

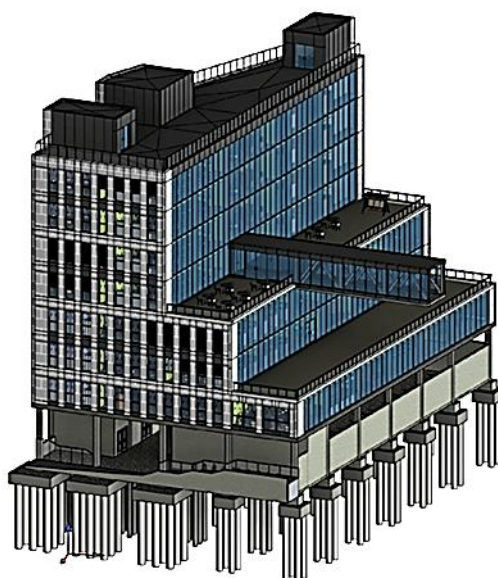
MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

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Methodological guidelines
the graphic job of

**«CREATION OF 3D BUILDING MODEL IN THE REVIT
SOFTWARE PRODUCT»**

*(for full-time foreign students education level «bachelor»
specialty 191 – Architecture and town-planning,
192 – Building and Civil Protection)*



Methodological guidelines the graphic job of «Creation of 3D building model in the Revit software product» (for full-time foreign students education level «bachelor» specialty 191 – Architecture and town-planning, 192 – Building and Civil Protection) / O. M. Beketov National University of Urban Economy in Kharkiv; com.: O. Mandrichenko, T. Demidenko. – Kharkiv : O. M. Beketov NUUE, 2020. – 42 p.

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The aim of the work

The presented methodological guidelines are developed for full-time foreign students education level «bachelor» specialty 191 – Architecture and town-planning, 192 – Building and Civil Protection.

The transformation of the world construction industry in recent years has been marked by the introduction of Building Information Modeling (BIM) technology. These technologies use a public information database consisting of a collection of library elements, each of which is presented in digital form and describes all the functional and physical properties of building objects.

The aim of the work to teach the students use opportunities of the specialized software product REVIT for creating a 3D building model. Teach using 3D libraries of structural elements: interior walls, doors, windows, exterior walls, floor slabs, roof elements, ceilings, floors using and in accordance with the requirements of existing DBN with customized annotations, analytical and other necessary.

1. Creation of a new architectural project

Create an architectural project. The easiest way is to click the Architecture Template button located on the left side of the project area in the Recent Files window. The second way is to click the New button in the same place or execute the command Create -> Project, located in the application menu (Fig. 1).

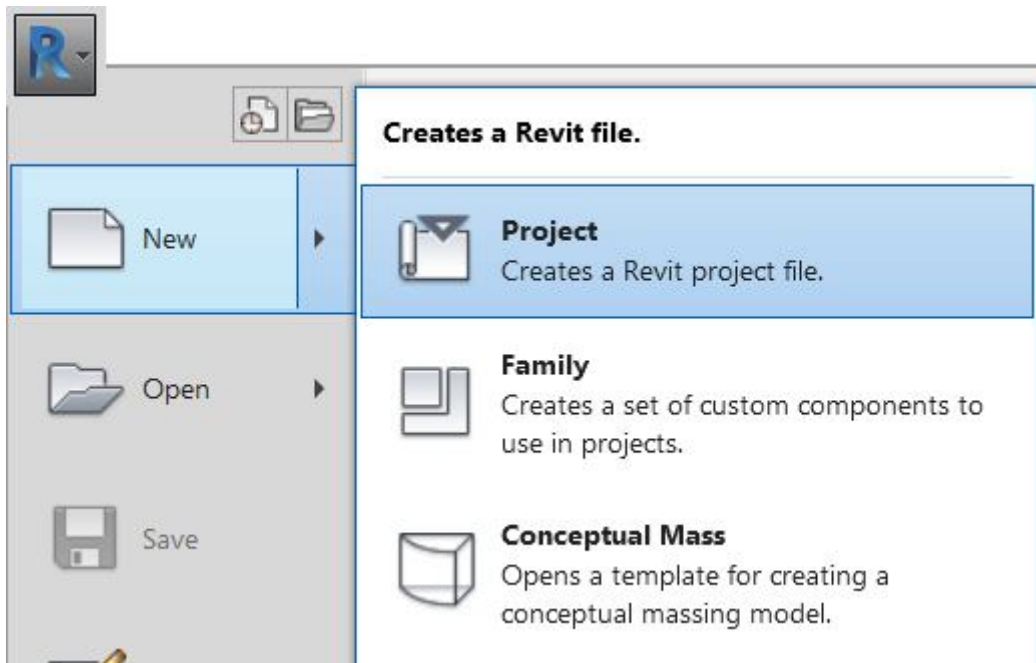


Figure 1 – Application menu

If you use the second method, the New Project window opens (Fig. 2). To select a template, expand the Template File drop-down list. To load a template that is not available in this menu, the Browse button is used. In the Create New area, you specify what exactly we are creating – Project or Project Template. In our case, you must select the Architectural template and tick the Project.

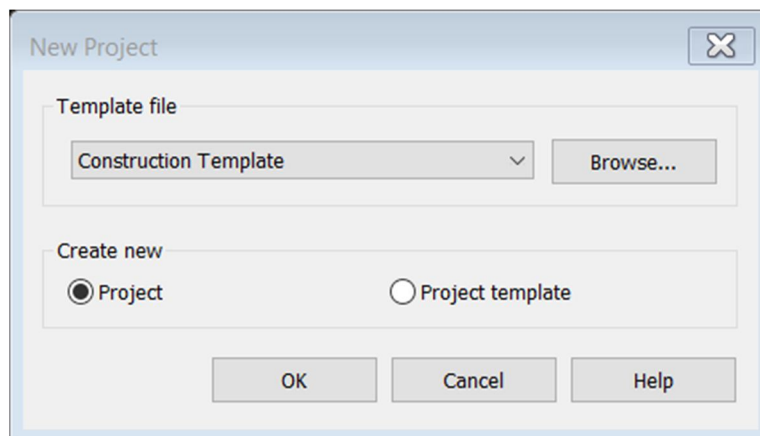


Figure 2 – New Project

2. Specifying axes and levels

Double-click on the LMC in the project manager and go to the Construction site plan (Fig. 3).

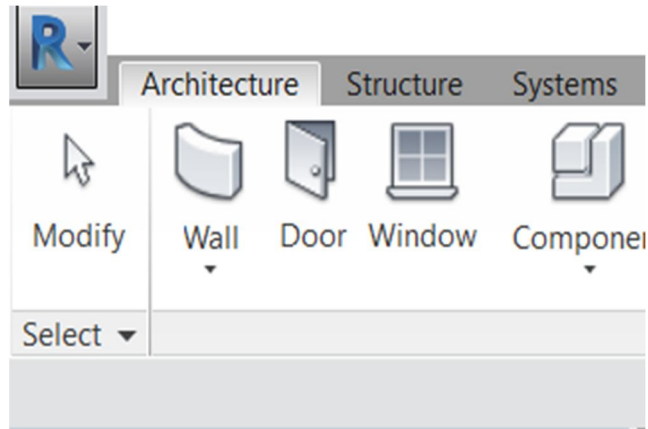


Figure 3 – Construction site plan

Activate the command Architecture -> Base -> Grid (Fig. 4).

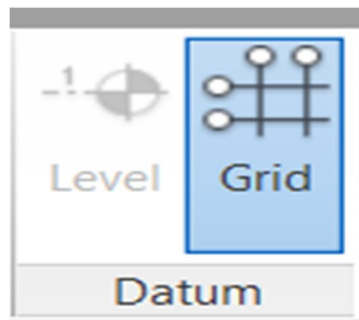


Figure 4 – Grid

Activate the Edit | Coordinates grid -> Draw -> Line (Fig. 5).

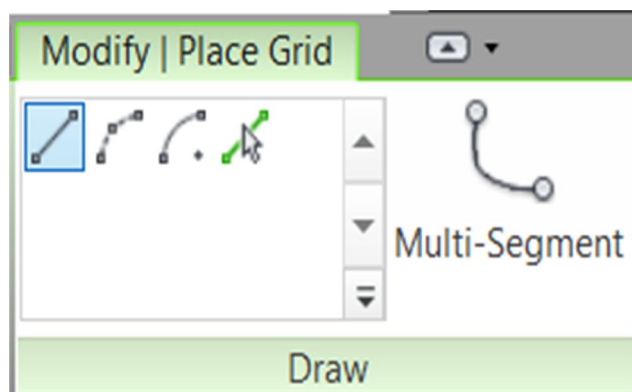


Figure 5 – Line

Draw an axis 1 in the drawing area (Fig. 6).



Figure 6 – Axis 1

Activate the Edit | Coordinates grid -> Drawing -> Select lines (Fig. 7).

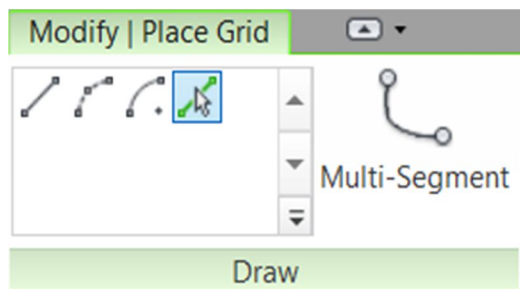


Figure 7 – Select lines

On the Options panel in the Offset window, set the offset value to 3000 (Fig. 8).

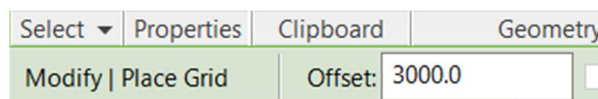


Figure 8 – Offset window

Move the cursor to the 1 axis in such a way that a blue dashed line appears on the right, and click the LMB (Fig. 9-1). The axis 2 will be built (Fig. 9-2). Build the axes 3 and 4 in the same way (Fig. 9-3).

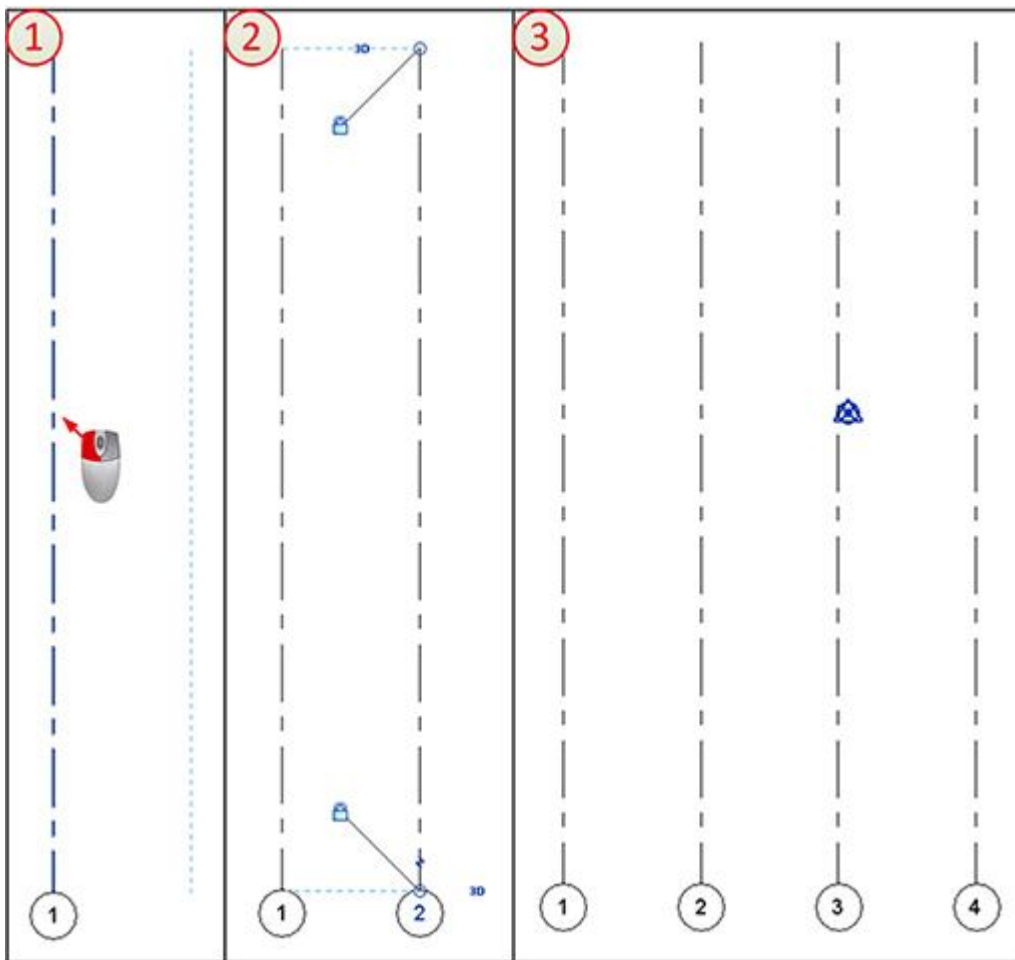


Figure 9 – Build the axes

Construct an axis perpendicular to the axes 1-4 (Fig. 10).

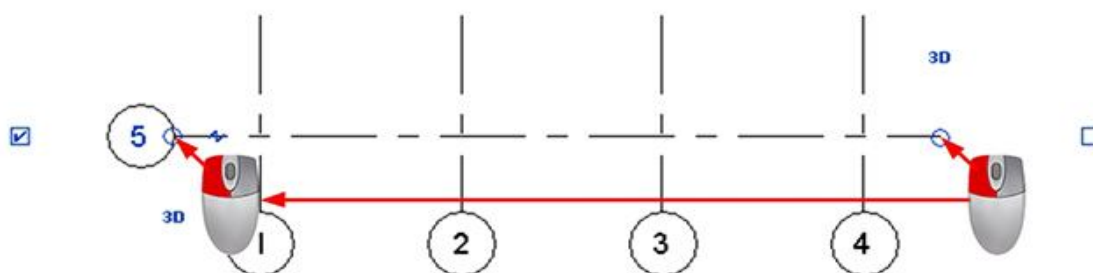


Figure 10 – Construct an axis

Click on the LMB along the 5 axis, and then on the mark (Fig. 11-1). Change the marking to the Russian letter A (Fig. 11-2 and 11-3). Click Spacebar or click LMB in any free place in the drawing area (Fig. 11-4).

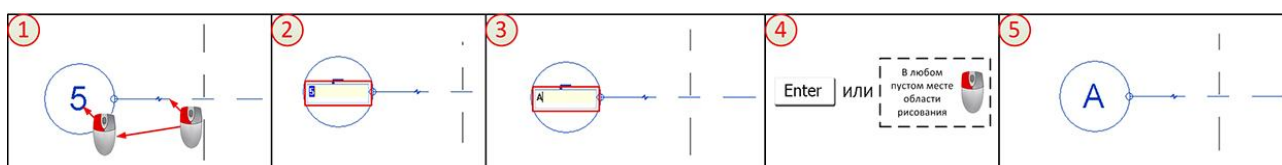


Figure 11 – Mark axis A

Repeating and construct the B, G and D axes (Fig. 12).

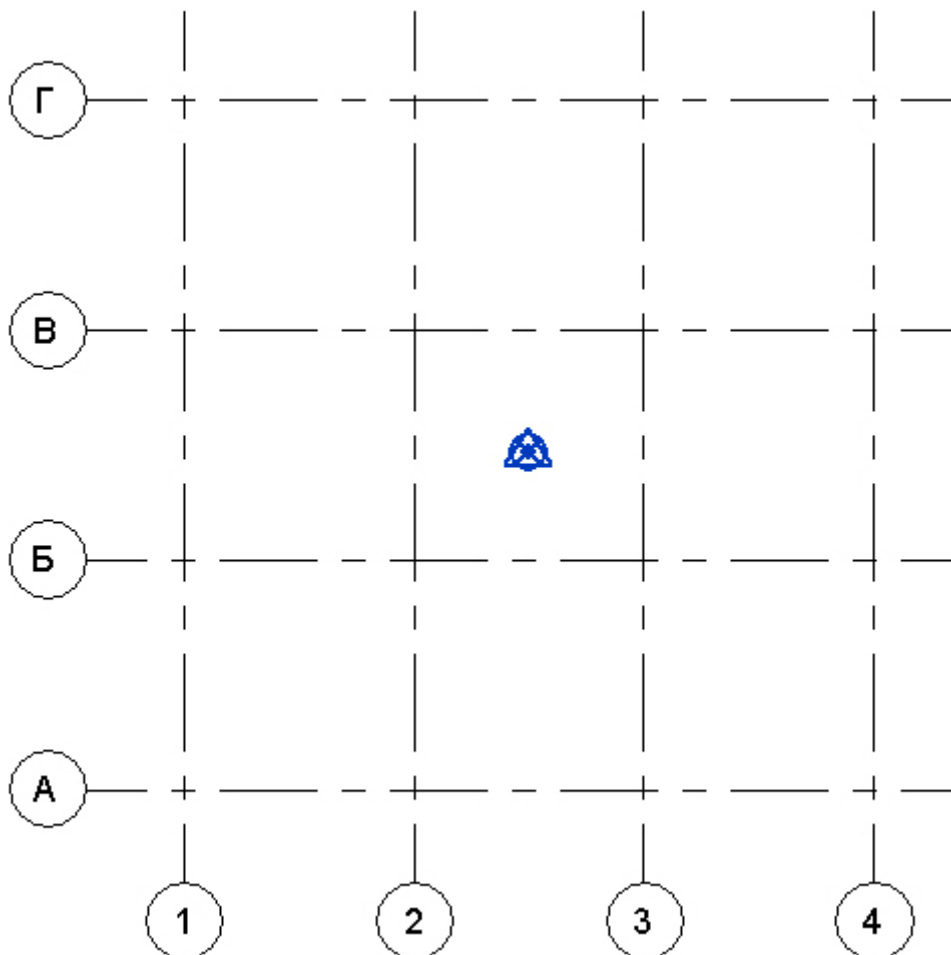


Figure 12 – Mark axis B, G and D

By successive clicks of the LMC along the axes from the 1st to the 5th, measure them (Fig. 13-1). With the last click in any free place in the drawing area, apply the dimensions. Lock the resulting dimensions by clicking on the icons in the form of open locks (Fig. 13-2 and 13-3). Set the size between axes 1 and 5 (Fig. 13-4).

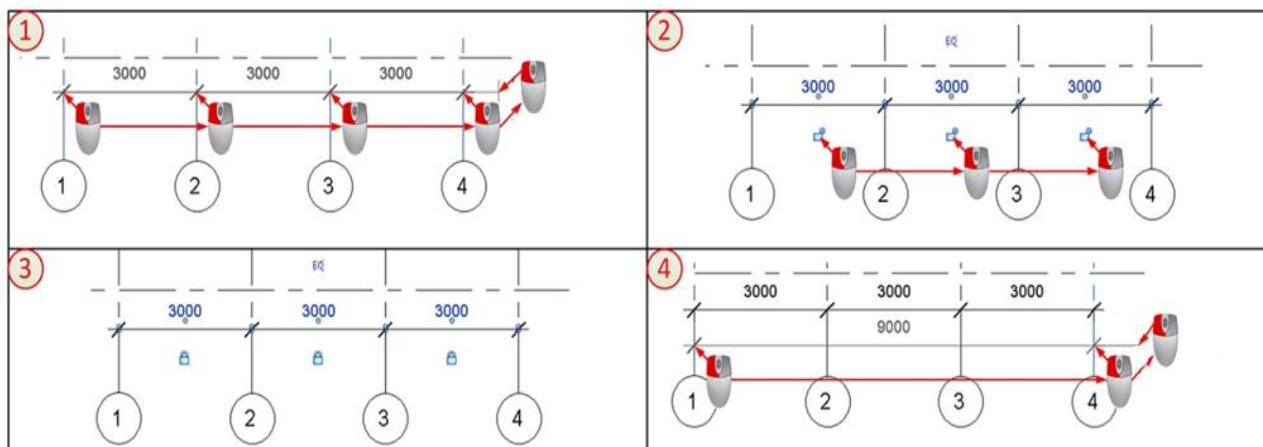


Figure 13 – Dimensions horizontal

Analogously dimension the axes A, B, C and D (Fig. 14).

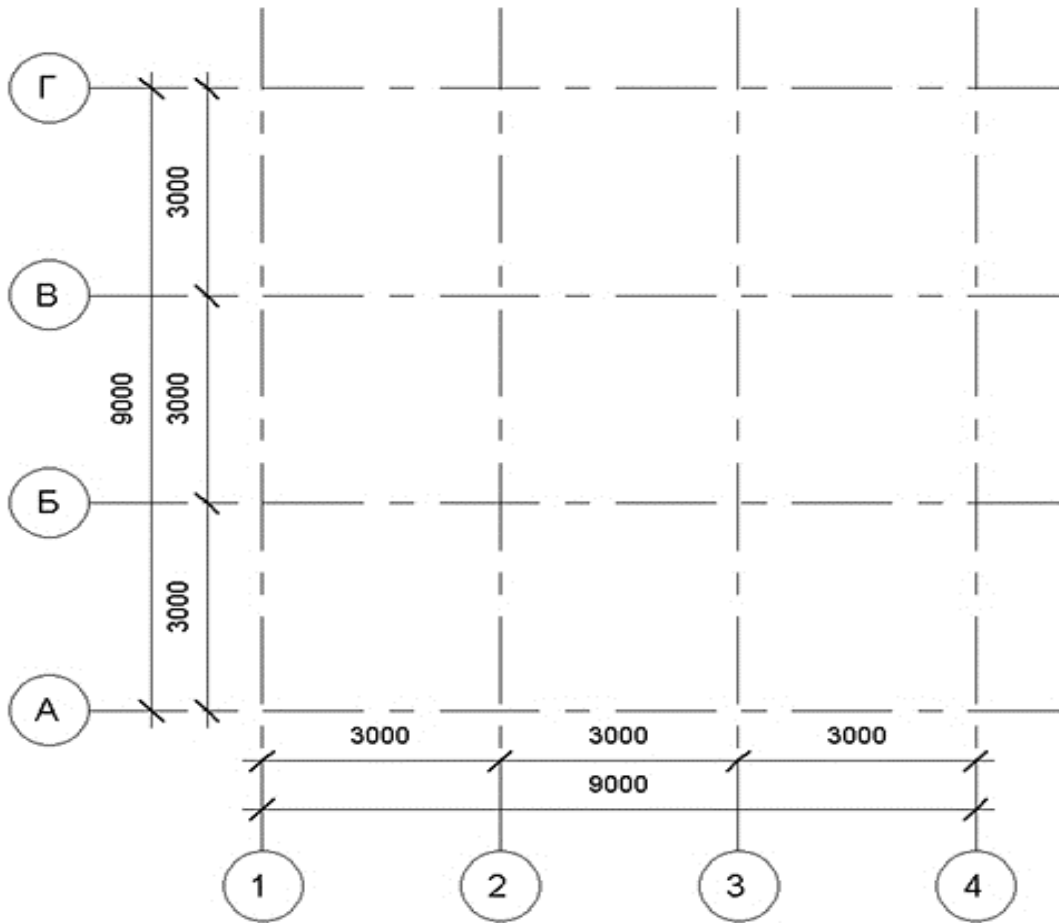


Figure 14 – Dimensions vertical

Double-click in the project manager, go to the East facade (Fig. 15).

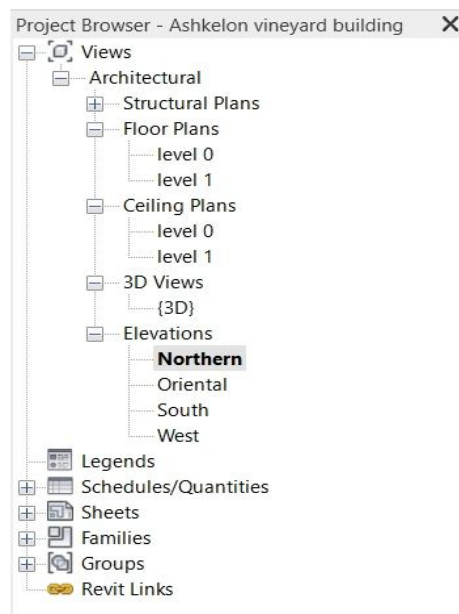


Figure 15 – East façade

Rename Level 1 to Floor 1 (Fig. 16-1), Level 2 to Mansard (Fig. 16-2). On the question Rename the relevant species? answer in the affirmative. Change the height of the Mansard level (Fig. 16-3).

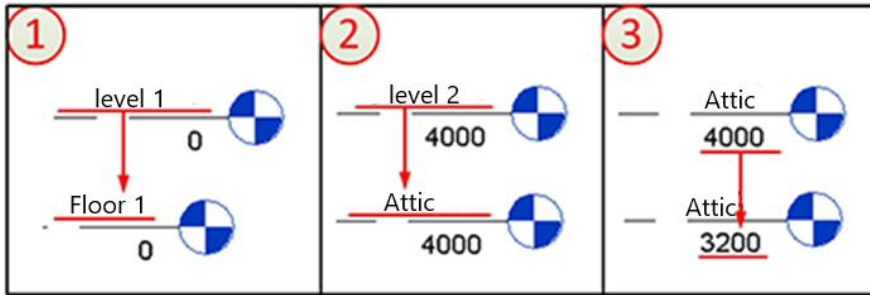


Figure 16 – Rename

Click the LMB axis (Fig. 17-1). On the Properties palette, click Change Type (Fig. 17-2). In the Type Properties dialog box that appears, in the Notation line that is not relevant to the plan view, expand the drop-down list and select Bottom (Fig. 17-3).

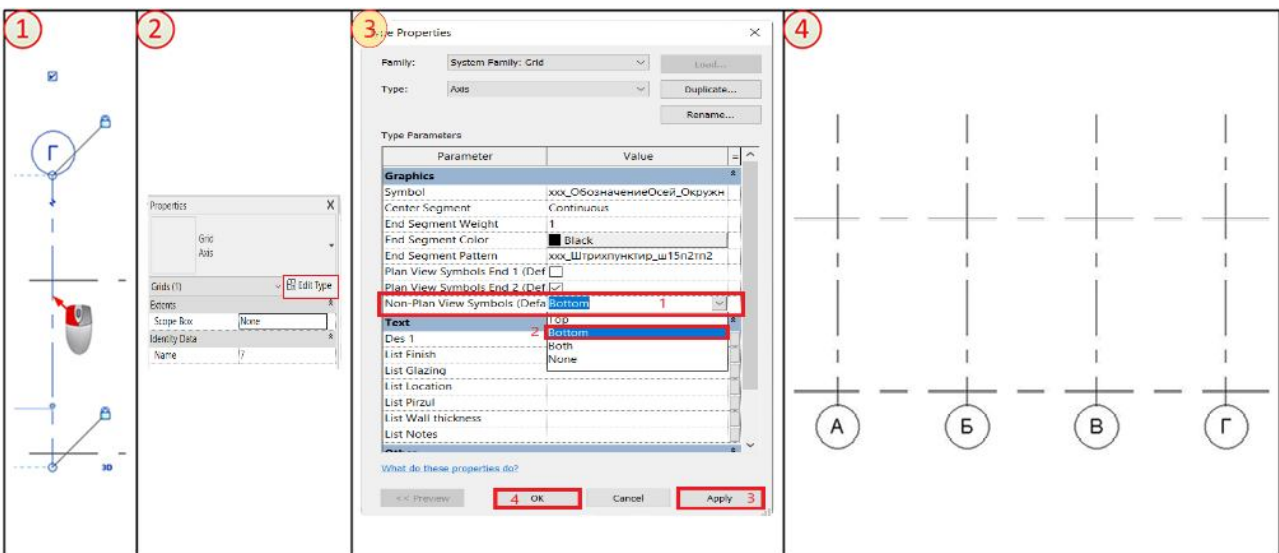


Figure 17 – select Bottom

3. Walls

Go to Floor 1. Activate the tool Architecture -> Formation -> Wall (Fig. 18).

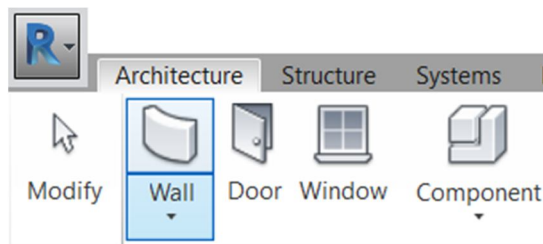


Figure 18 – Wall

In the options pane, select Height and Non-Connected in the drop-down list, in the window, write down 8000, check the Chain. Expand the Bindings drop-down list: and select Clarity surface: Interior (Fig. 19).

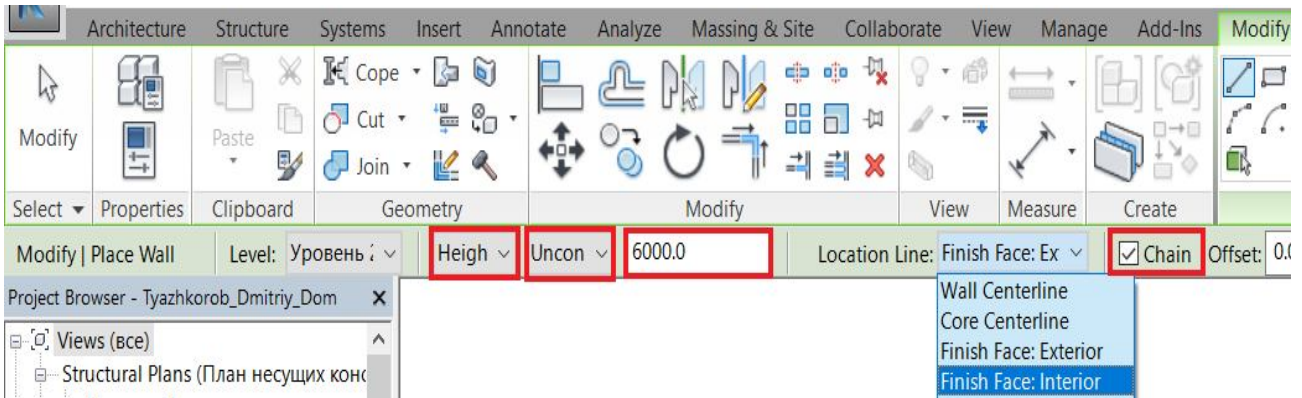


Figure 19 – Surface Interior

On the Properties palette, expand the list of dimension types and select Wall with air gap CW 102-50-100p (Fig. 20).

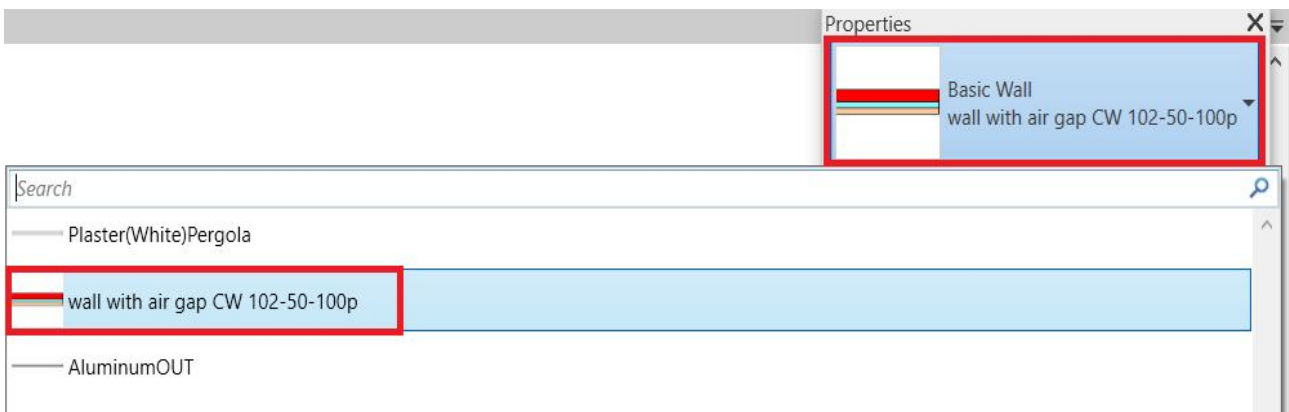


Figure 20 – select Wall

Construct an outer wall, successively clicking on the LMC along the intersections of the axes (Fig. 21):

- Γ and 1;
- Γ and 4;
- A and 4;
- A and 1;
- again Γ and 1;
- Press Esc.

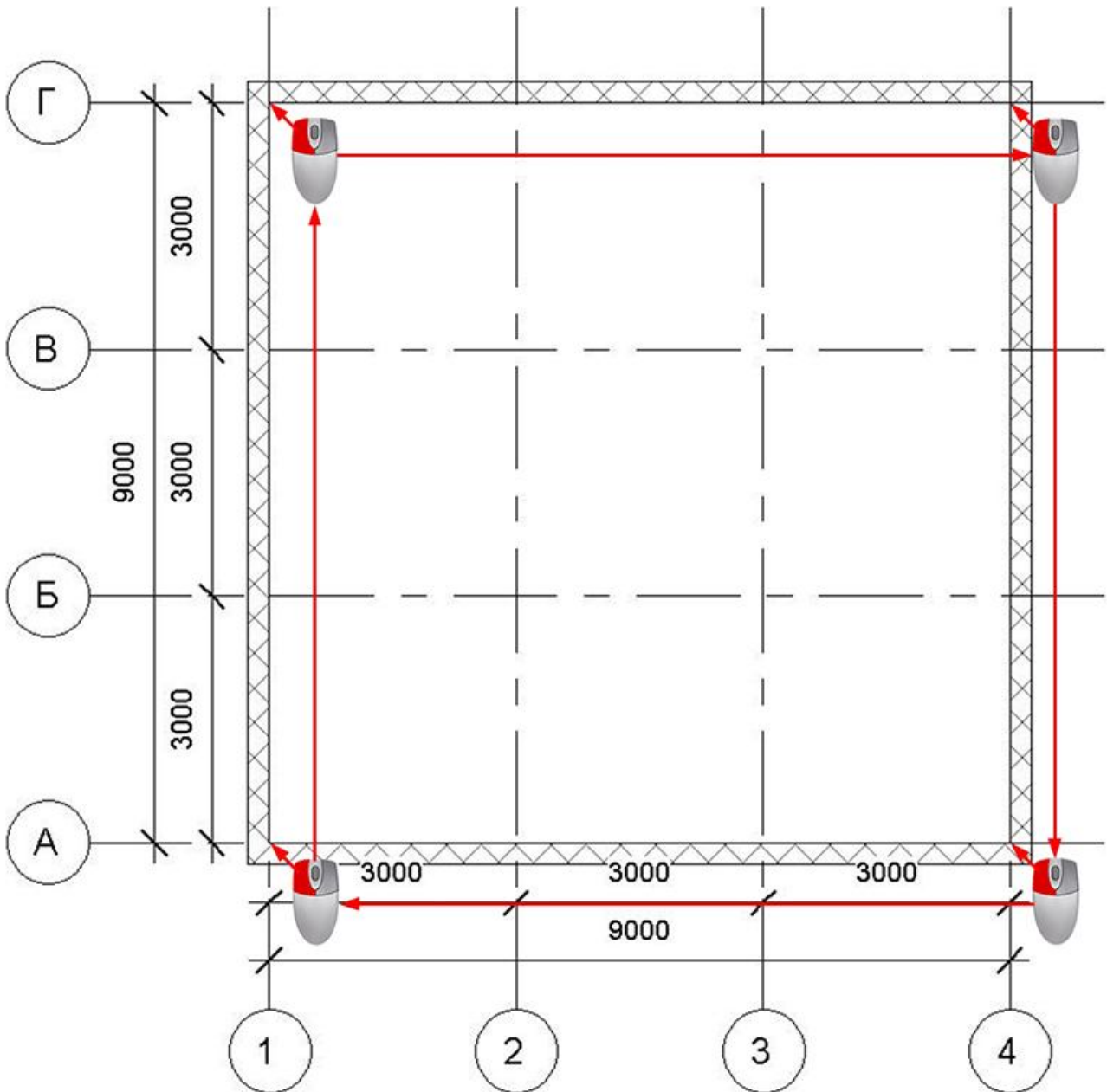


Figure 21 – Intersections of the axes

Use the Properties palette to select the Typical Size – 200 mm (Fig. 22).

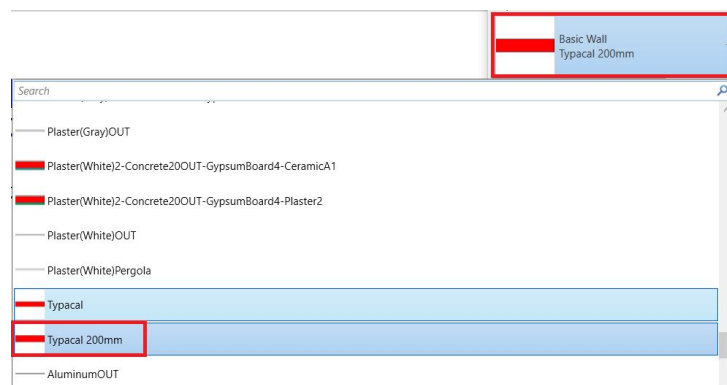


Figure 22 – Select the Typical Size

In the options panel, select the Mansard item in the drop-down list (Fig. 23).

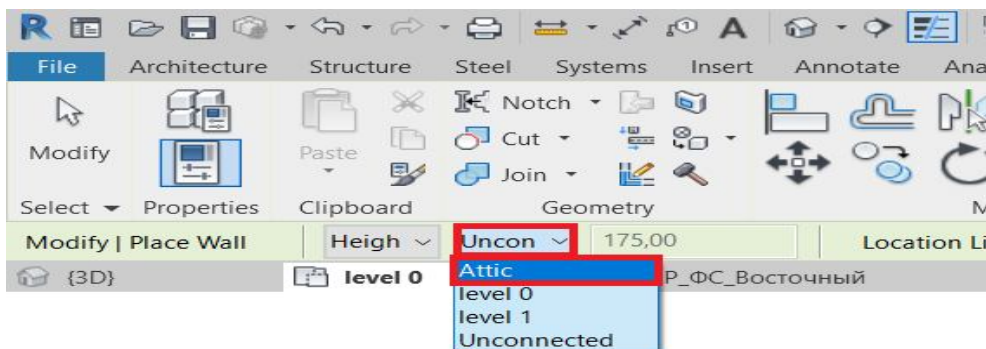


Figure 23 – Options panel

Draw the inner walls. For this purpose (Fig. 24):

- click the LMB in sequence to intersect the B and 4 axes and the B and 1 axes;
- press Esc;
- click the LMB in sequence to intersect the axes B and 4, the axes B and 3 and the axes A and 3;
- press Esc.

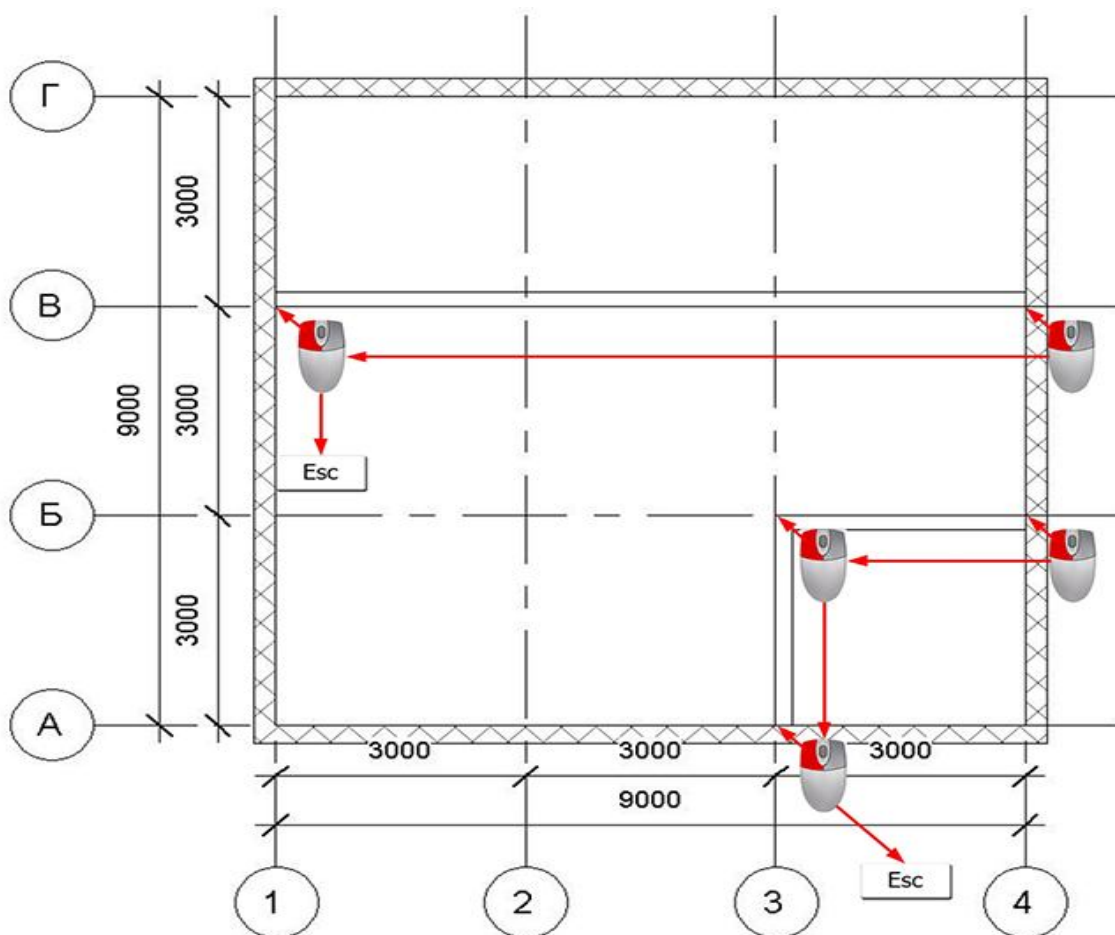


Figure 24 – Inner walls

If you need to turn the wall, then you need to select it and click on the icon in the form of two arrows (Fig. 25).

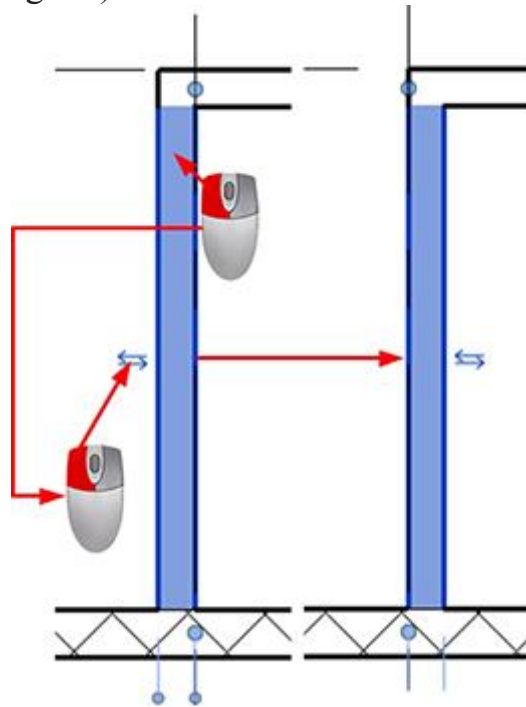


Figure 25 – Turn the wall

Go to the Attic plan. Activate the Wall tool. In the options panel, in the drop-down list, select Non-connected, height – 6000 (Fig. 26).

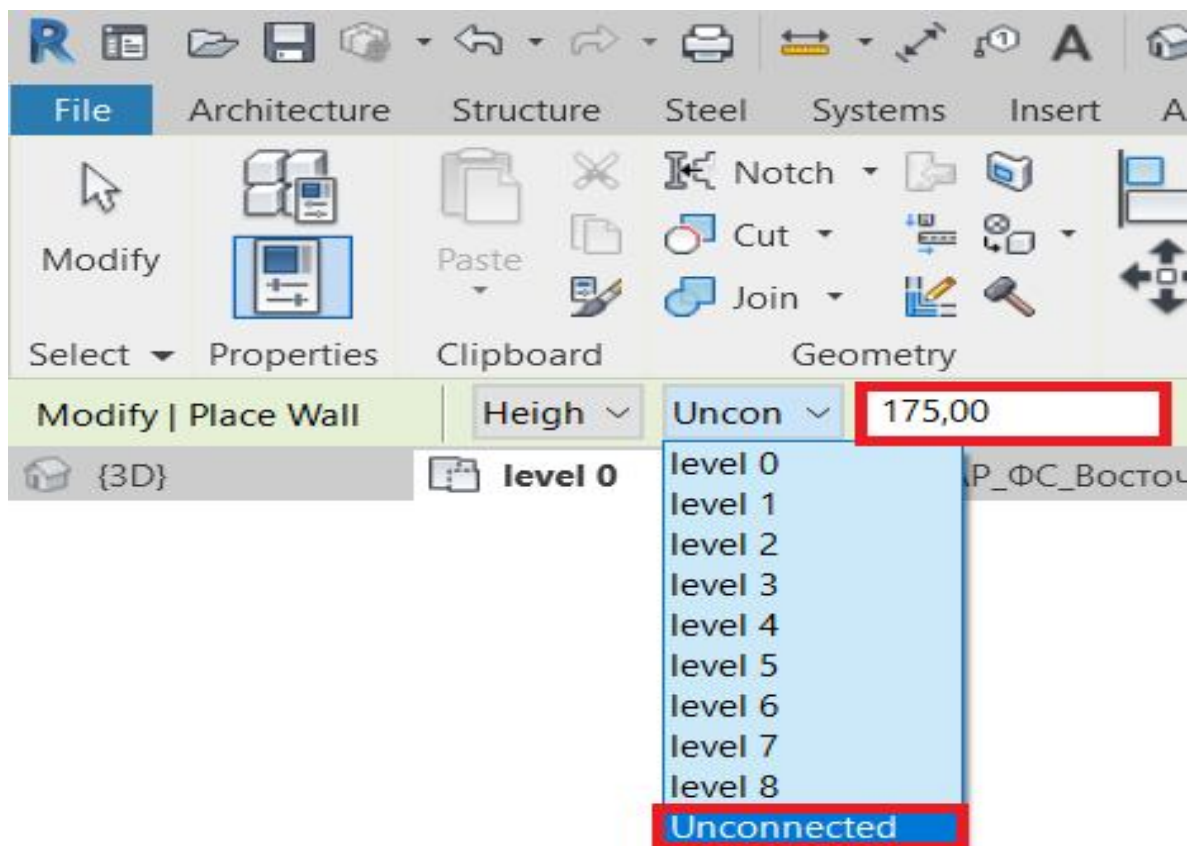


Figure 26 – Select Unconnected

Draw the inner walls of the attic (Fig. 27).

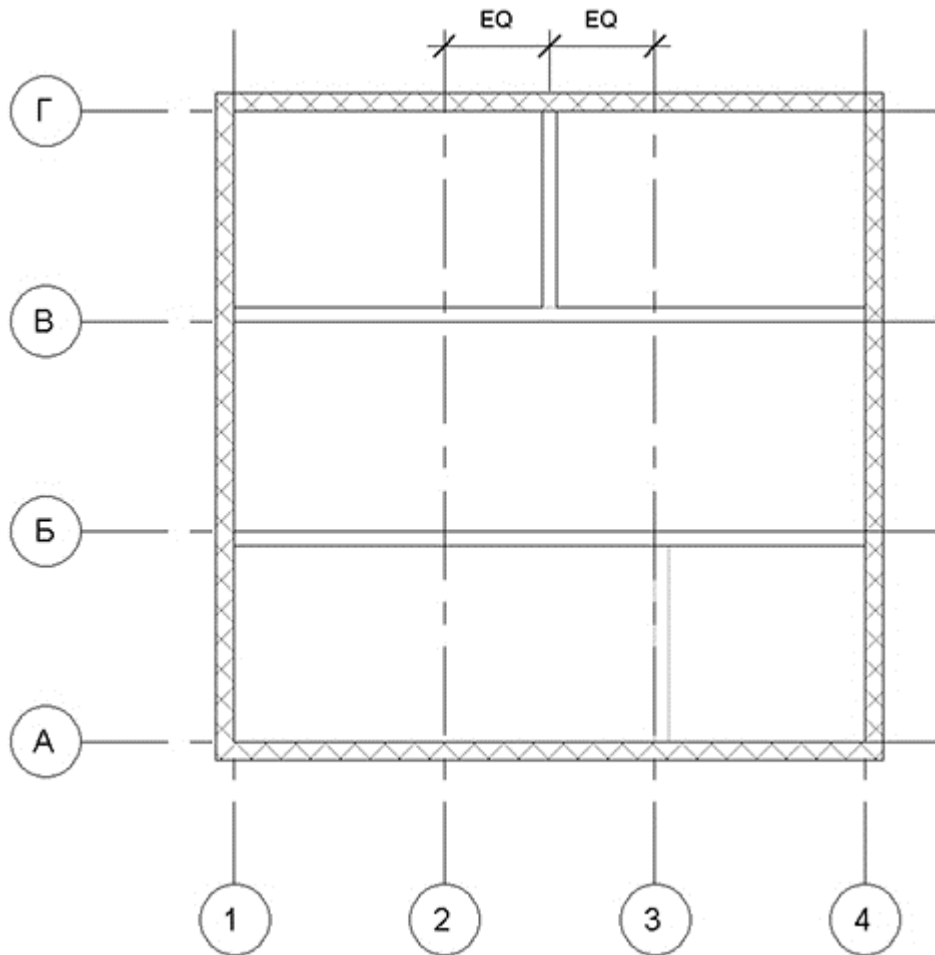


Figure 27 – Inner walls of the attic

To align the wall between axes 2 and 3, do the following:

- activate the command the parallel dimension;
- sequentially click the LMC axis 2, wall and axis 3 (Fig. 28-1);
- take out the size beyond the wall and apply it (Fig. 28-2);
- Click the icon with the letters EQ crossed (Fig. 28-3).

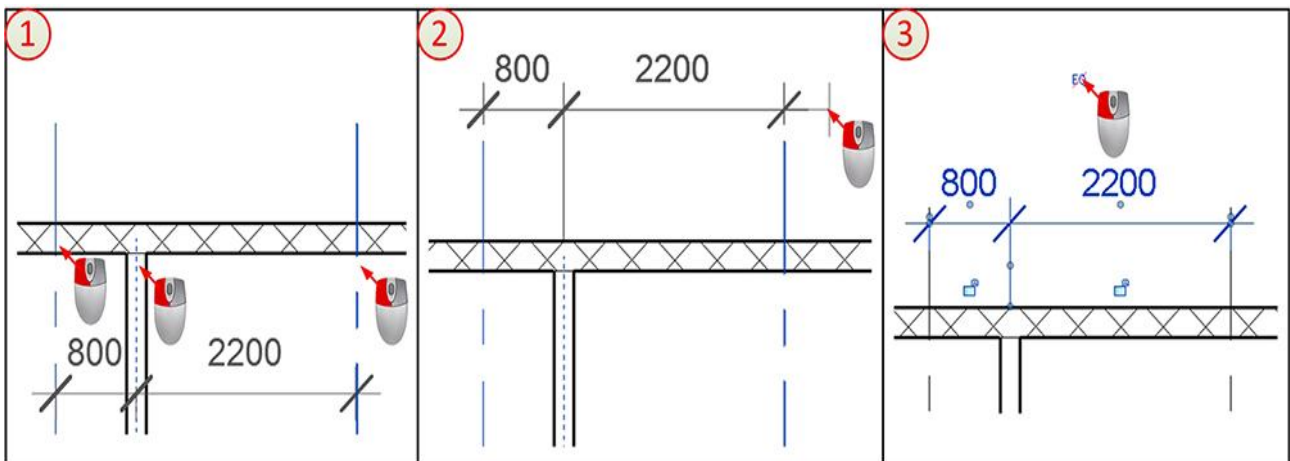


Figure 28 – Align the wall

4. Overlapping

Go to Floor 1. Activate the tool Architecture -> Formation -> Overlap -> Overlap: architectural (Fig. 29).

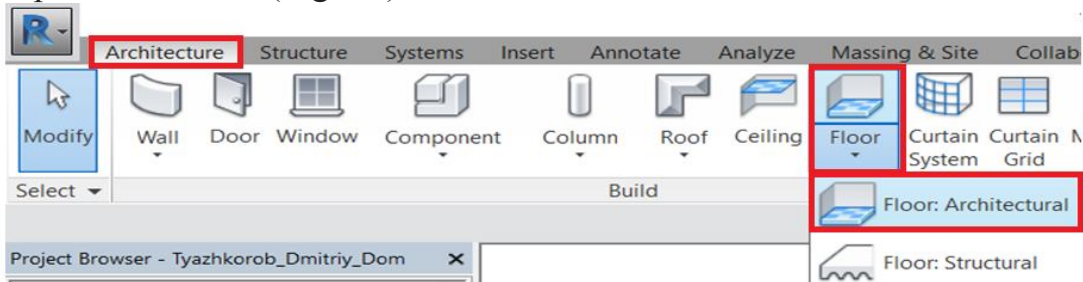


Figure 29 – Select Architectural

Activate the Edit | Create a floor array -> Draw -> Select lines (Fig. 30).

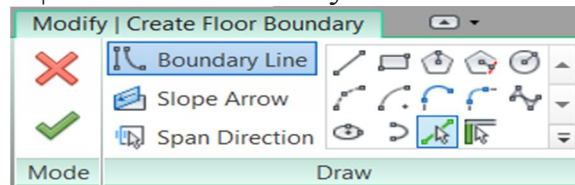


Figure 30 – Select lines

Move the cursor to the outer surface of the outer wall of the axis 1. It lights up in blue, click on the LMB (Fig. 31-1). The first segment of the overlapping contour appears, lock it (Fig. 31-2). Construct the remaining segments. Leave only the segment of the A axis unblocked (Fig. 31-3).

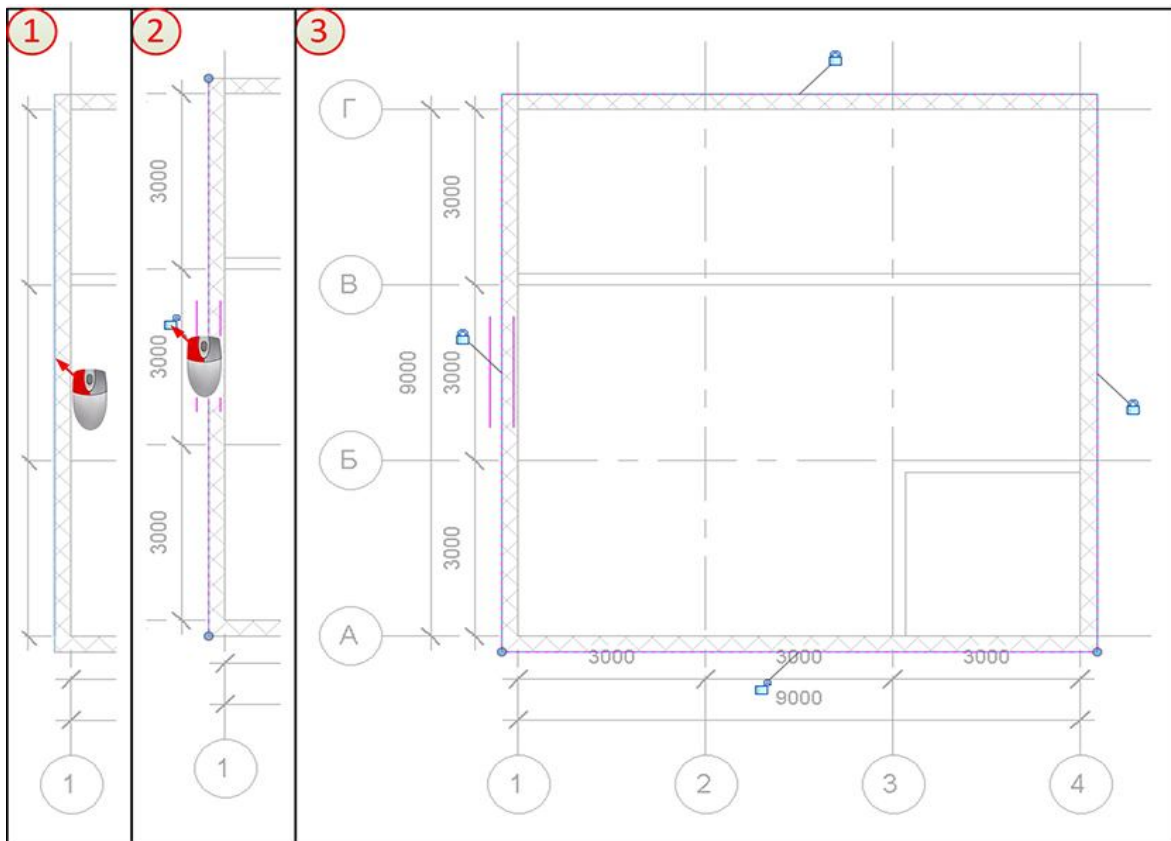


Figure 31 – Remaining segments

Activate the Edit | Create a floor array -> Draw-> The line (Fig. 32).

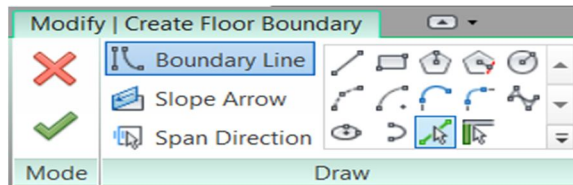


Figure 32 – The line

Construct three segments (Fig. 33).

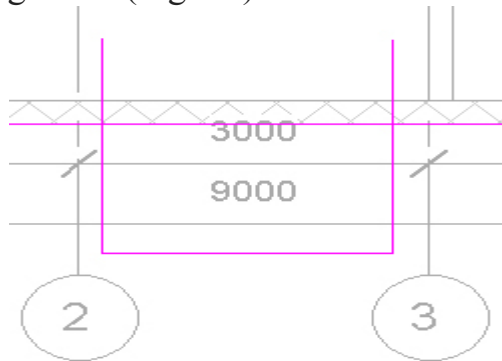


Figure 33 – Segment

Activate the Edit -> Draw -> Split Element tool (Fig. 34).

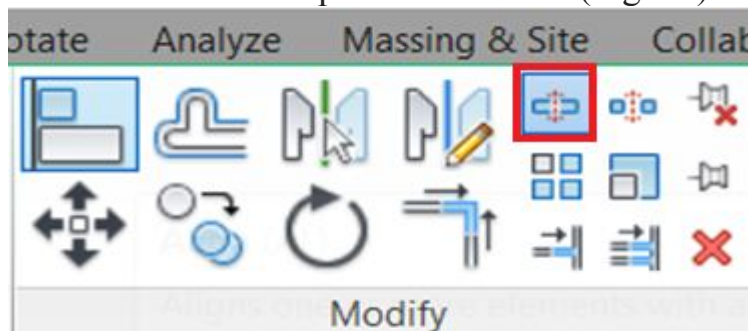


Figure 34 – Split Element tool

Hover the cursor to the center of the line of the A axis and click the LMB to split it (Fig. 35).

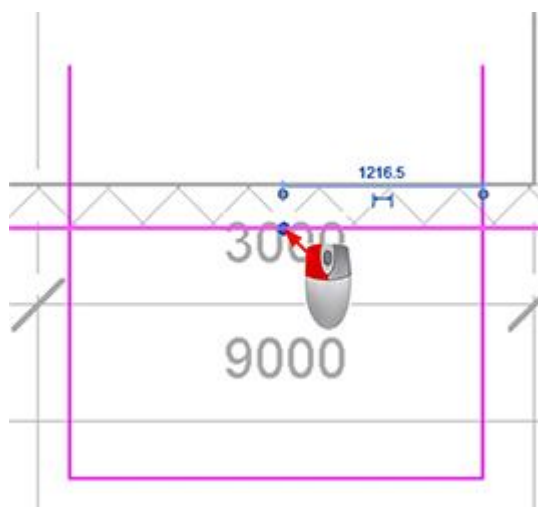


Figure 35 – Split line

Activate the tool Edit -> Draw -> Trim / Extend to the corner (Fig. 36).

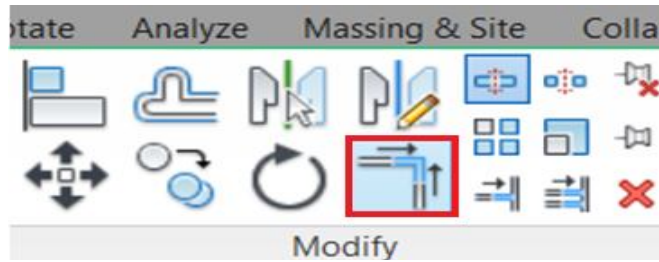


Figure 36 – Extend to the corner

Click on the line segment as shown in Fig. 37-1 and 37-2. Unnecessary stretches are cut off, the result is displayed in Fig. 37-3.

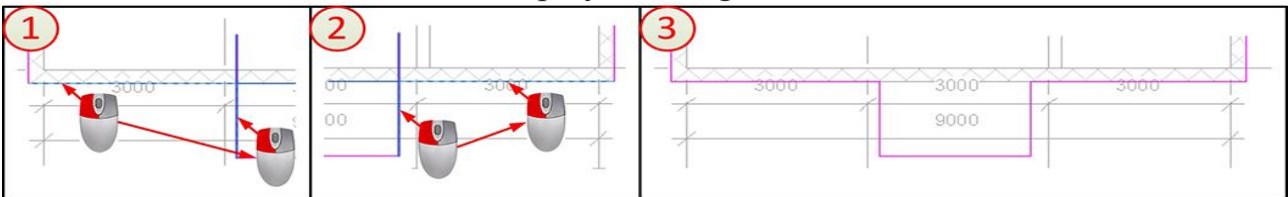


Figure 37 – Unnecessary stretches

Activate the Edit -> Draw -> Align tool (Fig. 38).

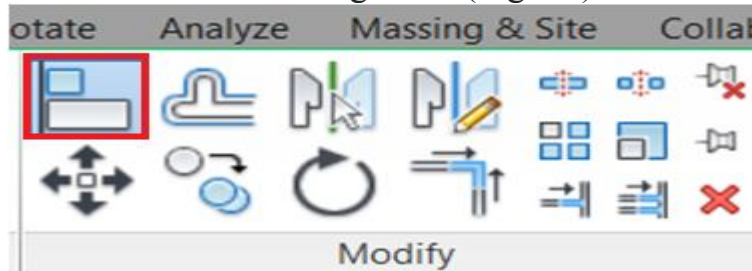


Figure 38 – Align tool

Click along the axes and segments, as shown in Figure 39-1 and 39-2, which would align the segments relative to the axes (Fig. 39-3).

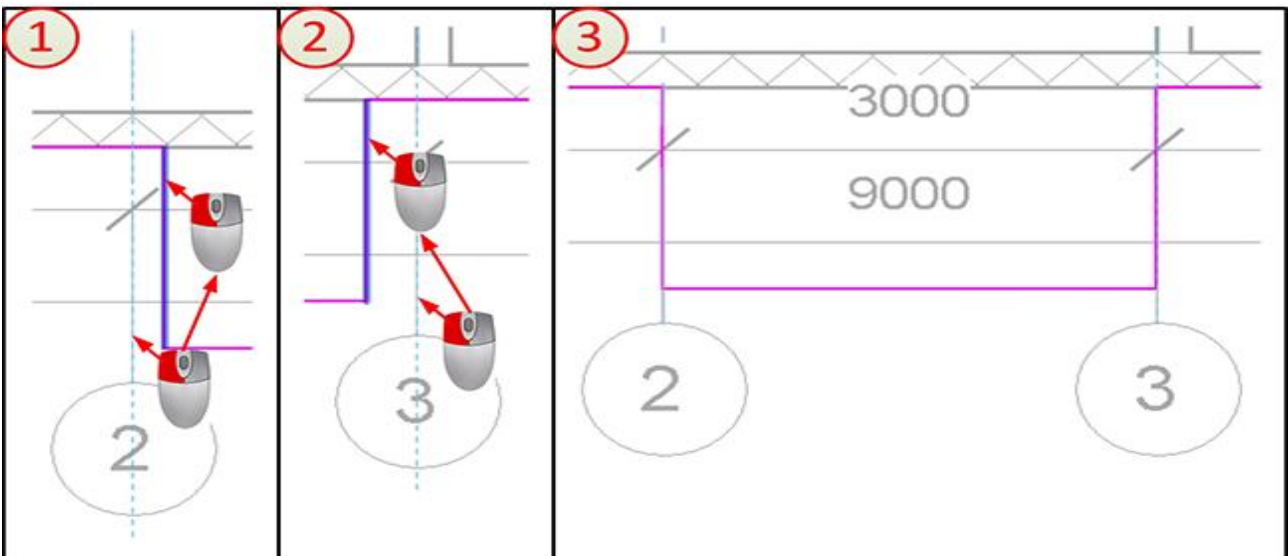


Figure 39 – Align the segments

Click the LMB along the segment between axes 2 and 3, the time dimension appears, click on it LMC and change it to 1500 (Fig.40).

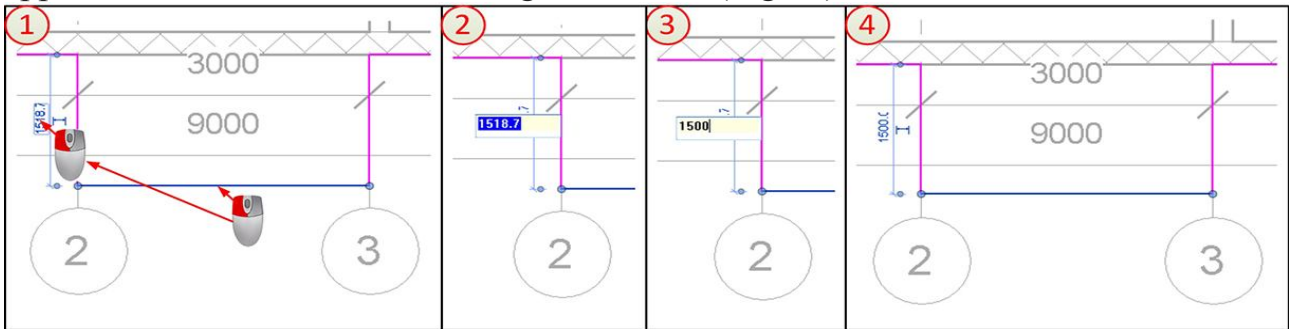


Figure 40 – Change segment

Complete the overlay sketch by clicking Edit | Create a floor array -> Mode -> Exit the editing mode (Fig. 41).



Figure 41 – Exit the editing mode

The result should look like in Figure 42.

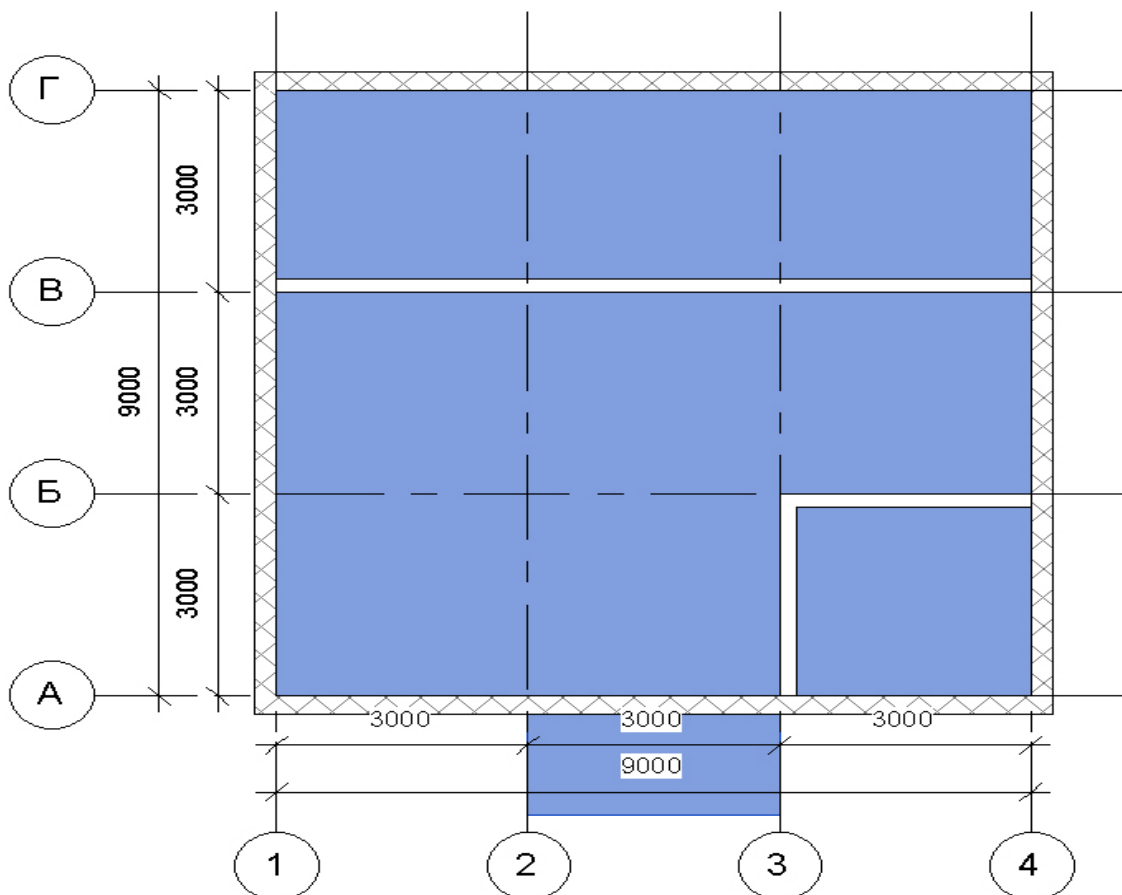


Figure 42 – Building result

Go to the Attic plan. Activate the tool Architecture -> Formation -> Overlap -> Overlap: architectural.
Activate the Edit | Create a floor array -> Draw -> Select walls (Fig. 43).



Figure 43 – Select walls

Move the cursor to one of the walls. Press Tab. The whole chain of walls will be illuminated. Click the LMB on the wall (Fig. 44-1). A contour of overlap will be created along the perimeter of the walls (Fig. 44-2).

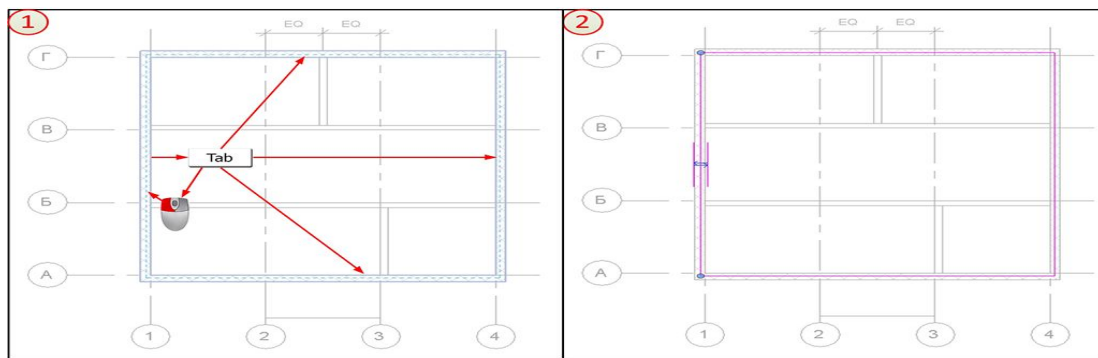


Figure 44 – Contour of overlap

The result should look like in Figure 45.

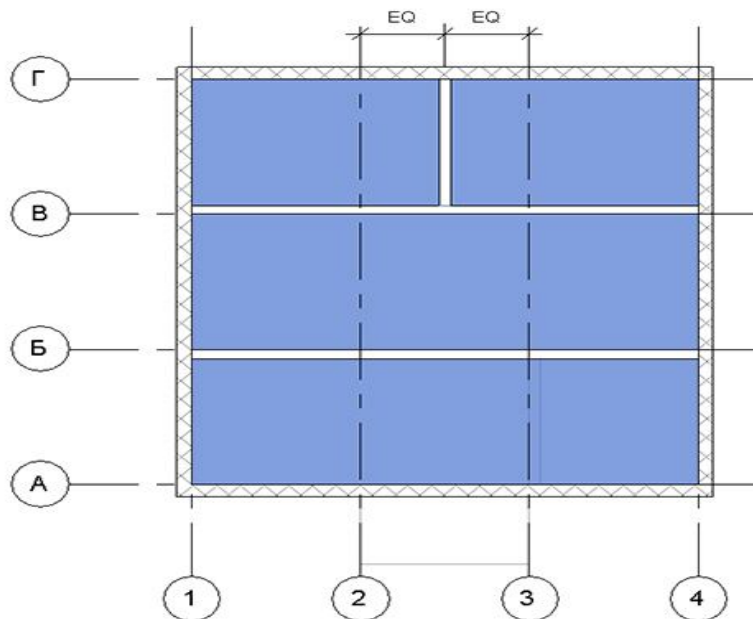


Figure 45 – Building result

5. The roof

Go to the Attic plan. Activate the command Architecture -> Formation -> Roof -> Roof over the contour (Fig. 46).

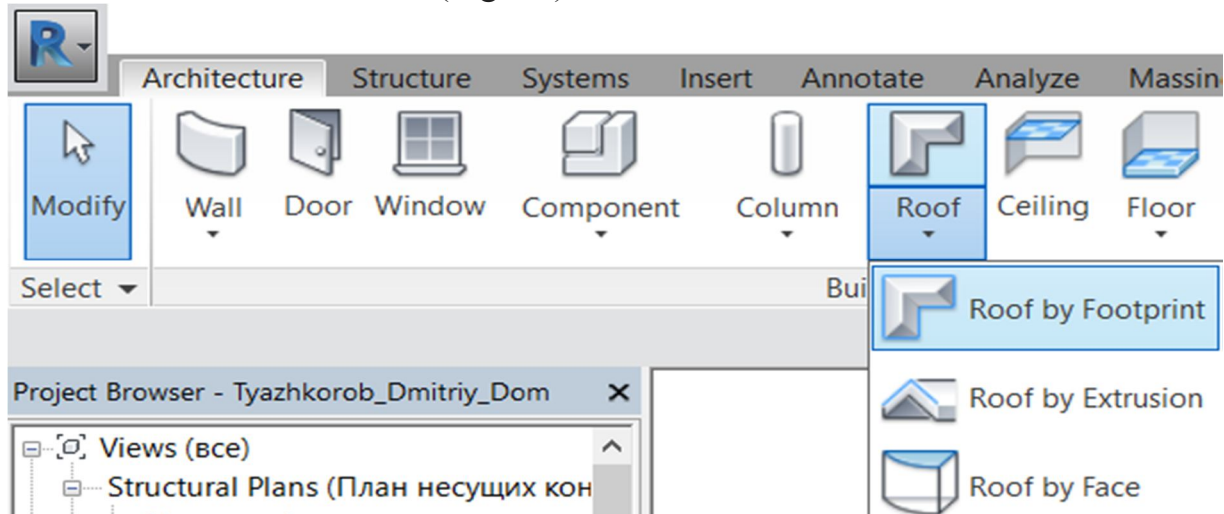


Figure 46 – Roof over the contour

On the Properties palette, expand the list of dimension types, and select Typical – 400mm (Fig. 47).

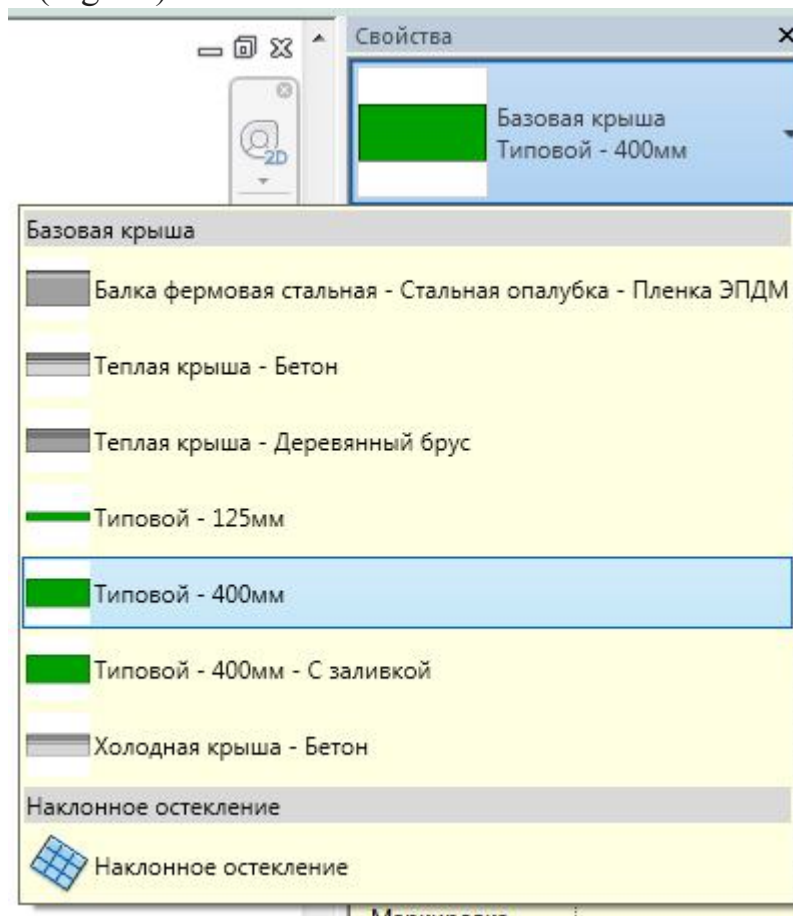


Figure 47 – Select Typical

On the Properties palette in the Offset from the level row, set the offset to 1000 (Fig. 48).

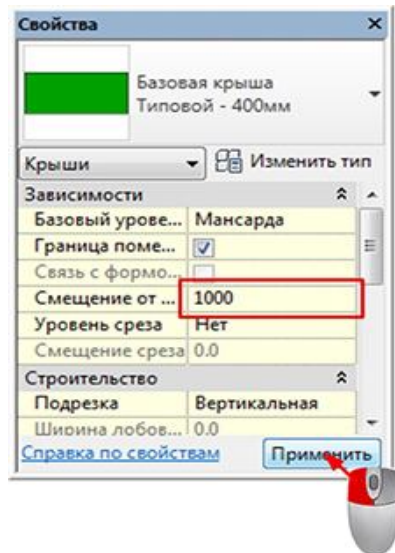


Figure 48 – Set the offset

Activate the Edit | Create a contour of the roof -> Draw -> Rectangle (Fig. 49).

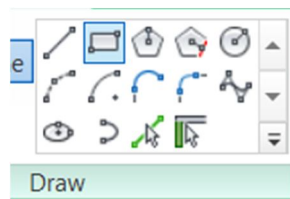


Figure 49 – Rectangle

Circle the outer walls of the rectangle (Fig. 50).

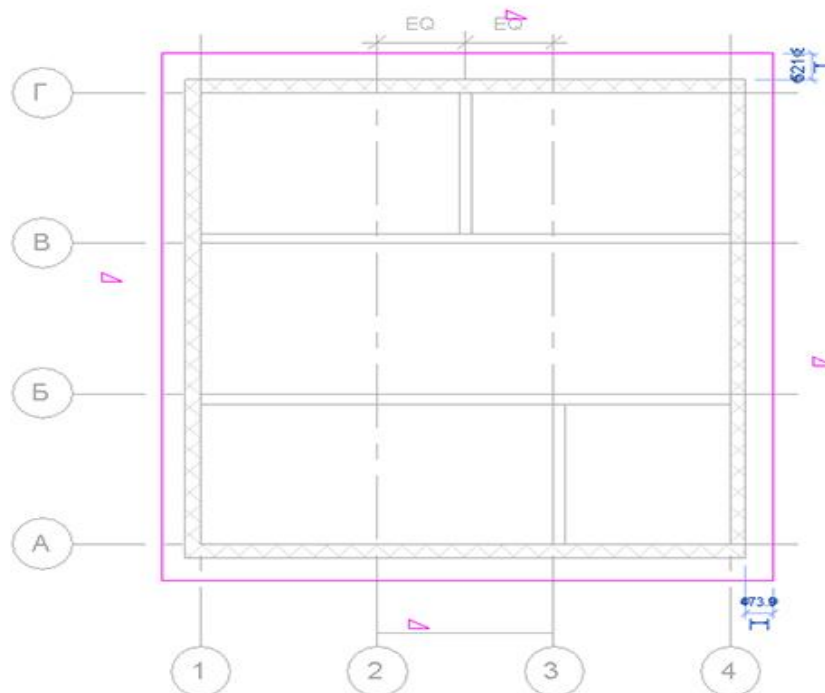


Figure 50 – Circle the outer walls

Using the time dimensions for each section of the contour, set the distance from the outer contour of the wall to 400 mm (Fig. 51).

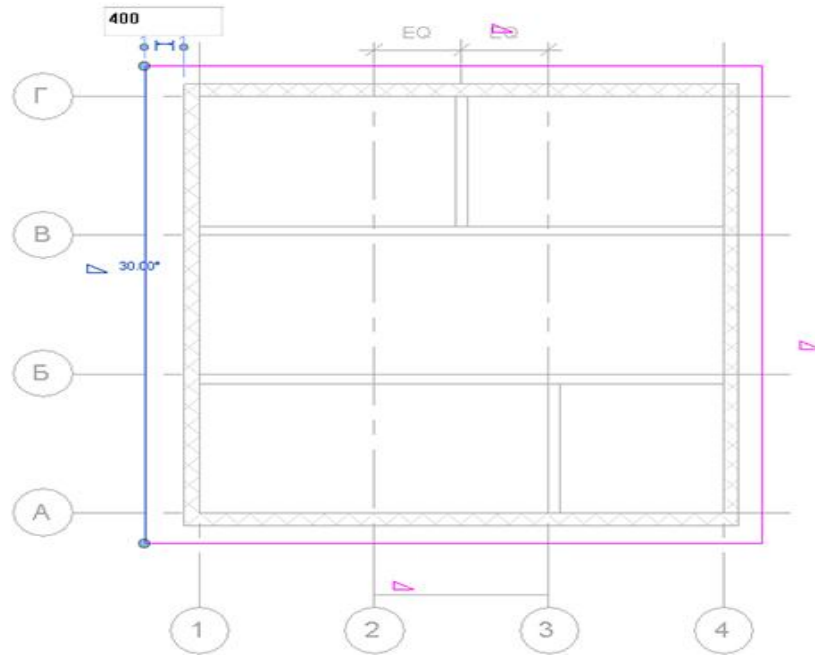


Figure 51 – Section of the contour

Using Ctrl, select the segments along the axes 1 and 4 (Fig. 52)

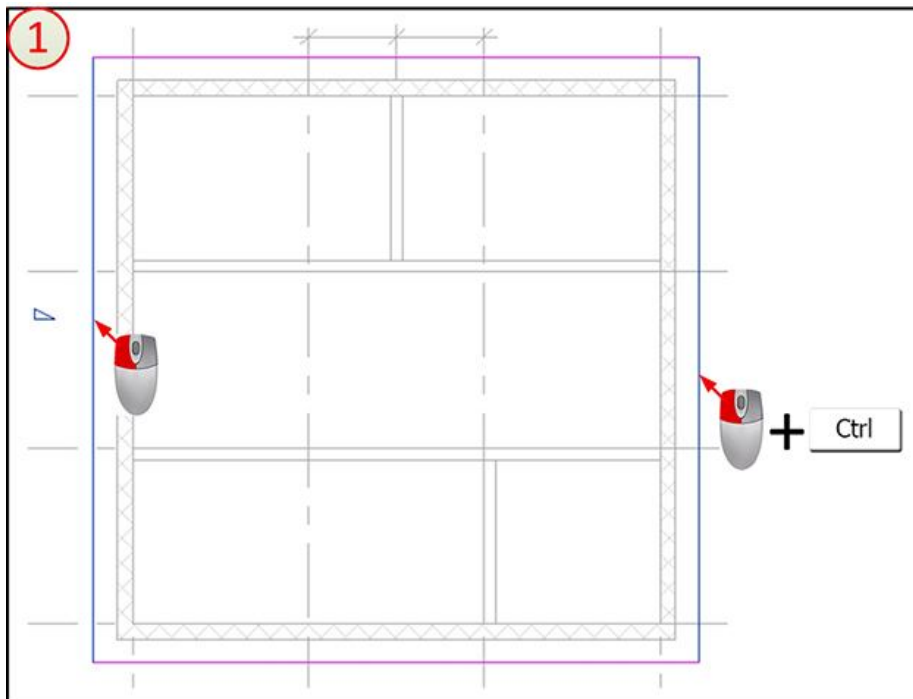


Figure 52 – Select the segments

Complete the overlay sketch by clicking Edit | Create a roof contour -> Mode -> Exit the editing mode. The program will ask the question, answer «yes» in the affirmative.

6. Windows

Go to Floor 1. Activate the tool Architecture -> Formation -> Window (Fig. 53).

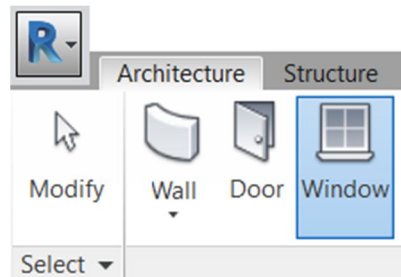


Figure 53 – Formation

Click Edit | Coordinates Window -> Mode -> Load family (Fig. 54).

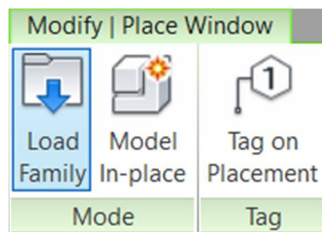


Figure 54 – Coordinates Window

In the window that opens, navigate to the Windows folder and load the Double-down double-trimmed window family (Fig. 55).

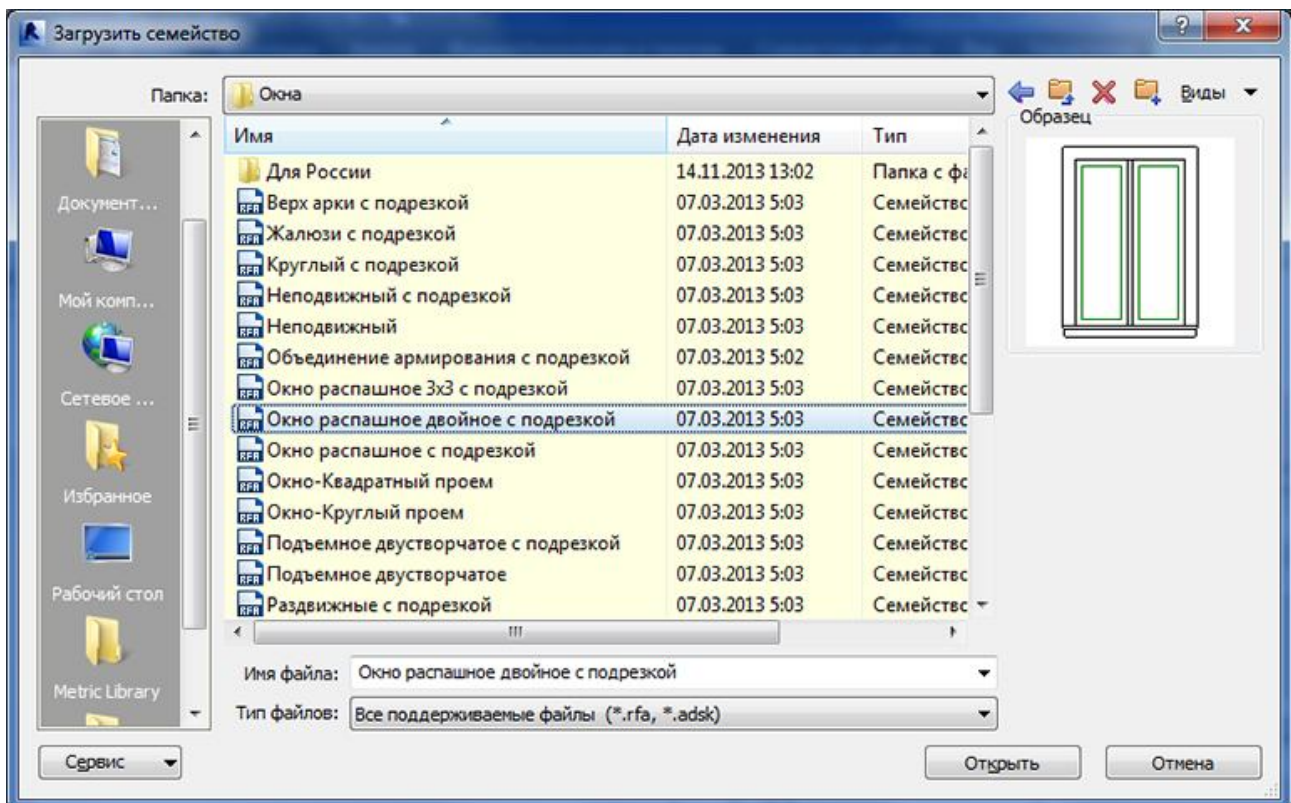


Figure 55 – Window famil

On the Properties palette, in the list of dimension types, select 1220 × 1220 mm (Fig. 56).

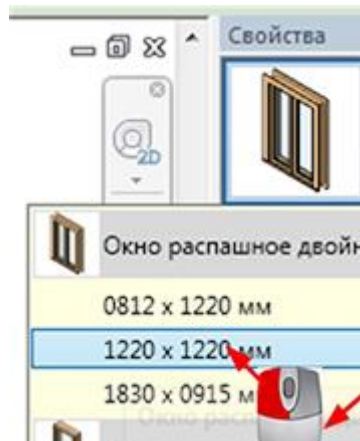


Figure 56

Hover the cursor over the wall, as shown in Figure 57-1 and click the LMB. The window will be installed (Fig. 57-2).

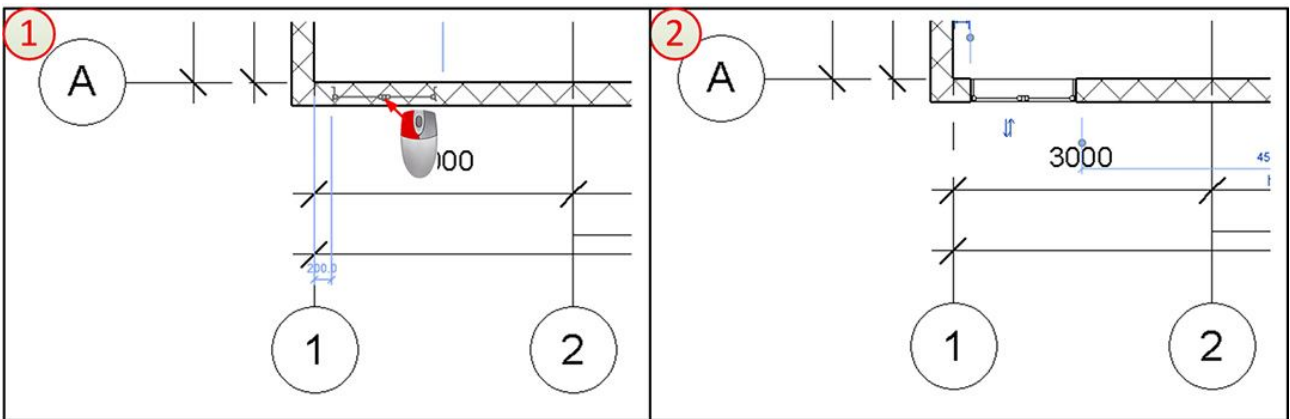


Figure 57 – Installed window

After activating the Parallel size command, align the window with respect to axes 1 and 2 (Fig. 58). The blue line in the center of the window will appear when you hover over the center of the cursor.

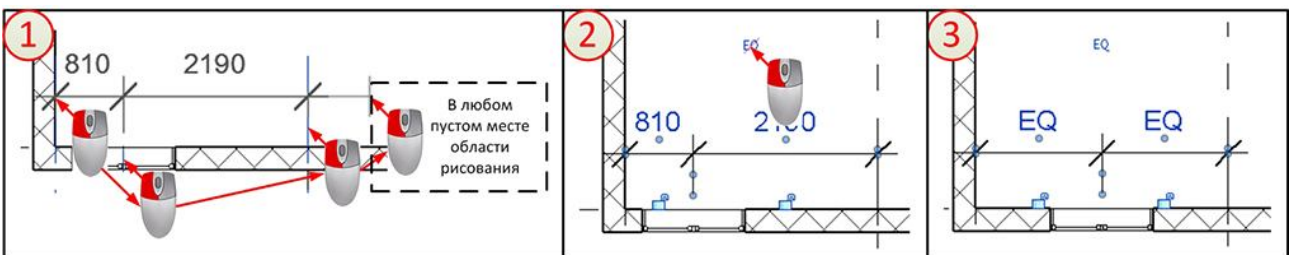


Figure 58 – Installed window in the center

Arrange and align the windows as shown in Figure 59.

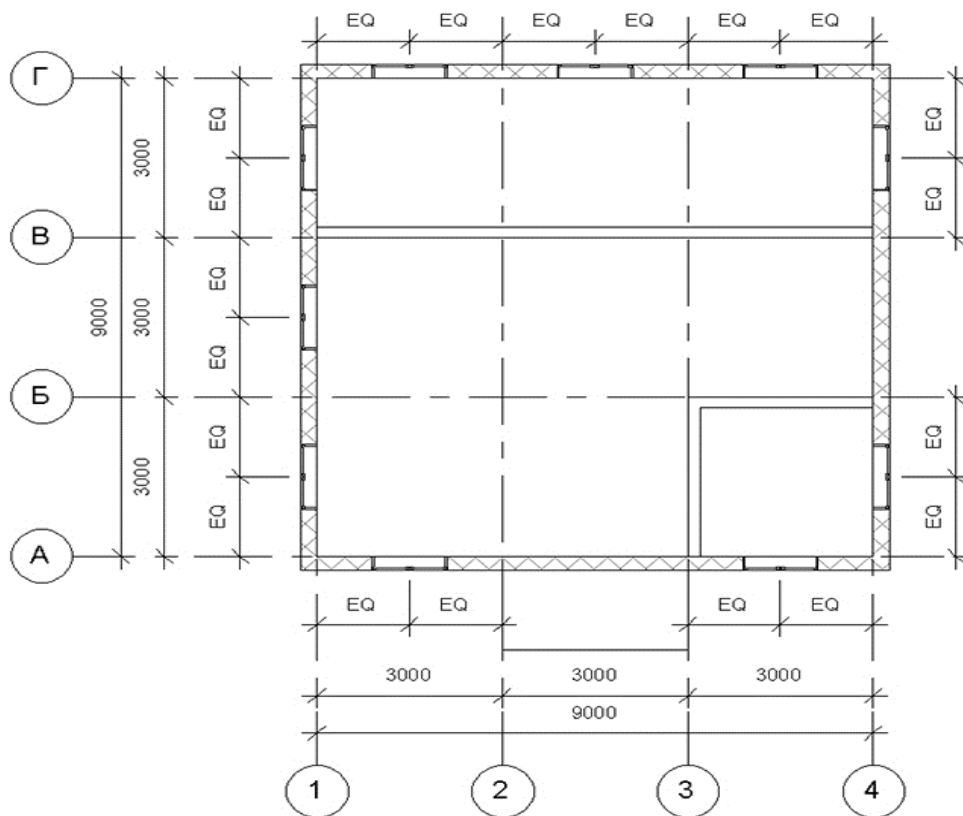


Figure 59 – Arrange and align the windows

Go to the Mansard plan, arrange and align the windows as in Figure 60.

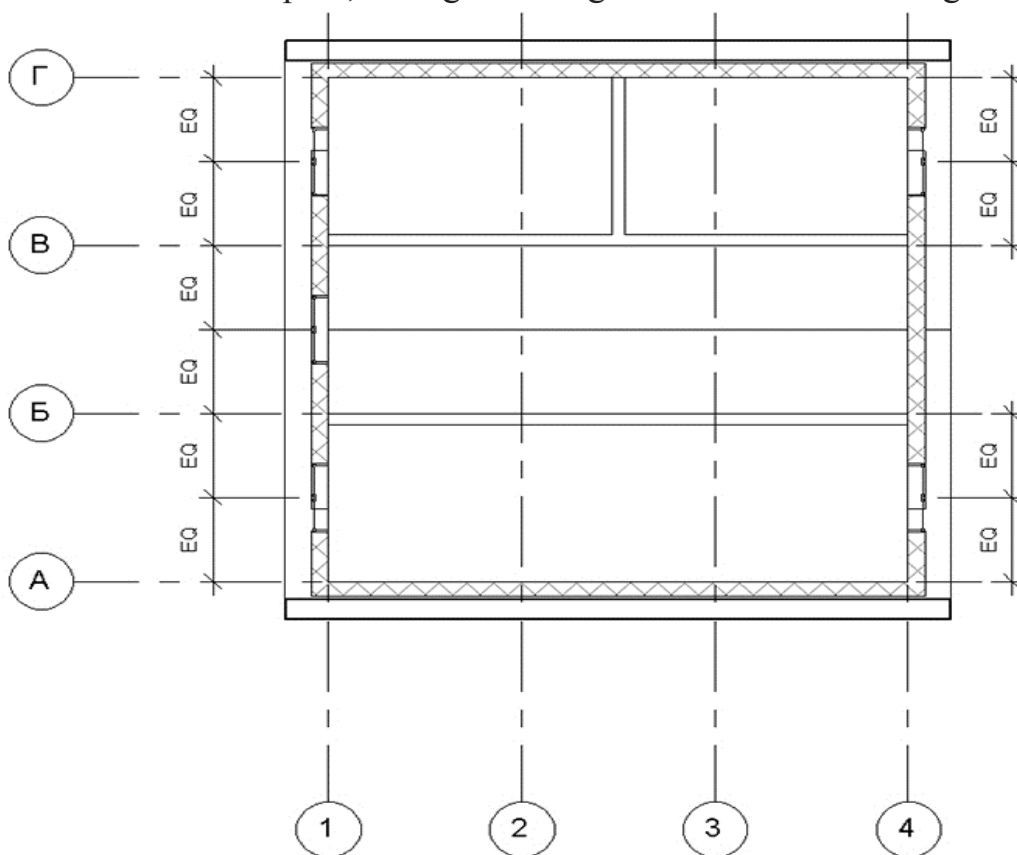


Figure 60 – Arrange and align the windows on the Mansard plan

7. Doors

Go to Floor 1. Activate the tool Architecture -> Formation -> Door (Fig. 61).

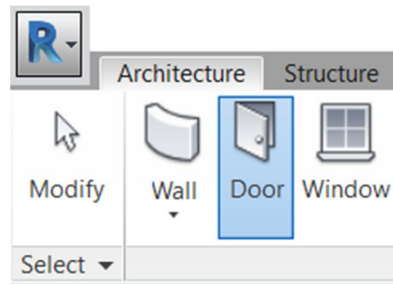


Figure 61 – Formation

Download the Single-Decorative 2 family (the Doors folder), and on the Properties palette in the list of dimension types, select 0915 × 2134 mm.

Align and align the doors between axes 2 and 3 on the wall of the A-axis (Fig. 62).

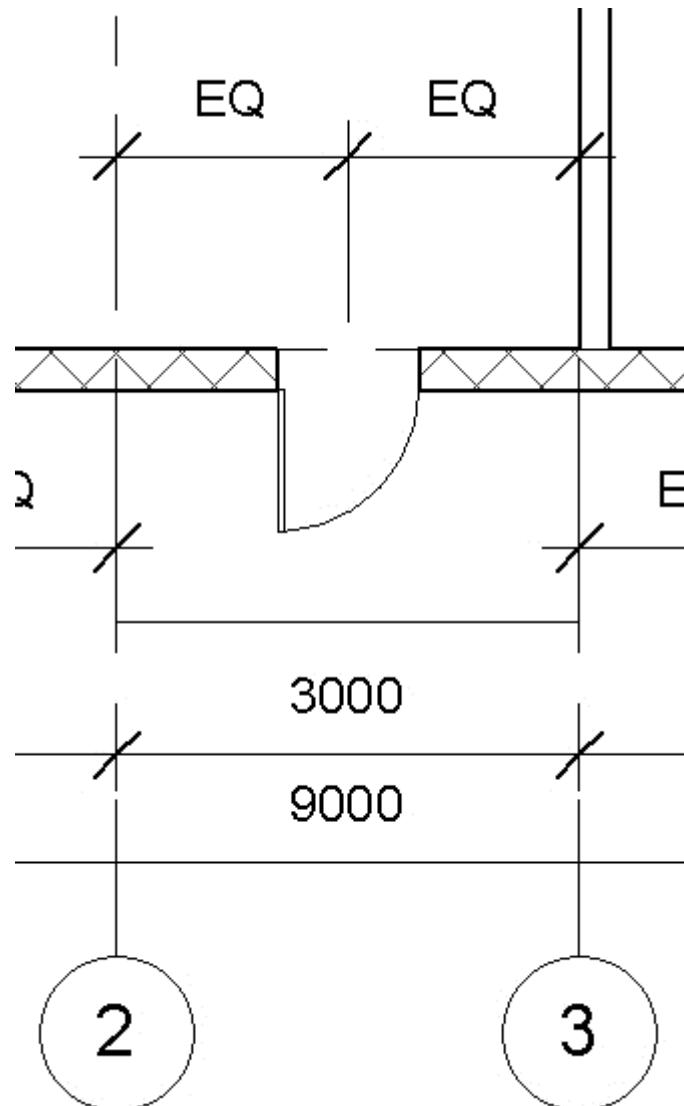


Figure 62 – Align the door

On the Properties palette, in the list of dimension types, select Single-Shield - > 0915 × 2134 mm.

Align and align the doors as shown in Figure 63. If it is necessary to turn them over. You can turn them over by pressing the Spacebar during installation.

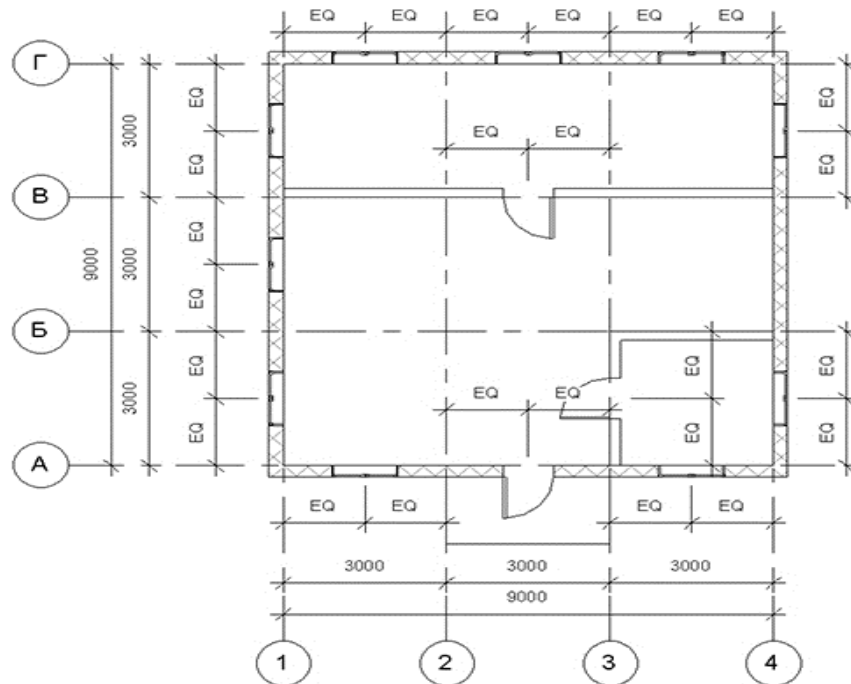


Figure 63 – Align the doors

Go to the Mansard plan, install and align the doors, as in Figure 64.

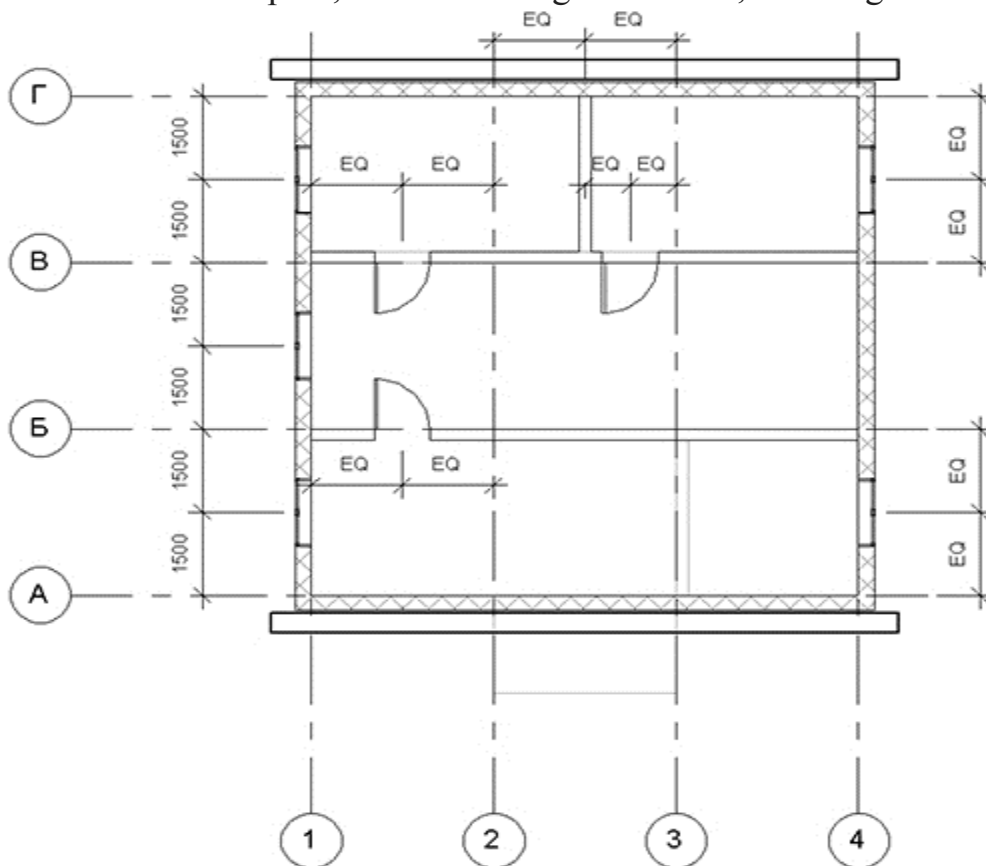


Figure 64 – Align the doors on the Mansard plan

8. Stairs

Go to Floor 1. Activate the tool Architecture -> Movement -> Ladder -> Ladder by component (Fig. 65).

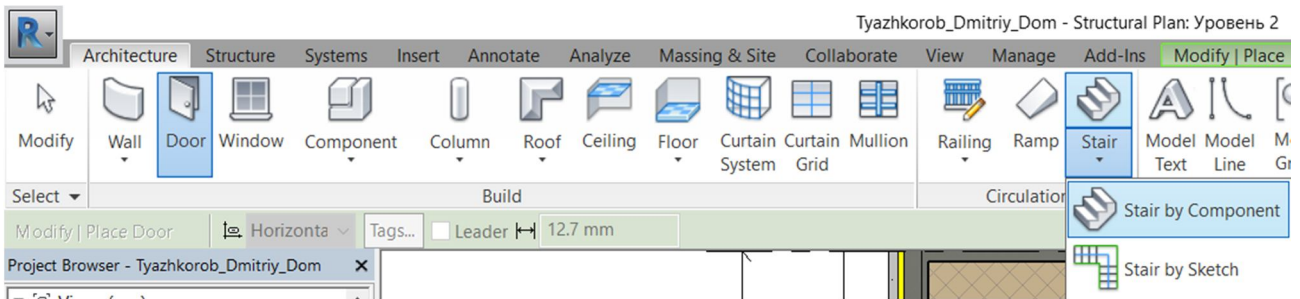


Figure 65 – Ladder by component

On the Edit | Create a ladder in the Components panel, activate the Span and Straight tools (Fig. 66).

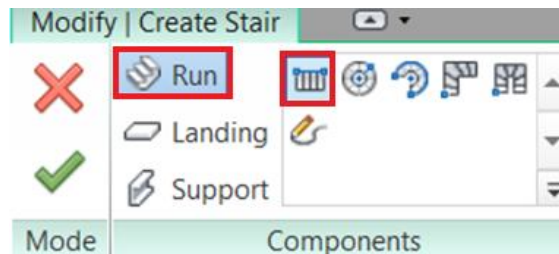


Figure 66 – Components panel

Make sure that the properties palette is set to the parameters, as in Figure 67.

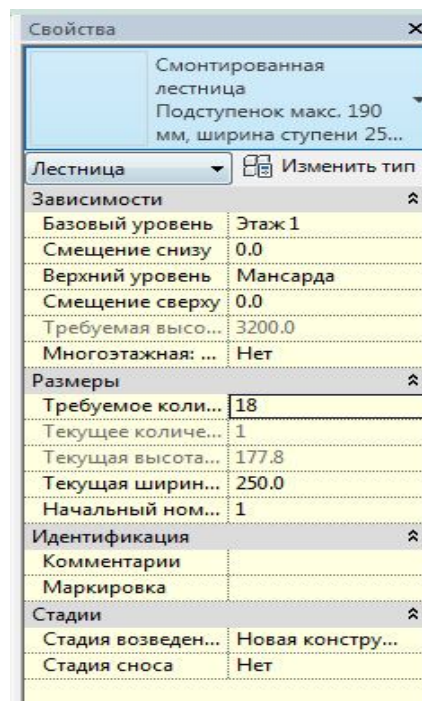


Figure 67 – Parameters

Click on the LMB as in Figure 68-1 and move the cursor to the right. On the screen there will be a ladder, below – an inscription. Click the LMB the second time, when it tells 9 PENDANTS CREATED, 9 REMAIN. Repeat this procedure for the second part of the ladder (Fig. 68-2) by clicking the second time the message says 9 PENDANTS CREATED, 0 REMAINED.

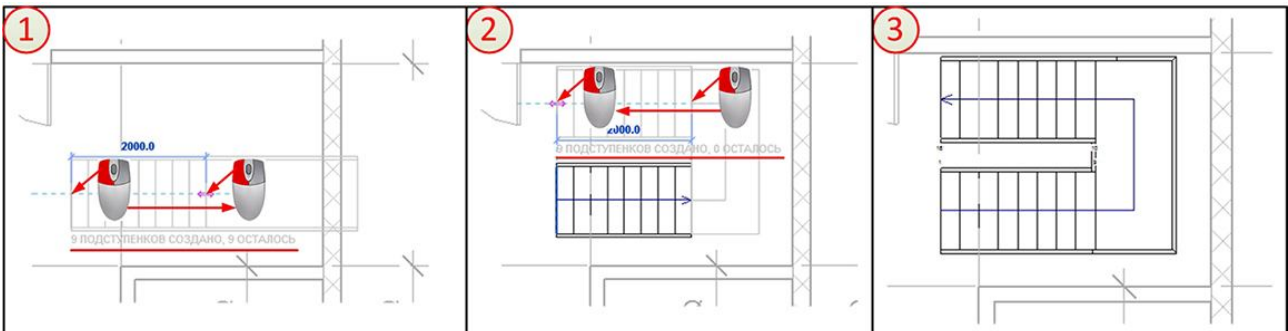


Figure 68 – Draw the stairs

Run the Edit | Create a ladder -> Tools -> Guard (Fig. 69).

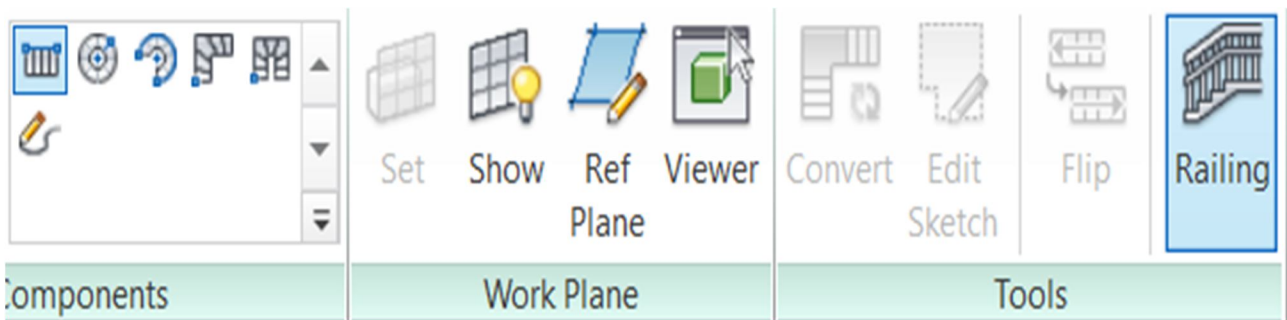


Figure 69 – Tools

In the drop-down list of the window that opens, select Glass panel – fill from the bottom. In the Location area, select Kosower / Stitch (Fig. 70).

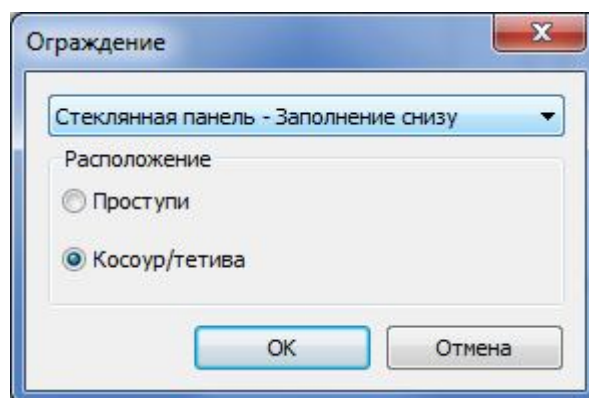


Figure 70 – Kosower / Stitch

Delete the elements highlighted in Figure 71.

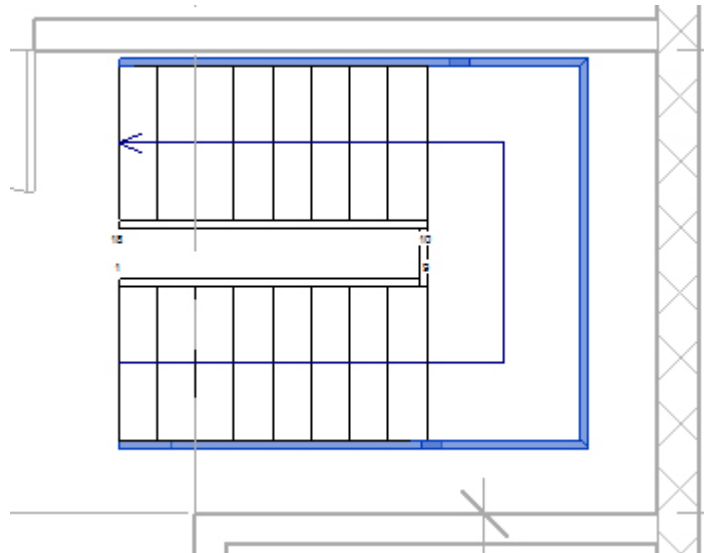


Figure 71 – Elements highlighted

Select the whole ladder with the frame (Fig. 72-1). Activate the Edit | Create a ladder -> Edit -> Move (Fig. 72-2). Click the LMB's bottom right corner of the selected group (Fig. 72-3). Click the LMB corner formed by the walls in the axes 4 and B (Fig. 72-4).

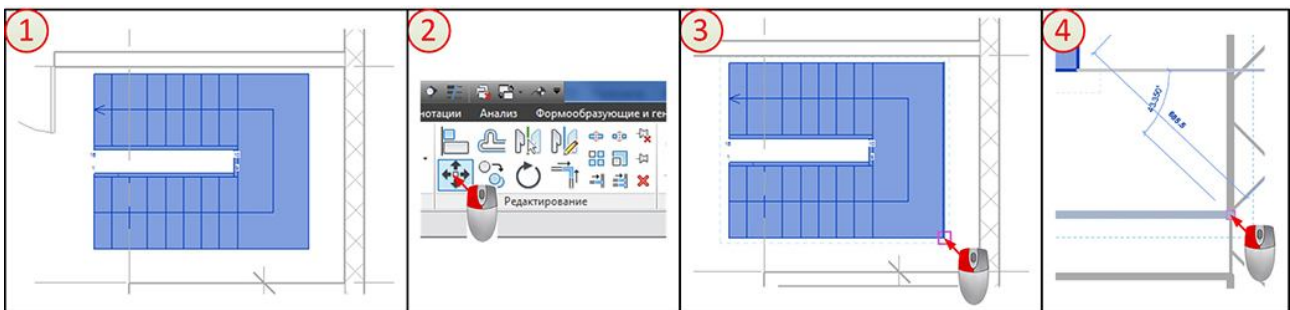


Figure 72 – Walls in the axes

Activate the Align tool. Click the LMB in succession on the A axis and the edge of the ladder nearest it (Fig. 73).

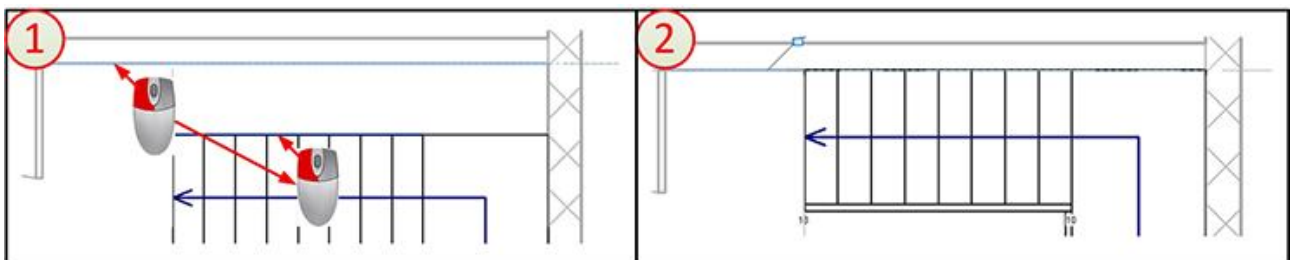


Figure 73 – Align tool

Select the outer enclosure of the ladder (Fig. 74) and remove it.

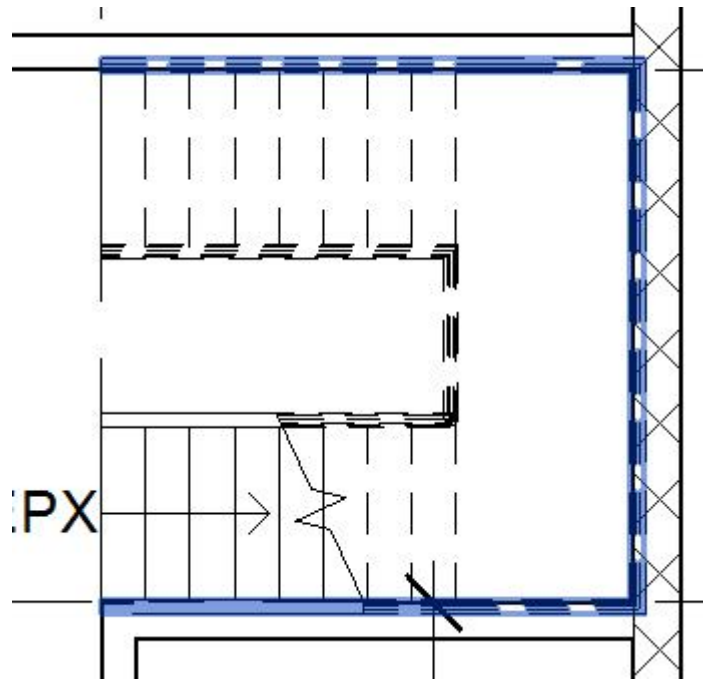


Figure 74 – Outer enclosure of the ladder

If you select the inner staircase guard (Fig. 75-1) on the Edit | The Guard appears button Show Alerts (Fig. 75-2), on the Properties palette, click the Change Type button. In the Type Properties window, click the Modify button in the Placing Balusters line (Fig. 75-3). In the Edit Balancing Layout window (Fig. 75-4), in the Fence Fence at the intersection of Line 2 and Top boxes, expand the drop-down list and select the Element of the upper handrail (Fig. 75-4). Do the same in the Racks table for all three rows (Fig. 75-4).

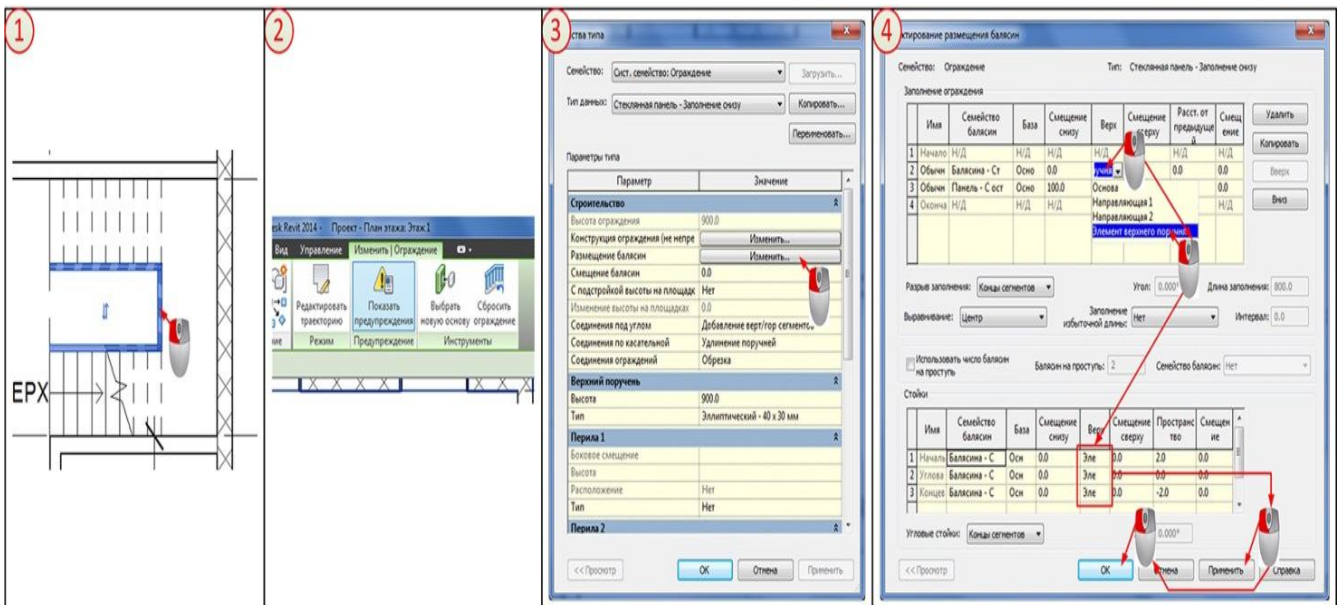


Figure 75 – Inner staircase guard

Go to the Attic plan. Select the rectangle with all the elements of the model (Fig. 76-1). Click Edit | Select multiple -> Select -> Filter (Fig. 76-2). In the Filter window that opens, delete all the checkmarks except Overlap and click OK (Fig. 76-3). Only the overlap of the attic will be allotted (Fig. 76-4).

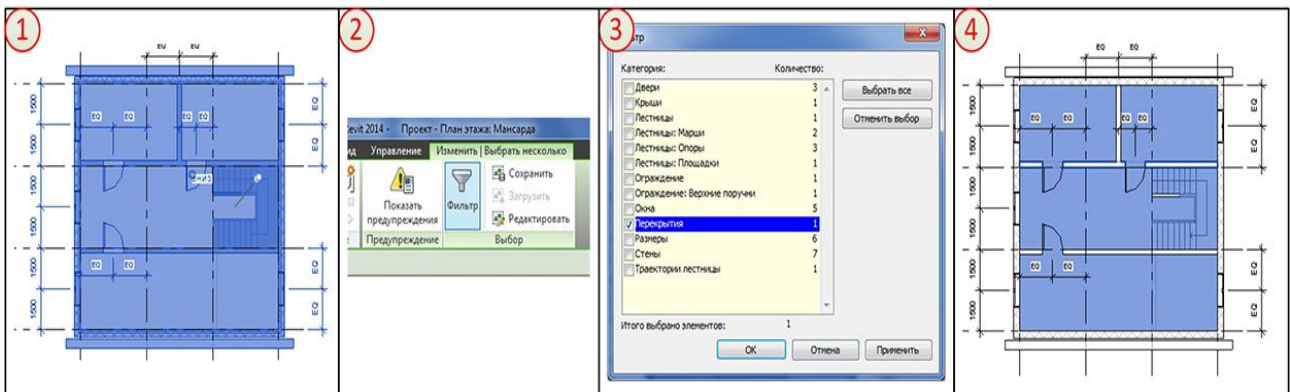


Figure 76 – Overlap of the attic

Click Edit | Overlapping -> Mode -> Edit border (Fig. 77).

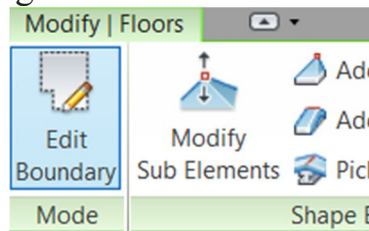


Figure 77 – Edit border

Edit the boundary of the path as shown in Figure 78, and exit the edit mode. Answer the question in the affirmative.

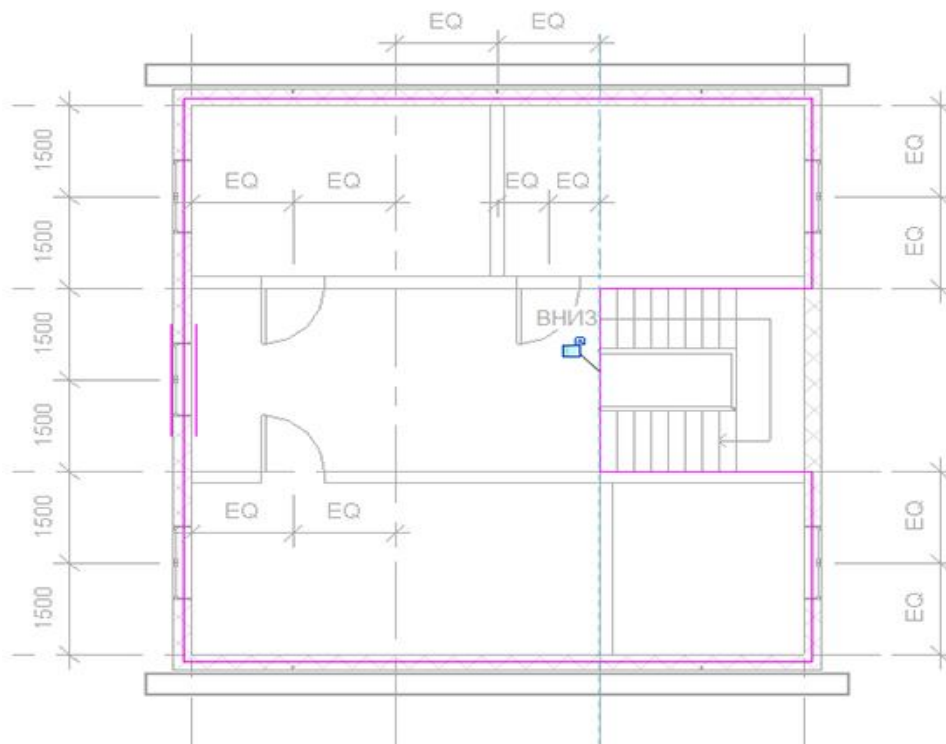


Figure 78 – Boundary of the path

9. Fences

Activate the tool Architecture -> Motion -> Protections -> Sketch trajectory (Fig. 79).

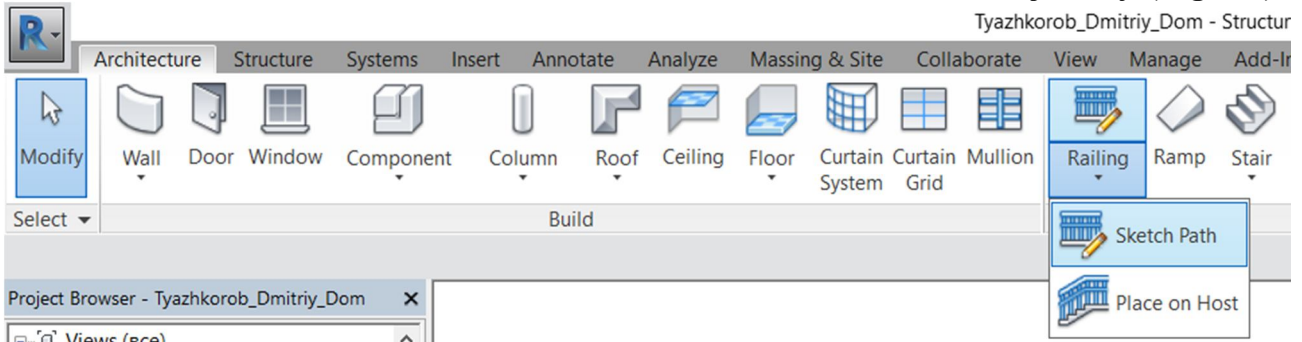


Figure 79 – Sketch trajectory

On the Properties palette, in the list of sizes, select Glass panel – fill from the bottom.

Draw a fence outline (Fig. 80) and exit the sketch mode.

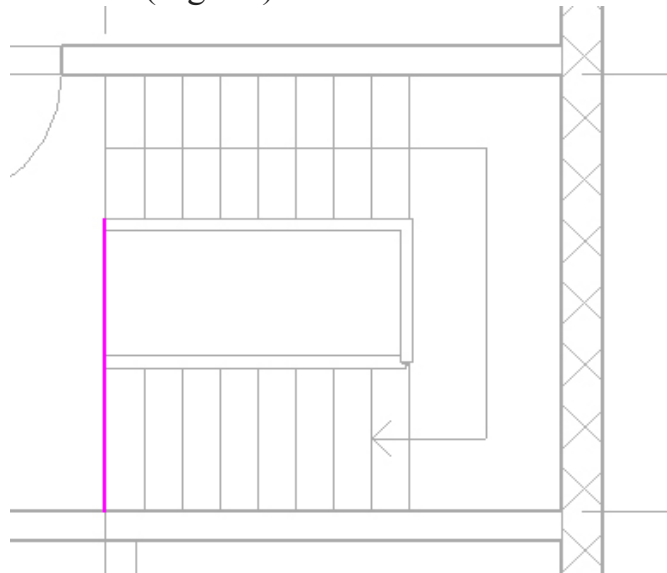


Figure 80 – Fence outline

Go to floor plan 1 and form the fences near the front door as in Figure 81.

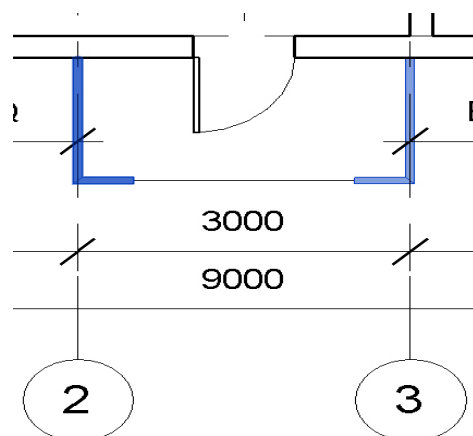


Figure 81 – Form the fences

Open the 3D view with the command View -> Create -> 3D View -> 3D view by default (Fig. 82).

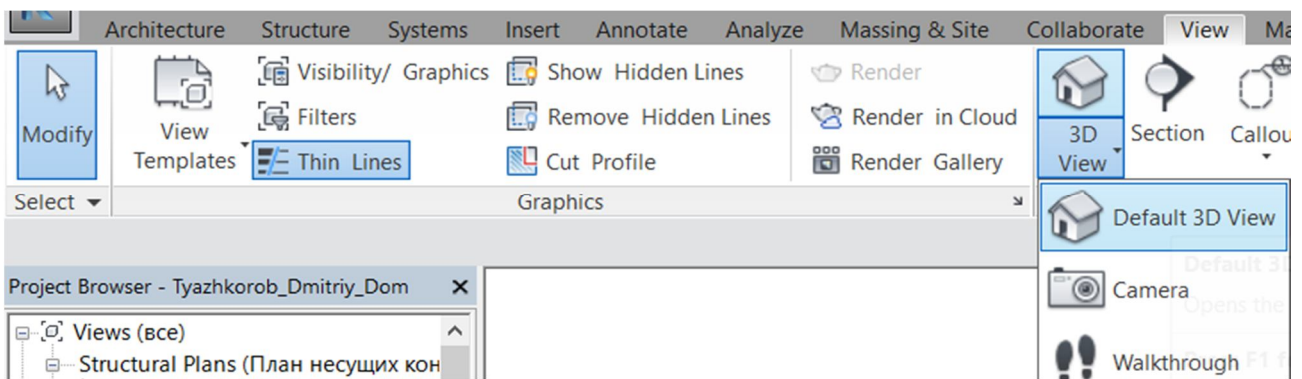


Figure 82 – Command View

A view similar to Figure 83.

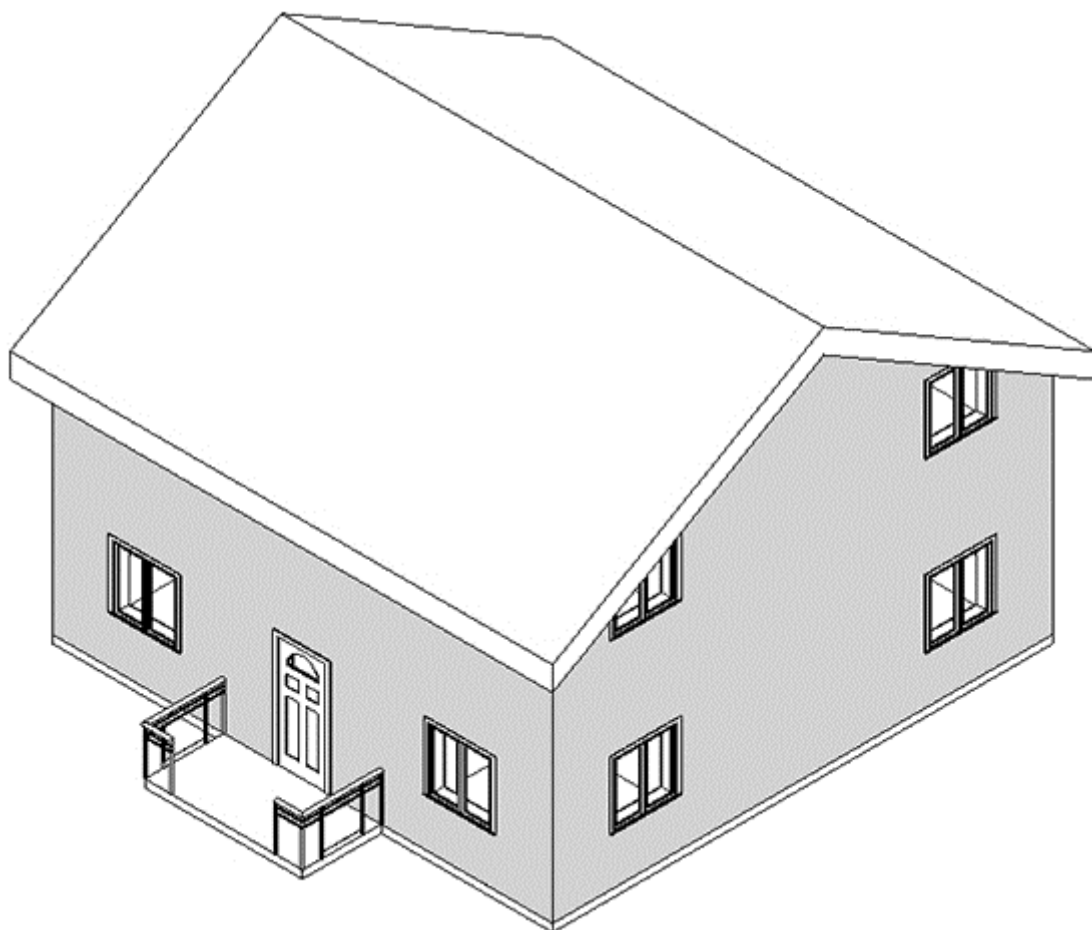


Figure 83 – 3-D drawing of buildin

10. Canopy above the entrance

Activate the tool Architecture -> Formation -> Roof -> The roof is extruded (Fig. 84).

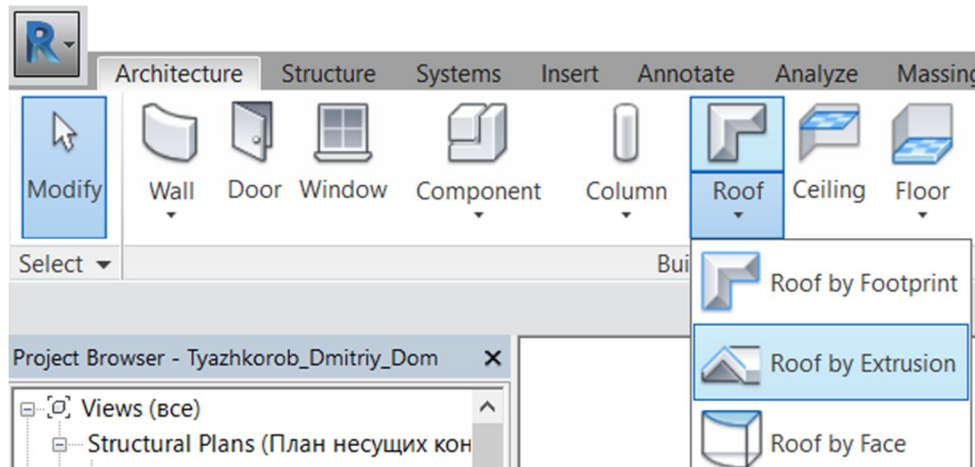


Figure 84 – Formation of Roof

In the Workplane window that opens, in the Specify working plane area, select Select plane (Fig. 85-1). After closing the window, select the outside of the wall on which the entrance door is located (Fig. 85-2). In the window that appears, specify the level of the attic and the mixture of 0 (Fig. 85-3).

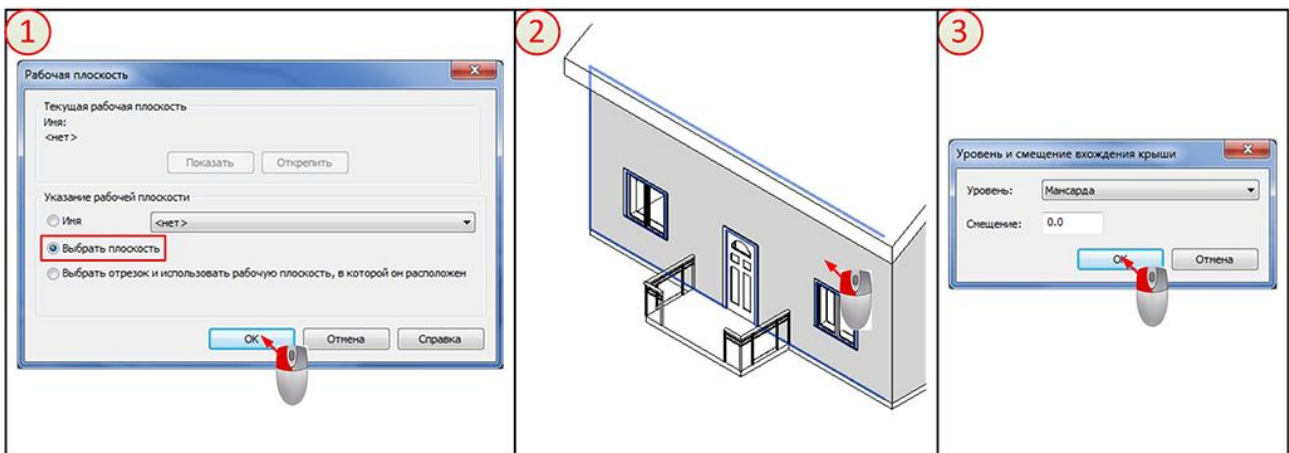


Figure 85 – Entrance door

Go to the South facade.

On the Properties palette, in the list of sizes, select Typical – 125 mm.

Activate the Edit | Create a roof profile formed by extrusion -> Draw -> Arc along the center and end points (Fig. 86).

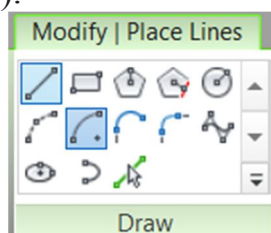


Figure 86 – Place lines

Draw an arc in such a way that the center is located in the center of the horizontal upper segment of the door, and the end points on the axes 2 and 3 (Fig. 87).

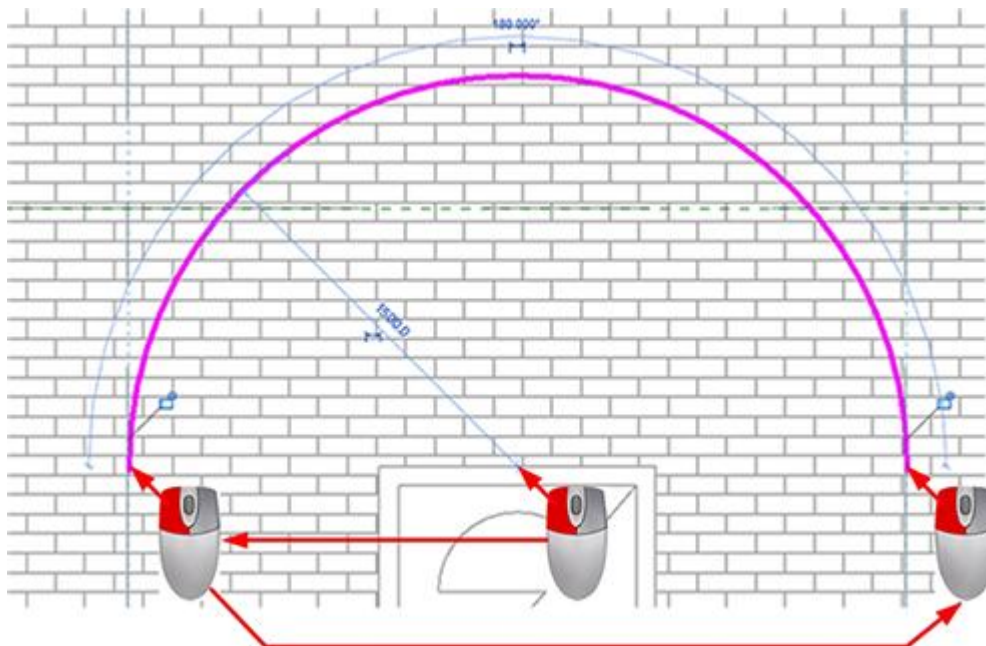


Figure 87 – Drawing arc

On the Properties palette in the Beginning extrusion and End extrusion lines, type 0 and -1500, respectively (Fig. 88). Finish work.

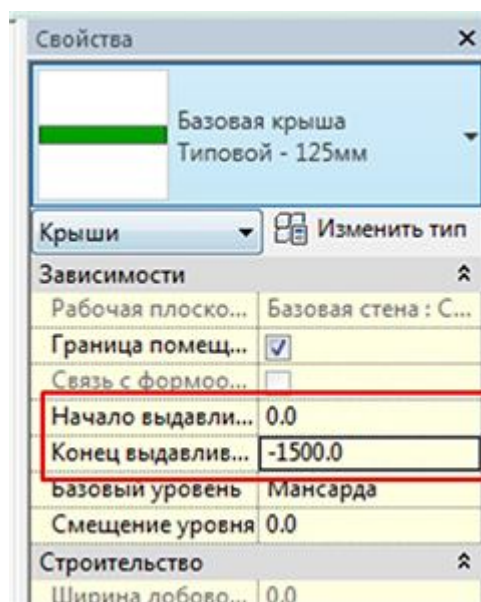


Figure 88 – Properties palette

The first draft is ready. Go to the {3D} view. In the View Control Panel, expand the Visual Style drop-down list and select Realistic. Now you can rotate the model using the view cube or the steering wheel.

To see the ladder, on the 3D view, click the LMB on the wall in axis 4 (Fig. 89). After its selection, click on it PKM (Fig. 90). The wall will disappear (Fig. 91) and a ladder will be visible (Fig. 92).

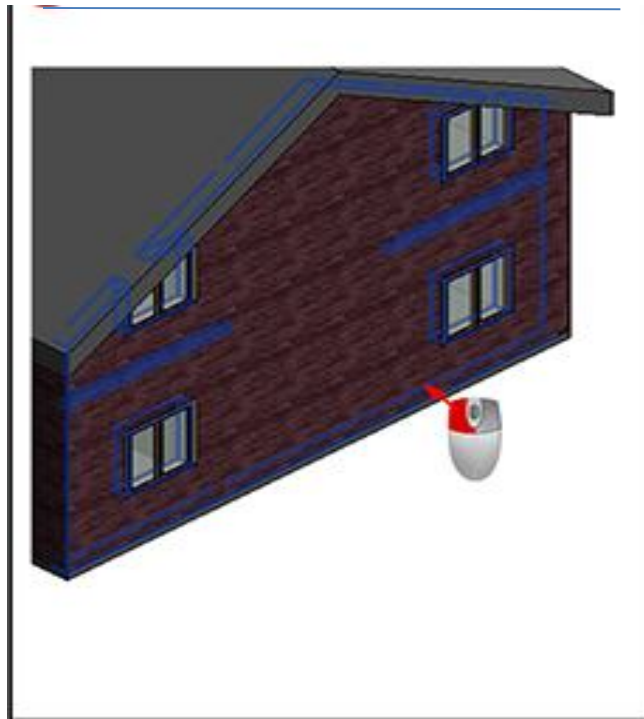


Figure 89 – The ladder on the 3D view

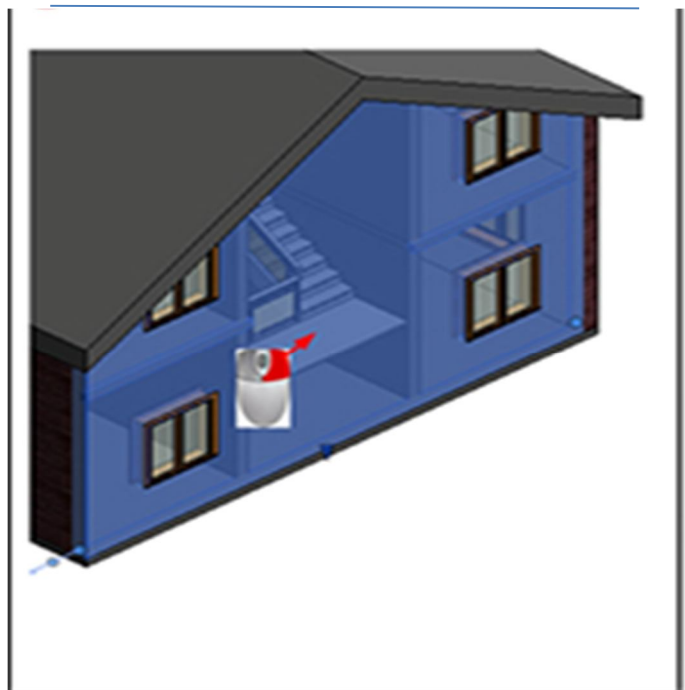


Figure 90 – After its selection

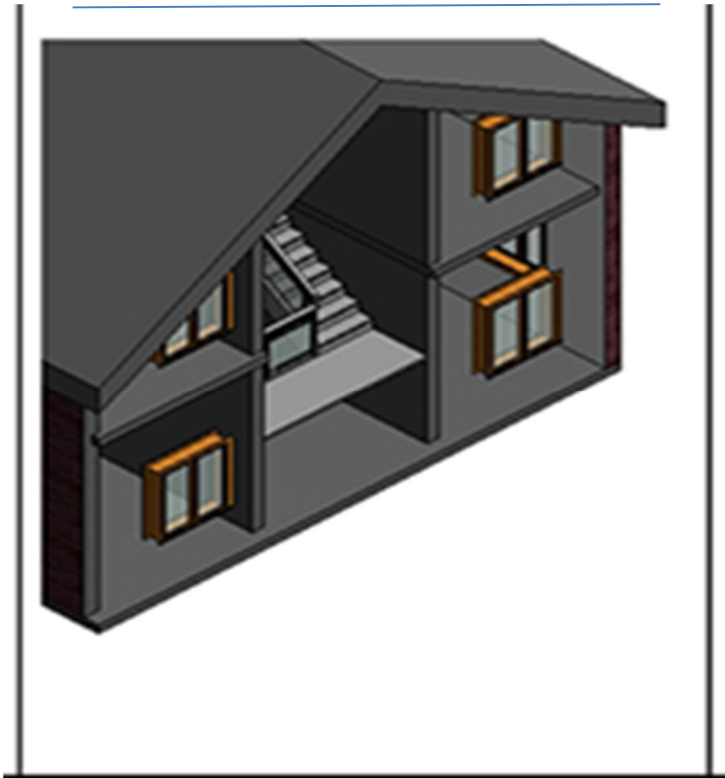


Figure 91 – The wall disappeared

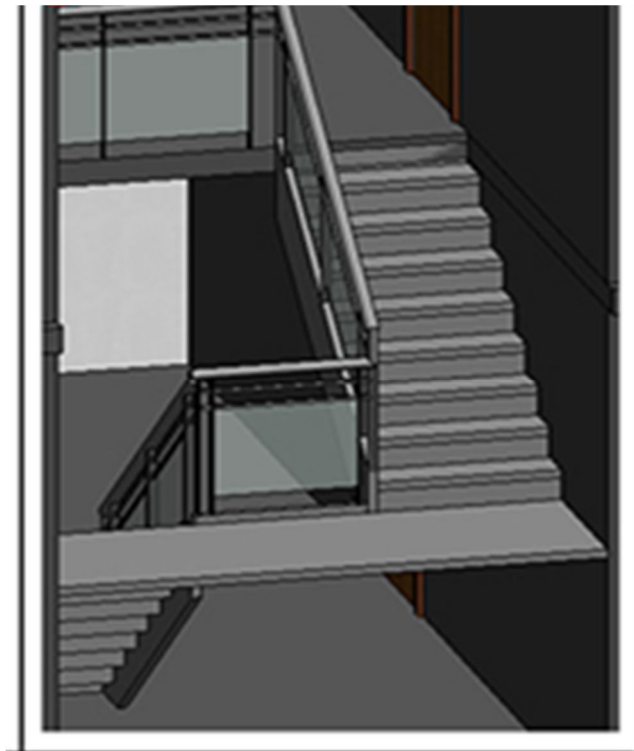


Figure 92 – The ladder is visible

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REVIT»**

*(для іноземних студентів денної форми
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192 – Будівництво та цивільна інженерія)*

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