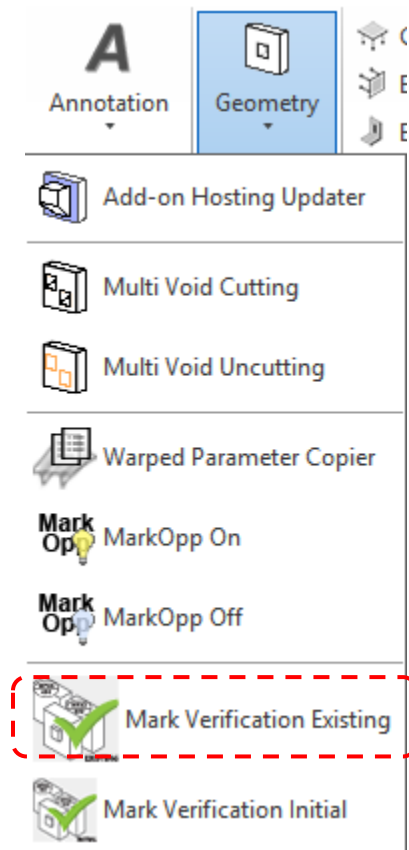


Geometry Tools: Mark Verification Existing



Programmed Result of Tool:

This tool will compare all structural framing in the model which have the same control marks. The tool will identify any elements which bear the same control mark. The user will be presented with a list of evaluated control marks and receive an indication of whether any of the elements in that control mark group failed to compare.

Tool employs fixed industry standard tolerances for similarity comparison and allows for users to implement custom tolerances in their user settings.

Steps to Perform tool Operation:

The tool will automatically find and compare all structural framing unless the user specifically selects a structural framing element or assembly. With a selection, the tool will only compare members in the model which bear the same control mark as the selected structural framing/assembly.

- 1) User clicks Mark Verification Existing Tool icon
- 2) If there is an active selection, the user then selects the desired scope of the tool: selected control marks only or entire model.
- 3) User selects the comparisons that they wish to see performed by Mark Verification Existing. User must also indicate whether a Detailed or Traditional check should be performed. The traditional check will stop processing each mark after the first failed comparison; whereas the detailed check will perform all comparison for all processed marks and will provide a detailed report of the causes for each failed comparison. The detailed check will take more time to run.
- 5) User reviews list of comparisons for each mark of interest. Selecting a control mark will show the list of tests run and the results. Selecting a failing test will highlight the two elements which failed comparison.

Geometry Tools: Mark Verification Existing

Comparison Selection Window:

This window controls which comparisons will be performed by Mark Verification Existing and the level of detail for the comparison.

- **Family Parameter Comparison** – This compares the relevant parameters on the compared pieces
 - Relevant Parameters - DIM_LENGTH, DIM_WIDTH, DIM_DEPTH, DIM_THICKNESS, DIM_HEIGHT, DIM_DIAGONAL, DIM_DIAMETER, DIM_ARC_LENGTH, DIM_DEPTH_ACTUAL, DIM_WYTHE_OUTER, DIM_DEPTH_FORM, DIM_WYTHE_INSULATION, DIM_WIDTH_INCHES, DIM_WYTHE_INNER, DIM_STEM_DEPTH, DIM_HEIGHT_INCHES, DIM_DEPTH_INCHES, WEIGHT_PER_UNIT, DESIGN_NUMBER, FINAL_STRENGTH, RELEASE_STRENGTH, ARCH_SF_1-4, MEMBER_WEIGHT_CAST, DIM_SQFT, CONSTRUCTION_PRODUCT, BOM_PRODUCT_HOST, and HANDLING_CODE.
- **Main Material Volume Parameter Comparison** – Compares MEMBER_VOLUME_CAST and Revit Volume on compared pieces
- **Addon Family Parameter Comparison** – Compares number, type, and family names of addons between compared pieces.
- **Plate Family Type Comparison** – Compares number, type, and family names of embeds between compared pieces.
- **Addon Location Comparison** – Compares addon locations between compared pieces.
- **Plate Location Comparison** – Compares embed locations between compared pieces
- **Solid Comparison** – Compares structural framing geometry between compared pieces. (Including edge lengths, face areas, etc.)

Compare Engine Selection Wi... — □ ×

Please select all of the comparisons that you would like Mark Verification Existing to process:

All

- Family Parameter Comparison
- Main Material Volume Parameter Comparison
- Addon Family Type, Count, and Volume Comparison
- Plate Family Type and Count Comparison
- Addon Location Comparison
- Plate Location Comparison
- Solid Comparison

Select method for comparison:

Detailed Approach Traditional Approach

OK Cancel

Geometry Tools: Mark Verification Existing

“Traditional Approach” – Main Results:

- For failing marks, comparisons will not be performed past the first failed comparison to limit processing time.

“Traditional Approach” – Export:

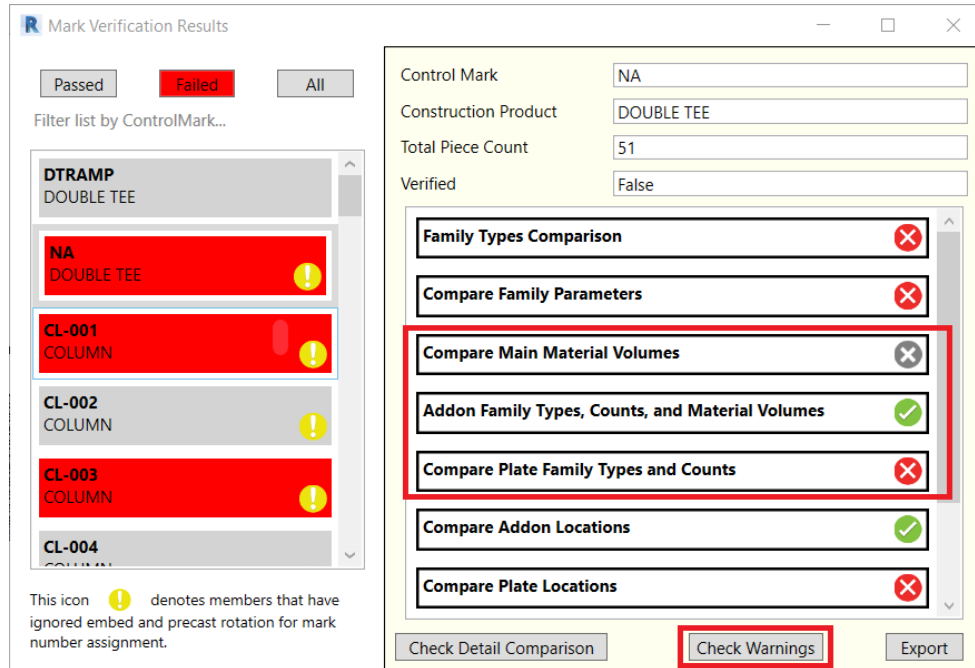
	A	B	C	D	E	F
1	ELEMENT	CONTROL MARKS	CONTROL NUMBER	RESULTS	FAILED TEST	GROUP ID
2	785200	DTRAMP	027			0
3	785805	NA	038	FAIL	Compare Family Parameters	1
4	785832	NA	047	FAIL	Compare Family Parameters	1
5	782172	NA	006	FAIL	Compare Family Parameters	2
6	782232	NA	009	FAIL	Compare Family Parameters	2
7	782248	NA	012	FAIL	Compare Family Parameters	2
8	782190	NA	004	FAIL	Compare Family Parameters	3
9	782235	NA	007	FAIL	Compare Family Parameters	4
10	782251	NA	010	FAIL	Compare Family Parameters	4
11	782267	NA	013	FAIL	Compare Family Parameters	4
12	782264	NA	015	FAIL	Compare Family Parameters	5
13	782344	NA	002	FAIL	Compare Family Parameters	6
14	782347	NA	003	FAIL	Compare Family Parameters	7
15	782404	NA	017	FAIL	Compare Family Parameters	8
16	782407	NA	018	FAIL	Compare Family Parameters	9
17	782410	NA	016	FAIL	Compare Family Parameters	10
18	782604	NA	032	FAIL	Compare Family Parameters	11
19	782607	NA	031	FAIL	Compare Family Parameters	12
20	782610	NA	033	FAIL	Compare Family Parameters	13
21	782804	NA	020	FAIL	Compare Family Parameters	14
22	782807	NA	019	FAIL	Compare Family Parameters	15
23	782810	NA	021	FAIL	Compare Family Parameters	16
24	783960	NA	022	FAIL	Compare Main Material Volume:	17
25	785148	NA	023	PASS		18
26	785158	NA	024	PASS		18



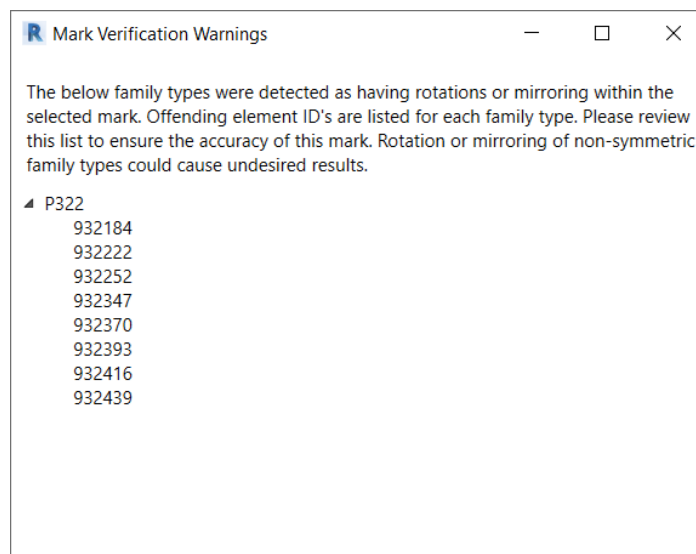
Geometry Tools: Mark Verification Existing

“Detailed Approach” – Main Results:

- Displays comparisons that passed, failed and the ones that were not selected to run.
- All failures for each mark will be reported.
- It also displays plate rotation warnings if appropriate location checks were selected to run.



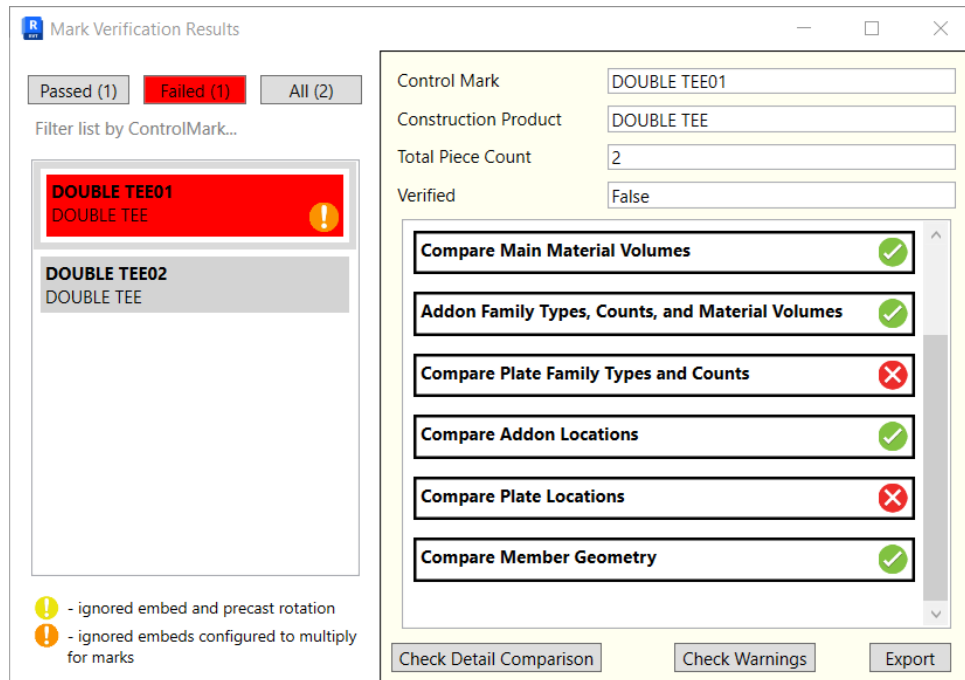
- If Plate Rotations exist in the control mark, then the ‘Check Warnings’ button appears and on clicking it opens a new window that displays the plate name and element ID along with highlighting in the model on selection.



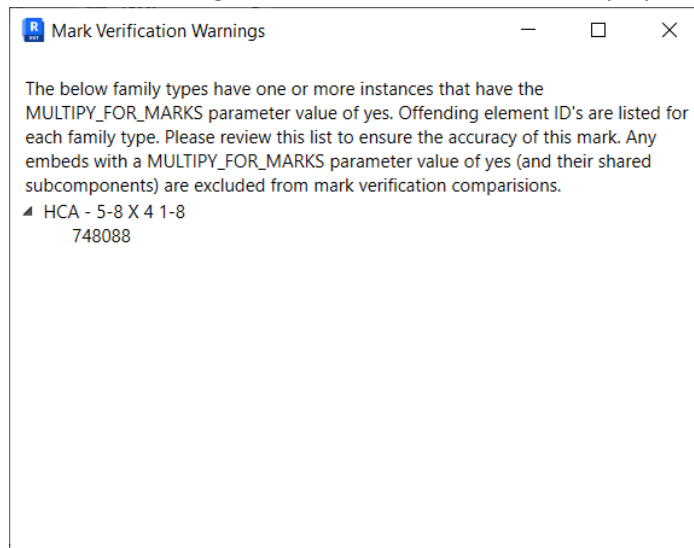
Geometry Tools: Mark Verification Existing

“Detailed Approach” – Main Results Continued:

- It also displays warnings if pieces within a group contain embeds configured to multiply for marks. Embeds configured to multiply for marks are ignored when comparing plate count and locations.



- If embeds configured to multiply for marks exist in the control mark, then the ‘Check Warnings’ button appears and on clicking it opens a new window that displays the plate name and element ID along with highlighting in the model on selection. If plate rotations and multiply for marks warnings both exist, the window will display both.



Geometry Tools: Mark Verification Existing

“Detailed Approach” – Export:

- The ‘Export’ button will export all results into an excel sheet. This workflow creates a cover sheet where all control marks are displayed linking it to their respective sheet. The cover sheet contains the overall “PASS”, “FAIL” and “NOT PROCESSED” status for all comparisons for each mark.
- Each sheet afterwards is named after the control mark which contains the individual control mark results and displays the details groups and their results for each comparison.
- If more than 255 marks are to be exported, then multiple export files will be saved.

Cover Sheet:

	A	B	C	D	E	F	G	H	I	J
1	Control Marks	Family Types	Family Parameters	Main Material Volumes	Plate Family Types and Counts	Plate Location Comparison	Addon Family Count	Addon Volume	Addon Location	Finish Family Count
2	HHH	PASS	PASS	FAIL	PASS	PASS	PASS	PASS	PASS	PASS
3	DT1	PASS	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS
4	DT2	PASS	FAIL	FAIL	PASS	PASS	PASS	PASS	PASS	PASS
5	DT3	PASS	PASS	FAIL	PASS	PASS	PASS	PASS	PASS	PASS
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										

Individual Control Mark Results:

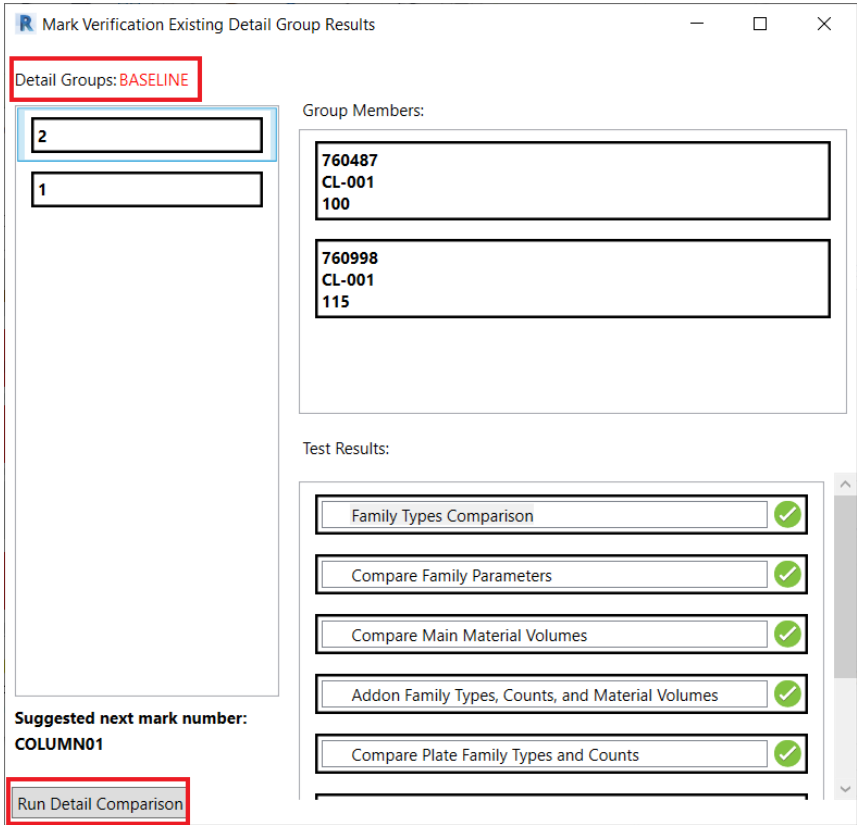
	A	B	C
1	Detail Groups		
2		1	2
3	Master Element ID		
4		5959987	5959989
5	Structural Framing Elements		
6		5959987	5959989
7	Family Types Comparison		
8		PASS	PASS
9	Compare Family Parameters		
10	DIM_WIDTH	12' - 0"	11' - 11 1/2"
11	Compare Main Material Volumes		
12	PRECAST CONCRETE	13.67	13.63
13	Compare Plate Family Types and Counts		
14		PASS	PASS
15	Plate Location Comparison (results provides Element ID for offending items)		
16		PASS	PASS
17	Addon Family Count Comparison		
18		PASS	PASS
19	Addon Volume Comparison		
20		PASS	PASS
21	Addon Location Comparison		
22		PASS	PASS
23	Finish Family Count Comparison		
24		PASS	PASS



Geometry Tools: Mark Verification Existing

“Traditional Approach” – Check Detail Comparison:

- Users can check the detail comparison for individual control marks to see the groupings of passing comparisons.
- For example, a mark with 3 pieces could have 2 pieces that pass with each other, but do not pass with the third one. This detail comparison would look as below.
- Selecting a group here will show which comparison failed for this group and select the contained element IDs in the project. The user can also scroll through the list of element IDs in the group to see details on them.
- The “BASELINE” detail group indicates which group passed all comparisons and was used to compare the other detail groups against.
- User can select the ‘Run Detail Comparison’ button to switch to the detailed approach for the selected control mark. Once processing completes, this replaces the Detail Group Results with the updated results. These results will show all failed comparisons for that mark and indicate exactly what caused the failure(s).



Geometry Tools: Mark Verification Existing

“Detailed Approach” – Check Detail Comparison:

- Users can check the detail comparison for individual control marks to see the groupings of passing/failing comparisons. The comparison criteria are exactly like the Traditional Approach.
- The detail group selected shows the comparisons that passed, failed and comparisons that were not selected to be run/processed.
- Each failed comparison can be expanded to show the reason for failure along with the expected result and the actual result found. Upon selection, it will highlight the failing element and the baseline it was compared against. This reasoning can vary depending upon the type of comparison, for example, a Main Material Volume Comparison failure will list the volume of the failing element (“Actual Result”) and the volume of the baseline element that it was compared against (“Expected Result”).
- The user has an option to re-run the detail comparison on the selected control mark which will replace the current Detail Group Results window.
- User is provided with an ‘Export’ button on this window to export the results for just this control mark.

Mark Verification Existing Detail Group Results

Detail Groups:

1

1

Group Members:

5959963
WP3
016

Test Results: BASELINE - 5959963

Family Types Comparison

Compare Family Parameters

Compare Main Material Volumes
PRECAST CONCRETE
Expected Result: 11.65
Actual Result: 11.64

Addon Family Types, Counts, and Material Volumes

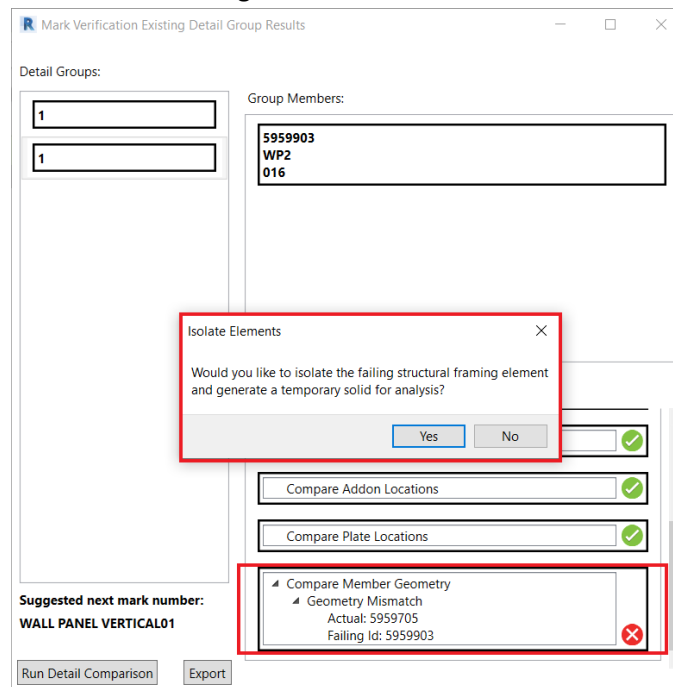
Suggested next mark number:
WALL PANEL VERTICAL01

Run Detail Comparison Export

Geometry Tools: Mark Verification Existing

“Detailed Approach” – Check Detail Comparison Cont.:

- If the user selects a failed Geometry Comparison, they are prompted with a message asking whether user would like to isolate the failed element along with a red solid that will be generated. This red solid will reflect the geometric differences between the baseline structural framing element and the failing structural framing element. During this display, all cursory operations are disabled except for navigating the view such as rotating, panning, using the view cube, etc. Pressing Esc will terminate the review failing geometry mode and will also remove the red solid that was constructed to indicate the geometric differences.



Geometry Tools: Mark Verification Existing

Known Limitations:

- This tool requires that the add-on hosting updater has been run for the desired pieces (the entire model if running mark verification for the entire model), if this has not been run, add-on components will not be accurately identified.
- Warped parameters are excluded from mark verification
- Certain elements are excluded from all Mark Verification Comparisons based on the criteria below:
 - If the MANUFACTURE_COMPONENT contains: MESH, WWF, LIFTING, REBAR, CGRID, SPIRAL REINFORCING, SHEARGRID, STRAND, PATCH, CENTROID, CIP, ERECTION, VOID, CONNECTION
 - If the Family Name contains: VOID, PATCH, SPOT_ELEVATION
- Symmetric elements that are rotated 180 degrees but placed in the same location on two identical SF elements with the same mark number will cause them to fail
- Mirroring and rotating of precast and embedded items may cause a false negative mark number value. Please evaluate these values for possible increase in mark number efficiency gains.
- Like add-ons with slightly different shapes may cause structural framing elements to incorrectly pass Mark Verification Existing if the addons have weights and volumes that are both within tolerance.
- During the analysis of a failed geometry comparison, if a comparison solid cannot be generated because of Revit limitations then a message is displayed that states 'solid could not generated'.
- Mark Verification Existing results reflect the state of the model at the time the tool was run. Making modifications to the model while the mark verification results window is still open will not cause the results to update. The tool would need to be re-run to accurately reflect the updated state of the model.
- If the Family Types Comparison fails, then Mark Verification Existing does not process any other comparisons for that mark/detail group.

