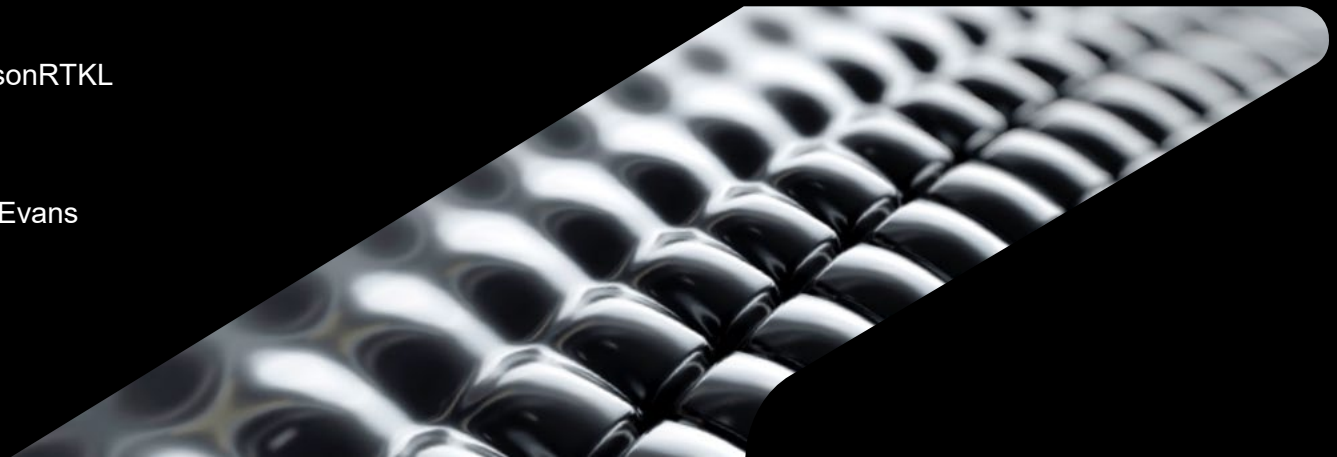
AUTODESK UNIVERSITY

Federal Agency Stress Tests Revit and BIM 360 Best Practices

Steven Register
Design Technology Specialist | CallisonRTKL

Robert Fink, AIA
Design Technology Director | Quinn Evans

Fotis Perizes, LEED AP BD+C
BIM Manager | CallisonRTKL



Steven Register

Design Technology Specialist
CallisonRTKL

Washington D.C.

AKA Phil Conners
Groundhog Day



Robert Fink

AIA

Design Technology Director
Quinn Evans

Washington D.C.

AKA Doc Emmett Brown (Back to the Future)



Quinn Evans/Britney Young

Fotis Perizes

LEED AP BD+C

BIM Manager
CallisonRTKL

Chicago

Superpowers:

Flight and X-Ray Vision!





Class Description

Objectives

- **Communication**

  Develop effective communication protocols for diverse teams

- **Distribution**

  Implement a model splitting strategy with confidence

- **Options**

  Identify appropriate methods for various design option scopes and scenarios

- **Orientation**

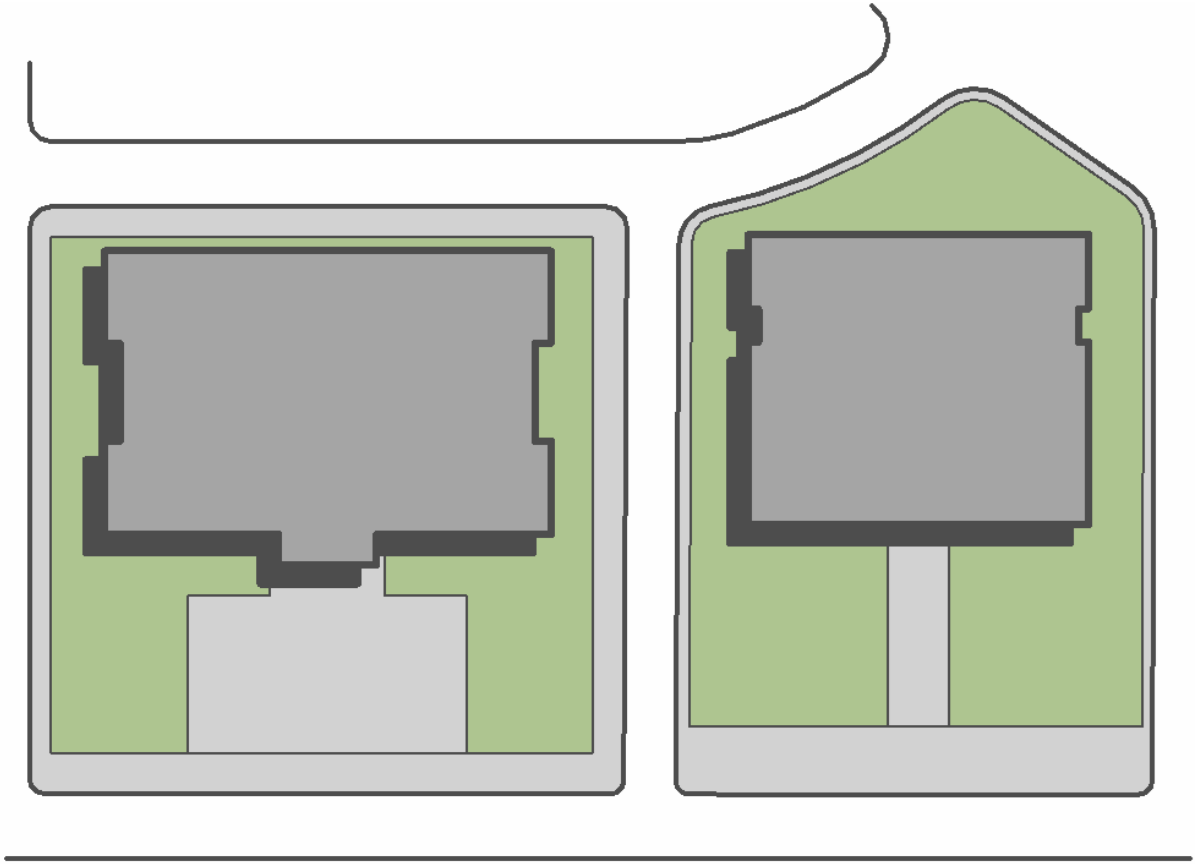
  Orient and align buildings and point clouds correctly

Agenda

- **Project Setup**
  - Dividing Models and Teams (Communication, Distribution)
  - Collaboration \ Communication Standards (Communication)
  - Point Clouds and Building Orientation (Orientation)
  - BIM 360 Model Coordination (Communication)
- **Alternate Design Options** (Options)
- **QA \ QC** (Communication)

Case Study

2	Large Historic Buildings Both with Major Additions
1	New Underground Parking Garage
1	New Connecting Tunnel
23	Design Consultants
200+	Person Design Team
40+	Revit Models
15+	GB Total Revit Models
4,295	Point Cloud Scans

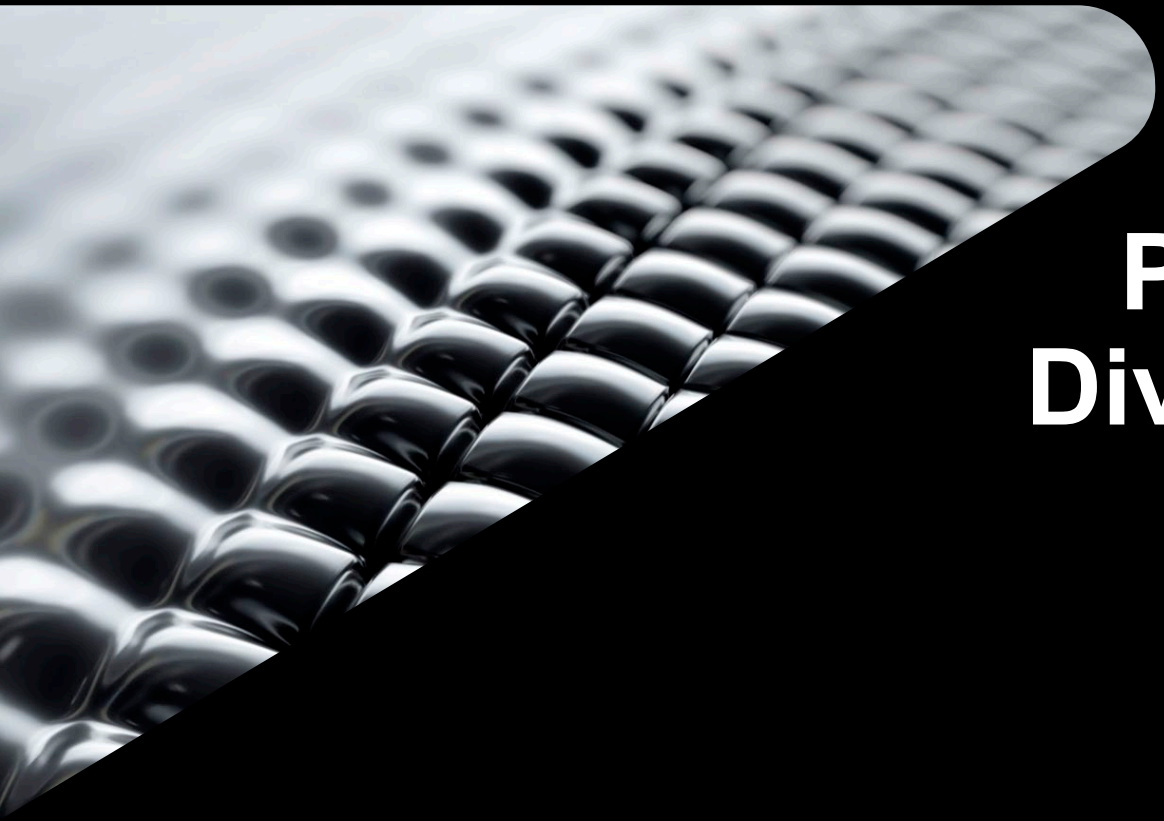


Best Practice Sources

- **BIM Team Experience**
- **Autodesk Help**

  Performance Optimization and Model Efficiency
- **Autodesk Knowledge Network**

  Recommended File Sizes

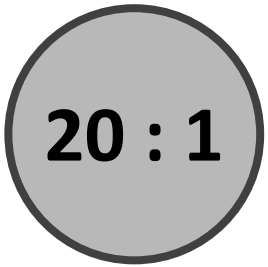


Project Setup: Dividing Models and Teams

Dividing Models and Teams

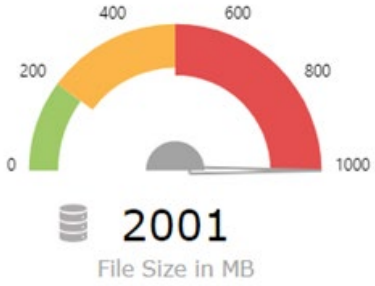
Best Practice

- **File Size**
  - No maximum unless non-workshared
  - Use a RAM to Project Size ratio of 20:1 plus factor in needs of OS and other open programs



Our Project (Worst Cases)

- **File Size**
  - Typical computer = 64 GB RAM
    Recommended max project size = < 3.2 GB
  - Largest model (no loaded links) = 2 GB
    Largest model (all links loaded) = 15 GB (needs 300+ GB RAM)

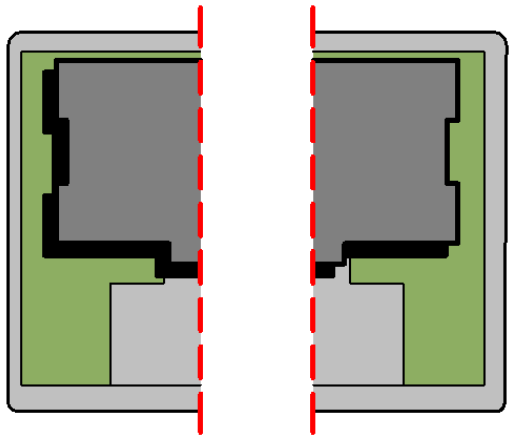


Dividing Models and Teams

Best Practice

- **Divide Large Models into Smaller Ones**

  Works best when the links are unloaded for a majority of the time



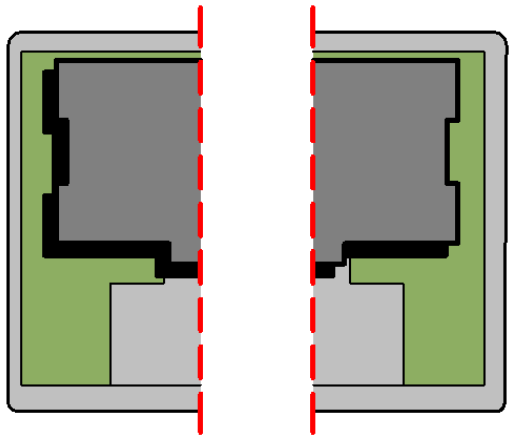
- **By Level**
- **In Plan (Match Lines or Expansion Joints)**
- **Existing vs Addition**
- **Team Member Scopes**
  - **Discipline**
  - **Specialty teams**
  - **Bid options**
- **Shell vs Core**

Dividing Models and Teams

Best Practice

- **Divide Large Models into Smaller Ones**

  Works best when the links are unloaded for a majority of the time



- **Downside of Dividing Model**

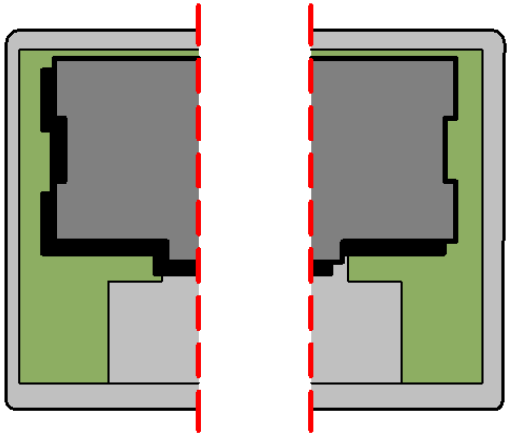
  Centralized Data Becomes Decentralized
  - Content
  - Parameter values
  - Standard detail views

Dividing Models and Teams

Best Practice

- **Divide Large Models into Smaller Ones**

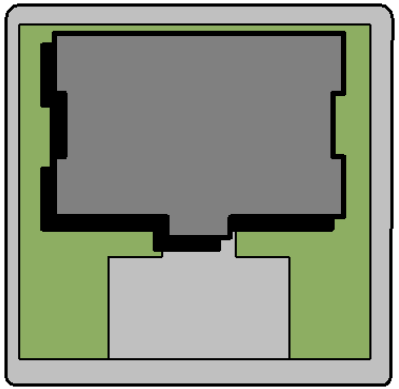
  Works best when the links are unloaded for a majority of the time



Our Project (Worst Cases)

- **Divide Large Models into Smaller Ones**

  No clear divisions of Architectural scope



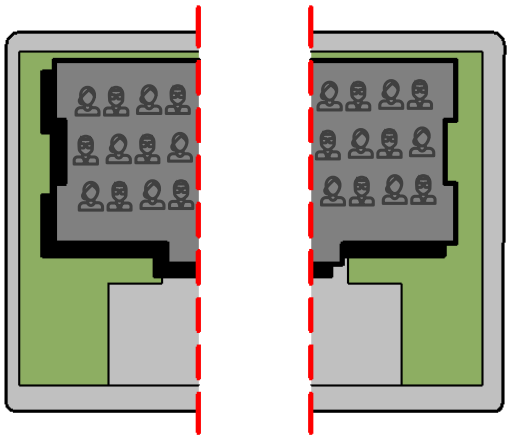
Dividing Models and Teams

Best Practice

- **Divide Large Models into Smaller Ones**

  Works best when the links are unloaded for a majority of the time

- **12 Max Concurrent Editors of a Single Model**

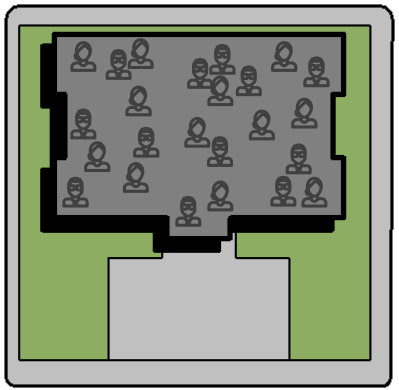


Our Project (Worst Cases)

- **Divide Large Models into Smaller Ones**

  No clear divisions of Architectural scope

- **20+ Max Concurrent Editors of a Single Model**



Dividing Models and Teams

Best Practice

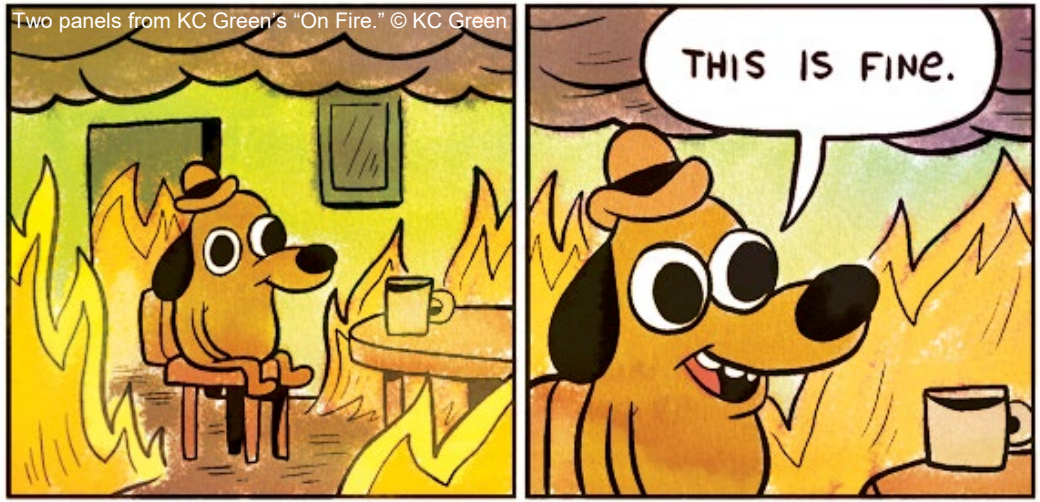
- **Each Link on its own Workset**

  Close worksets when not in use

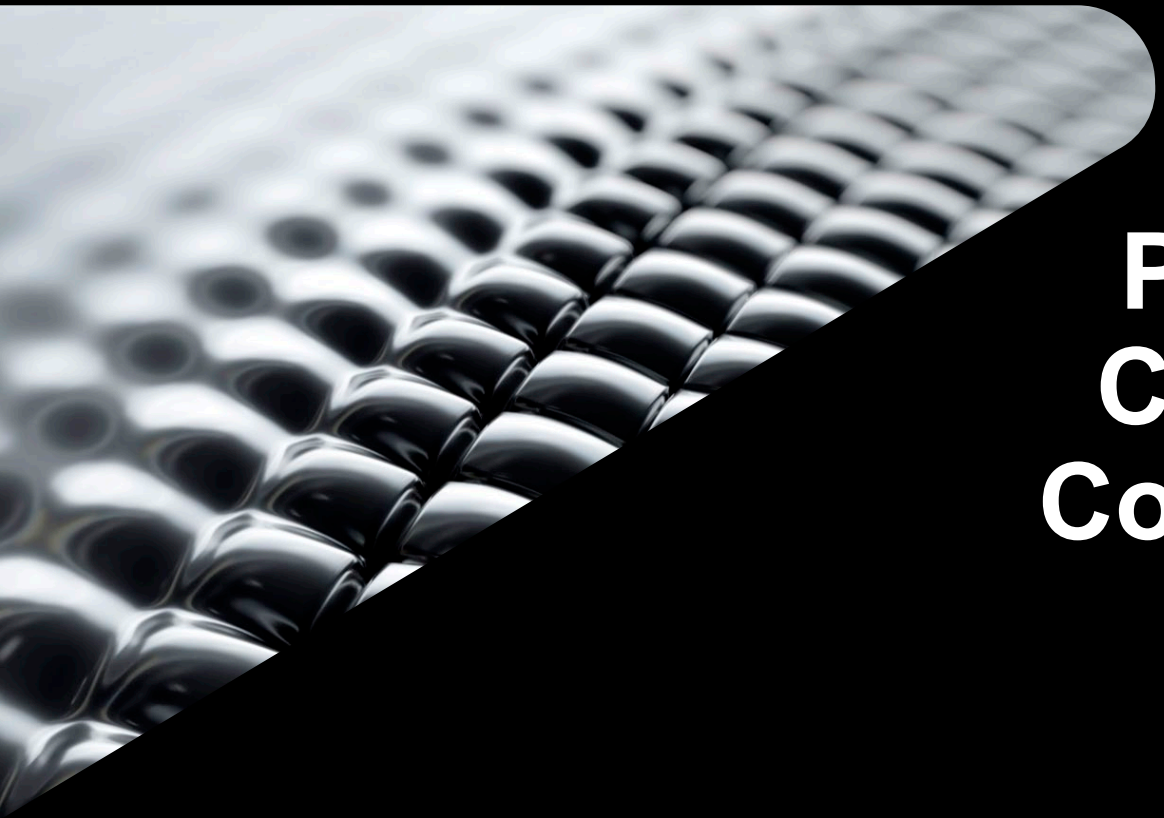
Our Project (Worst Cases)

- **Each Link on its own Workset**

  Work often done with clash context turned off



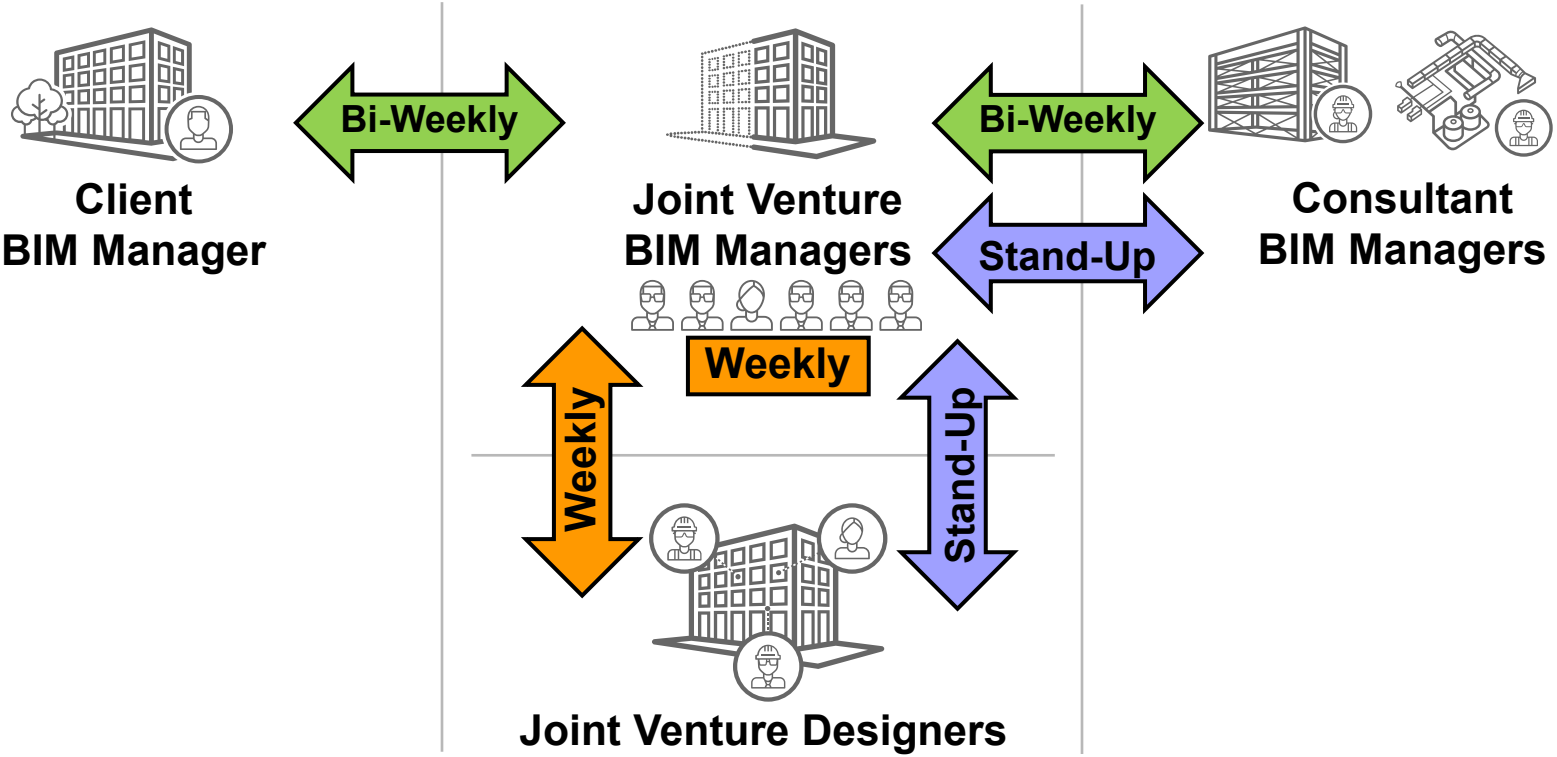
Two panels from KC Green's "On Fire." © KC Green



Project Setup: Collaboration \ Communication Standards

Collaboration \ Communication Standards

BIM Meetings



Collaboration \ Communication Standards

Tools

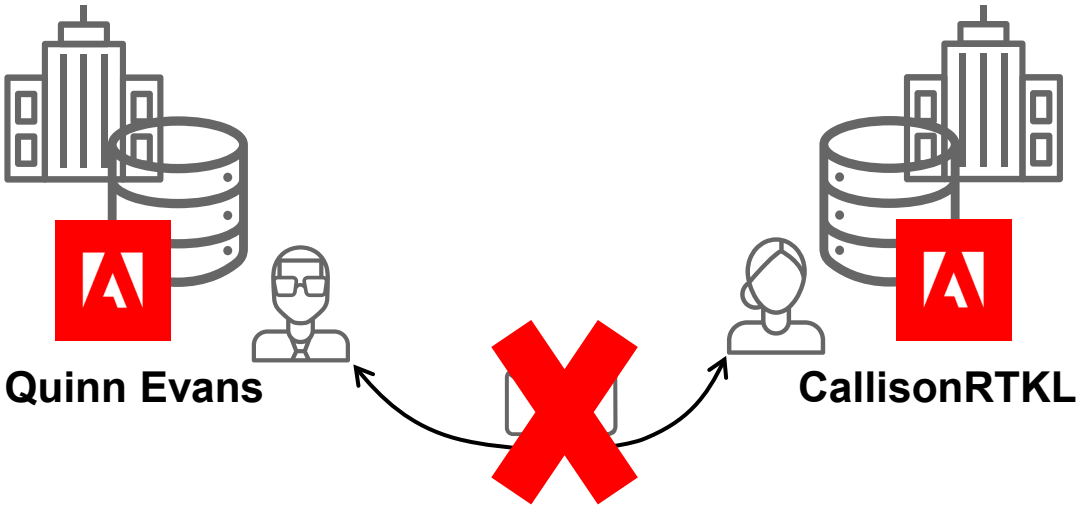
	WIP	Shared	Published	Archive
• **BIM 360**	RVT	RVT, Docs	RVT, Docs	
• **N2N**			Deliverables, Comments	Emails
• **MS Teams**	MS Office Docs, Planner, Chat			
• **Bluebeam Studio**	Sheet Set Review	Sheet Set		
• **Cintoo**			Point Clouds	
• **Keynote Manager**	Revit Keynote	Revit Keynote		
• **autoLink**		Standard Details		

Collaboration \ Communication Standards

Private Cloud Solution

- Adobe Resource Pathing

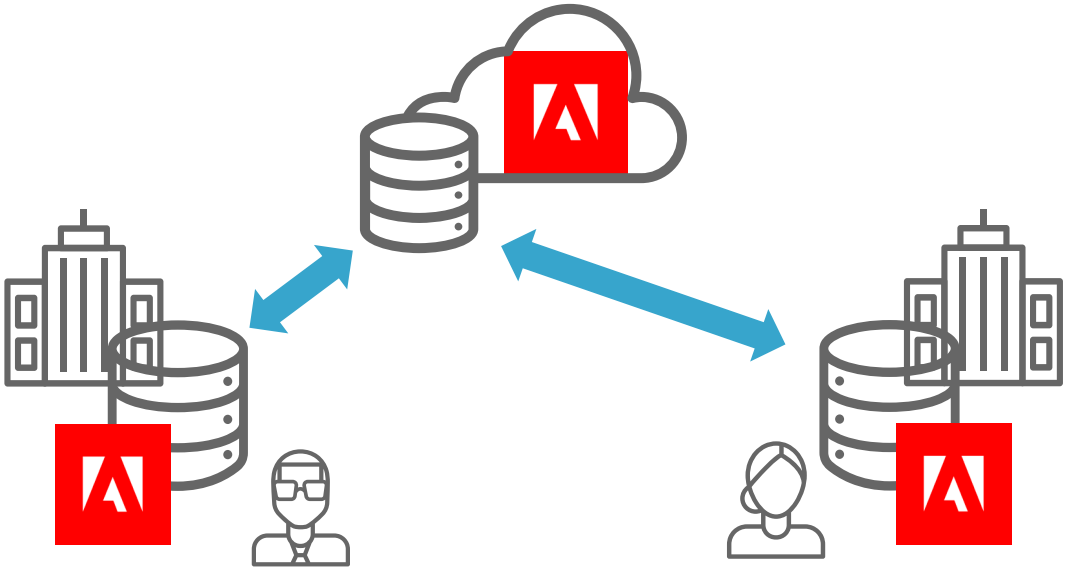
- Joint Venture

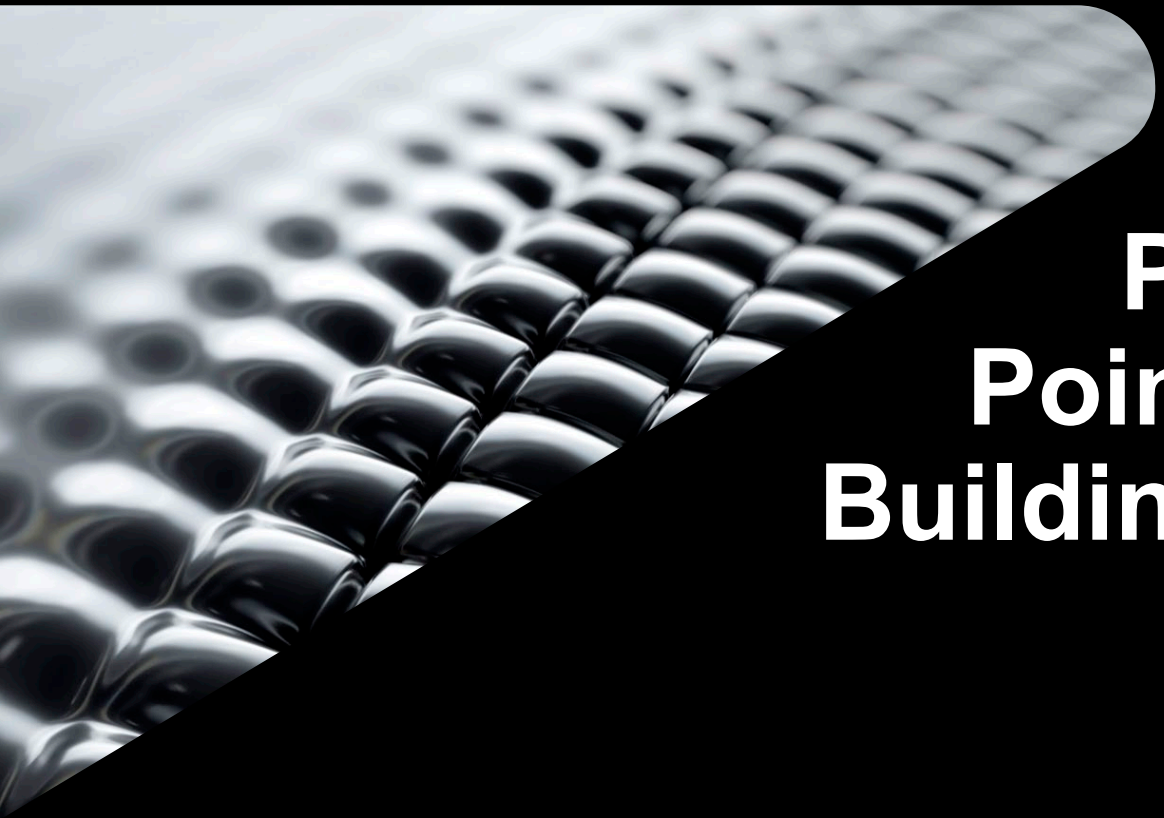


Collaboration \ Communication Standards

Private Cloud Solution

- Adobe Resource Pathing
- Joint Venture
- Lengthy setup time
- Security system incompatibilities





Project Setup: Point Clouds and Building Orientation

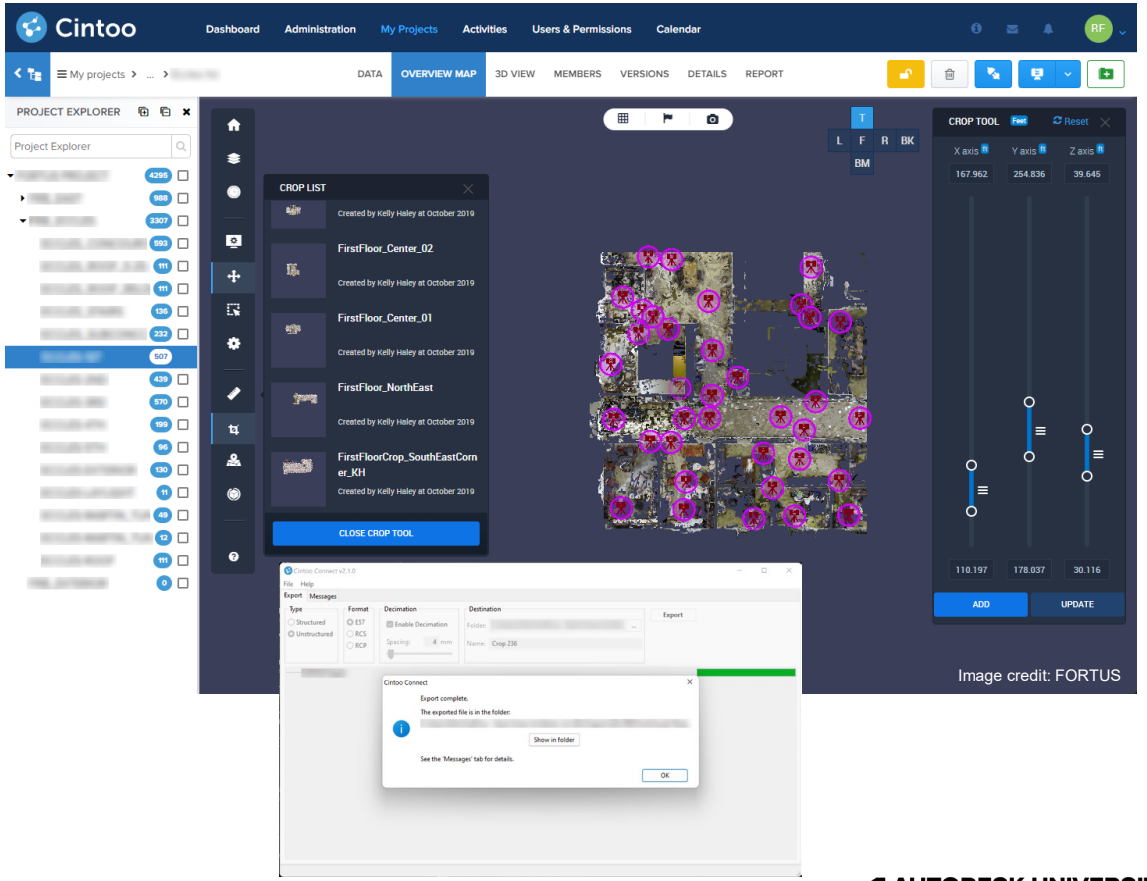
Sharing Point Clouds

Challenge

- How to most effectively share large data files among a large, geographically diverse team?

Lesson Learned

- A cloud-based point cloud hosting service provider allowed for all team members to view, crop, and download discreet portions of the point cloud from their own desktop.



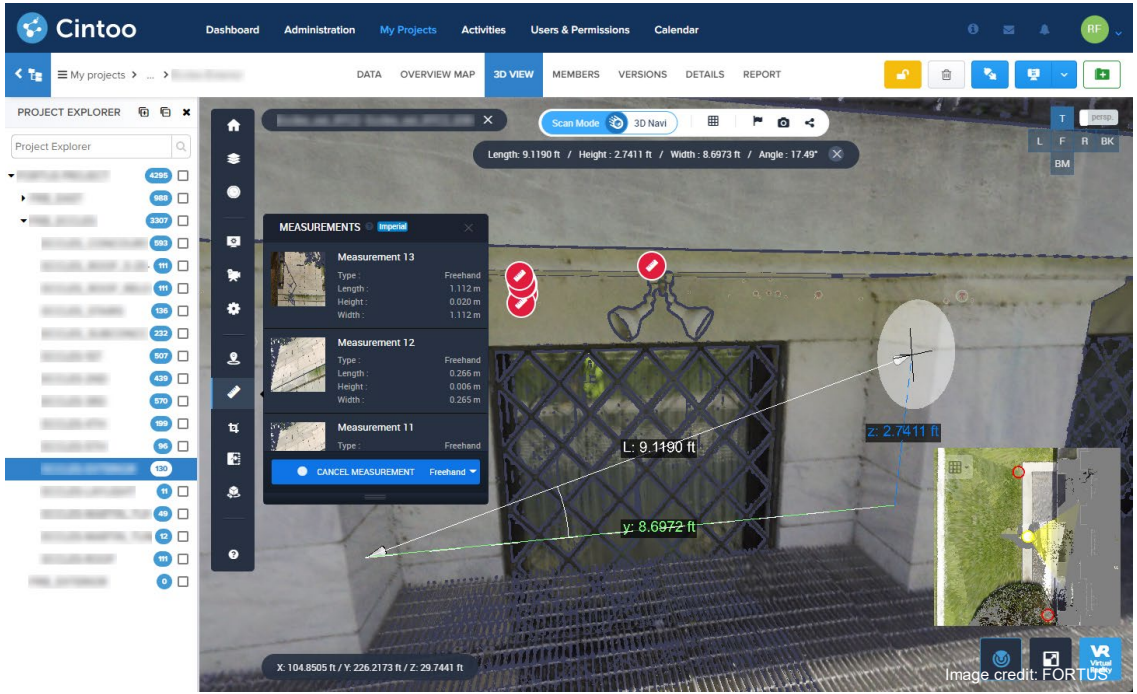
Sharing Point Clouds

Challenge

- How can the scan data be made accessible and useful for everyone on the team, not just BIM production staff?

Lesson Learned

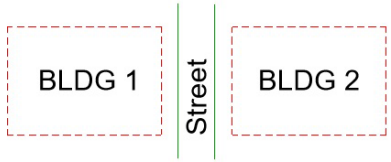
- Having the point cloud imagery available to everyone helped the entire team understand existing conditions and cut down on needed site visits.



Point Clouds and Building Orientation

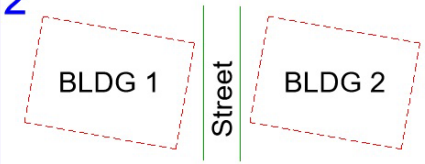
Entire Building is Slightly Off Axis

1



Building Orientation
Assumption

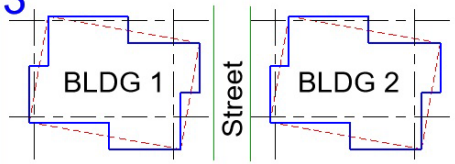
2



Building Orientation
Reality

Reflected in Civil
and Point Cloud

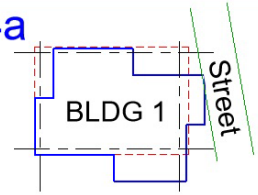
3



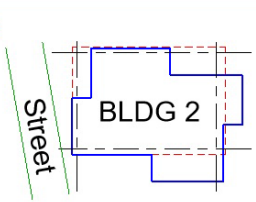
Result

Structural Grid revealed the issue as it remained aligned with the street

4a

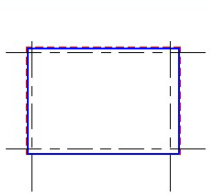


4b



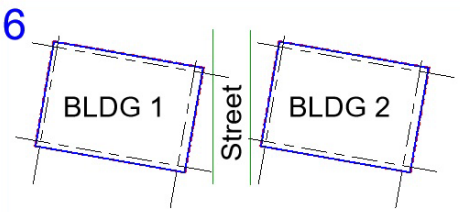
Rotate Civil and Point Cloud and then Re-Acquire Coordinates in Each Model.
Structural Grid is unchanged but rotated

5



Fix Skewed Elements in Each Model

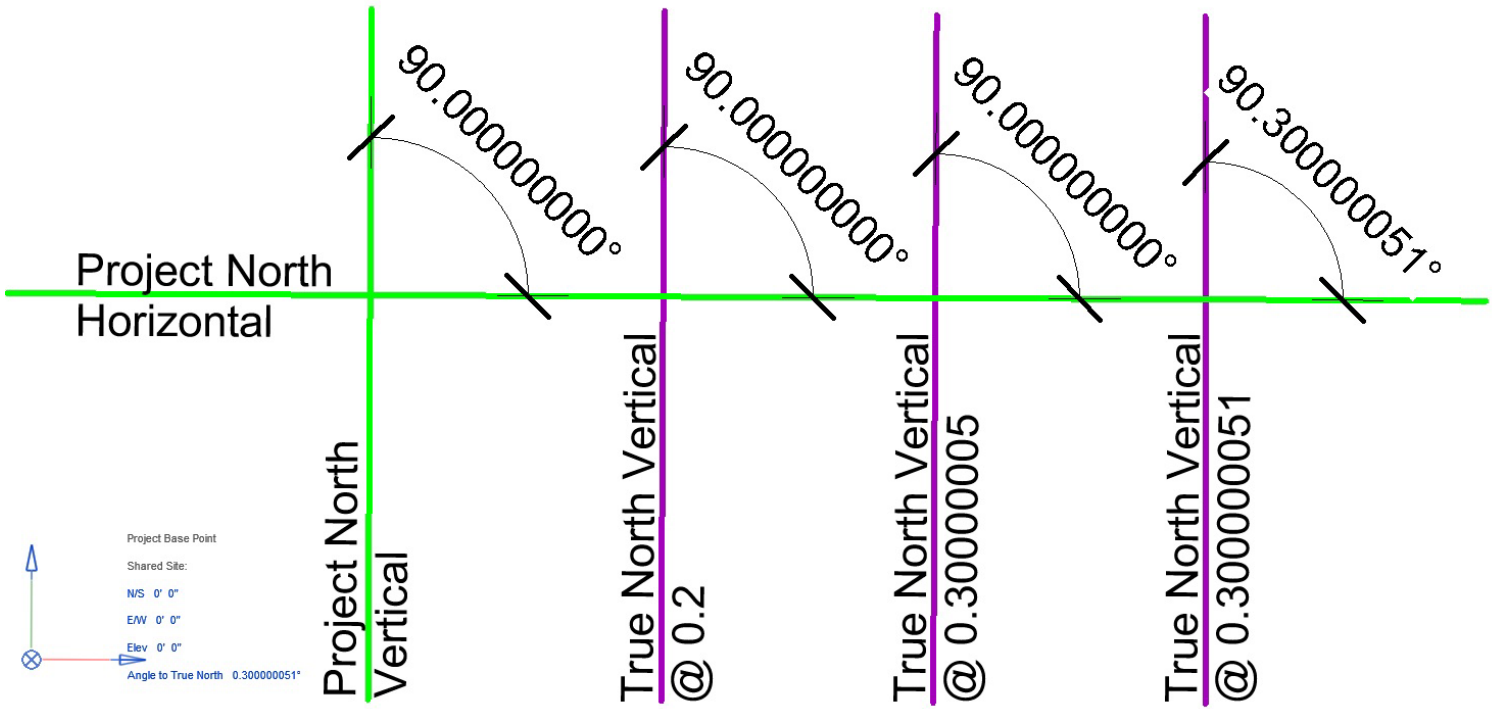
6



Link by Shared Coordinates result

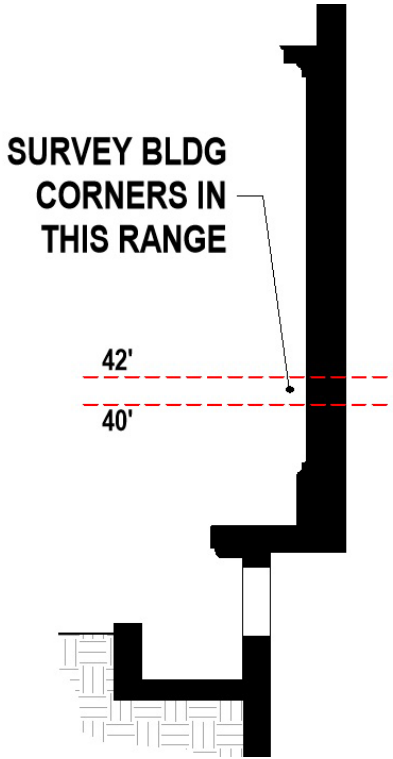
Point Clouds and Building Orientation

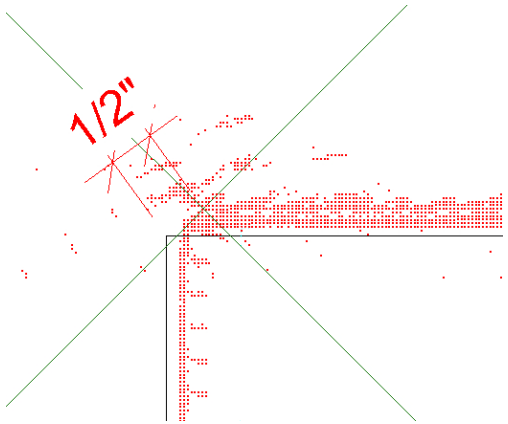
Revit 2020 and 2021 North Bug

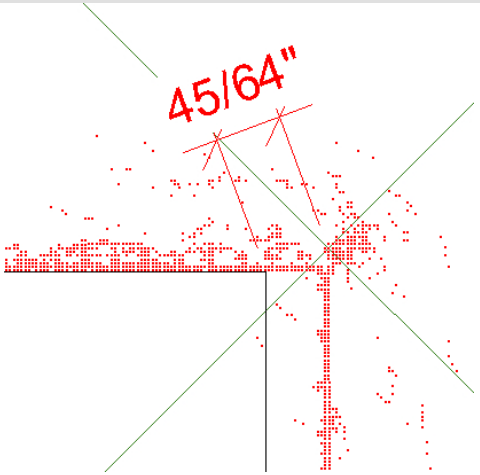


Point Clouds and Building Orientation

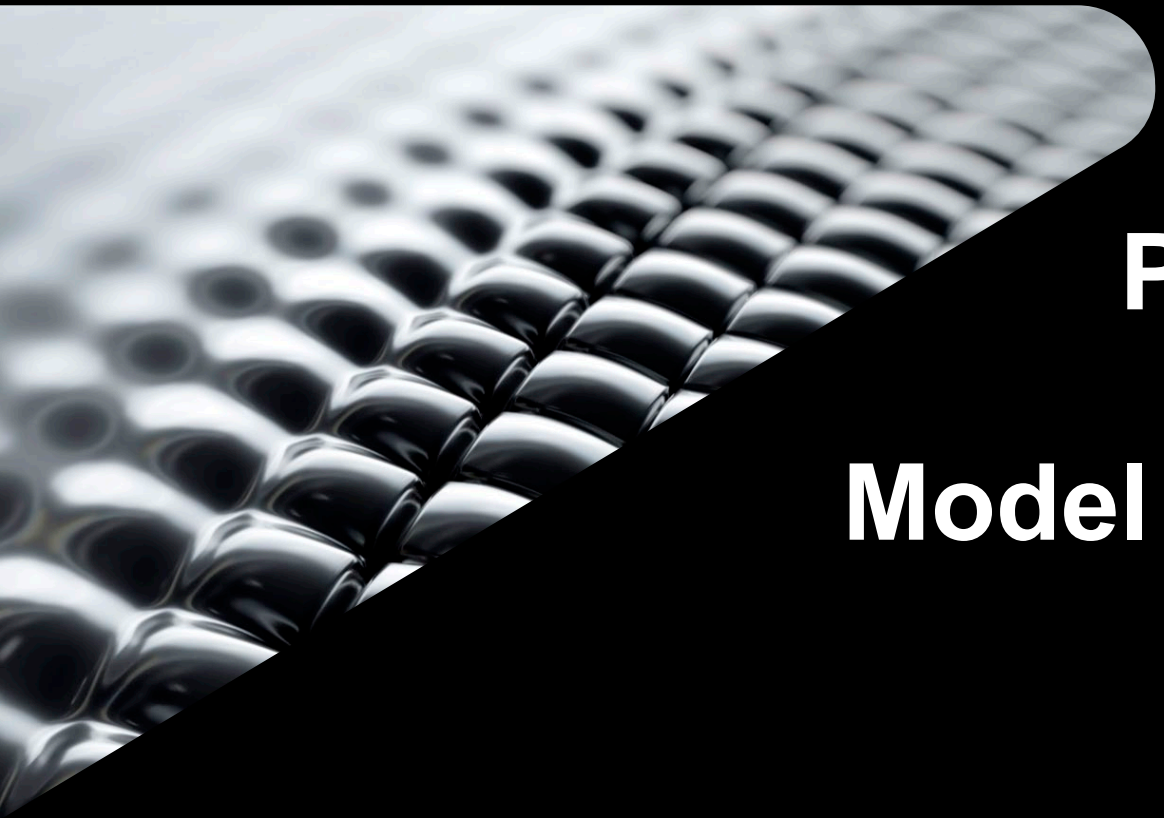
Visual Backcheck for Survey and Point Clouds







- Green X = New Building Corner Survey in Specified Elevation Range
- Red = Point Cloud Slice in Specified Elevation Range
- Black = Old Revit Building Corners to be Adjusted



Project Setup: BIM 360 Model Coordination

Clash Coordination Setup



Process

Define the working relationship between Revit, Navisworks and BIM 360 environments.



Protocol

Define the Hierarchy of Element Coordination

Clarify Project Specific Model Development



Schedule

“Assign-Review-Resolve”

Every team member’s participation is crucial



Insight

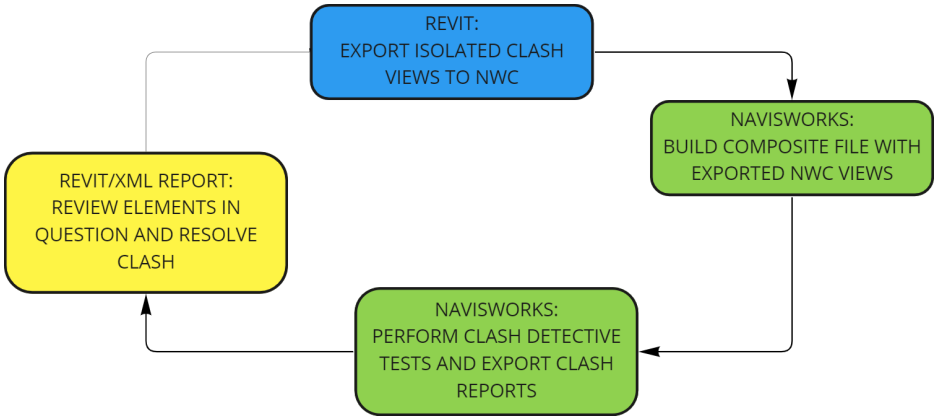
Lessons Learned

Process Assessment

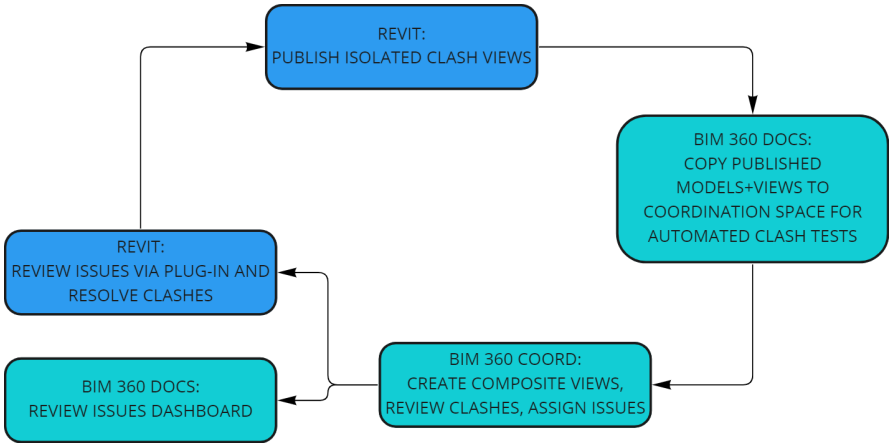
Do’s and Don'ts

Process

Traditional

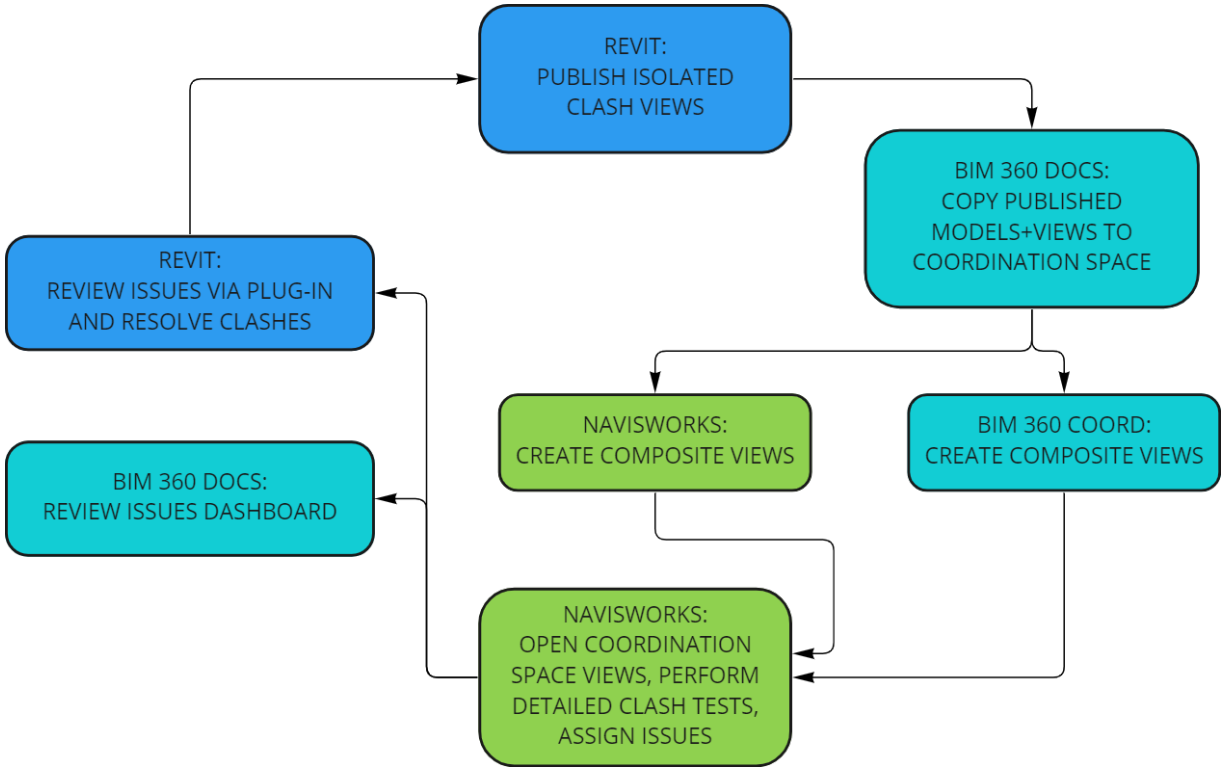


Cloud-based



Process

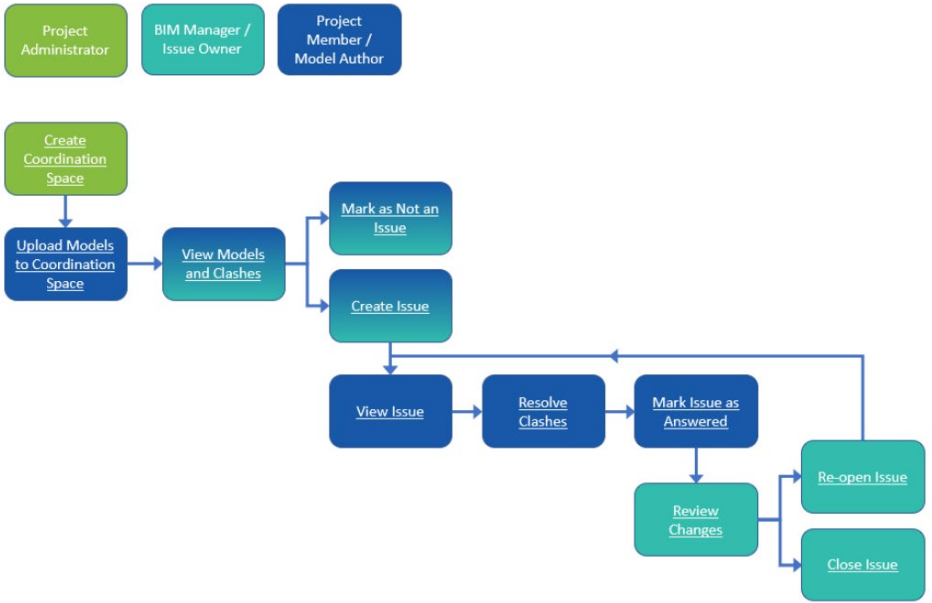
Integrated



Protocol

Documentation

- Hierarchy of Elements
- Model Development Clarifications
- BIM 360 Issues application
- Mitigate Expectation Bias



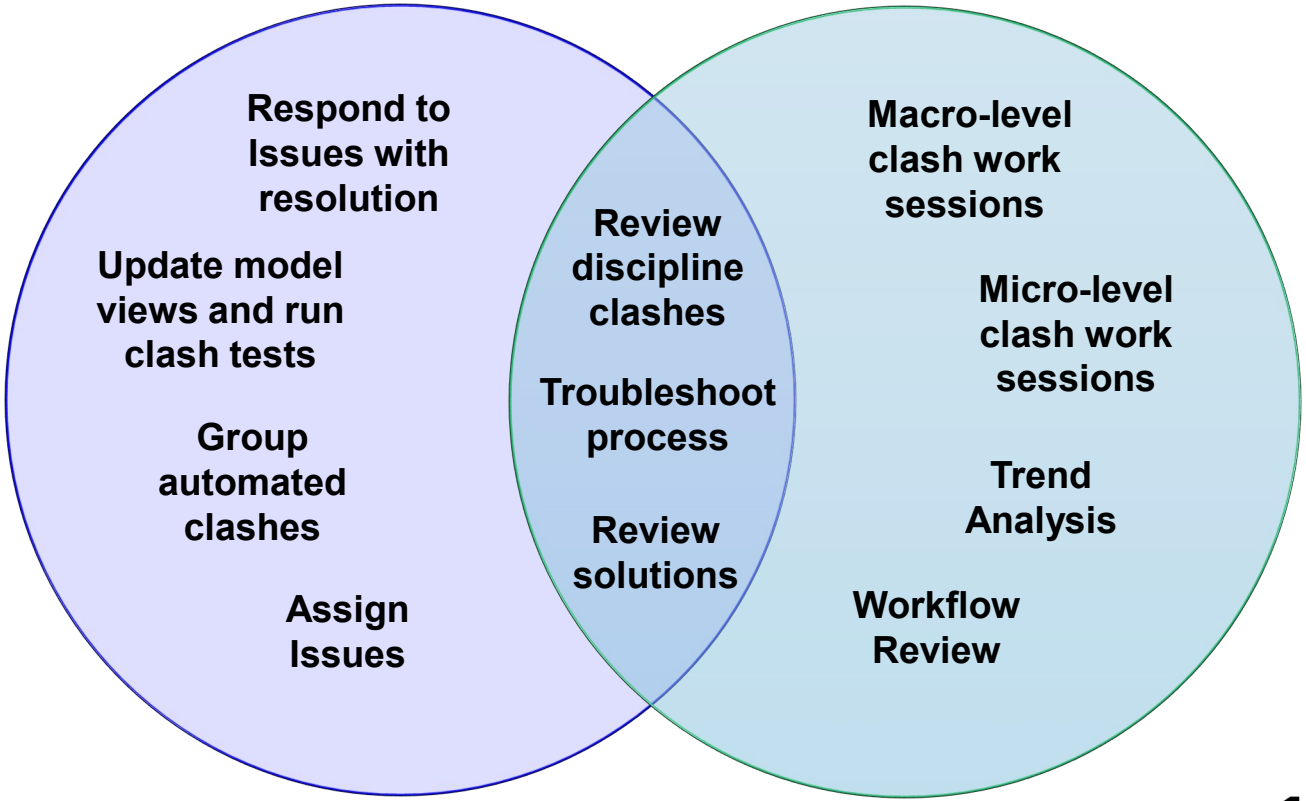
Autodesk Knowledge Network
https://help.autodesk.com/cloudhelp/ENU/BIM360D-Model-Coordination/images/model_coord_image_map.png

Schedule

Individual + Group Tasks



Individual Work





Group Sessions

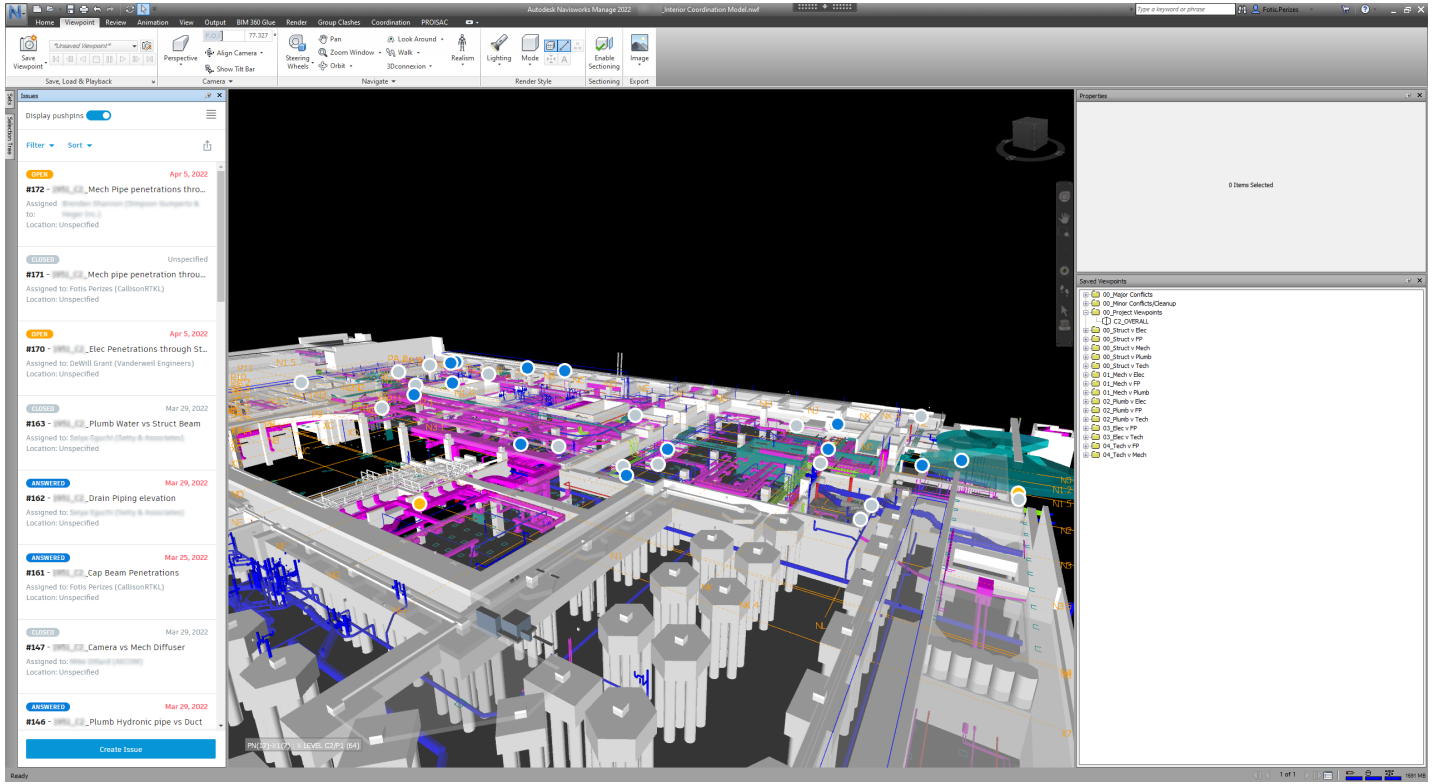
Issues

BIM 360



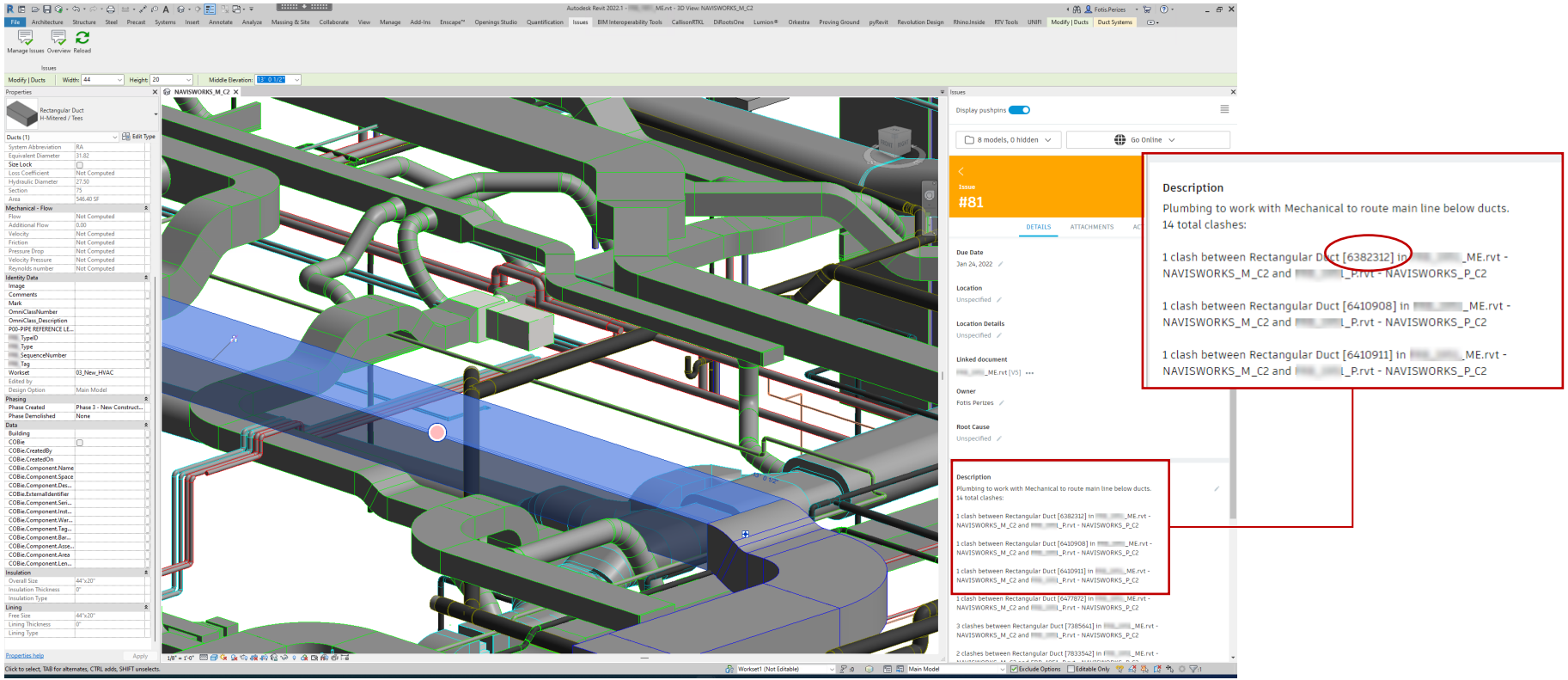
Issues

Navisworks



Issues

Revit



Insight

What we Learned

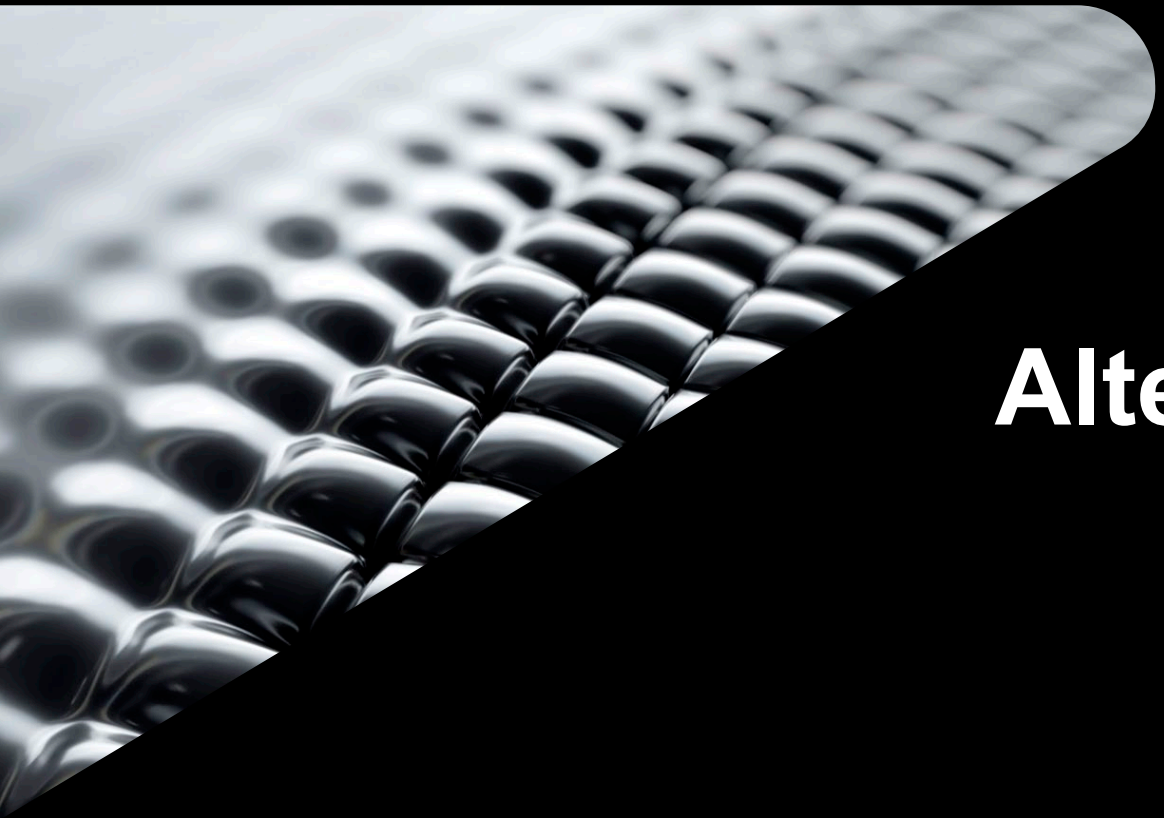
- Model Coordination module size limitations
- Cumulative model size per coordination space
- Web browser matters! Chrome vs Edge
- Macro to Micro Approach

Pros and Cons

- BIM 360 Model Coordination
  - ✓ Initial setup
  - ✗ Large, complex projects
- BIM 360 Issues Add-in
  - ✓ Tracking across platforms
  - ✓ High visibility and transparency
- Navisworks
  - ✓ Enhanced clash review tools
  - ✗ Complex setup

Do's and Don'ts

- **DO:** Distinguish between 'Not an Issue' vs actual 'Issue'
- **DO:** Assign Issues
- **DON'T:** Overload a coordination space (automated clash detection processing time)
- **DO:** Use Clash Groups in Navisworks



Alternate Design Options

Design Options

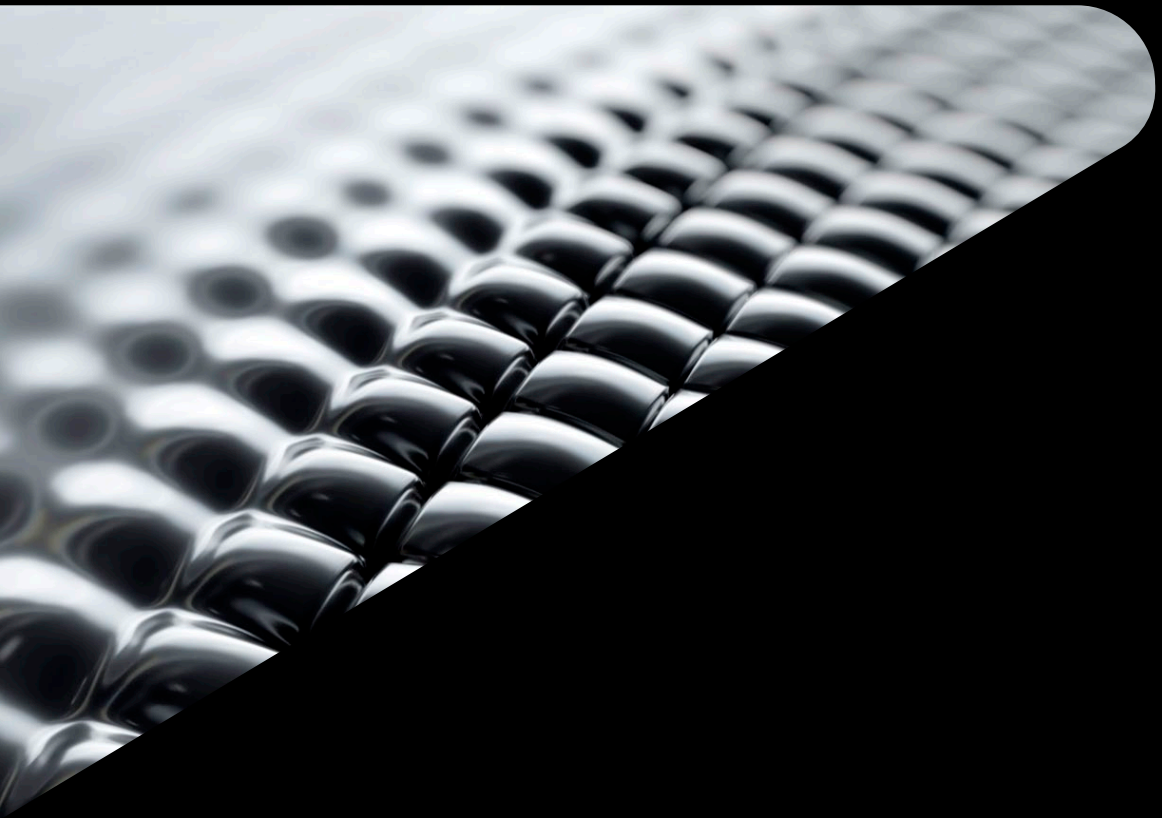
Challenge

- How do we manage the development of several design options?

Lessons Learned

- Resolve design options quickly.
- Have accountability for design options. Consider labeling them with date created and author.
- Sometimes a linked model is a better solution, but scope must be clearly separated.



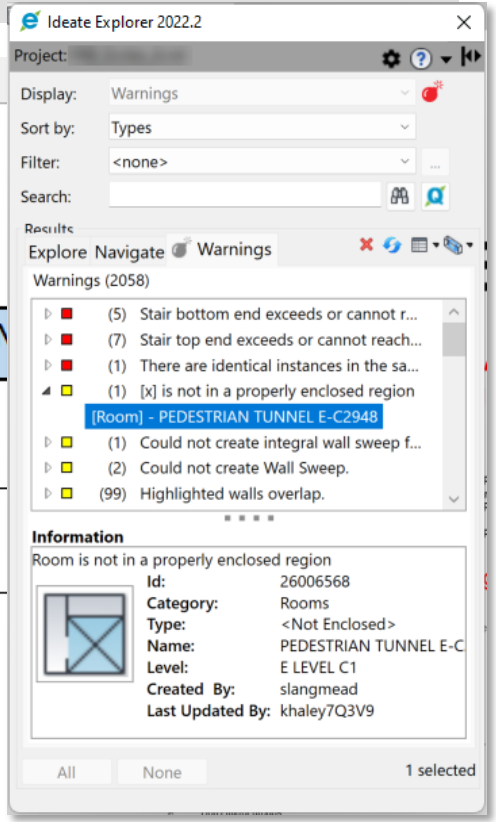


QA \ QC

QA \ QC

Single Model Tools

	A	B
1	Below are the compiled warnings from all models with an explanation of why they may exist within the models. Some warnings still need to be reviewed and/or corrected. The ones wothout an explanation are still under review. All the other tabs are the unique warnings that exist per model.	
2	**Warning**	**Explanation**
3	A Corner Mullion has been placed at the end of a Curtain Wall that is not joined to another Curtain Wall. The angle of the Corner Mullion will default to 90 degrees.	Intentional.
4	A wall and a room separation line overlap. One of them may be ignored when Revit finds room boundaries. Shorten or delete the room separation line to remove the overlap.	Existing conditions may require these conditions. Each should still be reviewed to ensure Rooms\Spaces are not affected.
	A wall and a room separation line overlap. One of them may be	Existing conditions may require these conditions.



QA \ QC

Model Checker Effort

40+



REVIT MODELS

Some over 1 GB

9



OPEN/CLOSE HOURS

One model at a time

24



HOURS TOTAL

Open, run checker, close (on BITs Desktop)

3



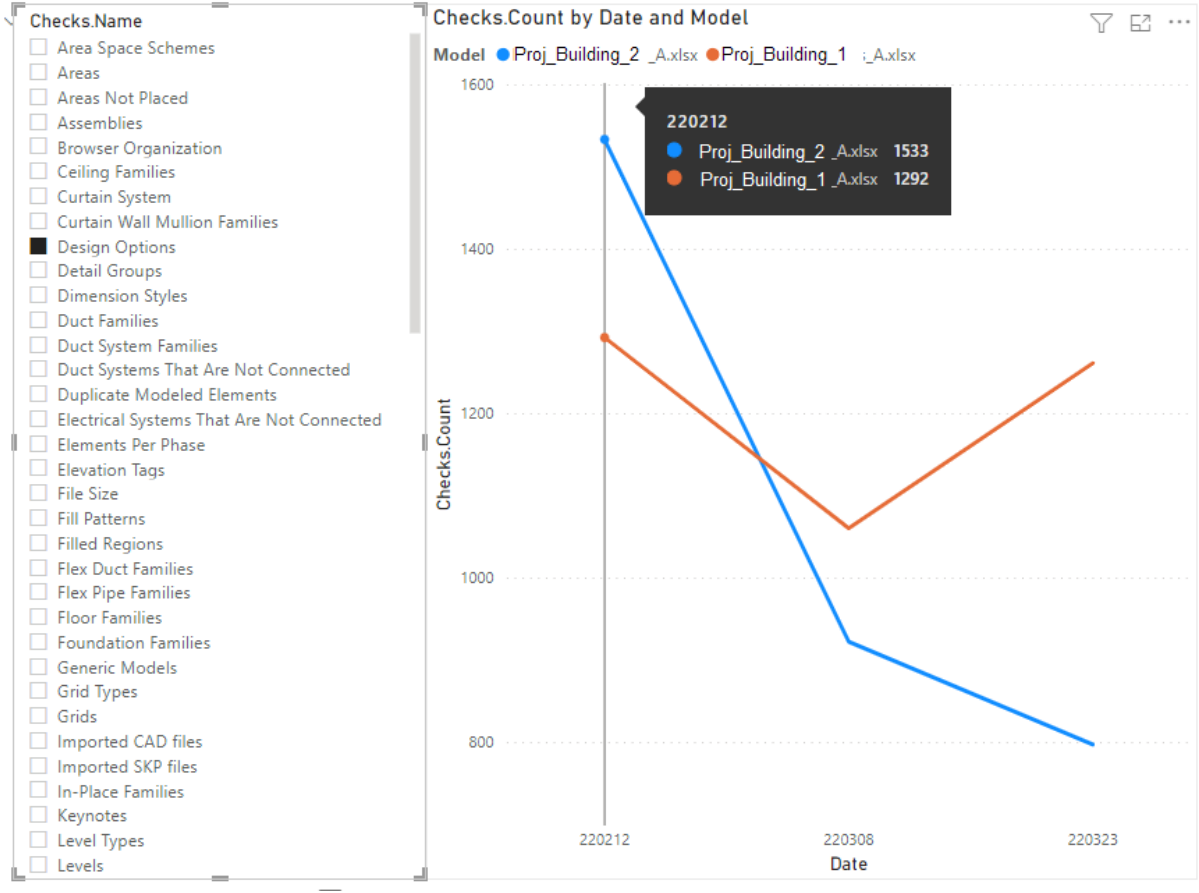
CLOUD HOURS

Look Ma! No Hands! Forge Model Checker

QA \ QC

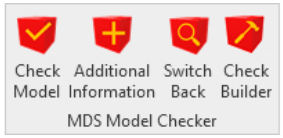
Model Checker Report

- Model Health
- Trend Comparison Across Models
- Peer-Pressure

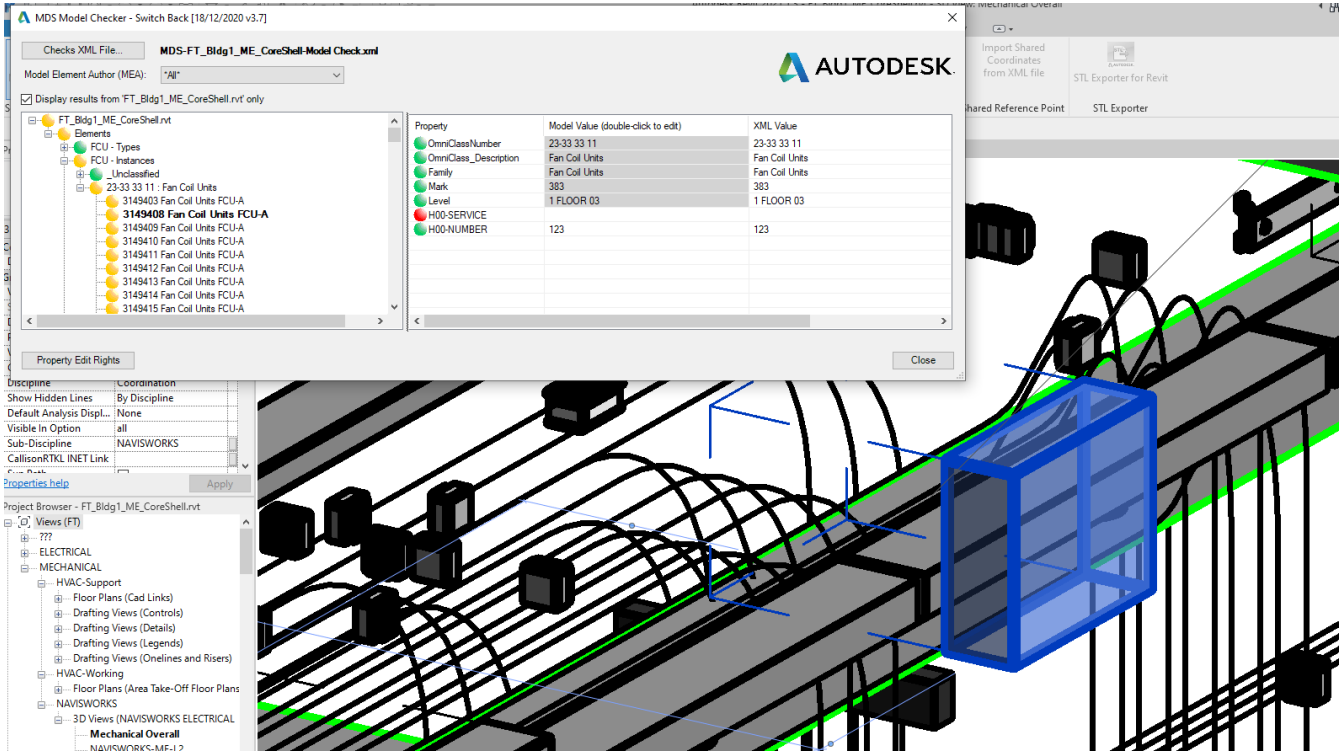


QA \ QC

Model Development Checker (MDC) Online



Contextual, Visual Feedback Loop





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