

BUILDING INFORMATION MODELLING LABORATORY

LAB MANUAL

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Subject Code : ACE111
Regulations : IARE – R16
Class : V Semester (CE)

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DEPARTMENT OF CIVIL ENGINEERING
INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal – 500 043, Hyderabad



INSTITUTE OF AERONAUTICAL ENGINEERING

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Dundigal, Hyderabad - 500 043

DEPARTMENT OF CIVIL ENGINEERING

Program: Bachelor of Technology (B. Tech)

VISION OF THE DEPARTMENT

To produce eminent, competitive and dedicated civil engineers by imparting latest technical skills and ethical values to empower the students to play a key role in the planning and execution of infrastructural & developmental activities of the nation.

MISSION OF THE DEPARTMENT

To provide exceptional education in civil engineering through quality teaching, state-of-the-art facilities and dynamic guidance to produce civil engineering graduates, who are professionally excellent to face complex technical challenges with creativity, leadership, ethics and social consciousness.



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DEPARTMENT OF CIVIL ENGINEERING

Program: Bachelor of Technology (B. Tech)

PROGRAM OUTCOMES (PO's)	
PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities

PO 6	relevant to the professional engineering practice.
PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



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The Program Specific outcomes (PSO's) listed below were developed specifically to meet the Program Educational Objectives (PEO's). The focus of these PSO's is consistent with the set of required PO's identified in the NBA accreditation guidelines.

The Civil Engineering PSO's require that graduates receiving a Bachelor of Technology in Civil Engineering degree from IARE demonstrate the following.

PROGRAM SPECIFIC OUTCOMES (PSO's)	
PSO 1	ENGINEERING KNOWLEDGE: Graduates shall demonstrate sound knowledge in analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good foundation in mathematics, basic sciences and technical communication
PSO 2	BROADNESS AND DIVERSITY: Graduates will have a broad understanding of economical, environmental, societal, health and safety factors involved in infrastructural development, and shall demonstrate ability to function within multidisciplinary teams with competence in modern tool usage.
PSO 3	SELF-LEARNING AND SERVICE: Graduates will be motivated for continuous self-learning in engineering practice and/or pursue research in advanced areas of civil engineering in order to offer engineering services to the society, ethically and responsibly.

BUILDING INFORMATION MODELING LAB SYLLABUS

EXP. NO.	NAME OF THE EXPERIMENT
1	Introduction to BIM & AUTODESK REVIT
2	Basic Drawing and editing tools
3	Setting Up Levels And Grids
4	Modeling Walls
5	Working With Doors And Windows
6	Working With Curtain Walls
7	Working With Views
8	Adding Components
9	Modeling Floors
10	Modeling Ceilings & Roofs
11	Modeling Stairs And Railing

ATTAINMENT OF PROGRAM OUTCOMES (PO's) & PROGRAM SPECIFIC OUTCOMES

Exp No.	Name of Experiment	Program Outcomes Attained	Program Specific Outcomes Attained
1.	Introduction to BIM & AUTODESK REVIT	PO1(H), PO3(H), PO5(H), PO12(H), PO9(S)	PSO1(H), PSO2(S)
2.	Basic Drawing and editing tools	PO1(H), PO5(H), PO9(S)	PSO1(H), PSO2(S)
3.	Setting Up Levels And Grids	PO1(H), PO3(H), PO9(S)	PSO1(H), PSO2(S)
4.	Modeling Walls	PO1(H), PO5(H), PO9(S)	PSO1(H), PSO2(S)
5.	Working With Doors And Windows	PO1(H), PO3(H), PO5(H), PO9(S)	PSO1(H), PSO2(S)
6.	Working With Curtain Walls	PO1(H), PO5(H), PO9(S)	PSO1(H), PSO2(S)
7.	Working With Views	PO1(H), PO3(H), PO9(S)	PSO1(H), PSO2(S)
8.	Adding Components	PO1(H), PO5(H), PO9(S)	PSO1(H), PSO2(S)
9.	Modeling Floors	PO1(H), PO3(H), PO5(H), PO9(S)	PSO1(H), PSO2(S)
10.	Modeling Ceilings & Roofs	PO1(H), PO3(H), PO5(H), PO9(S)	PSO1(H), PSO2(S)
11.	Modeling Stairs And Railing	PO1(H), PO3(H), PO5(H) PO9(S)	PSO1(H), PSO2(S)

MANDATORY INSTRUCTIONS

1. Students should report to the labs concerned as per the timetable.
2. Record should be updated from time to time and the previous experiment must be signed by the faculty in charge concerned before attending the lab.
3. Students who turn up late to the labs will in no case be permitted to perform the experiment scheduled for the day.
4. After completion of the experiment, certification of the staff in-charge concerned in the observation book is necessary.
5. Students should bring a notebook of about 100 pages and should enter the readings/observations/results into the notebook while performing the experiment.
6. The record of observations along with the detailed experimental procedure of the experiment performed in the immediate previous session should be submitted and certified by the staff member in-charge.
7. Not more than FIVE students in a group are permitted to perform the experiment on a set up.
8. The group-wise division made in the beginning should be adhered to, and no mix up of student among different groups will be permitted later.
9. The components required pertaining to the experiment should be collected from Lab- in-charge after duly filling in the requisition form.
10. When the experiment is completed, students should disconnect the setup made by them, and should return all the components/instruments taken for the purpose.

11. Any damage of the equipment or burnout of components will be viewed seriously either by putting penalty or by dismissing the total group of students from the lab for the semester/year.
12. Students should be present in the labs for the total scheduled duration.
13. Students are expected to prepare thoroughly to perform the experiment before coming to Laboratory.
14. Procedure sheets/data sheets provided to the students groups should be maintained neatly and are to be returned after the experiment.
15. DRESS CODE:
 1. Boys - Formal dress with tuck in and shoes.
 2. Girls - Formal dress (salwar kameez).
 3. Wearing of jeans is strictly prohibited

CONTENTS

S. No.		Page No.
1	Vision and Mission of the department	02
2	Program Outcomes (PO's)	03
3	Program Specific Outcomes (PSO's)	05
4	Mandatory Instructions	08
5	Contents	10
6	Experiment No 1: Introduction to BIM & AUTODESK REVIT	11
7	Experiment No 2: Basic Drawing and editing tools	14
8	Experiment No 3: Setting Up Levels And Grids	33
9	Experiment No 4: Modeling Walls	38
10	Experiment No 5: Working With Doors And Windows	42
11	Experiment No 6: Working With Curtain Walls	45
12	Experiment No 7: Working With Views	49
13	Experiment No 8: Adding Components	55
14	Experiment No 9: Modeling floors	58
15	Experiment No 10: Modeling Ceilings & Roofs	62
16	Experiment No 11: Modeling Stairs And Railing	73

Experiment No: 01

INTRODUCTION TO BIM & AUTODESK REVIT

INTRODUCTION TO BIM

Building Information Modeling (BIM) is a process of creating and managing 3D building data during its development. BIM is a complex multiphase process that gathers input from team members to model the components and tools that will be used during the construction process to create a unique perspective of the building process. The 3D process is aimed at achieving, savings through collaboration and visualization of building components into an early design process that will dictate changes and modifications to the actual construction process. It is a very powerful tool that when used properly will save money, time and simplify the construction process.

Over the year the industry has commercialized BIM towards architectural related professionals, however, the real purpose and benefits of BIM relate to all construction industry professionals. The 3D representation of the building and now used in roads and utilities too and is geared towards all construction professionals, and all of you are responsible for understanding the process and participate in providing input to the software.

BIM makes a reliable digital representation of the building available for design decision making, high-quality construction document production, construction planning, performance predictions, and cost estimates. Not only, that BIM can also be used by the property owners, once the construction process has ended, to carefully monitor how the building is performing and to complete repairs efficiently.

The building information modeling process covers geometry, space, light, geographic information, quantities, and properties of building components. BIM can be used to demonstrate the entire building life cycle, including the processes of construction and facility operation.

The BIM application process can be used during design and architecture process creating a clear picture used for better and more integrated designs.

The software will be used to foresee problems and coordination between different contractors and as a way to generate construction documents and process that will later be implemented during the physical process. It is ideal when there are many trades executing at the same moment or when schedules are compressed. There are multiple applications for BIM so it can be used by the following groups:

- Architecture

- Sustainability
- Structures
- MEP
- Construction Management
- Utilities
- Road Construction
- Scheduling
- Property Management

Industry groups are trying to develop one standardized BIM model that can be used to integrate all different types of modeling systems. By doing this, they will facilitate the coordination and communication in the design-construction-operation team under one single platform. The purpose of this movement is to create a single data center, with multiple CAD and specs depending on the discipline that you are working for.

All data will then come together allowing it to be used for take-offs, analysis, coordination and important project milestones. This effort will help standardize the process and will establish a base that can be used during the bidding process so everyone can be judged using some standard guidelines.

The Building Smart Alliance, a council of the National Institute of Building Sciences, in Washington, D.C., is leading these efforts towards a National BIM Standard.

INTRODUCTION TO AUTODESK REVIT

Autodesk Revit is building information modeling software for architects, landscape architects, structural engineers, MEP engineers, designers and contractors developed by Autodesk. It allows users to design a building and structure and its components in 3D, annotate the model with 2D drafting elements, and access building information from the building model's database. Revit is 4D BIM capable with tools to plan and track various stages in the building's lifecycle, from concept to construction and later maintenance and/or demolition.

Charles River Software was founded in Newton, Massachusetts, on October 31, 1997, by Leonid Raiz and Irwin Jungreis, key developers of PTC's Pro/Engineer software for mechanical design, with the intent of bringing the power of parametric modeling to the building industry

(PTC had previously tried and failed to market its recently acquired Reflex software to the construction sector). With funding from venture capitalists Atlas Venture and North Bridge Venture Partners, Raiz and Jungreis hired several software developers and architects and began developing Revit in C++ on the Microsoft Windows platform. In 1999 they hired Dave Lemont as CEO and

recruited board members Jon Hirschtick, founder of SolidWorks, and Arol Wolford, founder of CMD Group.

Revit can be used as a very powerful collaboration tool between different disciplines in the building design sphere. The different disciplines that use Revit approach the program from unique perspectives. Each of these perspectives is focused on completing that discipline's task. Companies that adopt the software first examine the existing work flow process to determine if such an elaborate collaboration tool is required.

Autodesk sells Building Design Suites which each include a different selection of software packages. Revit is included in the Premium and Ultimate suites. With the release of Revit 1906 Autodesk dropped support for 32-bit Windows. Latest software REVIT 2018 support for 64-bit Windows.

The Revit work environment allows users to manipulate whole buildings or assemblies (in the project environment) or individual 3D shapes (in the family editor environment). Modeling tools can be used with pre-made solid objects or imported geometric models. However, Revit is not a NURBS modeller and also lacks the ability to manipulate an object's individual polygons except on some specific object types such as roofs, slabs and terrain or in the massing environment.

There are many categories of objects ('families' in Revit terminology), which divide into three groups:

- System Families, such as walls, floors, roofs and ceilings which are built inside a project
- Loadable Families / Components, which are built with primitives (extrusions, sweeps, etc.) separately from the project and loaded into a project for use
- In-Place Families, which are built in-situ within a project with the same toolset as loadable components.

Experiment No: 02



BASIC DRAWING AND EDITING TOOLS

MOVE ELEMENTS WITH MOVE TOOLS

The Move tool works similarly to dragging. However, it offers additional functionality on the Options Bar and allows more precise placement.

To move elements with the Move tool

1. Do one of the following:

- Select the elements to move, and then click Modify | <Element> tab ► Modify panel ►  (Move).
- Click Modify tab ► Modify panel ►  (Move), select the elements to move, and then press Enter.

2. On the Options Bar, click the desired options:

Constrain: Click Constrain to restrict the movement of the element along vectors that run perpendicular or collinear to the element.

Disjoin: Click Disjoin to break the association between the selection and other elements before moving. This option is useful, for example, when you want to move a wall that is joined to another wall. You can also use the Disjoin option to move a hosted element from its current host to a new host. For example, you can move a window from one wall to another wall. This feature works best when you clear the Constrain option.

3. Click once to enter a start point for moving.

A preview image of the element displays.

4. Move the cursor in the direction that you want the element to move.

The cursor snaps to snap points. Dimensions appear as guides.

5. Click again to complete the move, or, for more precision, type a value for the distance to move the element, and press Enter.

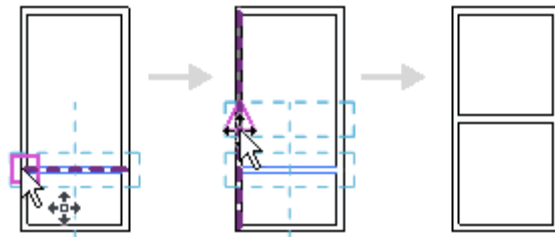


FIG 2.1

ALIGN ELEMENTS


Use the Align tool to align one or more elements with a selected element. This tool is generally used to align walls, beams, and lines, but it can be used with other types of elements as well. For example, in 3D views you can align surface patterns of walls with other elements. The elements to align can be of the same type, or they can be from different families. You can align elements in a plan view (2D), 3D view, or elevation view.

For example, you can use the Align tool to

- Align the ends of walls or beams with a selected beam, line, or wall. (This action extends the lengths of the aligned walls or beams.)
- Align the centers of walls or beams with a selected beam, line, or wall. (This action moves the aligned walls or beams.)
- Align the heights of windows with a selected line or wall.
- Join selected endpoints (of walls, for example) with a selected line.

To align elements

1. Click Modify tab ► Modify panel ►  (Align).

The cursor displays with the align symbol .

2. On the Options Bar, select the desired options:
 - Select Multiple Alignment to align multiple elements with a selected element. (As an alternative, you can press Ctrl while selecting multiple elements to align.)
 - When aligning walls, use the Prefer option to indicate how selected walls will be aligned: using Wall Faces, Wall Centerlines, Faces of Core, or Center of Core. (The core options refer to walls that have multiple layers.)
3. Select the reference element (the element to align other elements to).
4. Select one or more elements to align with the reference element.

Note: Before selecting, move the cursor over the element until the part of the element to align with the reference element is highlighted. Then click it.

5. If you want the selected elements to stay aligned with the reference element (if you later move it), click the padlock to lock the alignment. If the padlock symbol no longer displays because you have done something else, click Modify and select the reference element to make the symbol redisplay.

6. To start a new alignment, press Esc once.

7. To exit the Align tool, press Esc twice.

MOVE ELEMENTS WITH OFFSET TOOL


Use the Offset tool to copy or move a selected elements, such as a model line, detail line, wall, or beam, a specified distance perpendicular to its length.

You can apply the tool to single elements or to chains of elements belonging to the same family. You can specify the offset distance by dragging the selected elements or by entering a value.

The following restrictions apply to the Offset tool:

- You can offset lines, beams, or braces in their own work planes only. For example, if you sketch a model line whose work plane is set to floor plan: level 1, you can offset that line only in the plan view plane.
- You cannot offset walls created as in-place families.
- You cannot offset elements in a view perpendicular to their move plane. For example, you cannot offset a wall in an elevation view.

To offset an element or a copy of an element

1. Click Modify tab ► Modify panel ►  (Offset).
2. On the Options Bar, select how you want to specify the offset distance. If you want to create and offset copies of the selected element, select Copy on the Options Bar. (If you selected Graphical in the previous step, pressing Ctrl as you move the cursor has the same effect.)
3. Select the element or chain to offset. If you specified an offset distance using the Numerical option, a preview line displays at that distance from the highlighted elements on the side where the cursor is positioned, as shown.

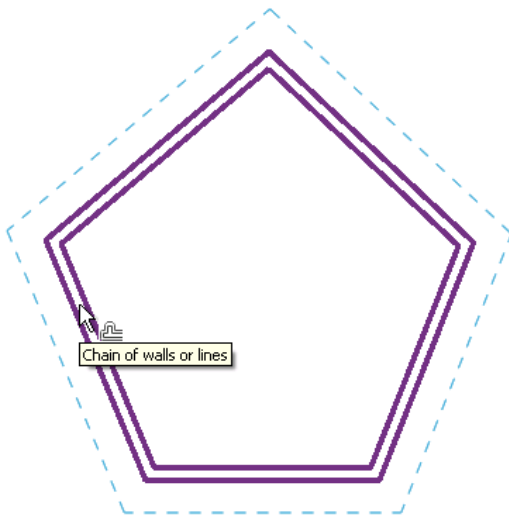


FIG 2.2 Cursor at outside face of the wall

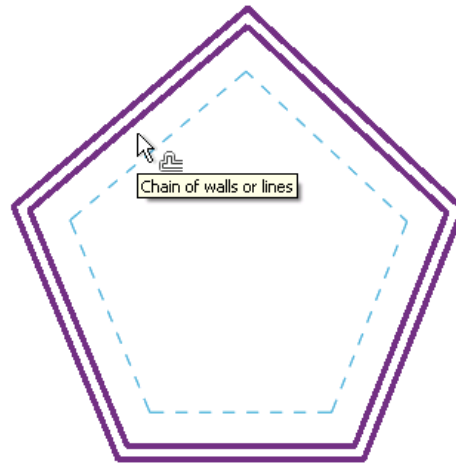




FIG 2.3 Cursor at inside face of the wall

4. Move the cursor as necessary to display the preview line at the desired offset position, and then click to move the element or chain to that position or to place a copy there. Or, if you selected the Graphical option, click to select the highlighted element, and then drag it to the desired distance and click again. After you start the drag, a listening dimension displays, and you can enter a specific offset distance.

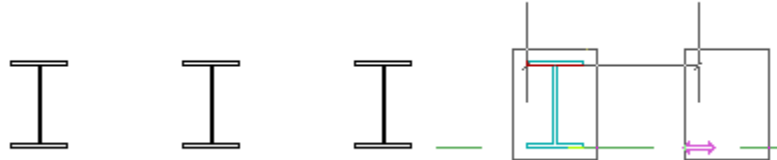
COPY ELEMENTS WITH THE COPY TOOL

The Copy tool copies one or more selected elements and allows you to place copies in the drawing immediately.

The Copy tool is different than the Copy to Clipboard tool. Use the Copy tool when you want to copy a selected element and place it immediately (for example, in the same view). Use the Copy to Clipboard tool, for example, when you need to switch views before placing the copies.

1. Do one of the following:
 - Select the elements to copy, and then click Modify | <Element> tab ► Modify panel ►  (Copy).
 - Click Modify tab ► Modify panel ►  (Copy), select the elements to copy, and then press Enter.
2. To place multiple copies, on the Options Bar, select Multiple.
3. Click once in the drawing area to begin moving and copying the elements.
4. Move the cursor away from the original elements and toward the area where you want to place a copy.

5. Click to place the copy or enter a value for the listening dimension.
6. Continue placing more elements, or press Esc to exit the Copy tool.







MIRROR ELEMENTS

The Mirror tool reverses the position of a selected model element, using a line as the mirror axis.

You can pick the mirror axis or draw a temporary axis. Use the Mirror tool to flip a selected element, or to make a copy of an element and reverse its position in one step.

For example, if you mirror a wall across a reference plane, the wall flips opposite the original.

1. Do one of the following:
 - Select the element to mirror, and on the Modify | <Element> tab ► Modify panel, click either  (Mirror - Pick Axis) or  (Mirror - Draw Axis).
 - Click Modify tab ► Modify panel, and click either  (Mirror - Pick Axis) or  (Mirror - Draw Axis). Then select the element to mirror, and press Enter.

Tip: You can select inserts, such as doors and windows, without their hosts.

To select the line that represents the mirror axis, select Pick Mirror Axis. Or to sketch a temporary mirror axis line, select Draw Mirror Axis.

2. To move the selected item (rather than making a copy of it), clear Copy on the Options Bar.

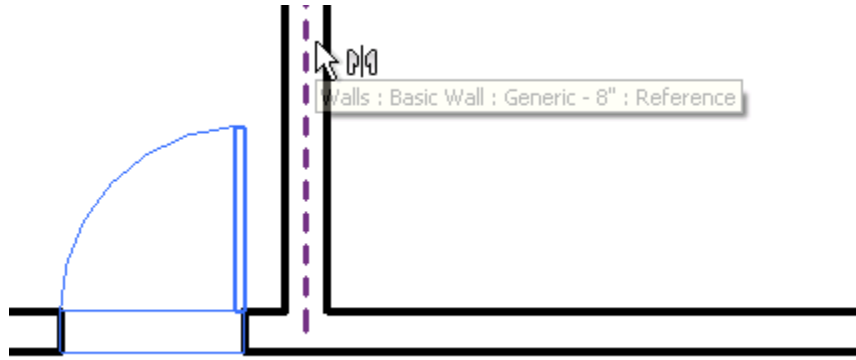
Tip: Use the CTRL key to clear Copy on the Options Bar.

3. Select or draw the line to use as a mirror axis.

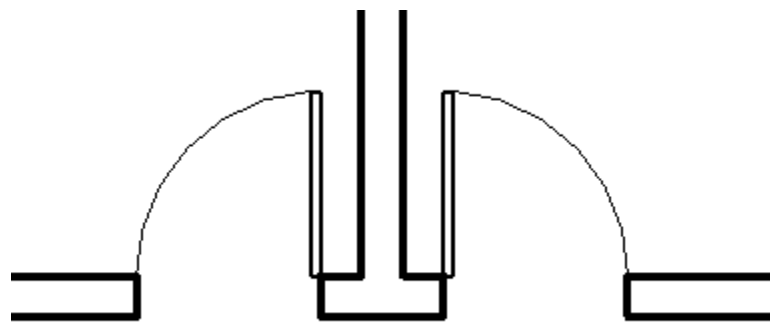
You can pick only a line or a reference plane that the cursor can snap to. You cannot mirror an element around empty space.

Revit moves or copies the selected element and reverses its position opposite the selected axis.

Example

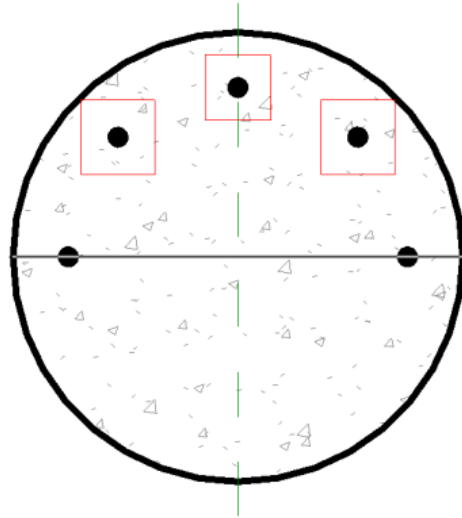


Selecting the element to mirror (and copy) and the mirror axis

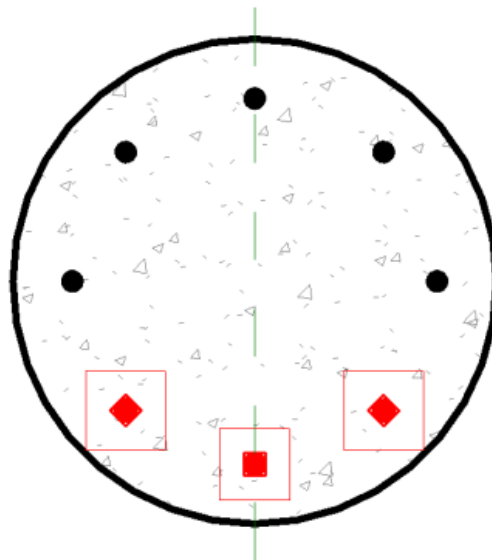


Mirrored (and copied) door

Structural Example



Selecting the element to mirror (and copy) and the mirror axis



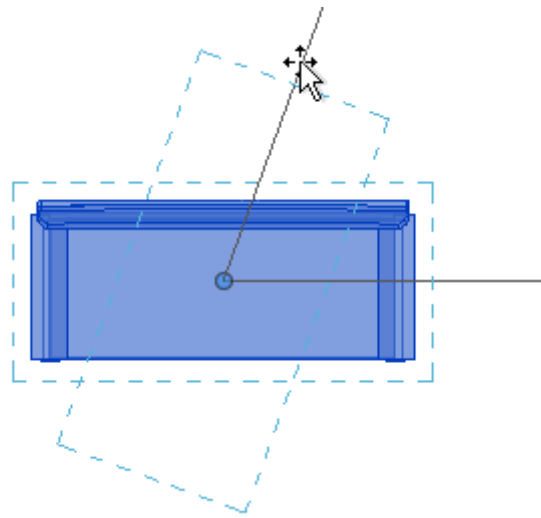
Mirrored (and copied) reba

ROTATE ELEMENTS

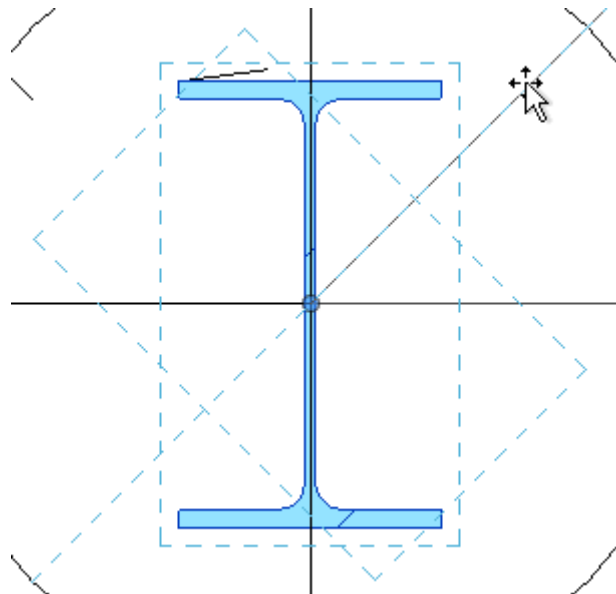
Use the Rotate tool to rotate elements around an axis.

In floor plan, reflected ceiling plan, elevation, and section views, elements rotate around an axis perpendicular to the view. In 3D views, the axis is perpendicular to the work plane of the view.

Architectural example





Structural example




Not all elements can rotate around any axis. For example, walls do not rotate in elevation views. Windows cannot rotate without their walls.

To rotate elements

1. Do one of the following:

- Select the elements to rotate, and then click Modify | <Element> tab > Modify panel >  (Rotate).
- Click Modify tab > Modify panel >  (Rotate), select the elements to rotate, and then press Enter.
- Selecting the Rotate after placement option on the Options Bar when placing a component.

Note: To select a work plane grid for rotation, zoom out to see the full extents of the work plane, and click the edge of the grid.

A center of rotation control () displays at the center of the selected element.

2. If desired, you can relocate the center of rotation by

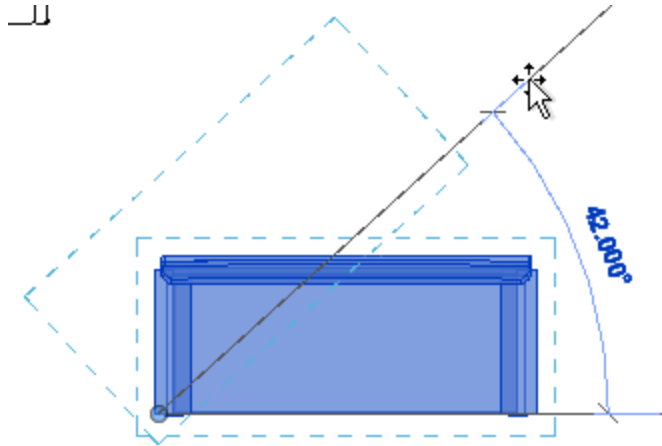
- dragging the control to a new location
- clicking the control and clicking a new location
- pressing Spacebar and clicking a new location
- on the Options Bar, selecting Center of rotation: Place and clicking a new location

Note: If you are in the Rotate command, a shortcut key (R3) activates the Place option. If you are not in the Rotate command, but have an element selected, using the R3 shortcut starts the Rotate command and activates the Place option. To customize the R3 shortcut, modify the Define a new center of rotation command in the Keyboard Shortcuts dialog.

The control snaps to points and lines of interest, such as walls and the intersections of walls and lines. You can also move it onto open space.

Example





Note: Clicking Center of rotation: Default on the Options Bar resets the center of rotation to the default position.

3. On the Options Bar, select any of the following:
 - Disjoin: Select Disjoin to break the connection between the selection and other elements before rotating. This option is useful, for example, when you want to rotate one wall that is joined to another wall.
 - Copy: Select Copy to rotate a copy of the selection. The original remains in place.
 - Angle: Specify the angle of rotation, and press Enter. Revit performs the rotation at the specified angle. Skip the remaining steps.

4. Click to specify the start ray of rotation.

A line displays to indicate the first ray. If the cursor snaps while specifying the first ray, the snap line will rotate with the preview box and snap to angles on the screen while placing the second ray.

5. Move the cursor to place the end ray of rotation.

Another line displays to indicate the ray. A temporary angular dimension displays as you rotate, and a preview image shows the selection rotating.

Tip: You can also rotate an element using listening dimensions. After you click to specify the start ray of rotation, the angular dimension displays in bold. Enter a value using the keyboard.

6. Click to place the end ray and finish rotating the selection.

The selection rotates between the start and end rays.

TRIM AND EXTEND ELEMENTS

Use the Trim and Extend tools to trim or extend one or more elements to a boundary defined by the same element type.




You can also extend non-parallel elements to form a corner, or trim them to form a corner if they intersect. When you select an element to be trimmed, the cursor position indicates the part of the element to retain.


You can use these tools with elements such as the following:

- walls
- lines
- beams
- braces
- MEP fabrication pipe work and ductwork

To trim or extend elements

1. Do one of the following:

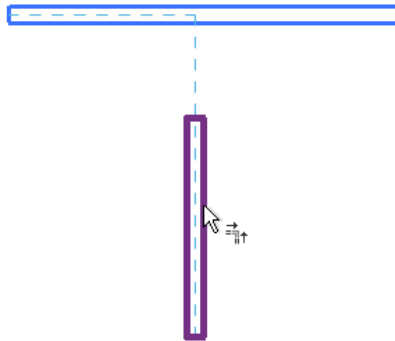
If you want to...	Then...
trim or extend 2 selected elements to a corner	<p>click Modify tab ► Modify panel ►  (Trim/Extend to Corner). Select each of the elements.</p> <p>When selecting an element that needs to be trimmed to form the corner, make sure you click the part of the element to be retained.</p>
trim or extend one element to a boundary defined by another element	<p>click Modify tab ► Modify panel ►  (Trim/Extend Single Element).</p> <p>Select the reference to use as a boundary. Then select the element to trim or extend.</p> <p>If this element crosses the boundary (or a projection), the part that you click is retained. The part on the other side of the boundary is trimmed.</p>
trim or extend multiple elements to a boundary defined by another element	<p>click Modify tab ► Modify panel ►  (Trim/Extend Multiple Elements).</p> <p>Select the reference to use as a boundary. Use one or both of the following methods to select the elements to trim or extend:</p> <p>Click to select each element to trim or extend.</p> <p>Draw a selection box around the elements to trim or extend.</p> <p>Note: When drawing a selection box from right to left, the elements do not have to be contained in the box to be selected. When drawing from left to right, only elements fully contained in</p>

If you want to...	Then...
	<p>the box are selected.</p> <p>For any elements that cross the boundary, the part of an element that you click is retained. When drawing a selection box, the parts of the elements on the same side of the boundary as where you click to begin the selection, are retained. The part or parts on the other side of the boundary are trimmed.</p>
trim an element between 2 points	<p>click Modify tab ► Modify panel ►  (Split Element). On the Options Bar, select Delete Inner Segment. Click 2 points on the element to define the desired boundaries. The inner segment is deleted, and the remaining pieces are retained. See Splitting Elements.</p>

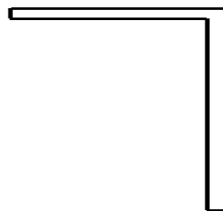
- Continue trimming or extending elements with the currently selected option, or select a different option.

Note: You can select a different Trim or Extend option at any time while the tool is active. This also clears any initial selection made with the previous option.

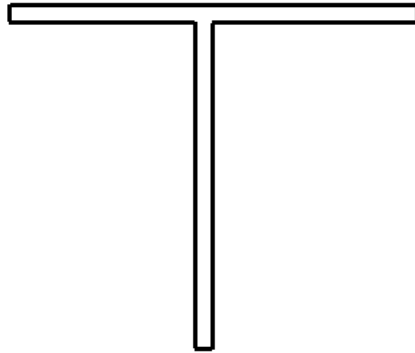
- To exit the tool, press Esc.



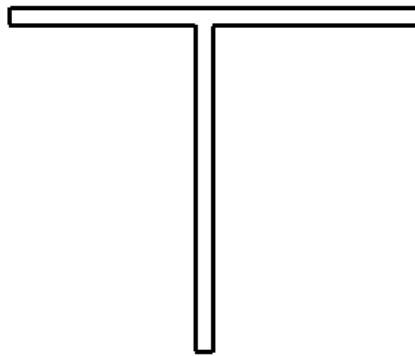
Preview for Trim/Extend to Corner tool



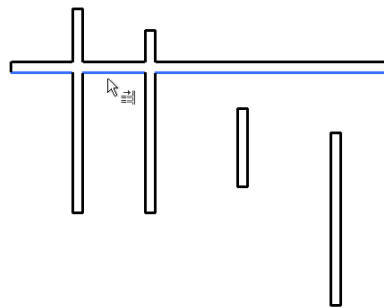
Result of Trim/Extend to Corner operation



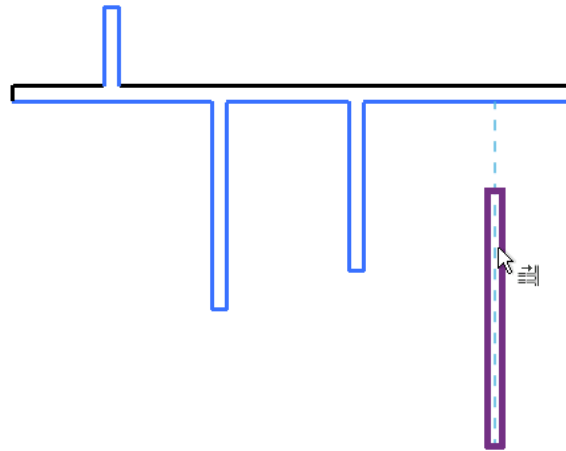
Preview of Trim/Extend Single Element option with horizontal wall selected as the boundary



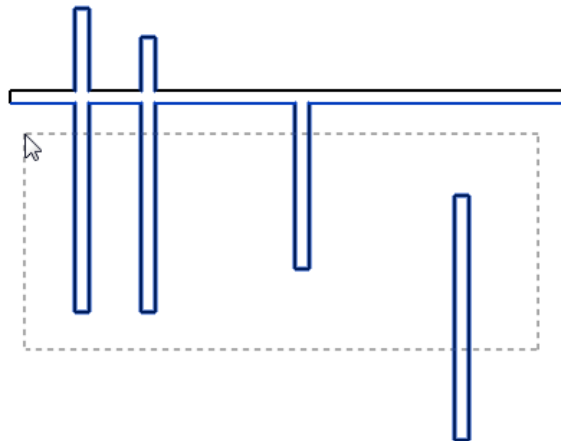
Result of Trim/Extend Single Element operation



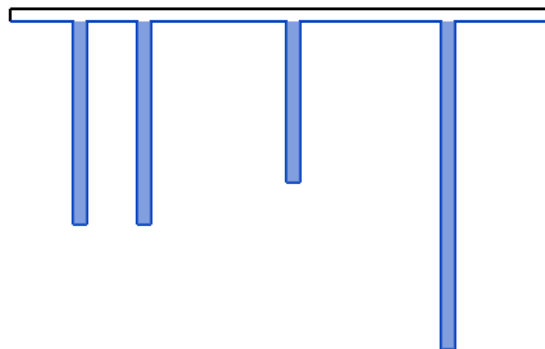
Preview of Trim/Extend Multiple Elements option with horizontal wall selected as boundary



Result of clicking left-most vertical wall above the boundary, clicking next 2 walls below the boundary, and highlighting the wall on the right



Preview of Trim/Extend Multiple Elements option with horizontal wall selected as boundary and selection box drawn from right to left



Result of drawing a selection box starting below the boundary to include the vertical walls

ARRAYS

The elements of an array can follow a line (a linear array), or they can follow an arc (a radial array).

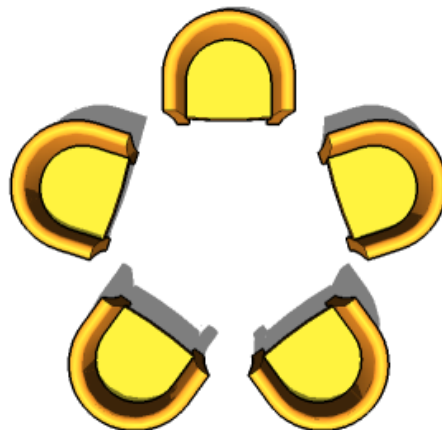
When creating an array, you specify the distance between elements using either of the following methods:

- Specify the distance between the first and second elements. (Use the Move To 2nd option.) All subsequent elements use the same spacing.
- Specify the distance between the first and last elements. (Use the Move To Last option.) All remaining elements are evenly spaced between them.

A linear array



A radial array



SPLITTING ELEMENTS

Use a Split tool to divide elements into 2 separate parts, remove segments between 2 points, or to create a defined gap between 2 walls.

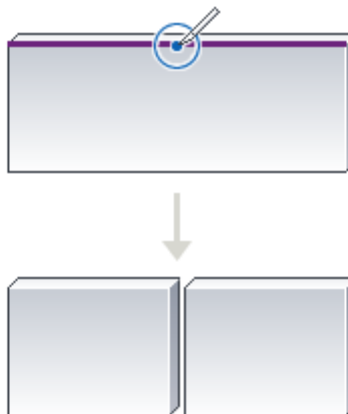
There are 2 ways to use Split tools:

- Split Element
- Split with Gap


You can split the following elements:

- walls
- lines
- railings (Split Element only)
- columns (Split Element only)
- beams (Split Element only)
- braces (Split Element only)
- generic MEP elements such as duct, pipe, cable trays, and conduit
- MEP fabrication parts such as duct, pipe, and cable trays

SPLIT WALLS WITH A DEFINED GAP



To create 2 walls with a defined gap


1. Click Modify tab ► Modify panel ►  (Split with Gap).
2. On the Options Bar, specify the Joint Gap dimension.

Note: Joint Gap is limited to values between 1/16” and 1’ (Imperial).

3. Move the cursor over the wall, and click to place the gap. The wall splits into 2 independent walls.

Joining walls that are split with a gap between them

When you select a wall that was created using Split with Gap, the Allow Join symbol displays in the drawing area. If desired, select Allow Join and drag the wall to the second wall to join them. Or, right-click and select Disallow Join. This allows the wall to rejoin with no gap.

1. Select a wall that was created using Split with Gap.
2. Click  to unlock the dimension constraint.
3. Select Drag Wall End (indicated by a blue circle on the selected wall), right-click, and click Allow Join.
4. Select the other wall and repeat Steps 2-3.
5. Select Drag Wall End and drag the wall to the other wall. The walls join.

Unjoining walls created using Split with Gap

1. Move the cursor over 1 of the 2 walls that was created using Split with Gap. The wall highlights.
2. Select the wall, right-click Drag Wall End (indicated by a blue circle on the selected wall), and click Select Disallow Join.
3. Drag the wall apart from the wall to which it had been joined.



USE PINS TO LOCK ELEMENTS IN PLACE

Use the Pin tool to lock a modeling element in place. When you pin a modeling element, it cannot be moved.

If you try to delete a pinned element, Revit warns you that the element is pinned.

If you pin a component, it can still move if it is set to move with nearby elements or if the level where it is placed moves up or down. See Move Lines and Components with Walls.

To pin an element, do one of the following:

- Select the elements to be pinned, and then click Modify | <Element> tab ► Modify panel ►  (Pin).
- Click Modify tab ► Modify panel ►  (Pin), select the elements to be pinned, and then press Enter.

Revit displays a pushpin control near the element to indicate that it is pinned in place. To move or delete the element, you must first unlock it by clicking the pushpin control. Click the pushpin again to lock the element.

RESIZING AND SCALING ELEMENTS

You can adjust the size and scale of elements graphically or by entering a scale factor. You can resize multiple elements simultaneously.

The Scale tool is available for lines, walls, images, links, DWG and DXF imports, reference planes, and the position of dimensions.



When resizing elements, consider the following:

- You can resize elements in 2D views and 3D views.
- You cannot resize pinned elements. Unpin elements before resizing them.
- To resize elements, you define an origin, which is a fixed point from which the elements equally resize.
- All selected elements must lie in parallel planes. All walls in the selection must have the same base level.
- When you resize a wall, inserts (such as doors and windows) remain at a fixed distance from the wall's midpoint.
- Resizing changes the position of dimensions but not their values. If you resize an element that a dimension references, the dimension value does change.
- Link symbols and import symbols have a read-only instance parameter called Instance Scale. It shows how much the instance size differs from the base symbol. You can change the instance scale by resizing the link symbol or the import symbol.

DELETE ELEMENTS

The Delete tool removes selected elements from the drawing, but does not paste deleted elements to the clipboard.

Do one of the following:

- Select the elements to delete, and then click Modify | <Element> tab ► Modify panel ►  (Delete).
- Click Modify tab ► Modify panel ►  (Delete), select the elements to delete, and then press Enter.

Results:

The basic drawing and editing tools of a building is drawn by using Revit software

Experiment No: 03

SETTING UP LEVELS AND GRIDS

3.1 Aim:

To draw the setting up levels and grids in building using Revit software

3.2 Software used:

Revit 2018

3.3 Tools Used And Their Description:

In menu bar click Architecture and upon selecting datum choose grid option and levels also.

3.3.1 Grids:

Grids are 3D elements that are visible only in views and intersect the grid extents. Structural columns are automatically join to grid intersections.

The Project Browser shows a logical hierarchy for all views, schedules, sheets, groups, and other parts of the current project. As you expand and collapse each branch, lower-level items display.

To open the Project Browser, click View tab ► Windows panel ► User Interface drop-down ► Project Browser, or right-click anywhere in the application window and click Browsers ► Project Browser.

Searching and Navigating

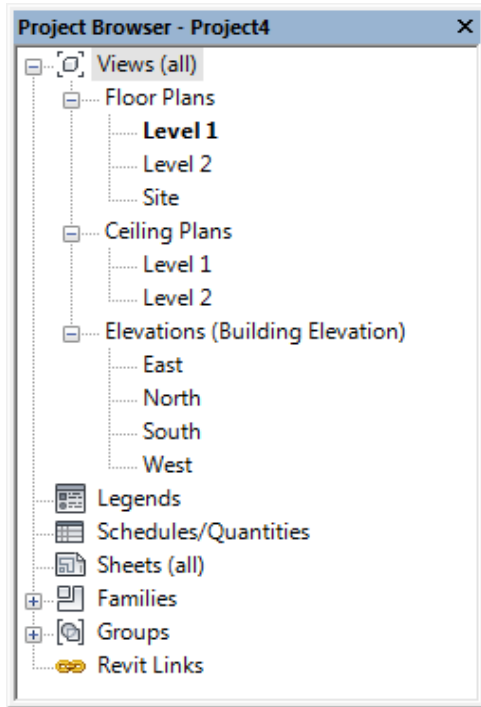
Large complex projects can contain hundreds of entries in the Project Browser. To quickly navigate and locate a desired item, use any of the following methods:

- Right-click the browser and click Search to open the Search in Project Browser dialog.
- To expand or collapse top-level nodes in the browser, right-click a node (such as Views or Families) and select Expand Selected or Collapse Selected.
- To expand or collapse all top-level nodes, right-click a node or white space in the browser and select Expand All or Collapse All.

Customizing the Project Browser

To change the location of the Project Browser, drag its title bar. To change its size, drag an edge. Changes to the size and location of the Project Browser are saved and restored when the application is restarted.

You can customize the organization of views, sheets, and schedules/quantities in the Project Browser to support the way you work. See Organizing the Project Browser.



Views, Schedules, Sheets

If you want to...	then...
open a view	double-click the name of the view, or right-click the name and click Open from the context menu. The active view name displays in bold.
open the sheet on which a view is placed	right-click the view name, and click Open Sheet. If the Open Sheet option is disabled in the context menu, the view is either not placed on a sheet, or is a schedule or legend view, which can be placed on more than one sheet.
add a view to a sheet	drag the view name onto the sheet name or onto the sheet in the drawing area. You can also right-click the sheet name, and click Add View on the context menu. In the Views dialog, select the view to add, and click Add View to Sheet. After you perform one of these actions, the sheet is active in the drawing area, and the added view displays as a viewport. As you move the cursor, the viewport moves with it. When the viewport is in the desired location on the sheet, click to place it.
remove a view from a sheet	under the sheet name, right-click the view name, and click Remove From Sheet.
create a new sheet	right-click the Sheets branch, and click New Sheet.

If you want to...	then...
copy a view	right-click the view name, and click Duplicate View ► Duplicate.
copy a view with view-specific elements	<p>right-click the view name, and click Duplicate View ► Duplicate with Detailing.</p> <p>View-specific elements (such as detail components and dimensions) are copied into the view.</p> <p>This tool is available for plan views, callout views, drafting views, and section views. You cannot copy callouts from plan views.</p>
rename views, schedules	right-click the view name and click Rename, or select it and press F2.
rename a sheet	right-click the sheet name and click Rename, or select it and press F2.
close a view	right-click the view name, and click Close.
delete a view	right-click the view name and click Delete.
change properties	click the view name, and change properties in the Properties palette.
expand or collapse branches in the Project Browser	<p>click + to expand, or click – to collapse. Use the arrow keys to navigate between branches.</p> <p>To expand or collapse top-level nodes in the browser, right-click a node and select Expand Selected or Collapse Selected.</p>
find referring views	right-click the view name, and click Find Referring Views.

Groups


If you want to...	then...
place a group instance in a view	under Groups, navigate to the desired group, then drag the group into the drawing area.
modify group types	<p>right-click the group type, and select one of the following tools:</p> <p>Delete: Deletes the group type.</p> <p>Rename: Renames the group type.</p> <p>Select All Instances: Selects all instances of a group type in the project.</p> <p>Properties: Changes type properties.</p>
duplicate a group type	<p>under Groups, navigate to the desired group, right-click the group name, and click Duplicate.</p> <p>The new group type displays in the Project</p>

If you want to...	then...
	Browser.
reload a group	under Groups, navigate to the desired group, right-click the group name, and click Reload.
rename a group	right-click the group and click Rename, or select it and press F2.

Revit Links

If you want to...	then...
create a new link to a Revit model	right-click the Revit Links branch, and click New Link.
manage links to Revit models	right-click the Revit Links branch, click Manage Links, and click the Revit tab.
copy a linked Revit model to another project file	under Revit Links, navigate to the linked model to copy, right-click the link name, and click Create Instance. Click in the drawing area to place the new instance of the linked model.
unload or reload a linked Revit model	under Revit Links, navigate to the linked model, right-click the link name, and click the desired tool to unload or reload the model.
unload a linked Revit model in a worksharing environment, when in a local file	under Revit Links, navigate to the linked model, right-click the link name, and select one of the following: Unload ► For all users: The Revit link is unloaded for all users in the model. Unload ► For me: The Revit link is unloaded for the current user only. This command works like a permanent override and remains set for the current user for that RVT link until cleared. To clear the override, right-click the link name in the Project Browser, and click Unload ► Clear my override.

Renderings

If you want to...	then...
render an image	display a 3D view and click View tab > Graphics panel >  (Render). Then select Render in the Rendering dialog.
place rendered images onto sheets	drag the rendered image name onto the sheet in the drawing area.

Results:

The levels and grids of a building is drawn by using Revit software

Experiment No: 04

MODELLING WALLS

4.1 Aim :

To draw a different types of modeling walls in building using Revit software.


4.2 Software used :

Revit 2018

4.3 Tools Used And Their Description:


In menu bar click Architecture and upon selecting wall choose types of option like Architectural, structural, & face.

The process of creating a structural wall is similar.

1. Open a floor plan view or a 3D view.
2. Click Architecture tab ► Build panel ► Wall drop-down ►  (Wall: Architectural).
3. If you want to place a wall type other than the one displayed in the Type Selector, select a different type from the drop-down.


You can use the bottom part of the Properties palette to modify some of the instance properties for the selected wall type before you start placing instances.

4. On the Options Bar, specify the following:
 - **Level.** (3D views only) Select a level for the wall's base constraint. You can choose a non-story level. See Levels.
 - **Height.** Select a level for the wall's top constraint, or enter a value for the default setting of Unconnected. See Height/Depth of Walls.
 - **Location Line.** Select which vertical plane of the wall you want to align with the cursor as you draw, or with the line or face you will select in the drawing area. For examples, see About the Wall Location Line.
 - **Chain.** Select this option to draw a series of wall segments connected at endpoints.
 - **Offset.** Optionally enter a distance to specify how far the wall's location line will be offset from the cursor position or from a selected line or face (as described in the next step).
 - **Join Status.** Select Allow to automatically create a butt join (default) where walls intersect. Select Disallow to prevent walls from joining when they meet. Allow is selected by default each time you open the software, but your last-selected option is maintained during the current session. You can change the join status of individual walls later, if desired. See Wall Joins.
5. On the Draw panel, select a draw tool to place the wall using one of the following methods:

- **Draw the wall.** Use the default Line tool  to place a straight wall segment by specifying both a start point and an endpoint in the drawing. Alternatively, you can specify the start point, move the cursor in the desired direction, and then enter a value for the wall length.

Other tools on the Draw panel let you sketch rectangular, polygonal, circular, or arced layouts. For detailed descriptions of these tools, see *Sketching Elements*.

As you are drawing a wall with any of these tools, you can press the Spacebar to flip the interior/exterior orientation of the wall in relation to its location line.

- **Place the wall along an existing line.** Use the Pick Lines  tool to place wall segments along lines you select in the drawing. The lines can be model lines, reference planes, or edges of elements, such as roofs, curtain panels, and other walls.

Tip: To place walls simultaneously on an entire chain of lines, move the cursor over a line segment, press Tab to highlight them all, and then click.

- **Place the wall on an existing face.** Use the Pick Faces tool  to place a wall on a massing face or a generic model face that you select in the drawing. See *Creating Walls from Mass Faces*.



Tip: To place walls simultaneously on all vertical faces on the mass or generic model, move the cursor over one of faces, press Tab to highlight them all, and then click.

6. To exit the Wall tool, click Modify.

Use the Structural Wall tool to sketch a structural wall in the building model.

1. On the ribbon, click  (Structural Wall).

Where is it?

- Structure tab > Structure panel > Wall drop-down >  (Wall: Structural)
- Architect tab > Build panel > Wall drop-down >  (Wall: Structural)

2. On the Properties palette, select the family type of the wall from the Type Selector drop-down.

3. (Optional) Change the instance properties of the wall to be placed by clicking on the Properties palette.

Modify the Type Parameters of the wall to be placed by clicking the Edit Type button on the Properties palette.

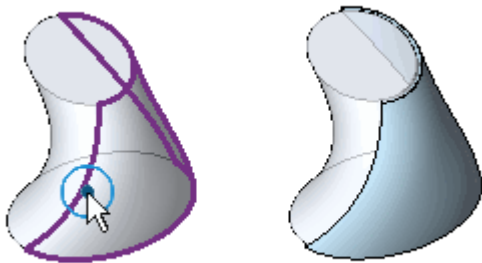
4. On the Options Bar, specify the following:

- **Level.** (3D views only) Select a level for the wall's base constraint. You can choose a non-story level.
- **Depth.** Select a level for the wall's bottom constraint, or enter a value for the default setting of Unconnected. Or if you want the wall to extend upwards from the base constraint, select Height.

- **Location Line.** Select which vertical plane of the wall you want to align with the cursor as you draw, or with the line or face you will select in the drawing area.
 - **Chain.** Select this option to draw a series of wall segments connected at endpoints.
 - **Offset.** Optionally enter a distance to specify how far the wall's location line will be offset from the cursor position or from a selected line or face (as described in the next step).
5. Sketch the shape of the wall.

If the walls do not display after you draw them, you may need to lower the view depth or create a foundation level to use as an underlay for the current level. .



Create walls from mass instances by picking lines or faces using the Wall by Face tool. This tool places walls on non-horizontal faces of a mass instance or a generic model.



If you change the mass face, walls created with the Wall by Face tool do not automatically update. To update the wall, use the Update to Face tool.


Tip: To create a non-rectangular wall on a vertical cylindrical face, use openings and in-place cuts to adjust its profile.

To create a wall from mass faces

1. Open a view that displays the mass.
2. Click Massing & Site tab ► Model by Face panel ►  (Wall by Face).
3. In the Type Selector, select a wall type.
4. On the Options Bar, select desired values for Level, Height, and Location Line.
5. (Optional) To create the wall from a single mass face, click Modify | Place Wall by Face tab ► Multiple Selection panel ►  (Select Multiple) to disable it. (It is enabled by default.)
6. Move the cursor to highlight a face.
7. Click to select the face.

If the Select Multiple option is cleared, a wall is placed on the face immediately.

8. If Select Multiple is enabled, select more mass faces as follows:

- a. Click an unselected face to add it to the selection. Click a selected face to remove it.
The cursor indicates whether you are adding (+) or removing (–) a face.
- b. To clear the selection and start over, click Modify | Place Wall by Face tab ► Multiple Selection panel ►  (Clear Selection).
- c. When the desired faces are selected, click Modify | Place Wall by Face tab ► Multiple Selection panel ► Create Wall.

Result:

To draw a different types modeling of walls in building using Revit software

Experiment No: 05

WORKING WITH DOORS AND WINDOWS

5.1 Aim:

To draw the doors and windows in building using Revit software

5.2 Software used:


Revit 2018

5.3 Used And Their Description:-


5.3.1 doors:

In menu bar click Architecture and upon selecting door & windows

Use the Door tool to place doors in walls of the building model. An opening is automatically cut into the wall to accommodate the door.

1. Open a plan, section, elevation, or 3D view.
2. Click Architecture tab ► Build panel ►  (Door).
3. If you want to place a door type other than the one displayed in the Type Selector, select a different type from the drop-down.

Note: To load additional door types from the Revit library, click Place Door tab ► Mode panel ► Load Family, navigate to the Doors folder, and open the desired family file.

4. If you want to tag doors automatically as you place them, click Modify | Place Door tab ► Tag panel ►  Tag on Placement. Then specify the following tagging options on the Options Bar:

If you want to...	then...
change the orientation of the tag	select Horizontal or Vertical.
load additional tags	click Tags (see Load a Tag or Symbol Style).
include a leader line between the tag and the door	select Leader.
change the default length of the leader	enter a value in the text box to the right of the Leader check box.

5. Move the cursor over a wall to display a preview image of the door.


When placing the door in plan view, press the Spacebar to flip the door hand from left to right. To flip the door facing (make it swing in or out), move the cursor closer to the inner or outer wall edge.

By default, the temporary dimensions indicate the distances from the door centerline to the centerlines of the nearest perpendicular walls. To change these settings, see Temporary Dimension Settings.


6. When the preview image is at the desired location on the wall, click to place the door.

You can add a window to any kind of wall or add a skylight to an in-place roof.

To add a window to a curtain wall panel, you must first change the panel to a wall (see About Curtain Wall Panels).

1. Open a plan, elevation, section, or 3D view.
2. Click Architecture tab ► Build panel ►  (Window).
3. If you want to place a window type other than the one displayed in the Type Selector, select a different type from the drop-down.

Note: To load additional window types from the Library, click Modify | Place Window tab ► Mode panel ► Load Family, navigate to the Windows folder, and open the desired family file.

4. If you want to tag windows automatically as you place them, click Modify | Place Window tab ► Tag panel ►  Tag on Placement. Then specify the following tagging options on the Options Bar:

If you want to...	then...
change the orientation of the tag	select Horizontal or Vertical.
load additional tags	click Tags (see Load a Tag or Symbol Style).
include a leader line between the tag and the window	select Leader.
change the default length of the leader	enter a value in the text box to the right of the Leader check box.

5. Move the cursor over a wall to display a preview image of the window.

By default, the temporary dimensions indicate the distances from the window centerline to the centerlines of nearest perpendicular walls. To change these settings, see Temporary Dimension Settings.

6. When the preview image is at the desired location on the wall, click to place the window.

Results:

To draw a doors & windows in building using Revit software .

Experiment No: 06

WORKING WITH CURTAIN WALLS

6.1 Aim: -

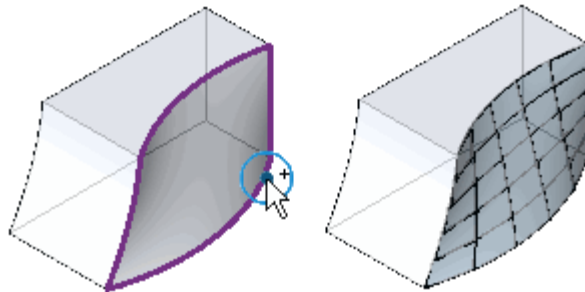
To draw a curtain walls in building using Revit software

6.2 Software:-

Revit 2018

6.3 Used And Their Description:-

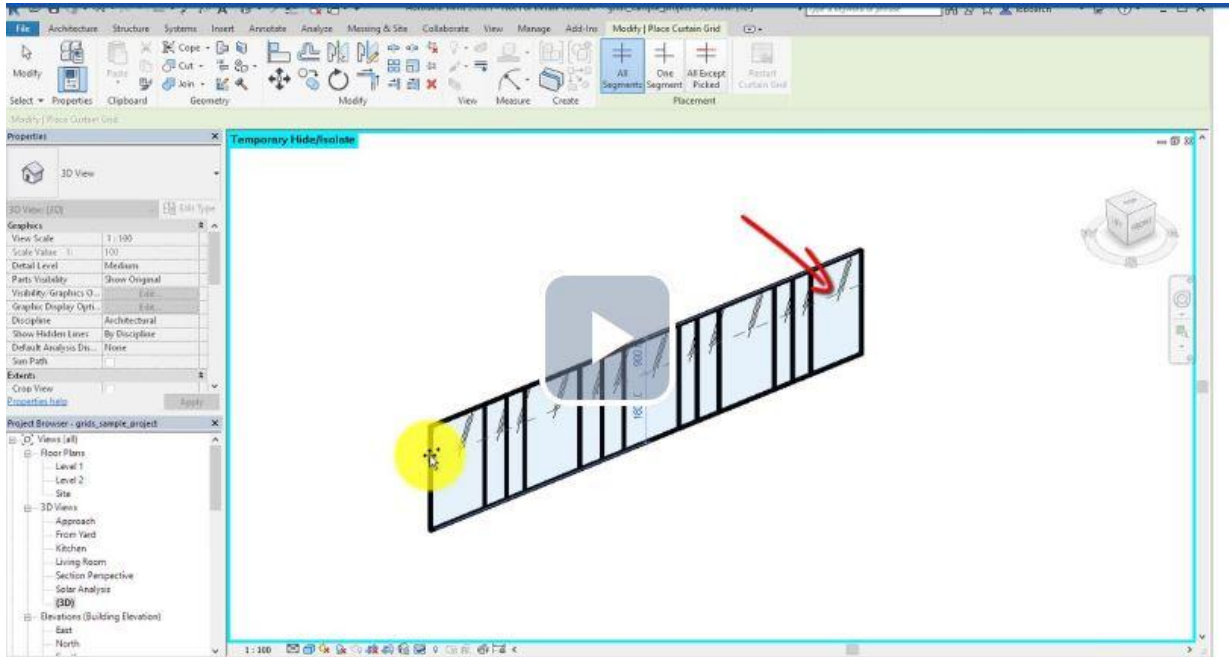
Create curtain systems on any mass faces or generic model faces using the Curtain System by Face tool.




Curtain systems do not have editable sketches. Use curtain walls if you require an editable sketch on a vertical mass face.


Note: You cannot edit the profile of a curtain system. If you want to edit the profile, place a curtain wall.

To create a curtain system from mass faces. If you sketched a curtain wall without automatic grids, you can add grids manually



1. Open a view that displays the mass.
2. Click Massing & Site tab ► Model by Face panel ►  (Curtain System by Face).
3. In the Type Selector, select a curtain system type.

Use a curtain system type with a curtain grid layout.

4. (Optional) To create the curtain system from a single mass face, click Modify | Place Curtain System by Face tab ► Multiple Selection panel ►  (Select Multiple) to disable it. (It is enabled by default.)

5. Move the cursor to highlight a face.
6. Click to select the face.


If the Select Multiple option is cleared, a curtain system is placed on the face immediately.

7. If Select Multiple is enabled, select more mass faces as follows:


- a. Click an unselected face to add it to the selection. Click a selected face to remove it.

The cursor indicates whether you are adding (+) or removing (–) a face.

Tip: Drag a pick box over the entire shape to make a curtain system on the entire form.

- b. To clear the selection and start over, click Modify | Place Curtain System by Face tab ► Multiple Selection panel ►  (Clear Selection).

c. When the desired faces are selected, click Modify | Place Curtain System by Face tab ► Multiple Selection panel ► Create Curtain System.

8. Open a 3D view or an elevation view.
9. Click Architecture tab ► Build panel ►  (Curtain Grid).
10. Click Modify | Place Curtain Grid tab ► Placement panel, and select a placement type.
11. Place the cursor along wall edges; a temporary grid line displays.
12. Click to place the grid lines.

Each section of the grid (design unit) is filled with a separate curtain wall panel of the selected type.


13. Click Esc when you are done.
14. Add additional grid lines, if necessary, or click Modify to exit the tool.

Curtain grid snapping

When you place curtain grids, they snap to evenly spaced intervals on the curtain wall. For example, as you drag the cursor over a panel, it snaps to the midpoint or to the 1/3 mark of the panel.

When you place curtain grids on walls, sloped glazing, and curtain systems, the curtain grids snap to visible levels, grids, and reference planes. In addition, curtain grids snap to other curtain grids when you select a common corner edge. For example, if you place the cursor on a joined edge between 2 curtain walls, the new curtain grid snaps to an existing curtain grid.

After creating a curtain grid, you can place mullions on grid lines.

1. Add a curtain grid to a curtain wall or curtain system.
2. Click Architecture tab ► Build panel ►  (Mullion).
3. Select the desired mullion type in the Type Selector.
4. On the Modify | Place Mullion tab ► Placement tab, select one of the following tools:
 - **Grid Line:** When you click a grid line in the drawing area, this tool places a mullion across the entire grid line.
 - **Grid Line Segment:** When you click a grid line in the drawing area, this tool places a mullion on the individual segment of the grid line that you click.
 - **All Grid Lines:** When you click any grid line in the drawing area, this tool places mullions on all grid lines.
5. Click in the drawing area to place mullions on grid lines as desired.
6. Click Modify.

Mullions resize to the grid line, and automatically split at an intersection with another mullion. You can change the properties of mullions.

RESULT:-

To draw a different types of curtain walls in building using Revit software.

Experiment No: 07

WORKING WITH VIEWS

7.1 Aim: -

To draw different types of view in a building using Revit software

7.2 Software: -

Revit 2018

7.3 Used Tools And Their Description :-

Orient the camera to a view or a direction.

You can set the position of the camera in a 3D view. Changes made to the orientation or position of the 3D camera are considered temporary until they are saved.


1. Open a 3D view.
2. Right-click the ViewCube, and click Orient to View or Orient to a Direction.

Orient to View allows you to select another view. The camera moves to the same location as in the view you specify, and a section box is placed around the model that emulates the extents of the selected view.

Note: To turn off the section box, in the Project Browser right-click the view name, and select Properties. On the Properties Palette, clear the Section Box check box.

Orient to a Direction includes options to orient the camera north, south, east, west, northeast, northwest, southeast, southwest, or top (places the camera at the top of the model).

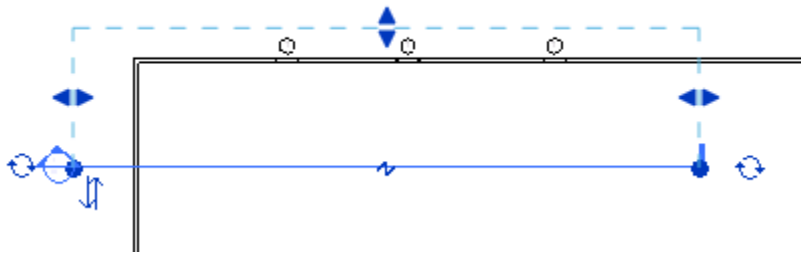
Add a section line and crop region to define a new section view.

1. Open a plan, section, elevation, or detail view.
2. Click View tab ► Create panel ►  (Section).
3. (Optional) In the Type Selector, select a view type from the list, or click Edit Type to modify an existing view type or create a new view type.
4. Place the cursor at the starting point of the section, and drag through the model or family.

Note: You can snap a section line parallel or perpendicular to a non-orthogonal datum or wall. Snapping to a wall is available in plan views.

5. Click when you reach the end point of the section.

The section line and the crop region appear and are selected.



6. If desired, resize the crop region by dragging the blue controls. The depth of the section view changes accordingly.

7. Click Modify or press Esc to exit the Section tool.

8. To open the section view, double-click the section header, or select the section view from the Sections grouping of the Project Browser.

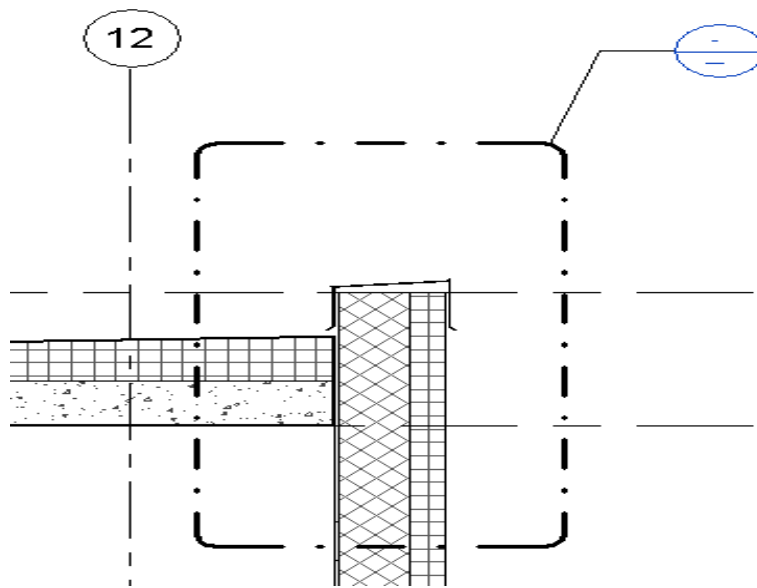
The section view changes when the design changes or the section line is moved.

Use a callout view shape that suits a particular purpose.

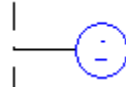
1. In a project, click View tab > Create panel > Callout drop-down >  (Rectangle).

2. In the Type Selector, select the type of callout to create: a detail callout or a view callout (a callout view that has the same view type as the parent view).

3. To define the callout area, drag the cursor from the upper-left to the lower-right, creating a callout bubble as shown by the dashed line enclosing the upper-left corner of the grid.








4. To see the callout view, double-click the callout head

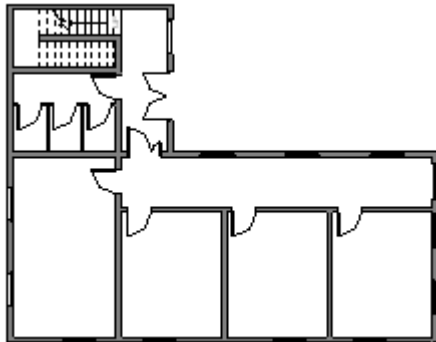


The callout view displays in the drawing area.

Two-dimensional views provide a traditional method for viewing a model. These views include floor plans, reflected ceiling plans, and structural plans.

- View tab > Create panel > Plan Views drop-down >
 -  (Floor Plan)
 -  (Reflected Ceiling Plan)
 -  (Structural Plan)
 -  (Plan Region)
 -  (Area Plan)

Most models include at least one floor plan.



Topics in this section

- **About Plan Views**

In a 2D view, display a floor plan, a reflected ceiling plan, or structural plan.

- **About the View Range**

The view range is a set of horizontal planes that control the visibility and display of objects in a plan view.

- **About Plan Regions**

To define multiple cut planes within a plan view, use plan regions.

- **About Adjusting the Depth of a Plan View**

Use the Depth Clipping parameter to display parts of a model below the cut plane.

- **About Underlays**

Underlays are helpful when you need to understand the relationship of components at different levels for coordination and construction.

- **Create a Plan View**

Add another view to your project or duplicate an existing view.

- **Cut a Plan View at a Clip Plane**

Control the visibility of parts of the model beneath a given clip plane.

- **Set the View Direction in a Structural Plan View**

Change the view from looking down for foundations to looking up for framing views.

- **Create a Plan Region**

Use a plan region to define a cut plane at a different height than the cut plane used for the rest of the plan view.

- **Control the Visibility of Plan Regions**

After creating a plan region, you can make it visible or hide it in the plan view.

- **Modify the View Range**

Establish or change the horizontal planes that control an object's visibility in plan views.

- **View Range Properties**

Define the set of horizontal planes that control the visibility and display of objects in a plan view.

- **Create an Underlay**

Create an underlay when you need to understand the relationship of components at different levels for coordination and construction.

Use elevation views to look at a project from different locations, either exterior or interior.

1. Open a plan view.
2. Click View tab ► Create panel ► Elevation drop-down ►  (Elevation).

The cursor appears with the elevation symbol.

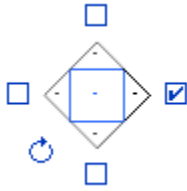
3. (Optional) In the Type Selector, select a view type from the list, or click Edit Type to modify an existing view type or create a new view type.

4. Place the cursor near a wall, and click to place the elevation symbol.

Note: As you move the cursor, you can press Tab to change the position of the arrowhead. The arrowhead snaps to perpendicular walls.

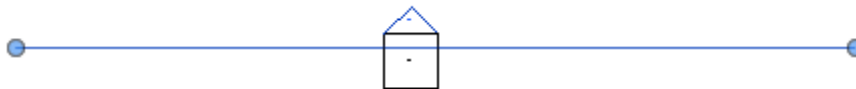
5. To set different interior elevation views, highlight the square shape of the elevation symbol, and click.

The elevation symbol displays with check box options for creating views, as the following image shows.



Tip: The rotation control is useful for aligning to angled elements in the plan.

6. Select the check boxes to indicate where you want to create elevation views.
7. Click away from the elevation symbol to hide the check boxes.
8. Highlight an arrowhead on the symbol to select it.
9. Click the arrowhead once to view the clip plane:




Elevation symbol with clip plane

The end points of clip planes snap and join to walls. You can resize the width of the elevation by dragging the blue controls. If the blue controls do not display in the view, select the clip plane and click **Modify Views** tab > **Element panel** > **Element Properties**. In the **Instance Properties** dialog, select the **Crop View** parameter, and click **OK**.

10. In the **Project Browser**, select the new elevation view.

The elevation view is designated by a letter and number, for example, **Elevation: 1 - a**.

Create a drafting view to provide details that are not part of the building model. Use the detailing tools on the **Annotate** tab to sketch the details.

1. Click **View** tab > **Create panel** >  (**Drafting View**).
2. In the **New Drafting View** dialog, enter a value for **Name**, and select a value for **Scale**.

If you select **Custom**, enter a value for **Scale** value 1.

3. Click **OK**.

The drafting view opens in the drawing area.

4. In the **Project Browser**, expand **Drafting Views** to see the newly created drafting view listed.
5. To create details in the drafting view, use the detailing tools on the **Annotate** tab.

The detailing tools include **Detail Lines**, **Insulation**, **Masking Region**, **Filled Region**, **Text**, **Symbol**, and **Dimension**.

When duplicating a view, you can determine whether both the model geometry and the detail geometry are copied into the new view.

Detail geometry includes detail components, detail lines, repeating details, detail groups, and filled regions.

To copy the model geometry from an existing view into a new view, right-click the existing view in the Project Browser, and click Duplicate View ► Duplicate.

If you right-click, and click Duplicate View ► Duplicate with Detailing, both the model geometry and the detail geometry are copied into the new view.

Note: Hidden view-specific elements will not be created in the new view. Hidden model elements and datum will be created in the new view and will remain hidden.

RESULT :-

Thus different views for a building can be drawn in Revit software.

EXPERIMENT NO: 08

ADDING COMPONENTS

AIM:

To draw the adding components, modifying components & working with elements in building using Revit software.

SOFTWARE:

Revit 2018

PROCEDURE


You can to place freestanding components in the building model.

1. Open a project view appropriate for the type of component you want to place.
For example, you can place a desk in a plan or 3D view, but not in a section or elevation.


2. On the ribbon, click one of the following:

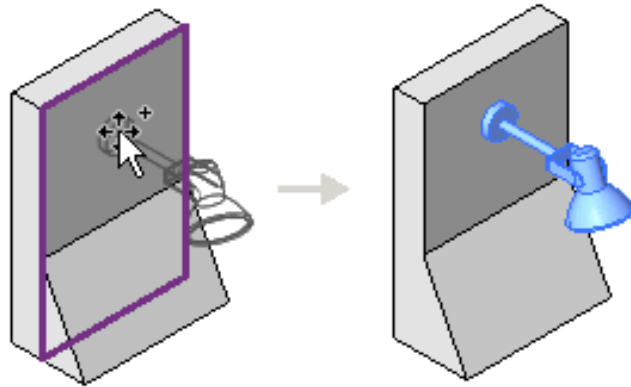
- Architecture tab > Build panel >  (Place a Component)
- Structure tab > Model panel > Component drop-down >  (Place a Component)
- Systems tab > Model panel > Component drop-down >  (Place a Component)

3. In the Type Selector at the top of the Properties palette, select the desired component type.

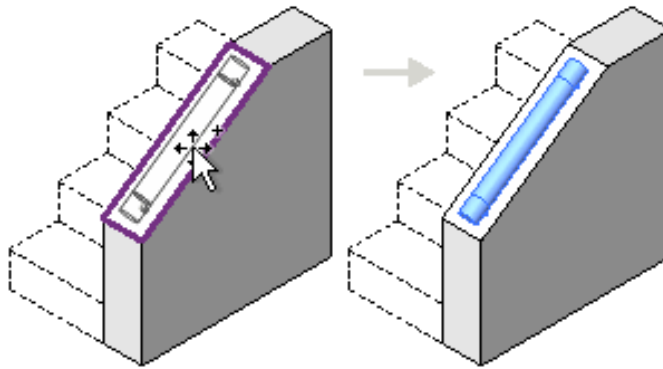
If the desired component family has not yet been loaded into the project, click Modify | Place Component tab > Mode panel >  Load Family. Then navigate to the appropriate category folder in the Load Families dialog, select the family, and click Open to add the family to the Type Selector.


4. If the selected component family has been defined as face-based or work plane-based (see the Note following this procedure), click one of the following options on the Placement panel, which displays on the Modify | Place Component tab:

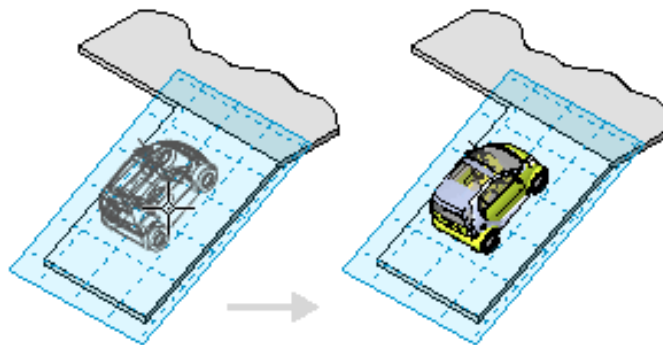
-  **Place on Vertical Face.** This option is only available for some components and allows placement only on vertical faces.



-  **Place on Face.** This option allows placement on faces regardless of orientation.



-  **Place on Work Plane.** This option requires an active work plane to be defined in the view (see Showing the Work Plane of a View). You can place the component anywhere on the work plane.



5. In the drawing area, move the cursor until the preview image of the component is in the desired location.

6. If you want to change the orientation of the component, press the Spacebar to rotate the preview image through its available positioning options.

7. When the preview image is in the desired location and orientation, click to place the component.

After you place a component, you can specify that it moves when a nearby wall moves. See *Moving Lines and Components with Walls*.

RESULT:

Thus drawn the adding components, modifying components & working with elements in building using Revit software.

EXPERIMENT NO: 09

MODELING FLOORS

AIM:

To draw the modeling floors in a building using Revit software.

SOFTWARE:

Revit 2018


PROCEDURE:

To create a floor, define its boundaries by picking walls or sketching its profile with drawing tools.

1. Click Architecture tab ► Build panel ► Floor drop-down ►  (Floor: Architectural).

Where is it?

2. Draw the floor boundaries, using one of the following methods:

- **Pick walls:** By default, Pick Walls is active. If it is not active, click Modify | Create Floor Boundary tab ► Draw panel ►  (Pick Walls). Select walls in the drawing area to use as floor boundaries.
- **Sketch boundaries:** To sketch the profile of the floor, click Modify | Create Floor Boundary tab ► Draw panel, and select a sketching tool. See Sketching.

The floor boundary must be a closed loop (profile). To create an opening in the floor, you can sketch another closed loop where you want the opening to appear.

3. On the Options Bar, for Offset, specify an offset for the floor edges.

Note: When you are using Pick Walls, select Extend into wall (to core) to measure the offset from the wall's core.




4. Click  Finish Edit Mode.

Create a structural floor by selecting support framing, walls, or by sketching the extent of the floor.


1. On the ribbon, click  (Structural Floor).

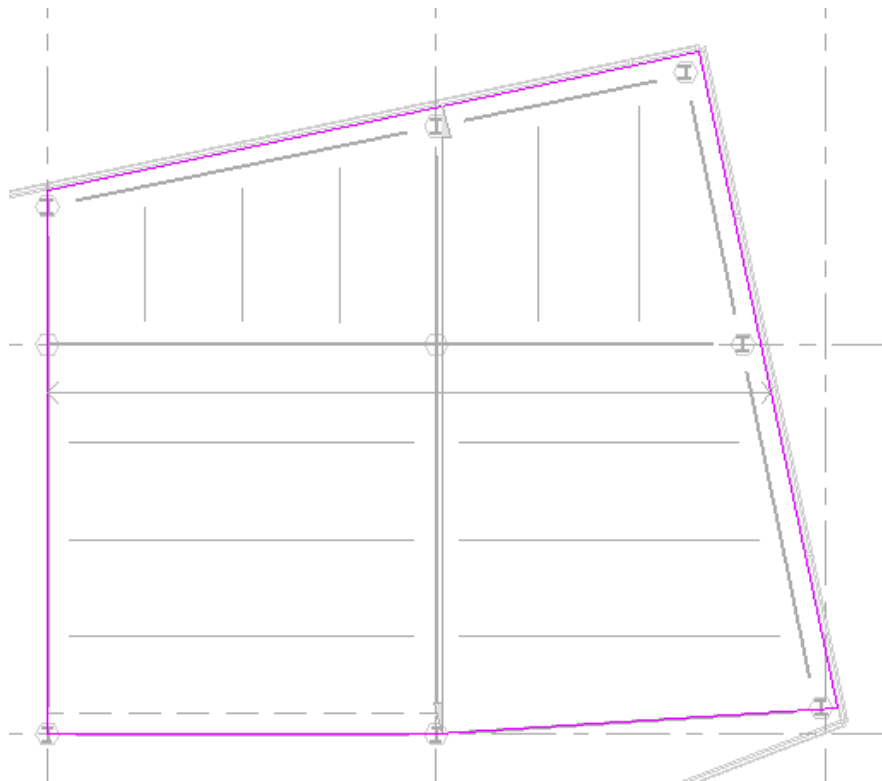
Where is it?

- Architecture tab ► Build panel ► Floor drop-down ►  (Floor: Structural)

- Structure tab > Structure panel > Floor drop-down >  (Floor: Structural)
2. From the Type Selector, specify a structural floor type.
 3. On the ribbon, click  (Boundary Line).
 4. Click  (Pick Walls) and select the bounding walls.

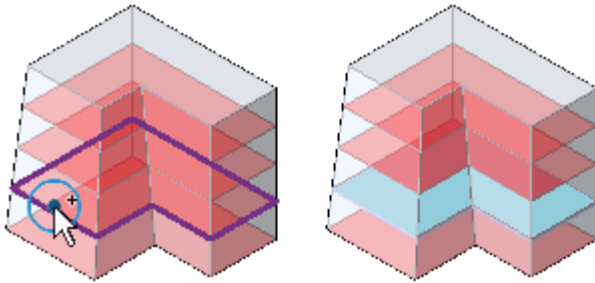
Note: Instead of picking walls you can sketch a structural floor. On the Draw panel of the ribbon, use the sketch tools to form the boundary of the structural floor. The sketch must form a closed loop or boundary condition.

5. To change the span direction, click  Span Direction, and click the desired edge or line.
6. (Optional) On the Options Bar:
 - specify an offset for slab edges.
 - select Extend into wall (to core).





7. On the ribbon, click  (Finish Edit Mode).

To create floors from a mass instance, use the Floor by Face tool or the Floor tool.



To use the Floor by Face tool, you first create mass floors. Mass floors calculate floor areas in a mass instance.


To create a floor from a mass floor

1. Open a view that displays the mass.
2. Click Massing & Site tab ► Model by Face panel ►  (Floor by Face).
3. In the Type Selector, select a floor type.
4. (Optional) To create the floor from a single mass face, click Modify | Place Floor by Face tab ► Multiple Selection panel ►  (Select Multiple) to disable it. (It is enabled by default.)
5. Move the cursor to highlight a mass floor.
6. Click to select the mass floor.


If the Select Multiple option is cleared, a floor is placed on the mass floor immediately.

7. If Select Multiple is enabled, select more mass floors.
 - a. Click an unselected mass floor to add it to the selection. Click a selected mass floor to remove it.

The cursor indicates whether you are adding (+) or removing (–) a mass floor.

- b. To clear the selection and start over, click Modify | Place Floor by Face tab ► Multiple Selection panel ►  (Clear Selection).
- c. When the desired mass floor are selected, click Modify | Place Floor by Face tab ► Multiple Selection panel ► Create Floor.

You add slab edges by selecting horizontal edges of floors. You can place slab edges in 2D views (such as plan or section views) or in 3D views.

1. Click Architecture tab ► Build panel ► Floor drop-down ►  (Floor: Slab Edge).
2. Highlight horizontal edges of floors, and click to place a slab edge.

Watch the status bar to look for valid references. For example, if you are placing a slab edge on a floor, the status bar might display: Floors : Basic Floor : Reference. You can also click model lines.

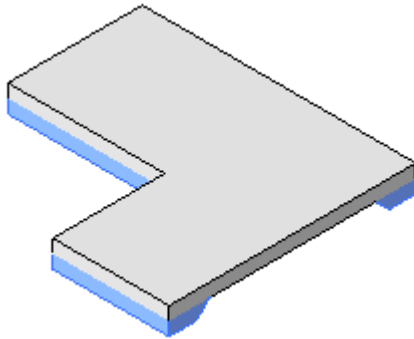
When placing a slab edge in section, place the cursor near the corners of the floor to highlight the reference.

As you click edges, Revit treats this as one continuous slab edge. If the slab edge segments meet at corners, they miter.

3. To finish the current slab edge, click Modify | Place Slab Edge tab ► Placement panel ►  Restart Slab Edge.

4. To start another slab edge, move the cursor to a new edge and click to place.

5. To finish placing slab edges, click Modify | Place Slab Edge tab ► Select panel ► Modify.



RESULT:

The draw of different types of modeling floors in a building using Revit software.

EXPERIMENT NO: 10

MODELING CELING & ROOFS

AIM:

To draw the modeling floors in a building using Revit software.

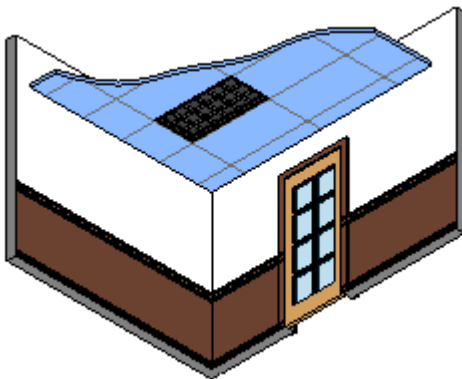
SOFTWARE:

Revit 2018

PROCEDURE:

Use the Ceiling tool to create a ceiling at a specified distance above its level. To place a ceiling, click within walls that form a closed loop, or sketch its boundaries.

- Architecture tab ► Build panel ►  (Ceiling)



Topics in this section

- **About Ceilings**
You can create a ceiling defined by walls, or sketch its boundary. Create ceilings in a reflected ceiling plan view.
- **Create a Ceiling**
Use the Ceiling tool to create a ceiling in a reflected ceiling plan view.
- **Create a Sloped Ceiling**
You can create sloped ceilings and cathedral ceilings in the building model.
- **Modify a Ceiling**
To modify a ceiling, select it and use tools on the Modify | Ceilings tab.
- **Ceiling Instance Properties**
Modify instance properties to change a ceiling's level and offset, slope, and more.
- **Ceiling Type Properties**
Modify type properties to change the structure and thickness of a ceiling, its fill pattern, and more.

Creates a roof using the building footprint to define its boundaries.


1. Display a floor plan view or a reflected ceiling plan view.
2. Click Architecture tab > Build panel > Roof drop-down >  (Roof by Footprint).

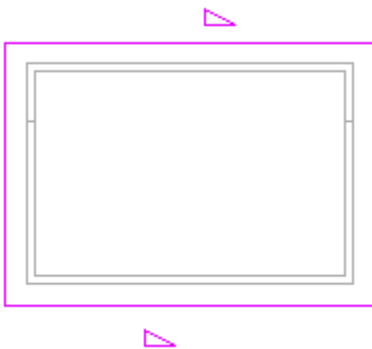
Note: If you try to add a roof on the lowest level, a dialog prompts you to move it to a higher level. If you choose not to move the roof to a different level, Revit notifies you later if the roof is too low.

3. On the Draw panel, select a sketch or pick tool. To edit roof properties before sketching, use the Properties palette.

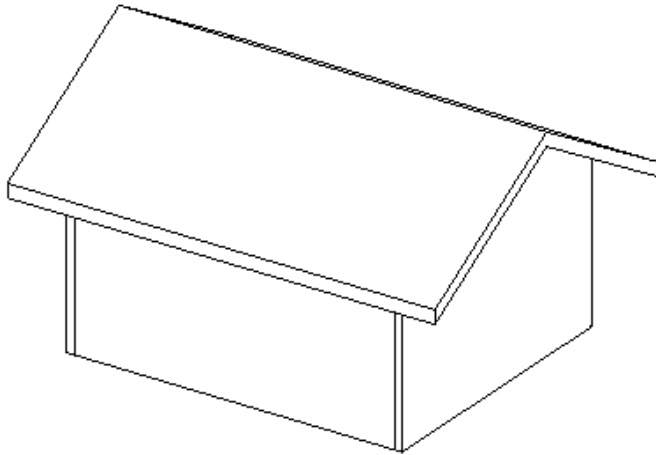
Tip: When using Pick Walls, you can specify the overhang before you sketch the roof. On the Options Bar, select Extend to wall core if you want the overhang to be measured from the core of the wall, and then specify a value for Overhang.

4. Sketch, or pick, a closed loop for the roof.
5. Specify slope defining lines. To change the slope definition of a line, select the line and, on the Properties palette, click Defines Roof Slope. You can then change the slope value.

When a roof line is set to slope defining, this symbol  appears adjacent to it.



6. Click  (Finish Edit Mode), and then open a 3D view.




Completed gable roof with overhang

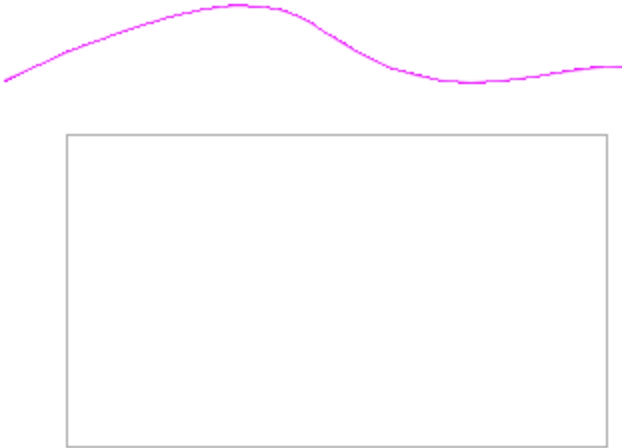
Note: To apply sloped glazing, select the roof, and in the Type Selector, select Sloped Glazing. You can place curtain grids on the curtain panels of the sloped glazing. Press Tab to switch between horizontal and vertical grids.

Add a roof to another roof

1. To cut off a roof in order to sketch another roof on top of it, select the roof in the drawing area.
2. On the Properties palette, specify a Cutoff Level, and then specify a height for Cutoff Offset.
This property specifies the distance above or below the level at which the roof is cut off.

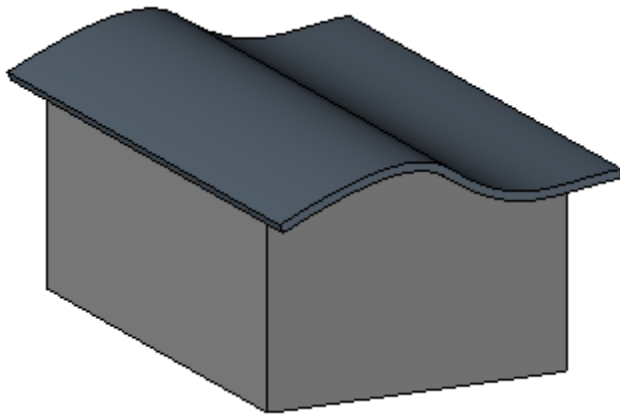
3. Sketch the new roof on top of the existing roof.
Creates a roof by extruding a profile that you sketch.

1. Display an elevation, 3D, or section view.
2. Click Architecture tab > Build panel > Roof drop-down >  (Roof by Extrusion).
3. Specify the work plane.
4. In the Roof Reference Level and Offset dialog, select a value for Level. The highest level in the project is selected by default.
5. To raise or lower the roof from the reference level, specify a value for Offset. Revit places a reference plane at the specified offset. Using the reference plane, you can control the position of the extruded roof in relation to a level.
6. Sketch the profile of the roof as an open loop.



Roof profile sketched using spline tool

7. Click  (Finish Edit Mode), and then open a 3D view.



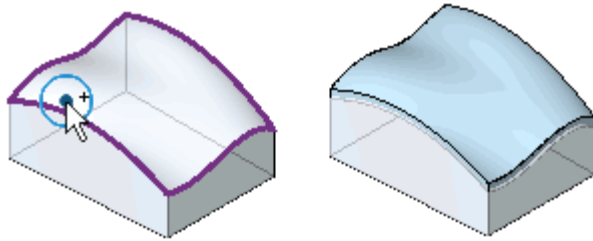
Completed extruded roof

Attach walls to the roof, if desired.

After you create a roof by extrusion, you can rehost the roof or edit the work plane of the roof.

Note: To apply sloped glazing, select the roof, and in the Type Selector, select Sloped Glazing. You can place curtain grids on the curtain panels of the sloped glazing. Press Tab to switch between horizontal and vertical grids.



Create roofs on any non-vertical faces of a mass using the Roof by Face tool.



You cannot select faces from different masses for the same roof.


Note: Roofs created using the Roof by Face tool do not automatically update if you change the mass face.

To create a roof from mass faces

1. Open a view that displays the mass.
2. Click Massing & Site tab ► Model by Face panel ►  (Roof by Face).
3. In the Type Selector, select a roof type.
4. (Optional) On the Options Bar, specify the level of the roof.
5. (Optional) To create the roof from a single mass face, click Modify | Place Roof by Face tab ► Multiple Selection panel ►  (Select Multiple) to disable it. (It is enabled by default.)
6. Move the cursor to highlight a face.
7. Click to select the face.

If the Select Multiple option is cleared, a roof is placed on the face immediately.

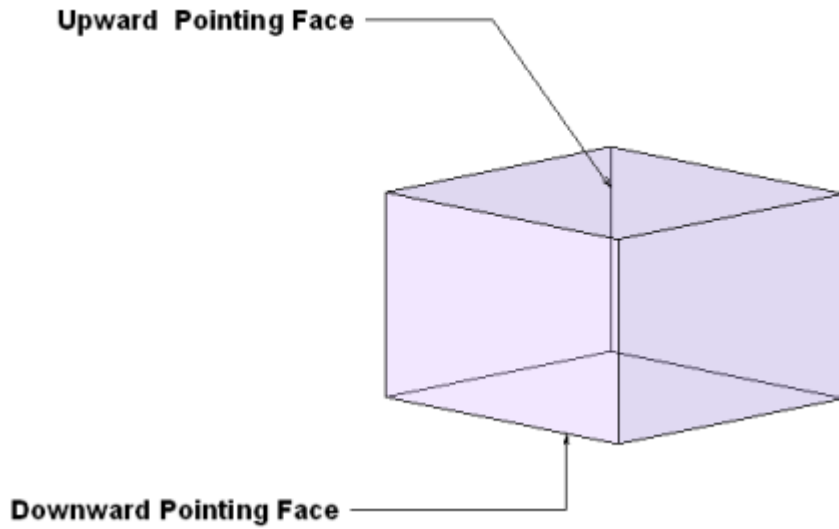
Tip: You can change the pick face location of the roof (either top or bottom) by modifying the roof's Picked Faces Location property in the Properties palette.

8. If Select Multiple is enabled, select more mass faces as follows:
 - a. Click an unselected face to add it to the selection. Click a selected face to remove it.
The cursor indicates whether you are adding (+) or removing (–) a face.
 - b. To clear the selection and start over, click Modify | Place Roof by Face tab ► Multiple Selection panel ►  (Clear Selection).
 - c. When the desired faces are selected, click Modify | Place Roof by Face tab ► Multiple Selection panel ► Create Roof.

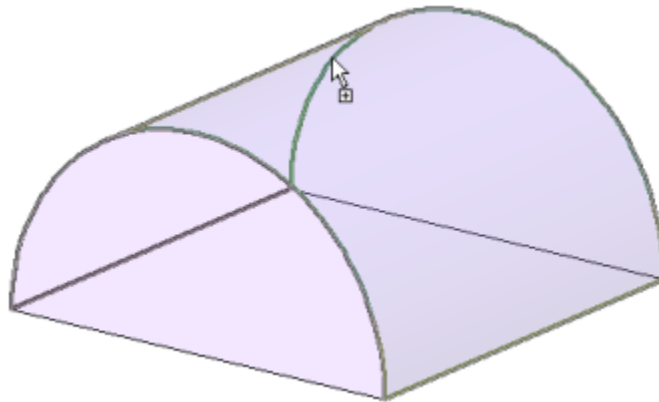
Tips

- Do not select upward-pointing and downward-pointing faces for the same roof.

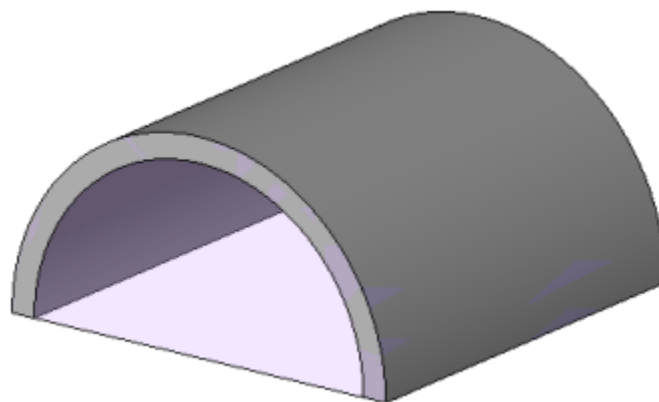
- To make roof panels that cover both upward and downward faces, split the mass into 2 faces, so that each face is either completely upward or downward. Then create one or more roofs from the downward faces and one or more from the upward faces.



Examples



Cursor highlighting cylindrical face





Placed roof

You can associate soffits with other elements, such as walls and a roof. If a wall or roof changes or moves, the soffit adjusts accordingly.


You can also create soffits that are not associated with other elements. To create non-associative soffits, use the Lines tool while in sketch mode.

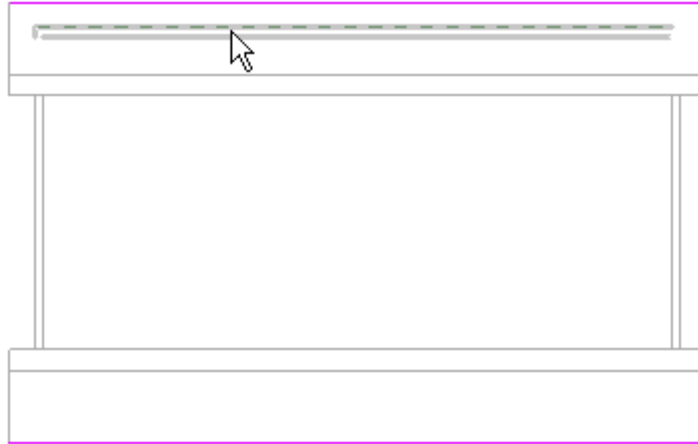
Create a sloping soffit by drawing a slope arrow or changing properties of the boundary line. See Sloped Surfaces.

1. Click Architecture tab > Build panel > Roof drop-down >  (Roof: Soffit).
2. Click Modify | Create Roof Soffit Boundary tab > Draw panel >  (Pick Roof Edges).
This tool creates a locked sketch line.
3. Highlight the roof, and click to select it.

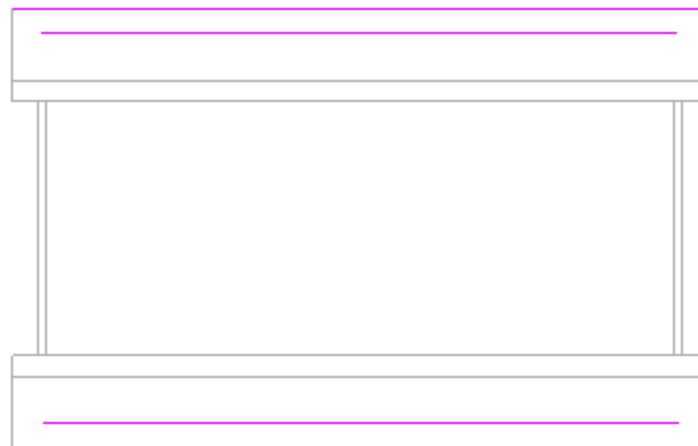


Roof selected with Pick Roof Edges tool

4. Click Modify | Create Roof Soffit Boundary tab > Draw panel >  (Pick Walls), highlight the outside faces of the wall beneath the roof, and click to select.



Wall highlighted for soffit line



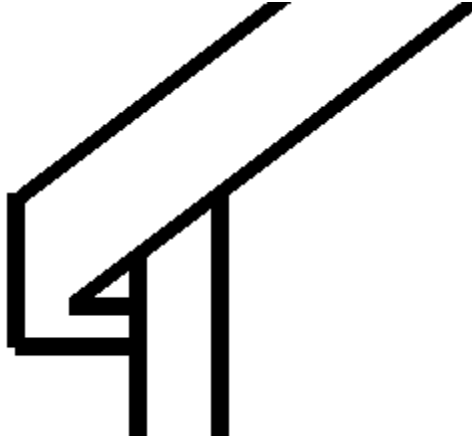
Sketch lines for soffit after picking walls

5. Trim the excess sketch lines and close the sketch loop.



6. Click ✓ (Finish Edit Mode).


To see the soffit better, create a section view through the plan view that shows the wall meeting the roof.




Roof, soffit, and wall in section view

Note: The Join Geometry tool was used to join the soffit and the roof in the previous illustration. To complete the image, join the soffit to the wall, and the wall to the roof.

Use the Fascia tool to add fascia to edges of roofs, soffits, model lines, and other fascia.

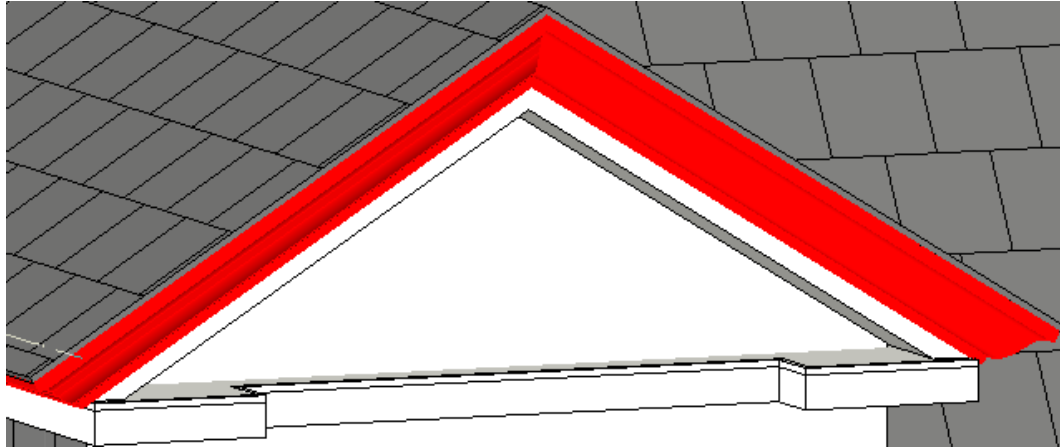
1. Click Architecture tab ► Build panel ► Roof drop-down ►  (Roof: Fascia).
2. Highlight edges of roofs, soffits, other fascia, or model lines, and click to place the fascia. Watch the status bar for information about valid references.

As you click edges, Revit treats this as one continuous fascia. If the fascia segments meet at corners, they miter.


3. Click Modify | Place Fascia tab ► Placement panel ►  (Restart Fascia) to finish the current fascia and start a different fascia.
4. Move the cursor to a new edge and click to place.
This different fascia does not miter with other existing fascias, even if they meet at the corners.
5. Click onto white space in the view to finish placing roof fascias.

Crown molding fascia

Fascia profiles miter correctly only around a square cut roof. The roof in this image was created by running a fascia along the edge of a roof with a Two-Cut Square rafter cut.

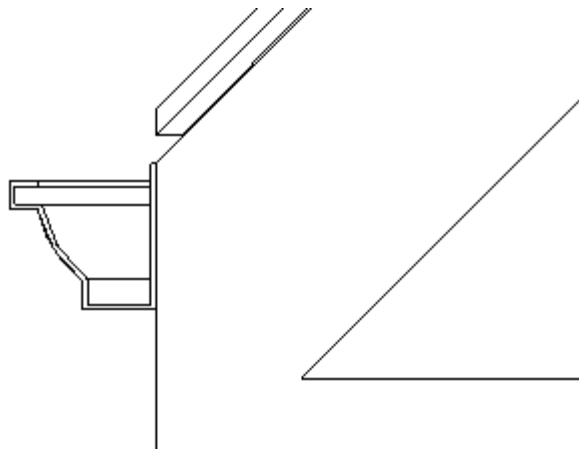


Use the Gutter tool to add gutters to roofs, soffits, model lines, and fascia.

1. Click Architecture tab ► Build panel ► Roof drop-down ►  (Roof: Gutter).
2. Highlight horizontal edges of roofs, soffits, fascias, or model lines, and click to place the gutter. Watch the status bar for information about valid references.

As you click edges, Revit treats this as one continuous gutter.

3. Click Modify | Place Gutter tab ► Placement panel ►  (Restart Gutter) to finish the current gutter and start a different gutter.
4. Move the cursor to a new edge, and click to place.
5. To finish placing gutters, click on white space in the view.



Gutter in section

RESULT

To draw a ceiling & roofs in a building using Revit software.

EXPERIMENT NO: 11

MODELING STAIRS AND RAILING

AIM:

To draw the modeling floors in a building using Revit software.

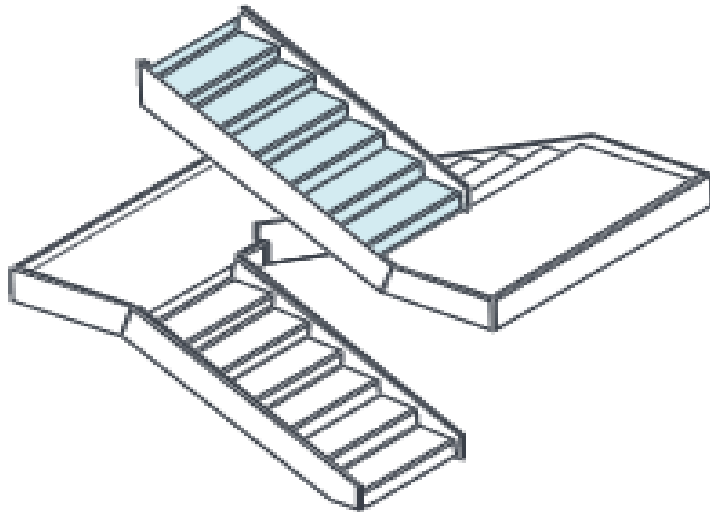
SOFTWARE:

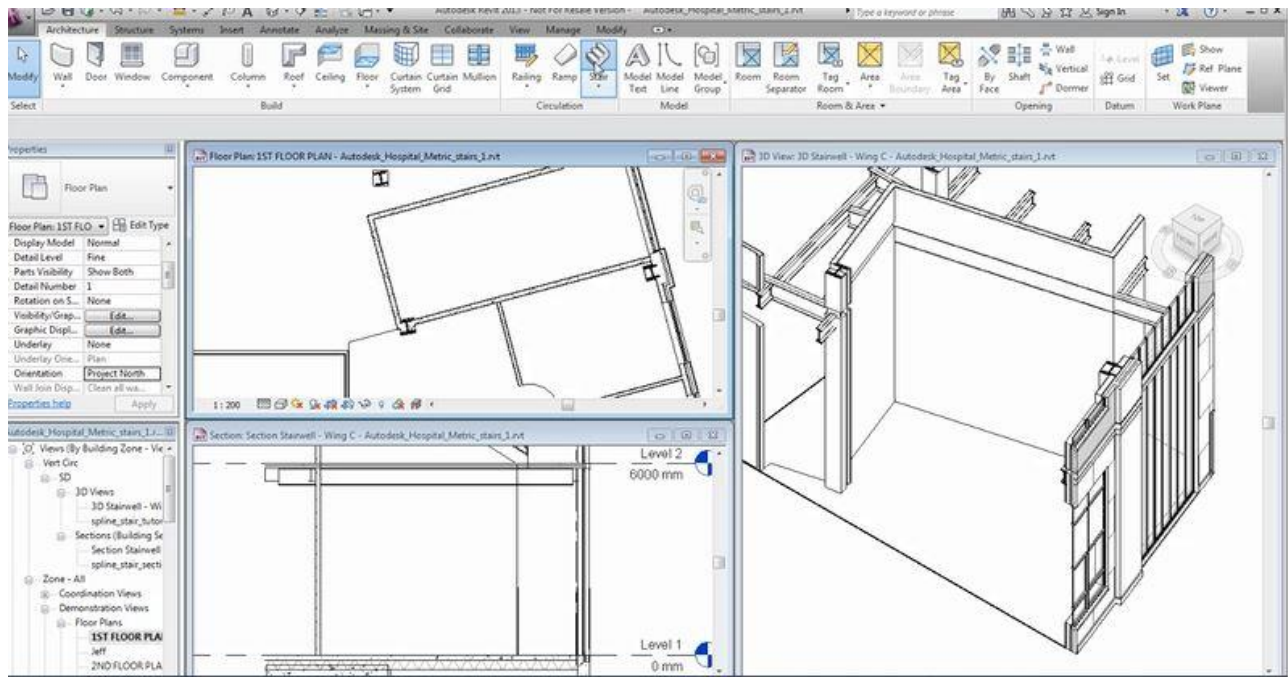
Revit 2018

PROCEDURE:

Create a stair by assembling components for common runs, landings, and supports.

- Architecture tab > Circulation panel >  (Stair)





RESULT:

The draw of different types of modeling floors in a building using Revit software.