked="" type="checkbox"/>
	Connection		<input type="checkbox"/>
	Connection		<input type="checkbox"/>

 Appended  Modified  Deleted

Filter

Direct Transfer

Revit and Robot Structural Analysis must be installed on the same computer.

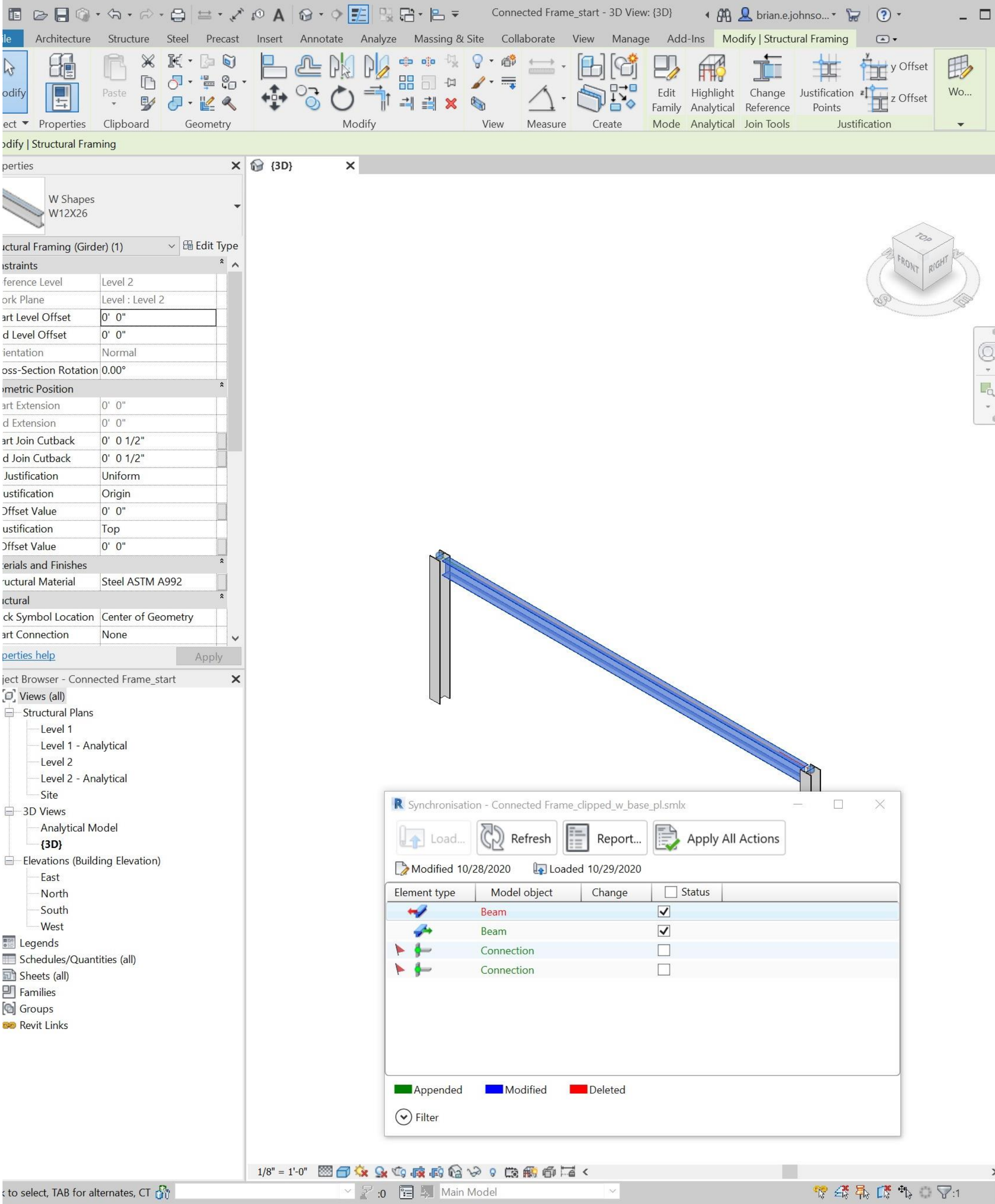
Intermediate File Transfer

Use when only one application is on the computer or when the intermediate file is desired as secondary backup.

Advance Steel Transfers

The interface and intermediate files are different than the those with Revit. The processes are virtually identical.

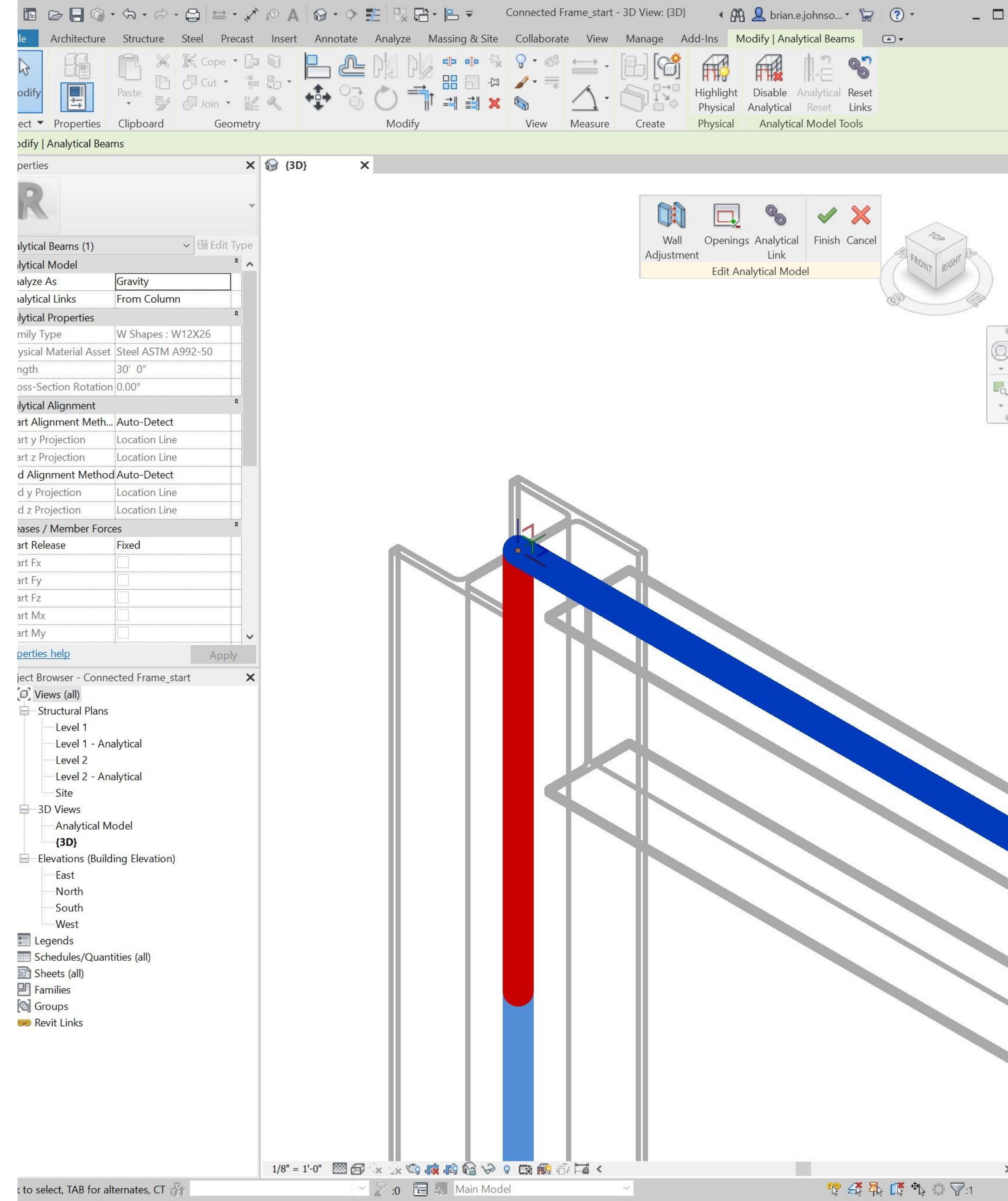
- Review the options
- Export
- Synchronize
- Accept or reject updates
- Complete the transfer



Pre-Transfer Activities

Model the structure, of course!

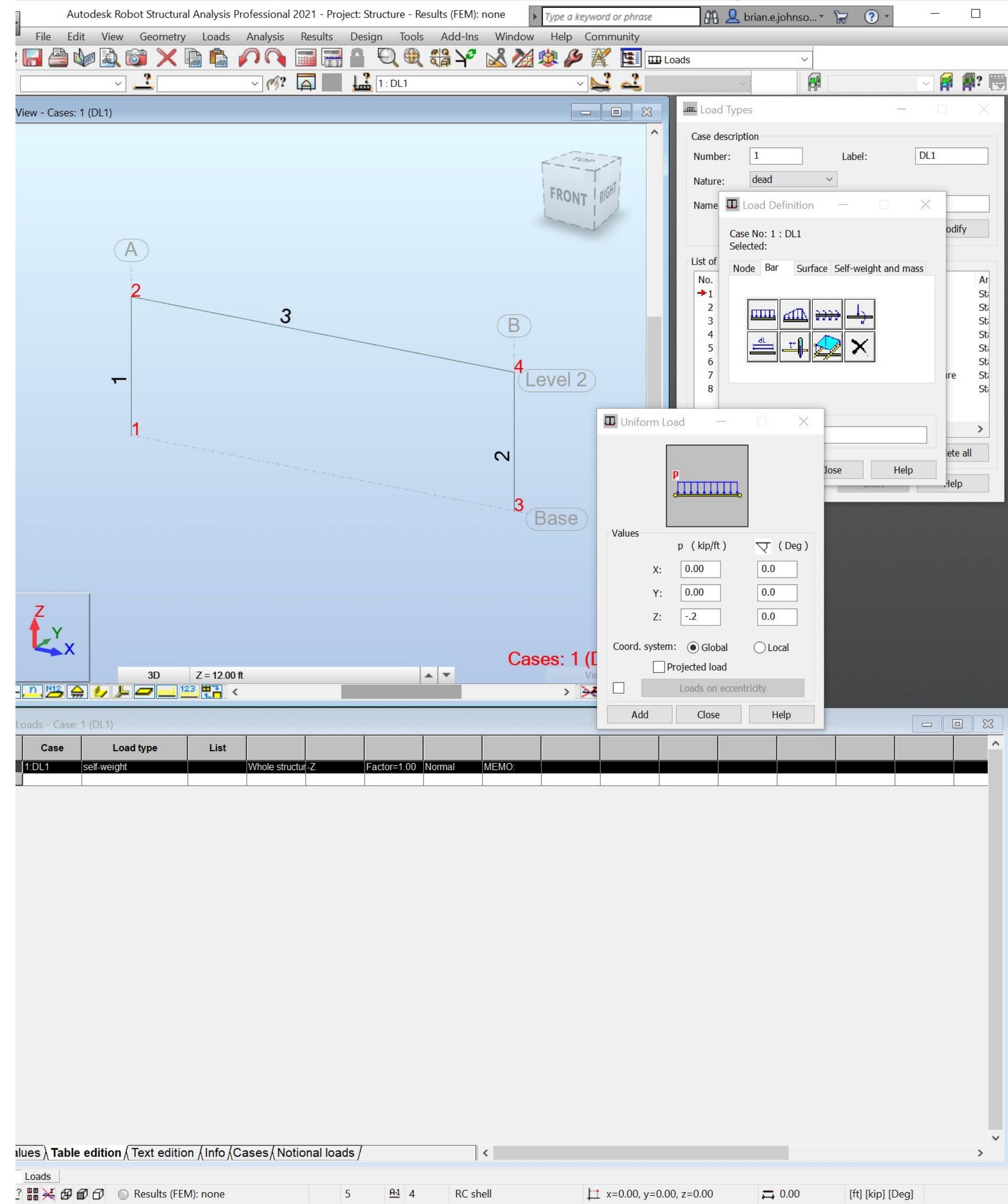
- Review and adjust the Analytical Model (Revit) or System lines (Advance Steel)
- No adjustments needed for sending from Robot Structural Analysis



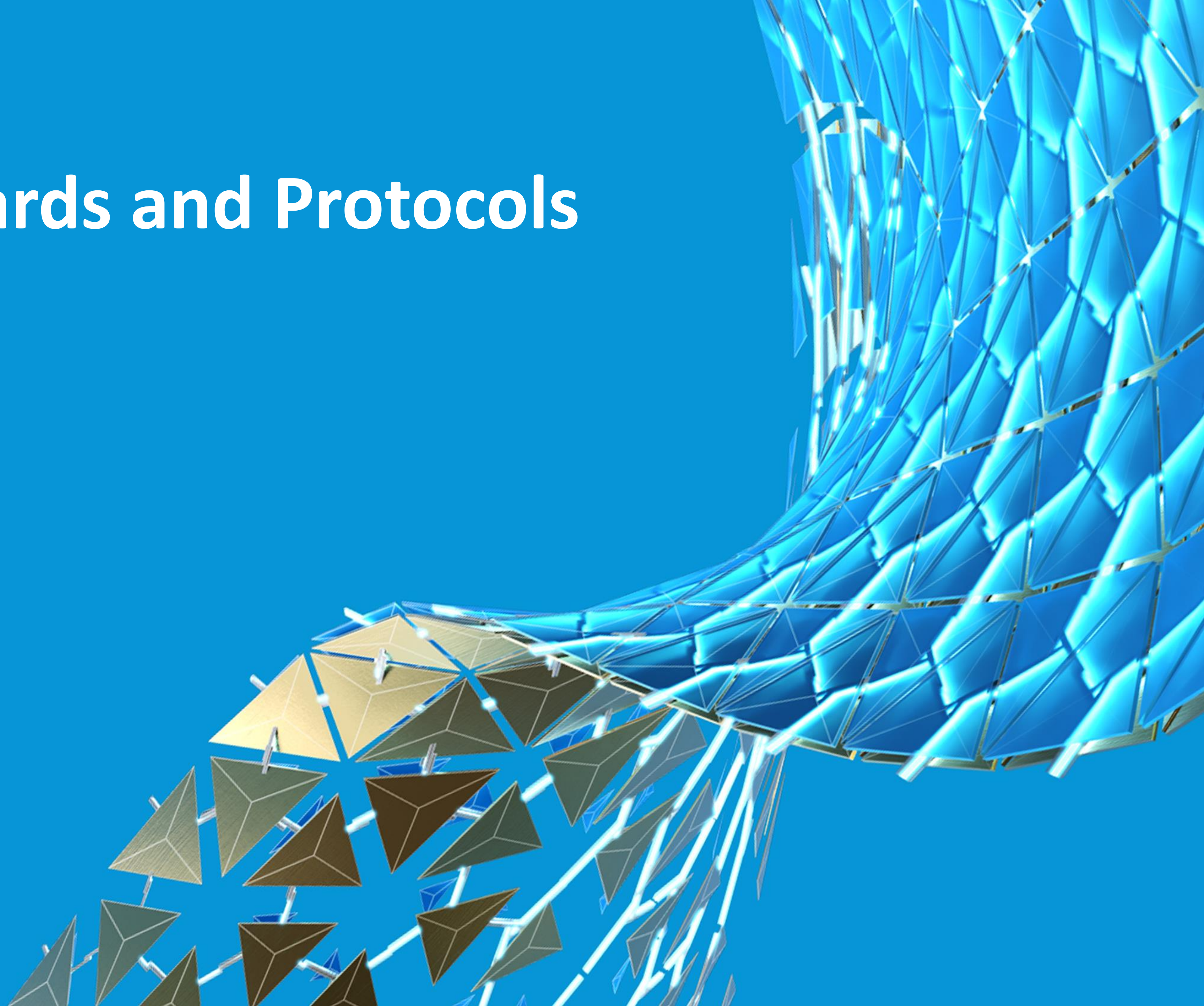
Post-Transfer Activities

Some of these activities may be performed in either Revit or RSA. Others are simply the other model preparations needed for structural analysis.

- **Edit end releases of members**
- **Add load cases, loads, and load combinations**
- **Edit any advanced member properties**
- **Edit mesh settings for panel elements**
- **Edit design parameters/criteria for steel and concrete elements**



Model Standards and Protocols



Model Hygiene

A change in process requires forethought and planning for success.

- Inspect both 3D and 2D views of just the analytical elements.
- Compare the analytical elements to the “physical” elements in a 3D, Wireframe model.
- Adjust the analytical model elements using the tools in the Analyze ribbon and properties palette.
- Disable the analytical model for non-structural elements such as veneer walls or slabs-on-grade.
- Check and resolve any warnings related to the analytical model elements

Content Libraries

A change in process requires forethought and planning for success.

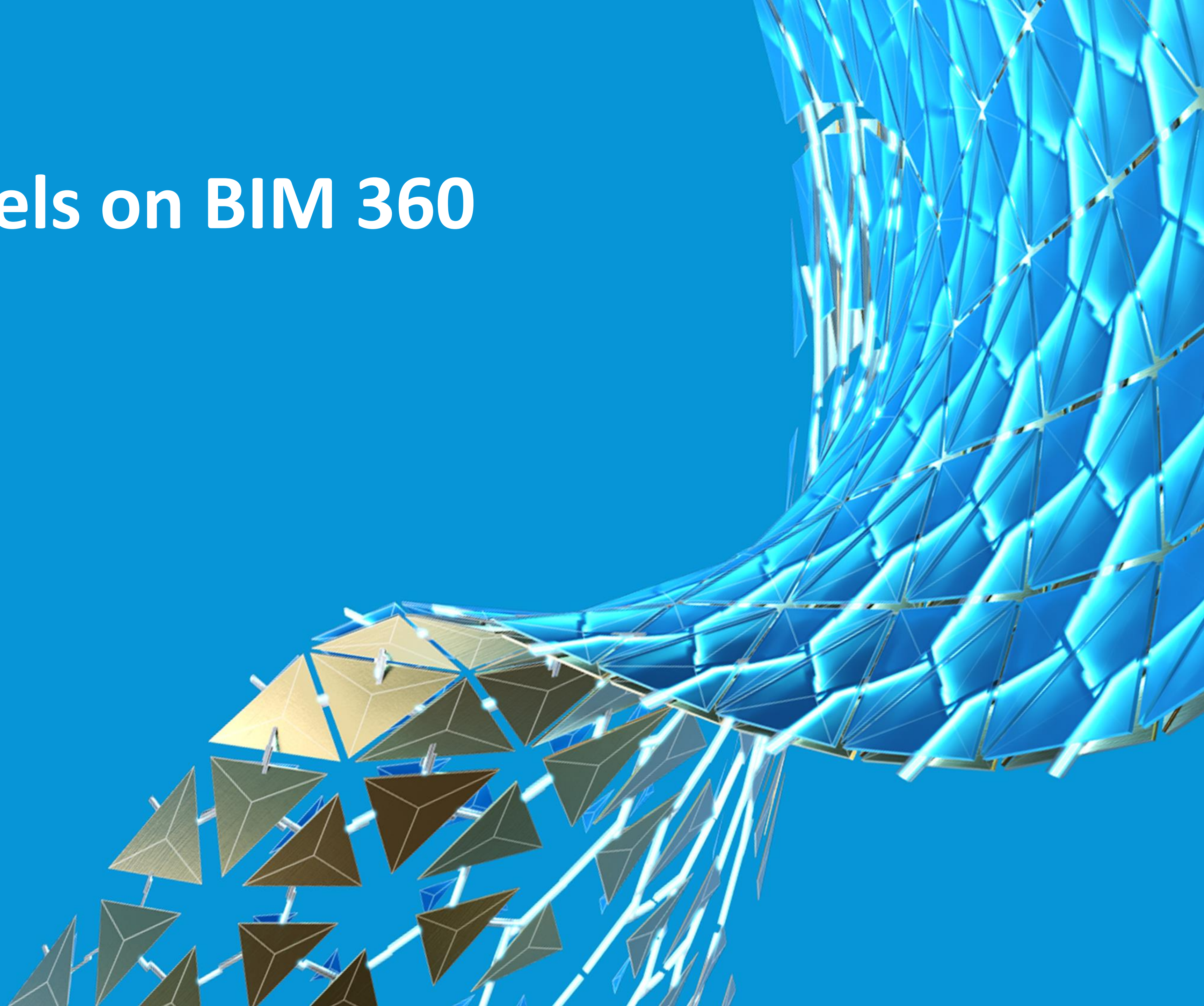
- Align Revit family Types with RSA and Advance Steel section names.
- Align Revit material Types with RSA and Advance Steel material names.
- Load Case and Load Combination names in Revit and RSA.
- Create custom content in Revit, RSA, and/or Advance Steel PRIOR to transfers.
- Experiment with transfers of compound and built-up shapes between applications.

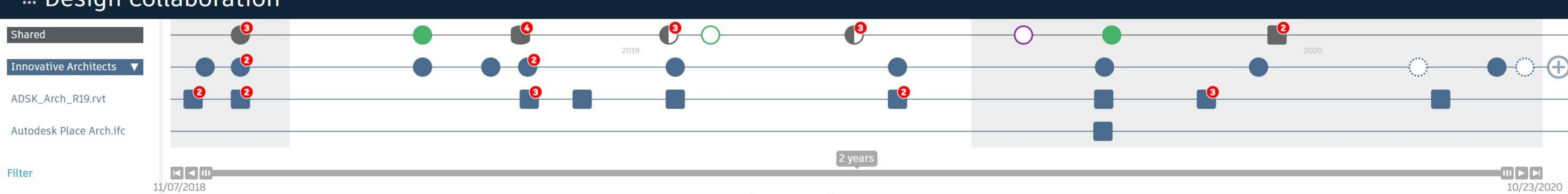
Protocols

Who does what and in which software?

- Model grids, levels, framing and foundations in Revit.
- Model & update Boundary Conditions, Load information, and End Releases in RSA
- Model connections in Revit if needed for clash coordination during design.
- Model remaining connections in Advance Steel.
- Update Revit with optimized members from RSA
- Update design changes from the Architect or Owner in Revit

Manage Models on BIM 360

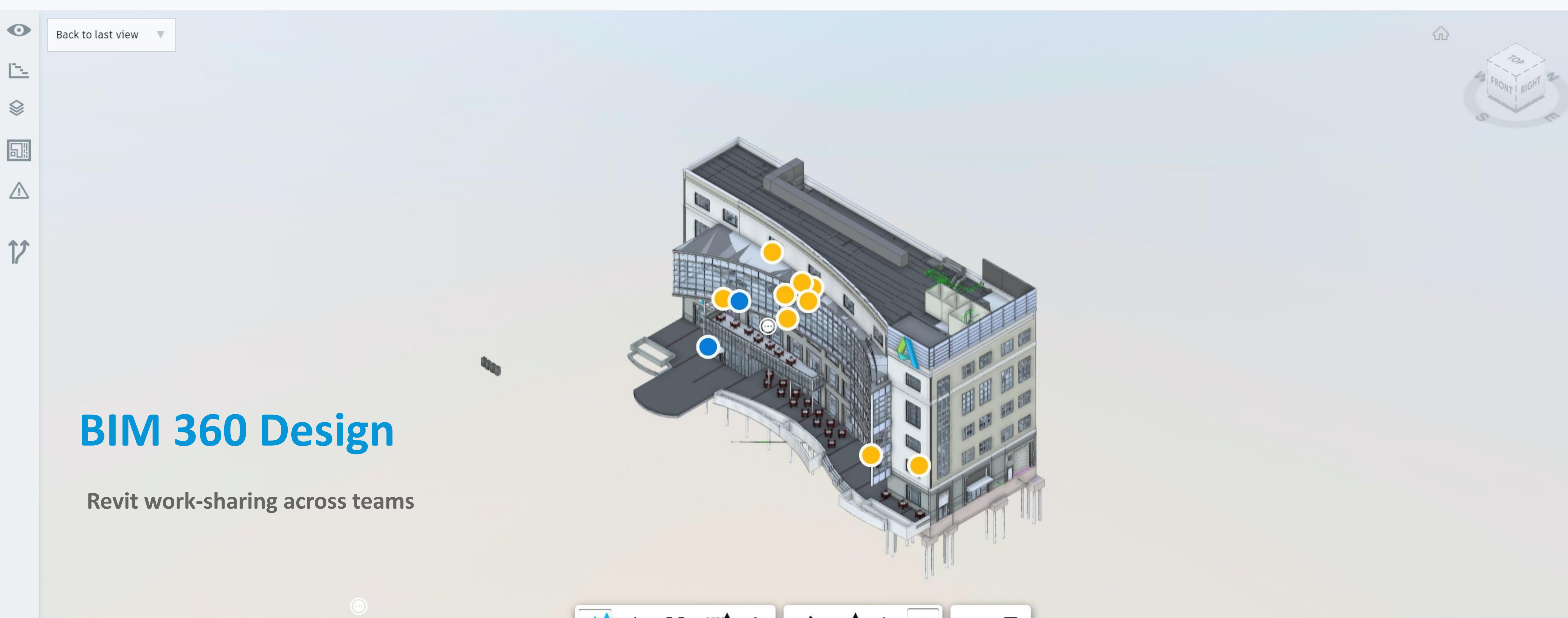




Innovative Architects

3 Sets 17 Sheets 4 3D views Project Model

Show changes



BIM 360 Docs

File Locking:

- Check out / Check in workflow
- Prevent overwrite race condition

AUTODESK BIM 360 | TS Construction > SME_CON Center

Document Management

FOLDERS REVIEWS TRANSMITTALS ISSUES

View by: Folders Sets

Upload files Showin... Search for documents

Name ^	Description	Version	S
Consumed	--	--	-
Documents	--	--	-
GPUCache	--	--	-
ADSK_Structure_R19.rvt		V15	-

Context menu for ADSK_Structure_R19.rvt:

- Move
- Copy
- Rename
- Unlock
- Share
- Delete
- Edit set assignment
- Edit attribute values
- View file activities
- Download source file
- Submit for review
- Create transmittal

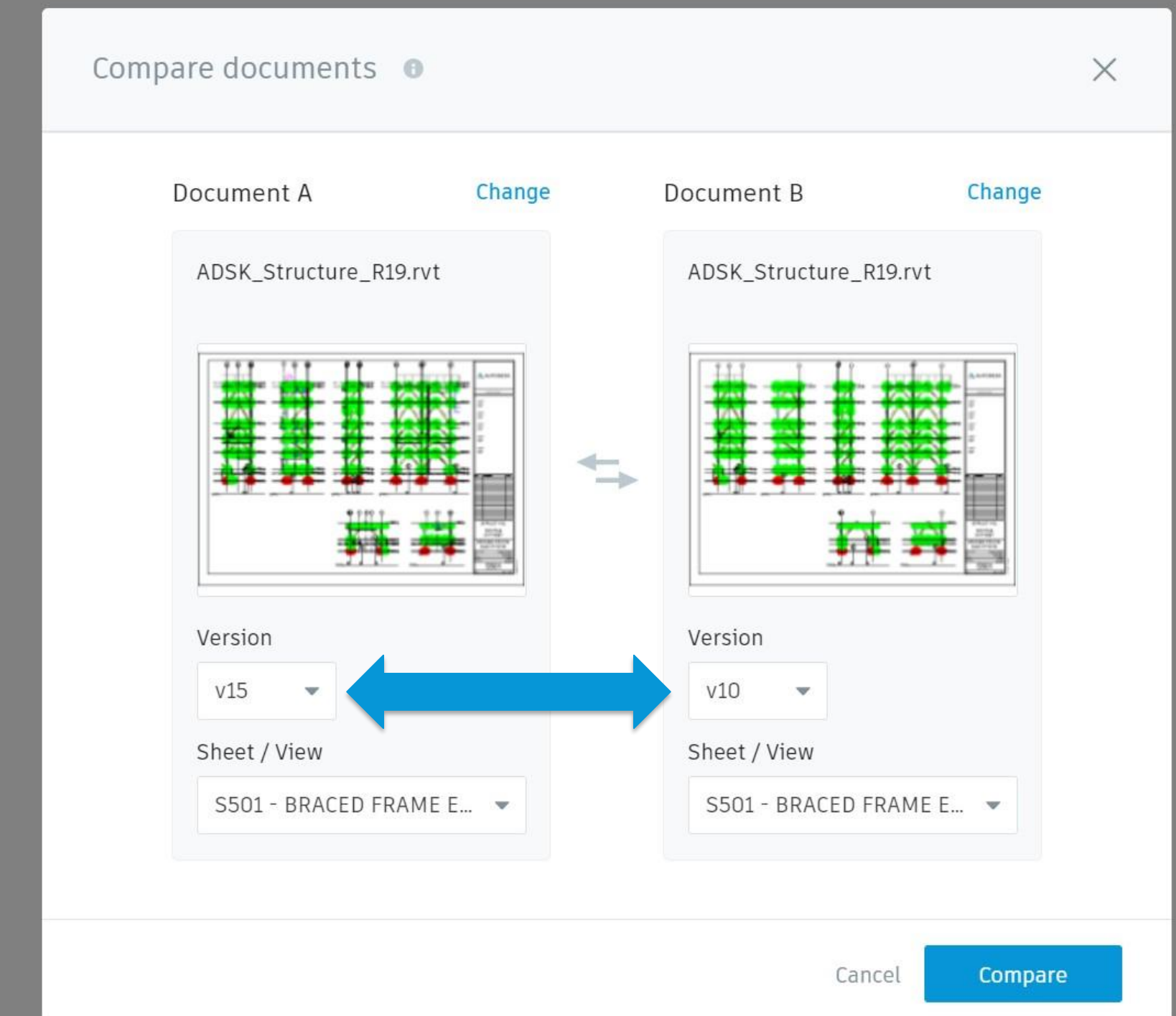
BIM 360 Docs

File Versions:

- Compare documents
- Regress to prior version

Compare

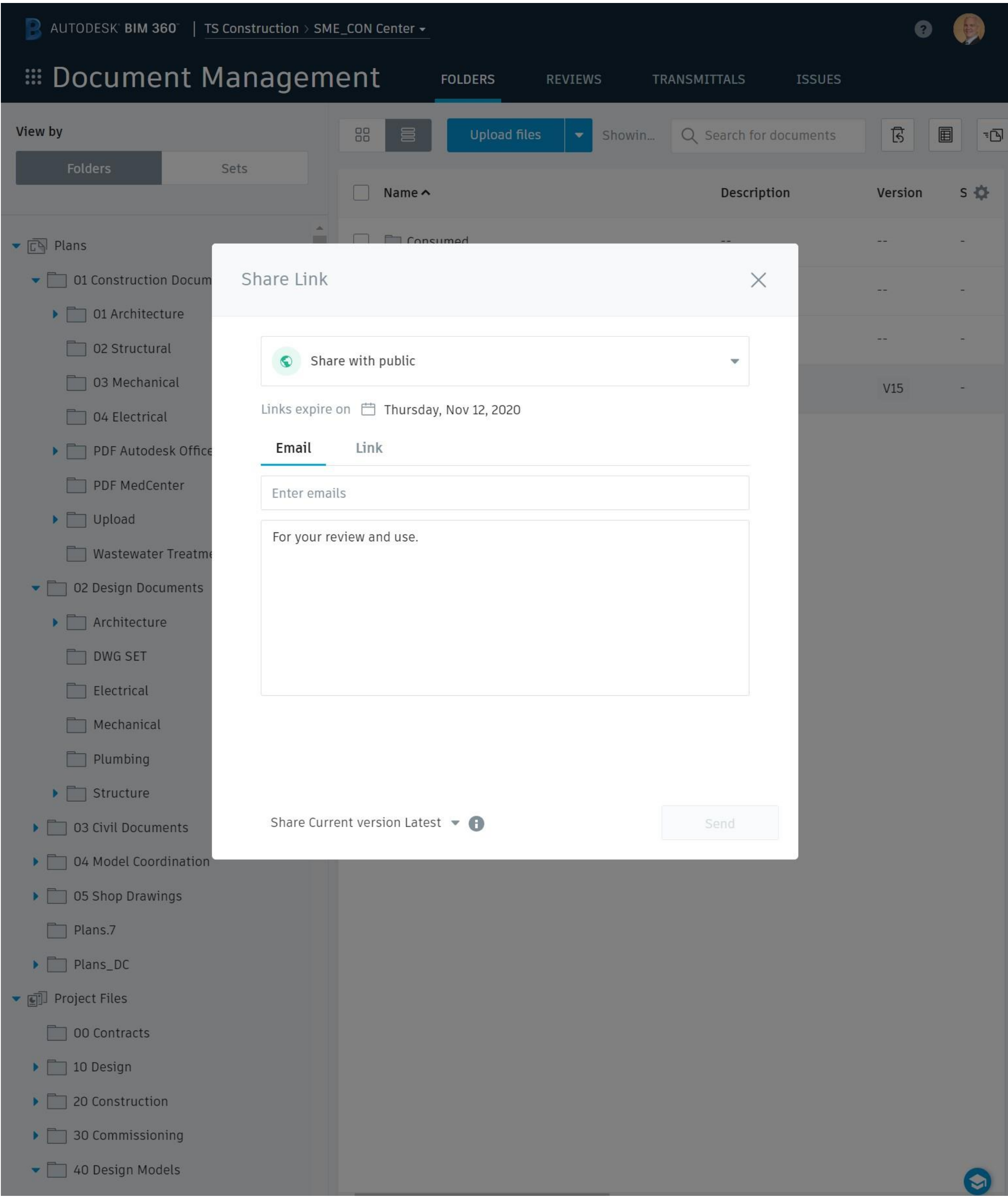
Close compare



BIM 360 Docs

Share documents with:

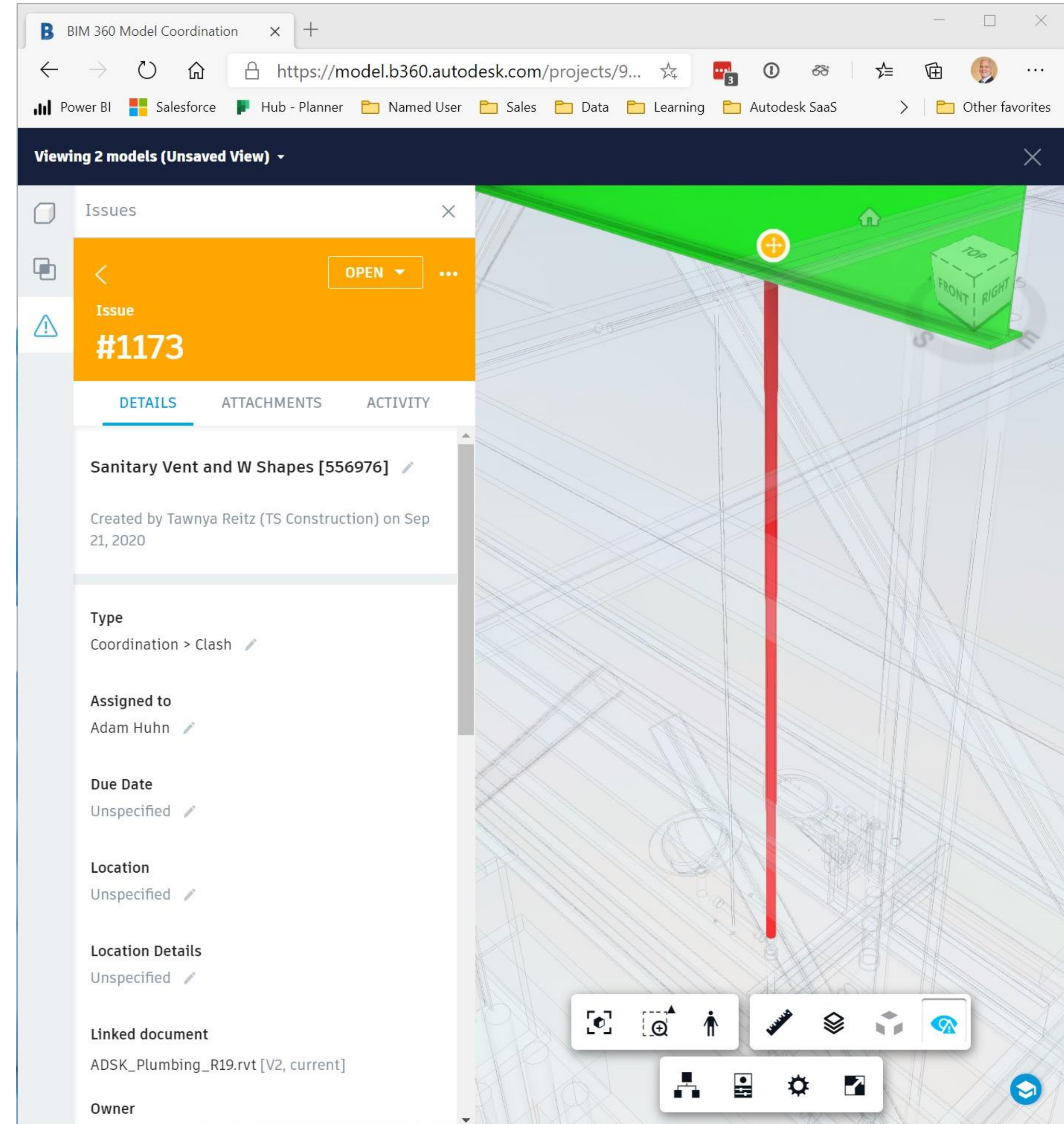
- BIM 360 team members
- Public



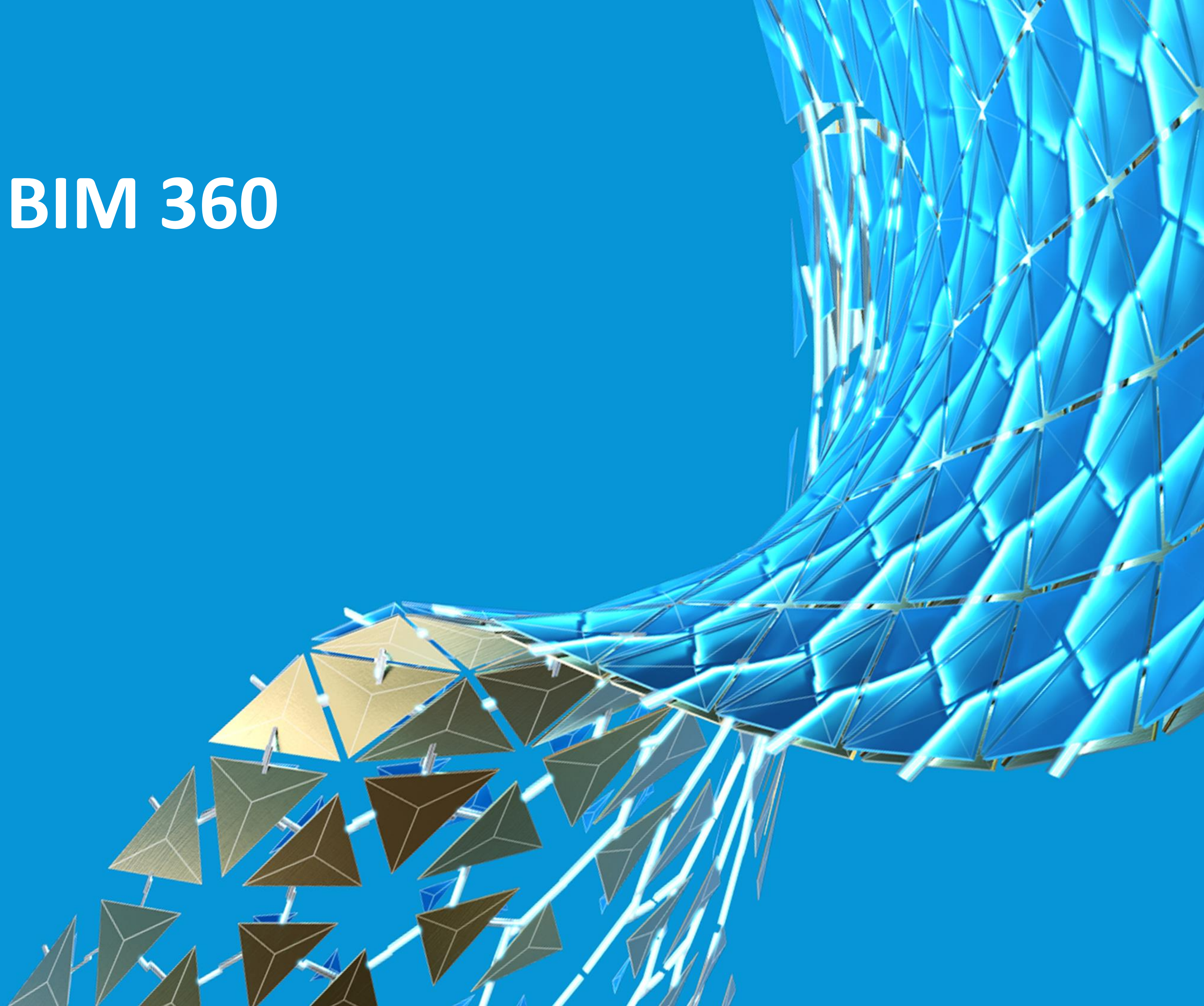
BIM 360 Docs

Coordinate with:

- Architecture & MEP models
- Steel fabrication & steel joist models



Reviews with BIM 360



Review & Approval

Use BIM 360 Markups, Issues for:

- Design reviews
- Internal coordination
- Shop drawing reviews

Power BI | Salesforce | Hub - Planner | Named User | Sales | Data | Learning | Autodesk SaaS | HR | Other favorites

AUTODESK BIM 360 | TS Construction > SME_CON Center

Documents

Issues | Templates

Issue #1166

OPEN

DETAILS | ATTACHMENTS | ACTIVITY

Not enough spacing between duct and line

Created by Will Gunter on Sep 9, 2020

Assigned to Will Gunter

Due Date Sep 24, 2020

Location Level 5

Location Details kitchen hood vent

Type Coordination

Owner Will Gunter

Root Cause Constructability

Linked document HVAC Model_Coordination_Linked Model.rvt [V6, current]

Description Space between line and duct needs to be at least 24 inches for acces.

Response Unspecified

Photos

screenshot_2020-...

Due date

Dec 9,

Oct 24

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ction Oct 21,

Oct 30

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Oct 20

Oct 16

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Oct 16

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Oct 16

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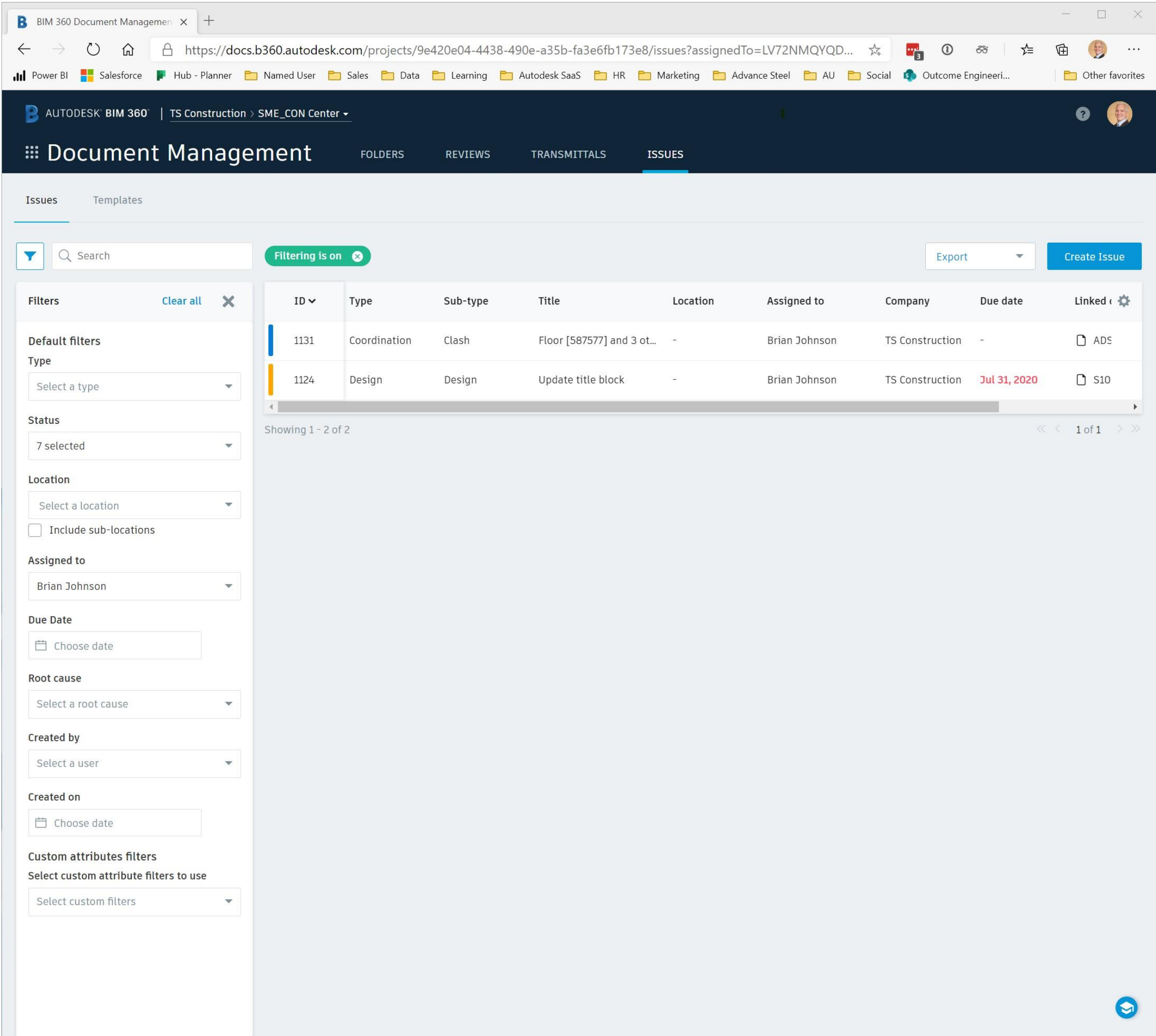
Oct 15,

-

Review & Approval

Assign Issues for:

- To do lists & action items
- Project progress & status
- Accountability



Review & Approval

Use Review workflows for:

- Formal QA/QC process
- Document release

Project Admin

MEMBERSCOMPANIESSERVICESPROFILE

Create an approval workflow

CancelSave

General info

Name *

Structural Design Review

Description

Internal QA/QC review prior to issuing Construction Documents.

Steps

Final Review

Initiator *

BIM Manager ×

Designer ×

Document Manager ×

Structural Engineer ×

Step name

Final Review

Approver *

Brian Johnson ×

Time allowed *

3

Calendar Day(s)

Document approval status

Value *

Approved

Rejected

Approved

Add status

Approval status label *

Approved

Rejected

Approved w/ comments

Icon *

✓

✗

✓

Action upon completion

Update documents with approval status when review is complete.

☐

Also copy approved documents to:

Select a folder *

Allow initiator to change copy location



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