INTRODUCTION

Contained in this appendix are some additional exercises that you can perform to gain more practice with tools and techniques covered in the book. With the exception of the existing conditions of the residential project, most of the attention in Chapters 4 through 10 was paid to the exterior of the buildings. The residential dataset provided in Chapter 6 and all subsequent chapters includes the existing conditions for the Second Floor. The commercial dataset for Chapter 11 includes interior partitions and other refinements not detailed in the tutorials. This appendix addresses these gaps by providing the minimal guidance required to assist you in creating the elements provided at the start of these chapters’ datasets. Some other suggested exercises are also included to help round out the projects with some finishing touches.

OBJECTIVES

The exercises presented in this appendix are intended for additional practice and are meant to be self-directed. As such, you’re given the overall goal of the exercise, the critical dimensions and some guidelines and tips to assist you. The exercises are optional and if you prefer you can skip them. The exercises are intended to be completed following each chapter listed in the headings below. After completing this appendix you will have:

- Gained additional experience with wall layout
- Added windows, doors, and other embellishments to the residential dataset
- Modified the toposurface in the commercial project to add roads
- Completed the third floor tenant build-out on the commercial project
- Added plumbing fixtures to both projects
- Practiced several other skills covered throughout the book

RESIDENTIAL PROJECT

The residential project requires refinements on all three levels (Basement, First, and Second). You can begin completing these exercises following Chapter 4.

CHAPTER 4—EXISTING CONDITIONS, SECOND FLOOR

Following the same procedures and techniques outlined in Chapter 4, create the existing conditions for the second floor of the residential project. You can use any of the techniques covered, including drawing walls, create similar, offset, copy, trim, split, and the use of temporary dimensions. Use Figure A.1 as a guide.
1. From the Chapter04\Complete folder, open 04 Residential_Complete.rvt [04 Residential_M_Complete.rvt].

2. Save a copy to the Appendix A folder.

Work on Level 2 of the project.

- Use the same wall, door, and window types as used on the first floor.
- Use the procedures covered in Chapter 4 to import appropriate plumbing fixtures.

**FIGURE A.1** Layout the Second Floor existing conditions of the residential project

**CHAPTER 11—NEW CONSTRUCTION**

Chapter 11 starts with all of the new construction interior walls, doors, and windows complete for the residential project. If you wish to build these items yourself, complete these exercises.

1. From the Chapter09\Complete folder, open 09 Residential_Complete.rvt [09 Residential_M_Complete.rvt].

2. Save a copy to the Appendix A folder.

**BASEMENT PLAN**

Start in the North elevation view.

1. Add a new level without floor plans at: -1' 1 3/4" [-319]. Name it: Top of Foundation.
Open the *First Floor* plan view.

2. Select the three walls of the addition, edit the properties and change the Base Constraint to: **Top of Foundation**.

3. In the *West* and *North* elevation views, edit the profile of the brick walls and remove the step from the bottom. Do not remove the edit at the top.

4. Delete the footings (see Figure A.2).

5. Copy and paste aligned the same three walls to the *Basement* plan. Ignore any warnings.

6. Select the walls on the west and the north one at a time and click the Reset Profile button on the ribbon.

7. Select all three Walls, edit their properties and change the type to: **Foundation - 12" Concrete [Retaining - 300mm Concrete]**.

   - Set the Base Offset to: **-4" [-100]**, and the Top Constraint to: **Up to level: Top of Foundation**.

8. Offset a copy of the west wall inside the plan. Trim and or split the walls as required and use the handles to stretch the two west walls to match the dimensions in the figure (see Figure A.3).

9. Add a monolithic stair from the Basement level to the height of the terrain at the rear of the house. (Refer to Chapter 8 for information on creating stairs.) Cut a section to assist in placement and sizing.
Add new footings to the walls as shown. The “Add Continuous Footings” topic of Chapter 6 discusses adding wall foundations and making them display in dashed line.

**FIRST FLOOR PLAN**

Open the First Floor plan view.

1. Create a new wall type. You can start with the: Interior - 4 7/8" Partition (1-hr) [Interior - 138mm Partition (1-hr)] and duplicate it.

   - Set the Core to: 3 1/2" [90] and choose wood or metal stud material.
   - Edit the finish layers so that there is one: 5/8" [16] thick Gypsum Wall Board layer on each side.

2. Draw the Walls in the center of the plan using the new type as shown.

3. Add windows and doors as shown. Assume that all inserts are centered unless dimensioned otherwise.

   - Load the bay window from Autodesk Seek.

4. Use the Demolish tool on the two windows between the addition and the existing house (see Figure A.4).
SECOND FLOOR PLAN

Demolition needs to take place in the bathrooms between the existing house and the new addition. However, the challenge is that currently, this is one continuous wall from ground to roof. To demolish just the portion on the second floor, we need to copy and paste the wall like we did for the basement, adjust the height parameters, and then demolish the portion we don’t need.

Stay on the First Floor plan view.

1. Copy and paste aligned (to the same place) the wall between new and existing. Ignore the warning.

2. With the wall still selected, edit the properties and change the Base Constraint to: Second Floor.

   When the Warning appears, click the Delete Instances button.

The warning is about the doors and windows on the lower portion of the wall. When you copy and paste a wall, it also copies the inserts. The inserts on the lower portion of this copied wall no longer have a host when you make this change. It is OK to delete them because we still have the original inserted in the original wall.

3. Click in empty space to deselect, and then click to select the wall again. (This is the original wall).

   When its properties and change the Top Constraint to: Up to level: Second Floor.

4. Open the Transverse section, select the same wall. Notice that it still appears to go to the roof.

   On the ribbon, click the Detach button. Select the existing roof to detach the wall from the underside of the roof.

   In the error, click Delete Instance(s) again. These are the duplicate inserts on the second floor this time.

When the process is done, you should have two walls stacked on top of each other and the doors and windows on both first and second floors should still be intact (see Figure A.5).
5. Open the Second Floor plan view.

6. Split the walls between the new addition and existing house.

Demolish the left side of the wall and demolish the remaining window in the wall as well.

7. Draw a new wall using the custom type build for the first floor between the two bathrooms.

Add a wall between the bathroom and new bedroom. Add a closet to the new bedroom.

8. Add doors and windows as shown. Choose shorter height windows for the bathrooms and set their sill heights at: 3'-8" [1100].

Assume that all windows and doors are centered unless noted otherwise (see Figure A.6).

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Feel free to add additional embellishments, such as upgraded fixtures in the bath rooms and counters, cabinets, and appliances in the kitchen. You can find such items in the out-of-the-box library and on Autodesk Seek.

9. Save and close the project.

CHAPTER 13—RESIDENTIAL SCHEDULES

Chapter 13 explores schedules and tagging in the commercial project. If you wish, you can follow many of the techniques covered in Chapter 13 in the residential project as well.

1. From the Chapter12\Complete folder, open: 12 Residential_Complete.rvt [12 Residential_M_Complete.rvt].

2. Save a copy to the Appendix A folder.

3. Add various schedules to the residential project.

4. Add rooms to the residential project.

5. Add room tags.

6. Add a schedule sheet.

COMMERCIAL PROJECT

The Commercial project requires some refinements to the site file created in Chapter 7 and interior wall layout on the first and third floors. The core walls can be added for all floors, a double-volume space for the lobby of the building at levels 1 and 2 and we also have the opportunity to add wall tags to the walls on the third floor following the exercises in Chapter 14 where the wall heights and their relationships to the ceilings were adjusted.

CHAPTER 7—SITE MODEL REFINEMENTS

The Commercial Site project built in Chapter 7 made a single Toposurface. The under lying CAD file however defines roads parking lots and grass areas. The material applied to a toposurface by default is earth. To make the toposurface appear more realistic in shaded and rendered views, we can split the surface and apply materials to it.


2. Save a copy to the Appendix A folder.

Start in the Site floor plan view.

3. Change the visual style display to: Wireframe.

4. Open the Visibility/Graphic Overrides dialog (VG), click the Imported Categories tab and turn off all layers in the Commercial-Site DWG except: C-Site-Pkng and C-Site-Road.

While not required, you may wish to increase the line weight and/or change the color of these layers as well to make them stand out better.

5. On the Massing & Site tab, click the Split Surface tool. Select the toposurface and then use the Pick Lines tool to chain-select one of the road lines in the CAD file (see Figure A.7).
6. Click Finish Edit Mode.

7. Repeat for the other three corners of the surface on the sides of the road intersection.

You will end up with five total toposurface elements after this operation—four grass areas in the four corners and the roads which will also include the parking lot and building lot area. You cannot use Split surface for the building lot area. For that you need a Subregion. Use Split Surface to cut a single surface into two pieces. Use Subregion to create one (or more) surface region(s) within the boundaries of another.

8. Click the Subregion tool, use the Pick Lines icon and chain select the curb line surrounding the building. Finish the surface.

9. Using the CTRL key, select the Subregion surface and the four split regions.

    On the Properties palette, change the Material to: Grass. You may have to load this from the material library first (see Figure A.8).

10. Assign: Asphalt, Pavement to the roads surface.

There are other site tools that you may wish to explore. If you decide to join two surfaces together later, you can use the Merge Surface tool. There is a Property Line tool that you can draw by sketching or using distances.
and bearings from your Civil Engineer. You can also label the contours of your toposurface using the Label Contours tool. Finally, the Graded Region tool will allow you to calculate basic cut and fill. To use this tool, you have to move your toposurface to the Existing phase. The grading is then applied in a later phase such as New Construction. Phasing is discussed in the Residential project in Chapters 4 and 8. Feel free to experiment with any of these tools now.

For the parking lot, you can add parking components. A parking component family is already loaded in the default template. Decide who should have responsibility for laying out parking. If it is the Civil Engineer, you can add parking to this project, if it is the Architect, you may want to add it directly to the Commercial project instead. If you add it to the Site project, you should work in the Street Level view. You will need to turn on the Parking category in the Visibility/Graphic Overrides (VG) dialog first. You can also apply the Site Plan view template to the view if you prefer. The parking component places a single parking space. Move, rotate, copy, and array it as appropriate. The Site Component tool can be used to add trees and other site accoutrements. Again, it is up to you to decide if these should be in the Site model or the Architectural model.

CHAPTER 8—SITE MODEL REFINEMENTS

The commercial project in Chapter 8 starts with walls in the building core. You can do this exercise before you do the tutorials in Chapter 8 for the commercial project if you wish to gain additional practice with wall layout.

1. From the Chapter07|Complete folder, open: 07 Commercial Complete.rvt [07 Commercial M_Complete.rvt] file.
2. Save a copy of the file to the Appendix A folder.
3. In the Level 1 plan view draw the walls and doors shown in Figure A.9.

**FIGURE A.9** Add walls and doors to create a lobby on Level 1
All walls shown in the figure go from Street Level to the Roof level.

- For the walls, use the: Generic – 8" Masonry [Generic – 225mm Masonry] wall type.
- For the doors, use: Single Flush: 36" x 84" [0915 x 2134mm]. Center them unless indicated otherwise in the figure.
- The two openings are the: Door-Opening family. For the large one you will need to duplicate a new type named: 144" x 84" [3600 x 2134mm]. The small one is: 36" x 84" [900 x 2134mm].

CHAPTER 9—LEVEL 2 DOUBLE VOLUME SPACE

The provided dataset for Chapter 9 includes a double-height space at the front of the building. This simple task involves editing the floor element on Level 2 and then adding a guardrail.

1. From the Chapter08\Complete folder, open: 08 Commercial_Complete.rvt [08 Commercial_M_Complete.rvt] file.
2. Save a copy of the file to the Appendix A folder.
3. Edit the sketch of the floor element on Level 2 to create double-height space.
4. Add a guardrail. From the Railing too, choose the Sketch Path option.
5. Use Figure A.9 as a guide to create the Floor sketch.

- Use any railing type you like and the pick lines option to create the sketch lines from the edges of the floor opening you just modified. Use an offset of: 4" [100] to set the guardrail back slightly from the edge of the slab.

CHAPTER 10—MODEL REFINEMENTS

Chapter 11 includes a version of the Commercial dataset with a lobby plan, restroom layouts, and some tenant build-out on the third floor. If you wish to create these refinements on your own, the exercises that follow will progress through these tasks.

LOBBY PLAN

1. From the Chapter09\Complete folder, open: 09 Commercial_Complete.rvt [09 Commercial_M_Complete.rvt] file.
2. Save a copy of the file to the Appendix A folder.
3. Open the Level 1 plan view.

The lobby will follow the shape of the floor slab already in place on Level 2. The easiest way to do this is to add Level 2 as an underlay to Level 1.

4. Edit the Properties of Level 1 and add Level 2 as an underlay. Set the Underlay Orientation to: Reflected Ceiling Plan.

   ➔ Draw walls using the pick option with an offset of approximately: 1'-6" [450] and click each of the gray lines from the floor object from the underlay of Level 2.

5. Draw the additional walls, doors, and openings indicated (see Figure A.11).

![Figure A.11](image)

**FIGURE A.11 Add Walls and Doors to create a lobby on Level 1**

**TOILET ROOM LAYOUT**

To create the toilet rooms, we need to add walls and fixtures to the toilet rooms in the core area.

1. Draw the walls and then add fixtures to complete the layout (see Figure A.12).

   ![Figure A.12](image)

   **NOTE:** To find rest room fixtures, search on Autodesk Seek. Search for: “Toilet Stall” and “Counter Top.”
2. Select all the components added, Group them, and then copy and paste aligned to the other floors.

**LEVEL 3 PLAN LAYOUT**

There is a tenant space on the third floor on the left side of the plan.

1. Using the: **Interior - 4 7/8" Partition (1-hr) [Interior -123mm Partition (1-hr)]** Wall type, add the walls for the interior build-out as shown in the figure.

2. Add doors. Assume 6" [150] offset from corners or centered in the room as appropriate. Load any door types not currently resident in the project (see Figure A.13).
CHAPTER 10—BUILD A FAMILY WITH ANGULAR PARAMETERS

To add an angular parameter to a family, you need to use a Reference Line instead of a Reference Plane. Even though reference planes appear on screen to have a start and end point, they are really infinite. This makes it difficult to use them to control rotation in a family. A reference line, on the other hand, has a finite length and both a start and end point. You can assign angle parameters to them and use them to control the rotation of elements within a family such as the swing of a door.

In addition to a start and end point, a reference line has four integral work planes associated with it. In order to use a reference line to control a rotation parameter effectively, you need to establish two things: first, you must constrain the end of the reference line that you wish to be the point of rotation. If you do not, the rotation parameter will behave unpredictably. Second, you must set one of the work planes of the reference line current and then add your solid geometry to this plane.

MAKING A DOOR SWING PARAMETRIC

In this tutorial, we will create an angular parameter and associate it to a reference line for the purposes of defining a variable door swing parameter in a door family.

1. Create a new family based on the: Door.rft template.
The trick to making the reference line work properly is being sure that you apply the constraints and parameters to it very carefully. In the Family Editor, it is sometimes easier to do this if you hide some of the geometry.

2. Select the wall, and from the Temporary Hide/Isolate pop-up choose: Hide Element.
   
   ➡ Repeat for the Frame elements.

3. On the Create tab, Datum panel click the Reference Line tool.

   ➡ Starting at the intersection of two of the reference planes where you want the hinge point to be, draw a 45° reference line 3'-0" (900) long.

4. Cancel the command, then select the reference line. Click the small icon that appears to make the temporary dimension permanent.

   ➡ Select the new dimension and label it with the existing Width parameter (see Figure A.14).

5. Use the Align tool and set the vertical reference plane as the first reference.

6. Press tab near the end of the reference line until the endpoint highlights. Click to align this endpoint to the reference plane and then click the lock icon to constrain it.

   ➡ Repeat in the other direction aligning to the horizontal reference plane this time (see Figure A.15).

---

**FIGURE A.14** Add a reference line and label it with a parameter

**FIGURE A.15** Align the endpoint of the reference lines and lock it to the reference planes in both directions
This step is important. By locking the end point (hinge point) of the reference line in both the horizontal and vertical directions, we ensure that the hinge point of the door remain in the correct location relative to the door. Having applied the Width parameter above further ensures that the reference line will flex as expected with the rest of the door.

7. Flex the model. Modify the Width to another value and then set it back to: 3'-0" [900] before continuing.

ADD A SWING PARAMETER

Now we will add the parameter that will rotate the door panel and provide the swing angle.

1. On the Annotate tab, on the Dimension panel click the Angular button.
   ⇒ For the first witness line, click the horizontal reference plane and then click the reference line for the second witness line.
   ⇒ Click in empty space to place the dimension.
2. Select the angular dimension and then from the Label drop-down, choose: Add parameter.
   ⇒ Name the parameter: Swing, group it under: Graphics, make it an Instance parameter.
   ⇒ Optionally you can add a Tooltip Description and then click OK (see Figure A.16).

FIGURE A.16 Align the endpoint of the reference lines and lock it to the reference planes in both directions

3. Flex the Model. Try different Widths and different Swing angles.
   ⇒ When satisfied that everything works properly, reset the Width to: 3'-0" [900] and the Swing to: 45°.

It is simple to draw door geometry and constrain it to the reference line. The reference line has four integral work planes. There is one horizontal, one vertical, and one at each end point. You simply click the Set Work Plane tool, choose the “Pick a Plane” option, and then select the plane upon which you wish to draw. It is recommended that you leave the reference line oriented at 45° for this. Cut a section at 45° as well, parallel to the reference line. Then open this view to work. If you work in one of the orthographic views, you can accidentally constrain your geometry to other nearby reference planes and geometry making it difficult to flex the model later. If you build your door panel extrusion on the 45°, you can easily avoid this (see Figure A.17).
Create a section looking at the reference line, set the work plane to the reference line and then create an extrusion

4. Create the section, open it, and then set the vertical work plane of the reference line current. Use TAB to assist in selecting the correct plane.

5. Draw a solid extrusion on this plane. Snap it to the ends of the reference line using the Align tool with the TAB key to get the endpoints.

On the Properties palette, associate the Thickness parameter with the Extrusion End parameter.

An example of a door panel up to this point is provided in the Appendix A folder. The family is named: Door Panel w Swing.rfa. This file was created using the Door.rft template. The family contains only the reference line and the door panel extrusion. You can add more elements to it if you wish and draw a 2D version in the plan view using symbolic lines if you wish to explore further.

CHAPTER 14—WALL TAGS

In Chapter 14, we modified the heights of some of the walls in the commercial project third floor plan. We made some go all the way to the deck above, some stopped at the ceiling creating an underpinned condition and we discussed a third possible condition where the walls could be adjusted to an unconstrained height to...
make them stop a few inches above the ceiling plane. Each of these conditions would typically be assigned a
different wall type designation in a construction document set. To do this in Revit, we need to simply duplicate
the existing wall type for each condition, edit the Type Mark parameter and then add wall tags.

1. From the Chapter14\Complete folder, open: 14 Commercial_Complete.rvt (14 Commercial_M_Complete.rvt)
file.
2. Save a copy of the file to the Appendix A folder.
3. Select each of the underpinned walls (refer to Chapter 14), and on the Properties palette click the Edit Type
button.
   ➜ Duplicate the Type and give it a unique name.
   ➜ Input a value for the Type Mark such as: A1.
4. Select one of the other walls in the suite. In section, detach its top from the floor above. With it still
   selected, duplicate its type and change the Type Mark to: A2.
   ➜ Edit the Type Properties of a different wall (one that still goes to deck). Edit the Type Mark to: A3.
5. Using Tag by Category, add wall tags to each wall using a: 3/8" [9] leader (see Figure A.19).

FIGURE A.19 After duplicating wall types and inputting Type Marks, the wall tags will report the type designations