

# Table of Contents

<b>Dedication</b>	iii
<b>Preface</b>	xiii

## Chapter 1: Introduction to Autodesk Revit 2019 for Structure

Introduction to Autodesk Revit for Structure		1-2
Autodesk Revit as a Building Information Modeler		1-2
Basic Concepts and Principles		1-3
Understanding the Parametric Building Modeling Technology		1-4
Terms Used in Autodesk Revit for Structure		1-4
Creating a Structural Model Using Parametric Building Elements		1-6
Visibility/Graphics Overrides, Scale, and Detail Level		1-8
Extracting Project Information		1-8
Creating a Structural Drawing Set		1-8
Creating an Unusual Building Geometry		1-8
Flexibility of Creating Special Elements		1-9
Creating Structural Layouts		1-9
Working on Large Projects		1-9
Working in Large Teams and Coordinating with Consultants		1-9
Starting Autodesk Revit 2019	Enhanced	1-10
User Interface	Enhanced	1-12
Title Bar		1-12
Ribbon		1-12
Application Frame		1-15
Status Bar		1-16
View Control Bar		1-17
Options Bar		1-17
Type Selector		1-17
Drawing Area		1-18
Project Browser		1-18
Keyboard Accelerators		1-18
Properties Palette		1-19
Dialog Boxes		1-19
Multiple Document Environment		1-20
Interoperability of Autodesk Revit		1-21
Building Information Modeling and Autodesk Revit 2019		1-21
Worksharing Using Revit Server		1-22

Linking Analytical Model for Analysis	1-23
Autodesk Revit Help	1-24
Using the Revit 2019 Help	1-24
Self-Evaluation Test	1-25

## Chapter 2: Getting Started with a Structural Project

Introduction		2-2
Starting a New Structural Project		2-2
Setting Project Units		2-3
Common Unit Type		2-4
Structural Unit Type		2-7
Structural Settings		2-9
Symbolic Representation Settings Tab		2-10
Connection Settings		2-15
Snaps Tool		2-17
Dimension Snaps Area		2-18
Object Snaps Area		2-18
Temporary Overrides Area		2-19
Options Dialog Box	Enhanced	2-19
General Tab		2-19
User Interface Tab		2-21
Graphics Tab	Enhanced	2-22
Hardware Tab	New	2-22
File Locations Tab		2-23
Rendering Tab		2-24
Check Spelling Tab		2-24
SteeringWheels Tab		2-25
ViewCube Tab		2-27
Macros Tab		2-28
Saving a Project		2-29
Using the Save As Tool		2-30
Using the Save Tool		2-31
Closing a Structural Project		2-32
Exiting a Structural Project		2-32
Opening an Existing Structural Project		2-32
Opening an Existing Project Using the Open Tool		2-32
Using the Windows Explorer to Open an Existing Project		2-34
Tutorial 1		2-35
Tutorial 2		2-39
Self-Evaluation Test		2-42
Review Questions		2-43
Exercise 1		2-44
Exercise 2		2-44

### Chapter 3: Setting up a Structural Project

Project Template	3-2
Creating a Custom Project Template	3-2
Settings for the Project Template	3-4
Using Levels	3-13
Understanding Controls in a Level	3-13
Adding Levels	3-14
Instance and Type Properties of a Level	3-17
Changing the Level Parameters	3-19
Controlling the Visibility of Levels	3-21
Grids	3-21
Creating Grids	3-22
Creating Multi-Segmented Grids	3-27
Modifying Grids	3-28
Customizing the Grid Display	3-28
Controlling the Visibility of Grids	3-29
Working with Reference Planes	3-29
Working with Work Planes	3-30
Setting a Work Plane	3-30
Controlling the Visibility of Work Planes	3-31
Using the Workplane Viewer Window	3-31
Working with Project Views	3-31
Viewing a Building Model	3-31
Controlling the Visibility of Elements in Views	3-32
Scope Box	3-32
Creating a Scope Box	3-32
Applying a Scope Box to Datum Elements	3-33
Controlling the Visibility of a Scope Box	3-33
Tutorial 1	3-34
Tutorial 2	3-46
Self-Evaluation Test	3-58
Review Questions	3-59
Exercise 1	3-59
Exercise 2	3-61
Exercise 3	3-62

### Chapter 4: Structural Columns and Walls

Structural Columns	4-2
Types of Structural Column	4-2
Loading Structural Column Families	4-3
Adding Structural Columns to a Project	4-4
Creating Openings in Structural Columns	4-10
Modifying the Element Properties of Structural Columns	4-12
Architectural Columns	4-19
Adding Structural Column to an Architectural Column	4-20
Difference between a Structural Column and an Architectural Column	4-21

Structural Walls	4-21
Adding Structural Walls	4-21
Modifying Structural Walls	4-34
Tutorial 1	4-35
Tutorial 2	4-44
Self-Evaluation Test	4-48
Review Questions	4-49
Exercise 1	4-50
Exercise 2	4-51
Exercise 3	4-52

## Chapter 5: Foundations, Beams, Floors, and Open Web Joists

Foundations	5-2
Foundation Wall	5-2
Shallow Foundations	5-4
Structural Floors	5-22
Adding Structural Floors	5-22
Modifying Structural Floors	5-26
Adding Openings to a Structural Floor	5-27
Adding a Slab Edge to a Structural Floor	5-28
Beams	5-28
Adding Beams	5-29
Modifying Beams	5-31
Adding a Structural Beam System	5-31
Open Web Steel Joists	5-33
Adding K Series Joist System	5-34
Tutorial 1	5-35
Tutorial 2	5-48
Self-Evaluation Test	5-56
Review Questions	5-57
Exercise 1	5-57
Exercise 2	5-59
Exercise 3	5-60

## Chapter 6: Editing Tools

Selecting Elements	6-2
Selecting a Single Element	6-2
Selecting Multiple Elements	6-3
Selecting Elements Using the Advanced Selection Tools	6-5
Restoring a Selection	6-6
Selecting Elements Using the Filter Tool	6-6
The Filter Icon	6-8
Moving Structural Elements	6-8
Moving Elements by Changing Temporary Dimensions	6-8
Moving Elements By Dragging	6-8

Dragging End-joined Components		6-9
Moving Elements Using the Move Tool		6-10
Copying Structural Elements		6-11
Copying Elements Using the CTRL Key		6-11
Copying Elements Using the Copy Tool		6-12
Using the Create Similar Tool		6-13
Copying Elements Using the Clipboard		6-14
Rotating Structural Elements		6-17
Mirroring Structural Elements		6-18
Mirror - Pick Axis Tool		6-19
Mirror - Draw Axis Tool		6-19
Arraying Structural Elements		6-20
Linear Tool		6-20
Radial Tool		6-22
Resizing Elements		6-24
Pinning Elements		6-25
Aligning Elements		6-26
Steel Element Cutting Tools	New	6-27
Corner Cut		6-27
Cope Skew		6-28
Shorten		6-29
Contour Cut		6-29
Structural Steel Connections	New	6-29
Cope		6-29
Miter		6-30
Saw Cut - Flange		6-31
Saw Cut - Web		6-31
Cut Through		6-31
Cut By		6-31
Matching Type Properties		6-32
Trimming and Extending Elements		6-32
Trim/Extend to Corner Tool		6-33
Trim/Extend Single Element Tool		6-34
Trim/Extend Multiple Elements Tool		6-34
Offsetting Elements		6-35
Deleting Elements		6-37
Grouping Elements		6-37
Creating Groups by Selecting Elements		6-38
Creating Groups Using the Group Editor		6-38
Creating a Detail Group		6-38
Placing Groups		6-39
Modifying Groups		6-39
Excluding Elements from a Group		6-39
Saving and Loading Groups		6-40
Editing Elements		6-40
Applying and Removing Coping		6-40
Joining and Unjoining Elements		6-41
Splitting Face		6-42

Tutorial 1	6-44
Tutorial 2	6-49
Self-Evaluation Test	6-56
Review Questions	6-57
Exercise 1	6-58
Exercise 2	6-59
Exercise 3	6-60

## Chapter 7: Documenting Models and Creating Families

Introduction	7-2
Dimensioning	7-2
Types of Dimension	7-2
Using Temporary Dimensions	7-3
Entities in a Dimension	7-4
Adding Permanent Dimensions	7-6
Modifying Dimension Parameters	7-13
Locking Permanent Dimensions	7-14
Converting Temporary Dimensions into Permanent Dimensions	7-14
Text Notes	7-15
Adding Text Notes	7-15
Editing Text Notes	7-18
Adding Tags	7-19
Tagging Elements by Category	7-20
Tagging all Elements in a View	7-22
Beam Annotations	7-24
Creating Families	7-29
Creating In-Place Families	7-30
Creating a Family Geometry in the Family Editor	7-31
Editing a Family Geometry in the Family Editor	7-38
Creating Cuts in a Family Geometry by Using the Family Editor	7-39
Tutorial 1	7-40
Tutorial 2	7-47
Tutorial 3	7-52
Tutorial 4	7-64
Self-Evaluation Test	7-73
Review Questions	7-73
Exercise 1	7-74
Exercise 2	7-75

## Chapter 8: Standard Views, Details, and Schedules

Elevation Views	8-2
Creating a Building Elevation View	8-2
Creating a Framing Elevation View	8-5
Section Views	8-6
Creating a Section View	8-7
Callout Views	8-10

Creating a Callout using Rectangular Tool	8-10
Creating a Callout using the Sketch Tool	8-11
Displaying a Callout View	8-11
Modifying the Properties of a Callout View	8-11
Creating Details in a Callout View	8-12
Drafting Details	8-13
Creating a Drafting View	8-13
Drafting a Detail	8-13
Duplicate Views	8-14
Creating a Duplicate View as a Dependent View	8-14
Graphical Column Schedules	8-15
Creating Graphical Column Schedule	8-15
Using Schedules in a Project	8-16
Generating a Schedule	8-16
Editing a Schedule	8-20
Generating the Material Takeoff Schedule	8-20
Tutorial 1	8-21
Tutorial 2	8-31
Self-Evaluation Test	8-38
Review Questions	8-38
Exercise 1	8-39
Exercise 2	8-39

## **Chapter 9: 3D Views, Sheets, Analysis, and Reinforcements**

Introduction	9-2
Three-Dimensional (3D) Views	9-2
Creating Orthographic 3D Views	9-2
Creating Perspective Views	9-3
Creating 3D Section Views	9-5
Generating Shadows	9-7
Solar Study	9-8
Sheets	9-11
Adding a Drawing Sheet to a Project	9-11
Adding Views to a Drawing Sheet	9-12
Modifying a Building Model in Sheets	9-15
Adding Schedules to a Drawing Sheet	9-16
Analytical Models	9-16
Instance Parameters for an Analytical Model	9-18
Settings for an Analytical Model	9-22
Applying Loads in Analytical Model	9-25
Setting Boundary Conditions	9-32
Analytical Model Tools	9-36
Adding Reinforcements	9-40
Place Rebar Parallel to Work Plane Tool	9-40
Place Rebar Perpendicular to Cover Tool	9-42
Cover Tool	9-42
Area Tool	9-43

Path Tool	9-43
Fabric Area Tool	9-44
Fabric Sheet Tool	9-44
Rebar Coupler	9-44
Linking Building Models and Sharing Coordinates	9-45
Linking or Importing Models	9-46
Introduction to Massing	9-47
Understanding Massing Concepts	9-47
Creating the Massing Geometry	9-48
Tutorial 1	9-50
Tutorial 2	9-58
Tutorial 3	9-64
Self-Evaluation Test	9-71
Review Questions	9-72
Exercise 1	9-73
Exercise 2	9-73

## Chapter 10: Linking Revit Model with Robot Structural Analysis

Installing Robot Structural Analysis Professional 2019	10-2
Structural Analysis Interoperability	10-2
Linking the Analytical Model for Analysis and Code Check	10-2
Structural Analysis in Autodesk Robot Structural Analysis Professional 2019	10-5
Linking Revit Files to Robot	10-6
Setting Job Preferences in Robot	10-6
Analysis in Robot	10-7
Viewing Results in Robot	10-11
Updating the Model in Revit	10-12
Tutorial 1	10-13
Self-Evaluation Test	10-22
Review Questions	10-23
Exercise 1	10-24
<b>Student Project</b>	<b>SP-1</b>
<b>Index</b>	<b>I-1</b>