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BIM Workflows for the Structural Engineer: Design to Fabrication

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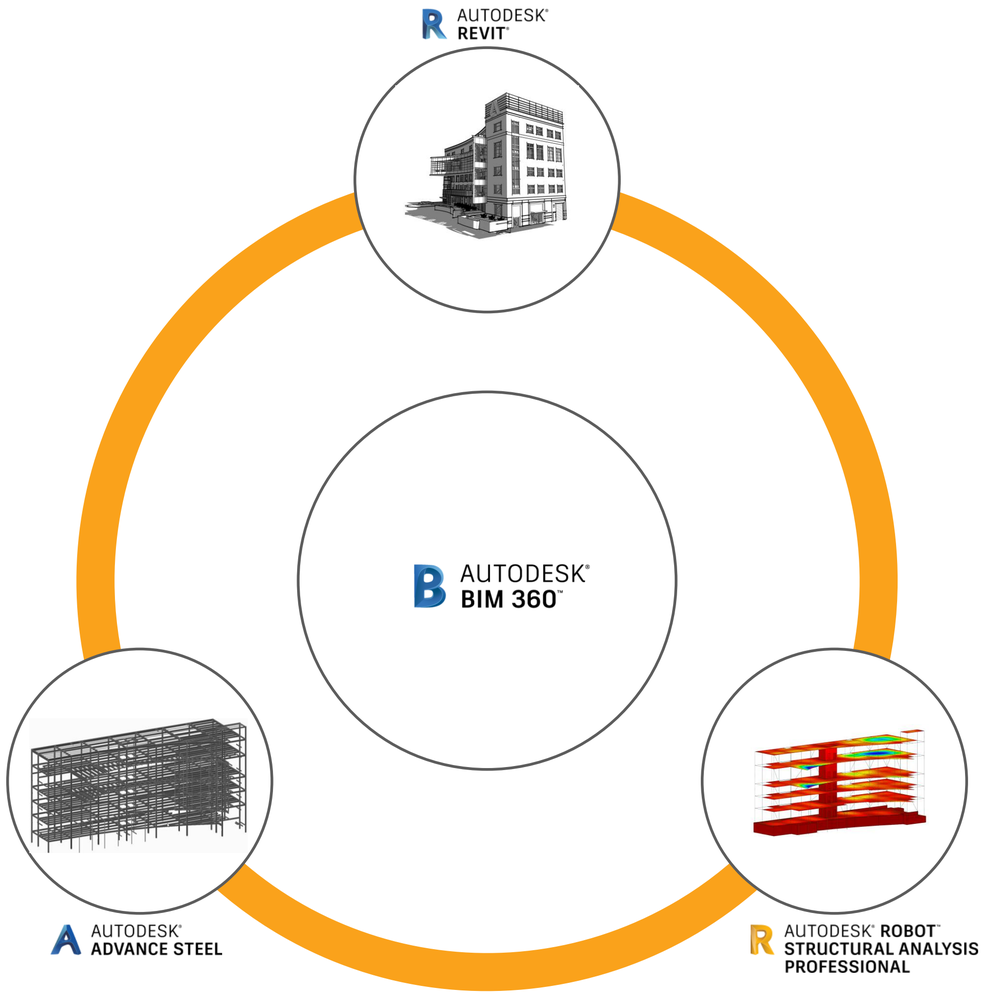
About the speaker

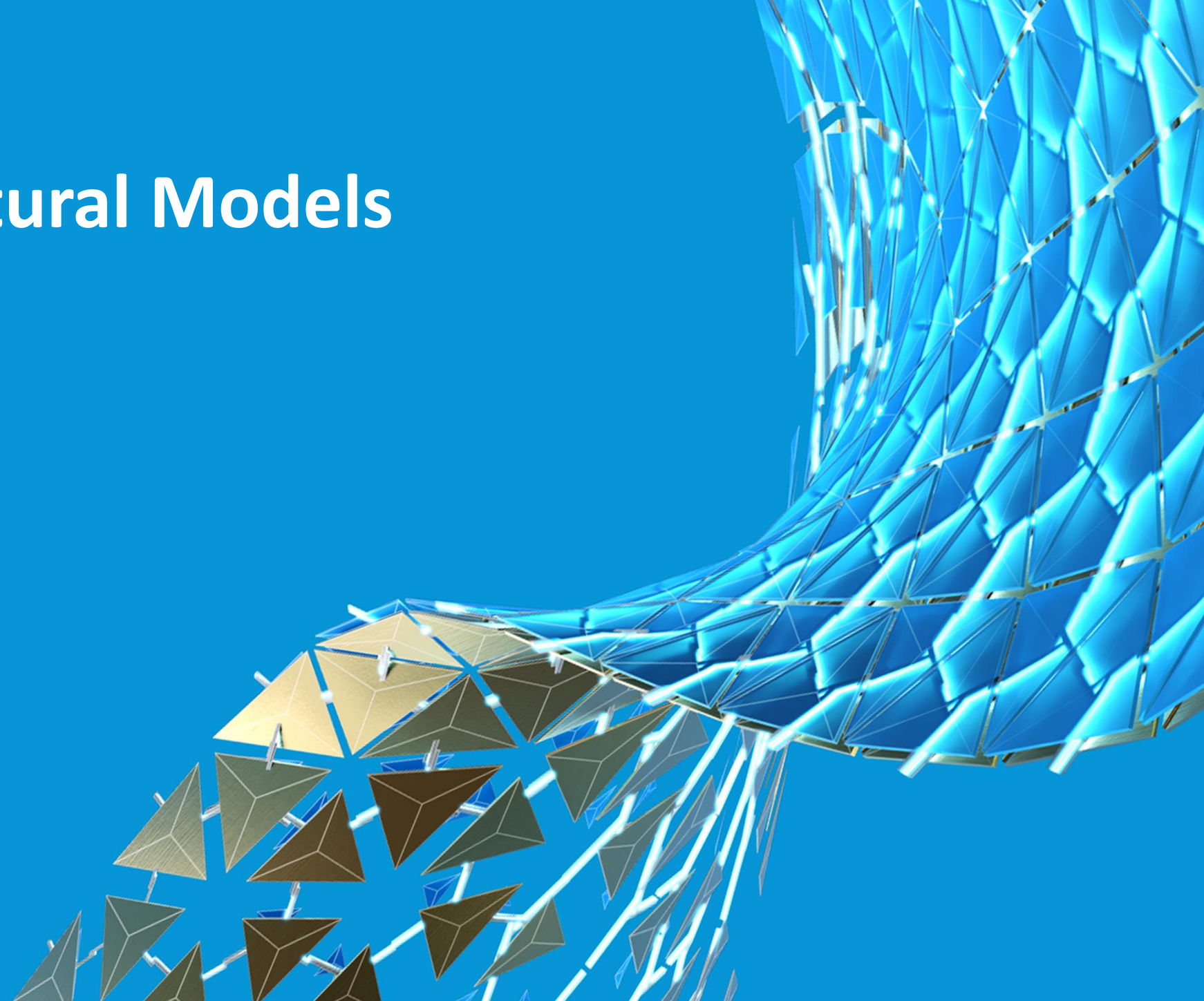
Brian E Johnson, PE

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

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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.

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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.

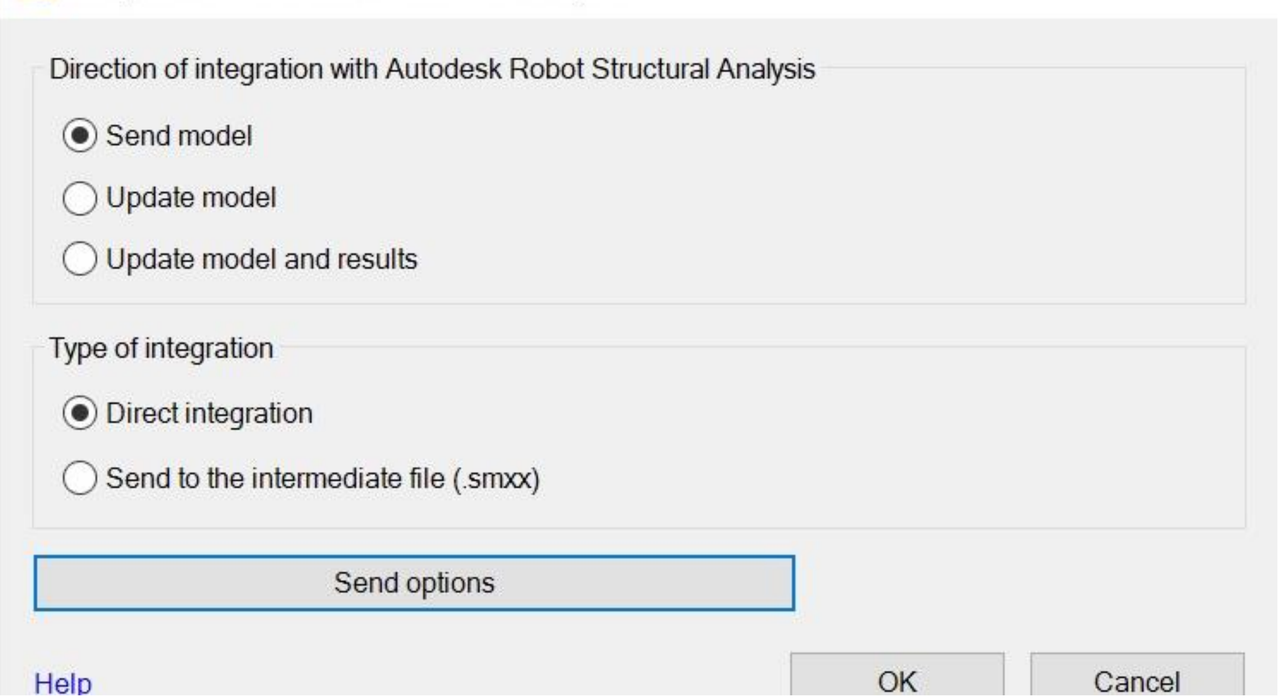
DELIVER

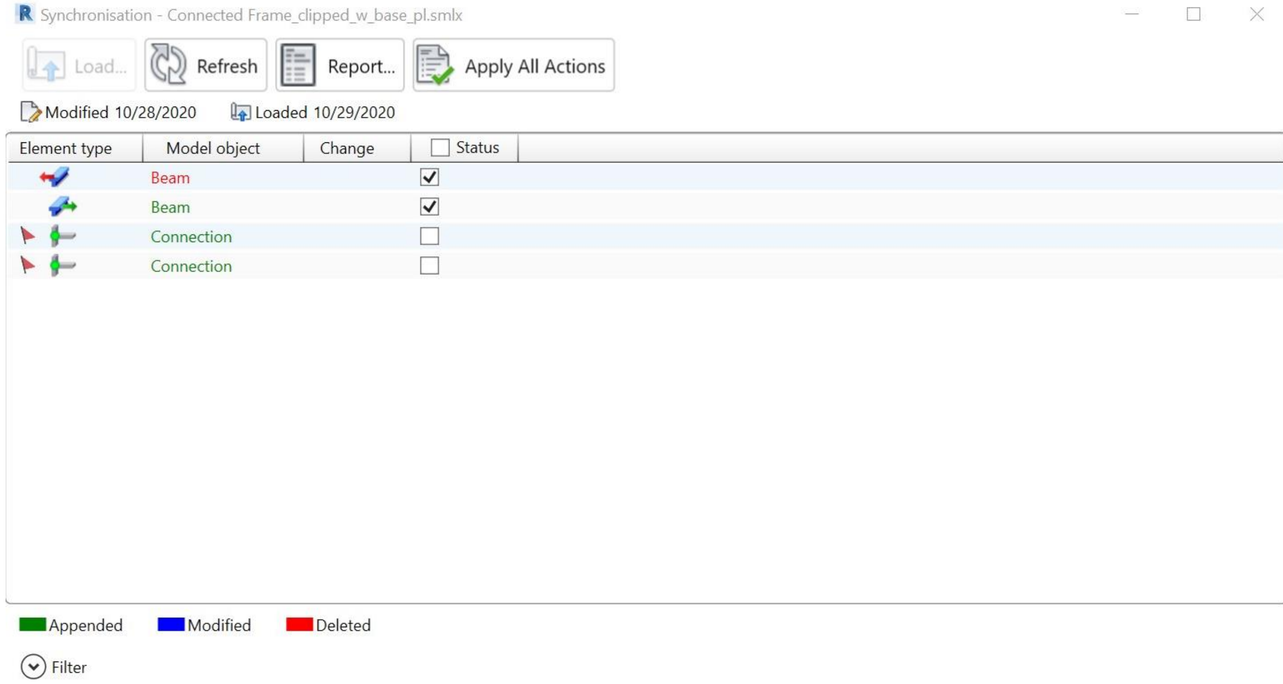
FABRICATE

Generate NC files.

Generate BOM lists.

Generate DXFs.





Direct Transfer

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

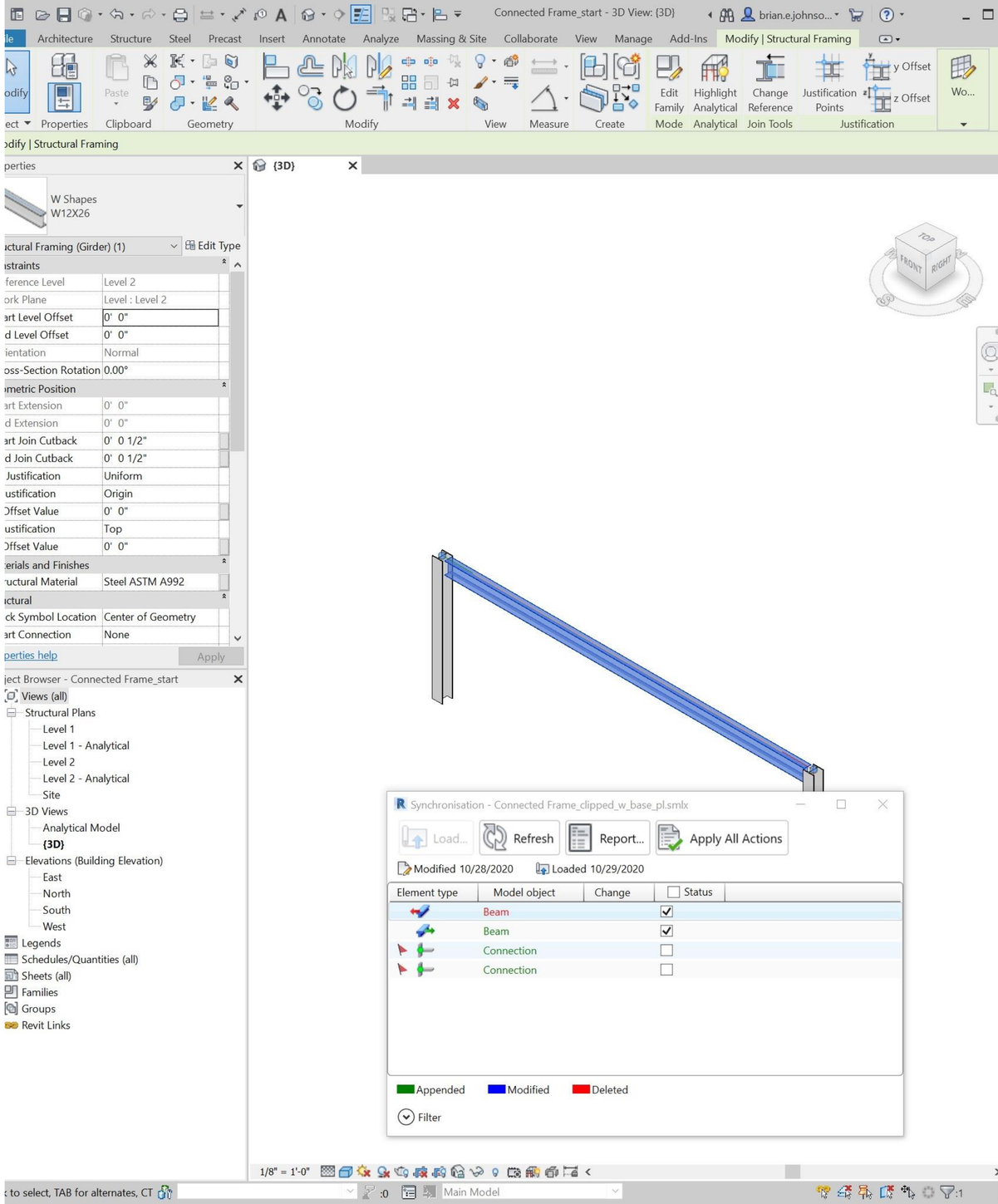
Intermediate File Transfer

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.

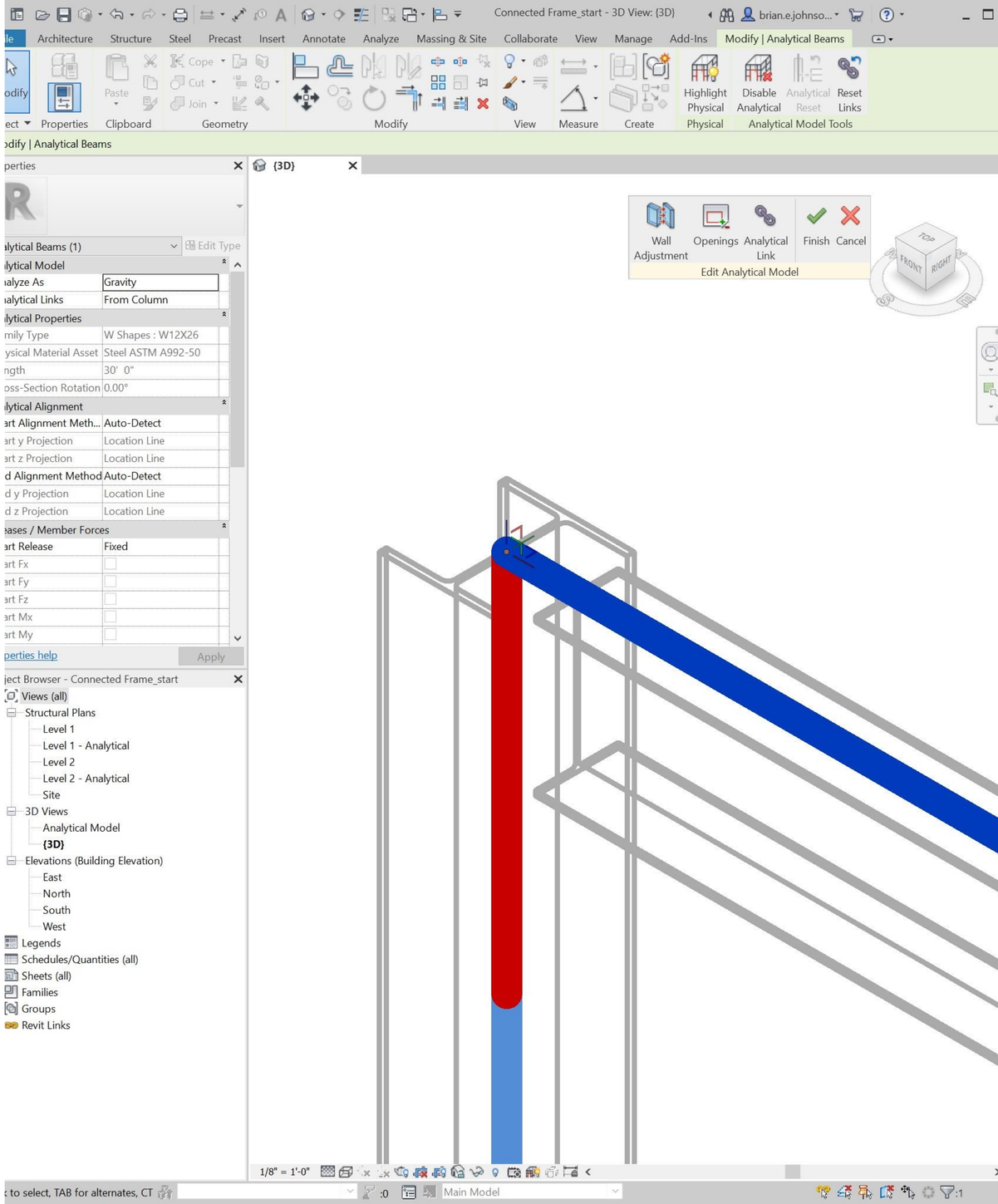
- **Review the options**
- **Export**
- **Synchronize**
- **Accept or reject updates**
- **Complete the transfer**



Pre-Transfer Activities

Model the structure, of course!

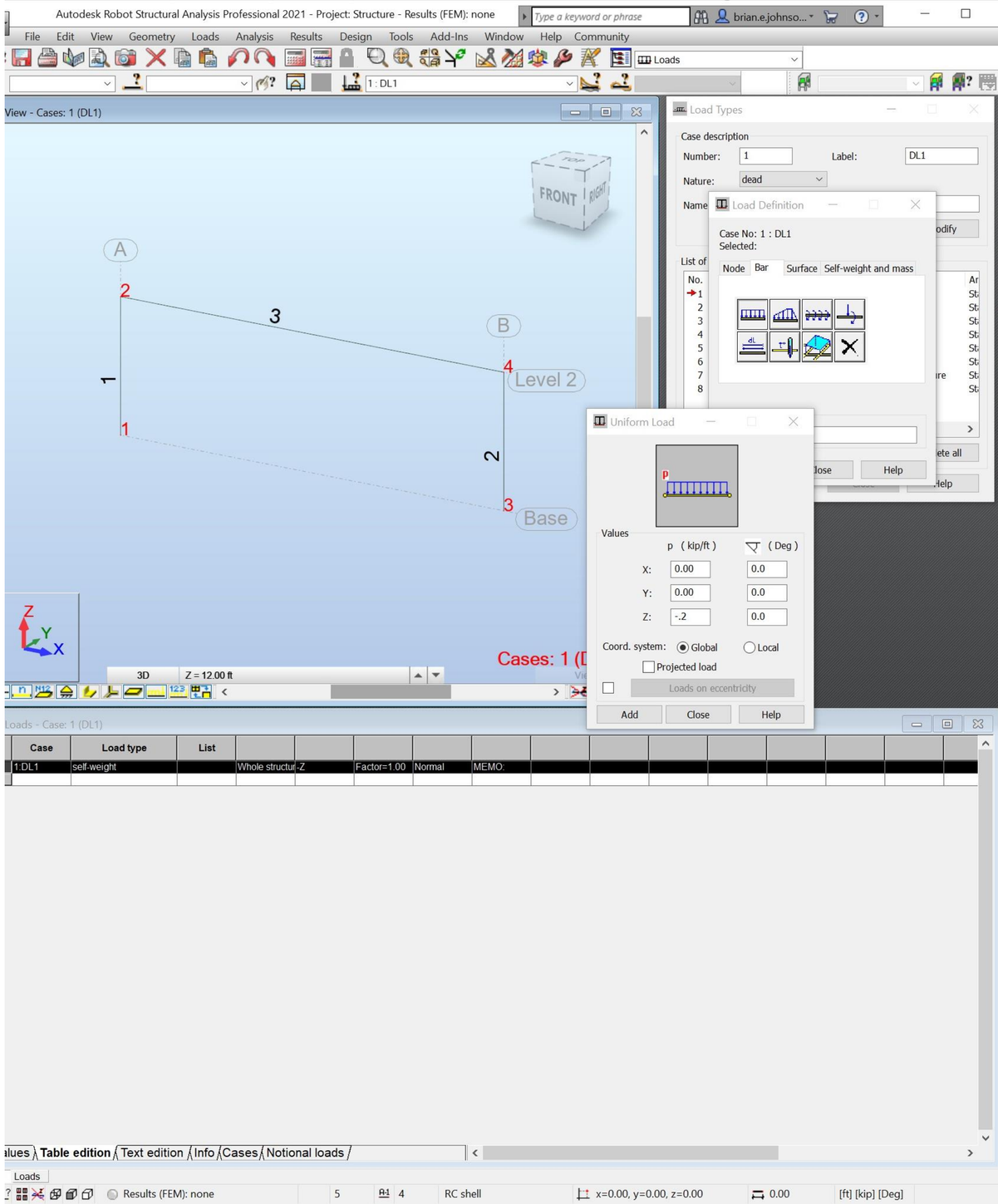
- **Review and adjust the Analytical Model (Revit) or System lines (Advance Steel)**
- **No adjustments needed for sending from Robot Structural Analysis**



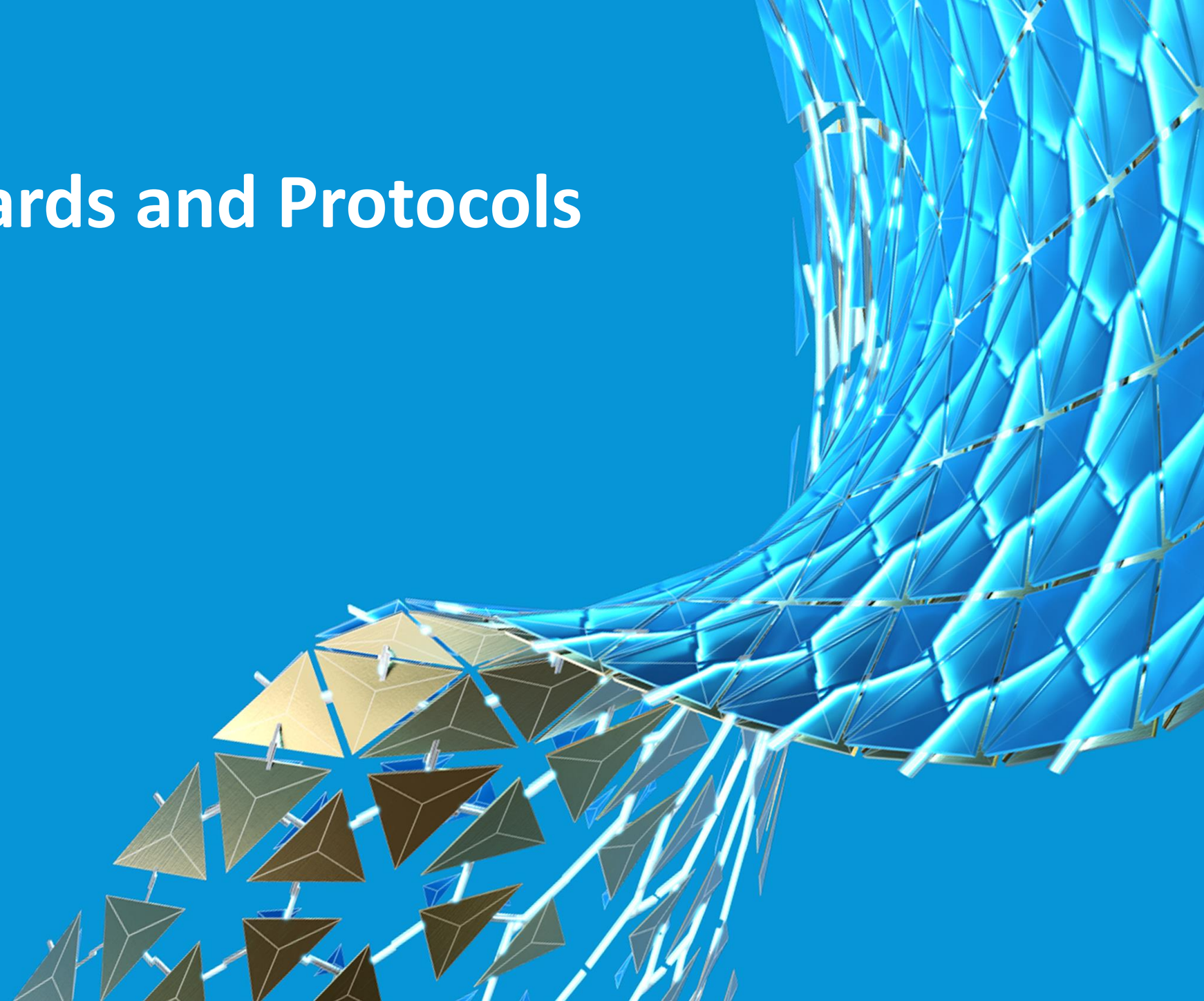
Post-Transfer Activities

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.

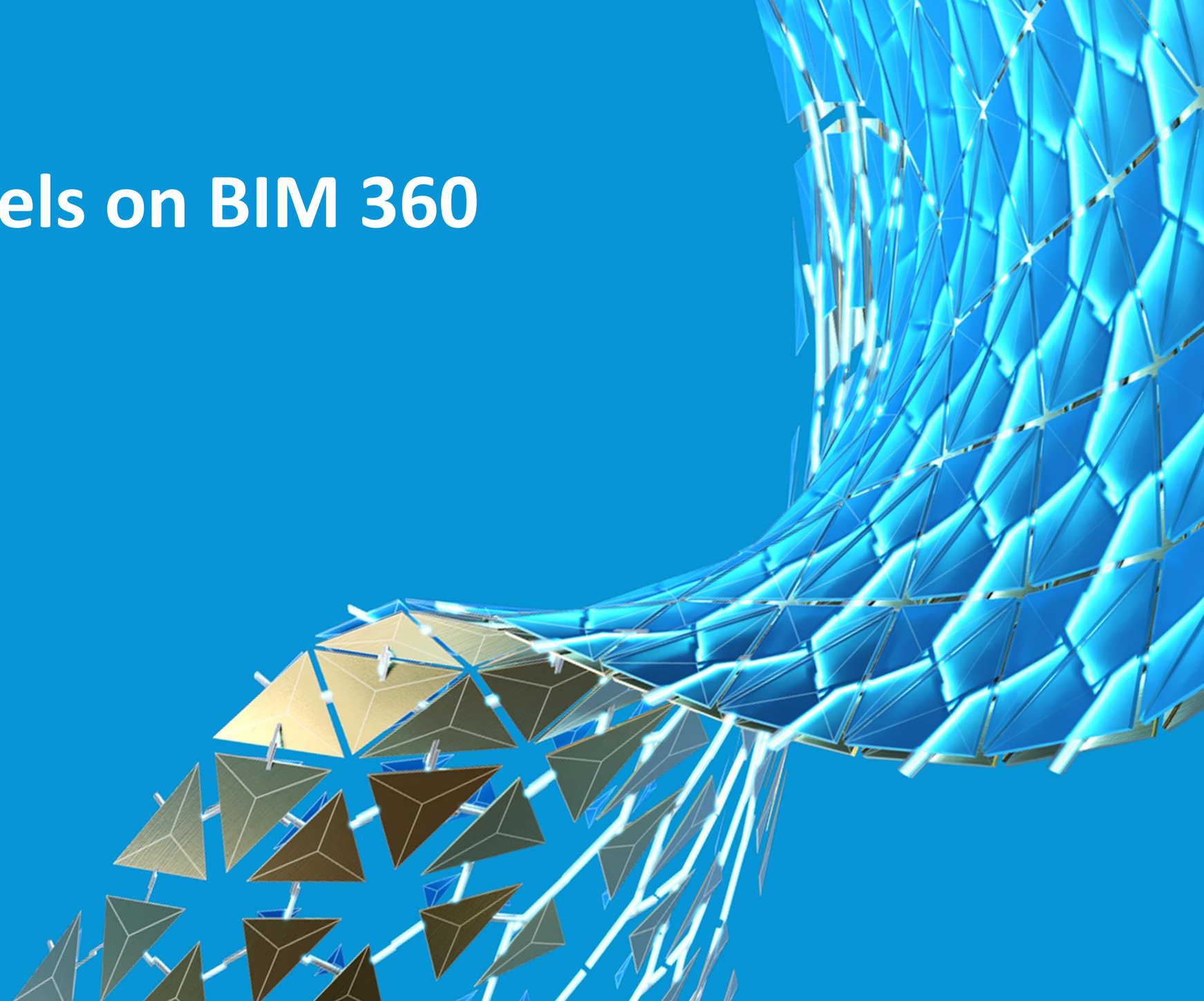
- **Align Revit family Types with RSA and Advance Steel section names.**
- **Align Revit material Types with RSA and Advance Steel material names.**
- **Load Case and Load Combination names in Revit and RSA.**
- **Create custom content in Revit, RSA, and/or Advance Steel PRIOR to transfers.**
- **Experiment 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



Design collaboration

Shared

Innovative Architects

ADSK_Arch_R19.rvt

Autodesk Place Arch.ifc

Filter

2019

2020

2 years

11/07/2018

10/23/2020

Innovative Architects

3 Sets

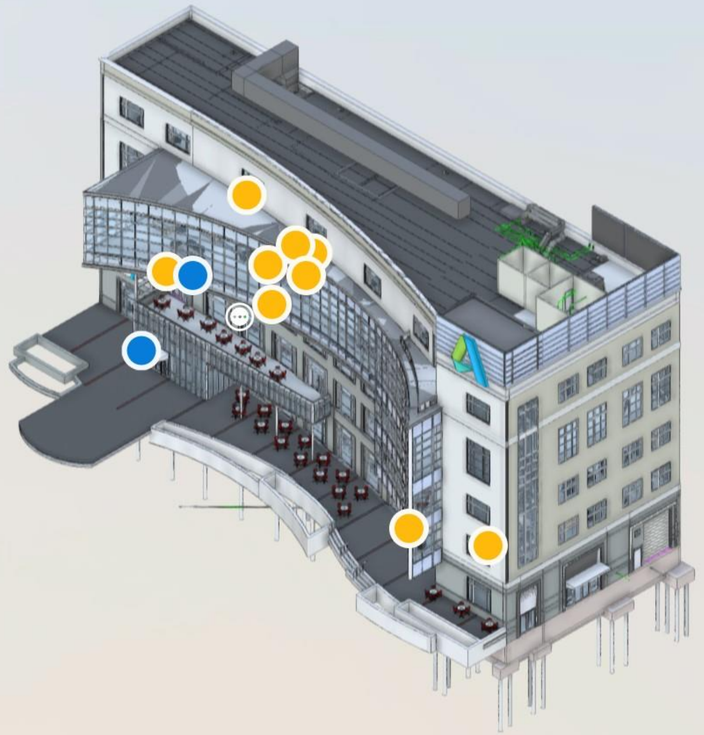
17 Sheets

4 3D views

Project Model

Show changes

Back to last view



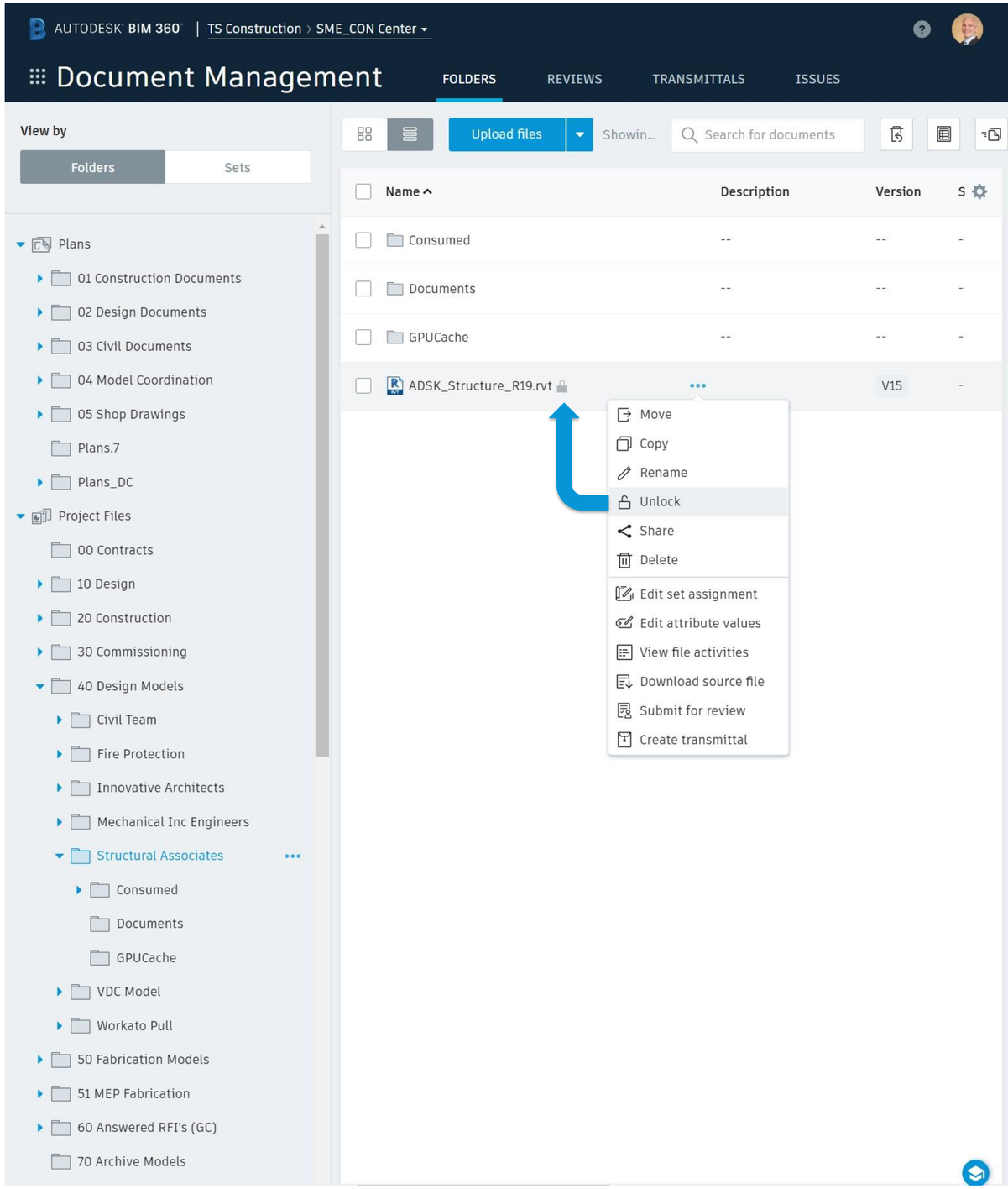
BIM 360 Design

Revit work-sharing across teams

BIM 360 Docs

File Locking:

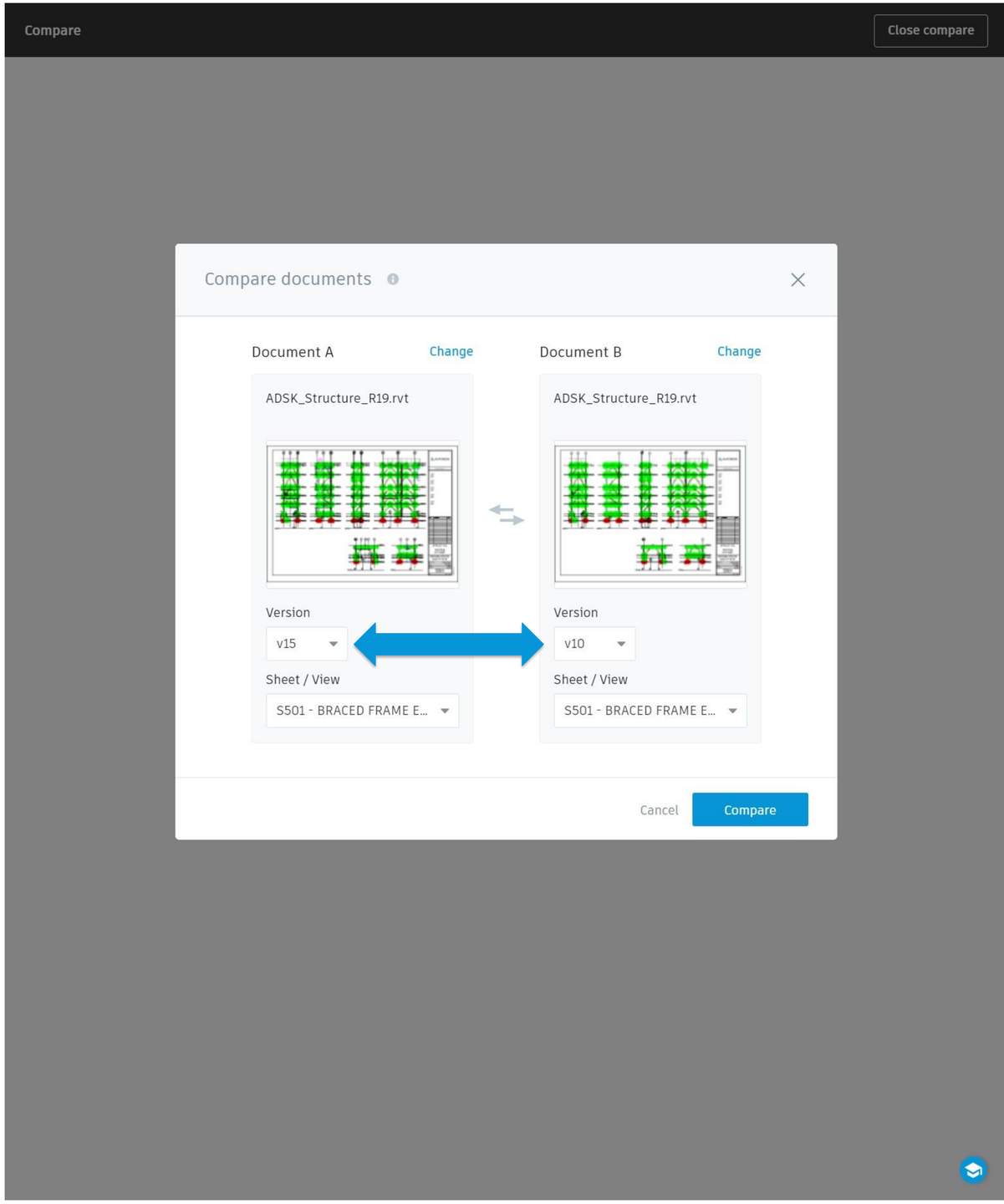
- **Check out / Check in workflow**
- **Prevent overwrite race condition**



BIM 360 Docs

File Versions:

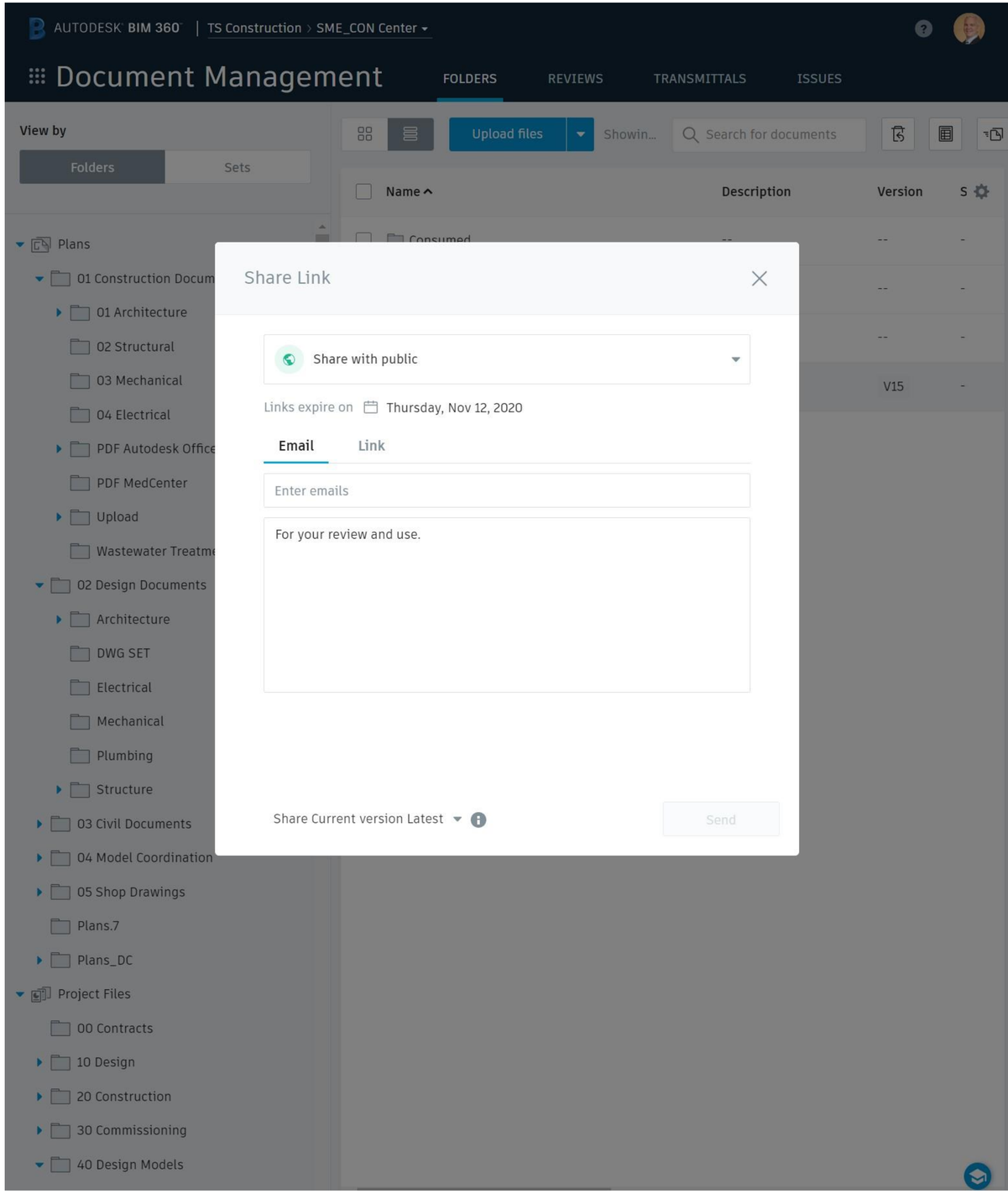
- **Compare documents**
- **Regress to prior version**



BIM 360 Docs

Share documents with:

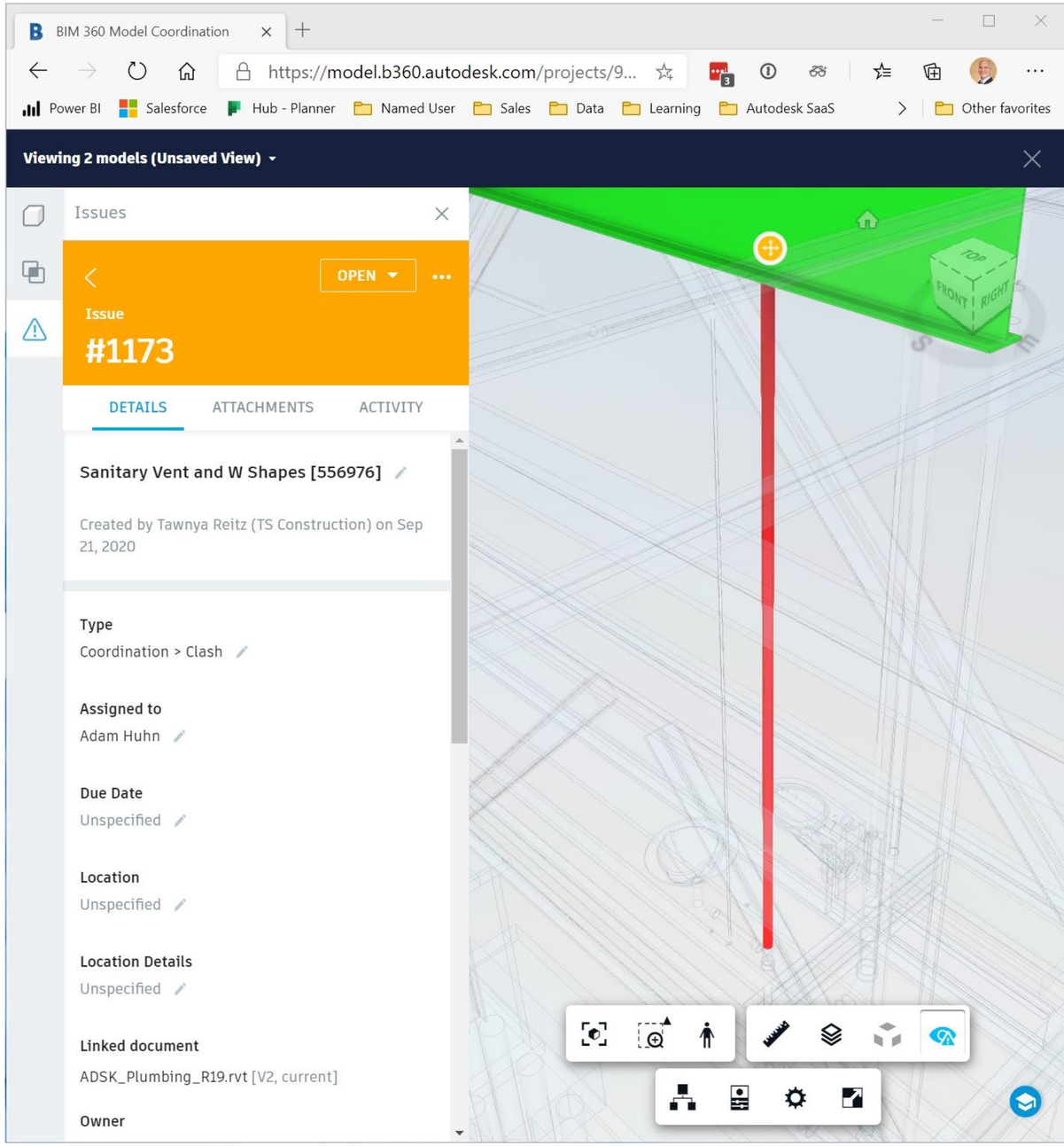
- **BIM 360 team members**
- **Public**



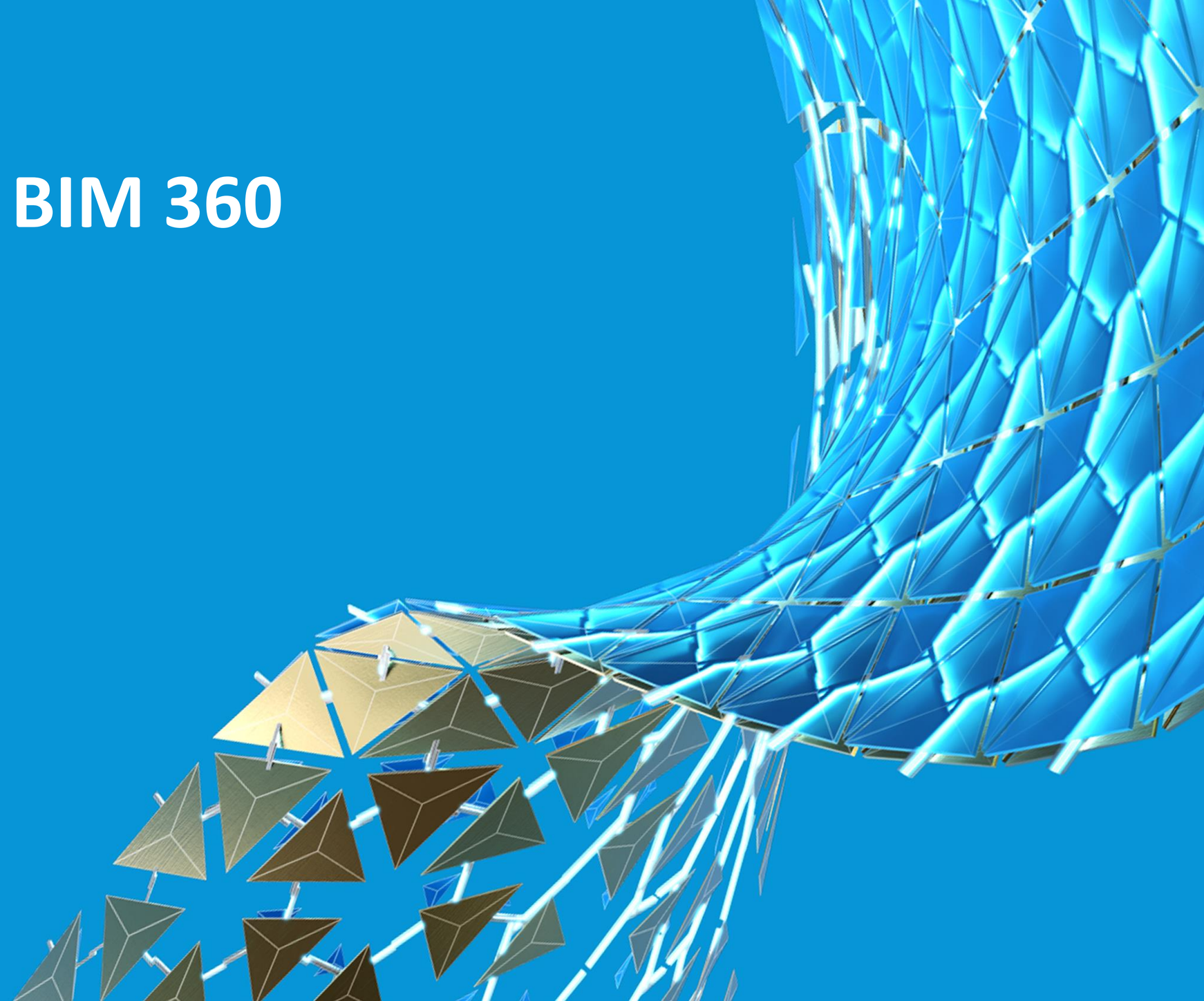
BIM 360 Docs

Coordinate with:

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



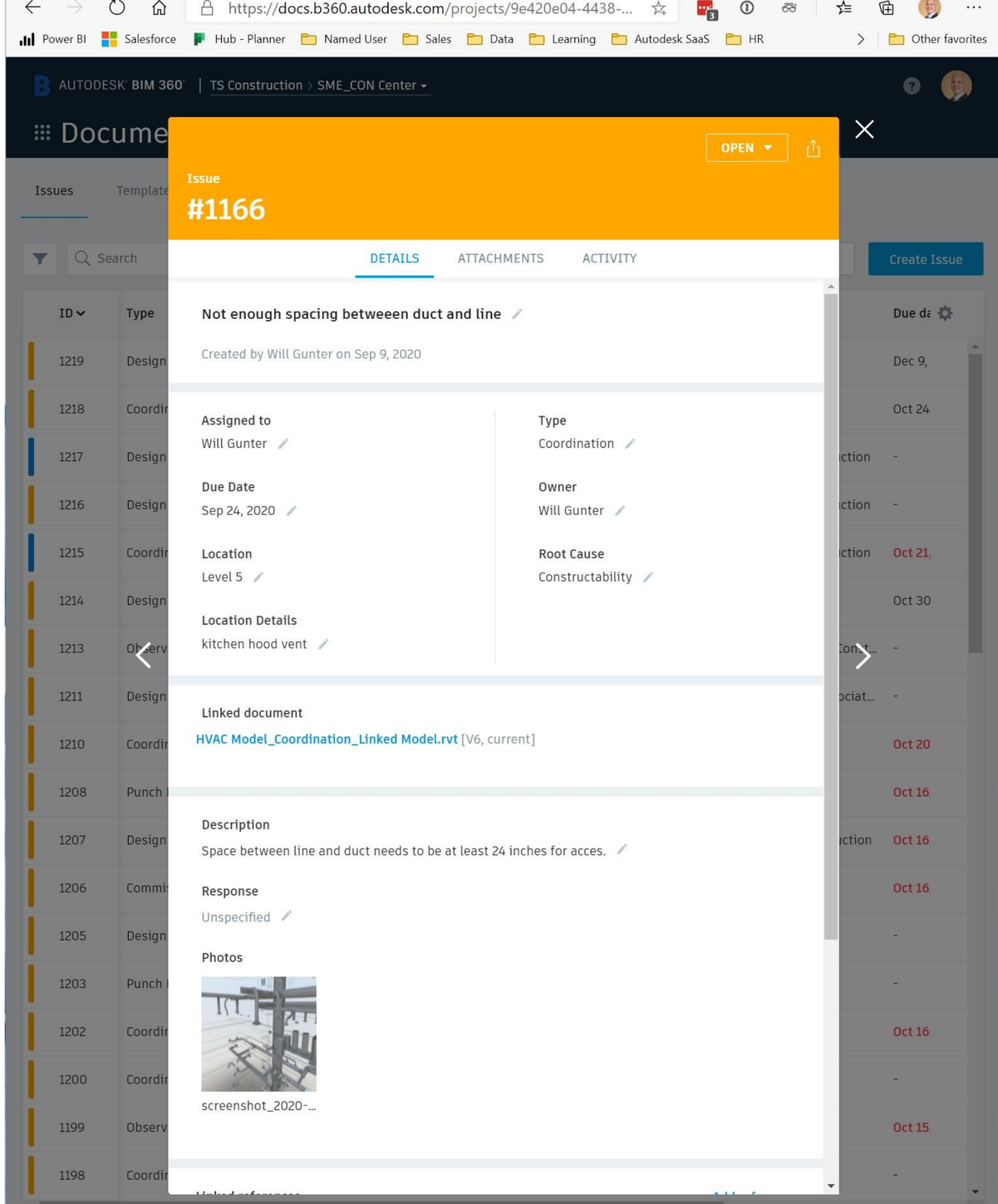
Reviews with BIM 360



Review & Approval

Use BIM 360 Markups, Issues for:

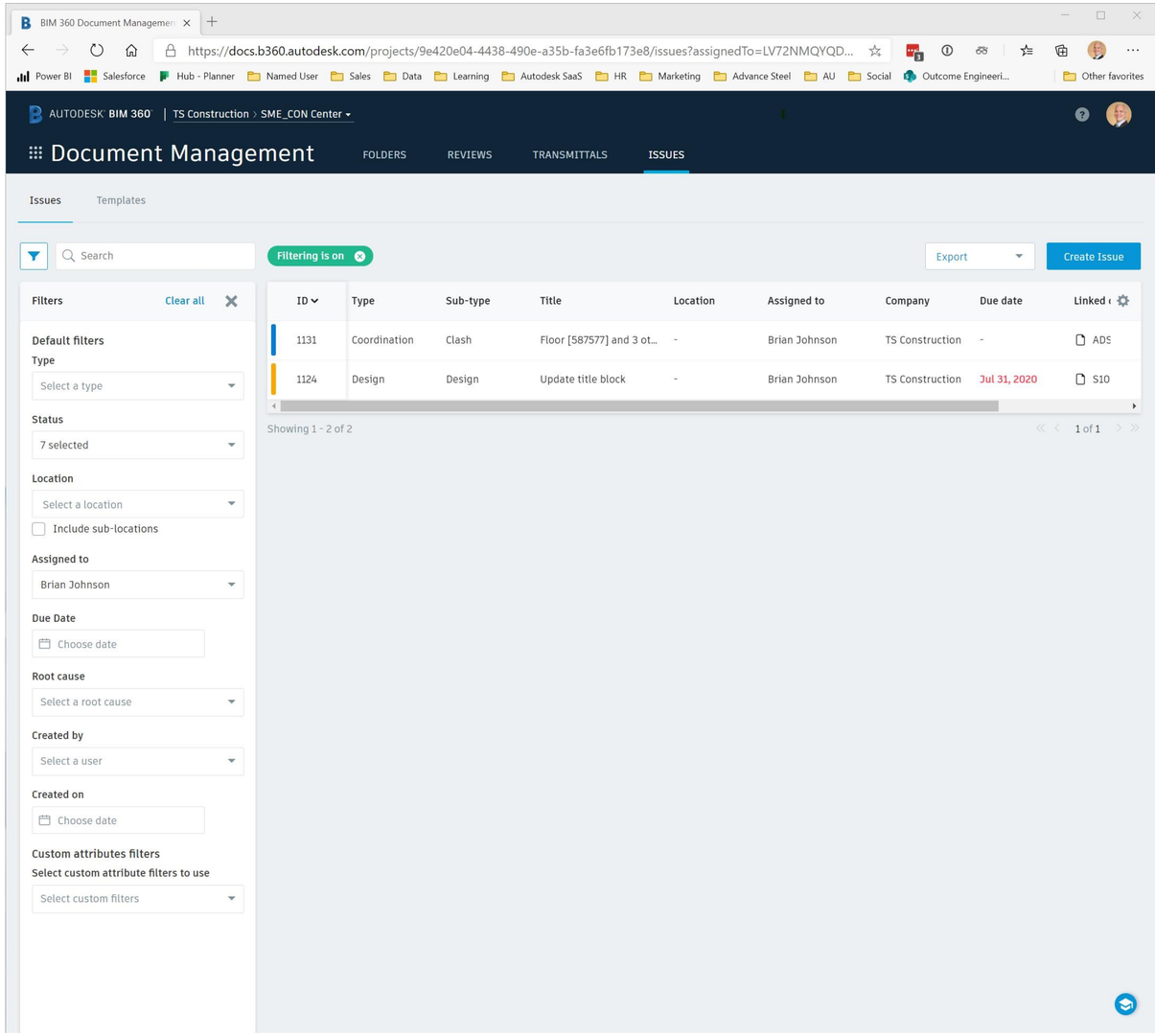
- **Design reviews**
- **Internal coordination**
- **Shop drawing reviews**



Review & Approval

Assign Issues for:

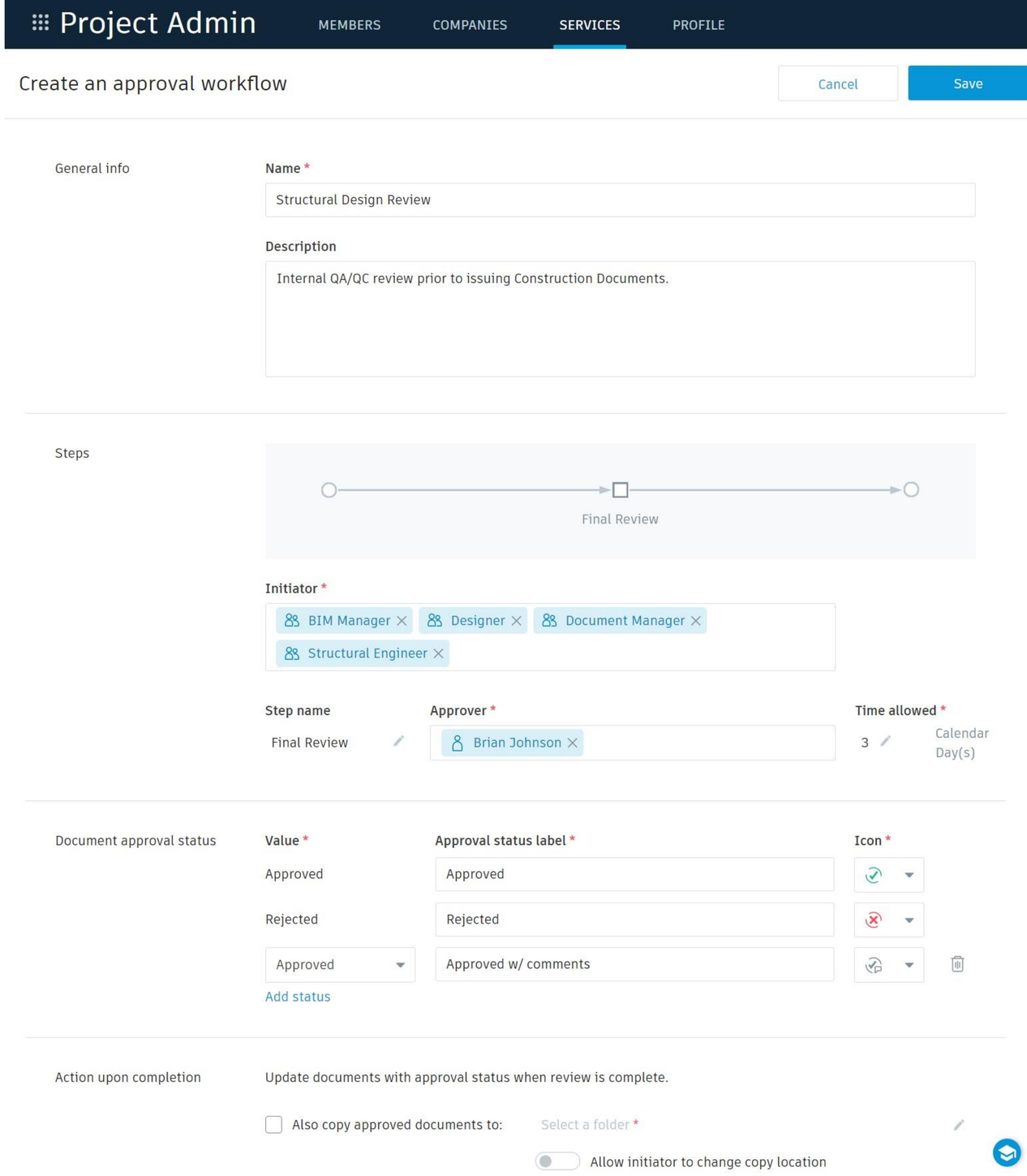
- **To do lists & action items**
- **Project progress & status**
- **Accountability**



Review & Approval

Use Review workflows for:

- **Formal QA/QC process**
- **Document release**



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