Clash Modeling Without Social Distancing

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About the speaker

Alan Flak, P.E. – Brighton, MI

Alan Flak is the Building Information Modeling (BIM) leader for Tetra Tech, a worldwide company of over 20,000 employees. He has over 20 years of experience in the architecture, engineering and construction world. He is responsible finding ways to improving BIM processes on projects from all phases of a project from studies through final design. He has years of experience with Revit, Navisworks, and BIM 360 Docs. He has worked on a variety of projects running clash detection reviews on water/waste-water treatment facilities, commercial buildings, and military facilities.
Uchenna T.E. Okoye, PE – Oakland, CA

Uchenna T.E. Okoye has over 15 years’ experience as a project manager, structural engineer, general contractor, and business consultant. His passion is to drive value by developing and aligning workflows to business strategy. He prides himself on driving true integration of people, processes, and technology using agile and outcome-based methodologies. His AEC background is primarily healthcare, large residential, and higher education utilizing Lean Principles and Integrated Project Delivery contracts. He serves as the Training and Professional Development Chair on the Autodesk Black Network ERG. He has served as the education and training chair of the Lean Construction Institute, Northern California Community of Practice.
Class Goal

- Best of both worlds
- Minimizes clashes over the life of a project

Why?

- Best of both worlds
- Minimizes clashes over the life of a project
Class Outline

AUTODESK® NAVISWORKS COORDINATION WORKFLOW FOR DESIGN PROJECTS
• Recognize and understand typical BIM coordination workflows using Navisworks Manage
• Recognize typical advantages and shortcomings of this workflow

AUTODESK® BIM 360 MODEL COORDINATION WORKFLOW FOR DESIGN PROJECTS
• Understand basic setup of the BIM 360 Model Coordination "Container File" workflow
• Recognize typical advantages and shortcoming of this workflow

COMBINED AUTODESK® NAVISWORKS & BIM 360 MODEL COORDINATION WORKFLOW FOR DESIGN
• Understand combined workflow
• Recognize advantages of combining workflow
• Understand best practice techniques to mitigate shortcomings of this workflow
Clash Detection -
Traditional Navisworks Workflow
Navisworks - Terms

- Search Set – A set of elements that is selected based on a set of predefined model parameters.
- Navisworks file types:
  - .NWC = Caching File (Bridge between Navisworks and original authoring program)
  - .NWF = Federated File (Links all of the .nwc files together)
  - .NWD = Documented File (Merges all .nwc files into one document)
Navisworks

Traditionally this has been the standard for clash detection

- Run before milestone submittals
- Designers had to react to these reports while incorporating other design comments
Navisworks Workflow

**STEP 1**
FILES IN NAVISWORKS
Make sure files are aligned properly.

**STEP 2**
SET UP CLASH TESTS
Make sure all elements to be clashed are included in clash tests.

**STEP 3**
SORT RESULTS
Group clashes and remove incidental clashes.

**STEP 4**
DISTRIBUTE RESULTS
Send reports, have meeting and design team resolves issues.
Navisworks – What Works

- Accepts Numerous 3D Model File Types
- Navisworks has compact file sizes
- Model Manipulation:
  - Model Coordinate and Orientation Transformations
  - Vertical, Horizontal, and Cube Sectioning
  - Per Model and Per Element Visibility Graphics Adjustments
- Control of what items are being clashed between models
- Clashing Tolerance Adjustments/Settings
- Creating clash reports:
  - Saving and Creating Clashing Views
  - Connectivity to BIM 360 via BIM 360 Coordinate Plug-in
Navisworks – Pain Points

• Model Visualization is cumbersome, hard to get model context with report views
• Creating and saving clashing viewpoints can be time consuming
• Minimal automation in terms of grouping clashes by element ID or type category
• Minimal integration with BIM 360 reporting / updating status
Navisworks – Lessons

• Create search sets and predefined clash tests
• Be aware of authoring model (i.e. Revit) governance. Copy and pasting elements may result in single element IDs for multiple elements making tracking difficult
• Make sure to export views from Revit with all items to clash turned on
• Make sure items to be clashed are turned on in Navisworks when running clash detection
• Combine clashes into groups
• Even if the initial file created is a .NWF files with associated .NWC files, make sure to save a “line-in-the-sand” .NWD after completion of passes
• . NWD files and associated saved viewpoints can also be viewed in BIM 360 Docs native 3D viewer
BIM 360 Model Coordination Workflow

Container File Method:

Ability to manage Model Coordination views from multiple Work-in-Progress (WIP) Revit files without changing the authoring model settings or file locations.

**STEP 1**

SETUP COORDINATION SPACE

Set the parameters of BIM 360 Model Coordination and activate the coordination space.

**STEP 2**

SETUP REVIT CONTAINER FILE

Setup a single Revit file that contains a link to the (WIP) 3D BIM files from each discipline already saved in BIM 360 Docs (Revit Cloud Model or Revit Cloud Workshare Model).

**STEP 3**

SETUP CLASHING VIEWS

Create specific 3D views for each discipline and set visibility graphics parameters to delineate clashing models and clashing areas/levels.

**STEP 4**

REVIEW AND RESOLVE CLASHES

Resolve clashes using the BIM 360 Model Coordination module. Clashes can either be categorized as Active, Assigned (BIM 360 Issue), or Closed (Not an Issue).
BIM 360 Overview

BIM 360 is an online & mobile enterprise software solution for managing all your project data in a single common data environment.
STEP 1
SETUP COORDINATION SPACE

First your BIM 360 Project Admin must set up the coordination space using the following steps:

1. Navigate to BIM 360 Project Admin module
2. Select “Services”
3. Select “Model Coordination”
4. Select “Create”
5. Name Coordination Space
6. Assign BIM 360 Docs coordination space file location
7. Select Create

TIP: Select a coordination folder where the BIM/Coordination manager will have View+Download+Upload+Edit access
STEP 2
SETUP REVIT CONTAINER FILE

The next step is to create a “Revit Cloud” or “Revit Cloud Workshare” model in the Model Coordination folder in BIM 360 Docs and add the links to the discipline WIP Revit files already saved in BIM 360 Docs.

Create and Save Revit Cloud Workshare File

1. Create a Revit v2019 or later file (other discipline Revit files must match Revit version)
2. Sign into BIM 360
3. Create New file, name, and save locally to your computer
4. Select “Collaborate” Ribbon and “Collaborate” button
5. Save in “BIM 360 Document Management”
6. Select “OK”
7. Navigate to BIM 360 Account
8. Navigate to BIM 360 Project and to Coordination Space Folder
9. Select “Initiate”

TIP: Make sure you have appropriate “Revit Cloud Model” and “Revit Cloud Workshare” entitlements – see your Autodesk Software Coordinator or admin.
STEP 2
SETUP REVIT CONTAINER FILE

Continued

Linking WIP files from BIM 360 Docs
1. Select “Manage” Ribbon
2. Select “Manage Links”
3. Select 3D File Type in Upper Tab and Select “Add”
4. Use “External…” navigation button
5. Navigate to BIM 360 Account and Project
6. Navigate to folder where discipline WIP 3D BIM file is located
7. After all discipline files are loaded select “OK”

TIP: When disciplines make updated to WIP models you must come to container file and “Reload Latest” linked Revit files and publish to update clashes
STEP 3
SETUP CLASHING VIEWS

The next step is setting up the 3D views of each discipline model that will be used to clash using the BIM 360 Model Coordination clash engine.

1. Select “View” Ribbon and Select “3D View”
2. Create a 3D view for each discipline coordination model
3. Set Visibility Graphics to show only that discipline Revit file on a 3D view
4. Set Worksets to show which you want to view and clash
5. Set other visibility settings
6. Set Scope box or section box settings as well
7. Publish 3D views to BIM 360 using “Collaborate” Ribbon and “Publish Settings” and “Mange Cloud Models”

TIP: Only elements explicitly shown in each view will be clashed in the BIM 360 Model Coordination engine
STEP 4
REVIEW AND RESOLVE CLASHES

The next step is setting up the 3D views of each discipline model that will be used to clash using the BIM 360 Model Coordination clash engine.

Review Clashes
1. Navigate to the BIM 360 “Model Coordination” module
2. Select “Clashes”
3. Select “Active”
4. Select box/number to view active clashes. Main model is row. Clashing model is column
5. Review each clash in clashing model views
6. Mark active clashes as either “Issue” or “Not an Issue”
STEP 4
REVIEW AND RESOLVE CLASHES

Continued

Resolve Clashes

1. Select “Assigned” in Model Coordination Clashes screen
2. Select clashes that were marked “Issues”
3. Review and resolve Issues using the typical BIM 360 Issues process
4. Select “Closed” in Model Coordination Clashes screen to review items that were marked “Not an Issue”
5. Repeat this process after every model update and BIM 360 model publishing
Model Coordination – What Works

• **Everyone has access (even non-Revit users)**
  o No Need for Standalone Desktop Software
  o Ability to adjust user-model access permissions

• **Easy to set up**

• **Easy to view/understand clashes:**
  o Easy to view the clash in the context of the model
  o Auto create 3D Views for clashes with full model and X-ray setting
  o Quick Access Matrix View of all clashes
  o Ability to create specific model views

• **Easy to update**
  o Clash detection runs automatically after model updates
  o Automated clash auditing and history

• **Complete integration between clash resolution and BIM 360 Issues**

• **Although it does not automatically track the number of clashes over time, this can be manually tracked to get a better understanding of how the job has progressed over time.**
Model Coordination – Pain Points

• **Minimal control over what objects should be checked for clashes:**
  o i.e., 3D Model visualization determines clashing parameters (hidden elements)
  o No control over clash tolerance
  o Minimally customizable clashing engine

• **Can be cumbersome working with clashes:**
  o Need to reload/update latest, then publish from Revit to realize clashing changes based on model updates
  o No ability to transform models in lieu of adjusting in authoring software
  o Takes some time to sort through and remove unnecessary clashes (although faster than Navisworks)
  o Can be tricky to navigate to find the best view of a clash

• **No one-click trackable reporting features**

• **No printable reports**
Model Coordination – Lessons

- Set up a Revit template file that has been vetted to use on all Model Coordination instances in projects to minimize setup processes
  - Set appropriate 3D view visualization graphics since it determines clashing elements
  - Be aware of Workset settings affecting visibility which influences clashing elements
  - Be aware of nomenclature for both Revit Model and 3D View names (succinct and transparent)
- Link associated models using Revit Cloud linking and not Desktop Connector
- View the Model Coordination using Google Chrome or Firefox.
- Clean up the number of irrelevant clashes before letting people know to look at the site.
- Make sure to set permissions for appropriate access to BIM 360 Docs Folders, Issues, and Model Coordination module for all users
- The model does not automatically update. The model needs to be opened, saved, and published before any model updates will show up on BIM 360.
Clash Prevention -

BIM 360 Model Coordination
& Navisworks Workflow
Model Coordination & Navisworks Workflow

1. START OF THE PROJECT
   • Set up Model Coordination once all models are started on BIM 360.
   • Allow models to develop before sharing with project team.

2. CONTINUOUS
   • Show project team how to access and use Model Coordination.
   • Update Model Coordination at regular intervals.

3. MILESTONES
   • Run Navisworks clash report.
   • Have a meeting to discuss results.
Using Navisworks MC Plug-In

Ability to run more sophisticated clash detection (proximity detection) while still being able to use the BIM 360 Model Coordination views and Issues already created

**STEP 1**

OPEN NAVISWORKS

Open Navisworks Manage 2021 or later

**STEP 2**

OPEN COORDINATION SPACE

Using the BIM 360 Model Coordination Plug-In, open the coordination space and select models

**STEP 3**

RUN NAVISWORKS CLASH

Run Navisworks based clashes with proximity clashes and save additional viewpoints

**STEP 4**

REVIEW AND RESOLVE CLASHES

View and resolve BIM 360 Model Coordination clashes by resolving BIM 360 issues and also resolve Navisworks clashes via viewpoints method
STEP 1
OPEN NAVISWORKS

First open a new Navisworks Manage 2021 or later session
STEP 2
OPEN COORDINATION SPACE

Take these steps to open the BIM 360 Model Coordination space being used to coordinate WIP Revit models

1. Select BIM 360 Coordination ribbon
2. Select “Coordination Space”
3. Select BIM 360 Account
4. Select BIM 360 Project
5. Select Model Coordination Space
6. Select Models to append to Navisworks for clash detection
STEP 3
RUN NAVISWORKS CLASH

From here you have the opportunity to run your robust Navisworks clash engine to pick up things like proximity clashes.

You may also create viewpoint here and follow the typical Navisworks clash detection workflow.
STEP 4
REVIEW AND RESOLVE CLASHES

Review and resolve clashes from BIM 360 Model Coordination space first by:
1. Selecting BIM 360 Coordination Ribbon
2. Selecting Issues
3. Resolving BIM 360 Issues from the Navisworks window
4. Then review and resolve Navisworks clashes via the typical saved viewpoint workflow
5. Save as a NWF file back to BIM 360 using the Autodesk Desktop Connector to clash and resolve future coordination file updates in Navisworks
Model Coordination & Navisworks

• Democratization of clashes process in between submittals
• Using BIM Model Coordination throughout design will limit the number of clashes at milestone submittals reducing time working in Navisworks.
• Although it does not automatically track the number of clashes over time, this can be manually tracked to get a better understanding of how the job has progressed over time. (good for PMs)
• Printable Report for milestones
Class Summary

AUTODESK® NAVISWORKS COORDINATION WORKFLOW FOR DESIGN PROJECTS
• Great for detailed clash detection reports
• Best used at milestone submittals

AUTODESK® BIM 360 MODEL COORDINATION WORKFLOW FOR DESIGN PROJECTS
• Easy to setup and access for everyone
• Easy to maintain throughout the life of a project

COMBINED AUTODESK® NAVISWORKS & BIM 360 MODEL COORDINATION WORKFLOW FOR DESIGN PROJECTS
• Best of both worlds
• Minimizes clashes over the life of a project
Model Coordination & Navisworks

Graph showing the comparison between a Typical Project and Using Navisworks and MC over time in terms of clashes.