BIMWERX

REVIT COORDINATION WORKFLOW

BY: CHRIS VORSTER
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GOAL

➤ Understand the various workflows of change management

➤ Create a base coordination model

➤ Create additional models from the base model

➤ Manage changes from one model to the other (incremental, minor checks)

➤ Perform an overall model comparison between 2 models (milestones, major checks)

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THE COLLABORATIVE NET CAD SOFTWARE ALLOWED TEAM MEMBERS TO GRAY OUT UNWANTED ELEMENTS

UNDERSTAND THE VARIOUS WORKFLOWS OF CHANGE MANAGEMENT

The role of the "change author" is dynamic and will be determined by the downstream affects of the proposed change.

When an Architect moves a column, the Engineer has to be informed, and the Engineer will ultimately "Approve" or "Reject" the change. On the other hand, when the Architect changes the position of a door or an opening, it might not concern the Engineer, and so the Architect assumes the role of "change proposer" as well as "change author". In the latter example, there might be different levels / departments within the same discipline assuming the "change proposer" and "change author" roles.

Should an Engineer propose to eliminate, move or add structural components or openings, then the Architect will most probably become the "change author", as these changes might impact the aesthetic design of the Architect.
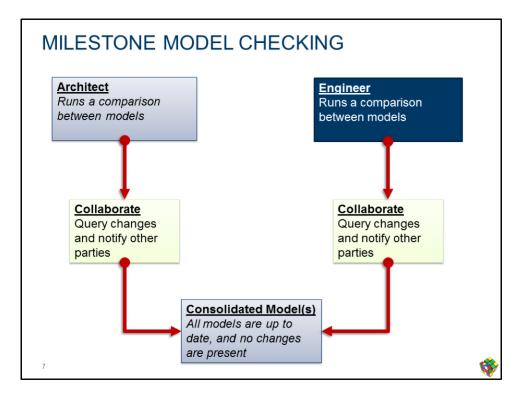
It is clear that the role of "change proposer" and "change author" is a dynamic role that is assumed by whoever is ultimately proposing the change, and who is responsible for validating these changes. Both these roles can be assumed by the same entity (person, company or discipline), or might require communication and a planned coordination process between various entities.

This is an example of an "incremental and minor" coordination exercise.
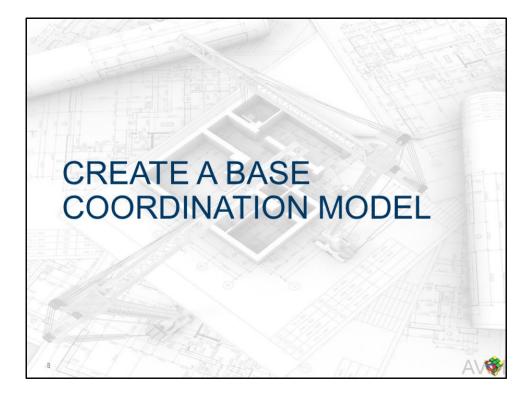
In this example, multiple changes are being proposed to the Architect by the Engineer. The Architect Approves certain changes / additions, but Rejects others. The information or "Status Change" is then communicated back to the Engineer.
Both models are updated partially, but awaits a final decision on the "Rejected" or "Pending" elements.
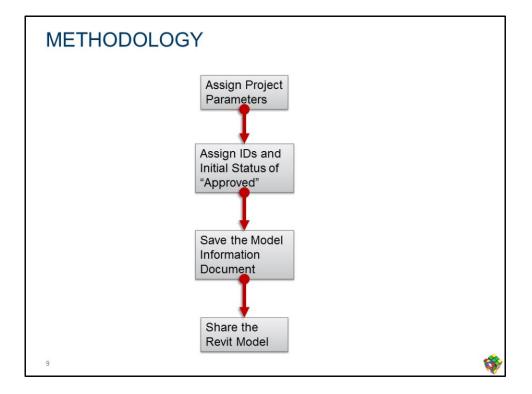
This is another example of an "incremental and minor" coordination exercise.
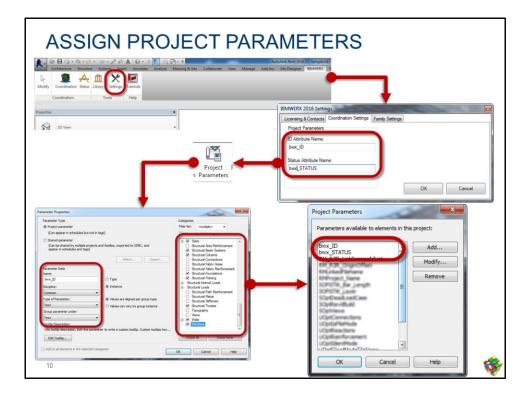
MILESTONE MODEL CHECKING

Architect
Runs a comparison between models

Engineer
Runs a comparison between models

Collaborate
Query changes and notify other parties

Collaborate
Query changes and notify other parties

Consolidated Model(s)
All models are up to date, and no changes are present

At every pre-determined milestone meeting / coordination update / data update, perform overall model comparisons, and resolve issues that might arise. Once a consensus has been reached, issue a revised "base" (typically Architect) and "base-derivative" (Typically Structural Engineer or MEP Engineer) model(s).
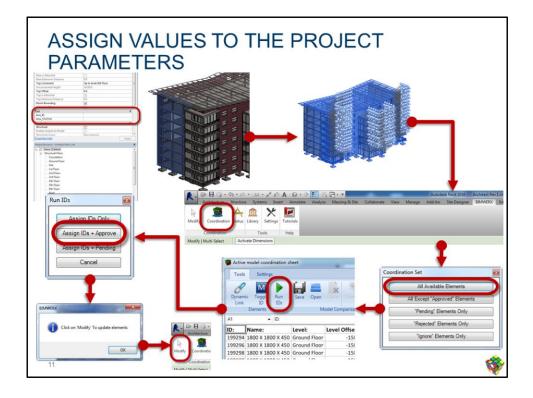
This is an example of a Milestone / Major coordination exercise.

CREATE A BASE COORDINATION MODEL

METHODOLOGY

```
┌─────────────────┐
│ Assign Project  │
│ Parameters      │
└────────●────────┘
         │
         ▼
┌─────────────────┐
│ Assign IDs and  │
│ Initial Status of│
│ "Approved"      │
└────────●────────┘
         │
         ▼
┌─────────────────┐
│ Save the Model  │
│ Information      │
│ Document         │
└────────●────────┘
         │
         ▼
┌─────────────────┐
│ Share the       │
│ Revit Model     │
└─────────────────┘
```

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* Using "*Architect Rev 1.rvt*" as the "base" model.
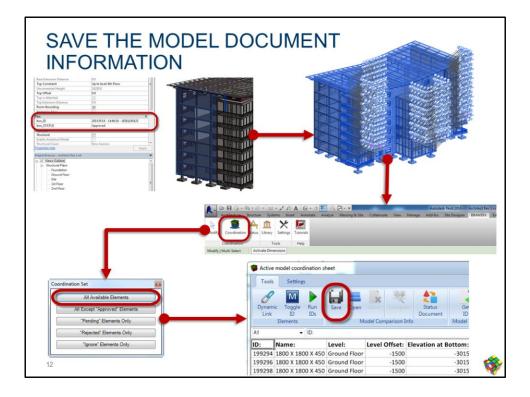
1. From the BIMWERX Coordination Setting dialog, specify the parameter mapping to be used for fields "ID" and "Status". This example will use "bwx_ID" and "bwx_STATUS" respectively

2. From the Revit "*Project Parameters*" command on the Revit "*Manage*" ribbon tab, add 2 Project Parameters, using the same attribute names as defined in step 1. **Make sure that:** "*Discipline*" is set to "*Common*", "*Type of Parameter*" is set to "*Text*" and "*Group Parameter Under*" is also set to "*Text*". Assign these parameters to the following Categories:
   - Doors
   - Floors
   - Stairs
   - Structural Beam Systems
   - Structural Columns
   - Structural Foundations
   - Structural Framing
   - Structural Trusses
   - Walls
   - Windows

ASSIGN VALUES TO THE PROJECT PARAMETERS

* Using "*Architect Rev 1.rvt*" as the "base" model
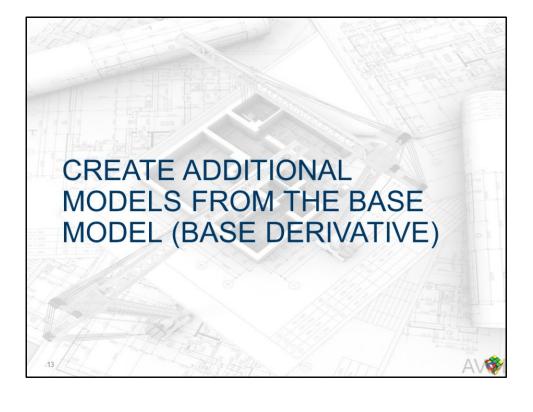
1. Now that the Project Parameters are available to the coordination elements, select the elements in the model (you may select the entire model, including non-coordination elements or elements of other categories than those to which the 2 Project Parameters were assigned)
2. From the BIMWERX ribbon menu, select "*Coordination*" and select "*All available Elements*"
3. Click on "*Run IDs*" when the Coordination menu appears, and select "*Assign IDs + Approve*"
4. Click "*OK*" to dismiss the notification, and remember to click "**MODIFY**" from the BIMWERX ribbon menu (not from any other menu)
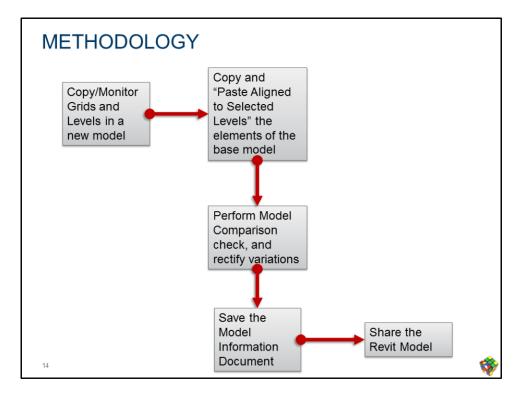
Note: This model is considered to be the first revision of the base model, and therefor all coordination elements are considered to be "Approved".

SAVE THE MODEL DOCUMENT INFORMATION
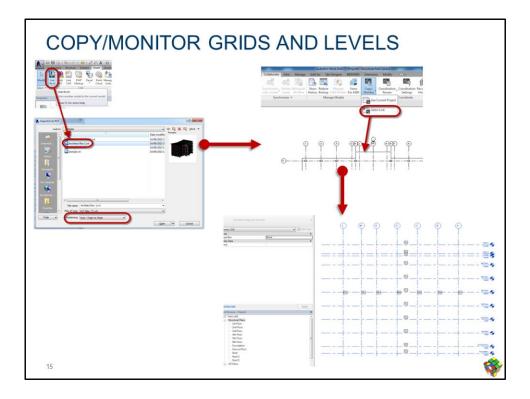
* Using "*Architect Rev 1.rvt*" as the "base" model
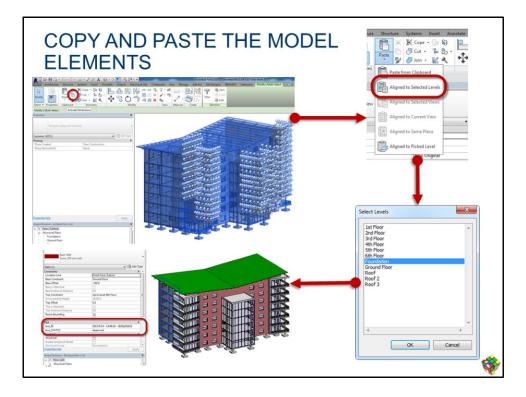
1. Now that values have been assigned to the Project Parameters, select the entire model again, and click on "*Coordination*" from the BIMWERX ribbon, again
2. Choose "*All Available Elements*", and click on "*Save*" from the Coordination dialog when it appears. In this example "*Architect Rev1 – Base.xlsx*" was used for the file name
3. Close the BIMWERX Coordination dialog, and save the Revit model

CREATE ADDITIONAL MODELS FROM THE BASE MODEL (BASE DERIVATIVE)

METHODOLOGY

Copy/Monitor Grids and Levels in a new model → Copy and "Paste Aligned to Selected Levels" the elements of the base model → Perform Model Comparison check, and rectify variations → Save the Model Information Document → Share the Revit Model

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COPY/MONITOR GRIDS AND LEVELS
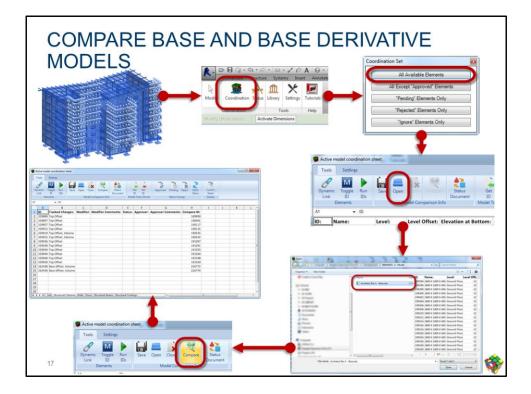
* Using "*Structural Rev 1.rvt*" as the "base derivative" model

1. Link the "base" ("*Architect Rev 1.rvt*" in this example) model into a new empty Revit model, use "*Auto – Origin to Origin*" for Positioning
2. Use Revit's standard "*Copy/Monitor*" feature to copy/monitor Grids and Levels only from the linked base model
3. Unload the linked model, and create views from the copied levels

COPY AND PASTE THE MODEL ELEMENTS

* Using "*Structural Rev 1.rvt*" as the "base derivative" model

1. Open the "base" model ("*Architect Rev1.rvt*" in this example), select everything and click on the "*Copy to clipboard*" button
2. Switch back to the "base derivative" model ("*Structural Rev 1.rvt*" in this example) and choose "*Aligned to Selected Levels*" from the "*Paste*" dropdown
3. Select the lowest level that is referenced from the current clipboard elements ("*Foundations*" will be used in this example) as the reference level
4. The model is now created, and most importantly, the custom Project Parameters and their values are transferred to the new project

Note: Warnings and errors might occur during the "*Paste*" process, dismiss them where possible
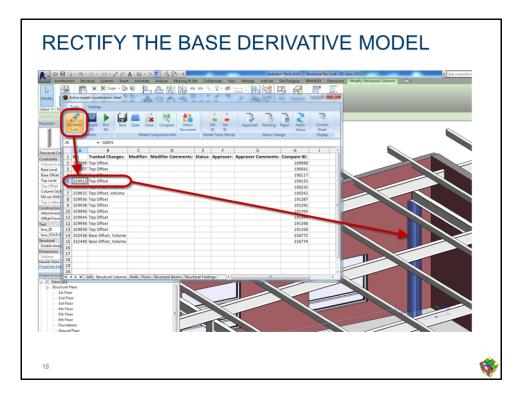
* Using "*Structural Rev 1.rvt*" as the "base derivative" model

1. Select the entire model, click on "*Coordination*" from the BIMWERX ribbon and select "*All available Elements*"
2. Click on "*Open*" from the BIMWERX Coordination dialog, and select the "base" Model Information Document ("*Architect Rev 1 - Base.xlsx*" in this example)
3. Now click on "*Compare*" and view the results when the comparison routine has completed

Theoretically, there should have been no changes between the "base" and the "base derivative" models, but there are usually a few settings and elements connections that gets lost in translation. We will rectify these variations in the next step.
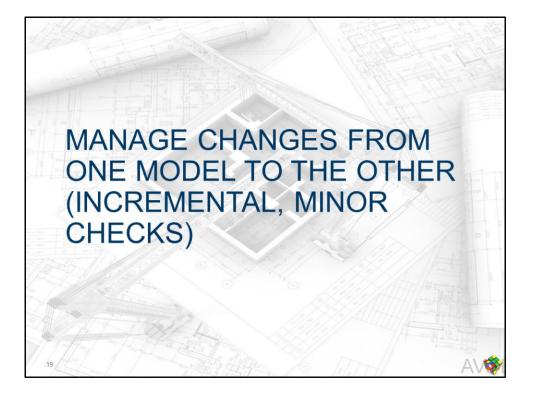
Note: The comparison sheet functions as a spreadsheet based component, and can be kept open on another screen while working in the Revit model.
The Material property is by default not included in the comparison check. This option can be switched on from the "*Settings*" ribbon menu on the Coordination dialog, together with tolerance (default of 10mm).

RECTIFY THE BASE DERIVATIVE MODEL
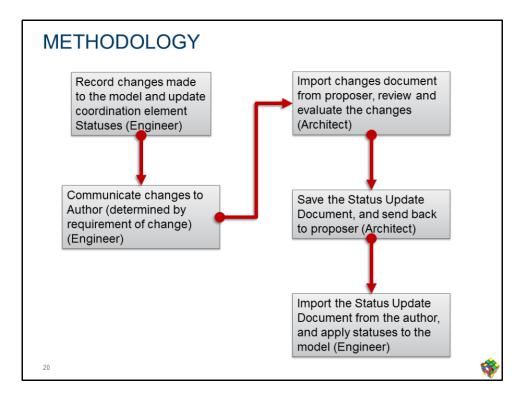
* Using "*Structural Rev 1.rvt*" as the "base derivative" model
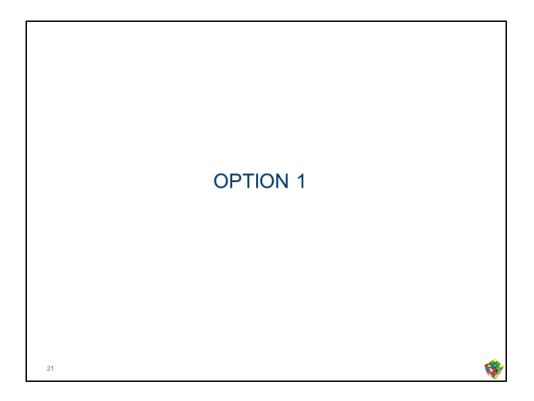
To rectify the variations, make use of the "*Dynamic Link*" functionality from the BIMWERX Coordination dialog to dynamically set focus to elements in Revit, selected from the coordination sheet. In this example, certain column join orders have been swopped with beams in comparison to the "base" model. Structural Beams have also lost their referenced level. These updates are relatively easy to apply to the model, and should not take up too much time.

Once finished, run a comparison between the 2 models again, there should be no variations now. Save the model ("*Structural Rev 1.rvt*" used in this Example), and use the same steps as with the previous exercises to save the Model Information Document for this model ("*Structural Rev 1 – Base Derivative.xlsx*" used for this sample).

MANAGE CHANGES FROM ONE MODEL TO THE OTHER (INCREMENTAL, MINOR CHECKS)

METHODOLOGY

Record changes made to the model and update coordination element Statuses (Engineer)

Communicate changes to Author (determined by requirement of change) (Engineer)

Import changes document from proposer, review and evaluate the changes (Architect)

Save the Status Update Document, and send back to proposer (Architect)

Import the Status Update Document from the author, and apply statuses to the model (Engineer)

For the purposes of this example, changes will be made to the "base derivative" (Structural model in this example) model and then communicated to the "base" (Architectural model in this example) model. The changes are made by the "change proposer" (Structural Engineer) and sent to the "change author" (Architect).

OPTION 1

* Using "*Architect Rev 1.rvt*" as the "base" model and "*Structural Rev 1.rvt*" as the "base derivative" model.

RECORDING CHANGES IN THE CURRENT MODEL
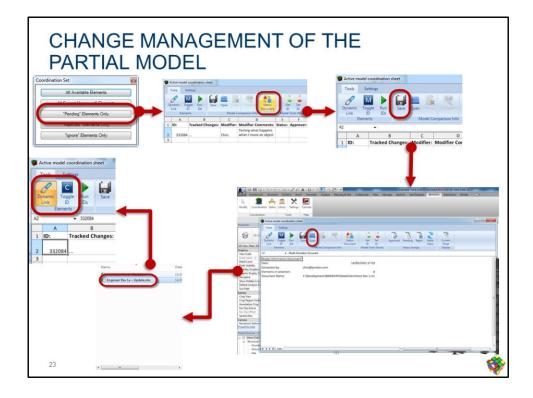
All changes made to the current model are being monitored by BIMWERX. When elements are modified that is marked for coordination, i.e. objects that are assigned with the 2 custom BIMWERX Project Parameters and who's status is equal to "Approved", they get added to a "modified elements" list.
Objects with a status of "Pending" or "Rejected" or "Ignore" will not be recorded when changes are being made to them – this is because there will be nothing new to communicate when they change. Only elements marked as "Approved" will be listed in the change management utility.

If you have made changes to elements, they will be listed (depending on their status values). You can use the "*Dynamic Link*" button to dynamically set focus to these elements in Revit when they are being selected from the "*Status Update*" dialog. When ready, select the elements from the ID column (use "click + mouse drag" to highlight desired elements) and choose either "Pending" or "Ignore" **and** then "*Apply*". **Be sure to click on "Modify"**, from the BIMWERX ribbon only, after making changes to the element's status(es).

When adding new elements to the model, they will automatically assume the 2 custom BIMWERX Project Parameters, but will have no values assigned to them yet. Assign changes to them by selecting them (use Revit view filters to isolate new objects, in other words, objects with a parameter "bwx_STATUS" where the value is empty) and performing the "Run IDs" function as before. **Take care not to renumber**

existing data, this will result in breaking the link between coordination model elements.
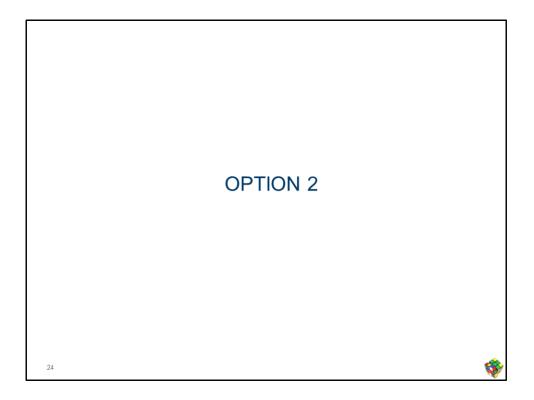
One can choose to only communicate the elements of the model that has changed, as opposed the sending and comparing the entire model, with every change.

To communicate changes of elements using their status values to filter for "Pending", do the following:
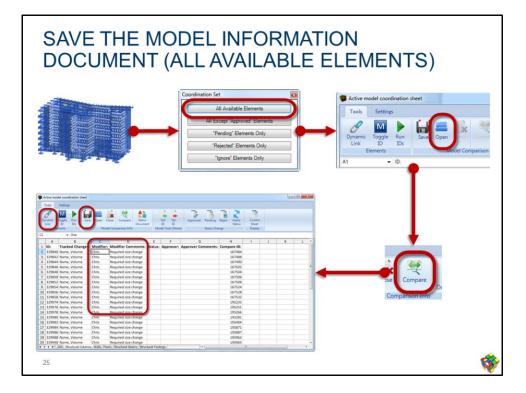
1. Select all elements in the "base derivative" model ("*Structural Rev 1.rvt*" in this sample), Click on "Coordination" form the BIMWERX ribbon and choose "Pending Elements Only"
2. Convert the current document to a "Status Information Document" by clicking on "Status Document" from the Coordination dialog ribbon
3. Save the current Status Information Document ("*Engineer Rev 1a - Update.xlsx*" used for this example) and send to the "change author"
4. The "change author" will now click the "Coordination" button from the BIMWERX ribbon without having to have selected any elements from the model. Once the Coordination dialog opens, open the Status Information Document sent from the "change proposer"
5. Click on the "*Toggle ID*" button once and use the "*Dynamic Link*" function to navigate to changed elements

Note: If you receive a message reading "Could not locate the element in the current model", then click the "*Toggle ID*" button again, and try again.

The "change author" could choose to view the changes using the "base" (Architectural model in this example) model or the "base derivative" (Structural model in this example) model, the latter would demonstrate the proposed change better. This sample workflow could also change direction, depending on the change requirements.
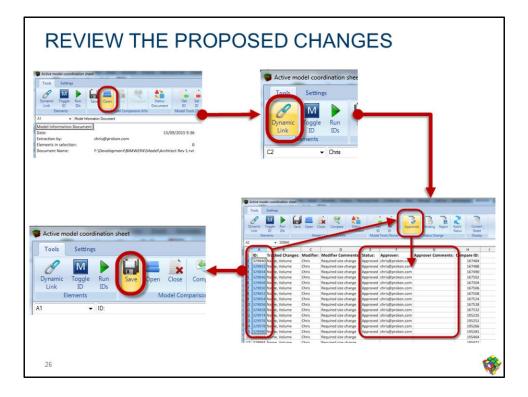
OPTION 2

* Using "*Architect Rev 1.rvt*" as the "base" model and "*Structural Rev 1.rvt*" as the "base derivative" model.

* Using "*Structural Rev 1.rvt*" as the "base derivative" model

In this example, all the column sizes on the first 2 levels have been changed in the Structural model ("base derivative"). This workflow can be reversed, and roles can be swopped.
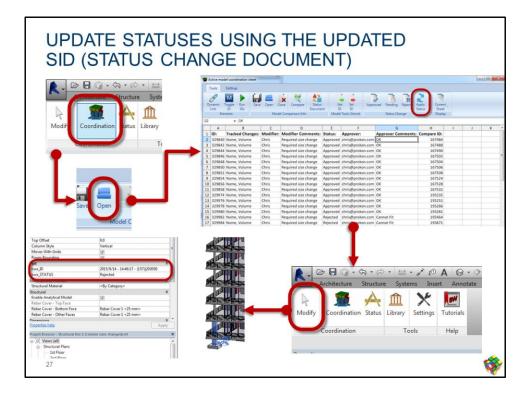
1. Select all elements in the "base derivative" model, click on "*Coordination*" from the BIMWERX ribbon menu
2. Choose "*All Available Elements*"
3. Open the "base" MID (Model Information Document), and click on "*Compare*" from the Coordination dialog ribbon (The current sheet now becomes a "Status Information Document")
4. Cycle through all Category tabs (bottom of dialog), and provide "Modifier" and "Modifier Comments" information
5. Save ("*Engineer Rev 1b - Columns Updated.xlsx*" used for this example) the SID (Status Information Document) and send to the owner of the "base" model

REVIEW THE PROPOSED CHANGES

* Using "*Architect Rev 1.rvt*" as the "base" model

The "base" model owner and "change author" will be reviewing the changes in this example.
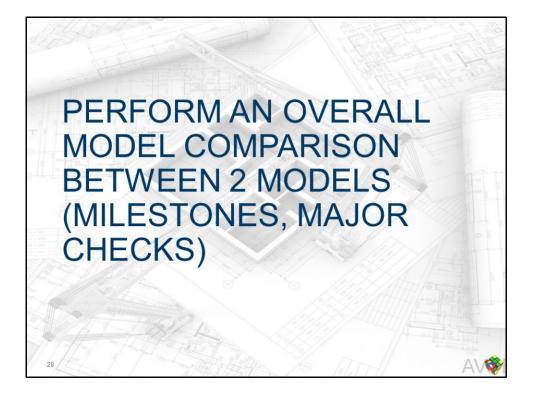
1. Without selecting anything in the model, click on "*Coordination*" from the BIMWERX ribbon
2. Click on "*Open*" and select to open the SID that was sent from the "change proposer" ("*Engineer Rev 1b - Columns Updated.xlsx*" used for this example)
3. Use "*Dynamic Link*" and review the comments to proposed changes
4. Use the "Approved", "Pending" or "Rejected" buttons to assign new statuses to a selection of "ID" rows
5. Save the updated SID and send back to the "change proposer" ("*Architect Rev 1b - SID updated.xlsx*" used for this example)
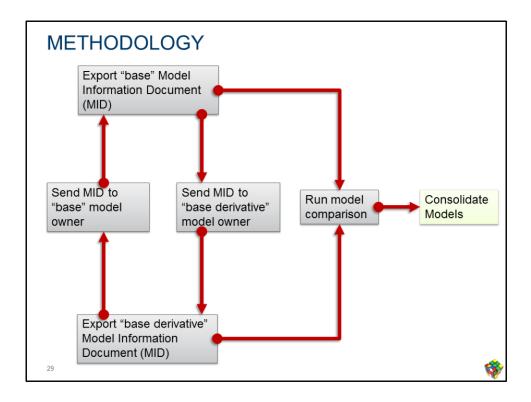
* Using "*Structural Rev 1.rvt*" as the "base derivative" model

For this example, we will be using the "base derivative" model (Structural model), and assume the role of "change proposer".

1. Without any objects selected, click on "*Coordination*" from the BIMWERX ribbon menu
2. Click on "*Open*" and select the SID document that was returned from the "change author" ("*Architect Rev 1b - SID updated.xlsx*" used for this example)
3. Use "*Dynamic Link*" and the "Approver Comments" to review the results, and click on "Apply Status" to update the current model coordination element statuses from the current SID
4. **Remember to click "Modify"** from the BIMWERX ribbon to accept the status update changes

PERFORM AN OVERALL MODEL COMPARISON BETWEEN 2 MODELS (MILESTONES, MAJOR CHECKS)

Summary:

Assuming many changes have occurred, and a new revision is to be issued.
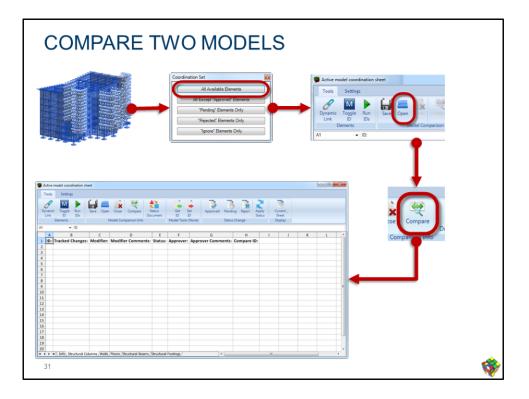
Both parties save and send their respective Model Information Documents (using "All Available Elements") to each other, each party then run a model comparison. Changes are then resolved and a new revision base model is issued.

SAVE THE MODEL INFORMATION DOCUMENT (ALL AVAILABLE ELEMENTS)

* Using "*Structural Rev 2.rvt*" as the "base derivative" model

In this example, all the column sizes on the first 2 levels have been changed in the Structural model ("base derivative"). This workflow can be reversed, and roles can be swopped.

1. Select all elements in the "base derivative" model, click on "*Coordination*" from the BIMWERX ribbon menu
2. Choose "*All Available Elements*"
3. Save the MID ("*Engineer Rev 2 - Base Derivative.xlsx*" used for this example) and send to the owner of the "base" model

COMPARE TWO MODELS

* Using "*Architect Rev 2.rvt*" as the "base" model

For this example, we will now assume the role of the "base" model owner (Architect in this example), which will also be the "change author".

The MID ("*Engineer Rev 2 - Base Derivative.xlsx*" used for this example) from the "change proposer" (Structural Engineer in this example) has been received by the "change author" (Architect in this example), and we will now review the proposed changes.

1. Elect the entire model, click "*Coordination*" from the BIMWERX ribbon
2. Choose "*All Available Elements*"
3. Open the "base derivative" model ("*Engineer Rev 2 – Base Derivative.xlsx*" used in this example)
4. Click "*Compare*" from the Coordination dialog

You should not see any changes in any of the categories, if there are variations, then they should be resolved.

CONCLUSION

- The Coordination tools can be used with various workflows

- Coordination roles can changes during the change management workflows

- Models should be shared across the board

- File naming conventions are extremely important, we recommend the use of the current revision (numerical for major and official revisions, and alphabetical for minor internal revisions or proposed changes) in the file name for the Revit models as well as the Coordination documents

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REFERENCES & RESOURCES

www.bimwerx.nz

chris@bimwerx.nz

Q & A