PROTOCOL – MODELLING INTERIOR WALLS FROM POINT CLOUDS

Document Information

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2015-08-04	Katie Graham	Modification for CB project
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??	M. Reina Ortiz	Minor Additions
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Sources

File Name	Date	Project Source	Author

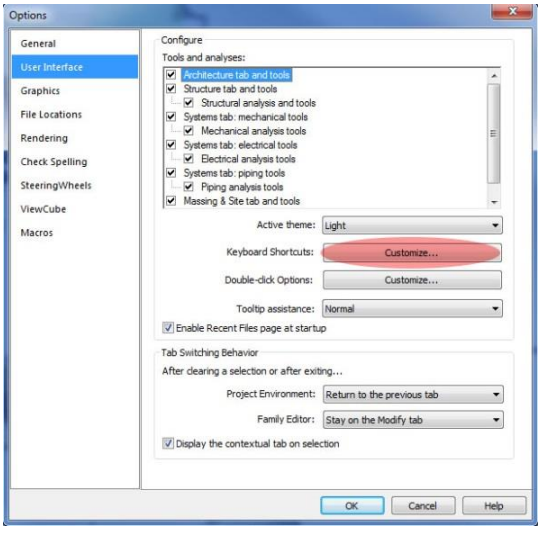
TASK

This protocol defines the steps necessary for modelling interior walls from point cloud data. The following information will provide you with techniques for drawing Revit wall components that conform to point cloud data, how to phase the wall components, and using Revit families to define wall openings (doors).

WORKFLOW

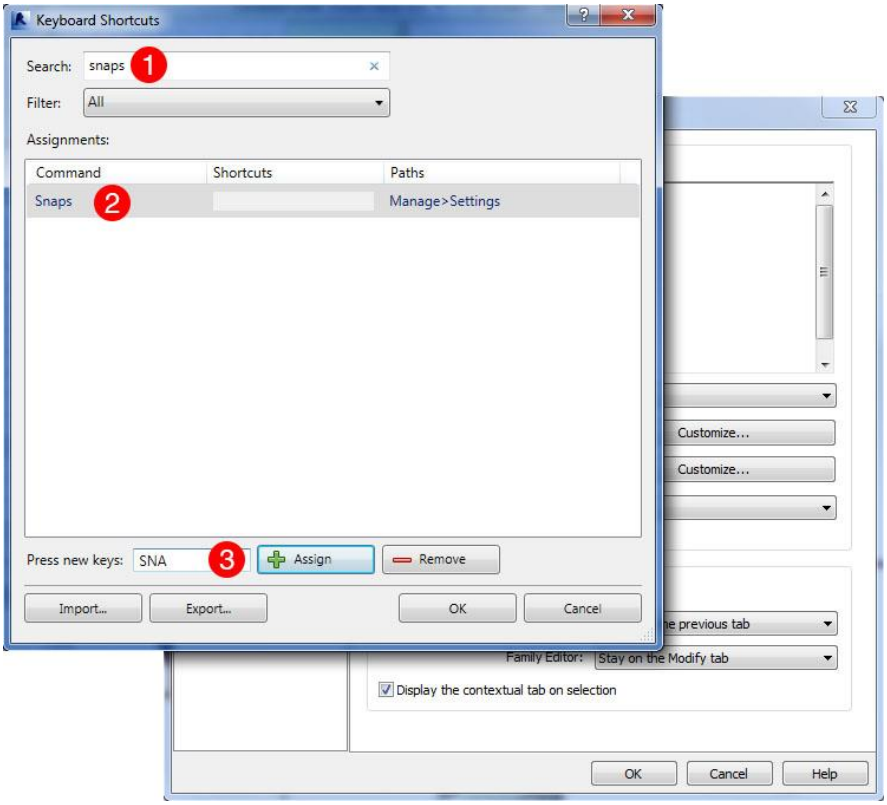
SNAP SETTINGS

Before beginning, managing Snaps using keyboard shortcuts is useful to efficiently draw walls that align with point cloud data. Select  > Options. In the *Option* window, select *User Interface* on the left panel and click the *Customize…* button related to *Keyboard Shortcuts*.

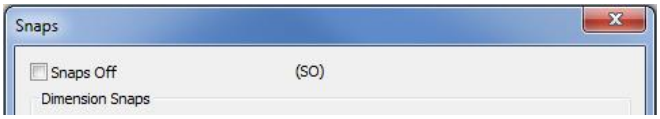


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A new window for Keyboard Shortcuts will open. In the Search field, type “snaps”, select Snaps line, type “SNA” in the new keys field and click *Assign* to apply shortcut and *Ok* to save modifications.



Now, every time *snaps* need to be enabled or disabled simply type *SNA* and check the *Snaps Off* checkbox on top-left of the *Snaps* window.



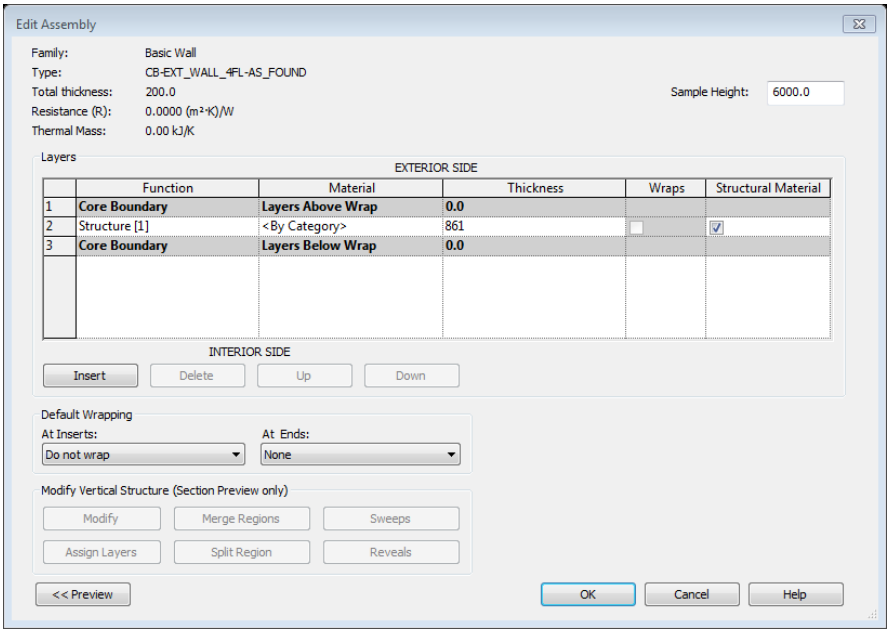
DRAWING WALLS AS WALL TYPES FROM POINT CLOUDS

1. Within your local file (ex. Centre Block: CB-CIMS-DOC-INTERIORS-AS_FOUND.rvt) verify that the point cloud data is visible. It is important to note that not all point clouds should be visible at once. Only select the required data.

   View tab > Graphics panel > Visibility/Graphics > Point Clouds

2. Determine the thickness of the walls from the combination of interior and exterior scans. Measure the thickness of the wall with the measure tool between both sets of corresponding point clouds.

3. Go to *Architecture tab > Build panel > Wall*. Duplicate the Basic Wall-Generic to create a new wall type for each floor named according to *PROTOCOL – NAMING CONVENTIONS*. Edit the structural assembly to match the measured thickness (round to the closest mm), keeping the assembly layers as *Structure: <By Category>.*

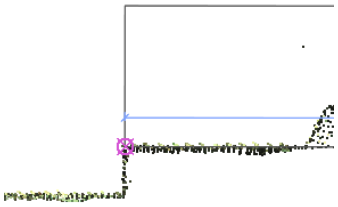


4. To start drawing the walls, go to a given floor plan and choose the corresponding wall type. In the Options bar of the wall tool, change *Height* to the floor above and change *Location Line* to *Finish Face: Exterior.*

   Here are a few tips to model the walls correctly:

   a. Start drawing the wall in a **clockwise** position by using the exterior scan as a guideline. Make sure you draw clockwise; otherwise the walls will be inside out.

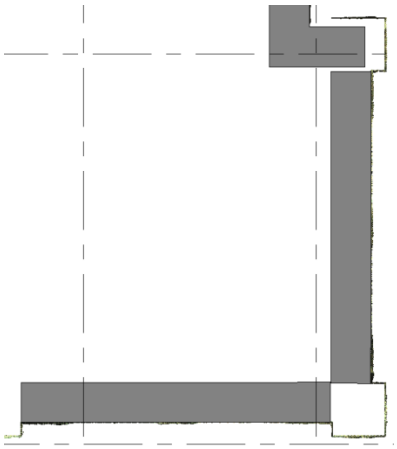
   b. Use the snaps and tab select to get accurately close to wall.



c. Span the wall segments between the pre-established gridlines in order to model the discrepancies of the façade with higher accuracy.

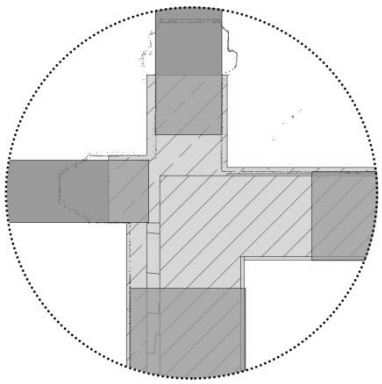


d. Use the *Trim/Extend to Corner* Tool  to join corners. Below is what the above image looked like before the tool was used.

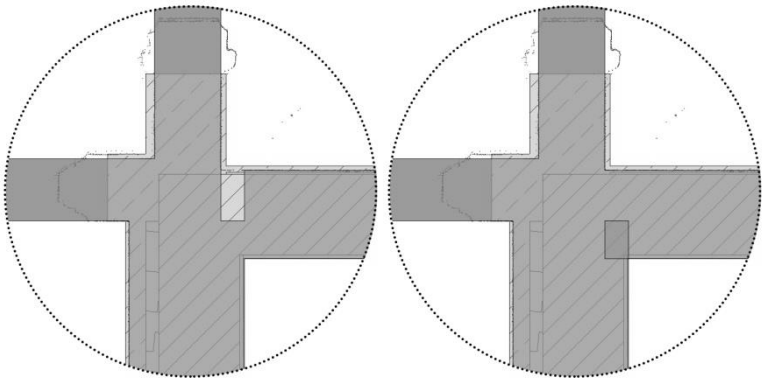


e. Some special wall joints will require the use of Join/Unjoin tool to obtain smooth connections.

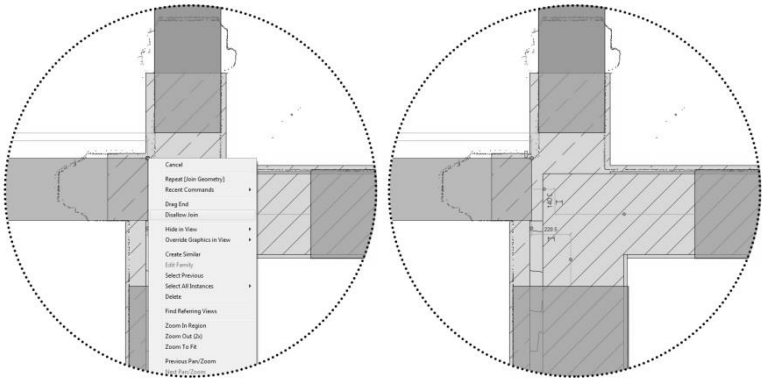
- Draw the walls using point cloud data.

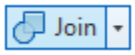


- Try to connect the walls with Trim/Extent Tool. Depending the geometry of the walls, directs joins will not generate clean intersections.

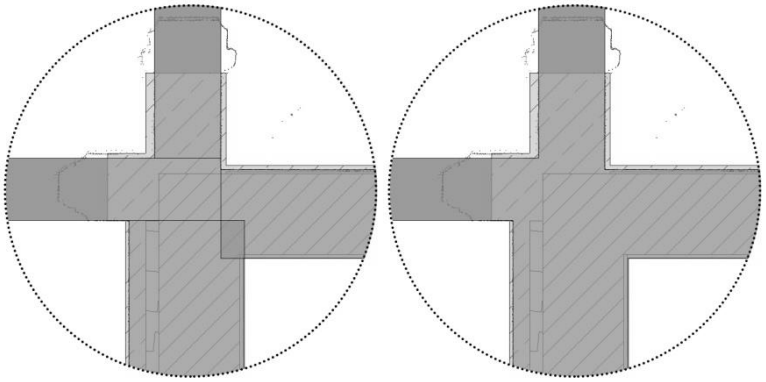


- To generate a clean intersection the walls need to be unjoin. Before connecting walls it is possible to unjoin their corners: ‘right click’ on the wall anchor and select ‘Disallow join’.

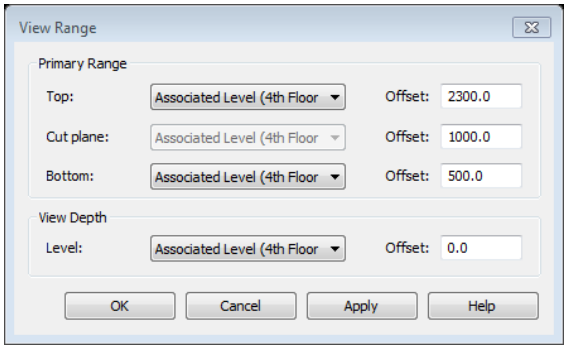


- When all corners have been unjoin it is possible to Trim/Extent their ends to match all sides in a regular shape. After that it is possible to join them in a clean intersection with the ‘Join’ tool 

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f. Change the *view range* (view properties) of a view if too much of the point cloud is visible or not visible. The view range shows what is between the *bottom* and *cut plane* numbers. Settings are currently:

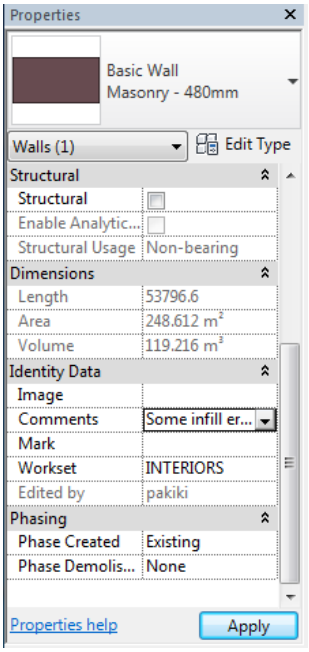


RECORDING INFILL

In some cases, infill is erected in an interior wall during the construction/restoration stage, as seen below.

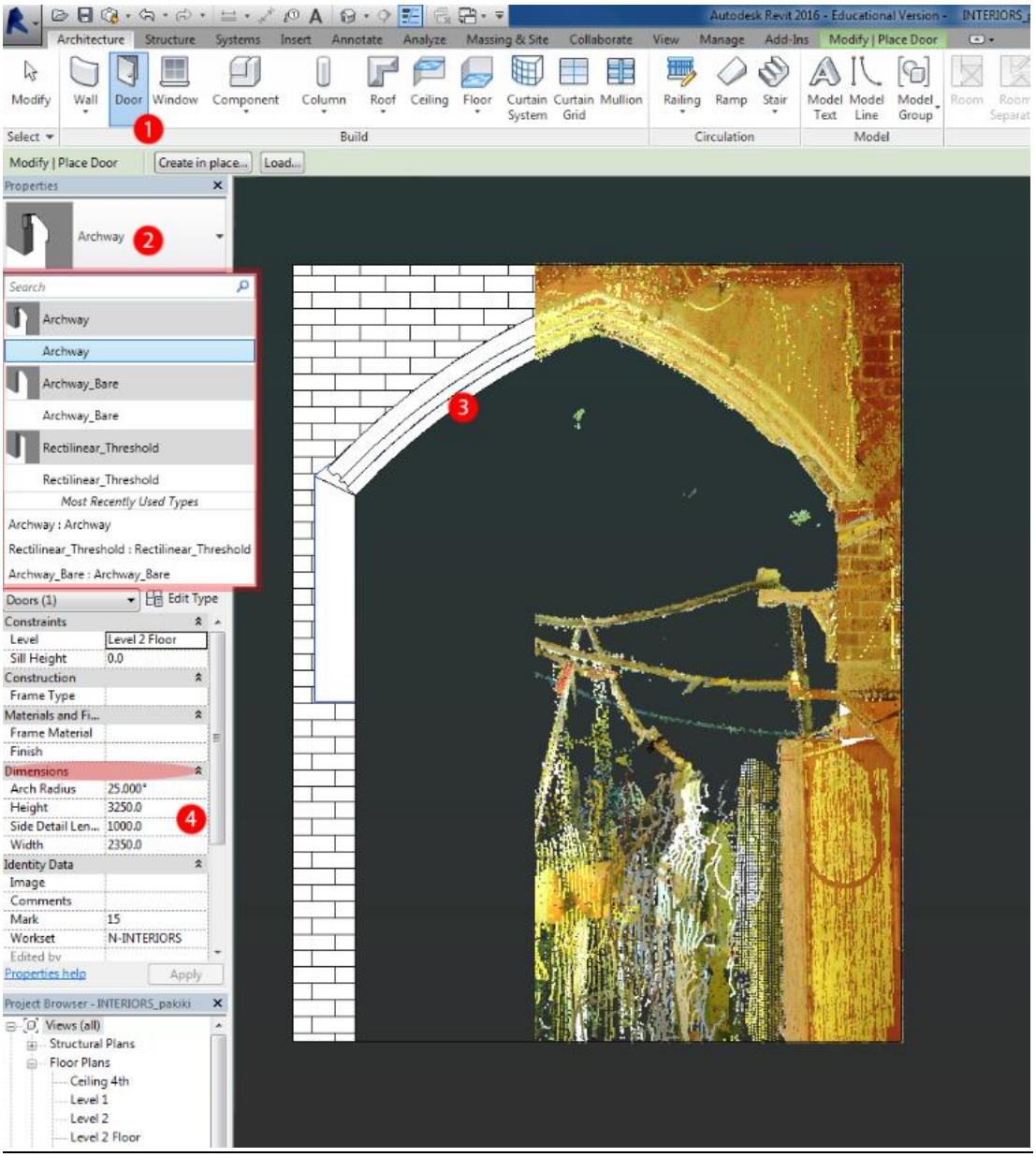


If so, it will be necessary to use the comments box to clarify which wall components have new infill. In the *Properties window*, under *Identity Data*, type “some infill erected” in the Comments box.



THRESHOLDS

Under the *Architecture* tab, use the *Door* component to create doorways and thresholds between rooms and corridors. Select the appropriate family component for the opening and place the opening in the interior wall. In the *Properties* window, under *Dimensions*, edit values of height, width and radius to match point cloud data.



TROUBLE SHOOTING

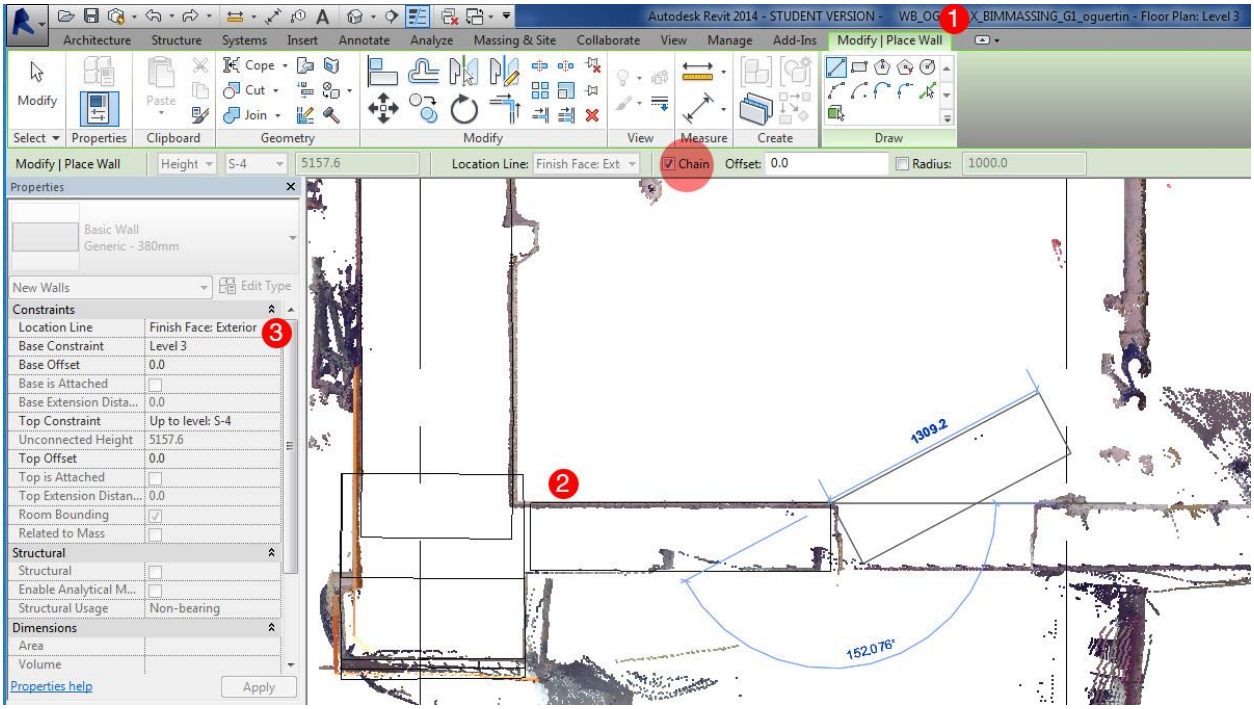
No trouble shooting to date.

PREVIOUS TECHNIQUES

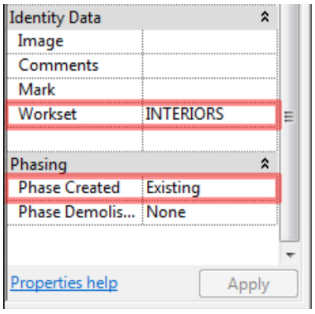
WALL COMPONENTS

Once selecting the Architectural Wall command, in the Modify/Place Wall Tab > Draw category select Line, check the Chain *checkbox* and start tracing walls following the point cloud. Once done, select walls (*TAB + left-click to change selection*) and validate the following properties:

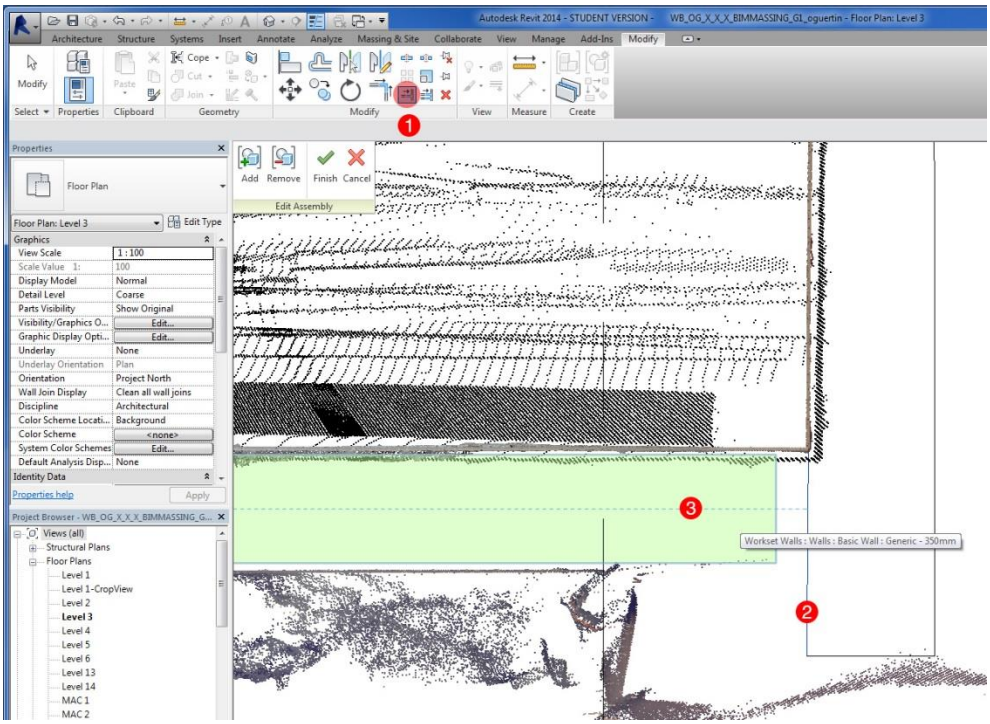
Base Constraint = [choose the appropriate level on which walls should be traced]
(here, “Level 3”);
Top Constraint = [choose the appropriate level on which walls should stop in height]



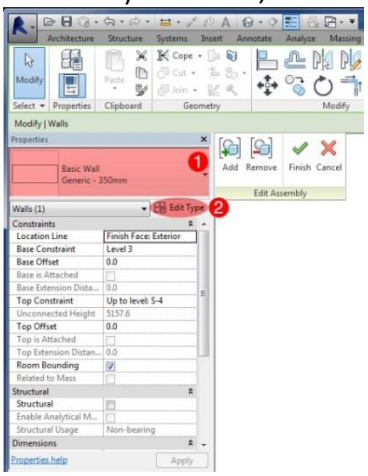
Readjust newly drawn walls as necessary with the Align and/or Move tools to closely align with point cloud data. Be sure to identify the appropriate workset and phase of each interior wall component. Use photos and/or point cloud data to help identify new versus existing walls. New walls are phased as New Construction and placed in the N-INTERIORS workset. Existing walls are phased as Existing and placed in the INTERIORS workset.



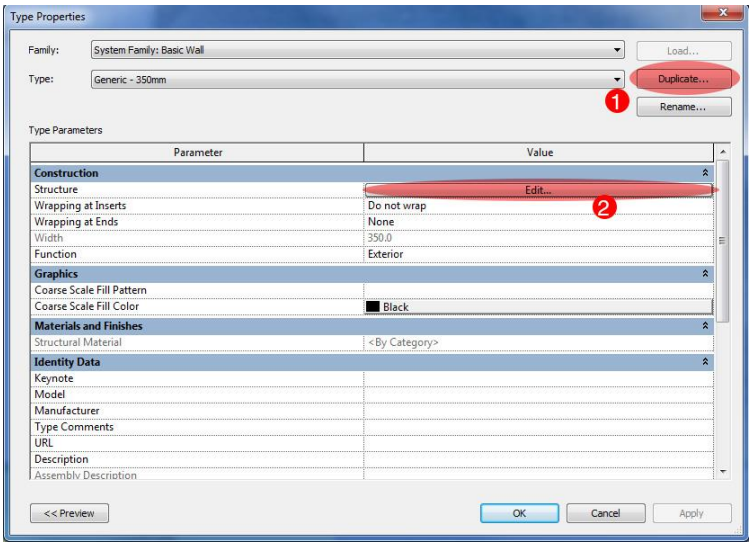
Drawing a single wall or chain of walls with *different thicknesses* is impossible. Instead, tracing many *chains of walls* and using the Trim/Extend commands (*corner, single* or *multiple* elements) allow continuity of walls. Following the same commands for *continuity* between interior and exterior walls avoid at the same time *joining* those elements together. In Modify tab > Modify Category select Trim/Extend Single Element, select the surface on which the wall must stop and select the wall to extend while paying attention to the dashed line (extension direction).



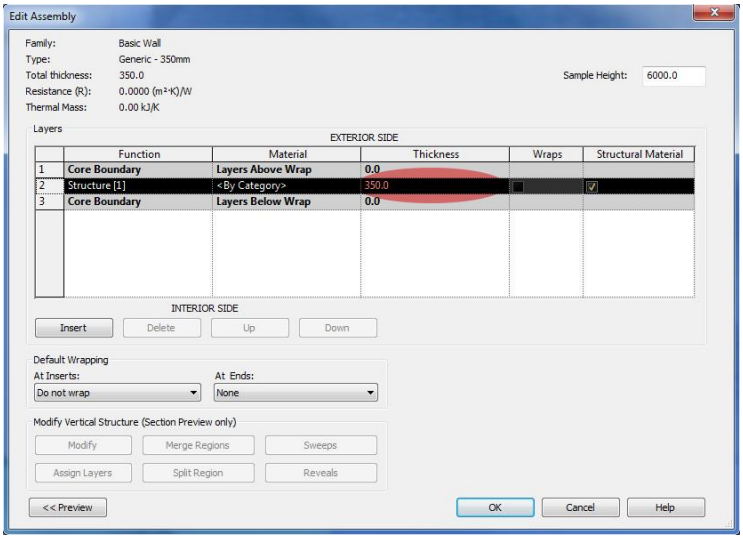
Walls being traced might need their thickness to be increased or decreased; there are two ways for doing this after selecting walls needing to be thickened: changing the wall type by selecting one with the dropdown button or it can be done by editing the *wall type* (customised thickness). To do so, click Edit Type in the *Properties panel*.



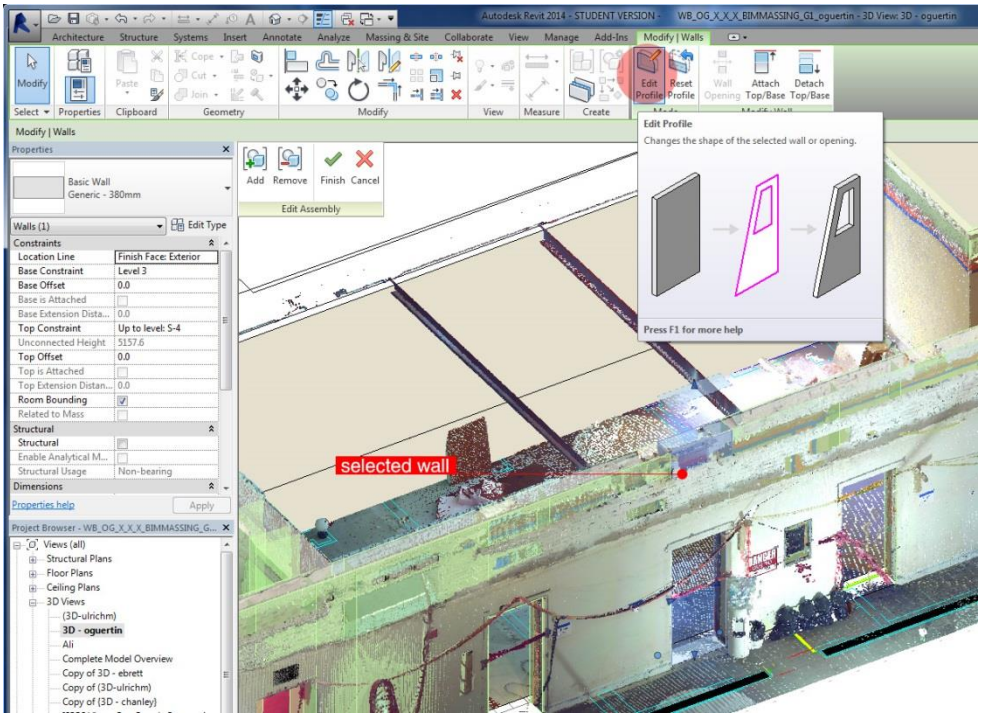
After, in the *Type Properties* window click the Duplicate button and a window “Name” shows up; change the name - it is suggested to change only the thickness value in “mm” – and click OK. Then, in order to change the thickness press the Edit button related to the wall structure.



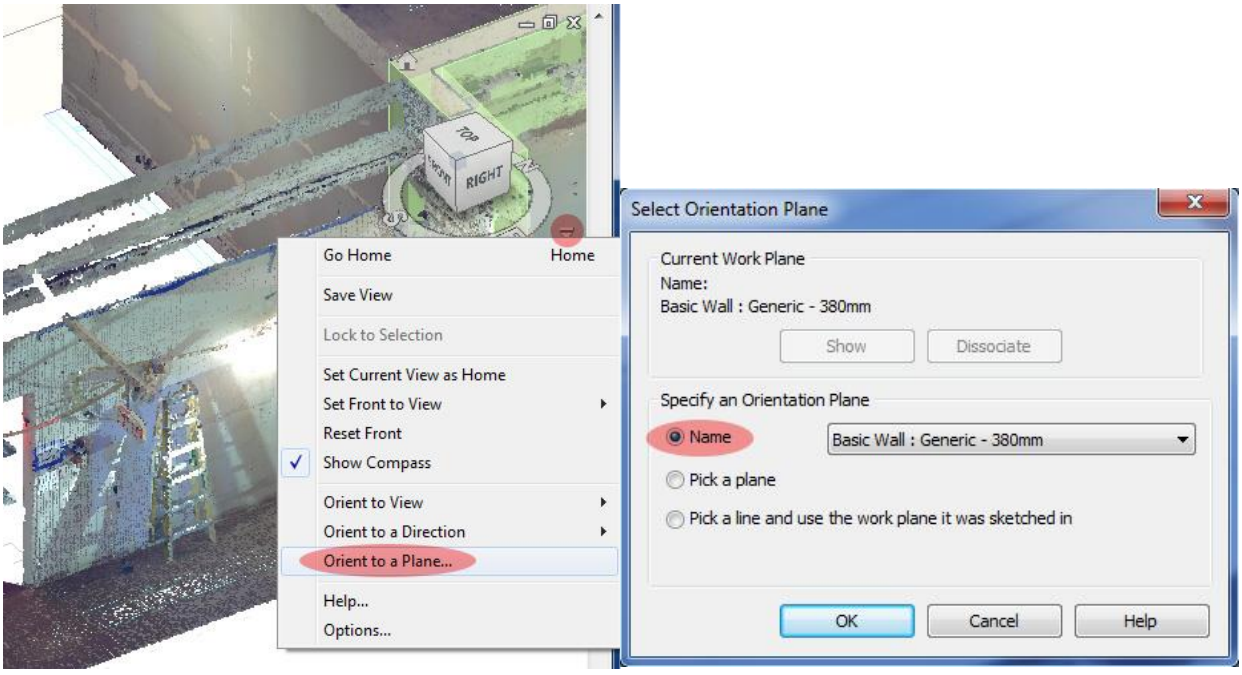
Lastly, enter a new value in the *Thickness* field that best coincides with the thickness of space measured between point cloud data.



Another advantage of using wall components is the ease of creating opening for mechanical or electrical equipment. Firstly, isolate the part to be modified with the *section box*. Then, select a single wall and in *Modify/Walls* tab > Mode category click Edit Profile.



Pink lines appear: those are wall profile lines. To rapidly orient view into elevation position, go to the Context Menu and select Orient to a Plane; in the *Select Orientation Plane* window, look if the chosen option button is at *Name* and press OK.



Editing profile lines is also simple. Zoom in to the opening and start tracing its shape using the tools in the *Modify/Edit Profile* tab > *Draw* & *Modify* categories (Line, Rectangle, Start-End-Radius Arc, Trim/Extend). Once finished, click the  in the *Mode* category.

