

IT in Construction

Lecture #7

Building Information Modeling

Introduction to Autodesk Revit Part 1

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Construction Engineering and Management

 [LinkedIn](#)

 [Instagram](#)

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Outline

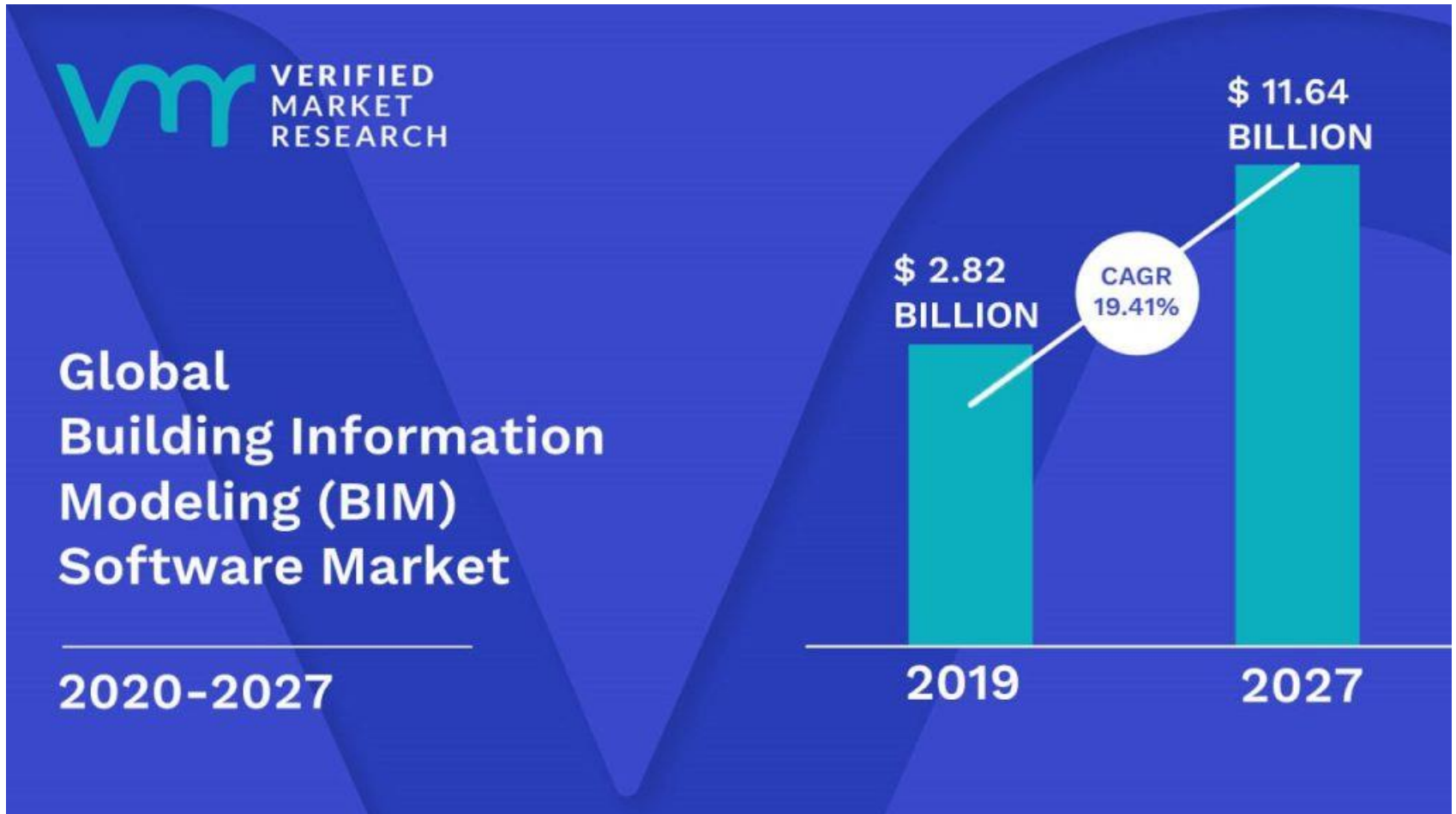
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- BIM Software Packages
- Open BIM/ Closed BIM
- Revit Standing in the Market
- Initial Adjustments
- Introduction to Revit-Architecture
- Introduction to Revit-Structure

BIM Software Packages

BIM Software Market

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BIM Modeling Software

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Manufacturer Company	3D Modeling
Autodesk	Revit
	Civil 3D
Bentley Systems	ProStructures
	AECOsim
	MicroStation
Graphisoft	ArchiCAD
	MEP Modeler
	BIMx
CYPE Ingenieros	CYPE
Nemetschek	Graphisoft ArchiCAD
Trimble	Tekla Structures
	SketchUp Pro
bimobject	bimObject
Vectorworks	Architect
ACCA	Edificius
Allplan	Architecture
	Engineering
Bricsys	BricsCAD BIM



Collaborative Environment Software

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Manufacturer Company	Collaborative Environment
Autodesk	BIM360
Graphisoft	BIM Server
Trimble	Trimble Connect
ACCA	usBIM
Allplan	BIMPlus
Bricsys	Bricsys 24/7
Procore	Procore
Dassault Systèmes	Dassault Systèmes
BuilderTREND	BuilderTREND



Special Service Software

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Manufacturer Company	Clash Detection	4D Scheduling	Quantity Takeoff
Autodesk	Navisworks Manage	Navisworks Manage	Navisworks Manage
Bentley Systems		Navigator	
Nemetschek	Solibri Model Checker		
Trimble	Vico Office	Vico Office	Vico Office
ACCA			PriMus IFC
Synchro Ltd.		Synchro Pro	

Manufacturer Company	Energy and Sustainability	Structural Analysis
Autodesk	Green Building Studio	Robot Structural Analysis
	Ecotect Analysis	
Bentley Systems	Hevacomp	RAM
		STAAD
Graphisoft	EcoDesigner	
ACCA		EdiLus



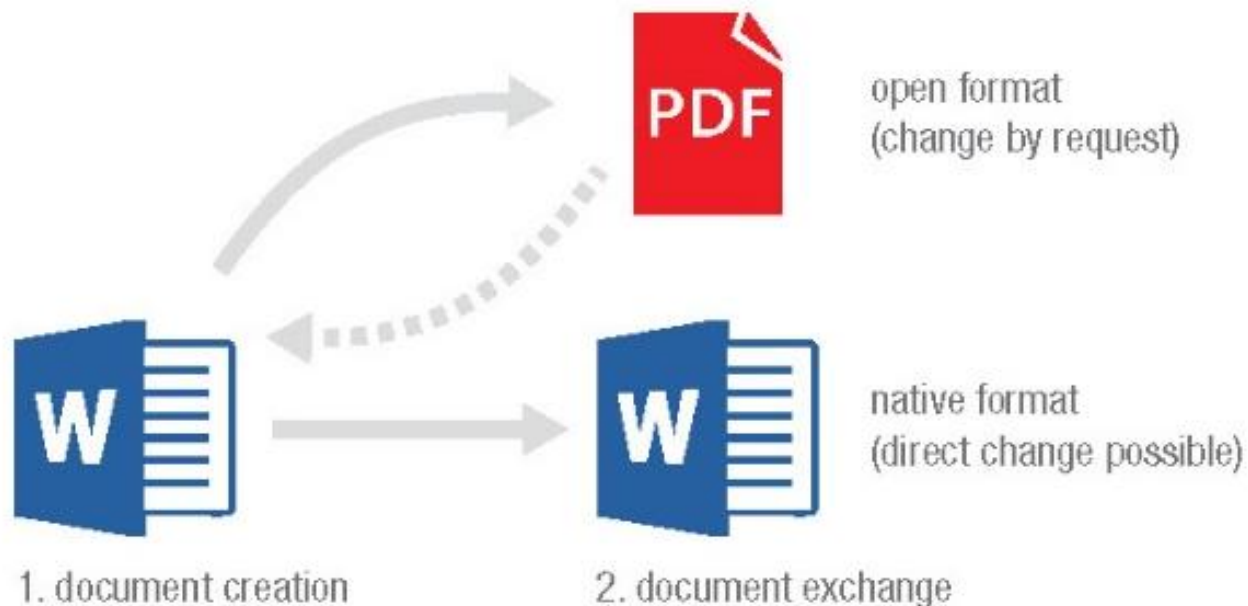
Open BIM/ Closed BIM

OpenBIM Necessity

- Variety of BIM based application packages have been produced by different specialized Companies and are used by various parties in different phases and aspects of construction projects,
- OpenBIM is about recognizing the need for vendor-neutral (***non-proprietary***) methods of exchanging information throughout a project (buildingSmart Australia).
- OpenBIM standards, recognizable to each BIM software producer, are required to support the exchange of information in a consistent and transparent way in the construction project,

Open Versus Closed File Format

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Source: based upon a chart by Thomas Leibich

Open (non-proprietary) pdf versus M.S. Word proprietary file format (Baldwin, 2019)

Open BIM Versus Closed BIM

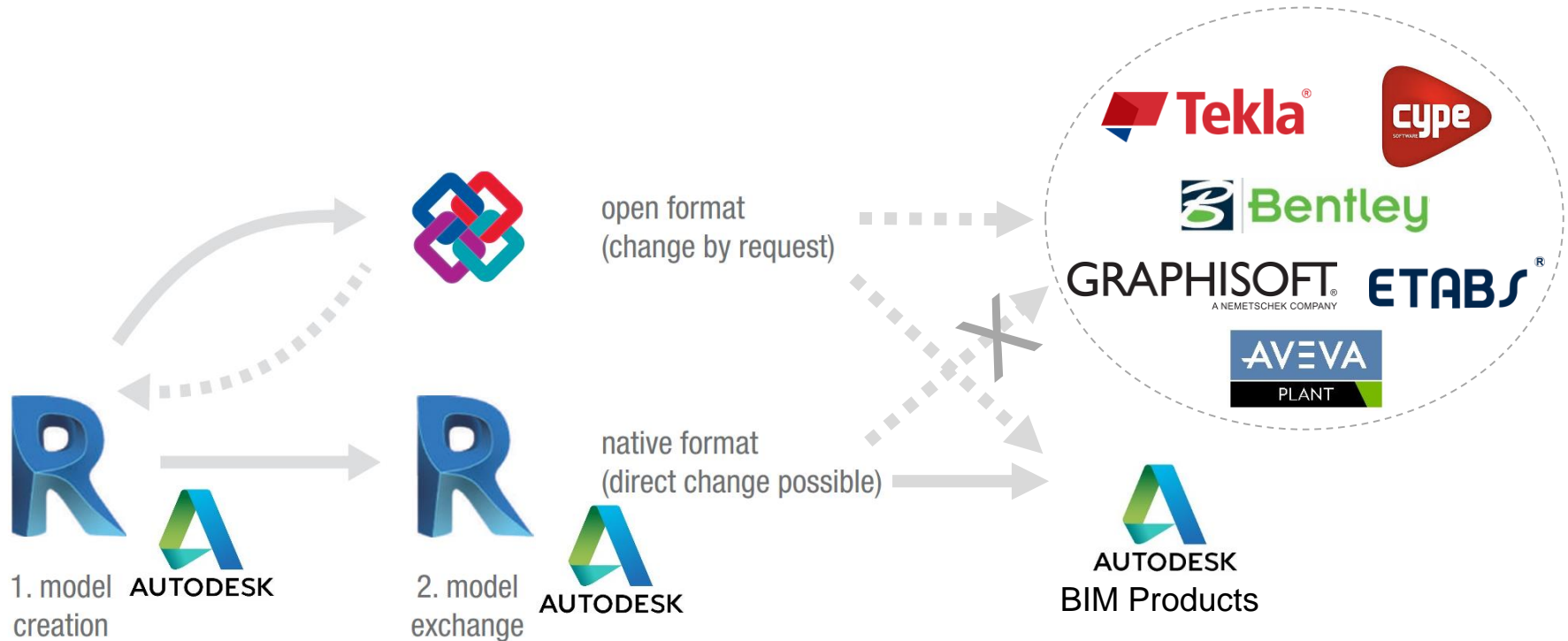
(Baldwin, 2019)

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- **openBIM** refers to collaborative processes (namely data exchanges) using neutral and openly available standards.
- **closedBIM (also nativeBIM)** refers to collaborative processes (namely data exchanges) that are based exclusively on proprietary systems and commercial file formats,

Open BIM Versus Closed BIM

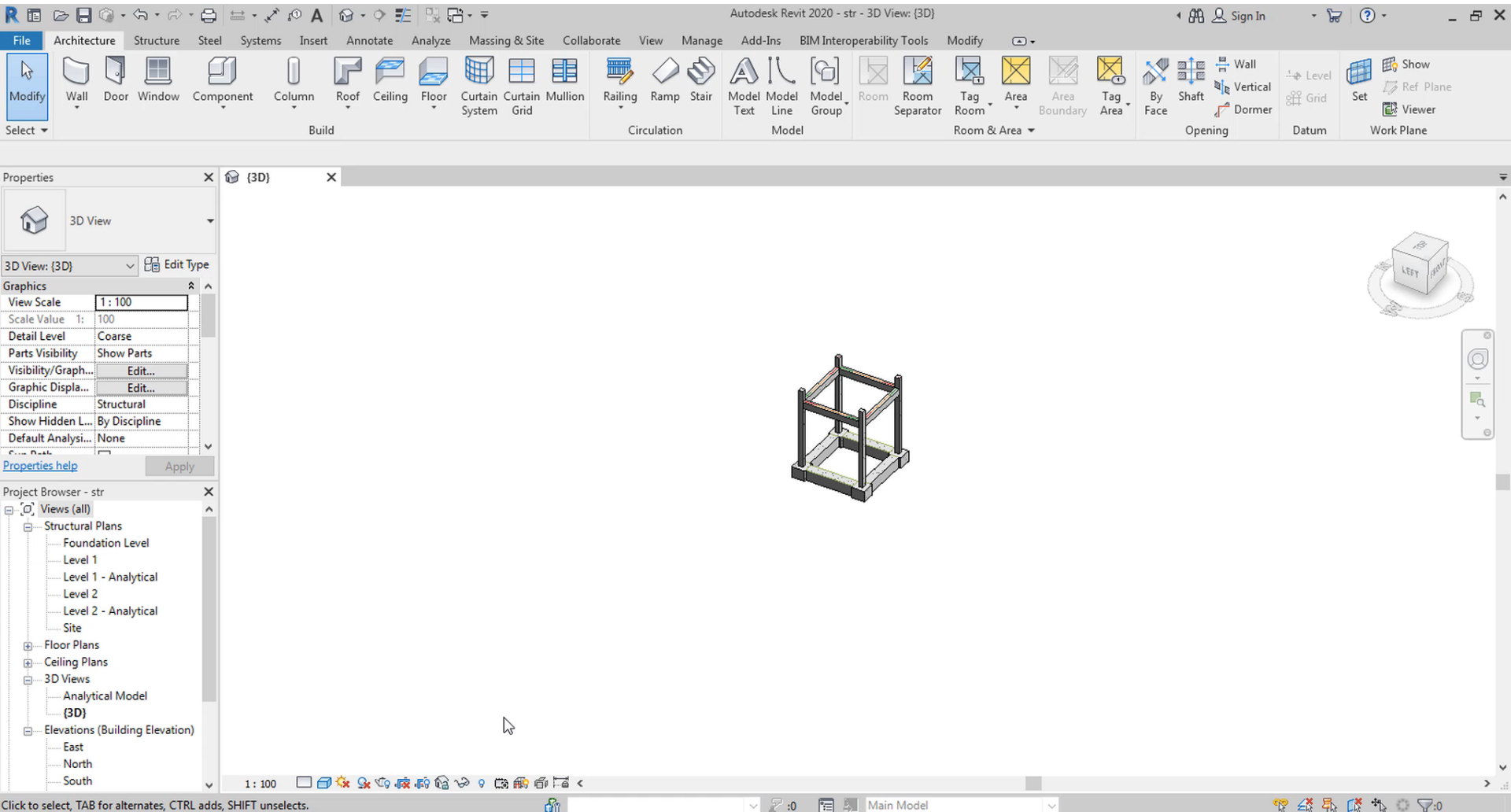
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OpenBIM (non-proprietary) versus Autodesk Revit proprietary format (Baldwin, 2019)

Open BIM Versus Closed BIM

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Open BIM Standards-buildingSMART

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What We Do

[Home](#) » [About](#) » What We Do

- buildingSMART International is leading the digital transformation by enabling **better collaboration** and digital workflows through the **solutions** and **standards** it delivers
- Interoperable, **open, international standards** for **BIM** that transcend traditional design and construction phases to enable a comprehensive digital environment for the entire project and asset lifecycle offer substantial benefits.

OpenBIM Standards-buildingSMART

(Baldwin, 2019)

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Name	Description (function)	Standard
IFC Industry Foundation Classes	Medium for Data Transfer	ISO 16739
MVD Model View Definition	IFC View Filter	buildingSMART MVD
IDM Information Delivery Manual	Standardised Process Description	ISO 29481-1 ISO 29481-2
IFD International Framework for Dictionaries (implemented in the bSDD)	Mapping of Terms	ISO 12006-3
BCF BIM Collaboration Format	Reporting and Tracking	buildingSMART BCF

Source: buildingSMART

The buildingSMART openBIM standards

IFC Standard

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- The Industrial Foundation Classes (IFC) is a standard for BIM model representation used by different BIM software packages for data exchanging.
- The IFC is registered by international standard organization (ISO) as an official International Standard of: ISO 16739.
- The IFC standard has been revised over time currently IFC ISO 16739:2018 is the latest revision.
- The IFC has become official standard BIM archiving format by the government of the countries such as UK, Norway, Denmark and Singapore.

IFC Standard-ISO 16739:2018

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iso.org/standard/70303.html



Standards

All about ISO

Taking part

Store



EN

ICS > 25 > 25.040 > 25.040.40

ISO 16739-1:2018

Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries – Part 1: Data schema

ABSTRACT

PREVIEW

The Industry Foundation Classes, IFC, are an open international standard for Building Information Model (BIM) data that are exchanged and shared among software applications used by the various participants in the construction or facility management industry sector. The standard includes definitions that cover data required for buildings over their life cycle. This release, and upcoming releases, extend the scope to include data definitions for infrastructure assets over their life cycle as well.

BUY THIS STANDARD

FORMAT

LANGUAGE

✓ HTML

English

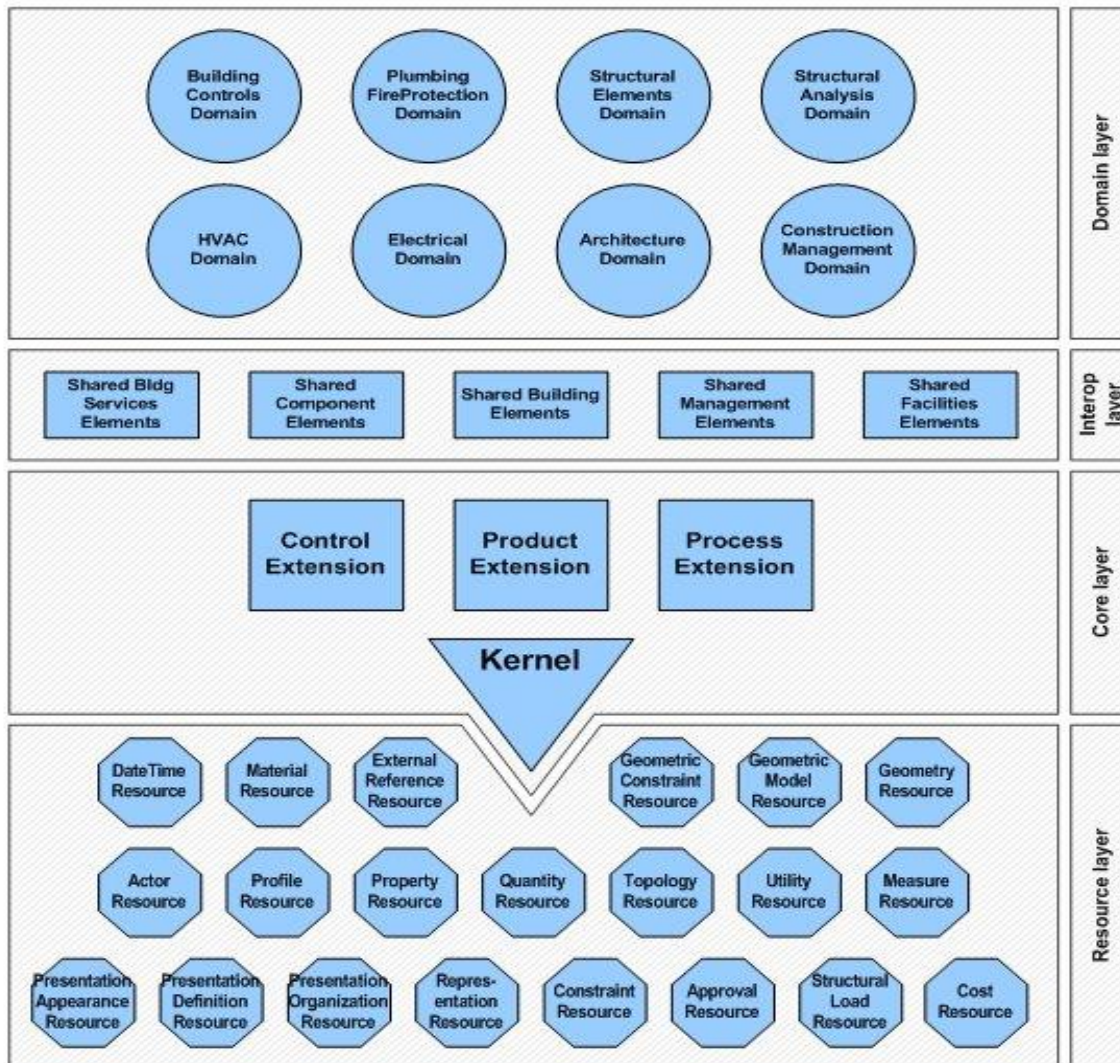
CHF 198

BUY

Activate
Go to Settings

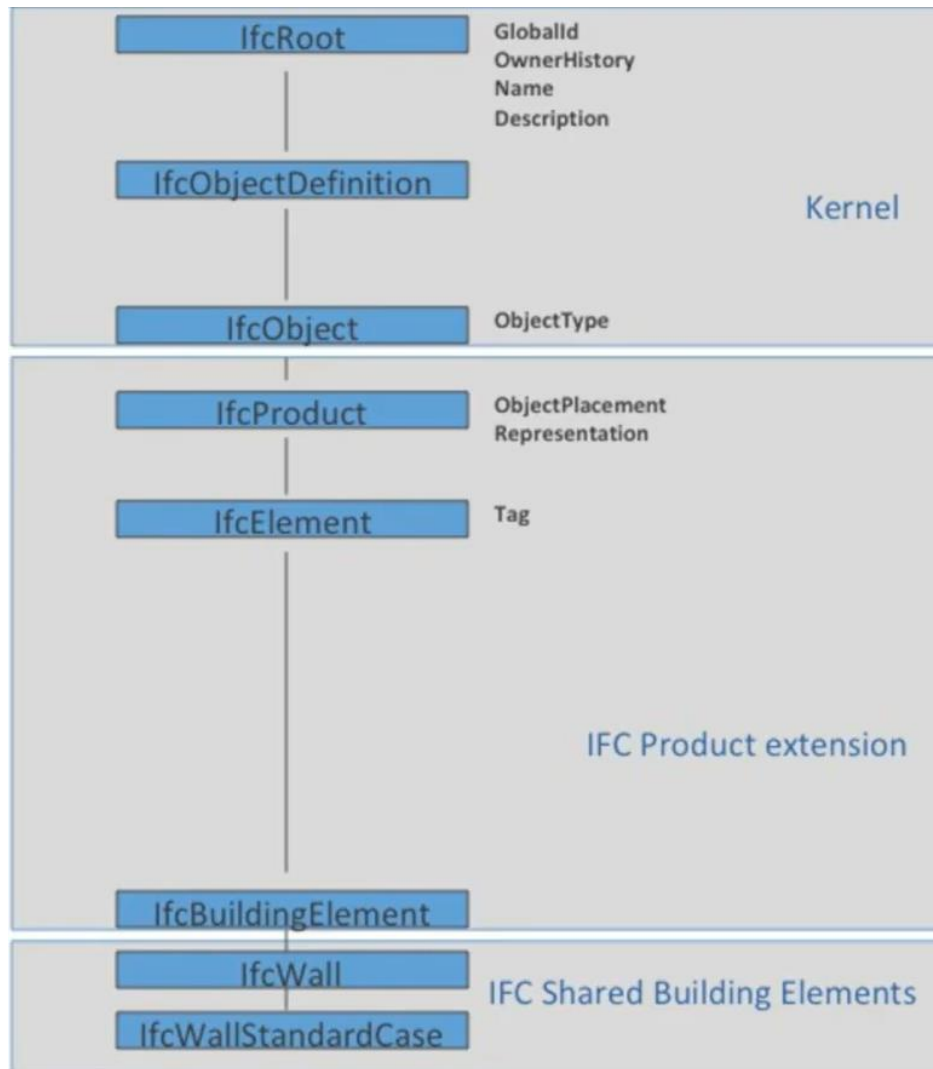
IFC Standard-Schema

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IFC Standard-Object Hierarchy

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IFC Standard

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- The IFC is supported by almost all BIM based computer software packages for data import and export
- Only limited number of BIM software packages have chosen IFC as the working file in their working environment
- Most software packages have developed their own version or proprietary file format, such as .rvt for Revit, .pln for ArchiCAD and .edb for ETABS,

MVD

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- The model view definition (MVD) defines a filter to view desirable part of IFC schema, i.e., an MVD contains a sub-set of IFC schema
- In reality, no BIM file has entire IFC schema objects/ entities, However, every IFC file you see is an MVD (or a sub-set) of IFC schema objects/ entities.
- buildingSmart regulates MVDs!
- The most famous MVDs are Coordination View (IFC2x3), Design Transfer View (IFC4), Reference View (IFC4), and COBie (Construction Operations Building Information Exchange).
- The COBie is going to be discussed in a separate section later on in the course.

IDM

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- The information delivery manual (IDM) defines the specification of BIM base process information exchange in the following steps:
 - 1) Figure out **who** exchanges the information, by drawing process maps using appropriate diagrams!
 - 2) Identify **what** information are exchanges, by extracting exchange requirements from the process maps!
 - 3) Determine **how** the information are exchanged, by determining the specification of the proper MVD based on the identified exchange requirements!

IFD











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- Many objects/ concepts/ entities are used in the IFC Schema that open-BIM models need to refer to them.
- The IFD (International Framework for Dictionaries) (ISO12006-3) standard serves as the IFC dictionary and description, by providing a single specific definition of the various objects/ concepts/ entities used in the construction industry in different countries or even in different communities.
- The IFD standard provides a glossary of concepts defined in building information modeling and general information required to facilitate communication between different people involved in the construction industry.
- The IFD provides each of the objects/ concepts/ entities listed in the IFC with a unique Global GUID (or Global Unique Identification) code and a set of names and definitions at different times.

IFD

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- The bSDD (buildingSMART Data Dictionary) is an online software package developed by buildingSMART based on the IFD standard.
- buildingSMART also provides a plug in to be used by BIM based software packages

	3vHRQ8oT0Hsm00051Mm008
	1
	2012.11.05 13:57:25
	door set, door
	dør med karm
	bloc-porte
	Tür, Türeinheit
	Deur
	IfcDoor
	a complete unit consisting of a door frame and a door leaf or leaves, supplied with the essential hardware and weatherseal, as a product from a singl

BCF (BIM Collaboration Format)

(Baldwin, 2019)

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- Working with IFC has typically been a one-way street. It is great for *exporting* a model for coordination or collaboration.
- IFC does not really translate decisions made in the collaborative environment back into the native software.
- To close the communication loop, the BIM Collaboration Format, or BCF, was developed. BCF serves as a communication channel between the federated IFC models and the native models.
- In simple terms, BCF can be thought of as a messaging tool, a sort of WhatsApp or Telegram for BIM.

BCF (BIM Collaboration Format)

(Baldwin, 2019)

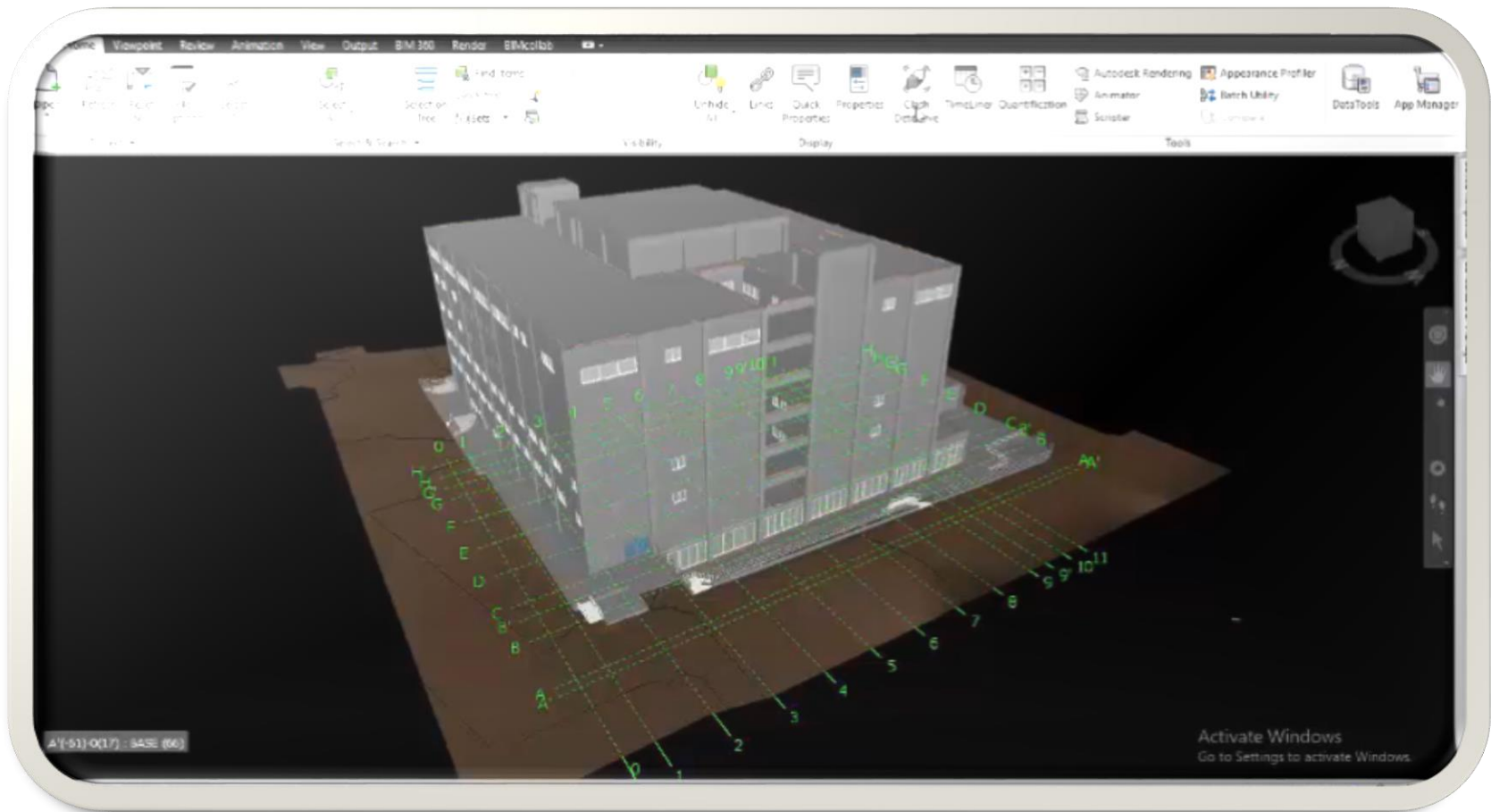
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- BCF was primarily designed for defining views of a building model during clash detection and removal process.
- Currently, BCF application is not limited to clash detection application and it is used in a broader range of information management in BIM applications such as space design, delivering process and building maintenance processes!
- BCF is supported natively by modeling software such as ArchiCAD, Tekla Structures, Navisworks, BIMsight, simplebim, and Vectorworks.
- Standalone BCF plugins include BCF Manager, BCFier.
- Cloud services offering BCF based issue tracking include BIMcollab and bimsync

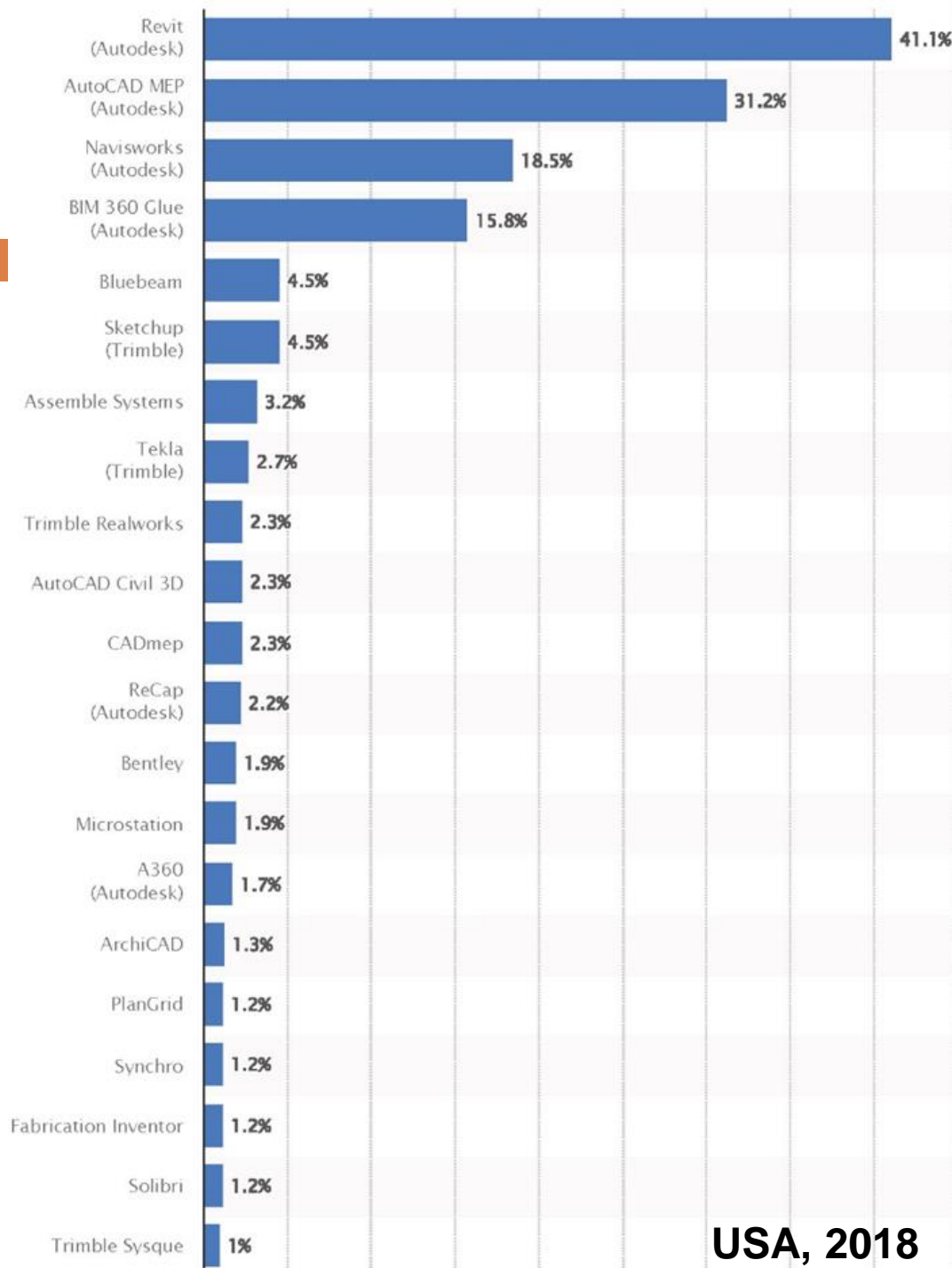
BCF (BIM Collaboration Format)-Sample

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- Sample BCF application in a real project



Revit Standing in the Market

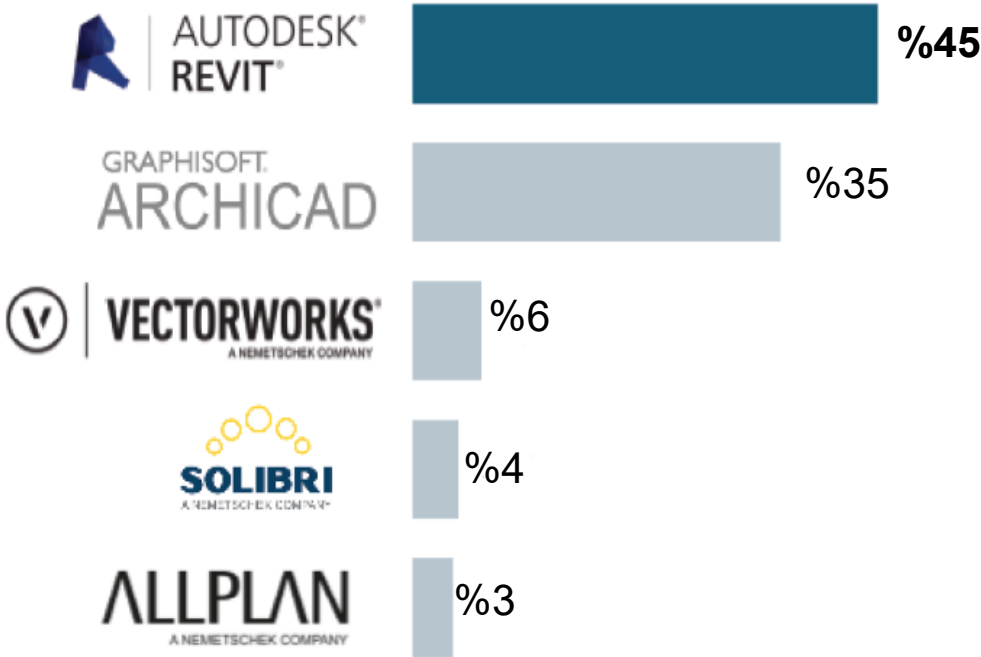


Revit, BIM Modeling Market Leader

USA, 2018

Revit, BIM Modeling Market Leader

Europe, 2021



Source: www.usp-research.com

Autodesk Revit

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- Revit is software for **Building Information Modeling**. Revit supports a **multidiscipline** design process for collaborative design. Its powerful tools let the user use the intelligent **model-based** process to plan, design, construct, and manage buildings and infrastructure.

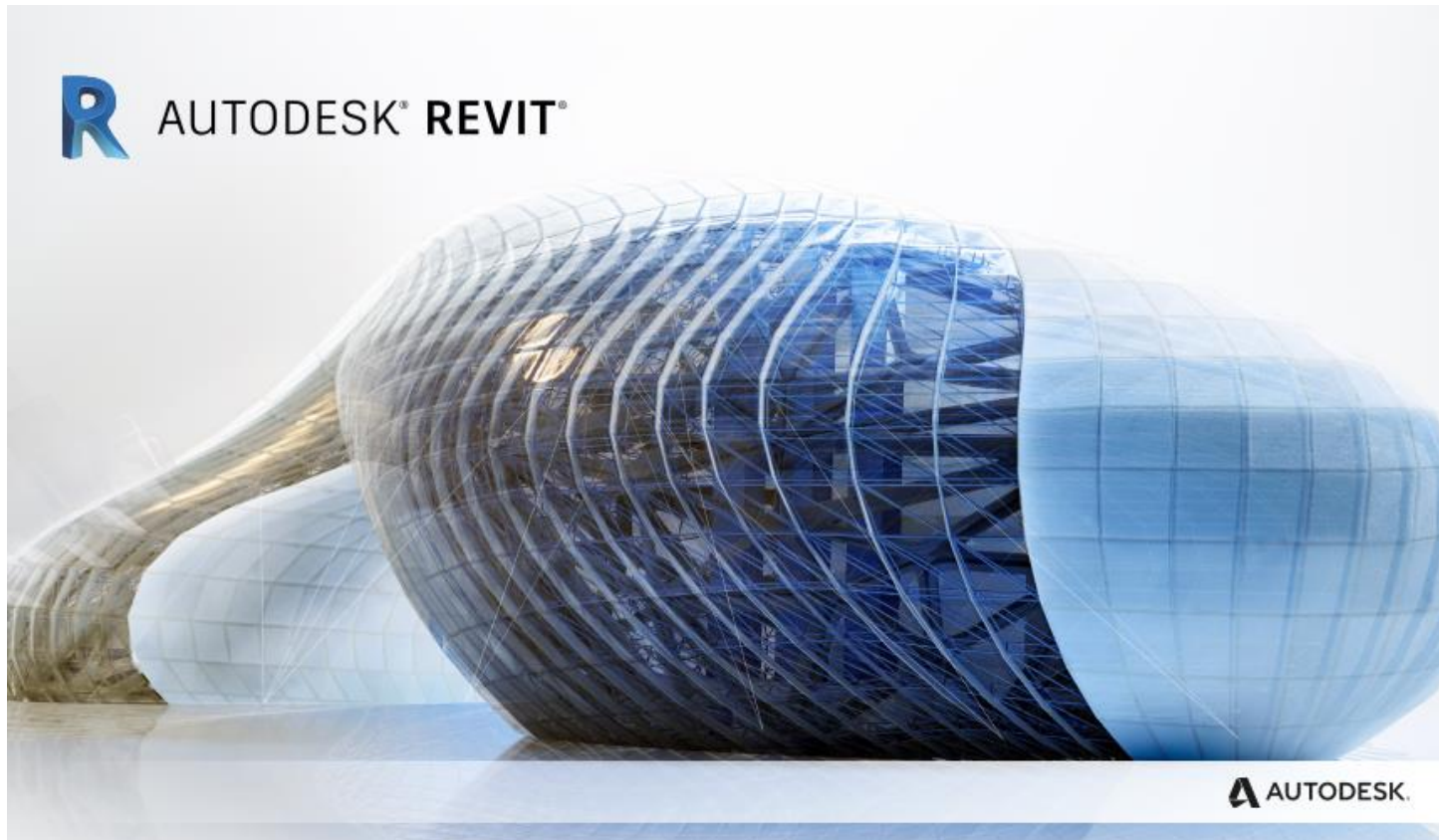


Initial Adjustments

Revit Installation

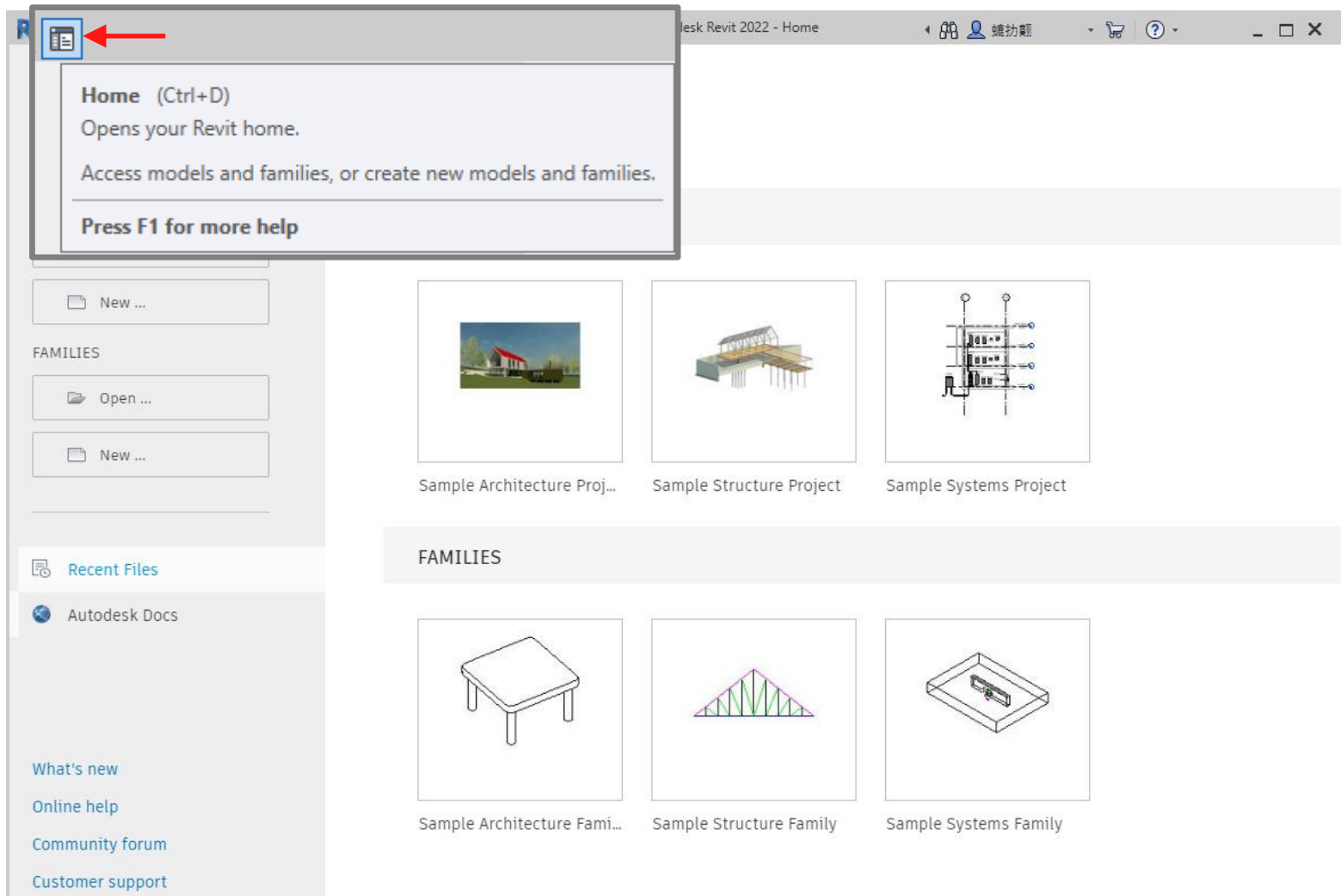
33

- [Revit Installation Guide](#)



Let's Begin

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The screenshot shows the Autodesk Revit 2022 Home interface. A red arrow points to the Home icon in the top-left corner, which has triggered a tooltip. The tooltip text reads: "Home (Ctrl+D)", "Opens your Revit home.", "Access models and families, or create new models and families.", and "Press F1 for more help".

The main interface is divided into two sections: "PROJECTS" and "FAMILIES".

PROJECTS

- New ...
- FAMILIES
 - Open ...
 - New ...
- Recent Files
- Autodesk Docs
- What's new
- Online help
- Community forum
- Customer support

PROJECTS

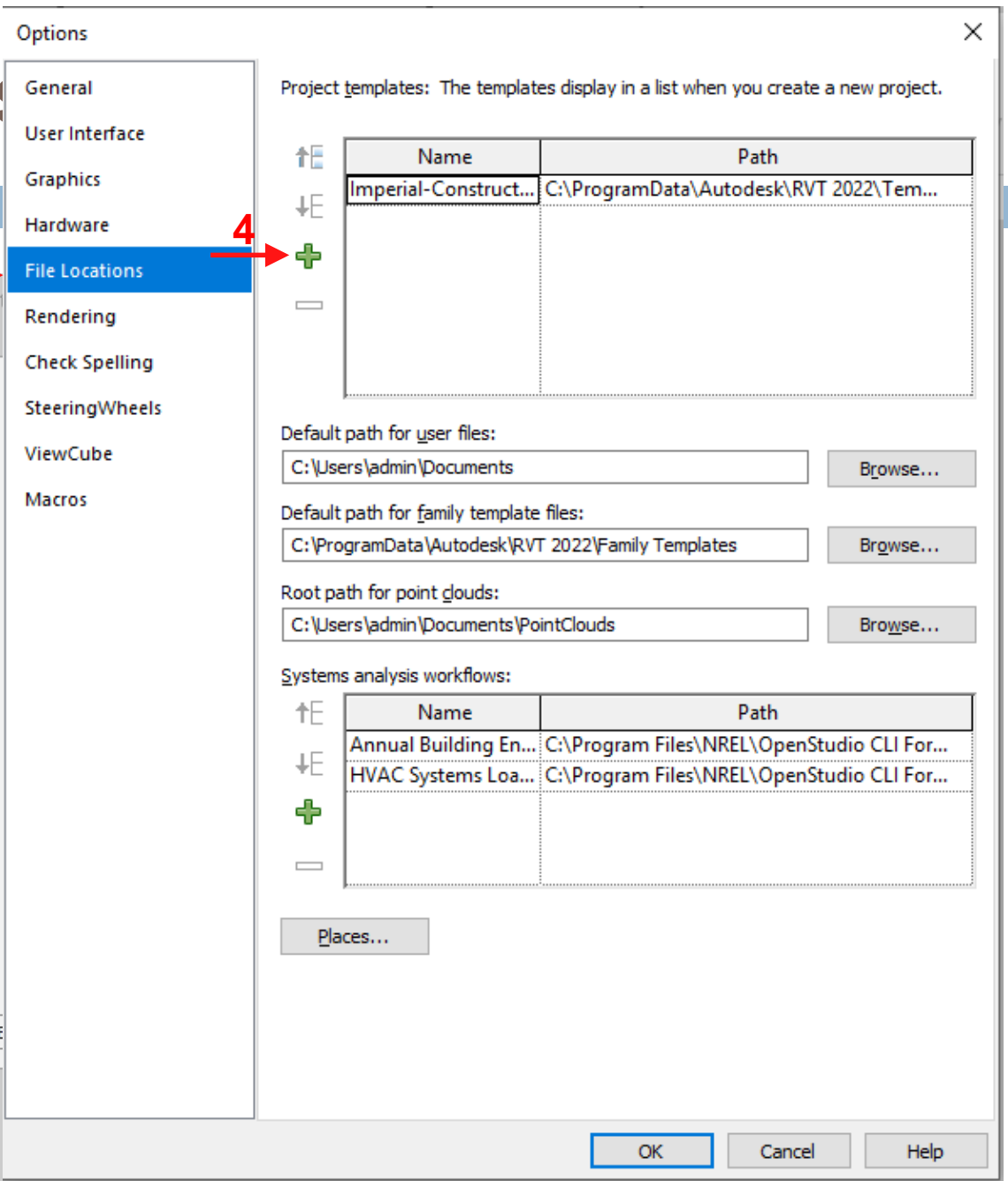
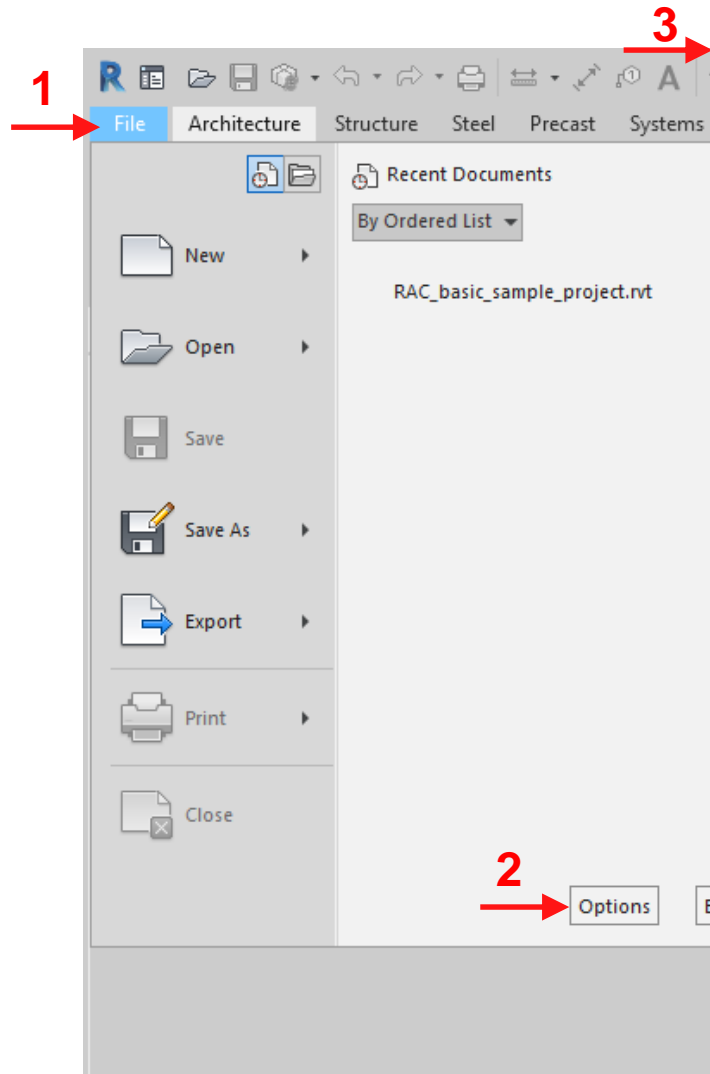
- Sample Architecture Proj...
- Sample Structure Project
- Sample Systems Project

FAMILIES

- Sample Architecture Fami...
- Sample Structure Family
- Sample Systems Family

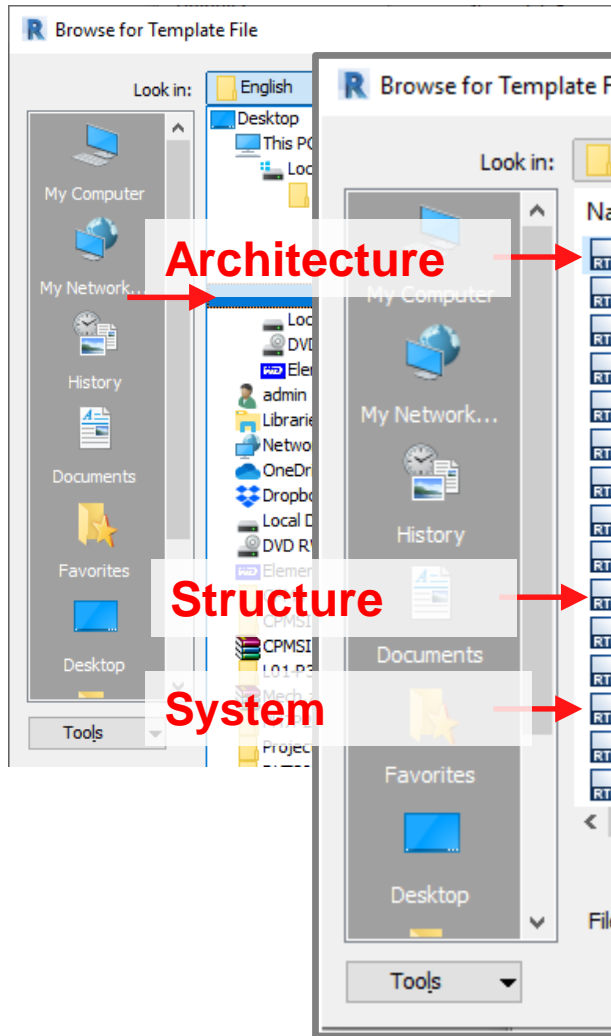
Adjust Address

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Adjust Add

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Options

- General
- User Interface
- Graphics
- Hardware
- File Locations**
- Rendering
- Check Spelling
- SteeringWheels
- ViewCube
- Macros

Project templates: The templates display in a list when you create a new project.

Name	Path
DefaultMetric	C:\ProgramData\Autodesk\RVT 2022\Tem...

Default path for user files:
C:\Users\admin\Documents

Default path for family template files:
C:\ProgramData\Autodesk\RVT 2022\Family Templates

Root path for point clouds:
C:\Users\admin\Documents\PointClouds

Systems analysis workflows:

Name	Path
Annual Building En...	C:\Program Files\NREL\OpenStudio CLI For...
HVAC Systems Loa...	C:\Program Files\NREL\OpenStudio CLI For...

Adjust Add

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The image shows a software interface with two overlapping dialog boxes. The background dialog is titled "Options" and has a sidebar menu with "File Locations" selected. The "Project templates" section contains a table with the following data:

Name	Path
DefaultMetric	C:\ProgramData\Autodesk\RVT 2022\Tem...

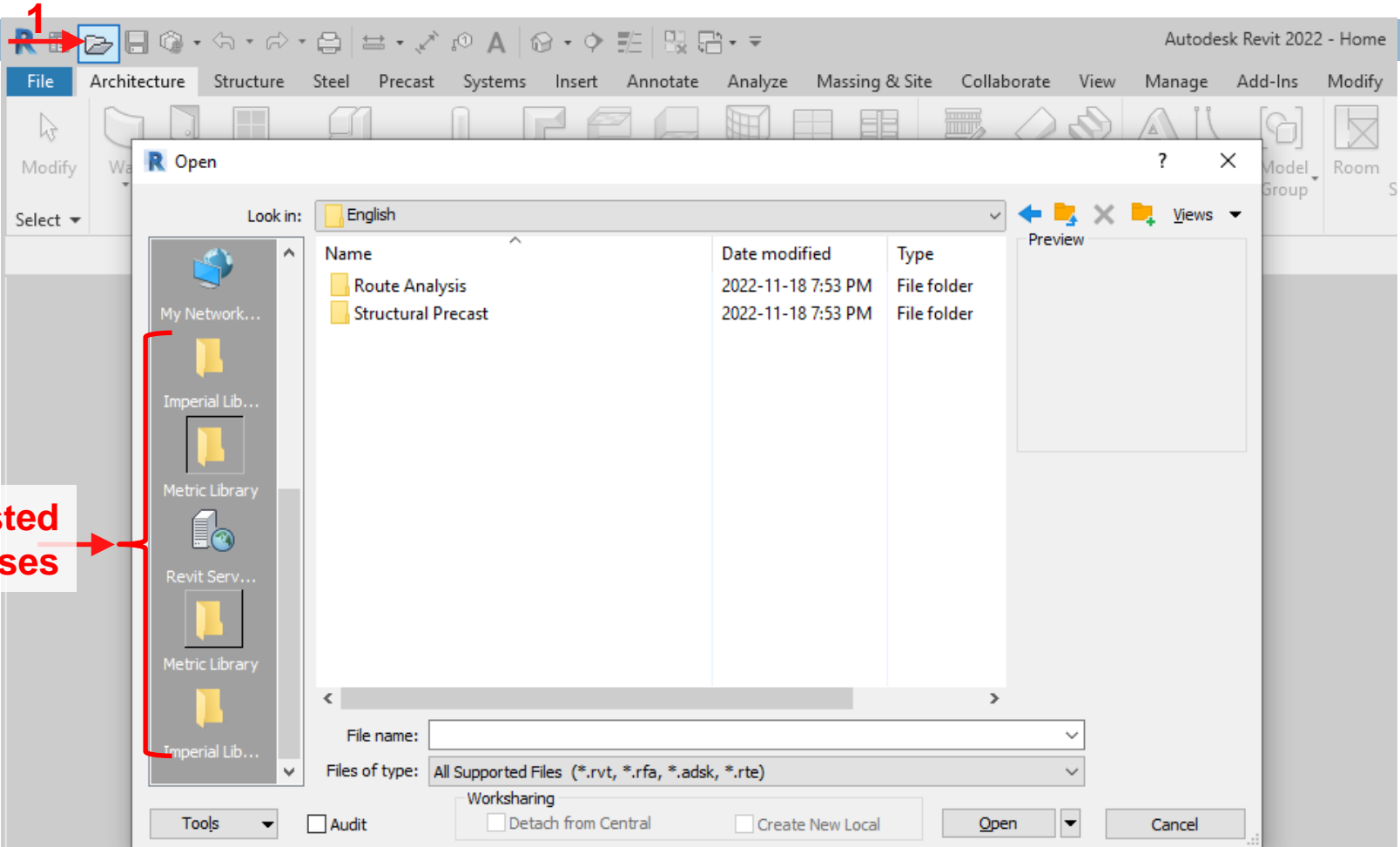
The foreground dialog is titled "Places" and contains a table with the following data:

Library Name	Library Path
Metric Library	C:\ProgramData\Autodesk\RVT 2022\Libraries\English
Imperial Library	C:\ProgramData\Autodesk\RVT 2022\Libraries\English-Im...

Red text in the center of the "Places" dialog reads: **Adjust Addresses for Shortcut Access**. A red arrow points to a "Places..." button at the bottom of the main window. The "Options" dialog has "OK", "Cancel", and "Help" buttons at the bottom right.

Adjust Addresses

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Start Working with Revit

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The image shows the Autodesk Revit 2022 interface. The top bar displays 'Autodesk Revit 2022 - Home' and a user profile icon labeled '姚勃朝'. The left sidebar contains navigation options: 'MODELS' with 'Open ...' and 'New ...' buttons, and 'FAMILIES' with 'Open ...' and 'New ...' buttons. A red arrow labeled '1' points to the 'New ...' button in the MODELS section. A red arrow labeled '2' points to the 'New ...' button in the FAMILIES section. A red arrow labeled '3' points to the 'OK' button in the 'New Project' dialog box. The 'New Project' dialog box is open, showing the 'Template file' dropdown menu with 'DefaultMetric' selected. Below the dropdown, there are radio buttons for 'Project' (selected) and 'Project template'. At the bottom of the dialog, there are buttons for 'OK', 'Cancel', and 'Help'. The background shows the 'Recent Files' panel and a grid of family templates: 'Sample Architecture Fami...', 'Sample Structure Family', and 'Sample Systems Family'.

Model Environment

Family Environment

Autodesk Revit 2022 - Home

姚勃朝

Recent Files

MODELS

Open ...

New ...

FAMILIES

Open ...

New ...

Recent Files

Autodesk Docs

What's new

Online help

Community forum

New Project

Template file

DefaultMetric

<None>

DefaultMetric

Browse...

Create new

Project

Project template

OK

Cancel

Help

Sample Architecture Fami...

Sample Structure Family

Sample Systems Family

Revit Working Environment

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The screenshot shows the Autodesk Revit 2022 interface. The ribbon is set to the 'Modify' tab, with the 'Architecture' panel active. The 'Properties' palette is open, showing settings for a 'Floor Plan' object. The 'Project Browser' on the left shows the project structure, including 'Level 1' and 'Level 2'. The 'Model Work Environment' is visible in the center, and the 'Object Selection Control' is at the bottom right. Red dashed boxes and arrows highlight specific areas: 'Object Type' points to the 'Floor Plan' icon in the Properties palette; 'Edit Type Specifications' points to the 'Edit Type' button; 'Instance Specification' points to the 'Edit...' button in the Properties palette; 'Model View Control' points to the 'View Range' and 'View Scale' settings; 'Object Selection Control' points to the selection tools in the bottom right; and 'Model Navigation' points to the navigation tools in the bottom right. The 'Model Views' label is positioned near the Project Browser.

Object Type

Edit Type Specifications

Instance Specification

Model View Control

Object Selection Control

Model Navigation

Model Work Environment

Model Views

Select/ Remove Working Environment Components

The screenshot shows the Autodesk Revit 2022 interface with the 'View' ribbon selected. The 'User Interface' panel is open, displaying a list of components to be selected or removed. A red arrow labeled '1' points to the 'Collaborate' tab, and another red arrow labeled '2' points to the 'User Interface' panel. A red arrow labeled 'Right Click' points to a context menu that is open over the 'Properties' panel. The context menu includes options like 'Cancel', 'Repeat [Navigation Bar]', 'Recent Commands', 'Select Previous', 'Find Referring Views', 'Zoom In Region', 'Zoom Out (2x)', 'Zoom To Fit', 'Previous Pan/Zoom', 'Next Pan/Zoom', 'Browsers', and 'Properties'. The 'Browsers' sub-menu is open, showing 'Project Browser', 'System Browser', 'MEP Fabrication Parts', and 'P&ID Modeler'. The 'Properties' sub-menu is also open, showing 'ViewCube', 'Navigation Bar', 'Project Browser', 'System Browser', 'Properties', 'MEP Fabrication Parts', 'P&ID Modeler', 'Status Bar', 'Status Bar - Worksets', 'Status Bar - Design Options', 'Browser Organization', and 'Keyboard Shortcuts'. The 'Project Browser' and 'Properties' sub-items are checked.

Autodesk Revit 2022 - Project1 - Floor Plan: Level 1

File Architecture Structure Steel Precast Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins Modify

Modify View Templates Visibility/ Graphics Show Hidden Lines Render Render in Cloud Render Gallery 3D View Section Callout Plan Views Elevation Sheet Composition Switch Windows Close Inactive Views Tile Views User Interface

Project Browser - Project1 Properties Level 1

Views (all) Floor Plans Level 1 Level 2 Site Ceiling Plans Level 1 Level 2 Elevations (Building Elevations) East North South West Legends Schedules/Quantities (all) Sheets (all) Families Groups Revit Links

Floor Plan: Level 1 Edit Type

Graphics

View Scale	1: 100
Scale Valu...	100
Display M...	Normal
Detail Level	Coarse
Parts Visib...	Show Ori...
Visibility/...	Edit...
Graphic D...	Edit...
Orientation	Project No...
Wall Join ...	Clean all w...
Discipline	Architectural
Show Hid...	By Discipline
Color Sch...	Background
Color Sch...	< none >
System C...	Edit...
Default A...	None
Sun Path	<input type="checkbox"/>
Range: Ba...	None
Range: To...	Unbounded
Underlay ...	Look down
Extents	
Crop View	<input type="checkbox"/>
Crop Regi...	<input type="checkbox"/>
Annotatio...	<input type="checkbox"/>
View Range	Edit...
Associate...	Level 1

1: 100 Main Model

Click to select, TAB for alternates, CTRL

Adjust Model Units

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The screenshot illustrates the process of changing the model units in Autodesk Revit 2022. The interface shows the 'Manage' tab selected in the ribbon, with the 'Project Units' option highlighted in the Settings panel. The 'Format' dialog box is open, showing the 'Units' dropdown menu set to 'Millimeters'. The 'OK' button is highlighted in the dialog, and another 'OK' button is highlighted in the background dialog. Red arrows and numbers 1 through 5 indicate the sequence of actions: 1. Click 'Manage' in the ribbon; 2. Click 'Project Units' in the Settings panel; 3. Select 'Millimeters' in the Units list of the Format dialog; 4. Click the 'OK' button in the dialog; 5. Click the 'OK' button in the background dialog.

Autodesk Revit 2022 - Project1 - Floor Plan: Lev

File Architecture Structure Steel Precast Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins Modify

Modify Materials Snaps Project Parameters Transfer Project Standards Shared Parameters Purge Unused Project Units Additional Settings Project Location Design Options Add to Set Pick to Edit Main Model Design Options

Project Browser - Project1

- Views (all)
- Floor Plans
 - Level 1
 - Level 2
- Site
- Ceiling Plans
 - Level 1
 - Level 2
- Elevations (Building Elev.)
 - East
 - North
 - South
 - West
- Legends
- Schedules/Quantities (all)
- Sheets (all)
- Families
- Groups
- Revit Links

Properties

Floor Plan

Floor Plan: Lt Edit Type

Graphics

View Scale	1 : 100
Scale Valu...	100
Display M...	Normal
Detail Level	Coarse
Parts Visib...	Show Ori...
Visibility/...	Edit...
Graphic D...	Edit...
Orientation	Project No...
Wall Join ...	Clean all w...
Discipline	Architectural
Show Hid...	By Discipline
Color Sch...	Background
Color Sch...	<none>
System C...	Edit...
Default A...	None
Sun Path	<input type="checkbox"/>

Underlay

Range: Ba...	None
Range: To...	Unbounded
Underlay ...	Look down

Extents

Format

Use project settings

Units: Millimeters

- Centimeters
- Decimeters
- Feet
- Inches
- Meters
- Millimeters
- US survey feet
- Feet and fractional inches
- Fractional inches
- Meters and centimeters

Rounding:

0 decimal places

Unit symbol:

None

Suppress trailing 0's

Suppress 0 feet

Show + for positive values

Use digit grouping

Suppress spaces

OK Cancel

Format

Format	12.35°
Format	1235 m ²
Format	[\$/ft ²] 1235
Format	1235 [']
Format	1235 [mm]
Format	1234.57 kg/m ³
Format	12.35°
Format	12.35°
Format	1234.6 km/h
Format	1234.6 s
Format	1234.57 m ³
Format	1234.57

Introduction to Revit-Architecture

Working with Model Views

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The screenshot displays the Autodesk Revit 2022 interface for a project named "Autodesk Revit 2022 - CPMS_Simple_Example.rvt - Floor Plan: Level 1". The ribbon is set to the "View" tab, with the "3D" button highlighted in red. The interface is divided into four viewports:

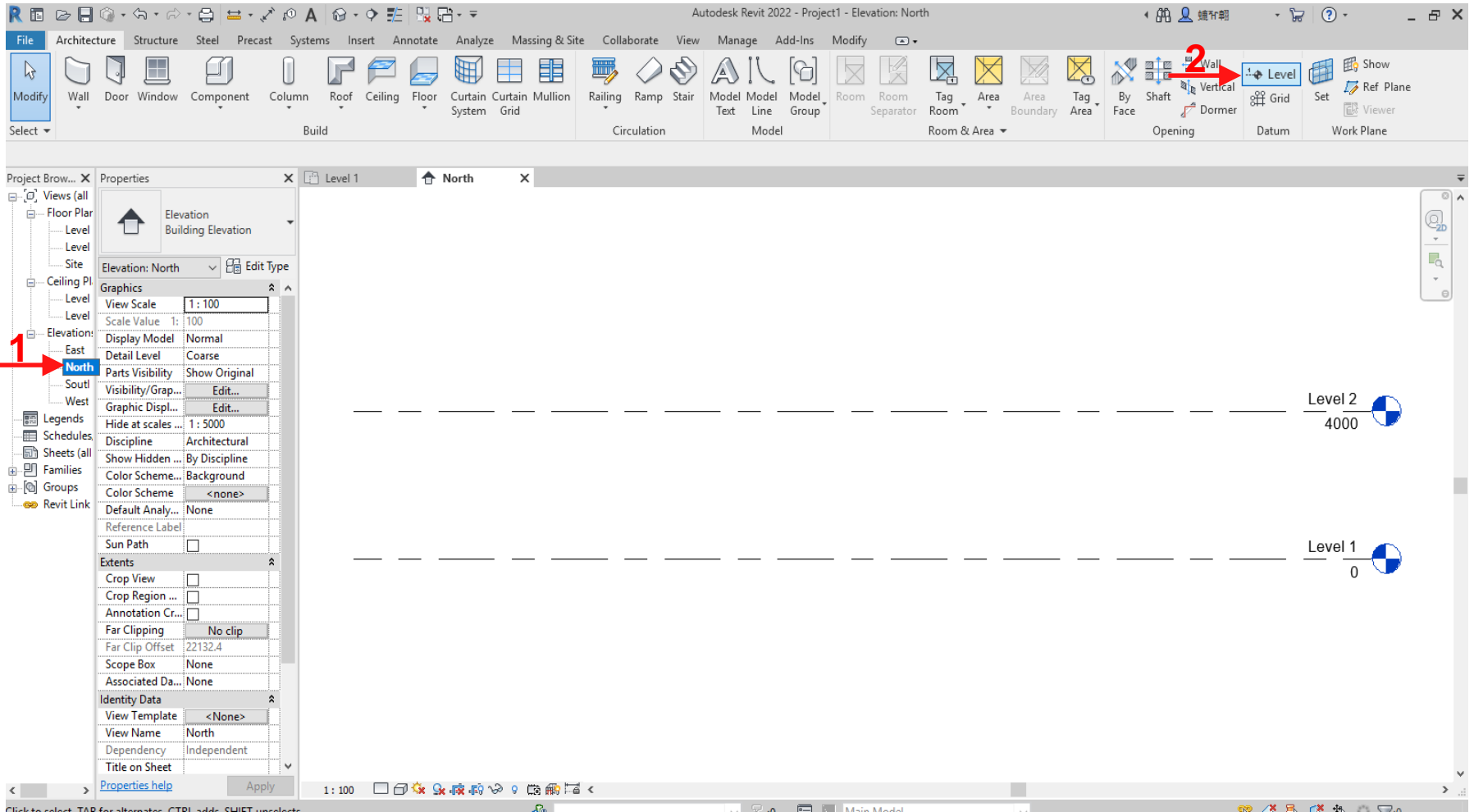
- 1- Level 1:** A 2D floor plan view of Level 1, indicated by a red arrow labeled "1" pointing to the "Level 1" item in the Project Browser.
- 2- North:** A 2D North elevation view, indicated by red arrows labeled "2" and "3" pointing to the "North" and "East" items in the Project Browser.
- 3- East:** A 2D East elevation view, indicated by red arrows labeled "2" and "3" pointing to the "North" and "East" items in the Project Browser.
- 4- 3D:** A 3D perspective view of the building model, indicated by a red arrow labeled "4" pointing to the "{3D}" item in the Project Browser.

The Project Browser on the left shows the following structure:

- Views (all)
 - Structural Plans
 - Floor Plans
 - Level 1** ← 1
 - Level 2
 - Level 3
 - Site
 - Ceiling Plans
 - Level 1
 - Level 2
 - Level 3
 - 3D Views
 - {3D} ← 4
 - Elevations (Building Elevation)
 - East ← 2, 3
 - North ← 2, 3
 - South
 - West
 - Legends
 - Schedules/Quantities (all)
 - Sheets (all)
 - Families
 - Groups
 - Revit Links

Levels

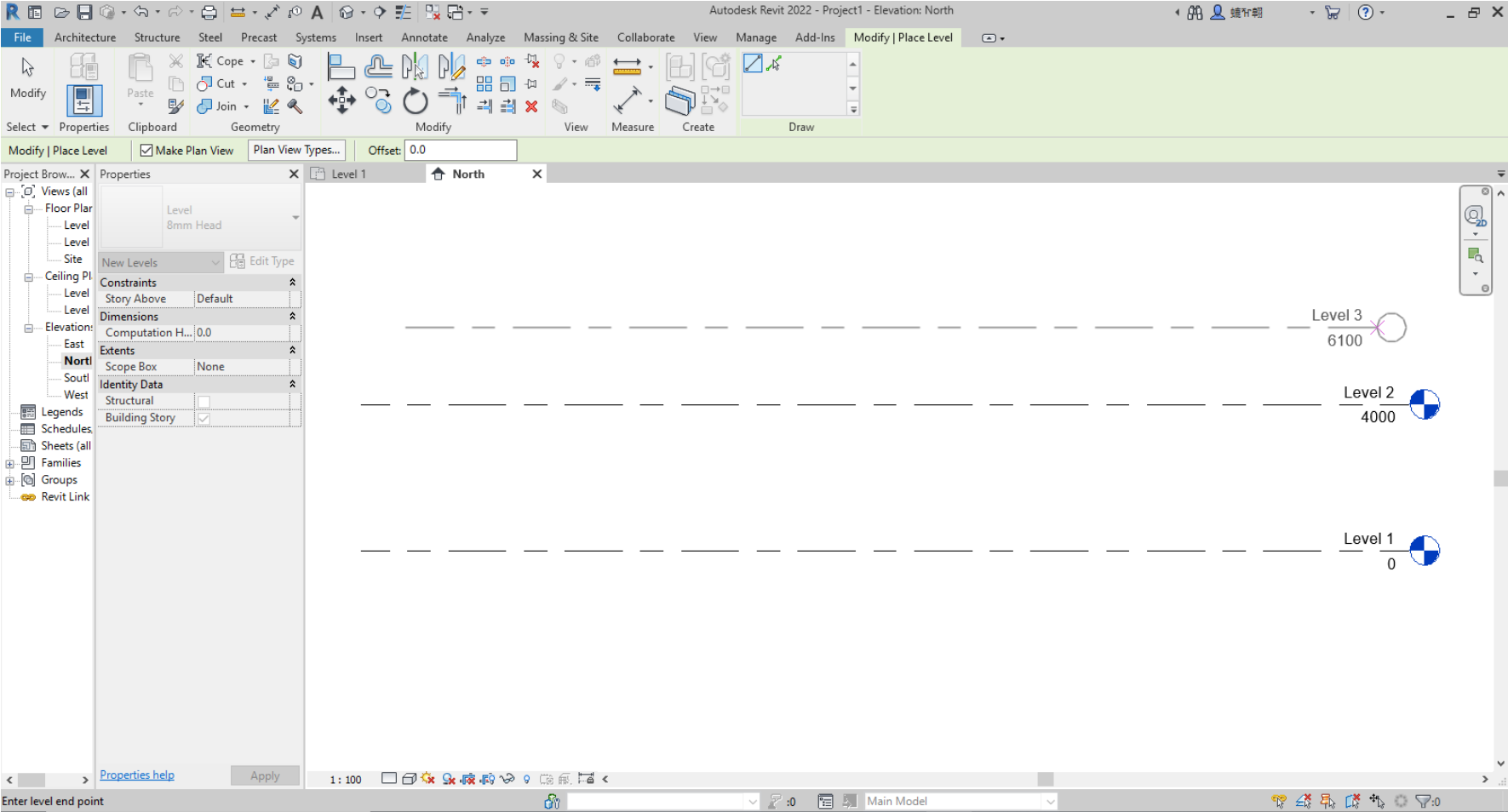
45



Click to select TAB for alternative. CTRL+click: SHEET unselect

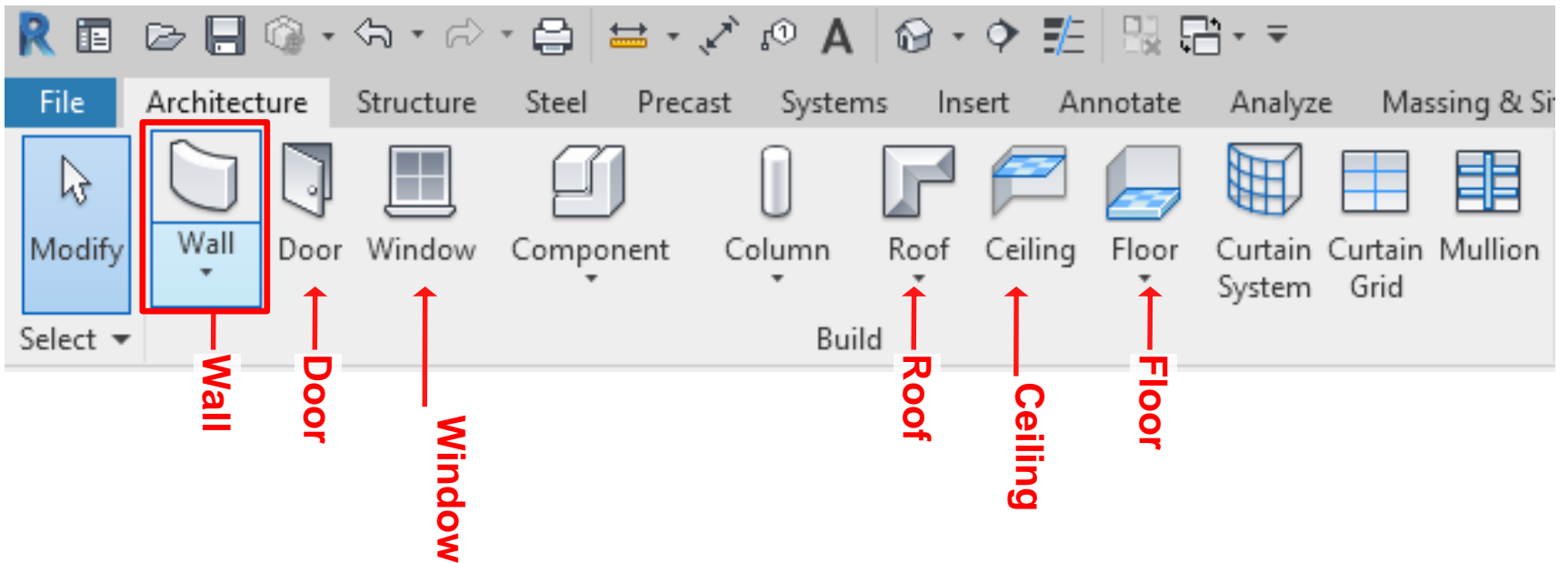
Main Model

Levels



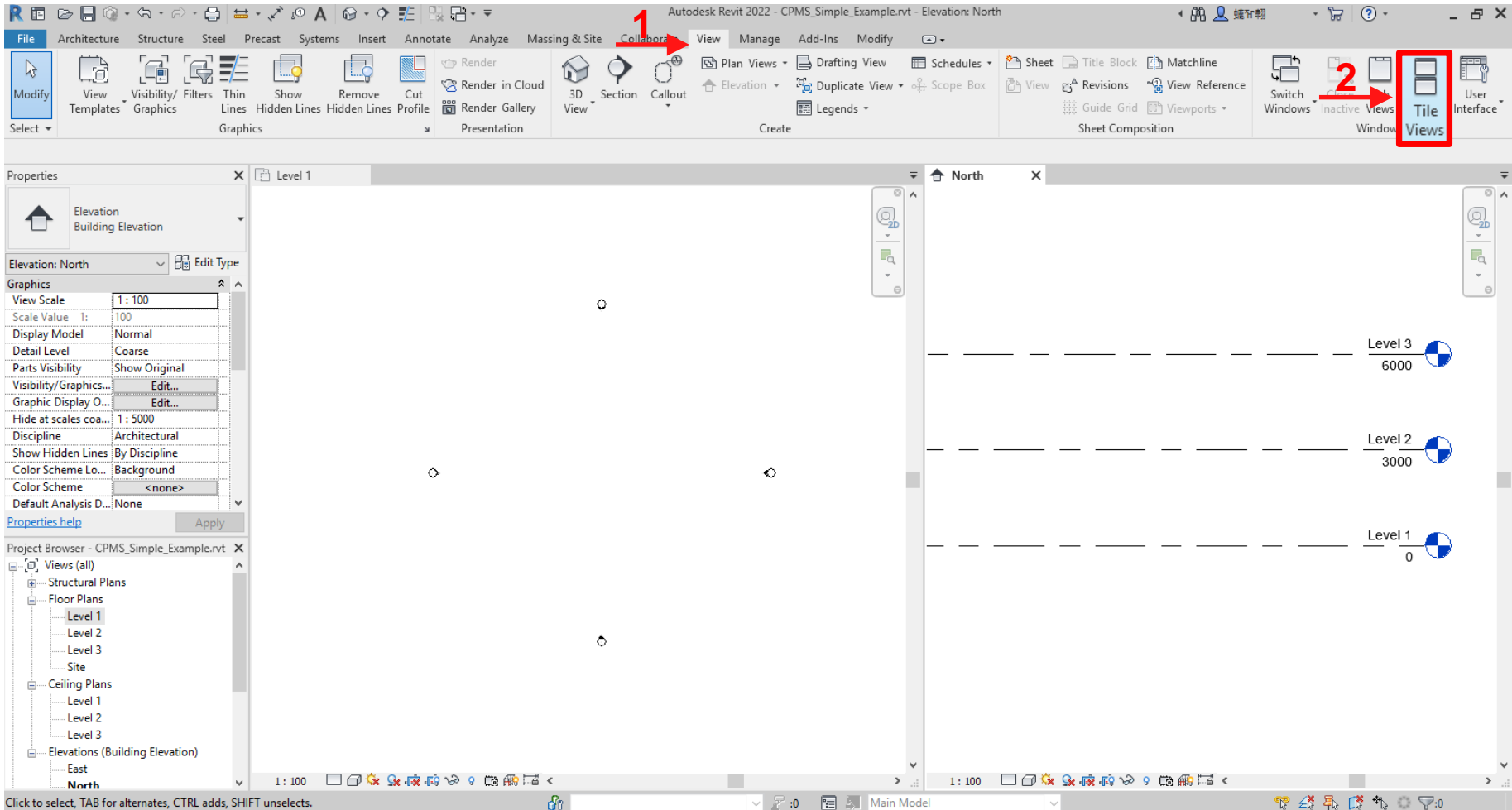
Basic Architecture Model Objects

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Split Work Environment

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Click to select, TAB for alternates, CTRL adds, SHIFT unselects.

Architectural Wall

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Autodesk Revit 2022 - CPMS_Simple_Example.rvt - Floor Plan: Level 1

File Architecture Structure Steel Precast Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins Modify | Place Wall

Modify | Place Wall Height Unconr 8000.0 Location Line: Wall Centerline Chain Offset: 0.0 Radius: 1000.0 Join Status: Allow

Wall Draw Pattern

Height

Location Line

Continual Draw

Location Line Distance to Wall

Curve Corners

Joint Walls

Draw Upward/Downward

Connected to a Level

Wall Type

Basic Wall
Generic - 200mm

New Walls Edit Type

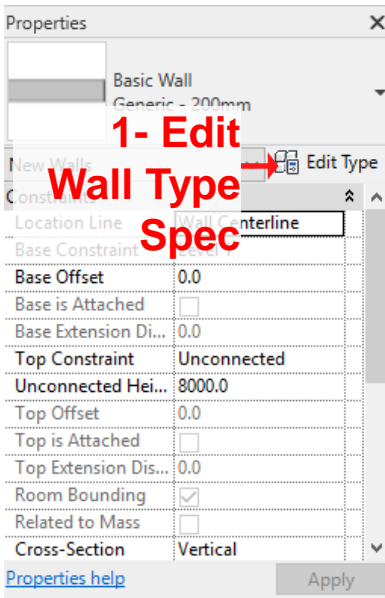
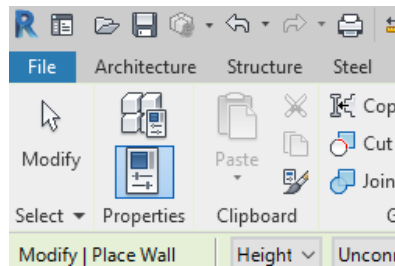
Constraints	
Location Line	Wall Centerline
Base Constraint	Level 1
Base Offset	0.0
Base is Attached	<input type="checkbox"/>
Base Extension Di...	0.0
Top Constraint	Unconnected
Unconnected Hei...	8000.0
Top Offset	0.0
Top is Attached	<input type="checkbox"/>
Top Extension Dis...	0.0
Room Bounding	<input checked="" type="checkbox"/>
Related to Mass	<input type="checkbox"/>
Cross-Section	Vertical

Wall Specification

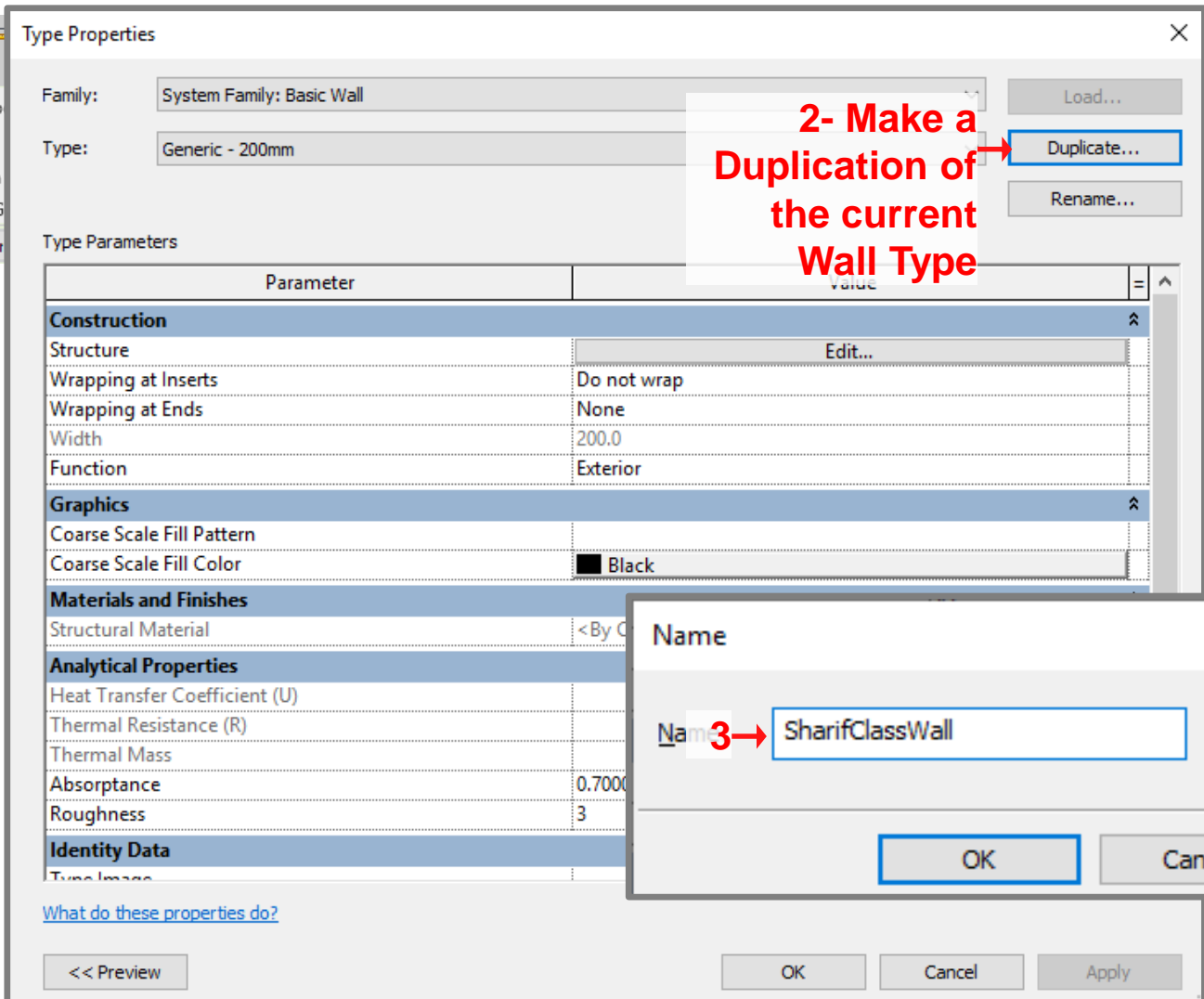
7200.0

Architectural Wall

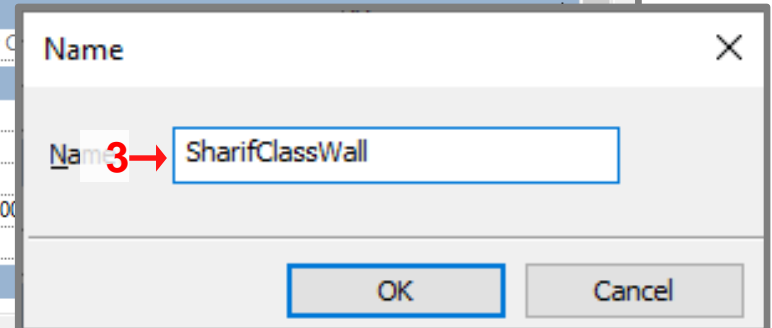
50



1- Edit
Wall Type
Spec



2- Make a
Duplication of
the current
Wall Type



3- SharifClassWall

Architectural Wall

51

Autodesk Revit 2022 - CPMS_Simple_Example.rvt - Floor Plan: Level 1

Type Properties

Family: System Family: Basic Wall [Load...]

Type: **1** → SharifClassWall [Duplicate...]

[Rename...]

Join Status: Allow

Type Parameters

Parameter	Value
Construction	
Structure	Edit... 2 →
Wrapping at Inserts	Do not wrap
Wrapping at Ends	None
Width	290.0
Function	Exterior
Graphics	
Coarse Scale Fill Pattern	
Coarse Scale Fill Color	Black
Materials and Finishes	
Structural Material	
Analytical Properties	
Heat Transfer Coefficient (U)	3.1424 W/(m ² ·K)
Thermal Resistance (R)	0.3182 (m ² ·K)/W
Thermal Mass	380.253000 kJ/(m ² ·K)
Absorptance	0.700000
Roughness	3
Identity Data	
Type Image	

[What do these properties do?](#)

<< Preview [OK] [Cancel] [Apply]

Properties

Basic Wall
Generic - 200mm

New Walls [Edit Type]

Constraints

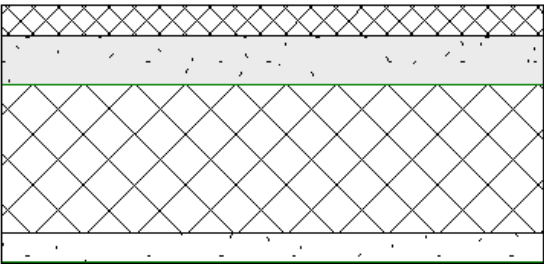
Location Line	Wall Centerline
Base Constraint	Level 1
Base Offset	0.0
Base is Attached	<input type="checkbox"/>
Base Extension Di...	0.0
Top Constraint	Unconnected
Unconnected Hei...	8000.0
Top Offset	0.0
Top is Attached	<input type="checkbox"/>
Top Extension Dis...	0.0
Room Bounding	<input checked="" type="checkbox"/>
Related to Mass	<input type="checkbox"/>
Cross-Section	Vertical

[Properties help](#) [Apply]

Architectural Wall

52

Edit Assembly ✕



Family: Basic Wall
 Type: SharifClassWall
 Total thickness: 260.0 (Default)
 Resistance (R): 0.2343 (m²·K)/W
 Thermal Mass: 381.08 kJ/(m²·K)

Sample Height:

Layers

	Function	Material	Thickness	Wraps	Structural Material	Variable
1	Finish 2 [5]	Ceramic Tile	30.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Finish 1 [4]	Concrete, Sand/Cem	50.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Core Boundary					
4	Structure [1]	Concrete Masonry U	150.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Finish 1 [4]			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Core Boundary	Layers below wrap	0.0			
7	Finish 2 [5]	Gypsum Wall Board	2.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

INTERIOR SIDE

Insert
Delete
Up
Down

Layer Adding New
Layer Removing Current Layer
Layer Move a Layer up
Layer Move a Layer Down

Assign Layers
Split Region
Reveals

OK Cancel Help

Preview >> ← Layers Preview

Architectural Wall

53

The screenshot shows the Revit Material Browser window titled "Material Browser - Granite, Cut, Polished". The window is divided into several sections:

- Search:** A search bar at the top left with the text "Search" and a magnifying glass icon. A red arrow points to it with the text "Search a Layer Material".
- Project Materials:** A list of materials under the heading "Project Materials: All". The list includes: Glass, Glass, Clear Glazing, Granite, Cut, Polished (highlighted in blue), Gypsum Wall Board, and Iron, Ductile. A red arrow points to this list with the text "List of Project Materials".
- Revit Library:** A tree view on the left side showing a hierarchy of material categories under "Favorites" and "AEC Materials". Categories include: Ceilings, Ceramic, Concrete, Fabric, Flooring, Gas, Glass, Insulation, Liquid, Masonry, Metal, Misc, Paint, Plaster, Plastic, and Stone. A red arrow points to this tree with the text "List of Materials from Revit Library".
- Property Panel:** On the right side, there are several tabs: Identity, Graphics, Appearance, Physical, and Thermal. A red dashed box highlights these tabs, with a red arrow pointing to it and the text "Tabs include Various Wall Specs". Below the tabs, the "Name" field contains "Granite, Cut, Polished".
- Descriptive Information:** Fields for Description ("Granite, polished gray, running"), Class (Stone), Comments, and Keywords.
- Product Information:** Fields for Manufacturer, Model, Cost, and URL.
- Revit Annotation Information:** Fields for Keynote and Mark.
- Buttons:** At the bottom right, there are "OK", "Cancel", and "Apply" buttons.

Architectural Wall

54

Autodesk Revit 2022 - Project1.rvt - Floor Plan: Level 1

File Architecture Structure Steel Precast Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins Modify | Place Wall

Modify Select Properties Clipboard Geometry Modify View Measure Create Draw

Modify | Place Wall Height Level 2 3000.0 Location Line: Wall Centerline Chain Offset: 0.0 Radius: 1000.0 Join Status: Allow

Properties Level 1

Basic Wall SharifClassWall

New Walls Edit Type

Constraints	
Location Line	Wall Centerline
Base Constraint	Level 1
Base Offset	0.0
Base is Attached	<input type="checkbox"/>
Base Extension Distance	0.0
Top Constraint	Up to level: Lev...
Unconnected Height	3000.0
Top Offset	0.0
Top is Attached	<input type="checkbox"/>
Top Extension Distance	0.0
Room Bounding	<input checked="" type="checkbox"/>
Related to Mass	<input type="checkbox"/>
Cross-Section	Vertical

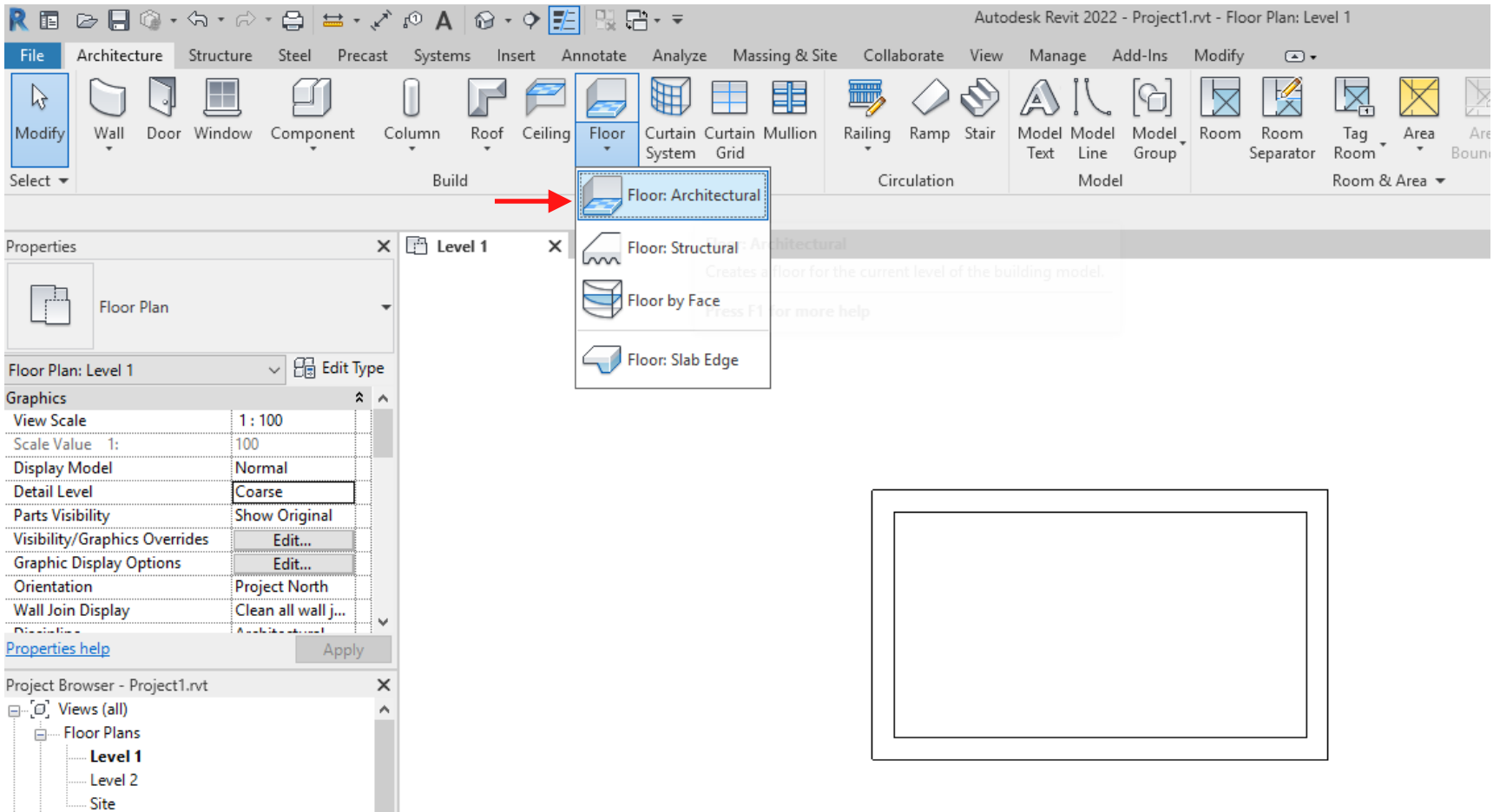
Structural	
Structural	<input type="checkbox"/>
Enable Analytical Model	<input type="checkbox"/>
Structural Usage	Non-bearing

Dimensions	
Area	
Volume	

The diagram shows a wall section with a 90-degree fillet. The vertical dimension is labeled 1600.C and the fillet angle is labeled 90.00°. A text box labeled 'Enter wa' is positioned near the wall.

Floor Modeling

55



Floor Modeling

56

Distance
Connect to Floor to the wall
Confirm Drawing Completion
Boundary of the Floor
Floor Drawing Pattern

Autodesk Revit 2022 - Project1.rvt - Floor Plan: Level 1

File Architecture Structure Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins Modify | Create Floor Boundary

Modify Boundary Line Slope Arrow Span Direction

Select Properties Clipboard Geometry Modify View Measure Create Mode Draw Work Plane

Offset: 0.0 Extend into wall (to core)

Properties **Select a Floor Type**

Floor
Generic 150mm

Floors Edit Type

Constraints

Level	Level 1
Height Offset From Level	0.0
Room Bounding	<input checked="" type="checkbox"/>
Related to Mass	<input type="checkbox"/>

Structural

Structural	<input type="checkbox"/>
Enable Analytical Model	<input type="checkbox"/>

Dimensions

Slope	
Perimeter	
Area	
Volume	
Elevation at Top	<varies>
Elevation at Bottom	<varies>
Thickness	150.0

Identity Data

Image	
Comments	
Mark	

Phasing

Phase Created	New Construct...
Phase Demolished	None

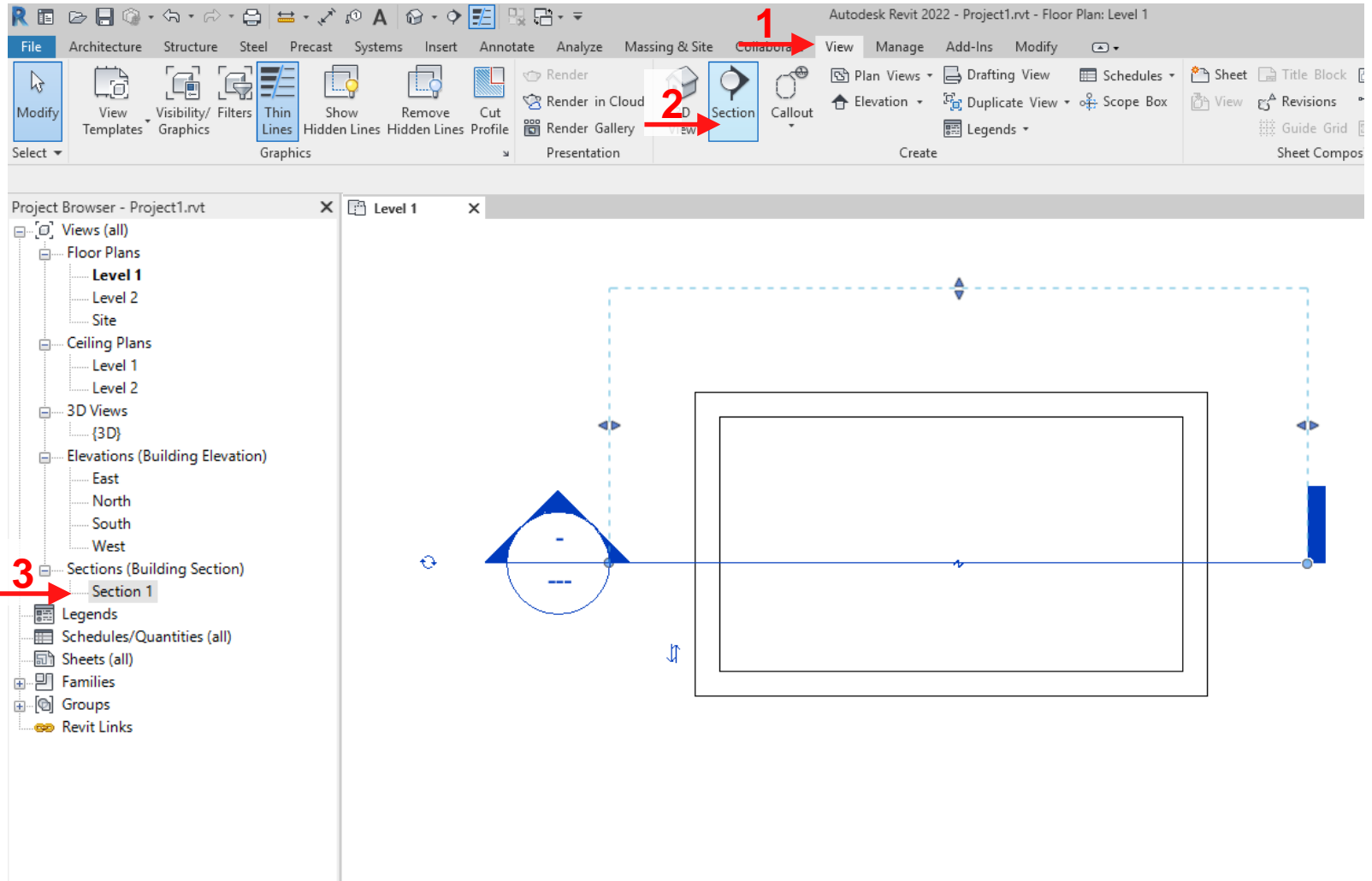
Properties help Apply

Select Boundary Walls

Adjust Floor Spec

2D-Sections

57



2D-Sections

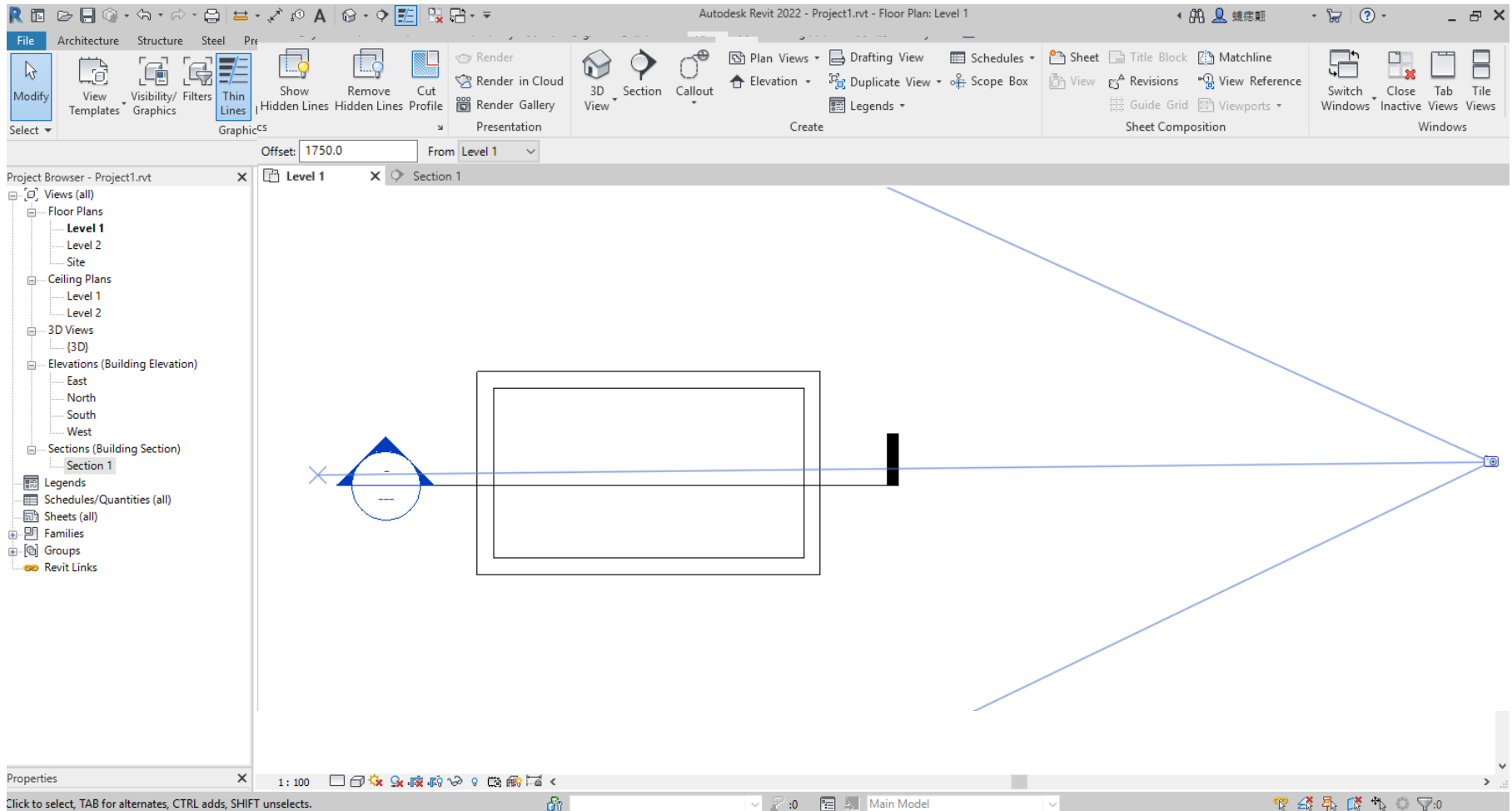
58

The image shows the Autodesk Revit 2022 interface with the following elements:

- Ribbon:** The 'View' tab is active, and the 'Section' button is highlighted with a red arrow labeled '1'. The 'Section' button is also highlighted with a blue box and a red arrow labeled '2'.
- Project Browser:** The 'Sections (Building Section)' folder is expanded, and 'Section 1' is selected with a red arrow labeled '3'.
- Section View:** A 2D section view is displayed. A red arrow labeled '4' points to the 'Section 1' tab in the Project Browser. The section view shows a wall and a floor. A red arrow labeled 'Wall' points to the wall, and a red arrow labeled 'Floor' points to the floor. The section view is bounded by two horizontal lines representing levels.
- Level Schedule:** On the right side of the section view, there is a level schedule with two levels:
 - Level 2 at elevation 3000, with a blue and white circular icon.
 - Level 1 at elevation 0, with a blue and white circular icon.

3D-Sections

59



3D-Sections

60

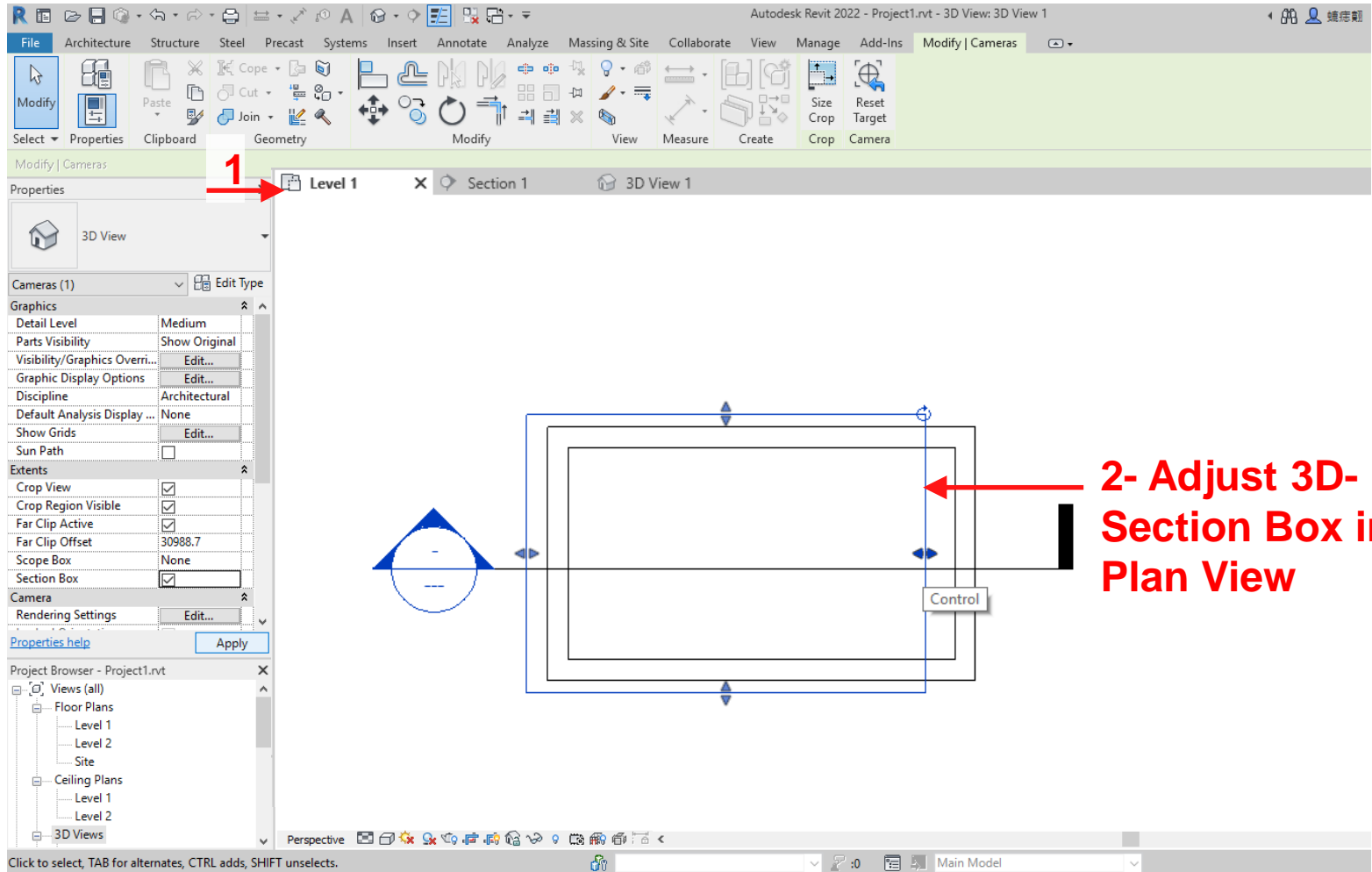
The screenshot displays the Autodesk Revit 2022 interface in 3D View. The ribbon is set to 'Modify | Cameras'. The Properties palette on the left shows the '3D View' camera settings. A red arrow labeled '1' points to the 'Section Box' checkbox, which is checked. Another red arrow labeled '2' points to the 'Apply' button. A third red arrow labeled '3- Section Box' points to a blue wireframe box in the 3D view area. The Project Browser on the bottom left shows the hierarchy: Views (all) > 3D Views > Section 1. The status bar at the bottom indicates 'Main Model'.

Property	Value
Detail Level	Medium
Parts Visibility	Show Original
Visibility/Graphics Overri...	Edit...
Graphic Display Options	Edit...
Discipline	Architectural
Default Analysis Display ...	None
Show Grids	Edit...
Sun Path	<input type="checkbox"/>
Extents	
Crop View	<input checked="" type="checkbox"/>
Crop Region Visible	<input checked="" type="checkbox"/>
Far Clip Active	<input checked="" type="checkbox"/>
Far Clip Offset	30988.7
Scope Box	None
Section Box	<input checked="" type="checkbox"/>
Camera	
Rendering Setting:	Edit...

Section Boxes : Section Box

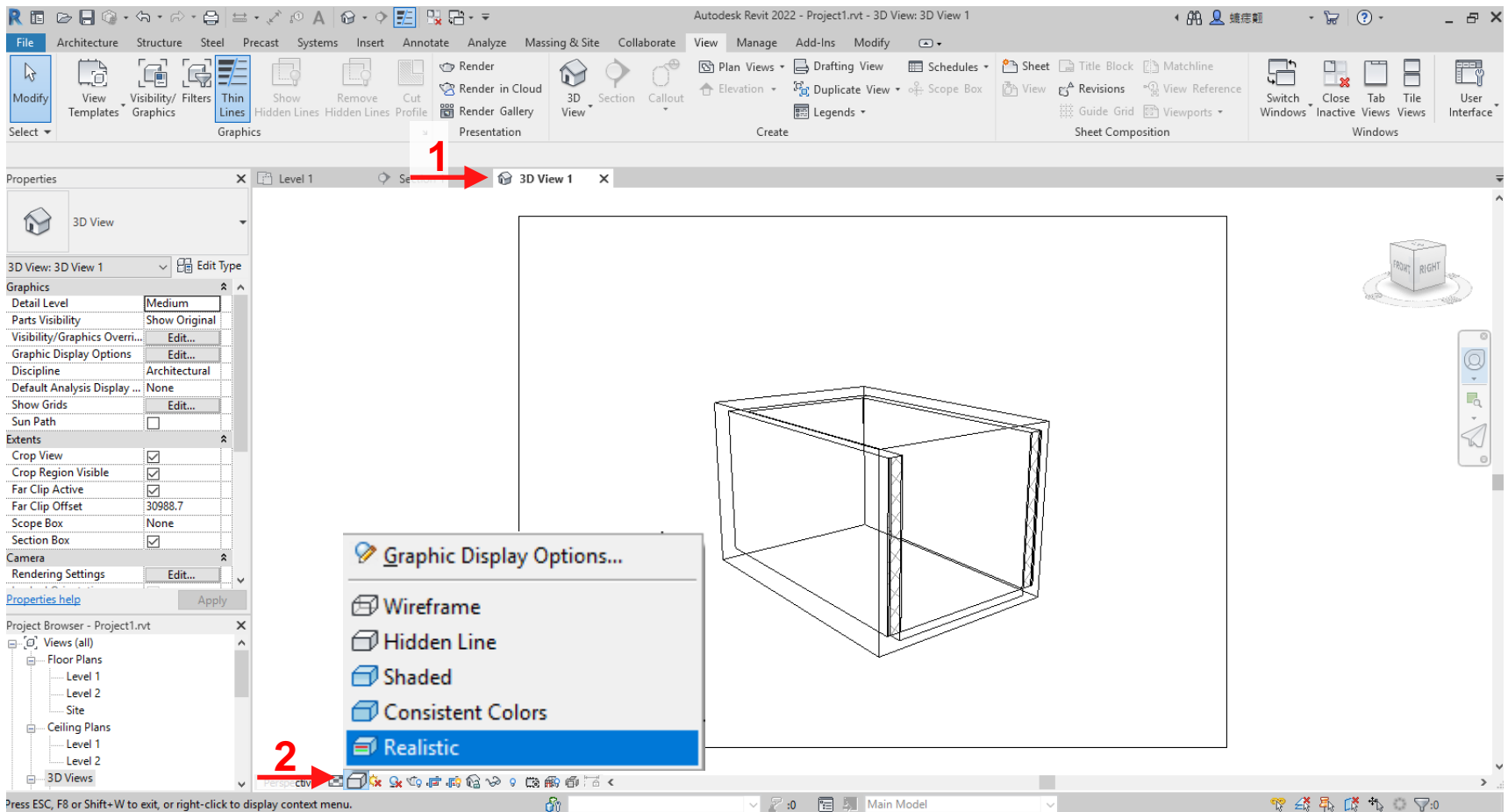
3D-Sections

61



3D-Sections

62



Press ESC, F8 or Shift+W to exit, or right-click to display context menu.

3D-Sections

63

The screenshot displays the Autodesk Revit 2022 software interface. The title bar indicates the project is 'Autodesk Revit 2022 - Project1.rvt - 3D View: 3D View 1'. The ribbon is set to the 'View' tab, with the 'Thin Lines' panel active. The 'Thin Lines' panel includes options for 'Show', 'Remove', and 'Cut Profile'. The '3D View' panel is also visible, showing 'Section' and 'Callout' options. The Properties palette on the left shows the '3D View' settings for '3D View 1', including 'Detail Level' (Medium), 'Parts Visibility' (Show Original), 'Discipline' (Architectural), and 'Section Box' (checked). The Project Browser on the left shows the hierarchy of views, including 'Level 1', 'Level 2', 'Site', 'Ceiling Plans', and '3D Views'. The main view area shows a 3D perspective view of a rectangular structure with a section cut through it, revealing the interior. The status bar at the bottom indicates the current view is 'Perspective' and the model is 'Main Model'.

Autodesk Revit 2022 - Project1.rvt - 3D View: 3D View 1

File Architecture Structure Steel Precast Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins Modify

Modify View Templates Visibility/ Graphics Filters Thin Lines Show Remove Cut Profile Hidden Lines Hidden Lines Profile Render Render in Cloud Render Gallery Presentation 3D View Section Callout Plan Views Drafting View Schedules Sheet Title Block Matchline Elevation Duplicate View Scope Box View Revisions View Reference Switch Windows Sheet Composition

Properties Level 1 Section 1 3D View 1

3D View

3D View: 3D View 1 Edit Type

Graphics

Detail Level Medium

Parts Visibility Show Original

Visibility/Graphics Overri... Edit...

Graphic Display Options Edit...

Discipline Architectural

Default Analysis Display ... None

Show Grids Edit...

Sun Path

Extents

Crop View

Crop Region Visible

Far Clip Active

Far Clip Offset 30988.7

Scope Box None

Section Box

Camera

Rendering Settings Edit...

Properties help Apply

Project Browser - Project1.rvt

Views (all)

Floor Plans

Level 1

Level 2

Site

Ceiling Plans

Level 1

Level 2

3D Views

Perspective Main Model

Press ESC, F8 or Shift+W to exit, or right-click to display context menu.

Drawing Doors

64

The screenshot displays the Autodesk Revit 2022 software interface. The top ribbon is set to the 'Architecture' tab, and the 'Door' tool is highlighted with a red arrow. The Properties panel on the left shows the 'Floor Plan' view for 'Level 1'. The 'Graphics' section of the Properties panel is expanded, showing various settings for the door.

Property	Value
View Scale	1 : 100
Scale Value 1:	100
Display Model	Normal
Detail Level	Coarse
Parts Visibility	Show Original
Visibility/Graphics Overri...	Edit...
Graphic Display Options	Edit...
Orientation	Project North
Wall Join Display	Clean all wall...
Discipline	Architectural
Show Hidden Lines	By Discipline
Color Scheme Location	Background
Color Scheme	<none>
System Color Schemes	Edit...
Default Analysis Display ...	None
Sun Path	<input type="checkbox"/>
Underlay	

The main drawing area shows a floor plan view of a door. The door is represented by a blue circle with a triangle on top, indicating its orientation. The door is placed within a rectangular wall opening. The wall is shown as a thick black line. The door is currently in a 'Coarse' detail level, showing only the basic outline.

Drawing Doors

65

The screenshot displays the Autodesk Revit 2022 interface for a floor plan. The ribbon is set to 'Modify | Place Door'. The 'Properties' panel shows the current door family as 'M_Single-Flush' with dimensions '0915 x 2134mm'. A red arrow points to the 'Door Type' dropdown menu, which is open, showing a list of door families and their dimensions. The dimensions listed are: 0762 x 2032mm, 0762 x 2134mm, 0813 x 2134mm, 0864 x 2032mm, 0864 x 2134mm, 0915 x 2032mm, and 0915 x 2134mm. The '0915 x 2032mm' and '0915 x 2134mm' options are highlighted. The '0915 x 2134mm' option is selected. The 'Properties' panel also shows 'Horizontal' orientation, 'Tags...' checked, and 'Leader' unchecked. The 'Modify | Place Door' ribbon includes options for 'Load Family In-place' and 'Tag on Placement'. The 'Project Browser' shows the current view as 'Level 1'.

Autodesk Revit 2022 - Project1.rvt - Floor Plan: Level 1

File Architecture Structure Steel Precast Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins Modify | Place Door

Modify Paste Cut Join Geometry Modify View Measure Create Load Family In-place Mode Tag on Placement Tag

Modify | Place Door Horizontal Tags... Leader 12.7 mm

Properties Level 1 Section 1 3D View 1

Door Type

M_Single-Flush 0915 x 2134mm

Search

M_Single-Flush

0762 x 2032mm

0762 x 2134mm

0813 x 2134mm

0864 x 2032mm

0864 x 2134mm

0915 x 2032mm

0915 x 2134mm

Properties help Apply

Project Browser - Project1.rvt

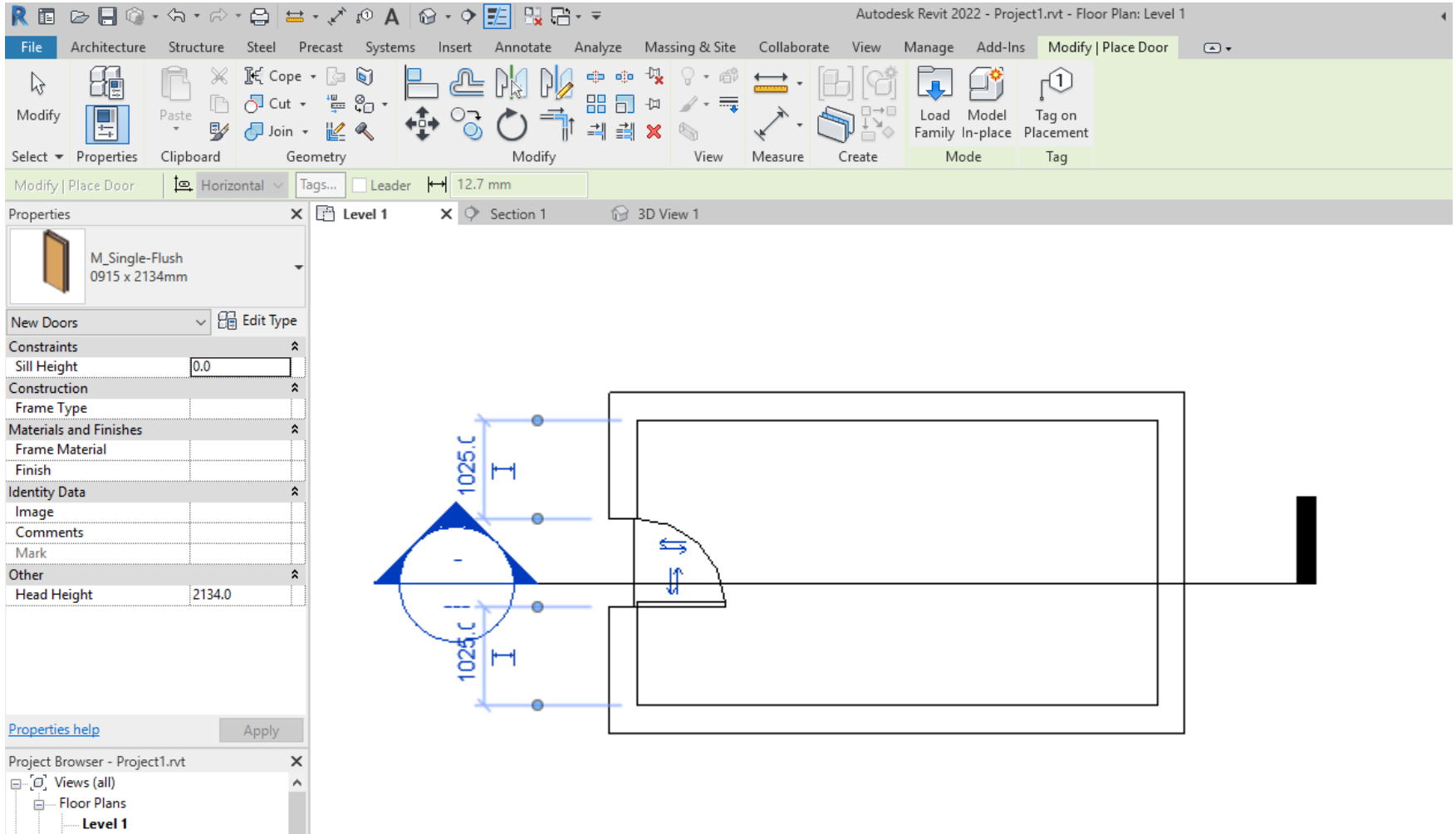
Views (all)

Floor Plans

Level 1

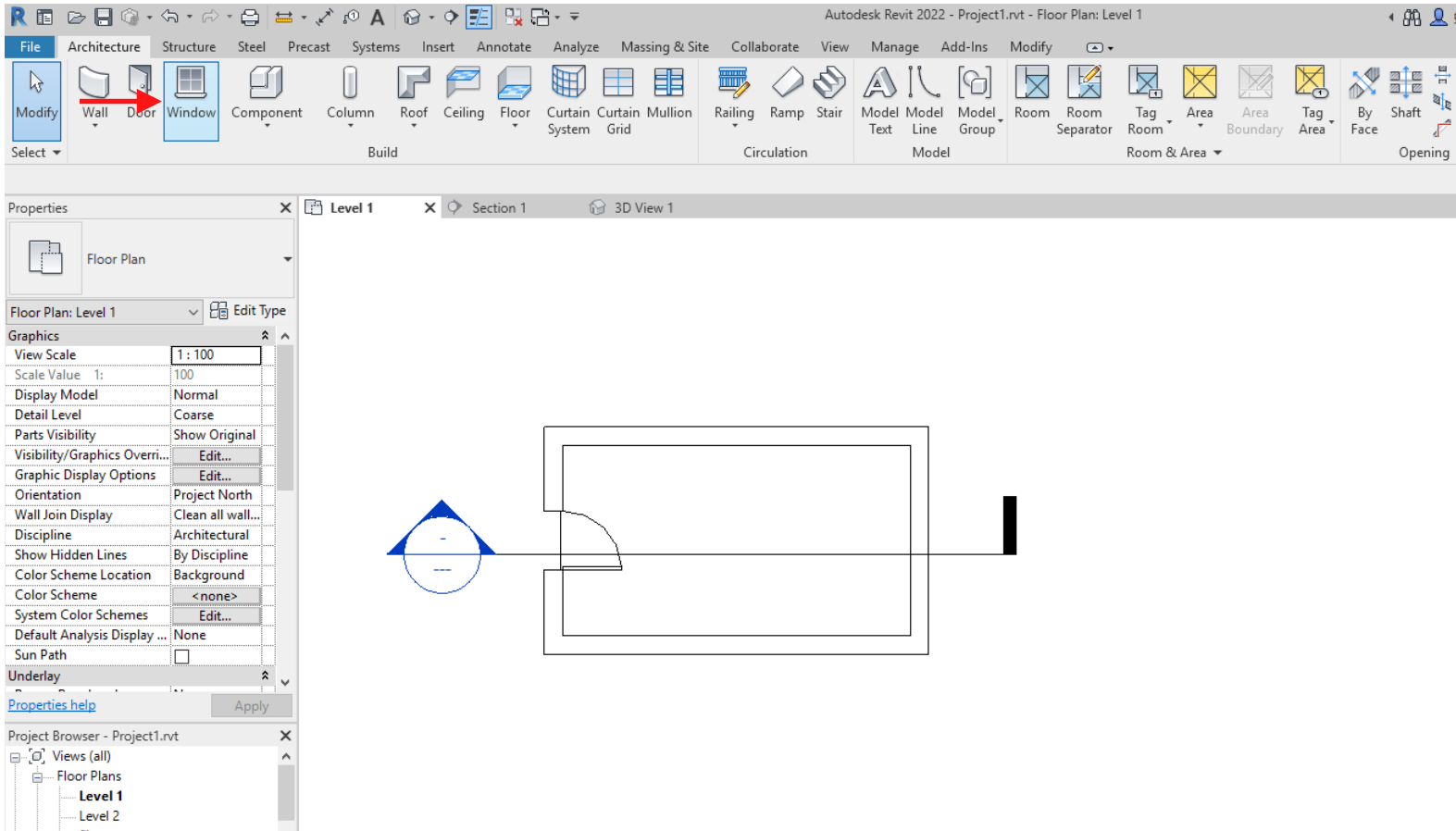
Drawing Doors

66



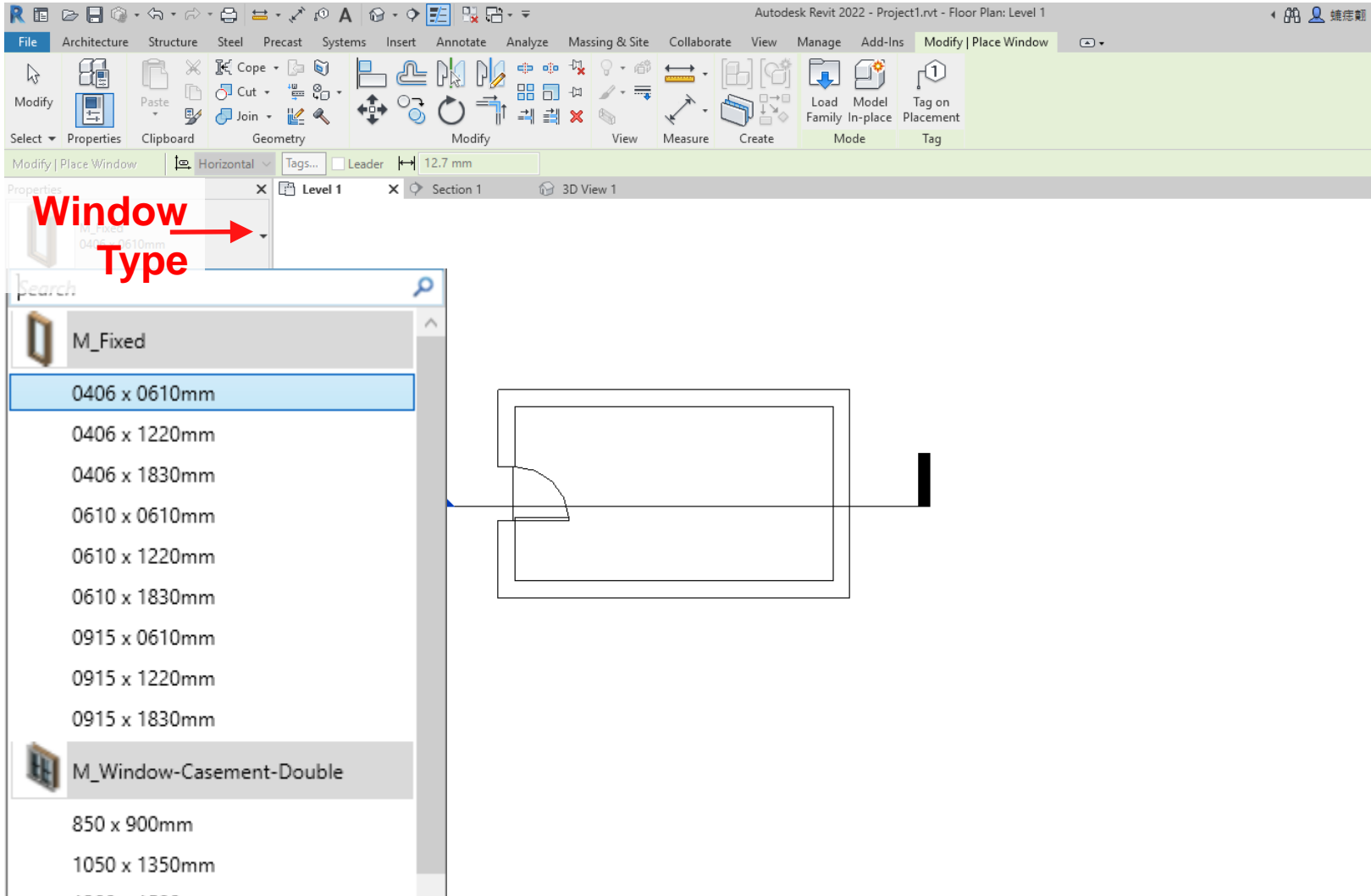
Drawing Window

67



Drawing Window

68



Drawing Window

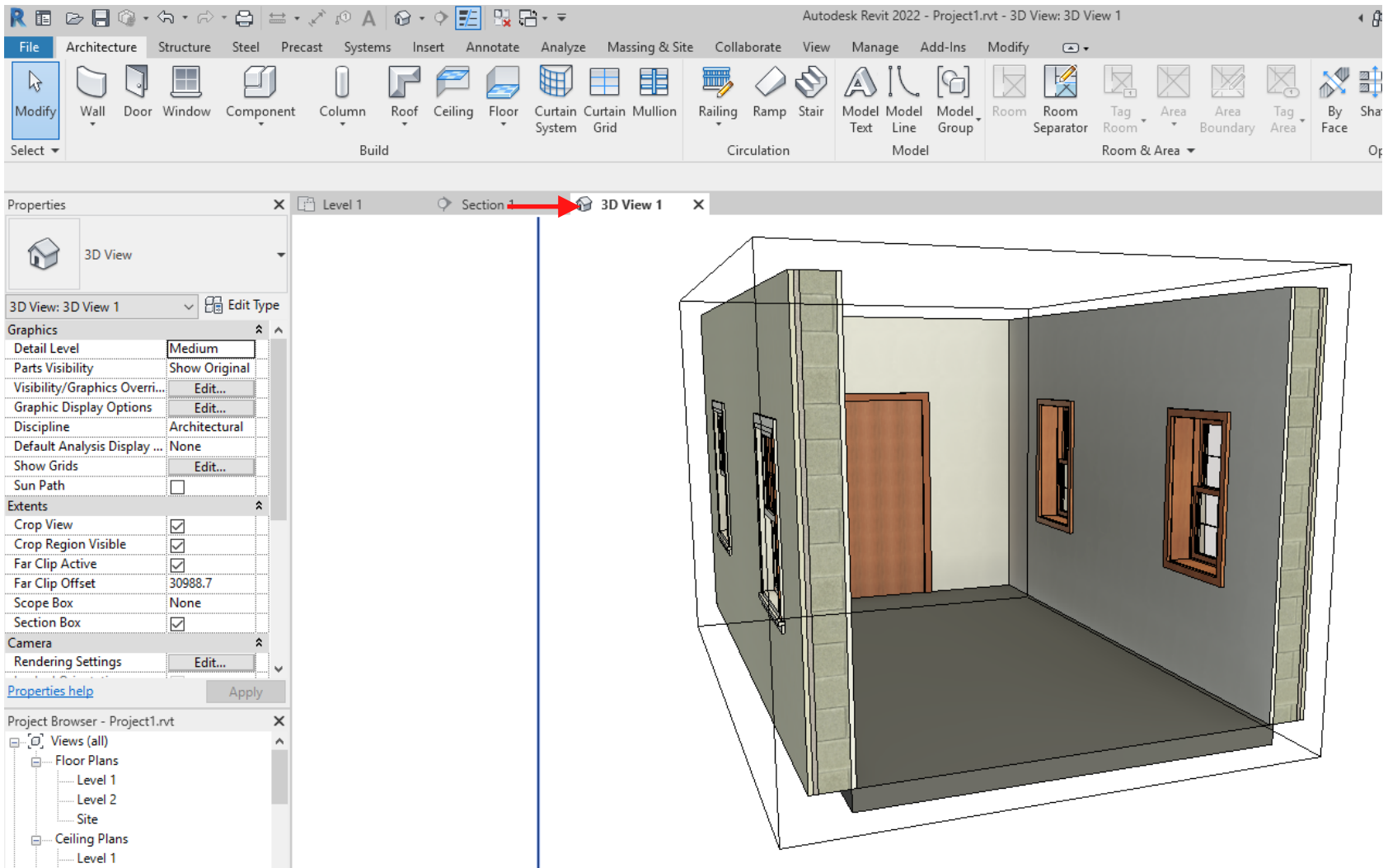
69

The screenshot displays the Autodesk Revit 2022 interface for a floor plan. The title bar indicates the project is 'Autodesk Revit 2022 - Project1.rvt - Floor Plan: Level 1'. The ribbon is set to 'Modify | Place Window'. The Properties panel on the left shows the selected window type as 'M_Window-Double-Hung 750 x 1200mm'. The 'Constraints' section shows 'Sill Height' set to 914.4. The 'Dimensions' section shows 'Exterior Wall Closure' at 12.7, 'Interior Wall Closure' at 35.7, and 'Extension Jamb' at 35.7. The floor plan drawing shows a window with dimensions: 2110.0 and 1100.0 for the window opening, and 700.0 and 3960.0 for the overall window placement. A north arrow is visible on the left side of the drawing.

Category	Property	Value
Constraints	Sill Height	914.4
Construction	Window Inset	0.0
Graphics	Exterior Trim Visibility	<input checked="" type="checkbox"/>
Graphics	Interior Trim Visibility	<input checked="" type="checkbox"/>
Graphics	Indicator Visibility	<input checked="" type="checkbox"/>
Graphics	Extension Jamb Visibility	<input checked="" type="checkbox"/>
Dimensions	Exterior Wall Closure	12.7
Dimensions	Interior Wall Closure	35.7
Dimensions	Extension Jamb	35.7

Drawing Window

70



Drawing Columns

71

The screenshot displays the Autodesk Revit 2022 interface for a floor plan. The ribbon is set to the 'Architecture' tab, and the 'Column' tool is selected. A dropdown menu shows 'Structural Column' and 'Column: Architectural', with the latter being highlighted. A red arrow points from the 'Column: Architectural' option to the Properties panel. The Properties panel shows the 'Floor Plan' view with 'Detail Level' set to 'Coarse'. A tooltip for 'Column: Architectural' is visible, stating 'Adds architectural columns to the building model.' and 'Press F1 for more help'. The main drawing area shows a floor plan with a north arrow and a column symbol.

Autodesk Revit 2022 - Project1.rvt - Floor Plan: Level 1

File Architecture Structure Steel Precast Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins Modify

Modify Wall Door Window Component Column Roof Ceiling Floor Curtain System Curtain Mullion Grid Railing Ramp Stair Model Text Model Line Model Group Room Room Separator Tag Room Area Room & Area

Properties

Floor Plan

Floor Plan: Level 1 Edit Type

Graphics

View Scale	1 : 100
Scale Value 1:	100
Display Model	Normal
Detail Level	Coarse
Parts Visibility	Show Original
Visibility/Graphics Overri...	Edit...
Graphic Display Options	Edit...
Orientation	Project North
Wall Join Display	Clean all wall...
Discipline	Architectural
Show Hidden Lines	By Discipline
Color Scheme Location	Background
Color Scheme	<none>
System Color Schemes	Edit...
Default Analysis Display ...	None
Sun Path	<input type="checkbox"/>

Underlay

Properties help Apply

Project Browser - Project1.rvt

Views (all)

Floor Plan

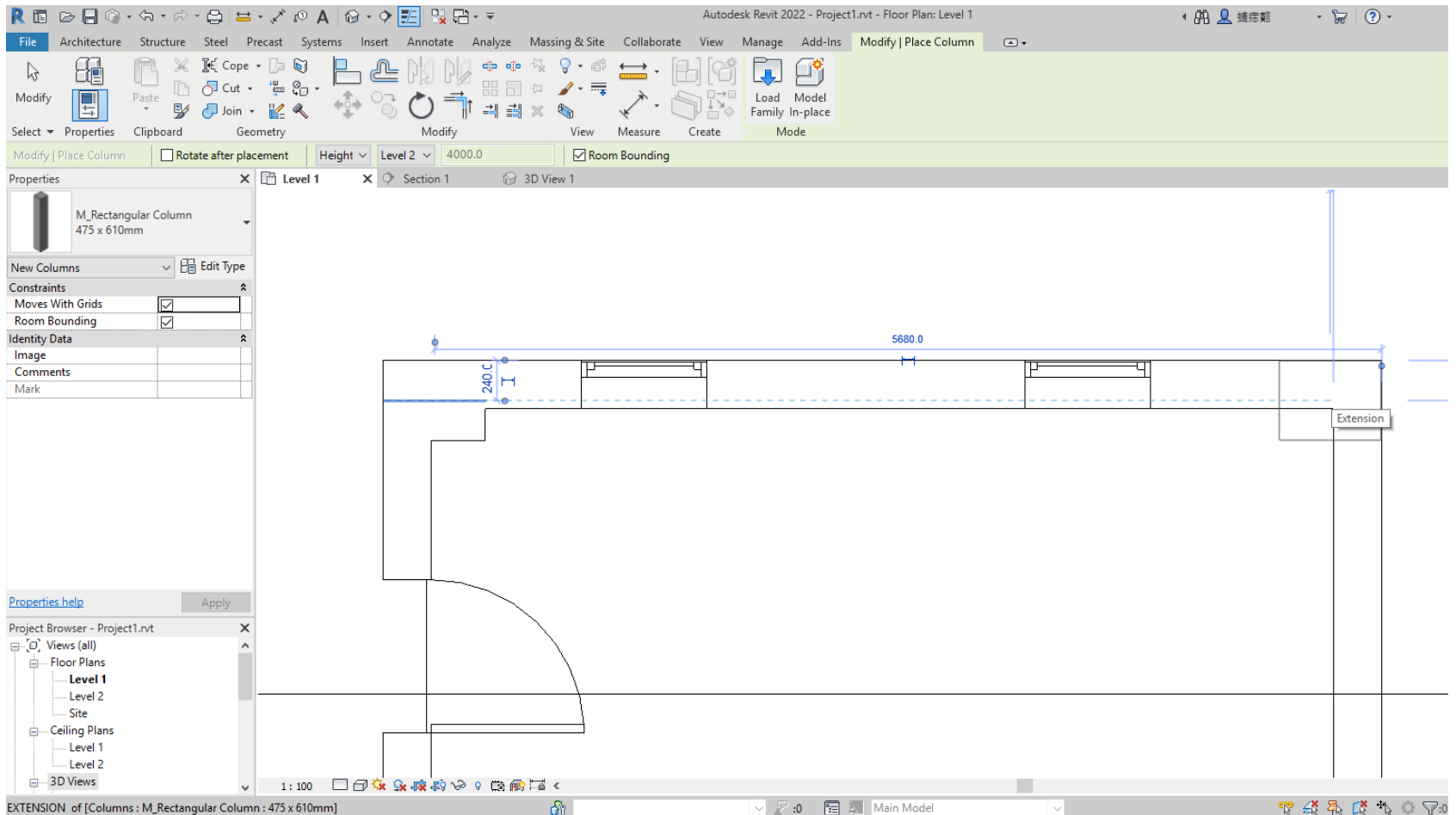
Column: Architectural

Adds architectural columns to the building model.

Press F1 for more help

Drawing Columns

72



Drawing Ceilings

73

The screenshot displays the Autodesk Revit 2022 software interface. The title bar indicates the current project is 'Autodesk Revit 2022 - Project1.rvt - Floor Plan: Level 1'. The ribbon is set to the 'Ceiling' tool, which is highlighted with a red arrow. The ribbon categories include 'Build', 'Circulation', 'Model', and 'Room & Area'. The Properties panel on the left shows the 'Floor Plan' view type and various settings for 'Floor Plan: Level 1', including 'View Scale' (1:100), 'Display Model' (Normal), and 'Orientation' (Project North). The Project Browser at the bottom left shows the hierarchy of views, with 'Level 1' selected. The main drawing area shows a floor plan view of a room with a blue circular symbol and a horizontal line, likely representing a ceiling or a section cut.

Drawing Ceilings-Automated Tools

74

The image shows the Autodesk Revit 2022 software interface for drawing ceilings. The ribbon is set to 'Modify | Place Ceiling', with the 'Automatic Ceiling' and 'Sketch Ceiling' tools highlighted by red arrows. The Properties panel on the left shows the 'Compound Ceiling Plain' type, with the 'Ceiling Height' property set to 2600.0, indicated by a red arrow and the text 'Ceiling Height'. The Project Browser on the bottom left shows the 'Level 1' view selected. The main view displays a floor plan with a red boundary line representing the ceiling perimeter.

Autodesk Revit 2022 - Project1.rvt - Floor Plan: Level 1

File Architecture Structure Steel Precast Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins Modify | Place Ceiling

Modify Properties Clipboard Geometry Modify View Measure Create Automatic Ceiling Sketch Ceiling

Properties

Compound Ceiling Plain

Ceilings (1) Edit Type

Constraints

Level Level 1

Height Offset From Level 2600.0

Room Bounding

Dimensions

Slope

Perimeter

Area

Volume

Identity Data

Image

Comments

Mark

Properties help Apply

Project Browser - Project1.rvt

Views (all)

Floor Plans

Level 1

Level 2

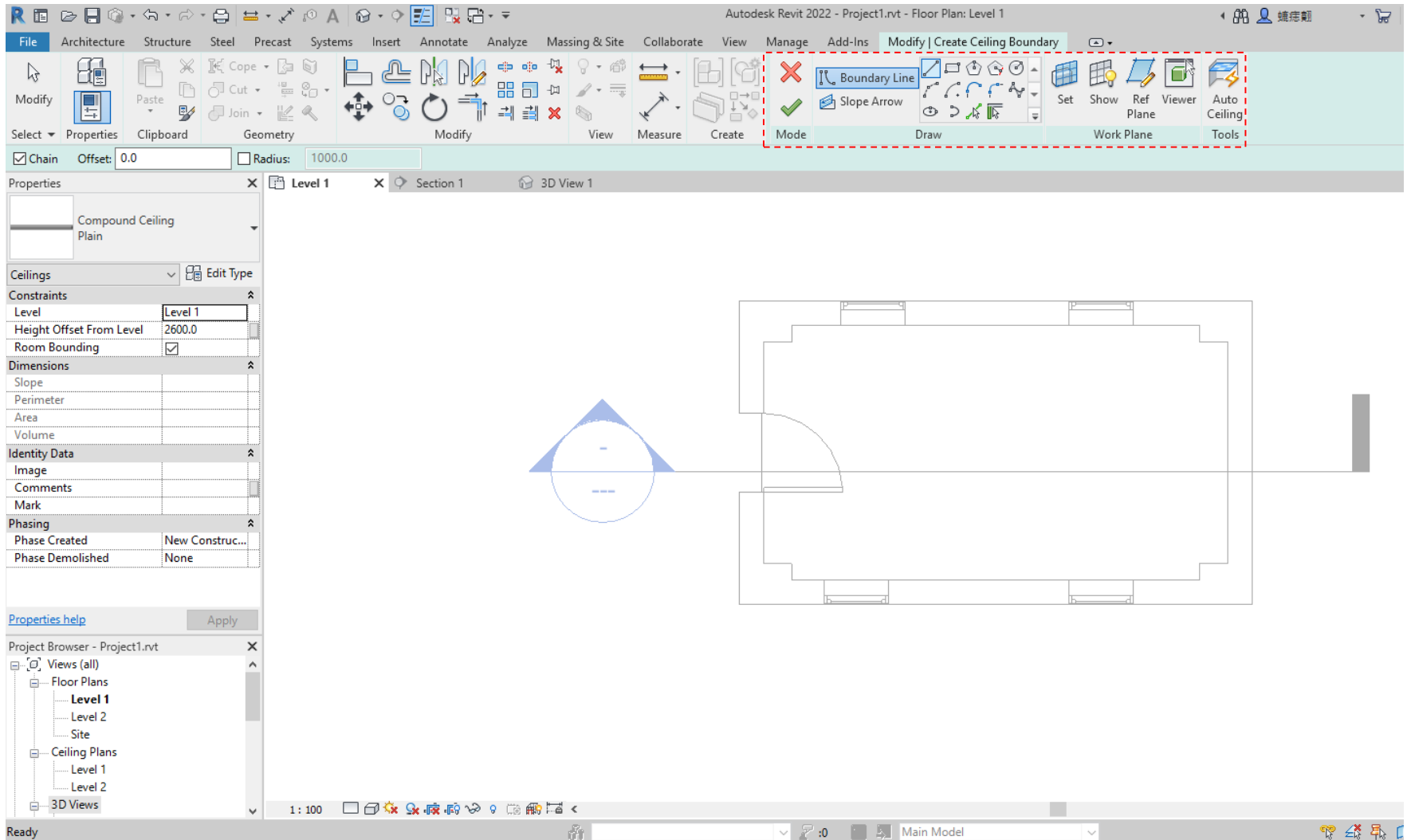
Site

Ceiling Plans

Level 1

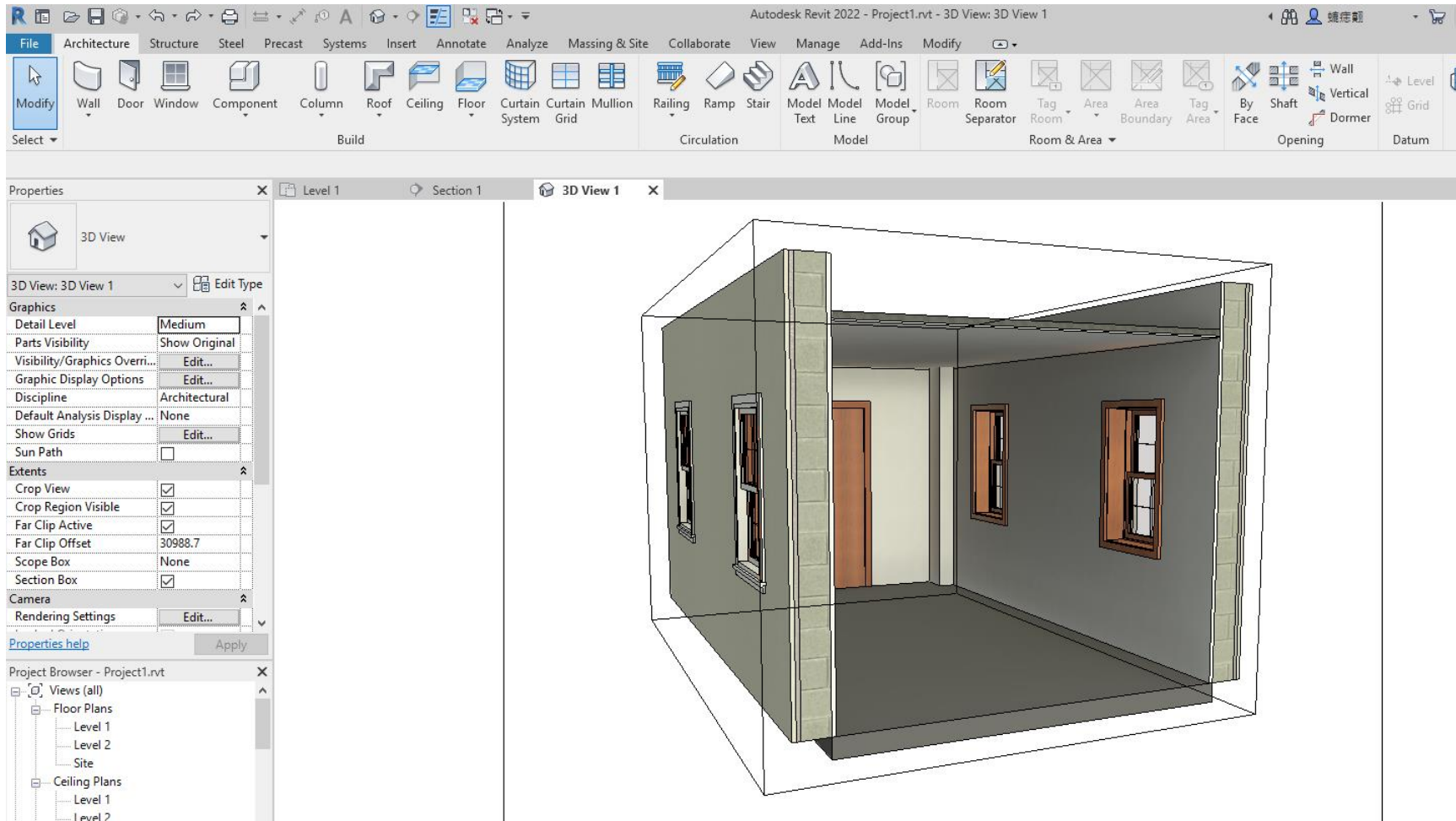
Drawing Ceilings-Manual Tools

75



Drawing Ceilings

76



Drawing Roofs

77

The image shows the Autodesk Revit 2022 software interface. The title bar indicates the project is 'Project1.rvt' and the current view is 'Floor Plan: Level 2'. The ribbon is set to the 'Roof' tab, with the 'Roof by Footprint' tool selected. A red arrow labeled '3' points to this tool. The 'Level 2' view is active, as indicated by a red arrow labeled '2' pointing to the 'Level 2' button in the view selector. The Properties panel on the left shows the 'Floor Plan: Level 2' view with a 'View Scale' of 1:100. The Project Browser on the bottom left shows the 'Level 2' view selected, with a red arrow labeled '1' pointing to it. The main drawing area displays a floor plan with a blue roof footprint and a black vertical line.

Autodesk Revit 2022 - Project1.rvt - Floor Plan: Level 2

File Architecture Structure Steel Precast Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins Modify

Roof Ceiling Floor Curtain System Mullion Railing Ramp Stair Model Text Model Line Model Group Room Room Separator Tag Room Area Area Boundary Tag Area By Face Shaft Vertical Wall Level Grid Set Datum

Roof by Footprint

Roof by Extrusion

Roof by Face

Roof: Soffit

Roof: Fascia

Roof: Gutter

Level 1

Level 2

Level 2

Level 2

Drawing Roofs

78

Autodesk Revit 2022 - Project1.rvt - Floor Plan: Level 2

File Architecture Structure Steel Precast Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins **Modify | Create Roof | Footprint**

Modify Paste Cope Cut Join Geometry Modify View Measure Create Mode Draw Work Plane Tools

Boundary Line Slope Arrow Adjust Height Adjust Overhang

Defines slope Chain Offset: 0.0 Radius: 1000.0

Level 1 Section 1 3D View 1 Level 2

Basic Roof
Generic - 400mm

Roofs Edit Type

Constraints

Base Level	Level 2
Room Bounding	<input checked="" type="checkbox"/>
Related to Mass	<input type="checkbox"/>
Base Offset From Level	0.0
Cutoff Level	None
Cutoff Offset	0.0

Construction

Rafter Cut	Plumb Cut
Fascia Depth	0.0
Maximum Ridge Height	0.0

Dimensions

Slope	30.00°
Thickness	400.0
Volume	
Area	

Identity Data

Image

Properties help Apply

Project Browser - Project1.rvt

- Views (all)
- Floor Plans
 - Level 1

2- Draw the Roof

3- Confirm

Drawing Roofs

79

The screenshot displays the Autodesk Revit 2022 interface for editing a roof footprint. The ribbon is set to 'Modify | Roofs'. The Properties palette on the left shows the selected roof type as 'Basic Roof, Generic - 400mm'. The 'Roofs (1)' section is expanded to show constraints and construction properties. The 'Slope' property is set to 30.00°. The main drawing area shows a floor plan with a purple roof footprint. A red arrow labeled '1' points to the 'Modify | Roofs' ribbon. A red arrow labeled '2' points to the 'Edit Footprint' button. A red arrow labeled '3' points to the slope adjustment process, where a text box shows '30.00°'.

Autodesk Revit 2022 - Project1.rvt - Floor Plan: Level 2

File Architecture Structure Steel Precast Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins **Modify | Roofs**

Modify Properties Clipboard Geometry Modify View Measure Create Mode

Modify | Roofs

Level 1 Section 1 3D View 1 Level 2

Basic Roof
Generic - 400mm

Roofs (1) Edit Type

Constraints

Base Level	Level 2
Room Bounding	<input checked="" type="checkbox"/>
Related to Mass	<input type="checkbox"/>
Base Offset From Level	0.0
Cutoff Level	None
Cutoff Offset	0.0

Construction

Rafter Cut	Plumb Cut
Fascia Depth	0.0
Maximum Ridge Height	4485.2

Dimensions

Slope	30.00°
Thickness	400.0
Volume	9.808 m ³
Area	24.520 m ²

Identity Data

Image

Properties help Apply

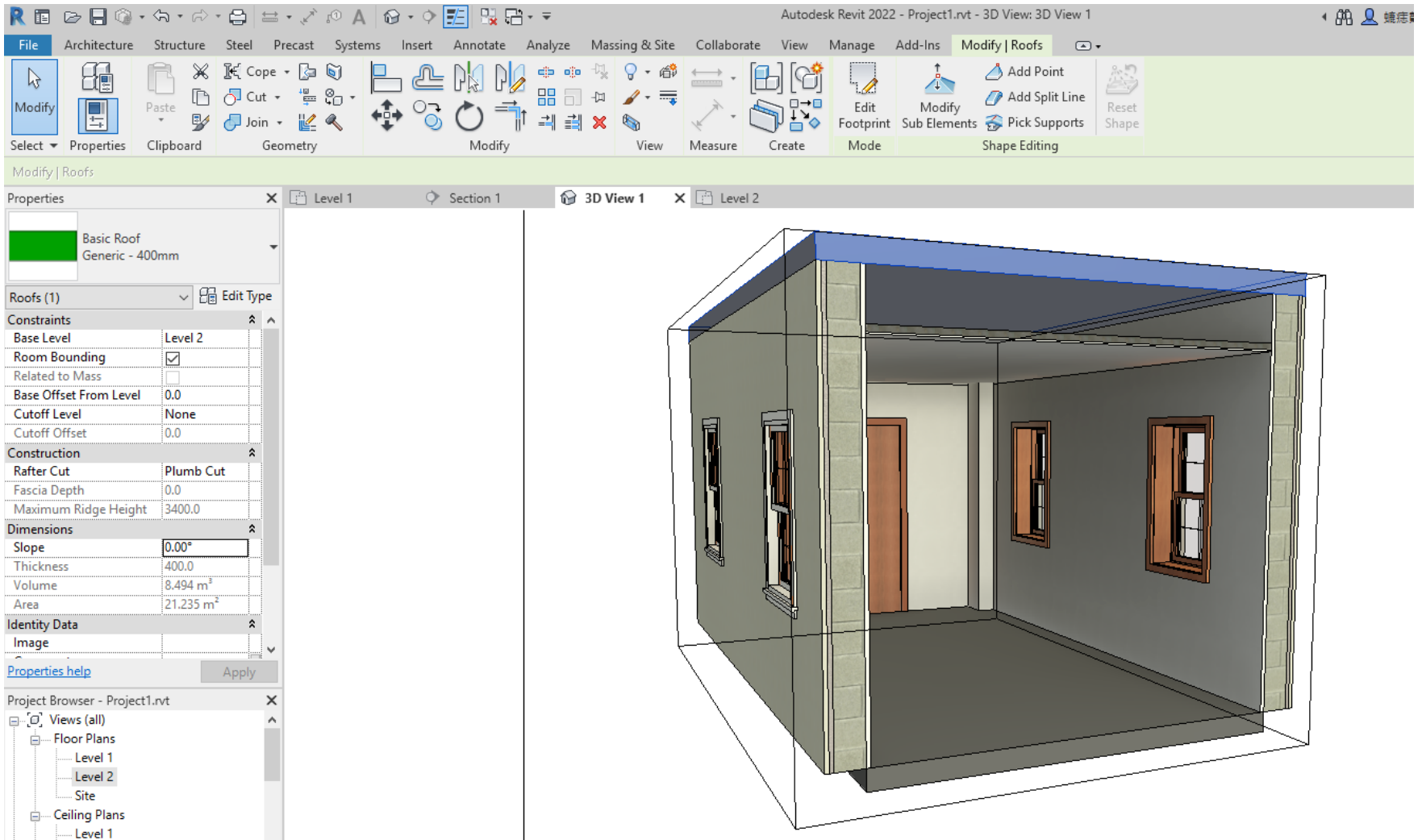
Project Browser - Project1.rvt

- Views (all)
- Floor Plans
 - Level 1
 - Level 2**
 - Site
- Ceiling Plans
 - Level 1

3- Adjust Slope of Every Side → 30.00°

Drawing Roofs

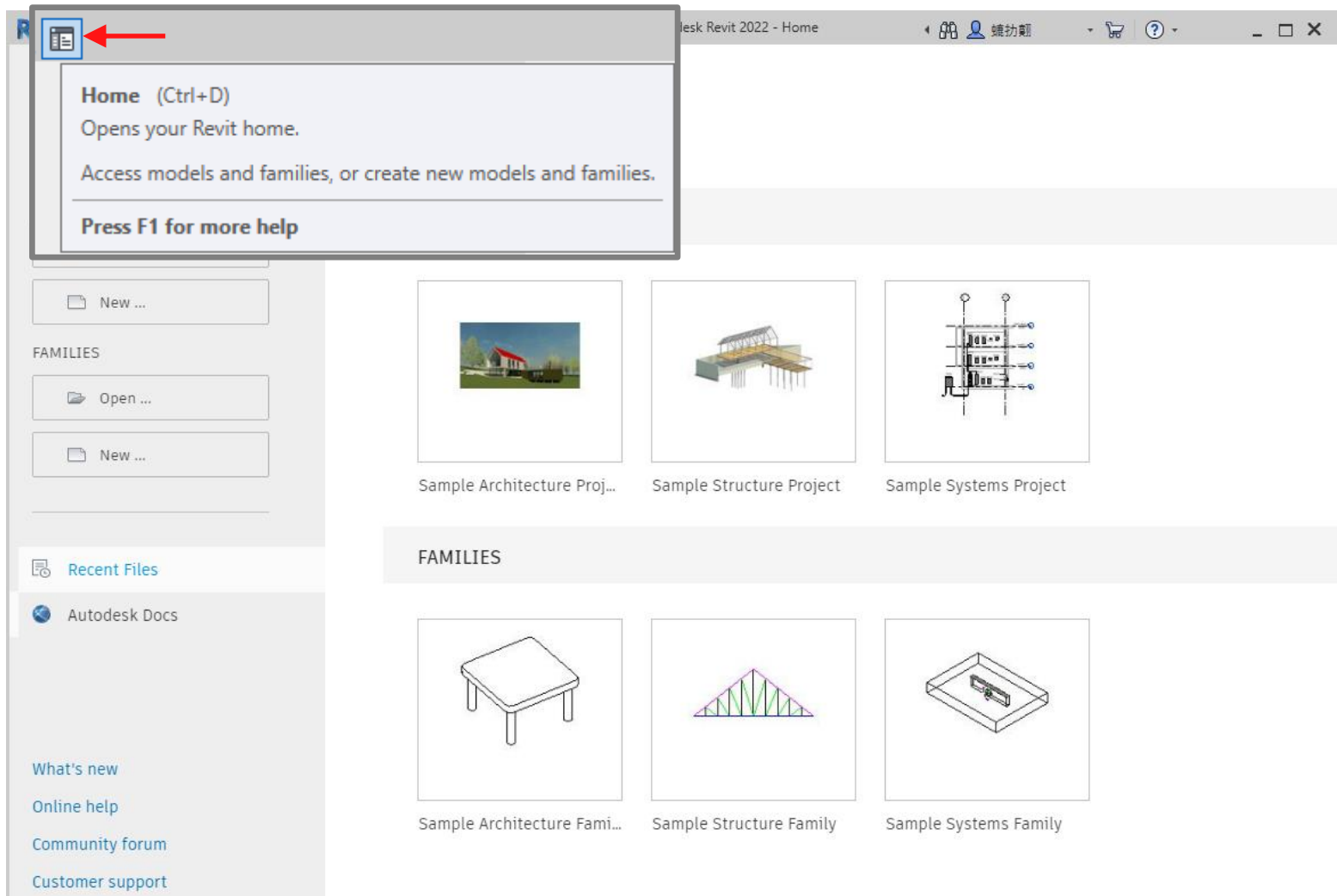
80



Introduction to Revit-Structure

Structure Template Set up

82



The screenshot shows the Autodesk Revit 2022 Home interface. A red arrow points to the Home icon in the top-left corner. A tooltip is displayed over the icon, containing the following text:

- Home (Ctrl+D)**
- Opens your Revit home.
- Access models and families, or create new models and families.
- Press F1 for more help

The main content area displays three project templates:

- Sample Architecture Proj...
- Sample Structure Project
- Sample Systems Project

Below these, a section titled "FAMILIES" displays three family templates:

- Sample Architecture Fami...
- Sample Structure Family
- Sample Systems Family

The left sidebar contains navigation options:

- New ...
- FAMILIES
- Open ...
- New ...
- Recent Files
- Autodesk Docs
- What's new
- Online help
- Community forum
- Customer support

Adjust Addresses

83

1 → File

2 → Options

3 → File Locations

4 → +

Options

Project templates: The templates display in a list when you create a new project.

Name	Path
DefaultMetric	D:\Program Files\Autodesk\RVT 202

Default path for user files: C:\Users\admin\Documents

Default path for family template files: D:\Program Files\Autodesk\RVT 2023\Family Templates

Root path for point clouds: C:\Users\admin\Documents\PointClouds

Systems analysis workflows:

Name	Path
Annual Building En...	C:\Program Files\NREL\OpenStudio CLI For...
HVAC Systems Loa...	C:\Program Files\NREL\OpenStudio CLI For...

Adjust Addresses

84

The image shows the Revit Options dialog box with the **File Locations** tab selected. The **Project templates** table is as follows:

Name	Path
DefaultMetric	D:\Program Files\Autodesk\RVT 202
Structural Analysis-DefaultMetric	D:\Program Files\Autodesk\RVT 202

Below this, there are fields for default paths for user files, family template files, and point clouds, each with a **Browse...** button. The **Systems analysis workflows** table is also visible:

Name	Path
Annual Building En...	C:\Program Files\NREL\OpenStudio CLI For...
HVAC Systems Loa...	C:\Program Files\NREL\OpenStudio CLI For...

Two file browser windows are overlaid on the Options dialog. The left window shows the **Structure** folder selected in the left-hand navigation pane. The right window shows a list of files in the **English** folder, with **DefaultMetric.rte** selected. At the bottom of the Options dialog, the **OK** and **Open** buttons are highlighted with red arrows.

Start Working with Revit

85

The screenshot displays the Autodesk Revit 2022 interface. The title bar reads "Autodesk Revit 2022 - Home" and the user name "魏勃" is visible. The left sidebar contains a navigation pane with a "Recent Files" section. The main workspace shows a "Recent Files" list. A "New Project" dialog box is open in the center, with four red arrows indicating the steps to create a new project:

- 1**: Points to the "New" button in the left sidebar.
- 2**: Points to the "New ..." button in the "MODELS" section of the left sidebar.
- 3**: Points to the "Structural Analysis-DefaultMetric" option in the "Template file" dropdown menu.
- 4**: Points to the "OK" button at the bottom of the dialog box.

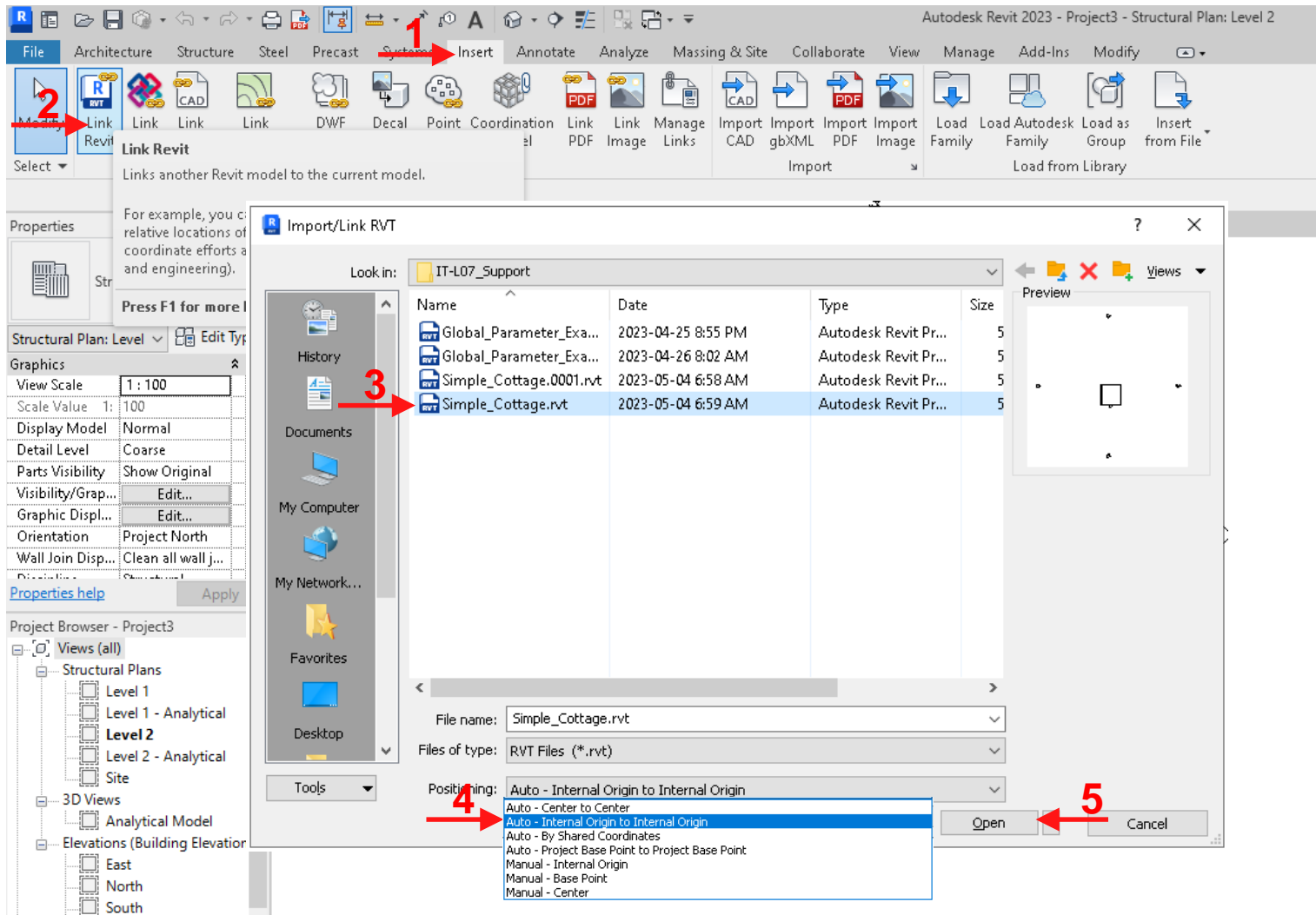
The "New Project" dialog box includes the following elements:

- Template file**: A dropdown menu showing "DefaultMetric", "<None>", "DefaultMetric", and "Structural Analysis-DefaultMetric". A "Browse..." button is next to it.
- Project type**: Radio buttons for "Project" (selected) and "Project template".
- Buttons**: "OK", "Cancel", and "Help" buttons at the bottom.

Below the dialog box, the "FAMILIES" section is visible, showing three sample family icons: "Sample Architecture Fami...", "Sample Structure Family", and "Sample Systems Family".

Linking the Architecture File

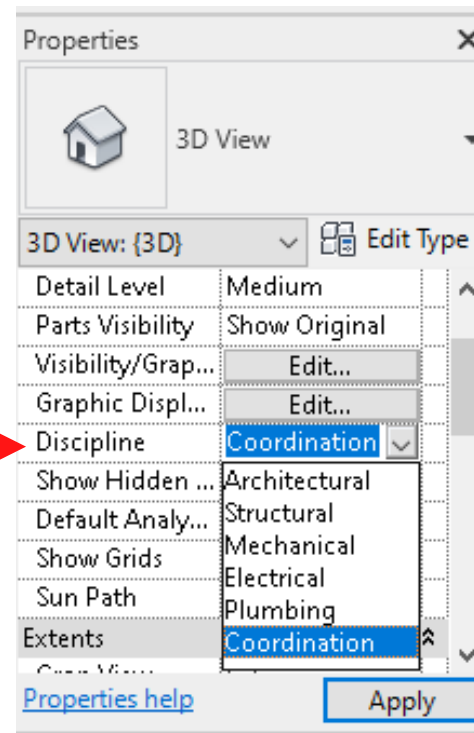
86



Adjusting the Linked File

87

1
→
**Set the *Discipline* to
the *Coordination* to
use both Arch. and
Struc. elements**

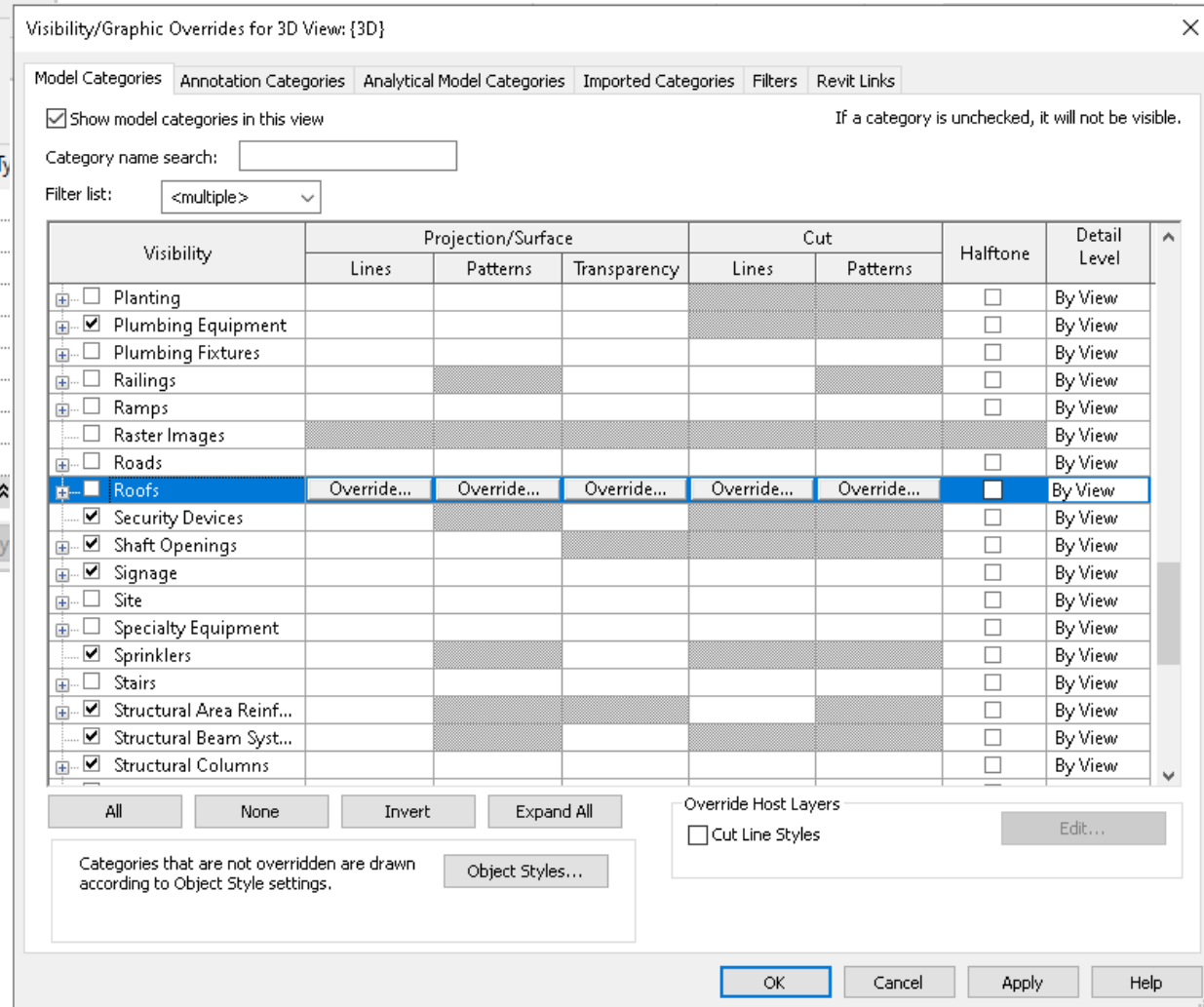
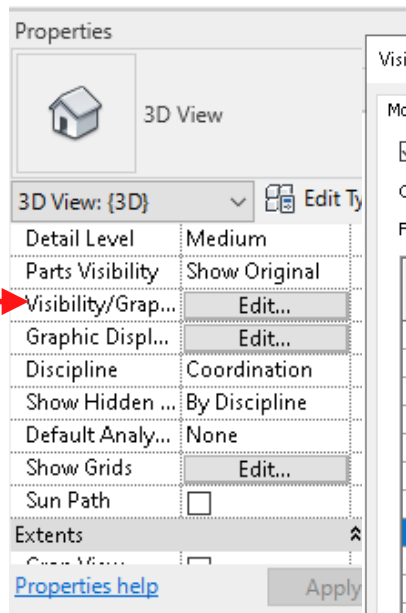


Adjusting the Linked File

88

2

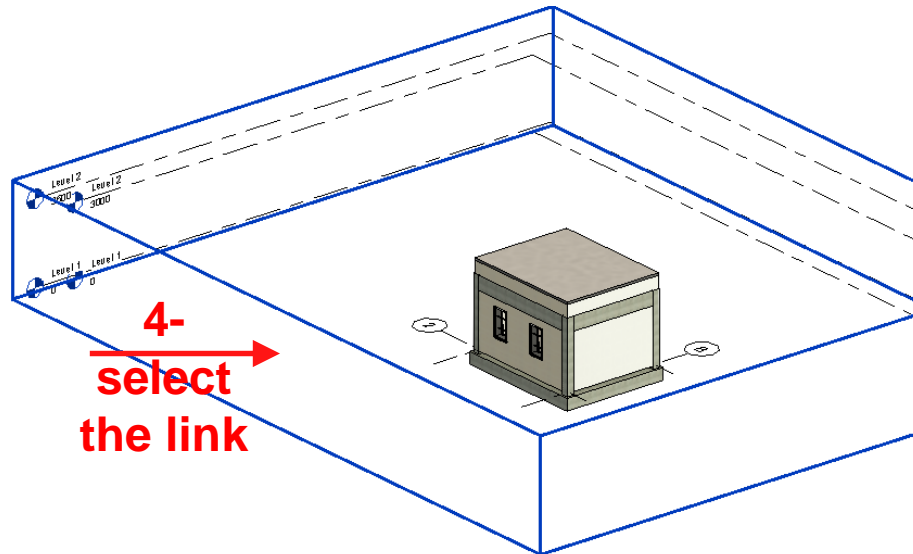
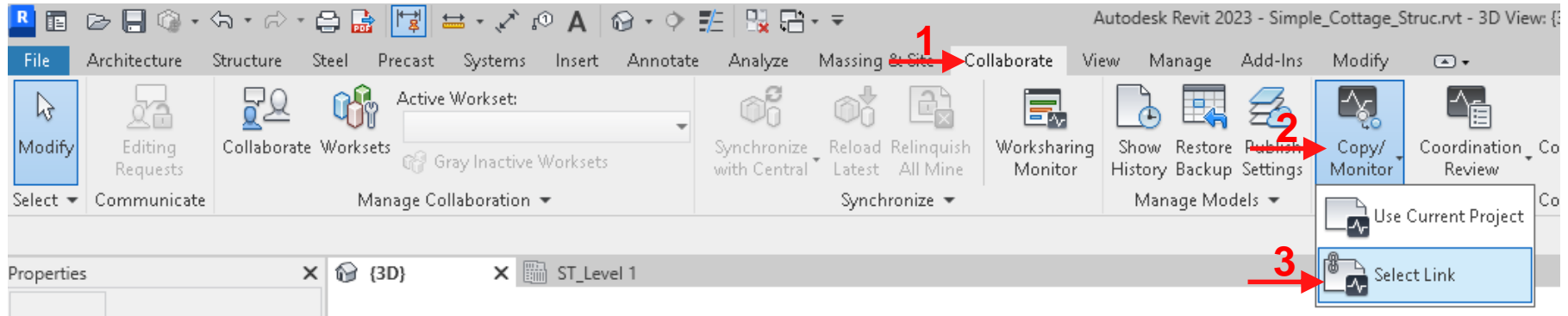
**Edit
Visibility/
Graphics
to select
elements
required**



Copy Required Elements from the Link

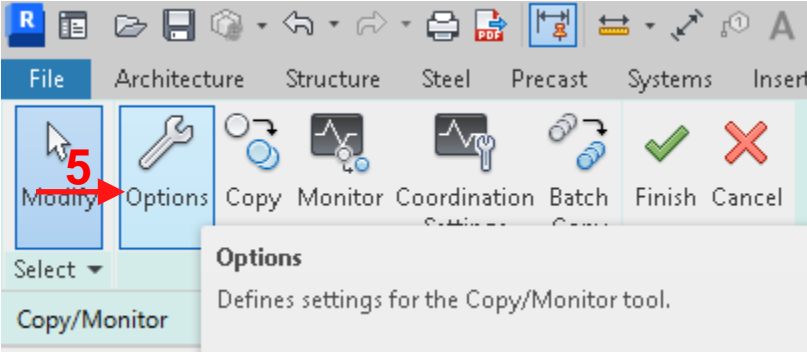
89

- Example: Copy the elevations from the linked Arch model



Copy Required Elements from the Link

Example (Cont'd)



The 'Copy/Monitor Options' dialog box is shown. It has tabs for 'Levels', 'Grids', 'Columns', 'Walls', and 'Floors'. The 'Levels' tab is active. Under 'Categories and Types to copy:', there is a table with two columns: 'Original type' and 'New type'. The first row shows '..... 8mm Head' in both columns. Below this, under 'Additional Copy Parameters:', there is another table with two columns: 'Parameter' and 'Value'. The 'Add prefix to Level Name' parameter is highlighted with a red dashed box and a red arrow pointing to it from the text '6 Adjust options'.

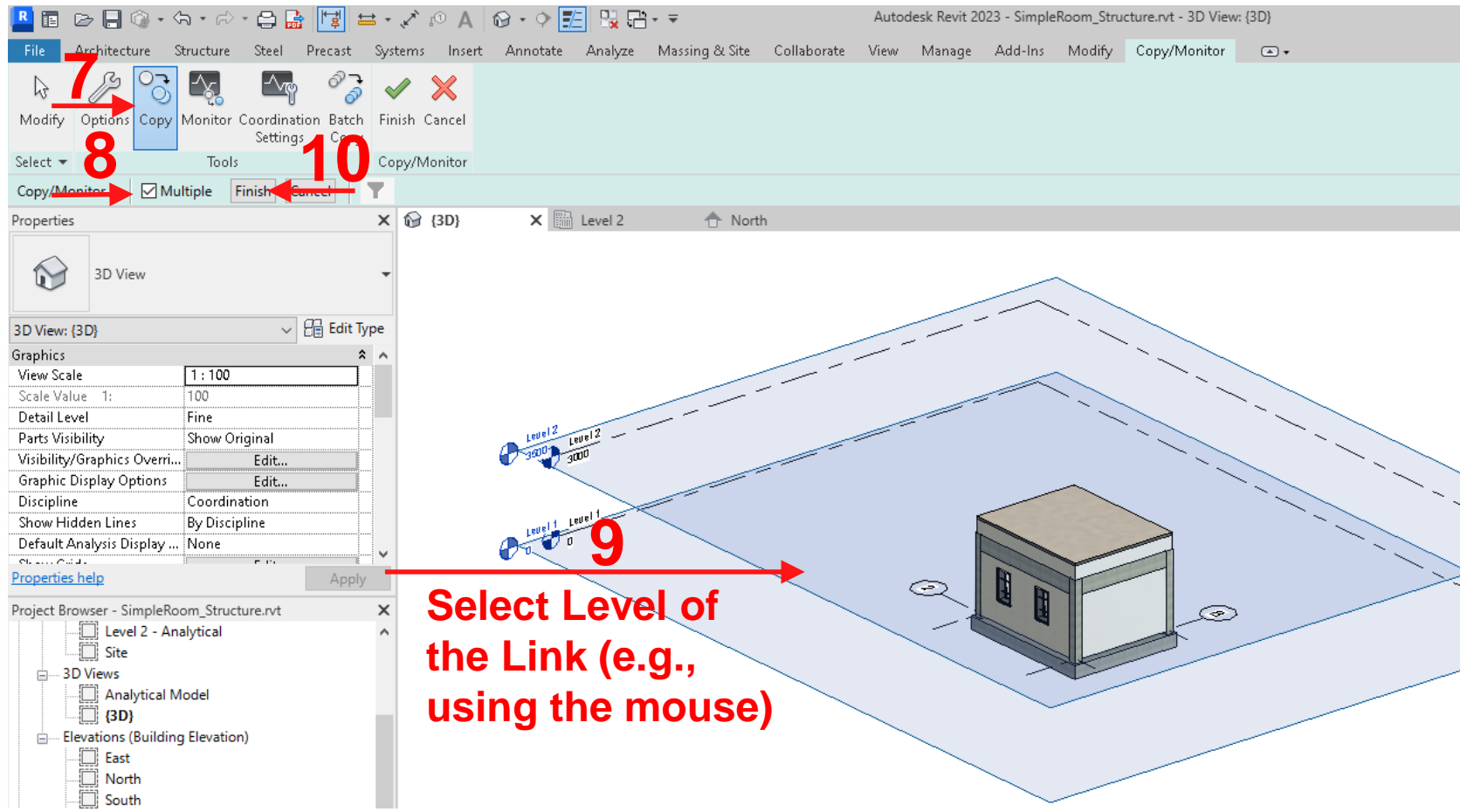
Original type	New type
..... 8mm Head	8mm Head

Parameter	Value
Offset Level	0.0
Reuse Levels with the same name	<input checked="" type="checkbox"/>
Reuse matching Levels	Don't reuse
Add suffix to Level Name	
Add prefix to Level Name	ST_

6
Adjust options

Copy Required Elements from the Link

Example (Cont'd)



Select Level of the Link (e.g., using the mouse)

Copy Required Elements from the Link

Example (Cont'd)

The image shows a screenshot of Autodesk Revit 2023 with several annotations in red:

- 11**: Points to the **View** menu in the top ribbon.
- 12**: Points to the **Plan Views** sub-menu.
- 13**: Points to the **Structural Plan** option in the sub-menu.
- 14**: Points to the selection of **ST_Level 1** and **ST_Level 2** in the **New Structural Plan** dialog box, with the text **Select copied levels** overlaid.
- 15**: Points to the **OK** button at the bottom of the dialog box.

The **New Structural Plan** dialog box includes the following elements:

- Type**: Structural Plan (with an **Edit Type...** button).
- Text: **Select one or more levels for which you want to create new views.**
- Level list: **ST_Level 1** and **ST_Level 2** (both selected).
- Checkbox: **Do not duplicate existing views**.
- Buttons: **OK** and **Cancel**.

Copy Required Elements from the Link

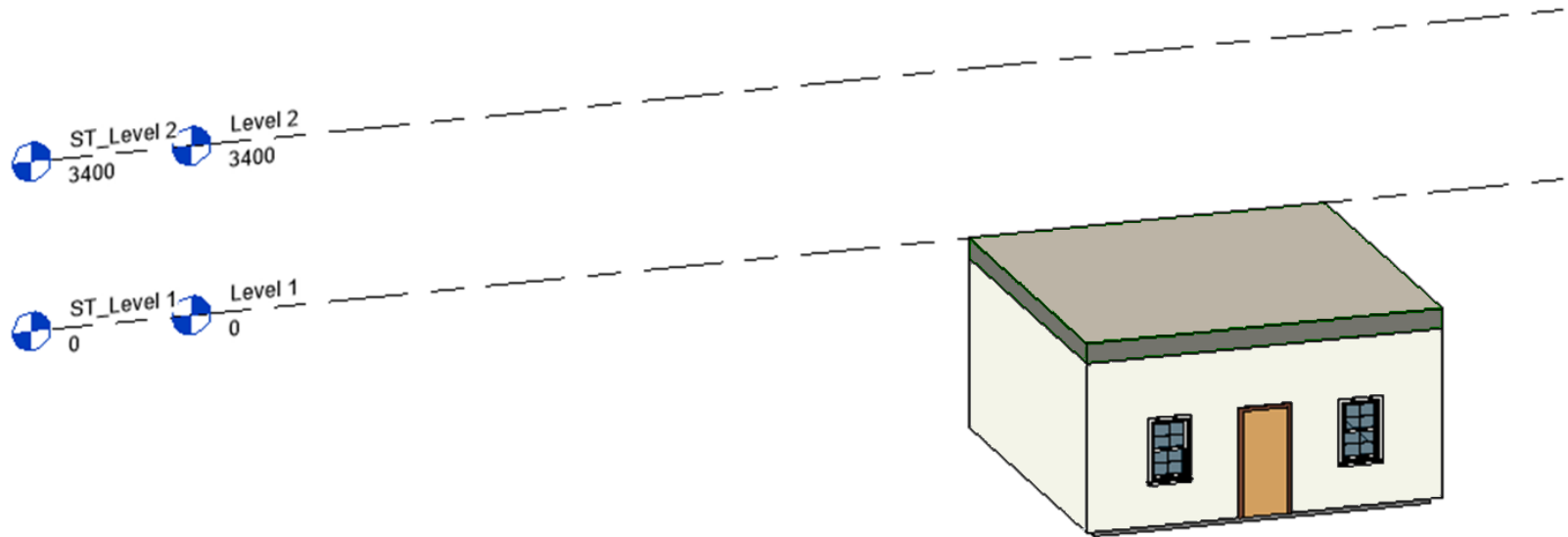
- Example (Cont'd)

The screenshot shows a 'Project Browser' window for a project named 'Simple_Cottage...'. Under the 'Views (all)' category, the 'Structural Plans' folder is expanded. It contains several items: 'Level 1', 'ST_Level 1', 'ST_Level 2', 'Floor Plans', 'Ceiling Plans', '3D Views', 'Elevations (Building Elevation)' (with sub-items 'East', 'North', 'South', 'West'), and 'Legends'. A red dashed box encloses 'Level 1', 'ST_Level 1', and 'ST_Level 2'. A red arrow labeled '14' points from the left towards 'ST_Level 1'. Another red arrow labeled '15' points from the right towards 'Level 1'. Red text annotations are present: 'New levels show up with the same spec as the Link' on the left and 'Previous Levels can be removed' on the right.

Copy Required Elements from the Link

94

- Example (Cont'd)



Clear the Room for Structure Objects

95

Autodesk Revit 2023 - Simple_Cottage_Struc - Structural Plan: ST_Level 1

File Architecture Structure Steel Precast Systems Insert Annotate Analyze Massing & Site Collaborate View Manage Add-Ins Modify

Modify Wall Door Window Component Column Roof Ceiling Floor Curtain Curtain Mullion Railing Ramp Stair Model Model Model Room Room Tag Area Area Tag By Fac

Select Build

Properties

Structural Plan

Structural Plan: ST_Level 1 Edit Type

Graphics

View Scale 1 : 100

Scale Value 1: 100

Display Model Normal

Detail Level Coarse

Parts Visibility Show Original

Visibility/Graphic Overrides Edit...

Graphic Display Options Edit...

Orientation Project North

Wall Join Display Clean all wall joins

Properties help Apply

Project Browser - Simple_Cottage_Struc

Views (all)

Structural Plans

3D Views

Elevations (Building Elevation)

East

North

South

West

Legends

Schedules/Quantities (all)

Sheets (all)

Families

Visibility/Graphic Overrides for Structural Plan: ST_Level 1

Model Categories Annotation Categories Analytical Model Categories Imported Categories Filters Revit Links

Show model categories in this view If a category is unchecked, it will not be visible.

Category name search: []

Filter list: <multiple>

Visibility	Projection/Surface			Cut		Halftone	Detail Level
	Lines	Patterns	Transparency	Lines	Patterns		
<input checked="" type="checkbox"/> Structural Fabric Rei...						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Structural Foundatio...						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Structural Framing						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Structural Path Reinf...						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Structural Rebar						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Structural Rebar Co...						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Structural Stiffeners						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Structural Trusses						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Telephone Devices						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Temporary Structures						<input type="checkbox"/>	By View
<input type="checkbox"/> Topography						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Vertical Circulation						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Walls	Override...	Override...	Override...	Override...	Override...	<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Windows						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Wires						<input type="checkbox"/>	By View

All None Invert Expand All

Override Host Layers

Cut Line Styles Edit...

Categories that are not overridden are drawn according to Object Style settings. Object Styles...

OK Cancel Apply Help

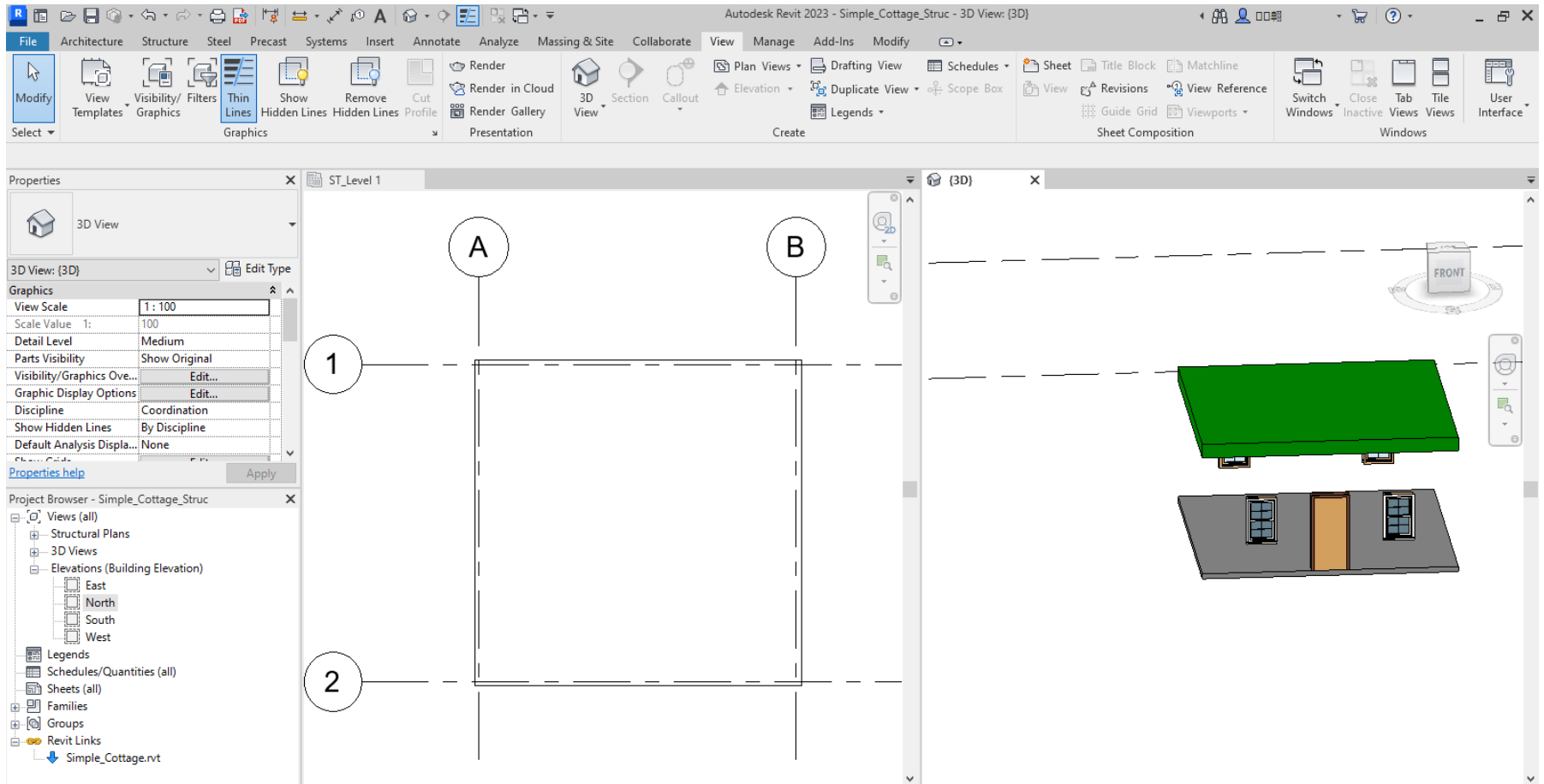
1

2

Unselect Walls

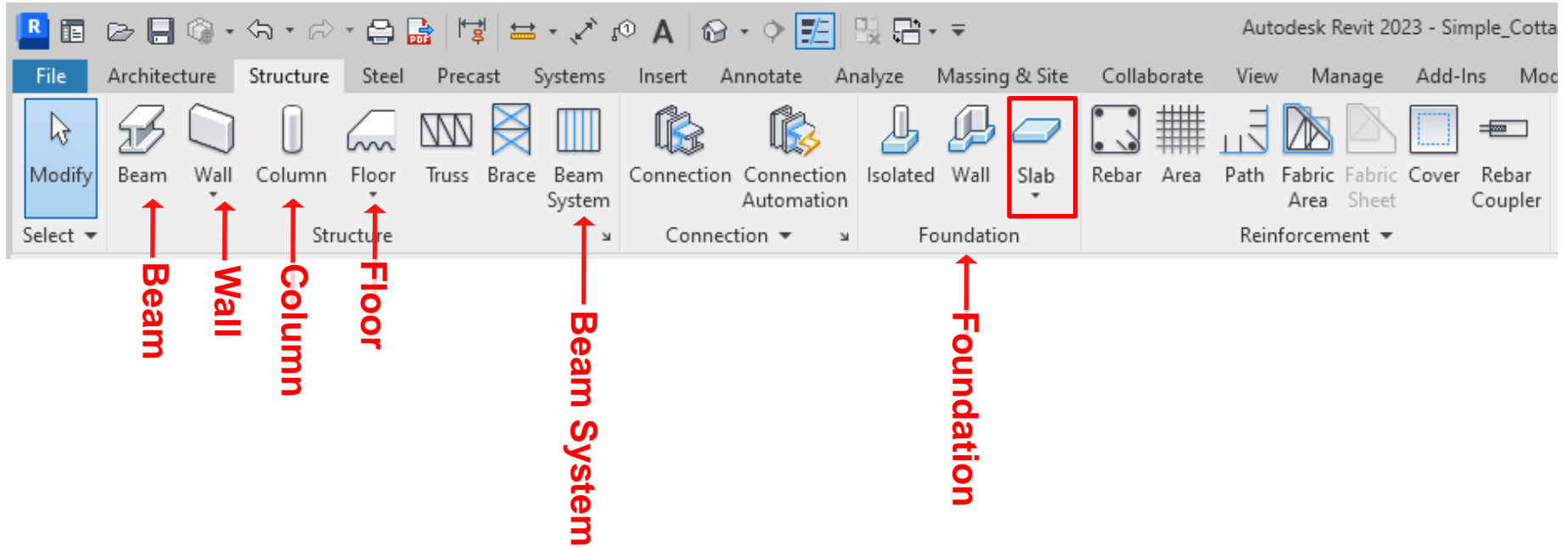
Clear the Room for Structure Objects

96



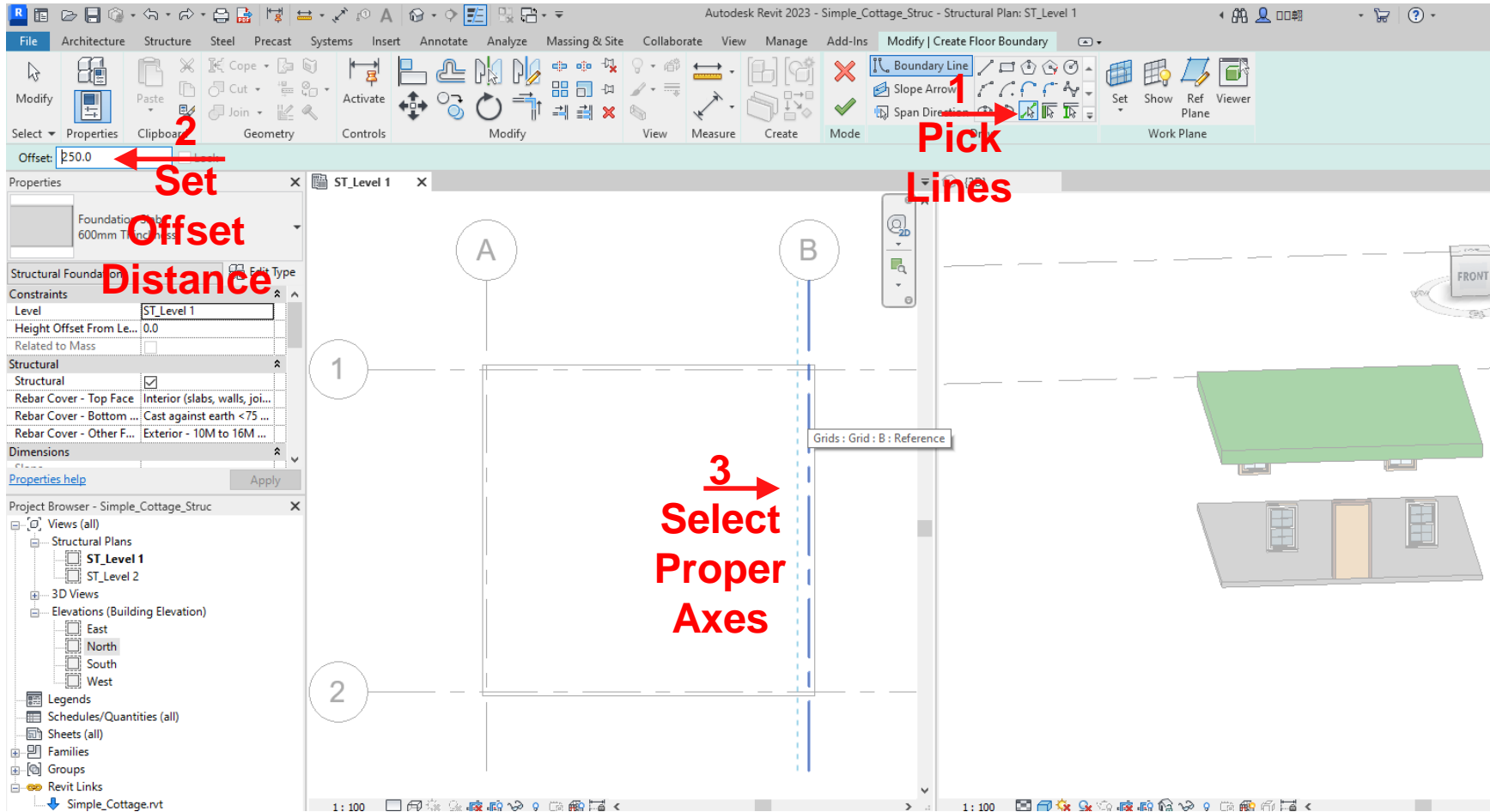
Basic Structure Model Objects

97



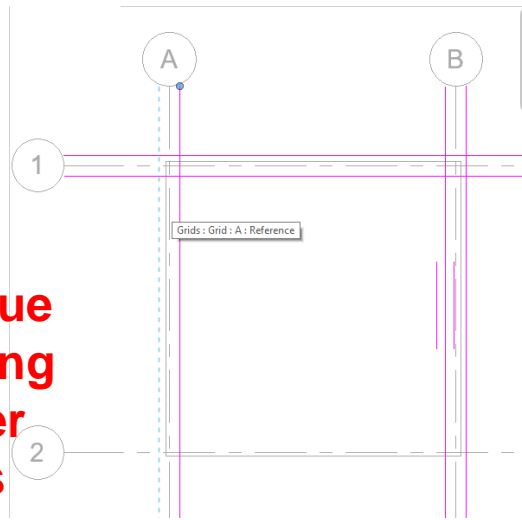
Drawing Foundation

98

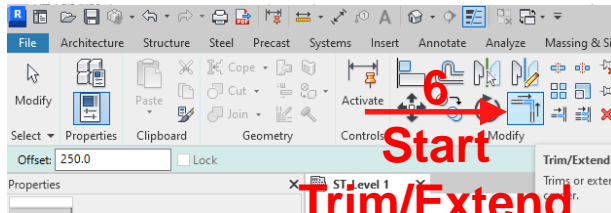
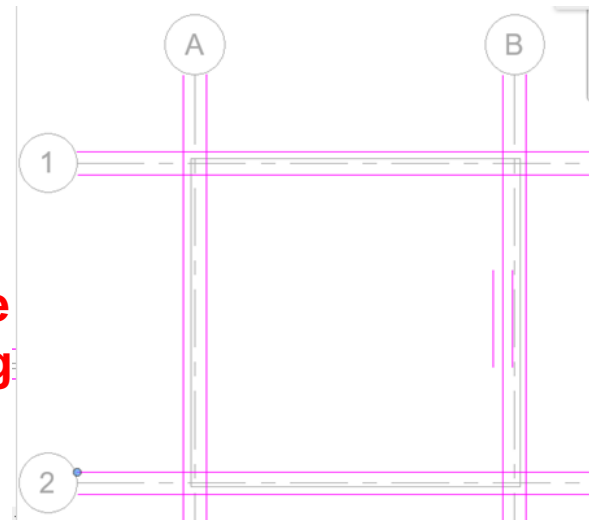


Drawing Foundation

4
Continue
Selecting
Proper
Axes

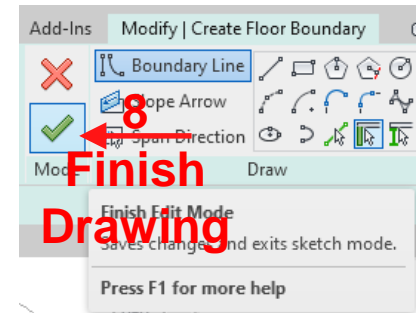
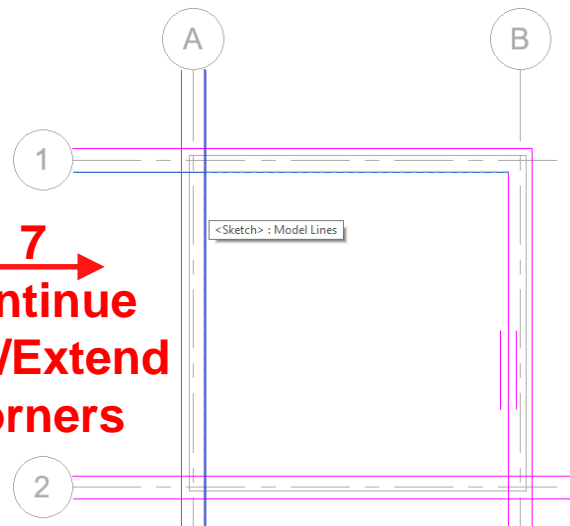


5
Continue
Selecting
Proper
Axes



6
Start
Trim/Extend
Corners

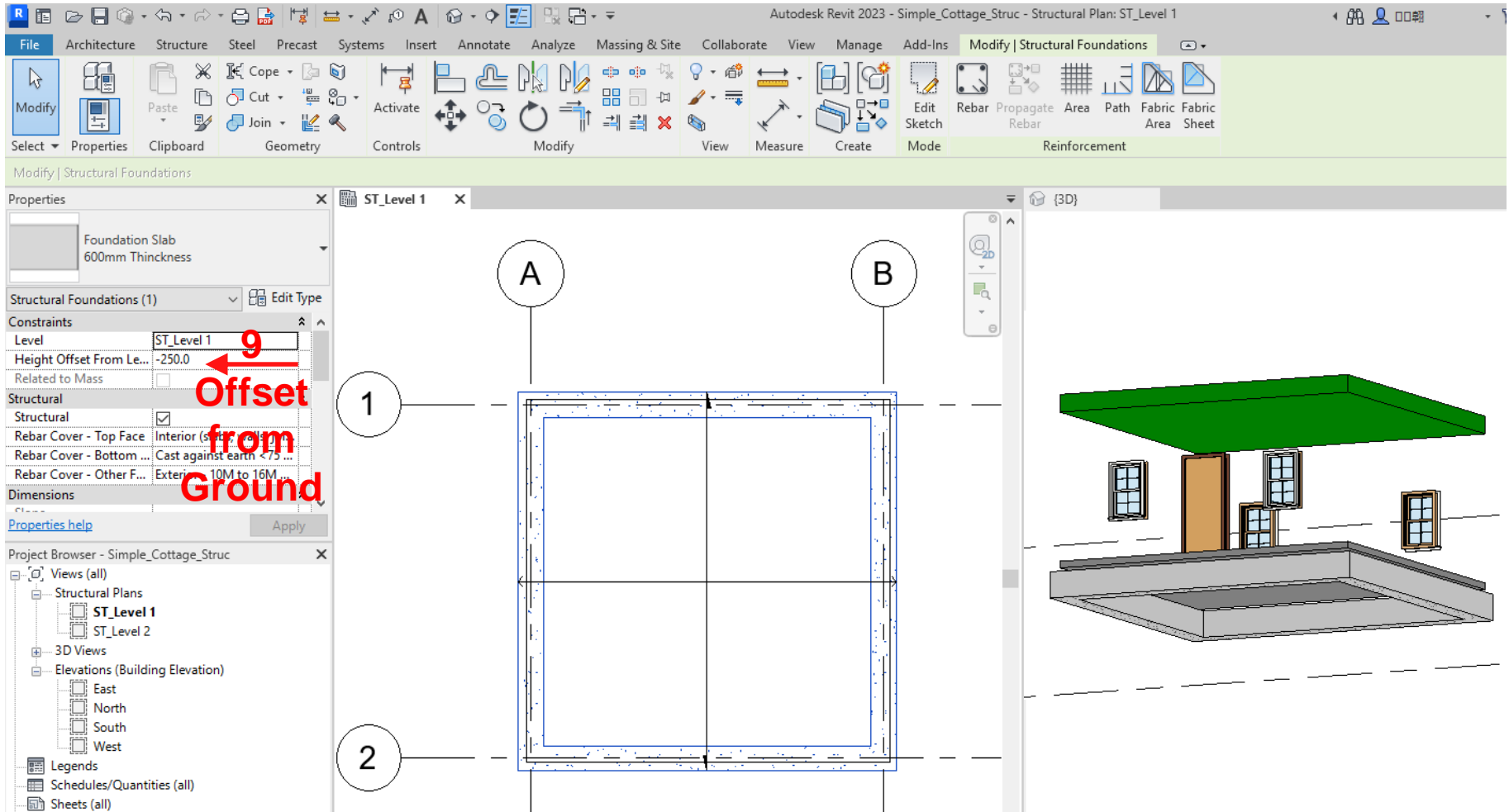
7
Continue
Trim/Extend
Corners



8
Finish
Drawing

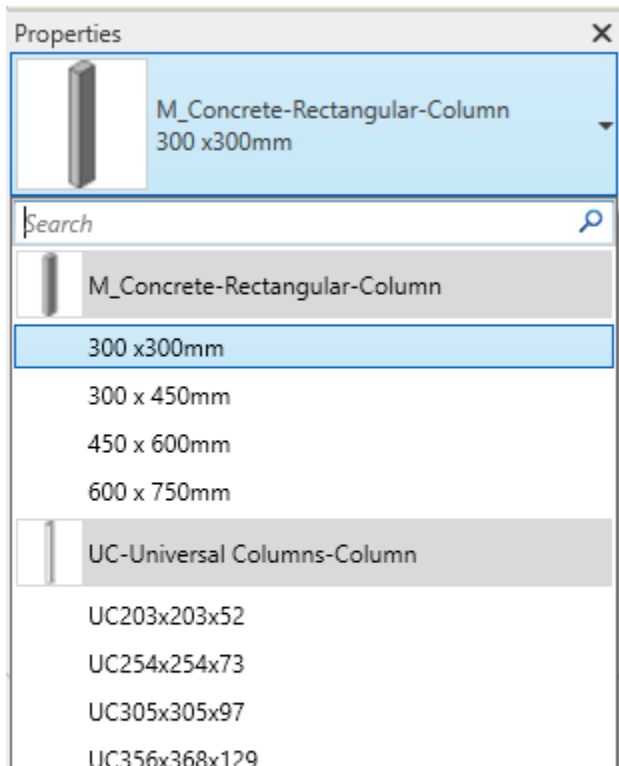
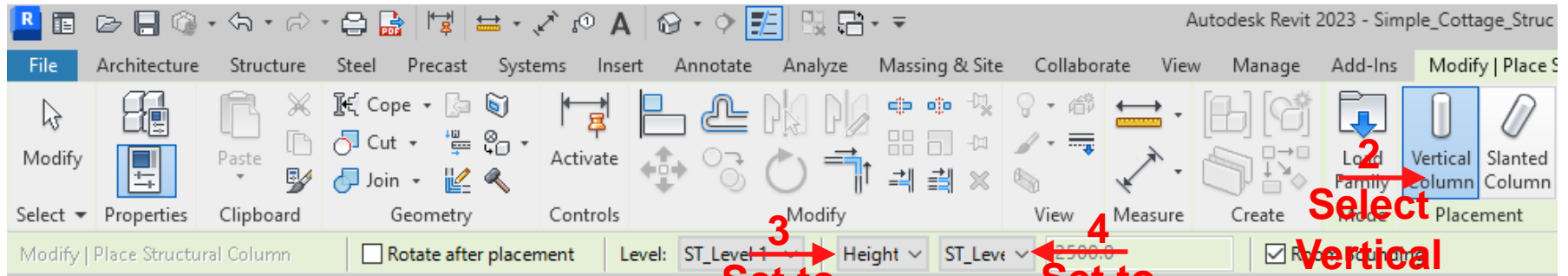
Drawing Foundation

100



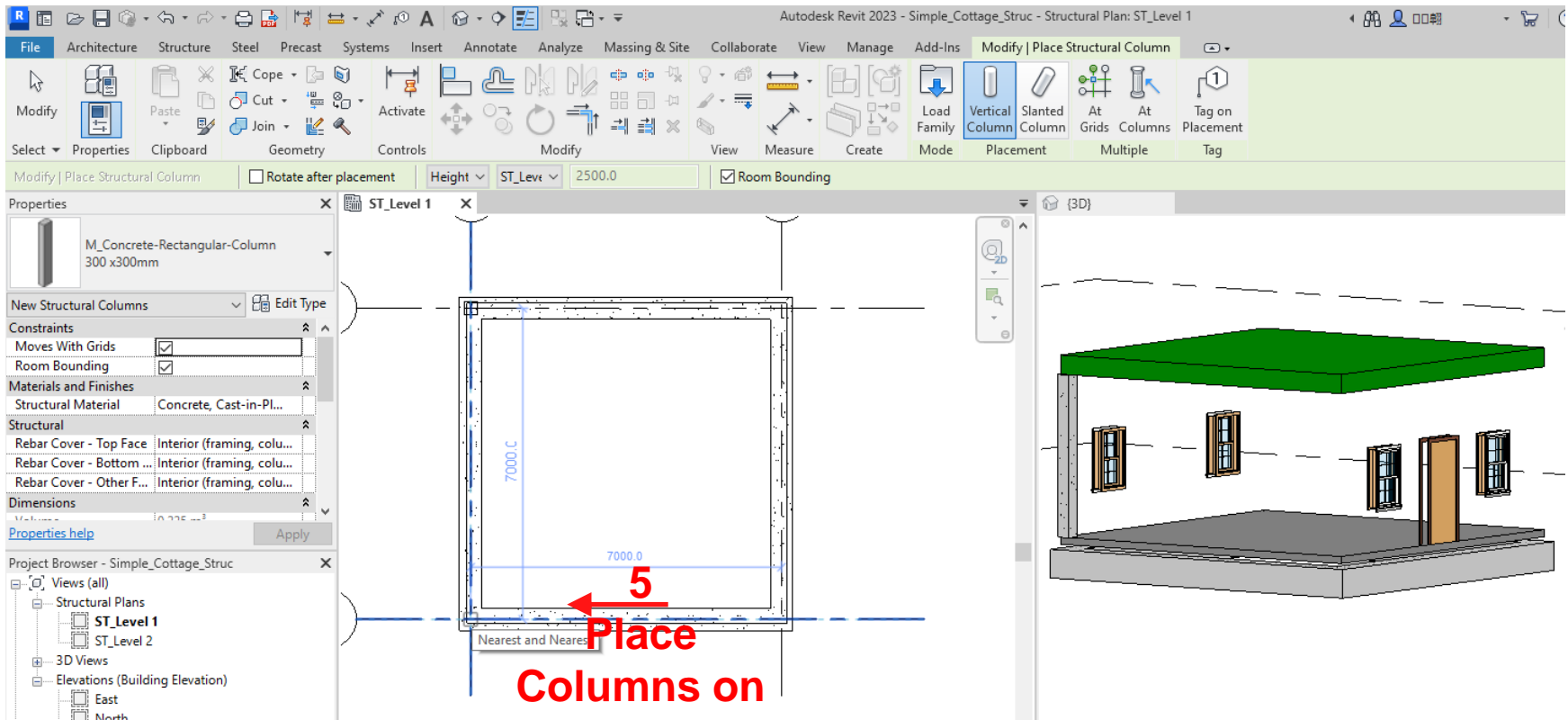
Drawing Columns

101



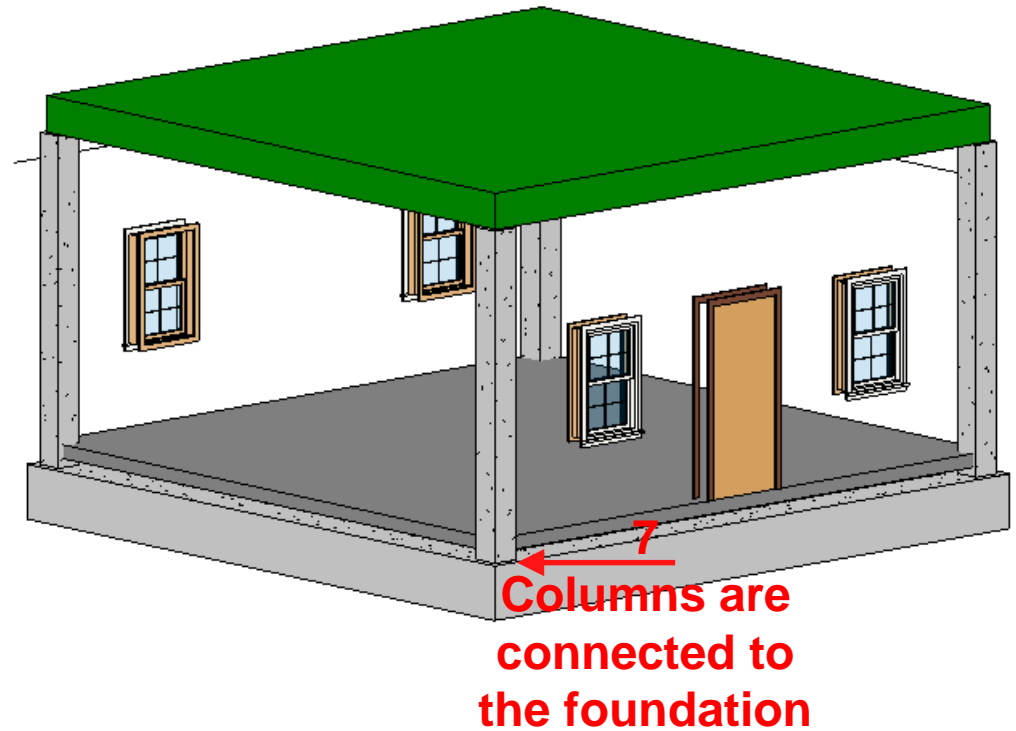
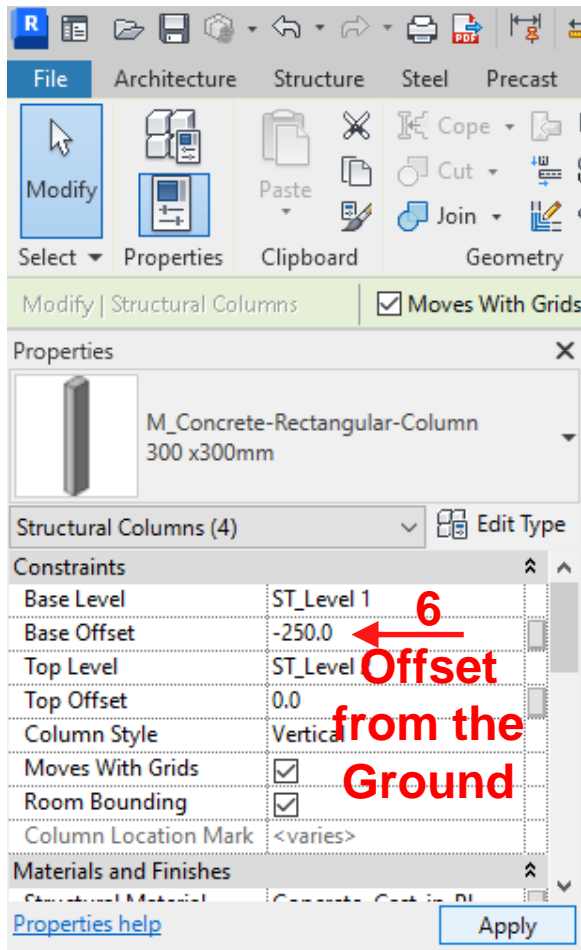
1
Select/define
Proper Spec

Drawing Columns



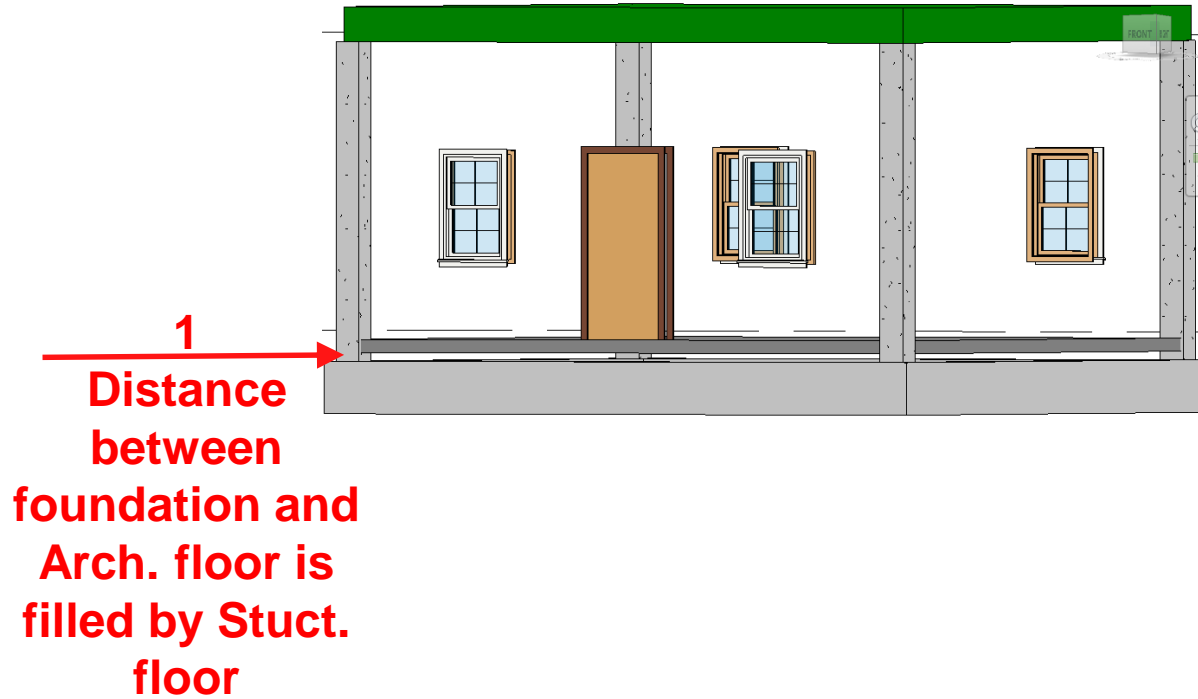
Drawing Columns

103



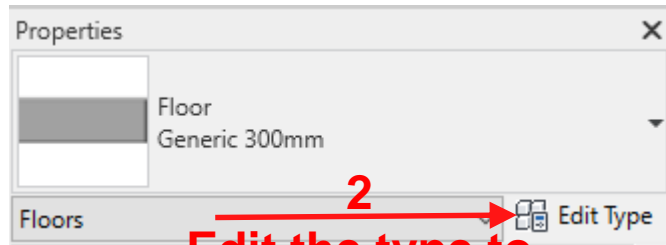
Drawing Floor

104

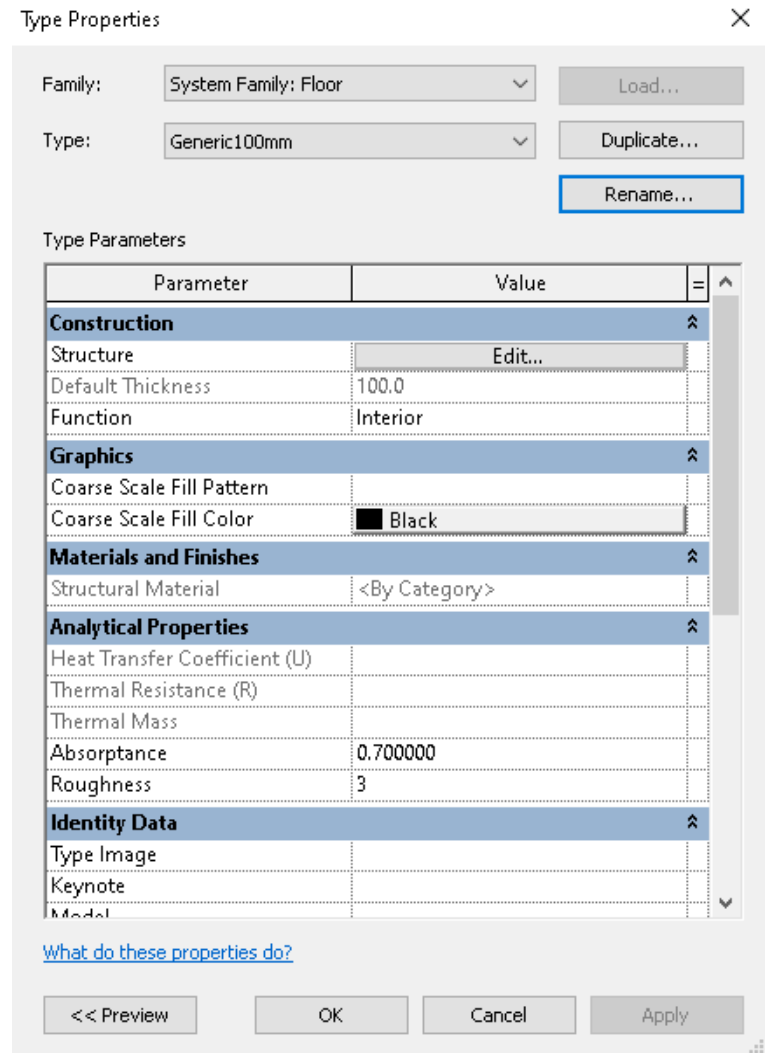


Drawing Floor

105

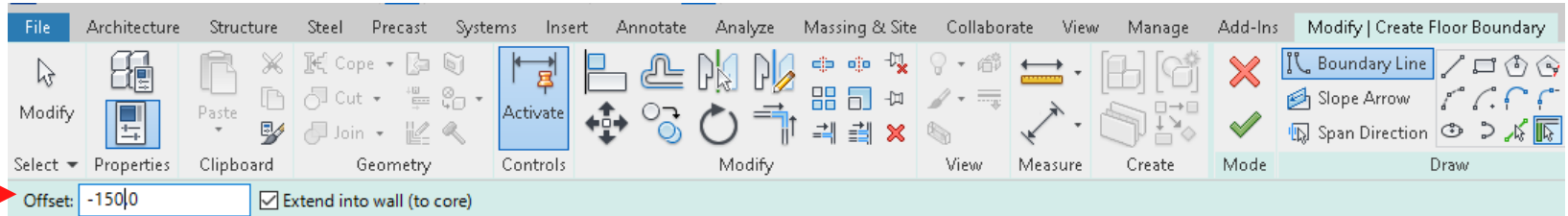


Edit the type to
fit the require
spec.



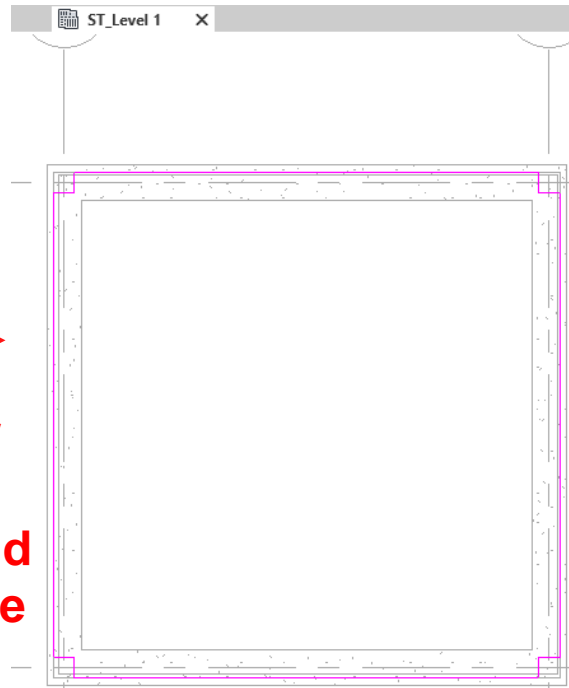
Drawing Floor

106

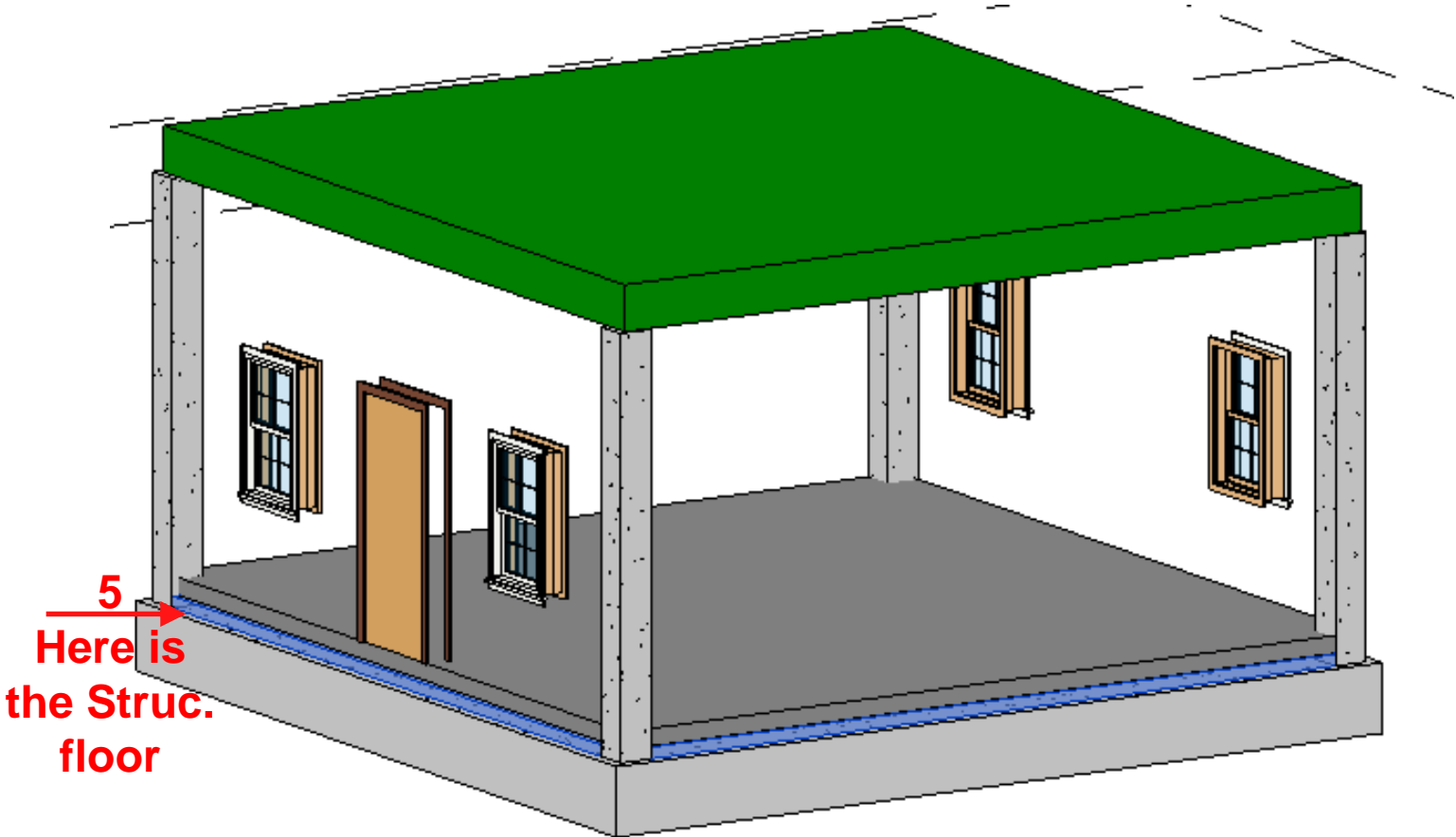


3 →
Set the proper offset just under the Arch. Floor

4 →
Use proper draw tools and push the finish!



Drawing Floor



Drawing Beams

108

Properties

3D View

3D View: {3D}

Graphics

View Scale	1 : 100
Scale Value 1:	100
Detail Level	Medium
Parts Visibility	Show Original
Visibility/Graphics Overri...	Edit...
Graphic Display Options	Edit...
Discipline	Coordination
Show Hidden Lines	By Discipline
Default Analysis Display ...	None

Properties help

Visibility/Graphic Overrides for 3D View: {3D}

Model Categories Annotation Categories Analytical Model Categories Imported Categories Filters Revit Links

Show model categories in this view If a category is unchecked, it will not be visible.

Category name search:

Filter list:

Visibility	Projection/Surface			Cut		Halftone	Detail Level
	Lines	Patterns	Transparency	Lines	Patterns		
<input checked="" type="checkbox"/> Nurse Call Devices						<input type="checkbox"/>	By View
<input type="checkbox"/> Parking						<input type="checkbox"/>	By View
<input type="checkbox"/> Parts						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Pipe Accessories						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Pipe Fittings						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Pipe Insulations						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Pipe Placeholders						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Pipes						<input type="checkbox"/>	By View
<input type="checkbox"/> Planting						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Plumbing Equipment						<input type="checkbox"/>	By View
<input type="checkbox"/> Plumbing Fixtures						<input type="checkbox"/>	By View
<input type="checkbox"/> Railings						<input type="checkbox"/>	By View
<input type="checkbox"/> Ramps						<input type="checkbox"/>	By View
<input type="checkbox"/> Raster Images							By View
<input type="checkbox"/> Roads						<input type="checkbox"/>	By View
<input type="checkbox"/> Roofs	Override...	Override...	Override...	Override...	Override...	<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Security Devices						<input type="checkbox"/>	By View
<input checked="" type="checkbox"/> Shaft Openings						<input type="checkbox"/>	By View

All None Invert Expand All

Categories that are not overridden are drawn according to Object Style settings. Object Styles...

Override Host Layers Cut Line Styles Edit...

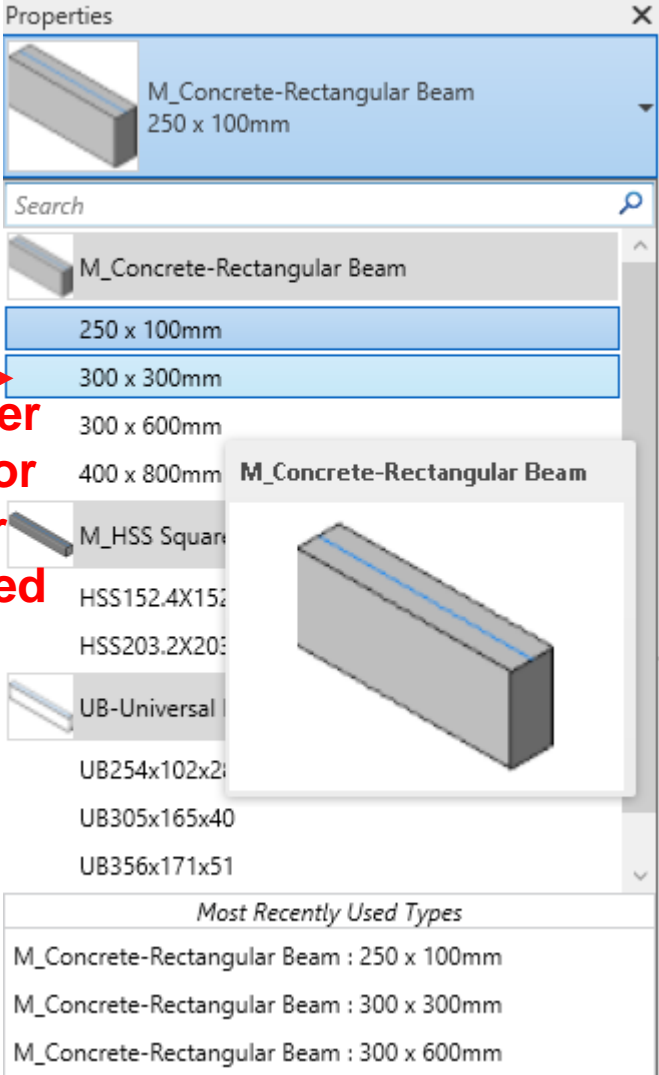
OK Cancel Apply Help

1
Uncheck the Arch. roof for a better visibility

Drawing Beams

109

2 → **Select proper beam type or
Creat your own specified
type**



The screenshot shows a 'Properties' dialog box with a search bar and a list of beam types. The selected item is 'M_Concrete-Rectangular Beam' with dimensions '250 x 100mm'. The list includes:

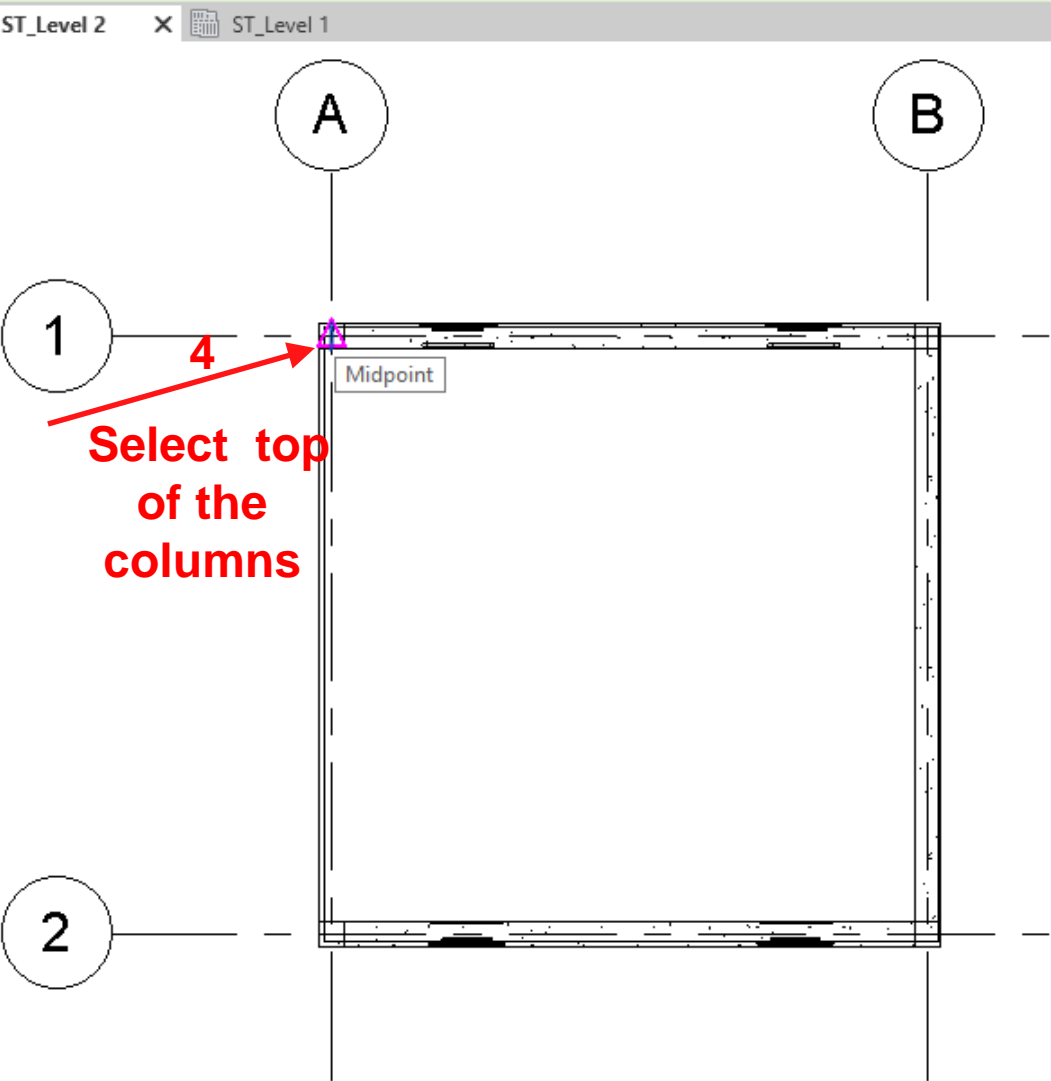
- M_Concrete-Rectangular Beam (250 x 100mm)
- 250 x 100mm
- 300 x 300mm (highlighted)
- 300 x 600mm
- 400 x 800mm
- M_HSS Square (HSS152.4X152, HSS203.2X203)
- UB-Universal (UB254x102x2, UB305x165x40, UB356x171x51)

A preview window shows a 3D model of a rectangular beam. Below the list is a section for 'Most Recently Used Types' with the following entries:

- M_Concrete-Rectangular Beam : 250 x 100mm
- M_Concrete-Rectangular Beam : 300 x 300mm
- M_Concrete-Rectangular Beam : 300 x 600mm

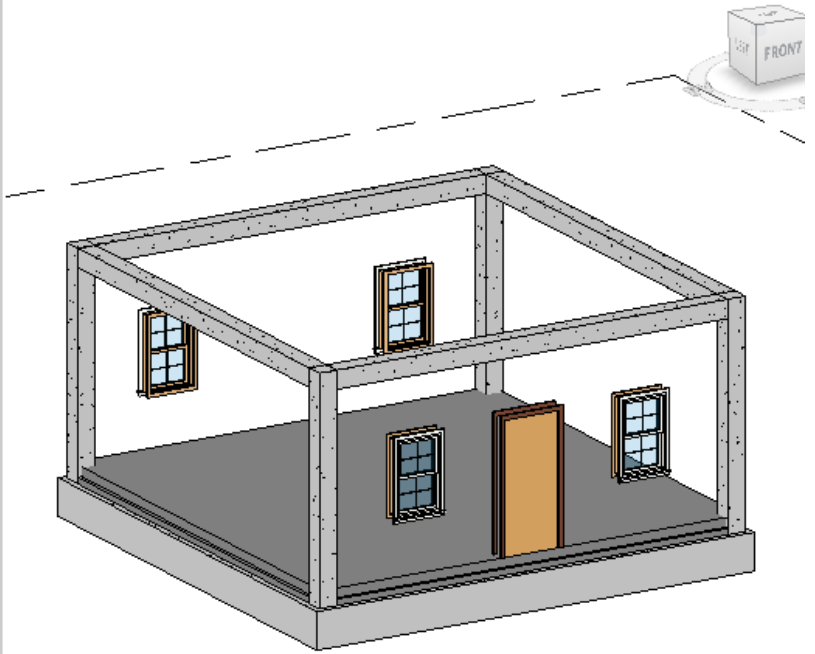
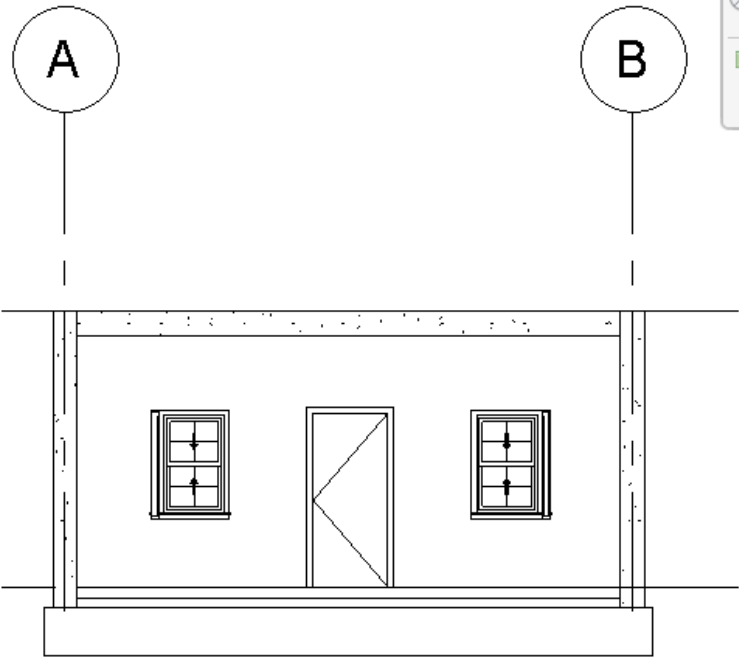
Drawing Beams

3
Go to
the 2nd
level



4
Select top
of the
columns

Drawing Beams



Drawing Beam System

112

1

Make sure proper beam types are on the list of creat your own specified type

Properties

M_Concrete-Rectangular Beam
250 x 100mm

Search

250 x 100mm

300 x 300mm

300 x 600mm

400 x 800mm

M_HSS Square

HSS152.4X152.4X9.5

HSS203.2X203.2X9.5

UB-Universal Beams

UB254x102x28

UB305x165x40

UB356x171x51

UB406x178x60

Most Recently Used Types

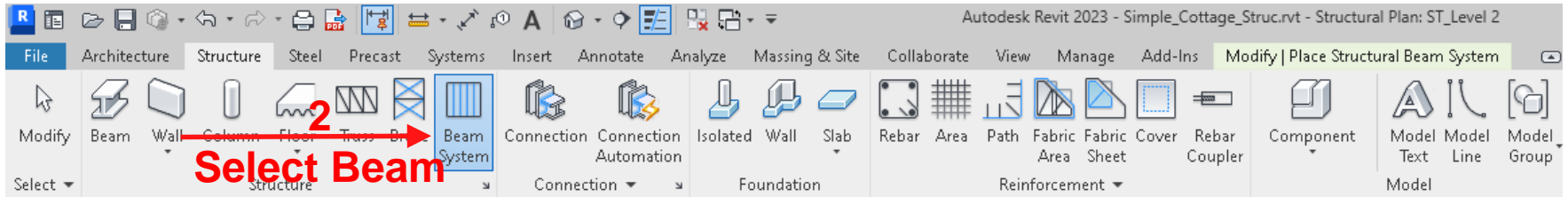
M_Concrete-Rectangular Beam : 250 x 100mm

M_Concrete-Rectangular Beam : 300 x 300mm

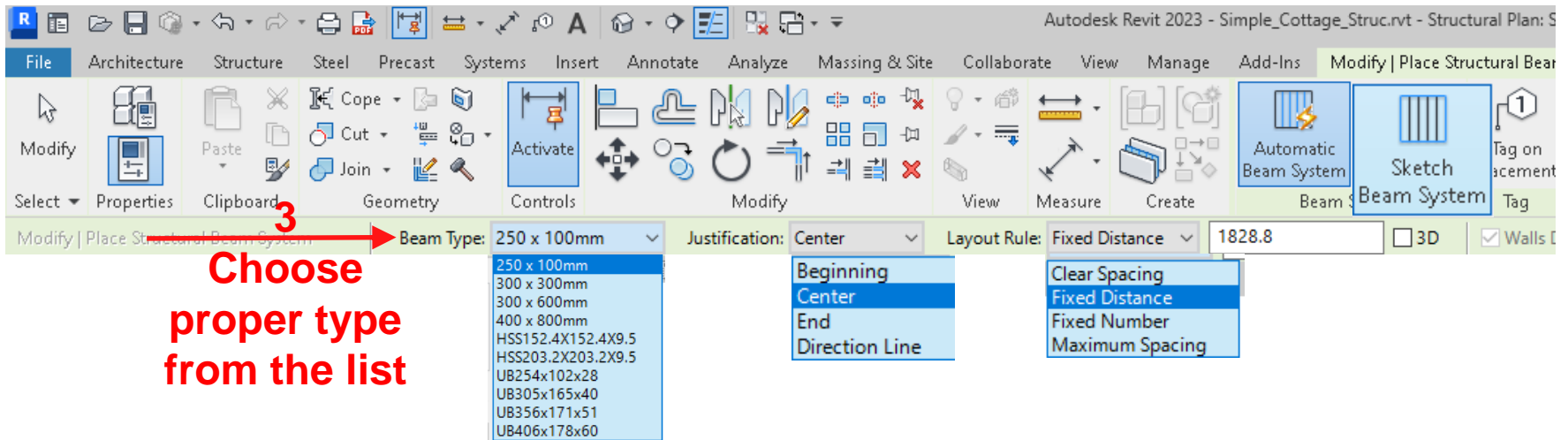
M_Concrete-Rectangular Beam : 300 x 600mm

Drawing Beam System

113



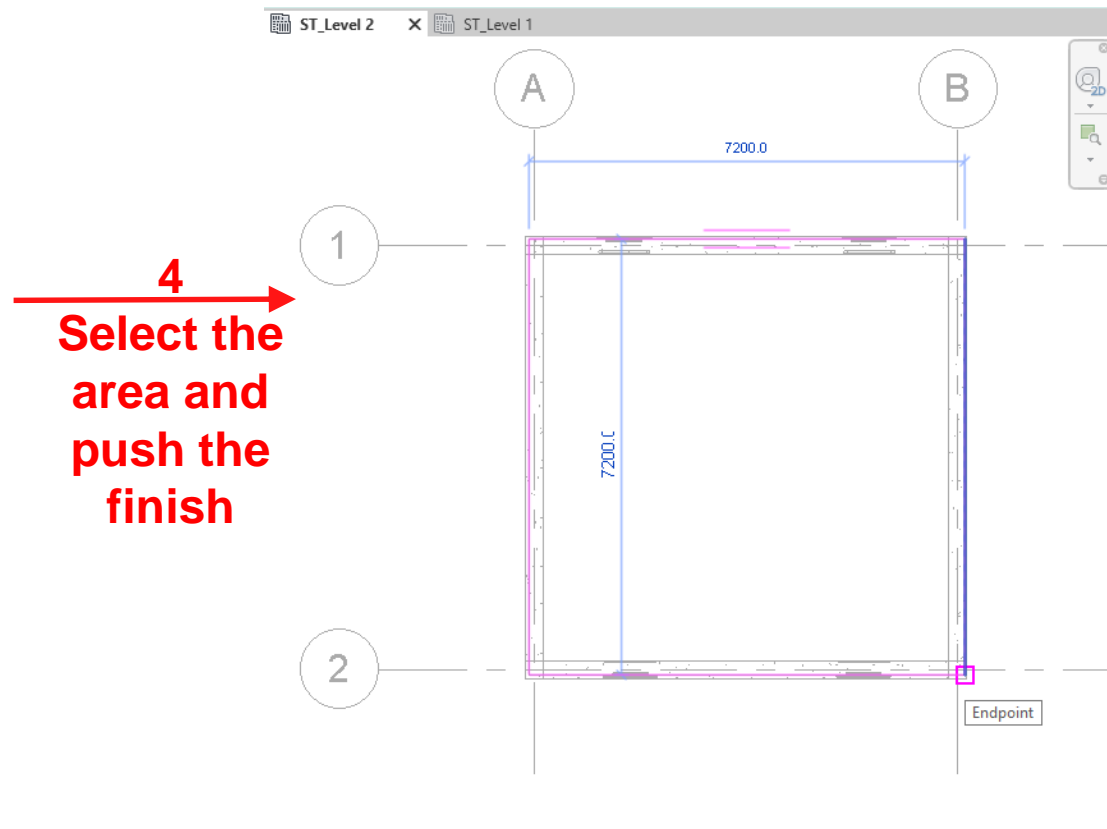
Select Beam System



Choose proper type from the list

Drawing Beam System

114



Drawing Beam System

115

Properties

Structural Beam System
Structural Framing System

Structural Beam Systems (1) Edit Type

Constraints

3D

Elevation from Level 250.0

Work Plane Level: ST_Level 2

Pattern

Layout Rule Fixed Distance

Fixed Spacing 1828.8

Centerline Spacing 1828.8

Justification Center

Beam Type M_Concrete-Rectangular

Identity Data

Properties help Apply

Project Browser - Simple_Cottage_Struct.rvt

Views (all)

- Structural Plans
 - ST_Level 1
 - ST_Level 2
- 3D Views
 - Elevations (Building Elevation)
 - East
 - North
 - South
 - West

A B

250 x 100mm

250 x 100mm

250 x 100mm

(3D)

FRONT

Structural Beam Systems : Structural Beam System :
Structural Framing System

1

2

5

Set proper elevation offset

Drawing Structural Roof

116

Floor
Generic1000mm

Search

- 160mm Concrete With 50mm Metal Deck
- Beam and Block 200mm
- Concrete-Commercial 362mm
- Concrete-Domestic 425mm
- Generic250mm
- Generic1000mm
- Generic 300mm**
- Insitu Concrete 225mm
- Standard Timber-V

Most Re

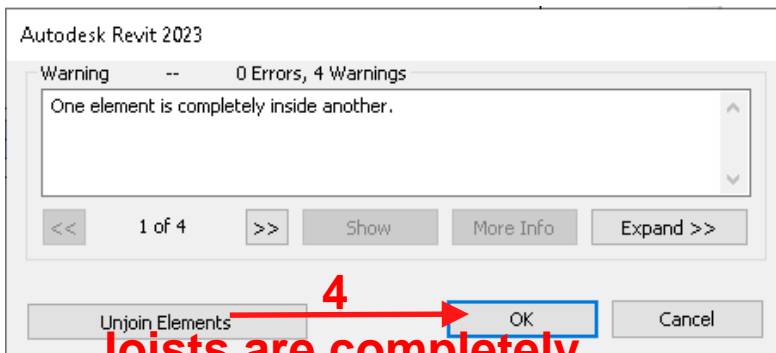
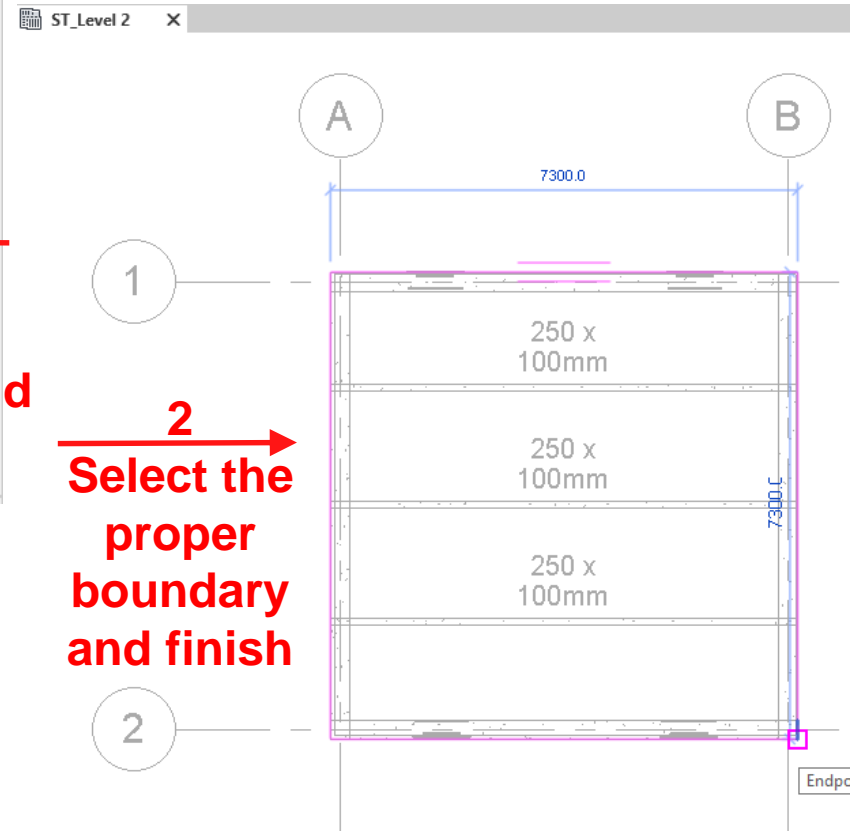
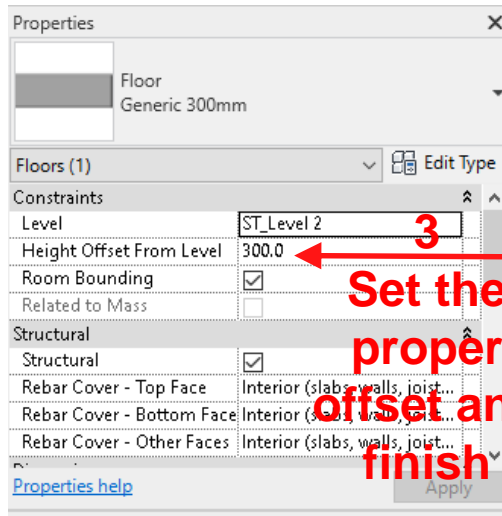
Floor : Generic1000mm

Floor : Generic250mm

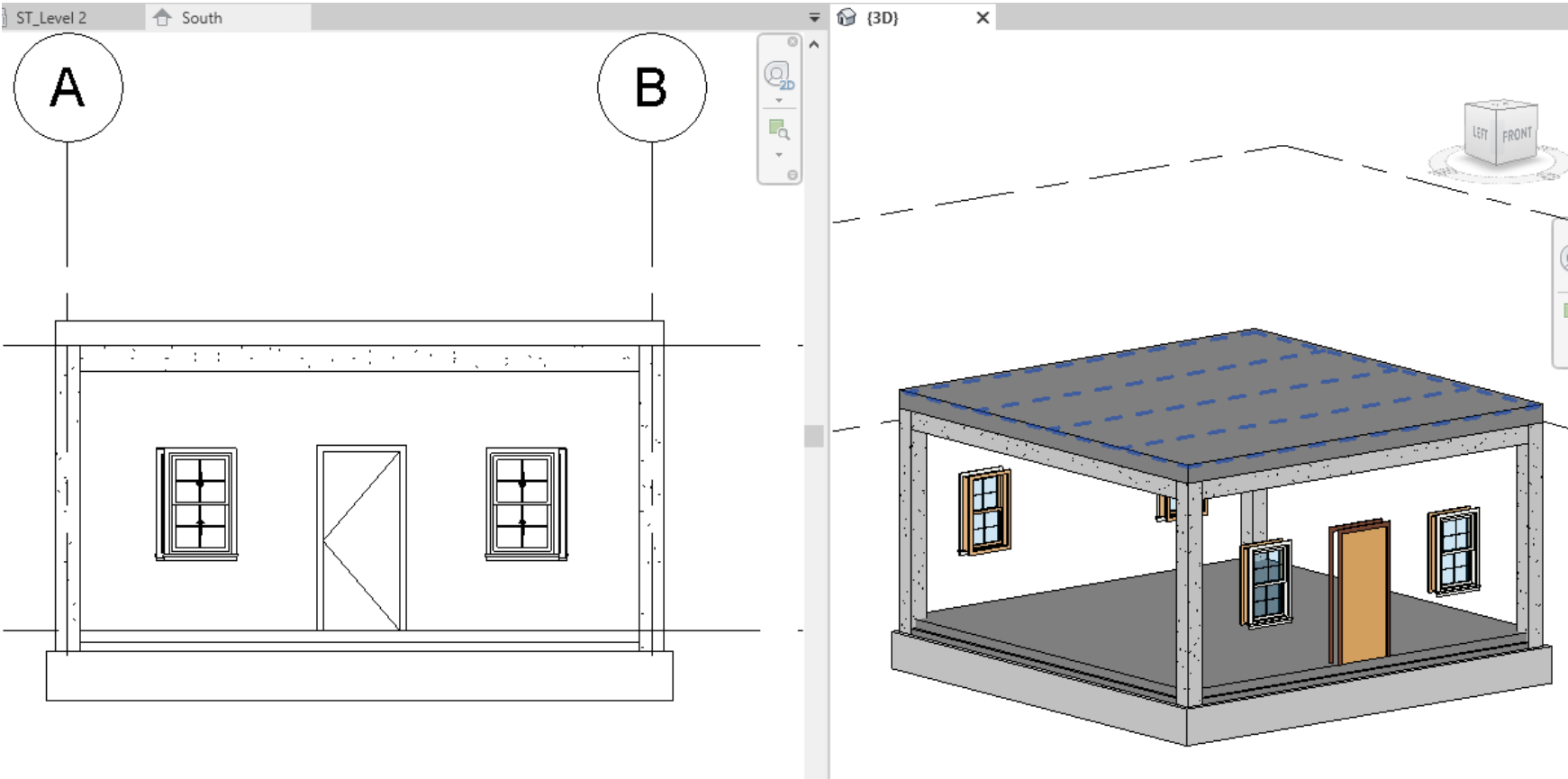
1
Select the proper type

Drawing Structural Ceiling

117



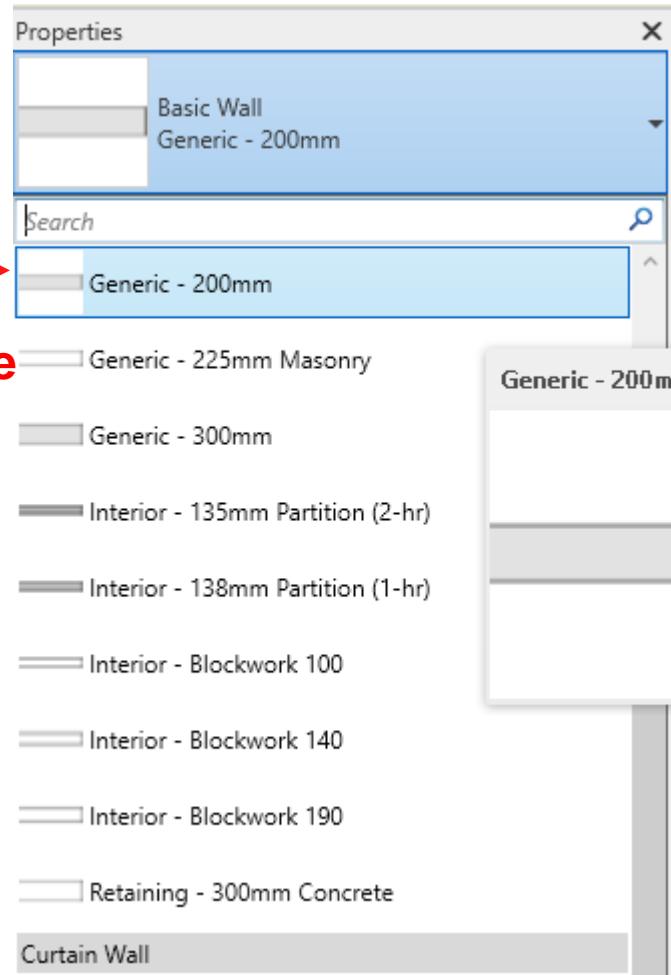
Drawing Structural Ceiling



Drawing Wall

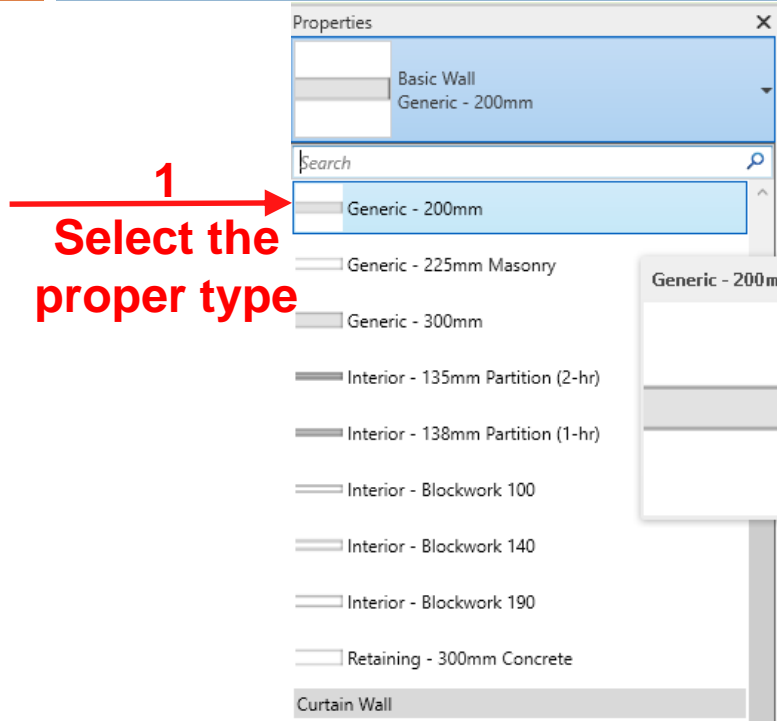
119

1
Select the
proper type

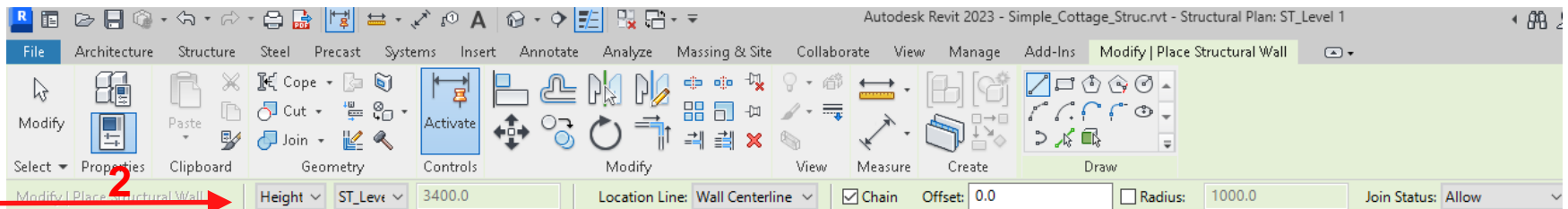


Drawing Wall

120



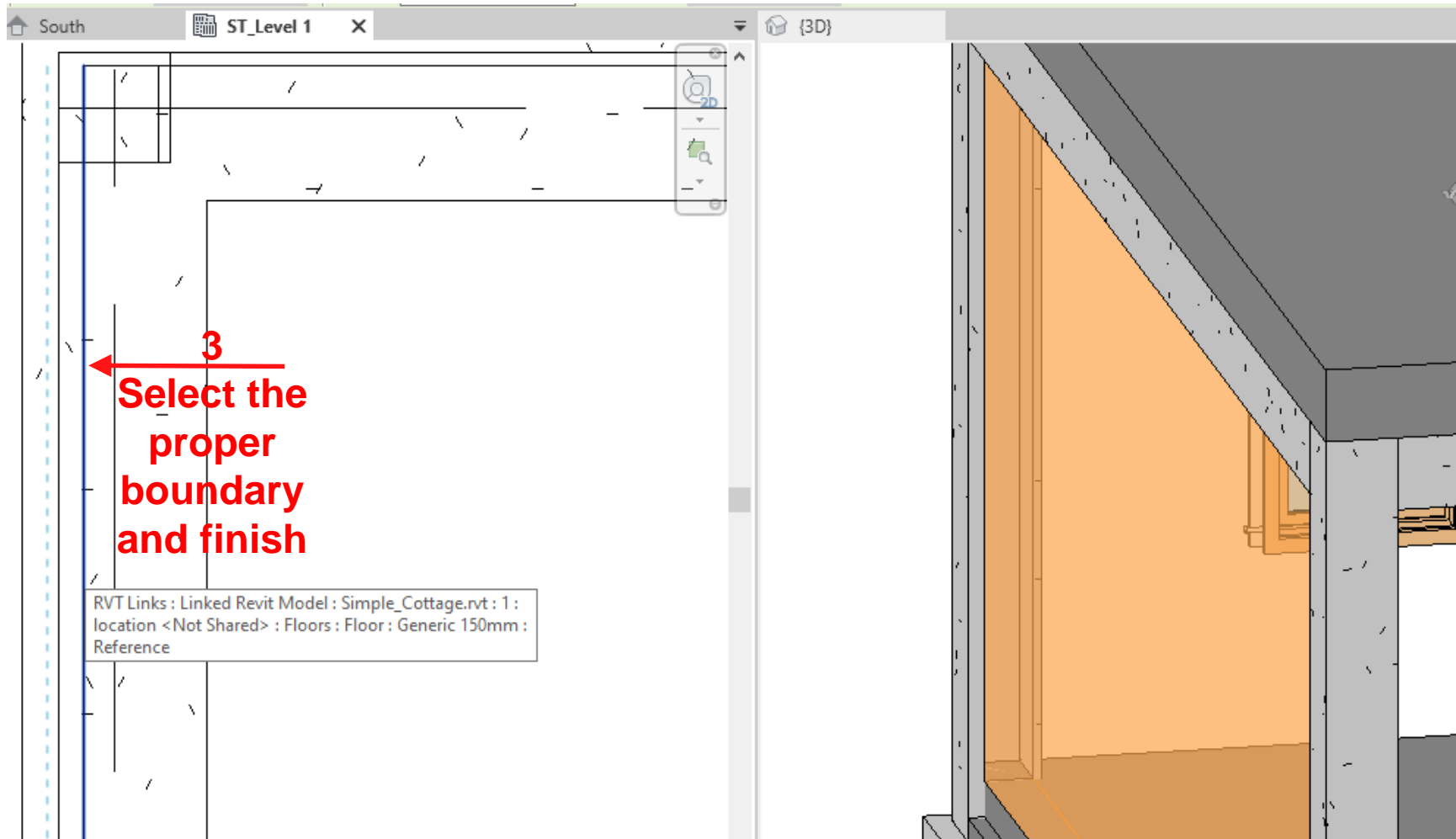
1
Select the proper type



2
Set the properties

Drawing Wall

121





In Class Practice

122

- Why do we have different approaches for modeling architecture, structure and utility systems in Revit?



Home Assignment

123

- Draw the following single story building using architecture and structure disciplines in Revit with the following assumptions:
 - Use strip footing foundation with 50cm x 50cm dimension; The columns are 40cm x 40cm; The max. floor height is 340cm; The beams are 30cm x 40cm; The beam system's columns are 15cm x 30cm with 2m distance; The max. floor height is 340cm; The façade is Travertine stone; Total thickness of the envelope walls is 40cm and for internal walls is 20cm with the core material of concrete blocks; Use reasonable assumptions for the rest!





Thanks