Autodesk®
Revit® 2026 MEP
Fundamentals

Visit the following websites to learn more about this book:

Starting a Revit Project

Starting a Revit project begins by using a template. You can then link in a CAD file or an existing Revit model, if these are available. From there, you can add the framework for a design, including levels to define vertical heights and grids to help define the Revit elements' layout.

Learning Objectives

- Select and open a project template.
- Link and import CAD files to be used as a basis for developing a design.
- Link existing Revit models to develop and coordinate with other disciplines.
- Add and modify levels to define floor-to-floor heights and other vertical references.
- Add and modify grids to provide locations for model elements.

2.1 Selecting a Project Template

New projects are based on a project template file. The template file includes preset levels, views, and some families, such as wall styles and text styles. When using templates, most of the views are set to display only the elements specific to the template, so it is best practice to select a template that reflects your company's discipline.

- Check with your BIM manager about which template you need to use for your projects. Your company might have more than one based on the type of project you are designing. Ideally, you should not start your work inside of another discipline or model. Instead, you should start from one of the default Revit templates or your company's custom template and link the architectural model into your project.

If you link a Revit model into your project, you can use the monitoring and coordinating features to copy/monitor necessary items, such as walls, floors, and grids, from the architect. To learn more about copying/monitoring, see ASCENT's *Autodesk Revit: Collaboration Tools* guide.

How To: Start a New Project

1. Click **New** from the Home screen. Alternatively, in the *File* tab, expand (New) and click (Project), as shown in Figure 2−1, or press <Ctrl>+<N>.
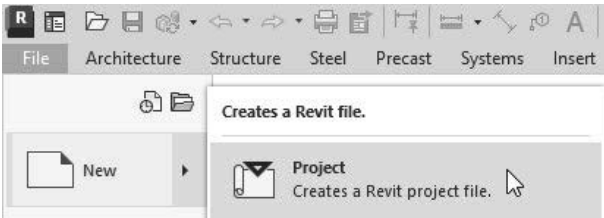

Figure 2−1

2. In the *New Project* dialog box (shown in Figure 2−2), select the template that you want to use and click **OK**.

   Note: The list of template files is set in the Options dialog box in the File Locations tab. It might vary depending on the installed product and company standards.
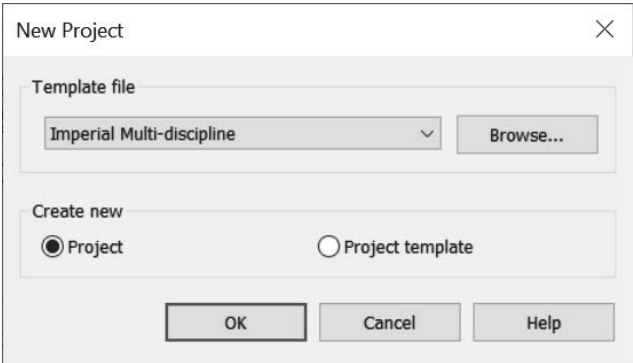

Figure 2−2

> ### 💡 Hint: Revit Worksharing
>
> If established by your company that worksharing is needed, you would typically want to start a worksharing project on your local network once a project has been created.
>
> - For more information on worksharing, see *A.8 Introduction to Revit Worksharing* in *Appendix A Additional Tools for Design Development*.
>
> - For more information about establishing and using worksets, refer to ASCENT's *Autodesk Revit: Collaboration Tools* guide.

Recommended Project Setup

A multidiscipline approach to design and data sharing is the recommended best practice for all Revit projects. It allows multiple teams to create and work on their own trade-specific designs and then easily share the models with other teams so they can consolidate all design data into one host model by linking in other disciplines, as illustrated in Figure 2–3.
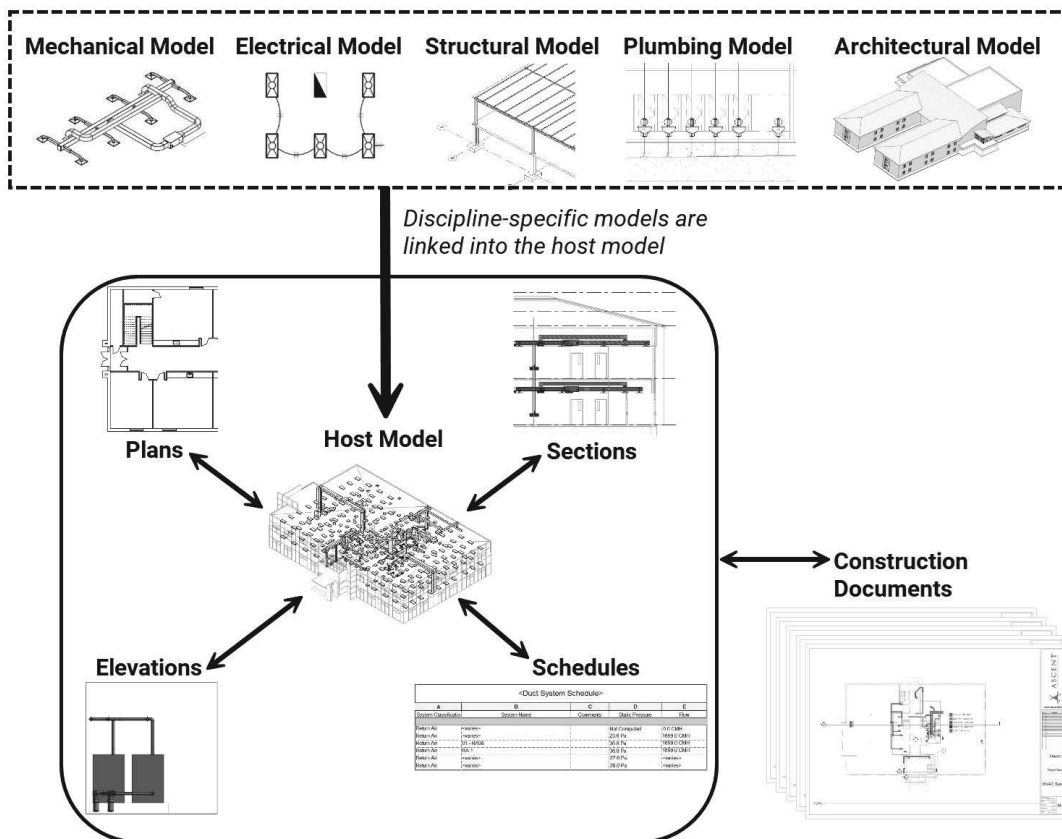

Figure 2–3

In Revit, models from different disciplines (such as architectural, mechanical, electrical, plumbing, and structural) can be linked together into one project. For example, mechanical and structural models can be linked into an architectural model, allowing teams to coordinate designs while maintaining separate project files.

Once saved, the links are part of the current project, and if any of the linked files are modified, the updated projects can be reloaded. Alternatively, each time a project is opened, it automatically loads the latest version of the linked projects. All links can be managed using the

Manage Links dialog box, as shown in Figure 2–4. To open it, click 🔗 (Manage Links) in the *Insert* tab>*Link* panel or in the *Manage* tab>*Manage Projects* panel.

Figure 2–4

2.2 Linking and Importing CAD Files

CAD files can be imported or linked into a Revit project. As an example, a designer might lay out a floor plan using the standard 2D AutoCAD software, and you then need to incorporate that information into your structural model. In addition, many renovation projects start with existing 2D drawings. Instead of redrawing from scratch, link or import the CAD file (as shown in Figure 2−5) and trace over it in Revit. You can also print a hybrid drawing that is part Revit project and part imported/linked drawing.

> **Note:** *When you hover over an imported or linked CAD file, you can see in the tooltip that it is called an Import Symbol.*
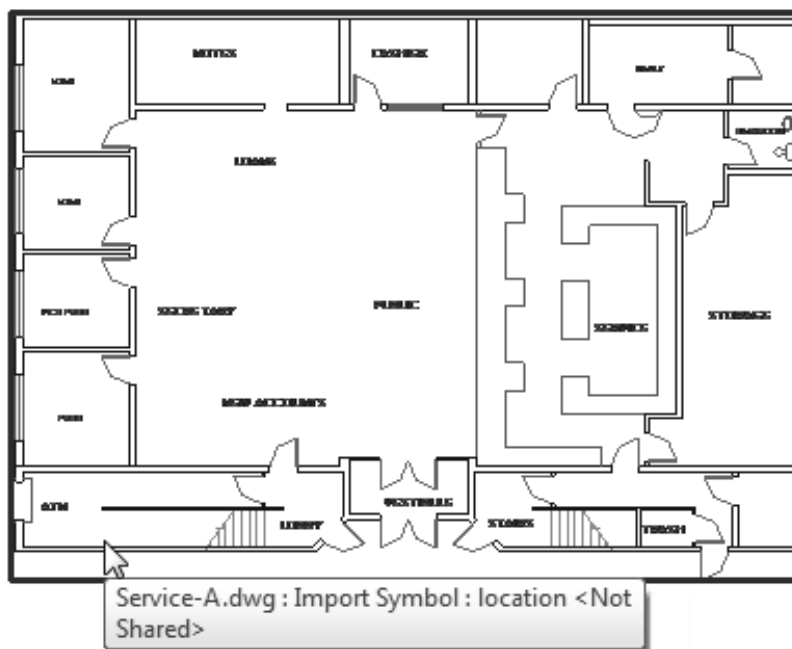
Figure 2−5

- CAD file formats that can be imported or linked include AutoCAD® (DWG and DXF), FormIt (AXM), 3D ACIS modeling kernel (SAT), MicroStation (DGN), 3D Shape (OBJ, STL, STEP, STP, and STPZ), Rhino (3dm), and Trimble SketchUp (SKP).

- When linking or importing a CAD file, you can specify a level or a named horizontal reference plane in the project to position the CAD file at.

- You can specify the linking or import units (e.g., feet, meter, or US survey feet).

Linking vs. Importing

- **Link:** A connection is maintained with the original file and the link updates if the original file is updated. Within the *Manage Links* dialog box (as shown in Figure 2–6), you can manually **Reload** the linked CAD file if updates occur. There are also options to **Unload**, **Remove**, or **Import**.
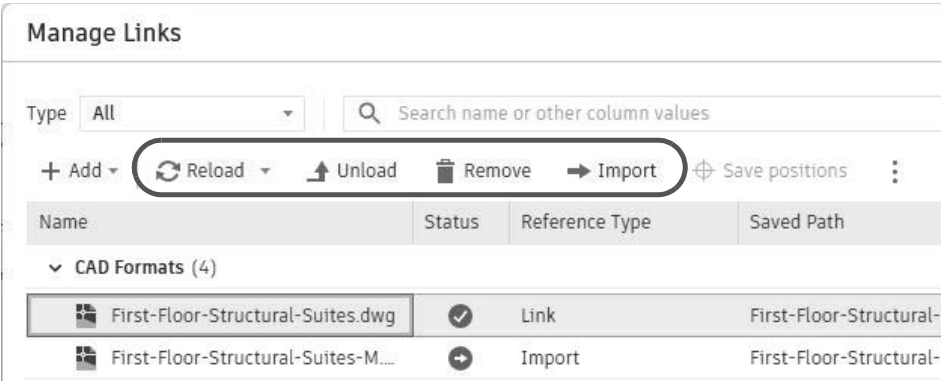
Figure 2–6

- **Import:** No connection is maintained with the original file. It becomes a separate element in the Revit model. Within the *Manage Links* dialog box, you only have the option to **Remove** the imported CAD file, as shown in Figure 2–7.
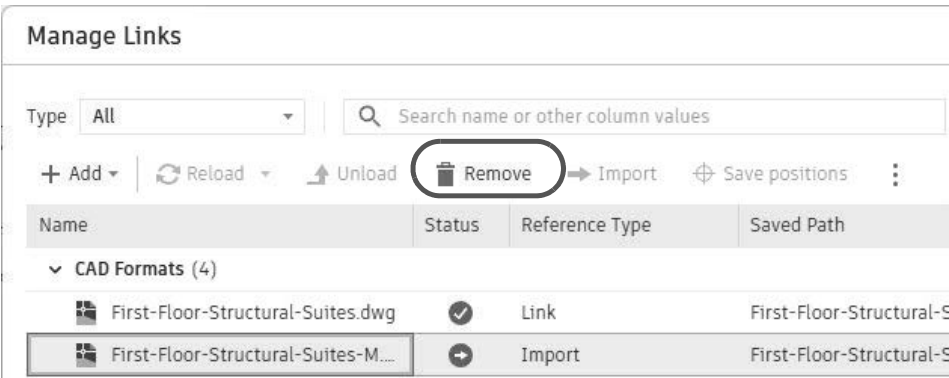
Figure 2–7

How To: Link or Import a CAD File

1. Open the view into which you want to link or import the file.

   - For a 2D file, this should be a 2D view. For a 3D file, open a 3D view.

2. In the *Insert* tab>*Link* panel, click ⬚ (Link CAD), or in the *Insert* tab>*Import* panel, click ⬚ (Import CAD).

3. In the *Link CAD Formats* (shown in Figure 2−8) or *Import CAD Formats* dialog box, select the file that you want to import.

- Select a file format in the *Files of type:* drop-down list to limit the files that are displayed.

Note: The dialog boxes for Link CAD Formats and Import CAD Formats are the same.
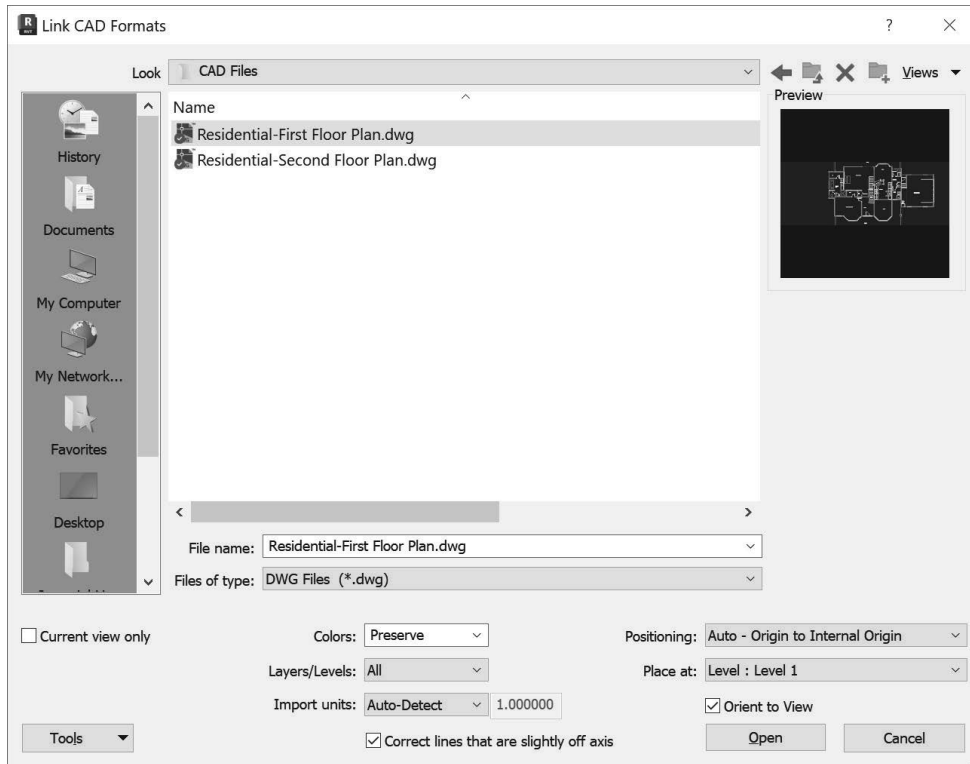
Figure 2−8

4. If **Current view only** is selected, as shown in Figure 2−9, you can set all options except the *Place at* and the *Orient to View* options. The view will only display in the current view.

Figure 2−9

5. If you would like to place the CAD file at a level or reference plane, verify **Current view only** is unchecked and set the *Place at* option, as shown in Figure 2−10. Click **Open**.

Figure 2−10

Link and Import Options

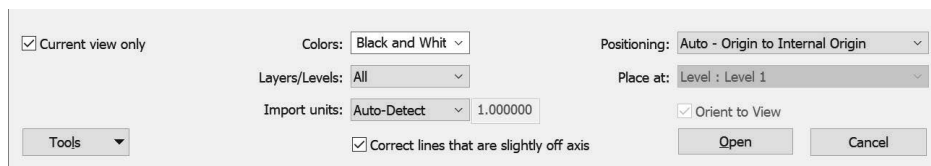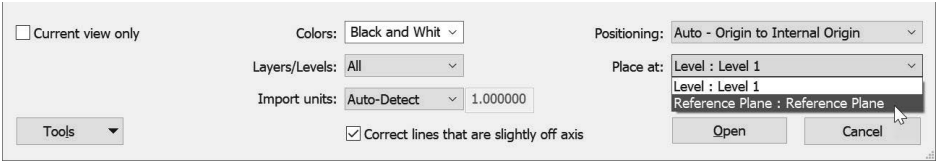| Current view only	Determine whether the CAD file is placed in every view, or only in the current view. This is especially useful if you are working with a 2D floor plan that you only need to have in one view.
Colors	Specify the color settings. Typical Revit projects are mainly black and white. However, other software frequently uses color. You can **Invert** the original colors, **Preserve** them, or change everything to **Black and White**.
Layers/Levels	Indicates which CAD layers are going to be brought into the model. Select how you want layers to be imported: **All**, **Visible**, or **Specify...**.
Import units	Select the units of the original file, as required. **Auto-Detect** works in most cases.
Correct lines...	If lines in a CAD file are off axis by less than 0.1 degree, selecting this option straightens them. It is selected by default.
Positioning	Specify how you want the imported file to be positioned in the current project: Auto - Center to Center · Auto - Center to Center Auto - Origin to Internal Origin · Auto - Origin to Internal Origin Manual - Origin · Auto - By Shared Coordinates Manual - Center · Manual - Origin · Manual - Center *Import option* *Linking option* The last option used will be the default position.
Place at	Select a level or named reference plane at which to place the imported file. If you selected **Current view only**, this option is grayed out.
Orient to View	Used to orient the CAD file on import/link.

- When a file is positioned **Auto - Origin to Internal Origin**, it is pinned in place and cannot be moved. To move the file, click on the pin to unpin it, as shown in Figure 2−11.
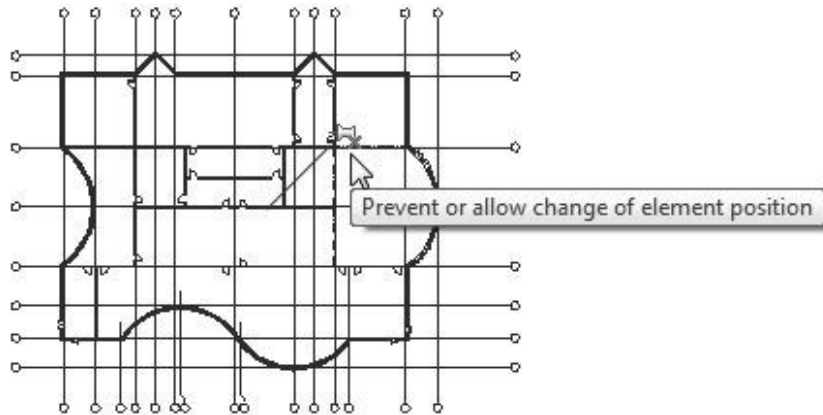
Figure 2−11

2.3 Modifying Imported/Linked CAD Files

An imported/linked CAD file is called an *import symbol* once it is inserted into a project, as shown in Figure 2–12. When you select an imported/linked file, you can modify it by arranging the *Foreground/Background* status, modifying its type properties, querying information about elements in the file, and deleting layers. You can also modify the visibility/graphic overrides of each imported/linked file instance.
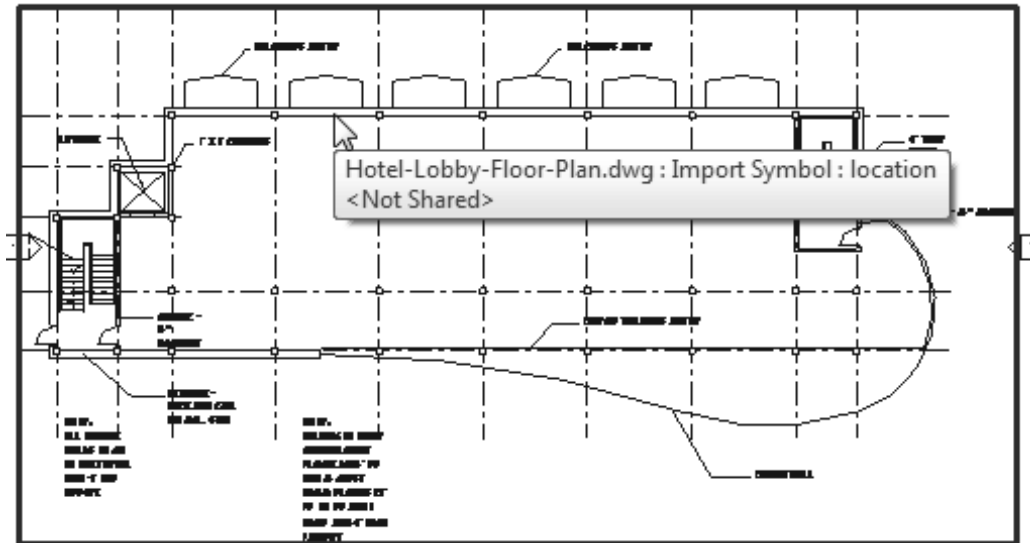
Figure 2–12

Arrange Linked/Imported CAD Files

CAD files that are linked or imported using the **Current view only** setting have the option to set the file to display in the foreground or background.

- Select the CAD file in the view and in Properties, expand *Draw Layer (*as shown on the left in Figure 2–13) and select either **Foreground** or **Background**.

- In the contextual tab>*Arrange* panel (shown on the right in Figure 2–13), select either **Bring to Front** or **Send to Back** or expand them to see more options to move linked files to the front or back of the host elements.

Properties

Contextual ribbon
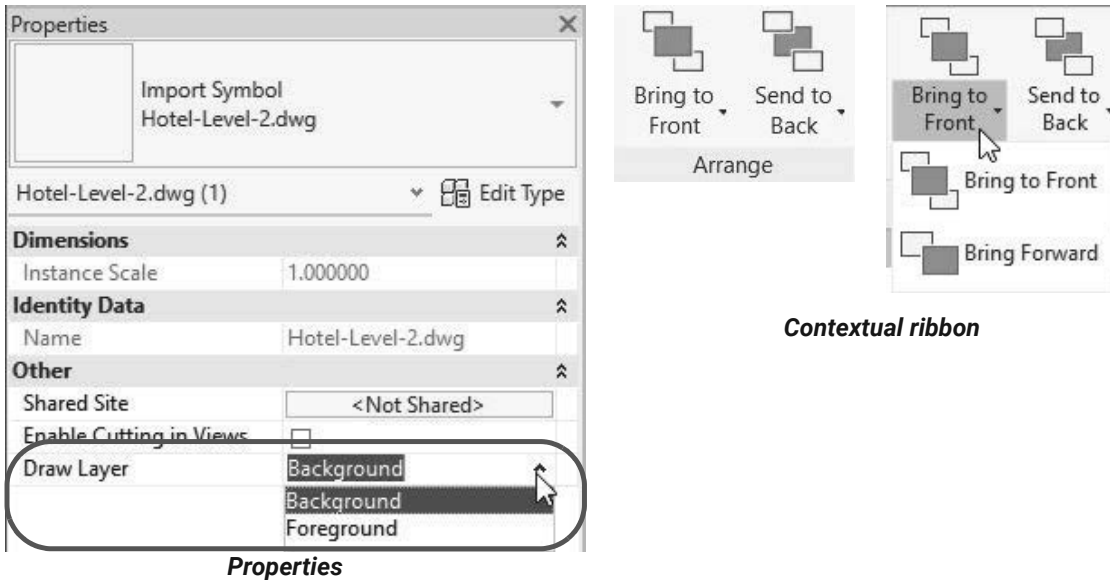
Figure 2–13

Visibility/Graphic Overrides – Imported Categories

Imported or linked CAD files have their own visibility settings in the *Visibility/Graphic Overrides* dialog box on the *Imported Categories* tab. You can control the display of individual layers within the CAD file by turning them on or off in the *Visibility* column (as shown in Figure 2–14) and changing their colors, line weights, and line patterns. This helps ensure that the CAD file appears clean and consistent with your Revit project's graphic standards. This is also where you can set your imported or linked CAD file to display in the view in halftone or turn it off completely.
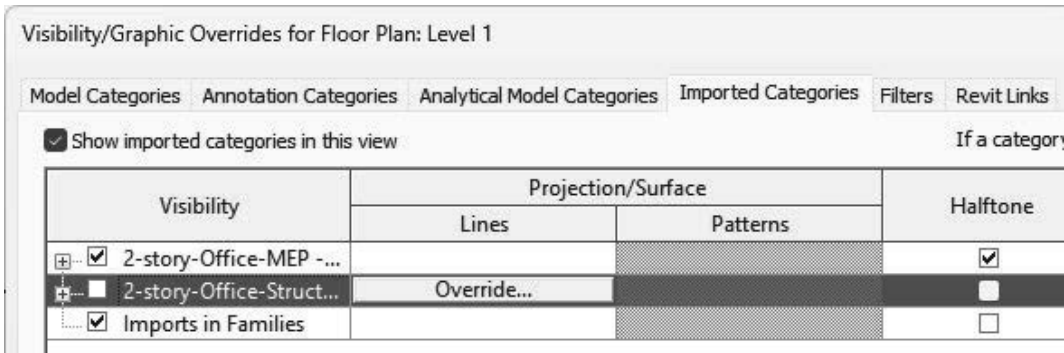
Figure 2–14

How To: Hide Individual CAD File Layers

1. In the *View* tab>*Graphics* panel, click ⬚ (Visibility/Graphics), or type **VG** or **VV** to open the *Visibility/Graphic Overrides* dialog box.

2. Select the *Imported Categories* tab. It displays a list of each imported instance and its layers/levels, as shown in Figure 2–15.

3. To have the linked/imported file display in halftone, check the box in the *Halftone* column.

4. Click the plus sign beside the file name to expand the list of the layers in that file.

5. Clear the checkmark from the individual layers that you do not want to display.

   - Typically, these layers contain similar information, such as all windows or all notes in a drawing. However, it is not as definite as using Revit elements. An item might have been misplaced on a different layer and, if so, it does not toggle off.

- To toggle off the entire file, clear the checkmark next to the file name in the *Visibility* column.

Turn off linked/ imported file's layers

Turn link to halftone in view
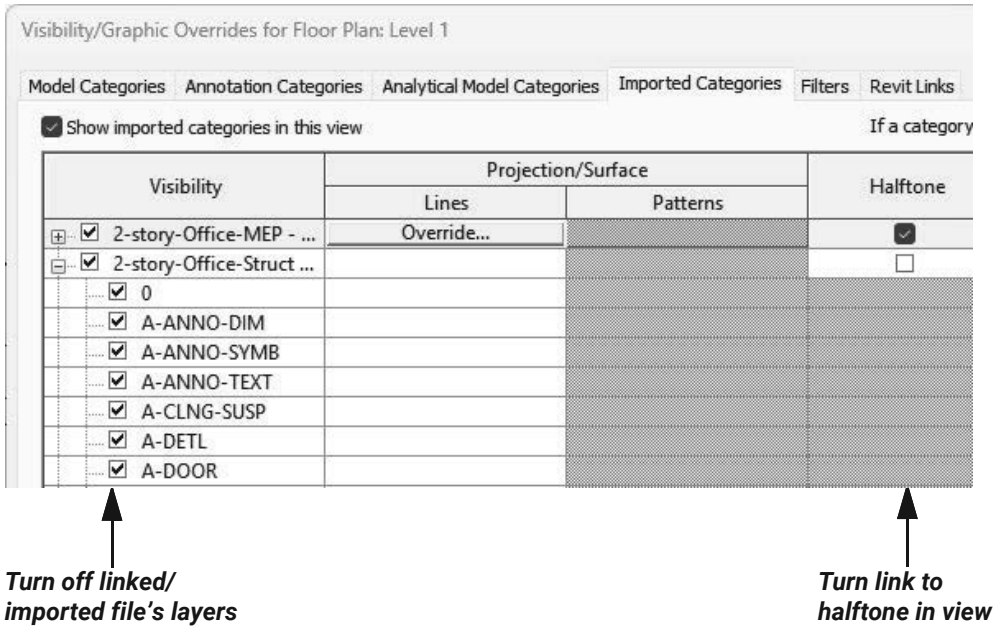
Figure 2–15

6. Close the dialog box.

Setting an Imported or Linked CAD File to Halftone in View

To see the difference between the host model elements and the linked or imported CAD file, you can set the linked/imported file to halftone, as shown in Figure 2−16.
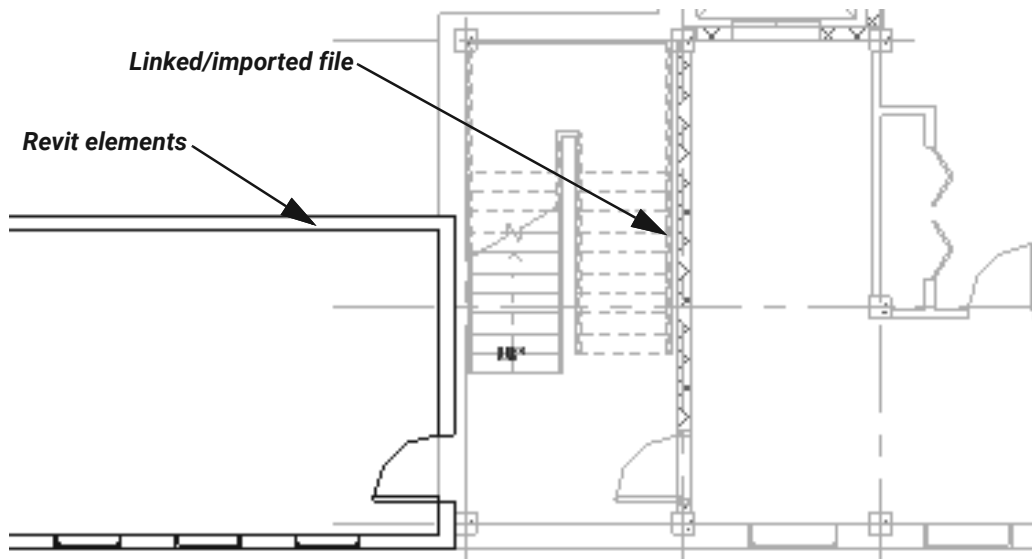
Figure 2−16

How To: Set a CAD File to Halftone in a View

1. Select the imported/linked CAD file.

2. Right-click and select **Override Graphics in View>By Element...** or **By Category...**, as shown in Figure 2−17.
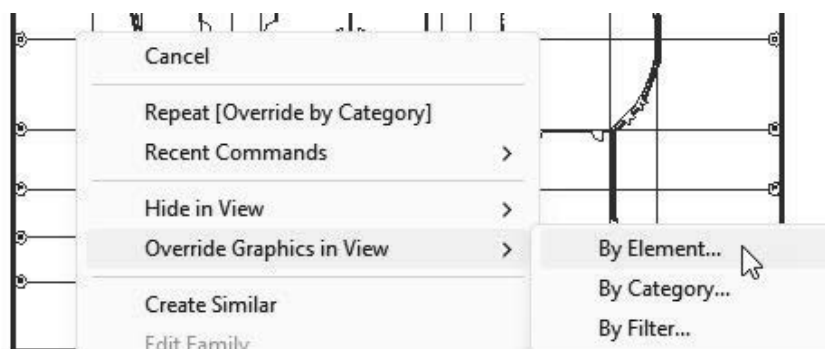
Figure 2−17

3. In the *View Specific Element* (or *Category*) *Graphics* dialog box, select **Halftone**, as shown in Figure 2−18.

    - If halftone is set using **By Element**, the setting will not show up in the *Visibility/Graphic Override* dialog box. You will need to select the CAD file, right-click, and select **Override Graphics in View>By Element** to turn it off in the *View Specific Element Graphics* dialog box.

    - If halftone is set using **By Category**, you can turn it off in the *View Specific Category Graphics* dialog box or using the *Visibility/Graphic Overrides* dialog box.
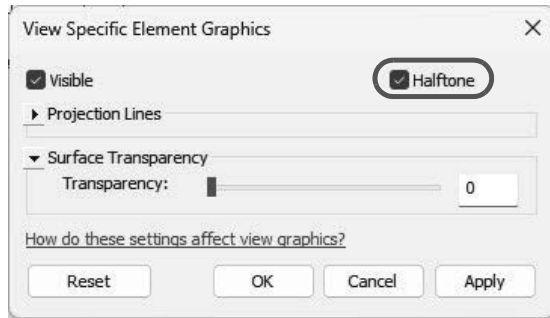
Override by Element   *Override by Category*
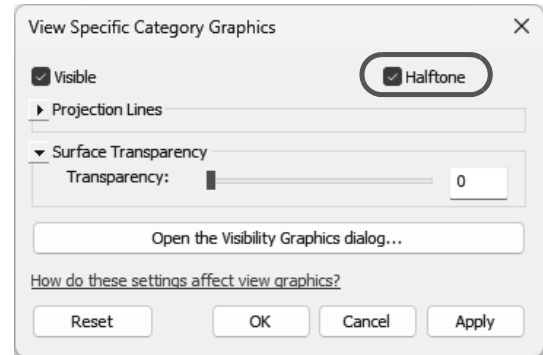
Figure 2−18

4. Click **OK**.

2.4 Linking in Revit Models

You can link Revit models directly into a project. These models can be an existing building that you are creating an addition to, as shown in Figure 2−19, or engineering models that you are checking to ensure that they line up with your model. This can also be used for campus-like projects where the same building is repeated multiple times. The Revit models that are linked are full 3D models.

> **Note:** *A linked model automatically updates when the original file is changed.*

***Linked Revit model with outline of
addition in the current project***
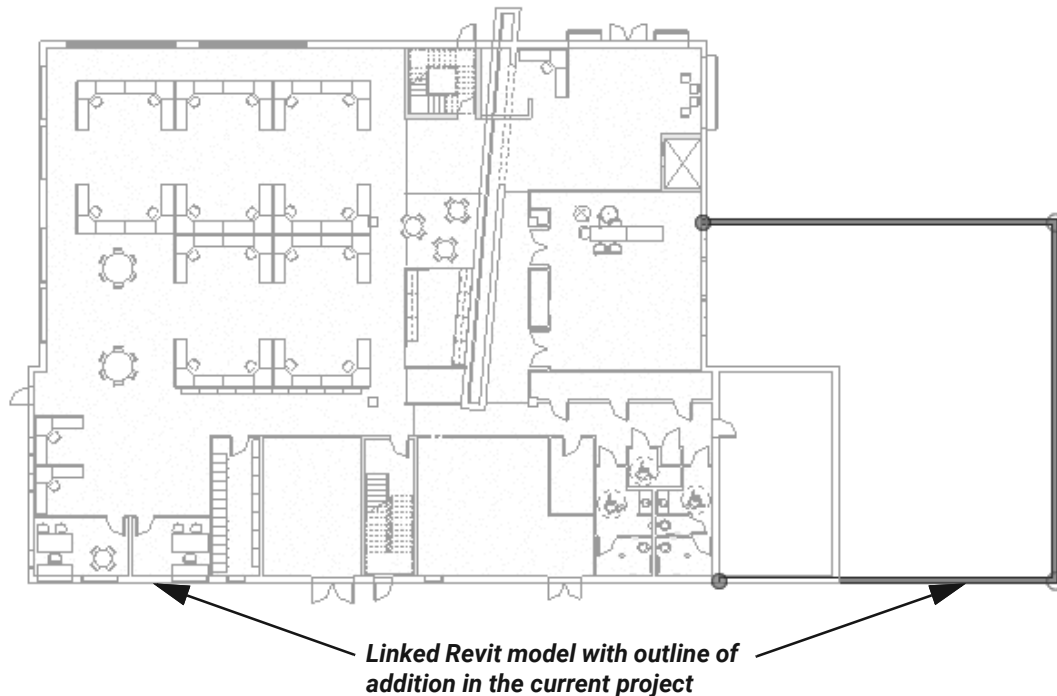
Figure 2−19

- Architectural, structural, and MEP models created in Revit can be linked into each other. It is best practice to always link Revit models that are from the same release cycle.

- When you link Revit models, clashes between disciplines can be detected and information can be passed between disciplines.

- Revit models are always linked. They cannot be imported.

How To: Add a Linked Model to a Host Project

1. In the *Insert* tab>*Link* panel, click ![Link Revit icon] (Link Revit).

2. In the *Import/Link RVT* dialog box, select the file that you want to link. Before opening the file, set the *Positioning*, as shown in Figure 2−20.

Figure 2−20

3. Click **Open**.

- Depending on how you decide to position the file, it is automatically placed in the project or you can manually place it with the cursor. The more links present in a project, the longer it takes to load.

2.5 Modifying Linked Revit Models

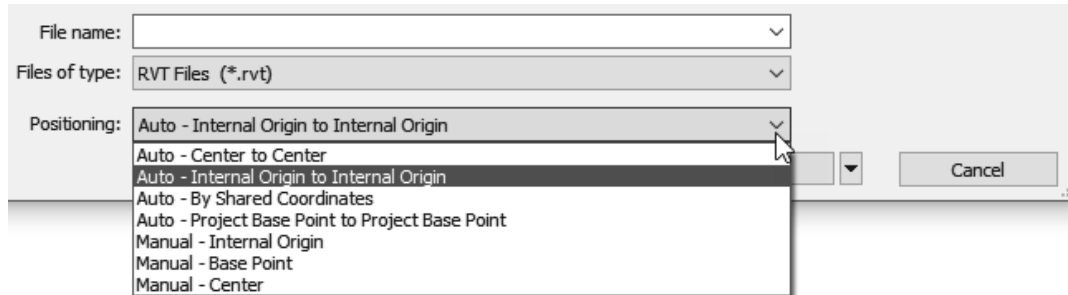A Revit linked model is a separate Revit file that you bring into your current project to use as a reference. It is often used when different teams are working on different parts of a building, like architecture, structure, or MEP. Linking the model lets you see and coordinate with other disciplines' work without editing their files directly. You can control how the linked model looks and behaves in your views, but the original file stays unchanged.

It is best practice to adjust a linked Revit model's visibility using the *Revit Links* tab in the *Visibility/Graphic Overrides* dialog box.

Visibility/Graphic Overrides – Revit Links

The *Revit Links* tab in the *Visibility/Graphic Overrides* dialog box (shown in Figure 2–21) allows you to control how linked Revit models appear in your views. In the *Visibility* column, you can turn on or off each link to show or hide it in the current view. The *Halftone* column lets you set the link to a gray tone, making it easier to distinguish from the main model. Checking the box in the *Underlay* column shows the linked model as a background reference. In the *Display Settings* column, **By Host View** means the linked model will follow the visibility settings of the current view in the host project for all view settings and visibility/graphic overrides settings for the model, annotation, analytical model, and imported categories.

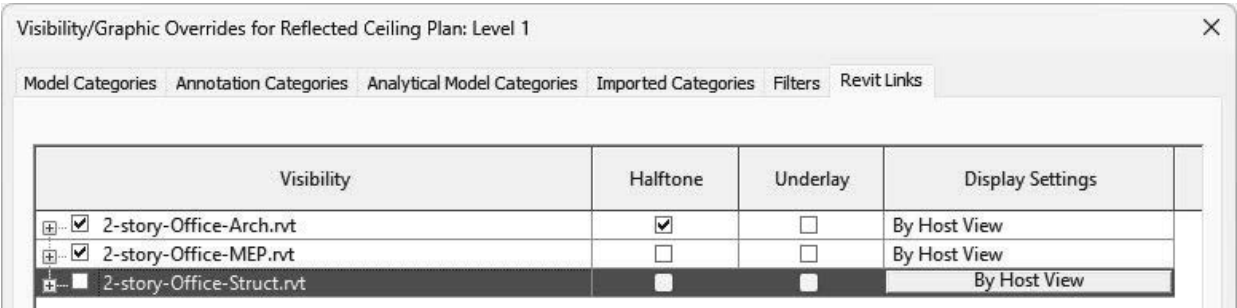
Figure 2–21

How To: Use Visibility/Graphic Overrides to Set the Revit Model to Halftone

1. In the *View* tab>*Graphics* panel, click (Visibility/Graphics), or type **VG** or **VV** to open the *Visibility/Graphic Overrides* dialog box.

2. In the *Visibility/Graphic Overrides* dialog box, on the *Revit Links* tab, check the checkbox for a specific Revit linked model in the *Halftone* column, as shown in Figure 2−22.

• If you want to turn off the Revit model in the view, uncheck the checkbox next to the model's name in the *Visibility* column.
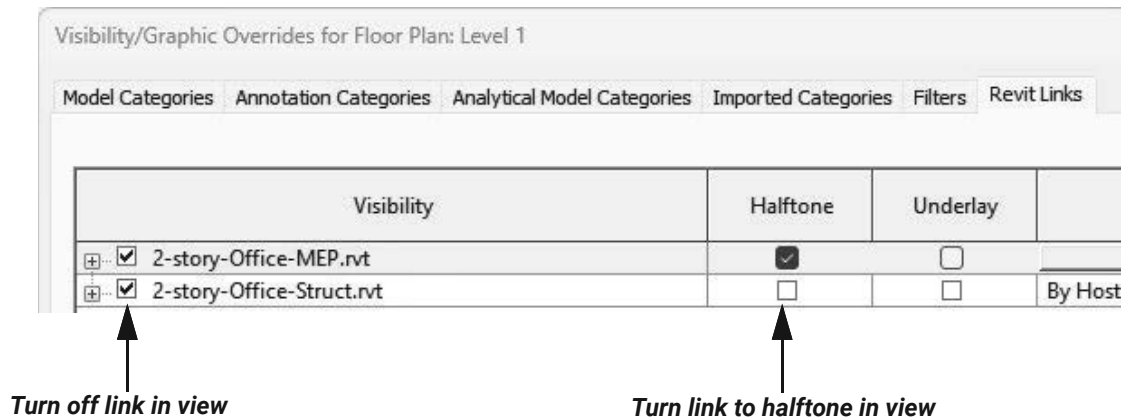

Figure 2−22

• If you select a Revit linked model and type **VH**, it will hide all Revit links in the model. To unhide the links, you will need to use **Reveal Hidden Elements** in the View Control Bar.

How To: Set Revit Models to Halftone Directly in a View

1. In the view, select a Revit model.

2. Right-click and select **Override Graphics in View>By Category...**.

3. In the *View Specific Category Graphics* dialog box, select the checkbox for **Halftone**, as shown in Figure 2−23, and click **OK**. All linked Revit models in the view are set to halftone.
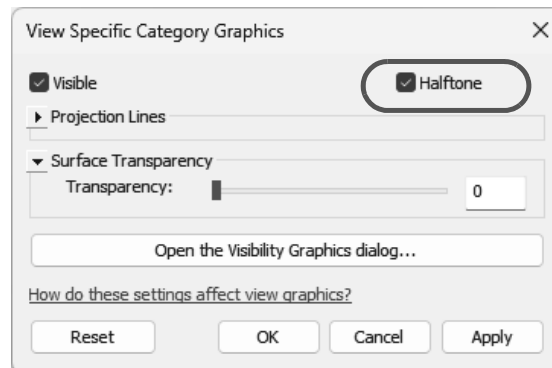

Figure 2−23

• You will need to remember that you set the linked Revit models to halftone using this dialog box, as the setting will not be reflected in the *Visibility/Graphic Overrides* dialog box as it is with CAD files.

2.6 Temporary Hide/Isolate

You might want to temporarily remove linked or imported CAD files and models from a view, modify the project, and then restore the elements. Instead of completely toggling the elements off, you can temporarily hide them.

Select the elements you want to hide (make invisible) or isolate (keep displayed while all other elements are hidden) and click 👓 (Temporary Hide/Isolate). Select the method you want to use, as shown in Figure 2–24.
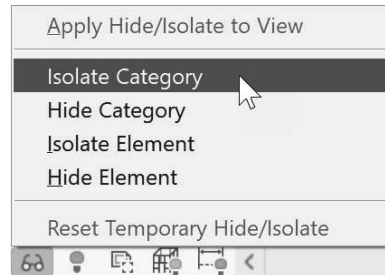

Figure 2–24

- The category or elements are hidden or isolated. A cyan border displays around the view with a note in the upper-left corner, as shown in Figure 2–25. It indicates that the view contains temporarily hidden or isolated elements.
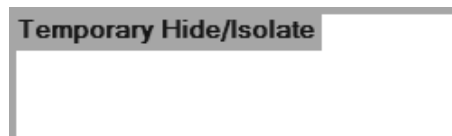
Figure 2–25

- Click 👓 (Temporary Hide/Isolate) again and select **Reset Temporary Hide/Isolate** to restore the elements to the view.

- If you want to permanently hide the elements in the view, select **Apply Hide/Isolate to View**.

- Elements that are temporarily hidden in a view are not hidden when the view is printed.

2.7 Managing Links

The *Manage Links* dialog box (shown in Figure 2–26) enables you to reload, unload, add, and remove links. You can also convert a linked CAD file to an imported file. If you accidentally click **Import**, you can close the *Manage Links* dialog box and click **Undo** in the Quick Access Toolbar.

There are three ways to open the *Manage Links* dialog box:

- In the *Insert* tab>*Manage* panel, click ⬮ (Manage Links).

- In the *Manage* tab>*Manage Project* panel, click ⬮ (Manage Links).

- Select the Revit link and click ⬮ (Manage Links) in the *Modify | RVT Links* tab>*Link* panel.
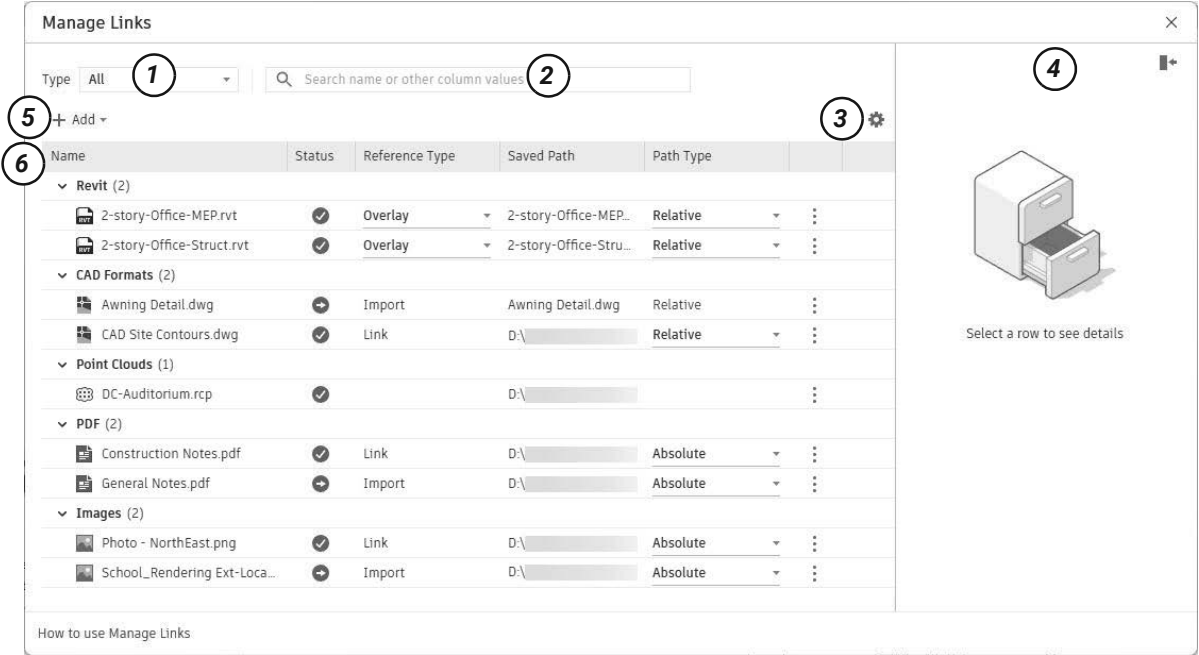

Figure 2–26

1. *Type* Drop-Down List   4. File Detail Panel

2. Search Bar   5. **Add** Menu

3. *Show Columns* List   6. File List

1. Type Drop-Down List

By default, the *Manage Links* dialog box is set to show all file types. You can adjust this by expanding the *Type* drop-down list and changing it from **All** to a specific type, as shown in Figure 2−27. The *Manage Links* dialog box shows both linked and imported CAD files.
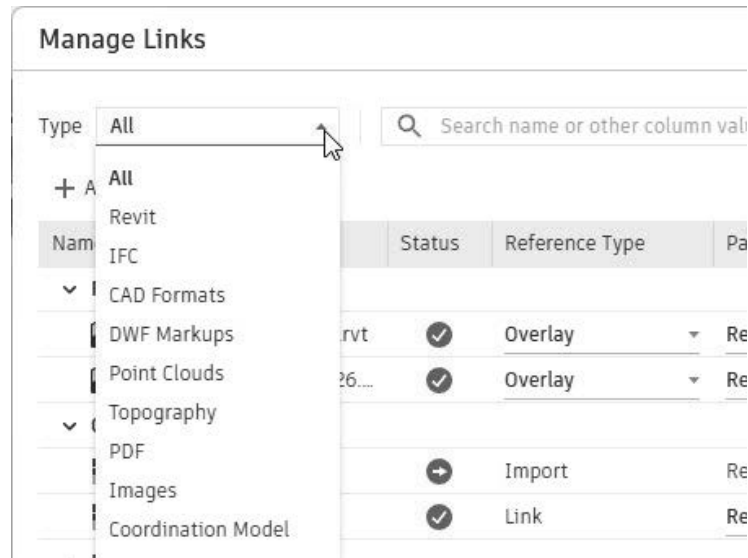
Figure 2−27

2. Search Bar

At the top of the *Manage Links* dialog box is a search bar to narrow down the list of linked and imported files that display. As soon as you start typing in the search bar, the list of files below will automatically update. It will only show the files that match the letters or words you are typing. Click the X in the search bar (shown in Figure 2−28) to clear the search and return to the full list.

Figure 2−28

3. Show Columns List

To choose which columns you want to see in the *Manage Links* dialog box, click the gear icon to expand a list of all available columns, as shown in Figure 2–29. You can check the boxes for the columns you want to show, and uncheck the ones you do not need. When you are done, click the gear icon again to close the list.
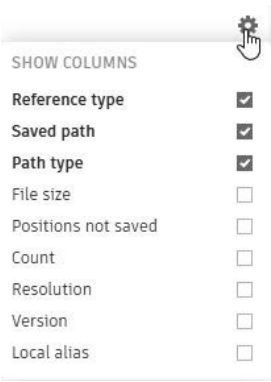

Figure 2–29

4. File Detail Panel

When you select a file in the file list, the file detail panel displays information about the file. This panel can be expanded and collapsed by clicking the icon in the upper-right corner. Depending on the file that is selected, you can modify things like *Path type* and *Reference type*, as shown in Figure 2–30.
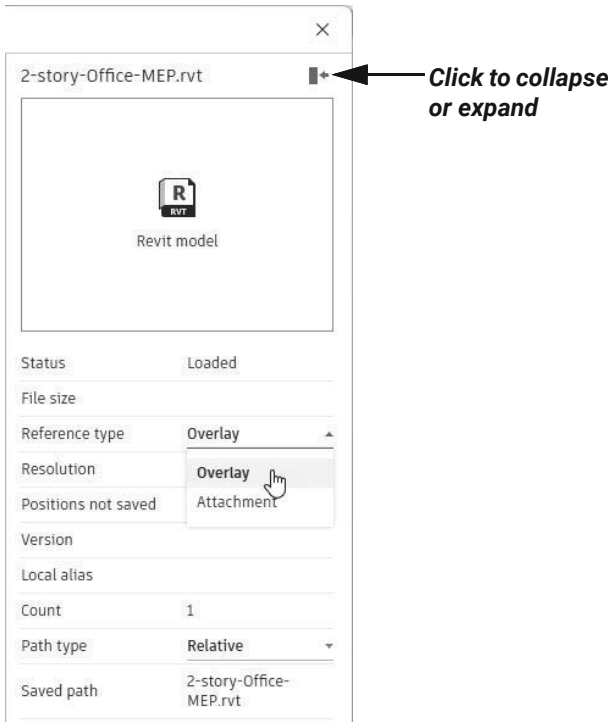

Figure 2–30

5. Add Menu

At the top of the *Manage Links* dialog box is the **Add** menu. When you click to expand it, as shown in Figure 2–31, a list displays of file types that you can add, including **Revit**, **CAD Formats**, **PDF**, and **Images**. When you select a type, it will open the respective import or link dialog box, where you can navigate to the file to bring it into the model. For file types that allow you to position the file manually, the manual options will not be available in the link or import dialog box. For example, if you select **Revit**, the *Link Revit* dialog box's *Positioning* options will not include any manual options.
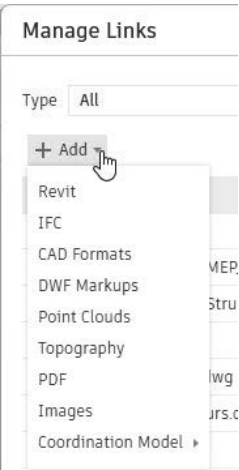

Figure 2–31

6. File List

By default, imported and linked file types display in the *Manage Links* dialog box within a tree structure that organizes the file types into their respective categories. When you select a file, operation tools display along the top of the dialog box, depending on which file type was selected. The tools are also available by right-clicking on a file or expanding the more menu at the end of the file. Figure 2–32 shows the operation tools that display when a Revit file is selected.
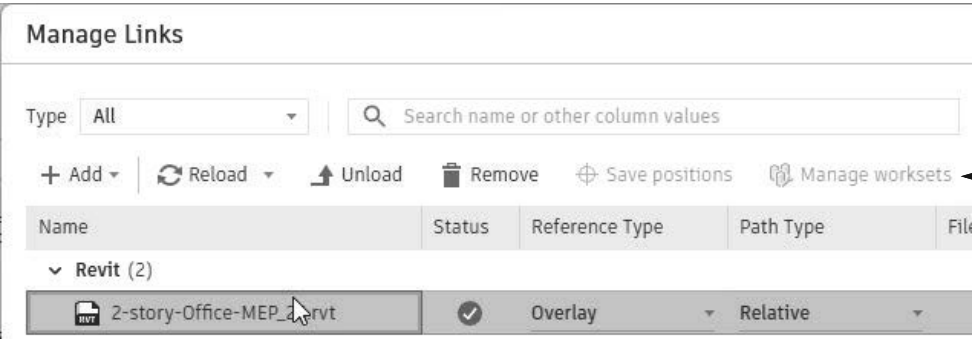

Figure 2–32

The *Saved Path* column shows the location where the file is stored on your computer or network. To copy the saved path for a file, hover your cursor over the file's saved path, as shown in Figure 2–33, triple-click on the path name to select the full path, and press <Ctrl>+<C> to copy the information.
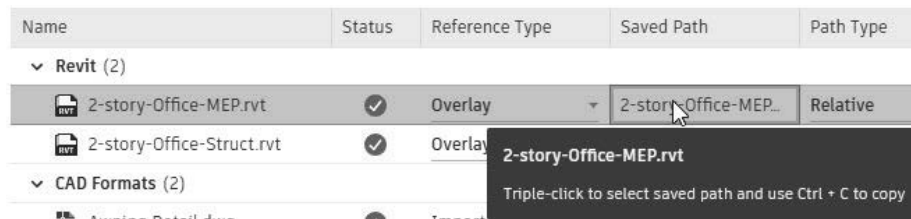

Figure 2–33

The following options are available:

- **Reload:** Reloads the file without additional prompts.

- **Reload From:** Opens the *Add Link* dialog box, which enables you to select the file you want to reload. Use this if the linked file location or name has changed. This is accessed by expanding **Reload**.

- **Unload:** Unloads the file so that the link is kept, but the file is not displayed or calculated in the project. Use **Reload** to restore it.

  *Note: For Revit links, some of these options are also available in the Project Browser. Expand the Revit Links section, then right-click on the Revit link and select **Reload, Unload, or Reload From…**.*

- **Remove:** Deletes the link or imported file from the host model.

- **Import:** Converts the linked file to an imported file.

Links can be nested into one another. How a link responds when the host project is linked into another project depends on the option in the *Reference Type* column.

- **Overlay:** The nested linked model is not referenced in the new host project.

- **Attach:** The nested linked model displays in the new host project.

The option in the *Path Type* column controls how the location of the link is remembered.

- **Relative**

  - Searches the root folder of the current project.

  - If the file is moved, the software still searches for it.

- **Absolute**

  - Searches the entire file path where the file was originally saved.

  - If the original file is moved, the software is not able to find it.

- Other options control how the linked file interfaces with worksets and shared positioning.

Unresolved Reference

When opening a project with linked files that have been moved or deleted, an *Unresolved References* dialog box will appear after the project opens in Revit, as shown in Figure 2−34. This message will only display for files that have been linked into the project and not for imported files. At the bottom of the dialog box, click **Show details** to view a list of the files that have unresolved issues.
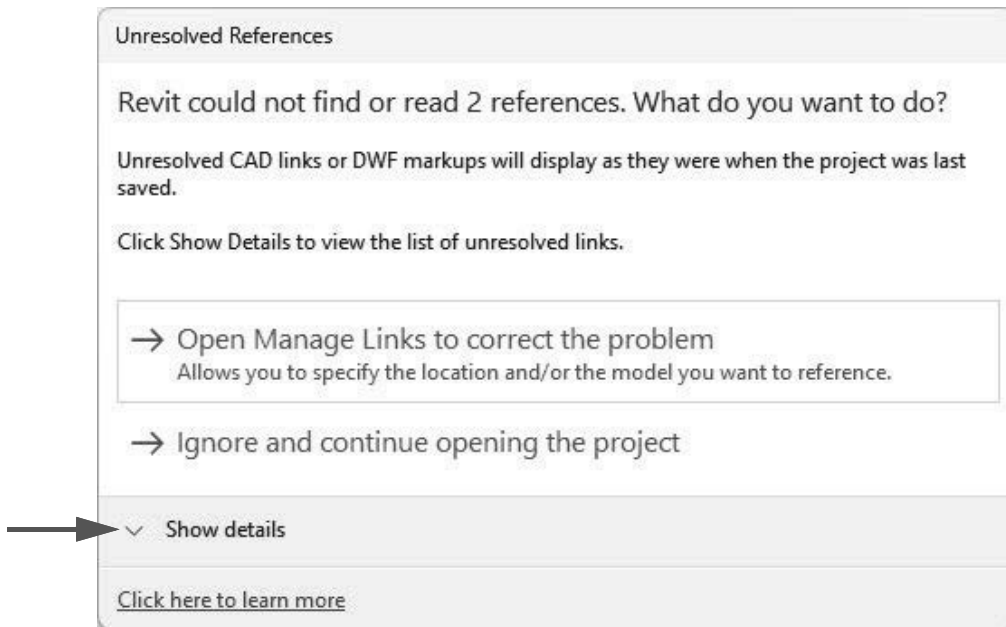

Figure 2−34

How To: Fix Unresolved References

1. After you open a Revit project that contains linked files, the *Unresolved References* dialog box displays.

2. In the *Unresolved References* dialog box, click **Open Manage Links to correct the problem**.

   • Alternatively, if you click **Ignore and continue opening the project**, you can open the *Manage Links* dialog box and resolve the issues at a later time. Note that if any elements in the project are hosted to a surface or element in a linked Revit model, the hosted elements will be orphaned or disassociated, potentially causing further issues.

3. In the *Manage Links* dialog box, any file that is missing will have a warning symbol in the *Status* column, as shown in Figure 2–35.
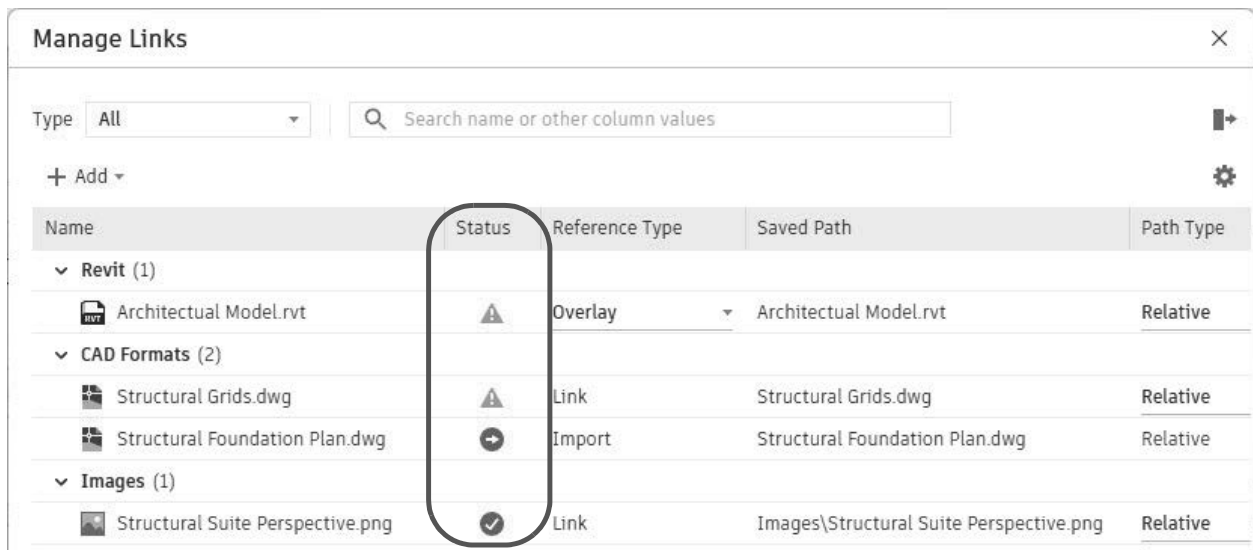

Figure 2–35

4. Click on the file in the *Name* column. The operation tools display at the top of the columns, as shown in Figure 2–36. Expand **Reload** and select **Reload from...**.
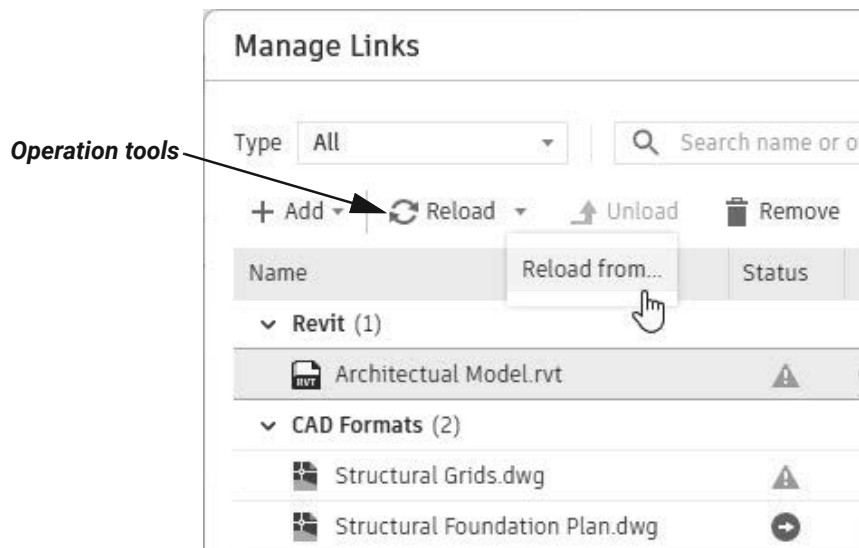

Figure 2–36

5. In the file browser dialog box, navigate to the file and click **Open**.

Practice 2a
Start a Project and Link Files – All Disciplines

Practice Objectives

- Start a Revit project.

- Link a CAD file.

- Link a Revit file.

- Modify the linked files in a view.

In this practice, you will start a Revit project, then link in a grid plan created in AutoCAD and a Revit model of the school. You will then modify the view properties. Figure 2−37 shows the completed practice.
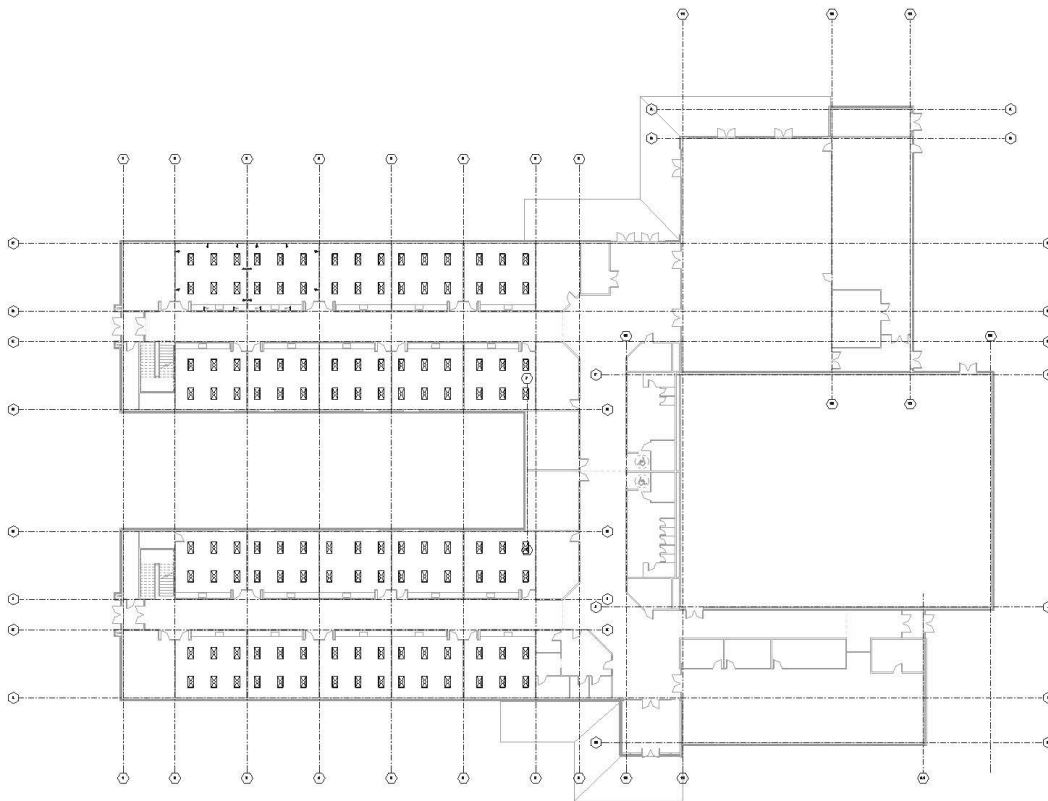

Figure 2−37

Task 1: Start a project.

1. On the Home screen, click the **New** button under the *Models* section. Alternatively, in the *File* tab, expand [ ] (New) and click [ ] (Project).

2. In the *New Project* dialog box, click **Browse...**.

3. In the *Choose Template* dialog box, navigate to the practice files *Templates* folder, select **Imperial-MEP-Template.rte**, and click **Open**.

4. In the *New Project* dialog box, click **OK**. (There are no elements in this file, only datums and basic views.)

5. In the *File* tab, expand 🖫 (Save As) and select 🖻 (Project). In the *Save As* dialog box, navigate to the practice files folder and name the project as **School-MEP-Start.rvt**. Click **Save**.

6. Review the Project Browser and note that the project has default floor plan, ceiling plan, and elevation views. By default, the **1 - Mech** view is open and displays in bold in the Project Browser within the *Mechanical>HVAC>Floor Plans* section. (You may need to scroll down in the Project Browser as this template displays all MEP disciplines.)

7. Note in the view area that the elevation markers are the only thing that displays.

Task 2: Link a CAD file.

1. In the *Insert* tab>*Link* panel, click 🖾 (Link CAD).

2. In the *Link CAD Formats* dialog box, navigate to the practice files *Working Models>General>CAD* folder and select the file **Struct-School_Grids.dwg**, then set the following options, as shown in Figure 2–38:

    • Uncheck **Current view only** (if applicable)

    • *Colors:* **Black and White**

    • *Layers/Levels:* **All**

    • *Import units:* **Auto-Detect**

    • *Positioning:* **Auto - Origin to Internal Origin**

    • *Place at:* **Level : Level 1**
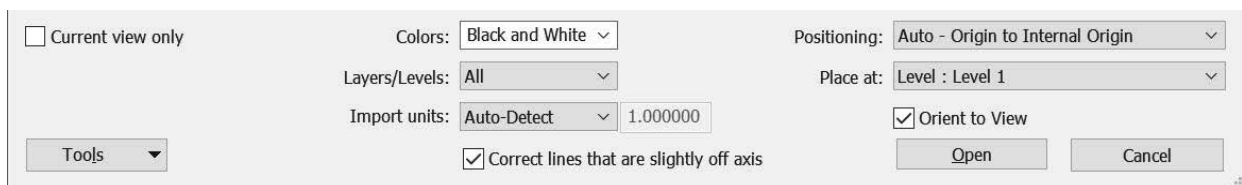
    • Keep **Orient to View** checked

Figure 2–38

3. Click **Open**. The linked CAD file is placed in the project.

4. Double-click your mouse wheel or type **ZF** (Zoom to Fit) to zoom to the extents of the view.

5. Select the linked CAD file. In Properties, you can see that it is an imported symbol. In the view, you can see a pin at the center of the CAD file because it was imported origin to internal origin.

6. In the ribbon, expand the *Select* drop-down list under the ⍋ (Modify) tool and make sure that **Select Links** is checked, or verify that the ⍩ (Select Link) icon in the Status Bar does not have a red X on it.

7. Right-click on the linked file and select **Override Graphics in View>By Category**.

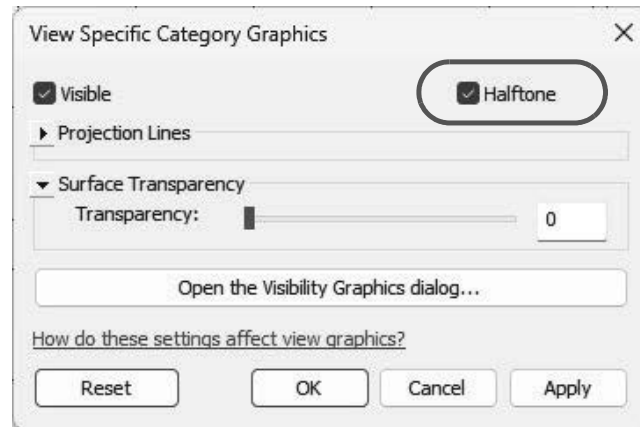8. In the *View Specific Category Graphics* dialog box, select **Halftone**, as shown in Figure 2–39.

Figure 2–39

9. Click **OK**.

10. Click in an empty space in the view to release the selection. The linked file displays in halftone. Note that the view's elevation markers are still dark.

11. From the Project Browser, open the Mechanical>HVAC> Floor Plans>**2 - Mech** view. The CAD file linked in level 1 does not display because the **Place at** in the *Link CAD Formats* dialog box was set to **Level : Level 1**.

12. Open the Electrical>Lighting>Floor Plans>**1 - Lighting** view. The grids display because this view is associated to level 1.

    *   Note that the grid is not set to halftone like in the **1 - Mech** view. This is because **Override Graphics in View** is view specific.

    *   If you do not want the CAD file to display in other level 1 views, you would select the **Current view only** option in the *Link CAD Formats* dialog box.

13. Save the project.

Task 3: Link in a Revit file.

1. In the Quick Access Toolbar, click 🏠 (Default 3D View). Note that the linked structural grid CAD file displays but is not halftone, and there are two level lines (they may be hard to see).

2. Repeat the steps you performed in the *1 - Mech* view and override the graphics of the structural grid CAD file to **Halftone**. The level lines are now easier to see.

3. Using your mouse wheel, zoom in to the levels and select one, then type **VH** to hide them in the view.

4. Double-click your mouse wheel to zoom to the extents of the view.

5. In the *Insert* tab>*Link* panel, click 🔲 (Link Revit).

6. In the *Import/Link RVT* dialog box, navigate to your practice files *Working Models>General> Revit Link Files* folder and select the file **School-Arch.rvt**. Ensure that the *Positioning* is set to **Auto - Internal Origin to Internal Origin** and click **Open**.

7. Type **ZF** (Zoom to Fit). The new building displays in the active view.

8. With nothing selected, in Properties, look at the *Discipline* and note that it is set to **Mechanical**. Because it is set to Mechanical, all of the architectural elements (walls, roofs, and windows) are grayed out.

9. Zoom and pan around the model. You can see that the Revit linked model's MEP-related elements display darker than the architectural elements that are grayed out, as shown in Figure 2–40.

MEP fixtures in the linked model

Architectural elements in the linked model
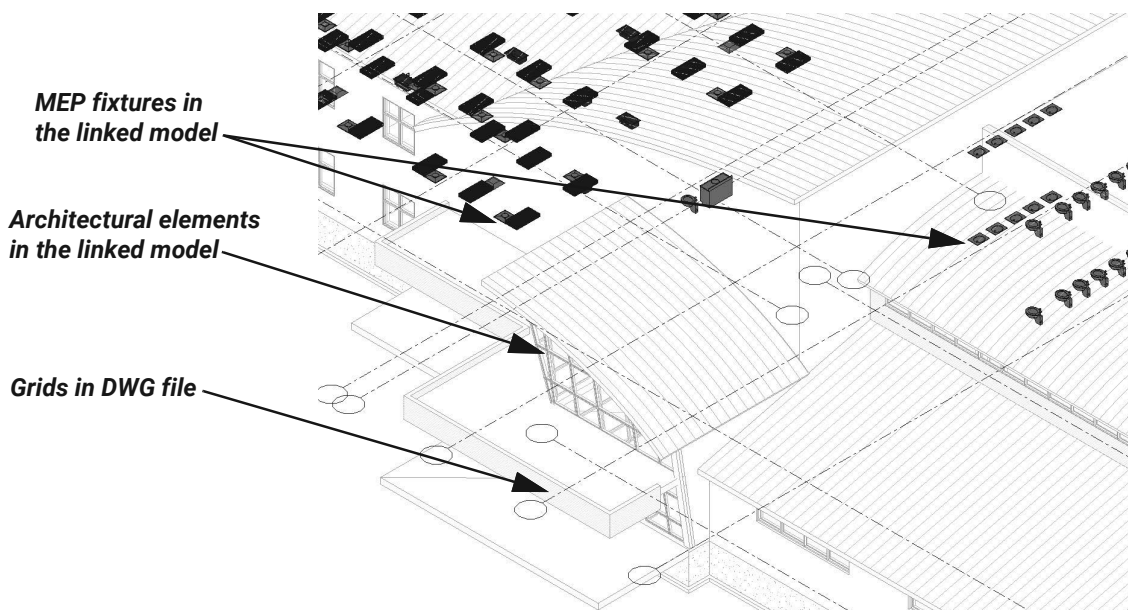
Grids in DWG file

Figure 2–40

10. Select the school linked model in the view and in the *Modify | RVT Links* tab>*Modify* panel, click 📌 (Pin). This will ensure that the linked model will not be accidentally moved in the project.

11. In the *Select* panel, click ⬚ (Modify), or click in an empty area in the view to release the selection.

12. In the *View* tab>*Graphics* panel, click 🔲 (Visibility/Graphics), or type **VG** or **VV** to open the *Visibility/Graphic Overrides* dialog box.

13. Select the *Revit Links* tab. Next to **School-Arch.rvt**, check the checkbox for **Halftone**, as shown in Figure 2−41. Setting a Revit link to halftone will help when trying to see the difference between objects in the linked architectural model and MEP objects.
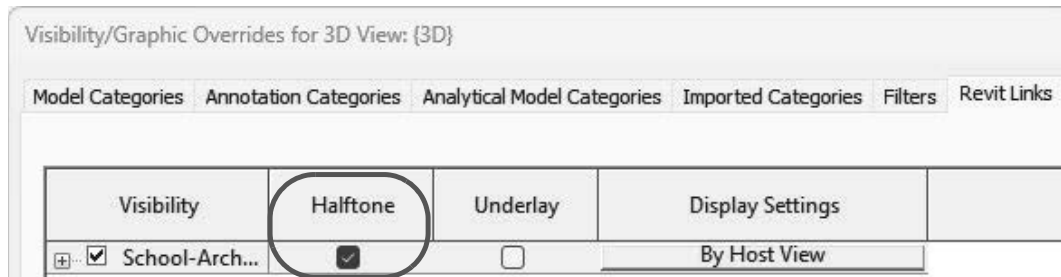

Figure 2−41

14. Select the *Imported Categories* tab and note that the linked **Struct-School_Grids.dwg** is set to *Halftone*. This is because you used **Override Graphics in View>By Category...** to set the file to halftone and did not use **By Element**.

15. Click **OK**. Note that the lighting fixtures, air terminals, and plumbing fixtures in the linked Revit model are now halftone as well.

16. In the View Control Bar, change the *Visual Style* to **Consistent Colors**, as shown in Figure 2−42, and note that the MEP objects and metal roofs darken.
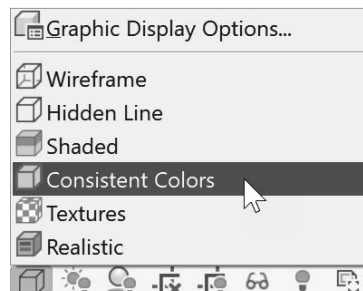

Figure 2−42

17. In the view, try to select on the lighting fixture, air terminal, or plumbing fixture. The linked Revit model **School-Arch.rvt** highlights and displays in Properties. This is because those objects are a part of the linked model.

18. Click in an empty area in the view to release the selection.

19. Zoom to fit the view.

20. Save and close the project.

End of practice

2.8 Setting Up Levels

Levels define floors and vertical heights in a project, like the first and second floor. The default template starts with two levels, but you can add as many as needed, including negative heights for things like basements or footings, as shown in Figure 2–43. Levels must be created in an elevation or section view, and once an element is attached to a level, it will move with that level if it changes. Levels can be shown or hidden in the default 3D view, where they can be modified and copied, but not created.
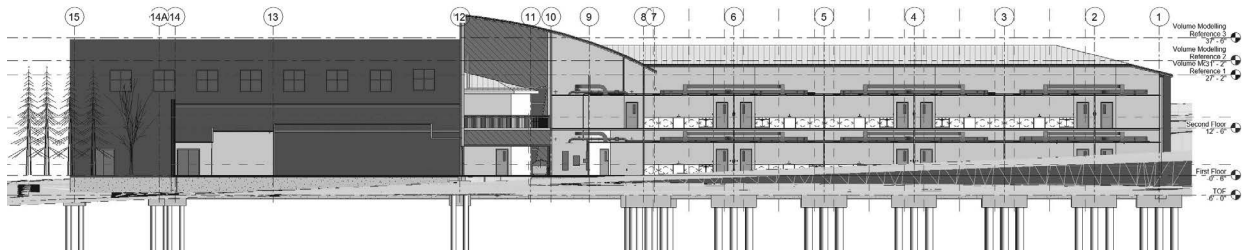
Figure 2–43

There are tools that you can utilize while drawing levels, such as modify tools, draw tools, and drawing aids like temporary dimensions and alignment lines. You will learn more about these tools in ***Chapter 5 Basic Sketching and Modify Tools***.

How To: Create Levels

1. Open an elevation or section view.

2. In the *Architecture* or *Structure* tab>*Datum* panel, click (Level), or type **LL**.

3. In the Type Selector, set the level head type, if needed.

4. In the *Modify | Place Level* tab>*Plan Views* panel, check **Create Plan View**, as shown in Figure 2–44.
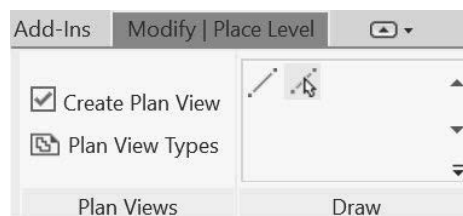

Figure 2–44

5. Click **Plan View Types** to select or unselect the types of views to create when you place the level. Figure 2–45 shows the *Plan View Types* dialog box.

    Note: *If you have Structural Tabs and Tools turned off in Revit Options>User Interface, you will not see the Structural Plan in the Plan View Types dialog box.*
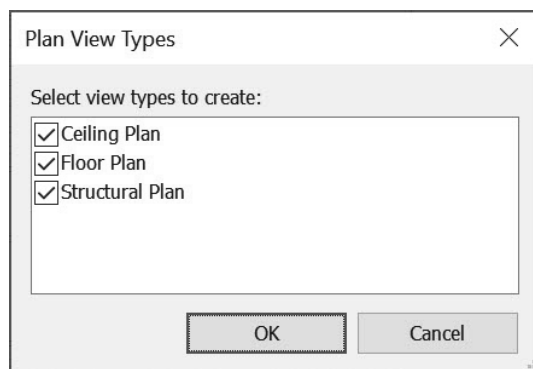

Figure 2–45

6. In the *Modify | Place Level* tab>*Draw* panel, click either (Pick Lines) to select an element or (Line) to sketch a level. Sketch the level lines in a consistent direction, either from left to right or right to left. When using **Pick Lines**, ensure that you do not place levels on top of each other or other elements by mistake.

    *   Level names are automatically incremented as you place them. This automatic numbering is most effective when you use names such as Floor 1, Floor 2, etc. (as opposed to First Floor, Second Floor, etc.). In addition, this makes it easier to find the view in the Project Browser.

7. Continue adding levels as needed.

How To: Use Draw and Modify Tools When Adding Levels

1. A fast way to create multiple levels is to use the (Pick Lines) option. In the Options Bar, specify an *Offset,* select an existing level, and then pick above or below to place the new level, as shown in Figure 2−46.

   Note: You specify above or below the offset by hovering the cursor on the needed side.
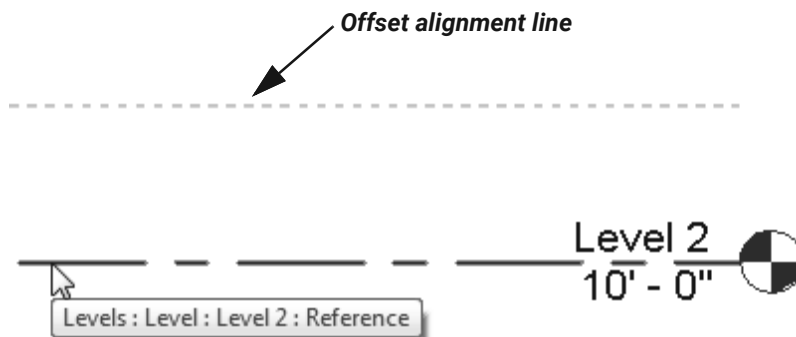
Offset alignment line

Level 2
10' - 0"

Levels : Level : Level 2 : Reference

Figure 2−46

2. When using the (Line) option, alignments and temporary dimensions help you place the line correctly, as shown in Figure 2−47.

Temporary dimension

Alignment line

Extension
10' - 0"

Level 2
10' - 0"

Level 1
0' - 0"

First click

Level 3
20' - 0"
Extension

Level 2
10' - 0"

Level 1
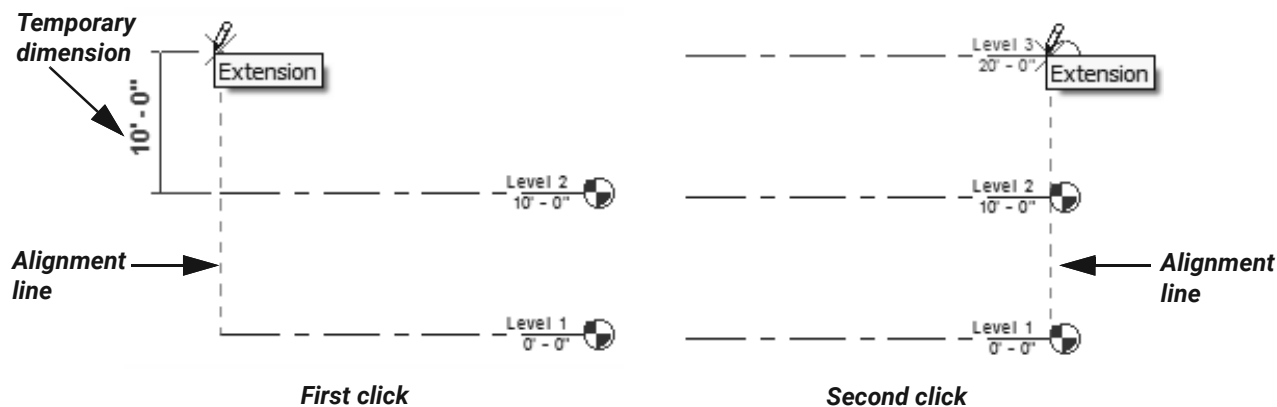0' - 0"

Alignment line

Second click

Figure 2−47

3. Use tools from the *Modify* tab like (Copy) to duplicate level lines. The level names are incremented but a plan view is not created. These are called **reference levels**.

Modifying Levels

You can change levels using standard controls and temporary dimensions, as shown in Figure 2–48 to the levels' appearance. You can also make changes to the name and height of the level by selecting on the individual items in the view as well as change these in Properties. You can change just the name of the level in the Project Browser but not the height.
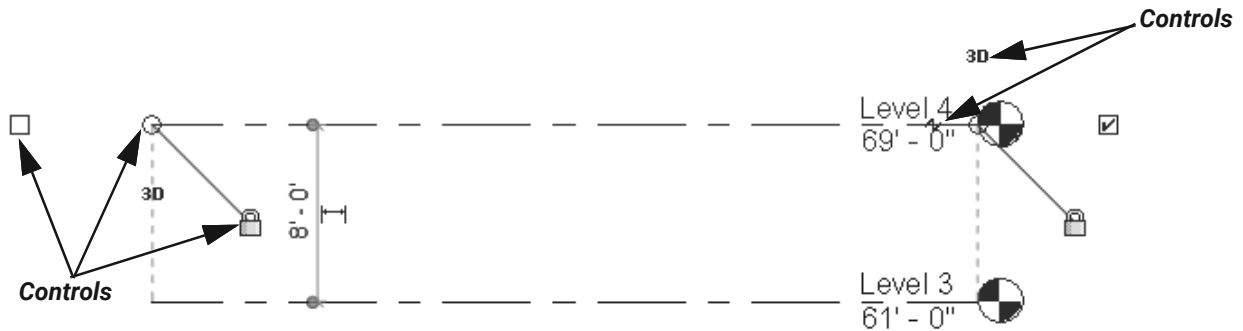

Figure 2–48

- ☑ ☐ (Hide/Show Bubble) displays on either end of the level line and toggles the level head symbol and level information on or off.

- **2D** **3D** (Switch to 3d/2d extents) controls whether any movement or adjustment to the level line is reflected in other views (3D) or only affects the current view (2D).

- ⊕ (Modify the level by dragging its model end) at each end of the line enables you to drag the level head to a new location.

- 🔒 🔓 (Create or remove a length or alignment constraint) controls whether the level is locked in alignment with the other levels. If it is locked and the level line is stretched, all of the other level lines stretch as well. If it is unlocked, the level line stretches independent of the other levels.

- Click ⚡ (Add Elbow) to add a jog to the level line, as shown in Figure 2–49. Drag the shape handles to new locations as needed. This is a view-specific change.
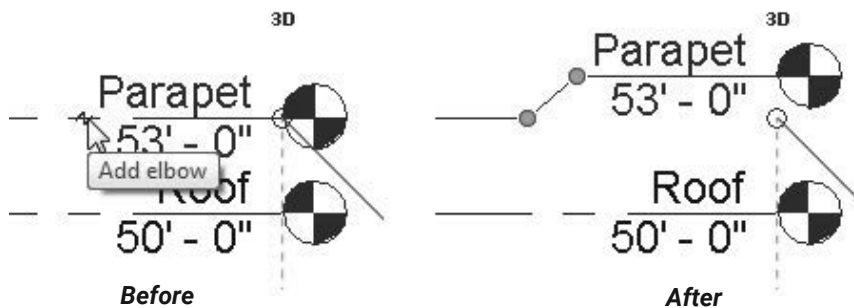

Figure 2–49

How To: Modify a Level's Name and Elevation

1. To change the level name or elevation, double-click on the information next to the level head, or select the level and modify the *Name* or *Elevation* fields in Properties, as shown in Figure 2–50.
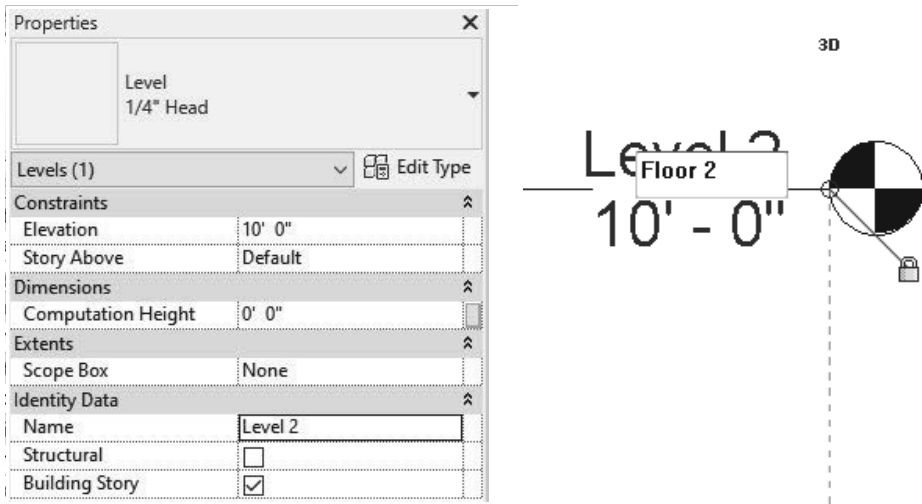

Figure 2–50

2. A *Confirm Level Rename* dialog box displays, prompting you to rename the corresponding views, as shown in Figure 2–51. Click **Yes** if you want to rename the view in the Project Browser.

   • If you change the name in the Project Browser, a *Confirm Plan View Rename* dialog box displays and you are asked if you would like to rename the corresponding level and views.
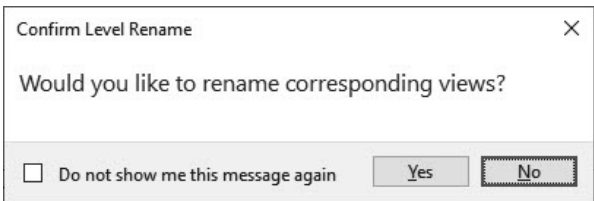
Figure 2–51

💡 **Hint: Modifying Measurements**

For imperial measurements (feet and inches), the software uses a default of feet. For example, when you type **4** and press <Enter>, it assumes **4'-0"**. For a distance such as 4'-6", you can type any of the following: **4'-6"**, **4'6**, **4-6**, or **4 6** (the numbers separated by a space). To indicate distances less than one foot, type the inch mark (") after the distance, or enter **0**, a space, and then the distance.

- If you delete a level, the views related to that level are also deleted. A warning displays, as shown in Figure 2–52.
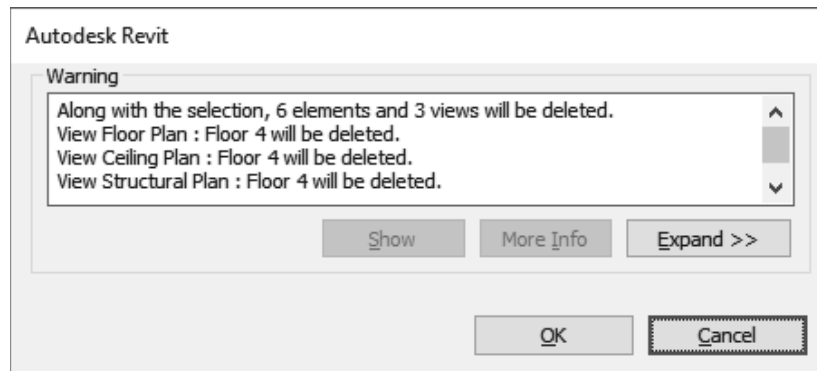

Figure 2–52

> 💡 **Hint: Copying Levels and Grids from Other Projects**
>
> Levels and grid lines can be added by drawing over existing levels or grids in an imported or linked file. They can also be copied and monitored from a linked Revit file. Some projects might require both methods.

Creating Plan Views

When you place a level, verify in the contextual tab that **Create Plan View** is selected. There may be instances where you do not need to create plan views for levels that only mark data points, such as the top of a storefront window or the top of a parapet. In these cases, either ensure the **Create Plan View** option is unchecked or copy the level. If needed, you can create a plan view manually. Level heads with views appear in blue, while those without views are black, as shown in Figure 2–53.
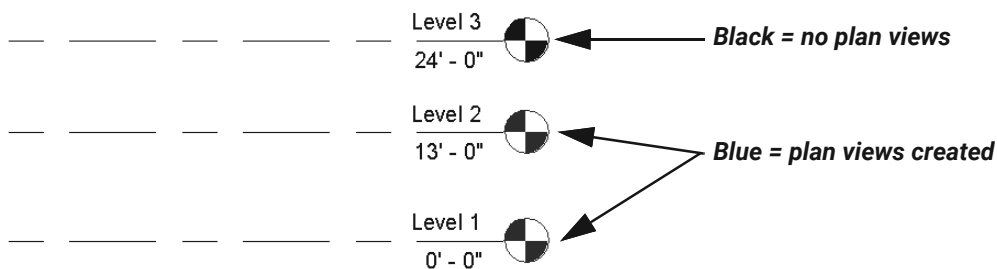
Figure 2–53

How To: Create Plan Views

1. In the *View* tab>*Create* panel, expand (Plan Views) and select the type of plan view you want to create, as shown in Figure 2−54.
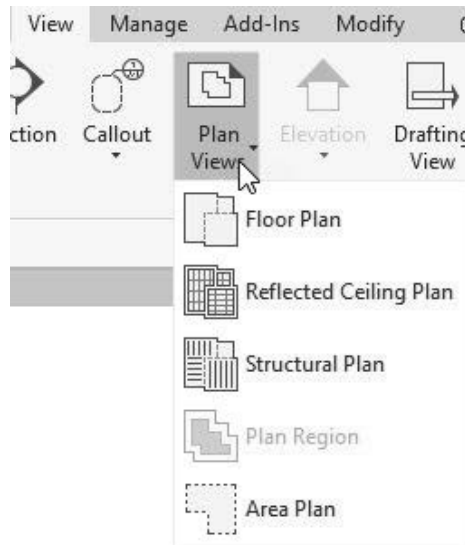

Figure 2−54

2. In the *New Plan* dialog box (shown in Figure 2−55), select the levels for which you want to create plan views. Hold <Ctrl> to select more than one level.

    • Clear **Do not duplicate existing views** to create a copy of an existing view.

Figure 2−55

3. Click **OK**.

*   Once a plan view is made from a level, you can double-click on the level head to open the related floor plan view. You create other plan views similar to creating a floor plan. Ceiling plans are typically created by default when you add a level with a view. If you do not want a level to have a ceiling plan, you can right-click on its name in the Project Browser and select **Delete**, as shown in Figure 2–56.
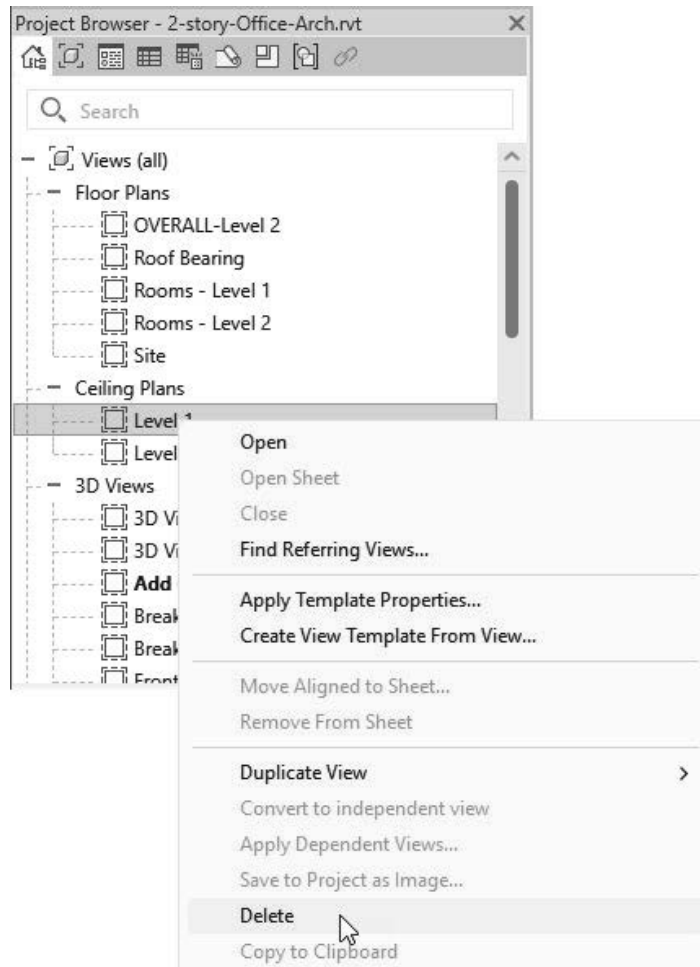
Figure 2–56

Practice 2b
Set Up Levels – All Disciplines

Practice Objectives

- Add and modify levels

- Create a floor and reflective ceiling plan view.

In this practice, you will set up the levels required in the project, as shown in Figure 2–57. You will then modify the levels' names and create floor and reflective ceiling plan views.
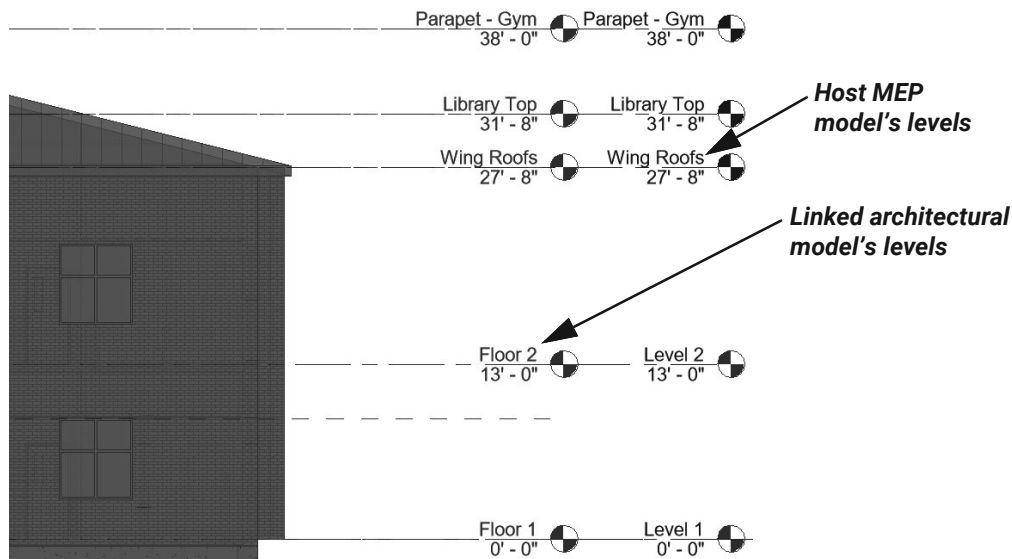
Figure 2–57

Task 1: Modify existing levels.

1. In the practice files *Working Models>General* folder, open **Gen-Levels.rvt**.

2. In the Project Browser, open the Mechanical>HVAC>Elevations (Building Elevation)>**North - Mech** view.

3. Pan and zoom in to the level markers to the right of the building.

4. There are two levels in the host project. Select the linked architectural model to help you distinguish between them, as shown in Figure 2–58.
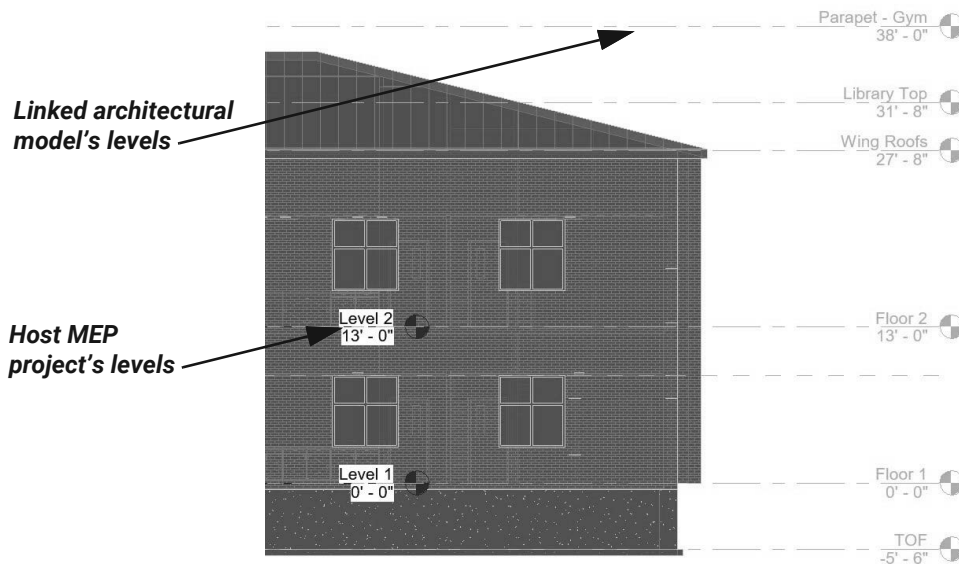
Figure 2–58

5. In the *View* tab>*Graphics* panel, click ⬛ (Visibility/Graphics), or type **VG** or **VV** to open the *Visibility/Graphic Overrides* dialog box.

6. On the *Revit Links* tab, check the checkbox in the *Halftone* column for **School-Arch.rvt**, as shown in Figure 2–59.
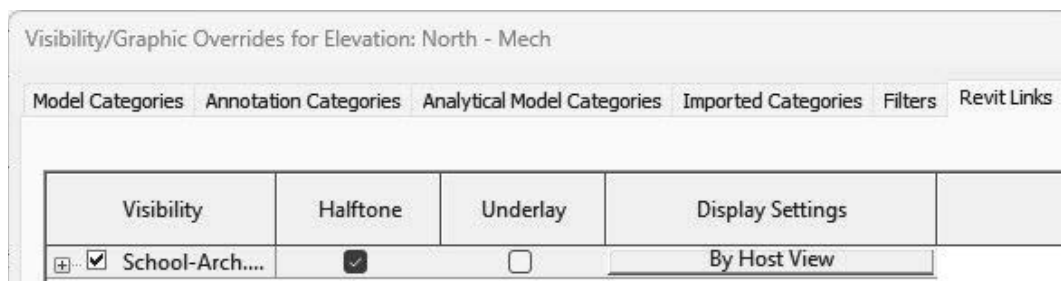

Figure 2–59

7. Click **OK**. It is now easier to distinguish between the linked model's and the host model's level lines as you work.

8. Click ⬚ (Modify).

9. Select one of the level lines (e.g., click on Level 2) in the host project. Select the level drag control (shown in Figure 2–60) and drag it to the side past the linked model's levels, as shown in Figure 2–60. Both of the host levels move together.
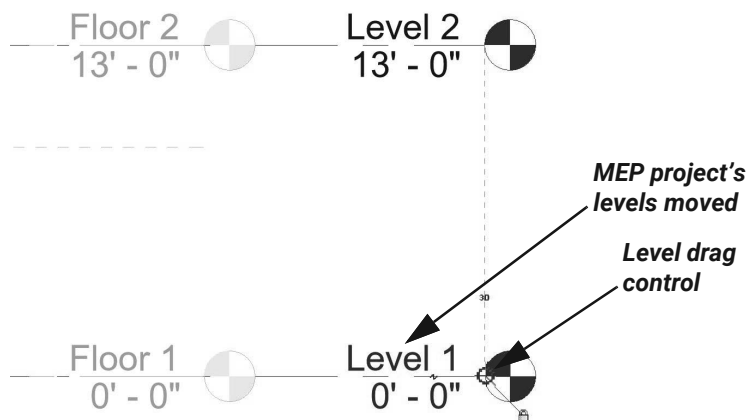

Figure 2–60

Note: If required, press <Tab> to select the level in the host project and not the linked model. If your levels disappear when dragging them, click ⊡ (Do Not Crop View) in the View Control Bar to turn off the crop region (which will look like this: ⊡).

10. Save the project.

Task 2: Create new levels.

1. In the *Architecture* tab>*Datum* panel, click ◑ (Level).

2. In the *Modify | Place Level* tab>*Draw* panel, click ⟋ (Pick Lines).

3. In the *Modify | Place Level* tab>*Plan Views* panel, check **Create Plan View**, then click 🗗 (Plan View Types).

4. In the *Plan View Types* dialog box, uncheck **Structural Plan** to clear it, as shown in Figure 2−61, then click **OK**.

   Note: *If you have Structural Tabs and Tools turned off in Revit Options>User Interface, you will not see the Structural Plan in the Plan View Types dialog box.*
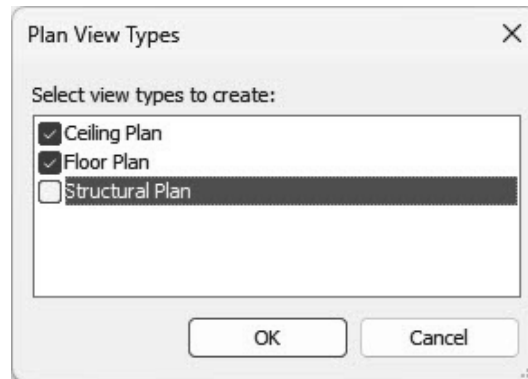

Figure 2−61

5. In the Options Bar, set the *Offset* to **14'-8"** and press <Enter>.

   Note: *Instead of typing the hyphen, just press <Spacebar> between typing the numerical values for feet and inches. When doing this, you do not need to add the symbols for feet and inches as well.*

6. Hover the cursor over the host project's **Level 2** level line and move the cursor slightly upward until you see the dashed alignment line display in line with the Wing Roofs level, as shown in Figure 2−62. (The alignment line in the image has been enhanced for clarity.) Click to place it.
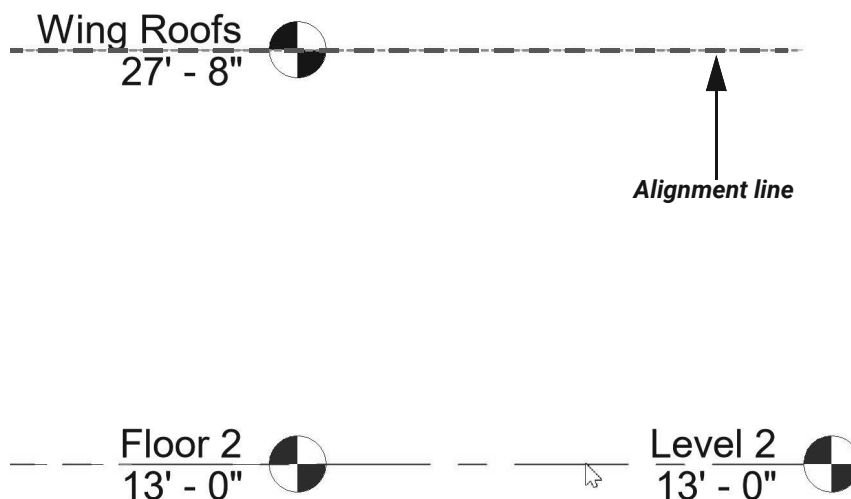

Figure 2−62

7. Click ⌖ (Modify).

    *   Note that the new level appears in the Project Browser under *Mechanical>HVAC>Floor Plans* and a new subsection named *???>Ceiling Plans*.

8. In the view, click on the new level name and type **Wing Roofs**, as shown in Figure 2−63, then press <Enter>.
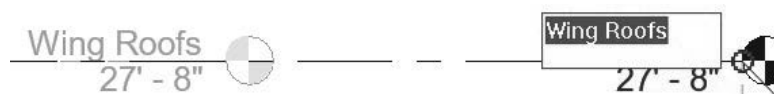

Figure 2−63

9. In the *Confirm Level Rename* dialog box, click **Yes** or press <Y> when prompted to rename the corresponding views. Note that in the Project Browser, in the *Floor Plans* section, the view name has changed.

10. In the Project Browser, in the *Mechanical* section, expand **???>Ceiling Plans** and select the **Wing Roofs** view.

11. In Properties, change the *Sub-Discipline* to **HVAC** and click **Apply**. In the Project Browser, the view moves to be under the *HVAC>Ceiling Plans* section.

12. Click ⌖ (Modify).

13. In the **North - Mech** view, start the **Level** command again. In the *Modify | Place Level* tab> *Draw* panel, click ⌖ (Pick Lines).

14. In the *Modify | Place Level* tab>*Plan Views* panel, clear the **Create Plan View** option. Verify in the Options Bar that the *Offset* is set to **0'-0"**. Hover your cursor over the linked model's **Library Top** level. Click to place the new level.

15. With the new level still selected, click and drag the level control (as shown in Figure 2−64) to the right to align with the other levels.

Figure 2−64

16. Click ⌖ (Modify).

17. Select the level and in Properties, in the *Identity Data* section, change the name to **Library Top**, as shown in Figure 2−65. Move the cursor into the view area to apply the changes and click in an empty area to release the selection.

Identity Data	⁑
Name	Library Top

Figure 2−65

*Note: You do not get the request to rename corresponding views because you unchecked **Create Plan View,** so no view was created when the level was placed in the view. The level head is black as opposed to blue like the rest of the levels. A black level head means that there are no views created for this level.*

18. In the North - Mech view, start the **Level** command again. Check **Create Plan View** and click ⬚ (Plan View Types).

19. In the *Plan View Types* dialog box, uncheck **Ceiling Plan** and verify **Structural Plan** is still unchecked so that only **Floor Plan** is checked, as shown in Figure 2−66. Click **OK**.
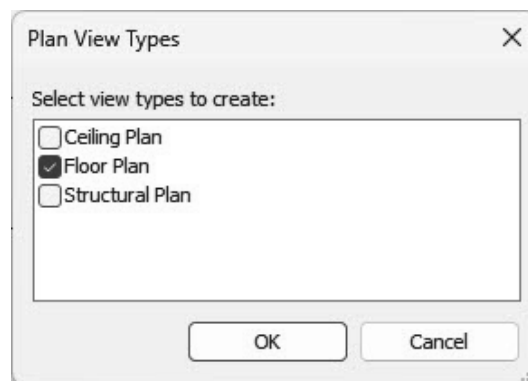
Figure 2−66

20. In the *Modify | Place Level* tab>*Draw* panel, click ⬚ (Pick Lines).

21. Add another level for the **Parapet - Gym**. Use the level control to drag the level to the right.

22. With the level still selected, change the name to **Parapet - Gym** and press <Enter>. (Rename the corresponding views.)

23. Click ⬚ (Modify).

24. Save the project.

Task 3: Create a ceiling and plan view.

1. In the *View* tab>*Create* panel, expand ⬜ (Plan Views) and click ⬜ (Floor Plan).

2. In the *New Floor Plan* dialog box, select the **Library Top** level, as shown in Figure 2−67, and click **OK**.
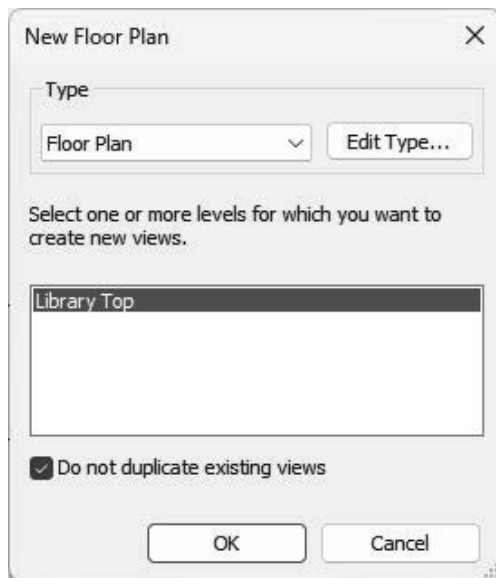

Figure 2−67

3. The new view opens and displays in the Project Browser.

4. In the *View* tab>*Create* panel, expand ⬜ (Plan Views) and click ⬜ (Reflected Ceiling Plan).

5. In the *New RCP* dialog box, select the **Library Top** level and click **OK**.

6. The new view opens. In the Project Browser, select the new view by expanding the *Coordination>???>Ceiling Plans* section. In Properties, set the *Discipline* to **Mechanical** and the *Sub-Discipline* to **HVAC** and click **Apply** to move the ceiling plan view into the correct section in the Project Browser.

7. Save and close the project.

End of practice

2.9 Creating Grids

Grids are annotation elements that display in most views, including plan, ceiling, section, elevation, and 3D views. They help organize your design when developing a layout and describe the pattern and location for columns, as shown in Figure 2−68. Grids can be multi-segmented, arcs, or straight lines, and they can be hidden in the view if needed. Each line or arc in a grid is a separate entity and can be placed, moved, and modified individually. Grids cannot be drawn in a 3D view but grids can be displayed in a 3D view, perspective view, or in a 3D view with a selection box, and when you click on a grid, the surface contour displays.
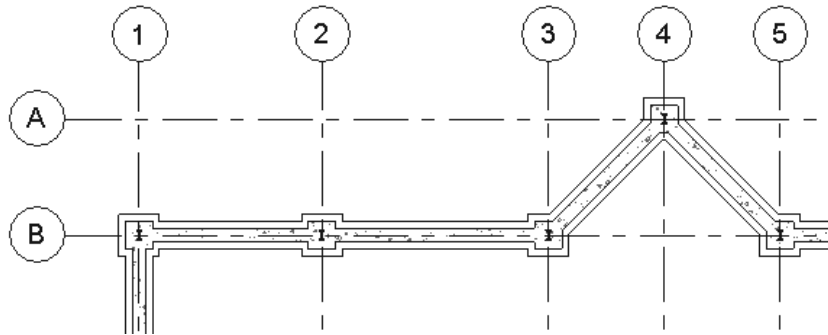

Figure 2−68

How To: Create a Grid

1. In the *Architecture* or *Structure* tab>*Datum* panel, click ⊞ (Grid), or type **GR**.

2. In the Properties, in the Type Selector, select the grid type, which will control the size of the bubble and the linestyle.

3. In the *Modify | Place Grid* tab>*Draw* panel (shown in Figure 2−69), select the draw method you want to use.

Figure 2−69

4. In the Options Bar, set the *Offset* if needed.

5. Start drawing grid lines. Grids can be sketched at any angle, but you should ensure that all parallel grids are sketched in the same direction (e.g., from left to right or from bottom to top). When using the **Multi-Segment** tool (shown in Figure 2−70), sketch the line and click
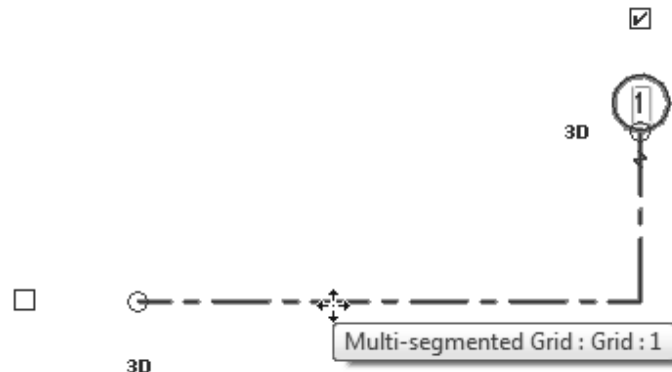
    ✔ (Finish Edit Mode) to complete the command.

Figure 2−70

How To: Turn On or Off Grids in 3D

1. Open a 3D or perspective view and press <Esc> twice to verify nothing is selected.

2. In Properties, click **Edit...** next to *Show Grids*, as shown in Figure 2−71.
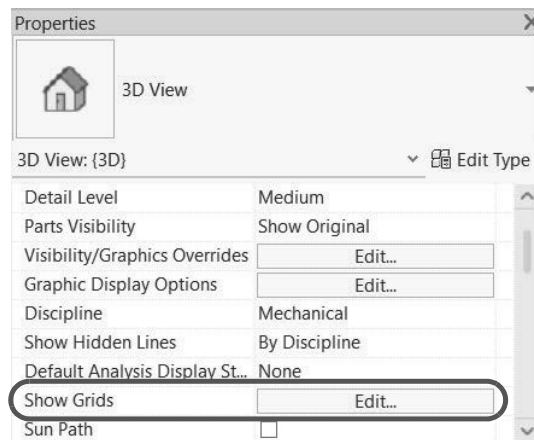

Figure 2−71

3. In the *Show Grids* dialog box, select the level(s) that you want the grids to display at in the 3D view, as shown in Figure 2−72.

Figure 2−72

4. Click **OK**.

5. (Optional) To display the grids on the bottom of a section box, in Properties, verify that **Section Box** is selected, and click **Edit...** next to *Show Grids*.

6. In the *Show Grids* dialog box, select only the **Project Grids On Section Box** option, as shown in Figure 2−73, and click **OK**. Note that you can also display the grids at a specific level and project the grids on the section box.
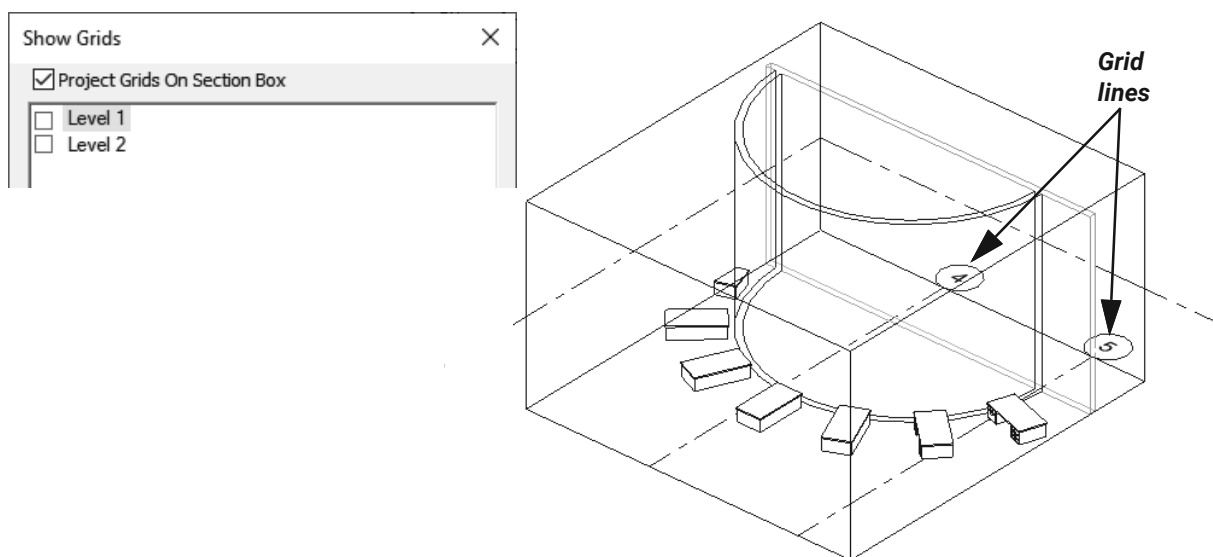

Figure 2−73

Modifying Grid Lines

Grid lines, like levels, are datum elements that you can adjust using controls, alignments, and temporary dimensions in the view, as shown in Figure 2–74. You can change the type using the Type Selector, and grid numbers can be letters, numbers, or a mix of both. To modify a grid number, double-click the bubble and type the new value, or change the *Name* in Properties. In MEP disciplines, grids serve as a reference guide to help align MEP elements with the architectural and structural models.
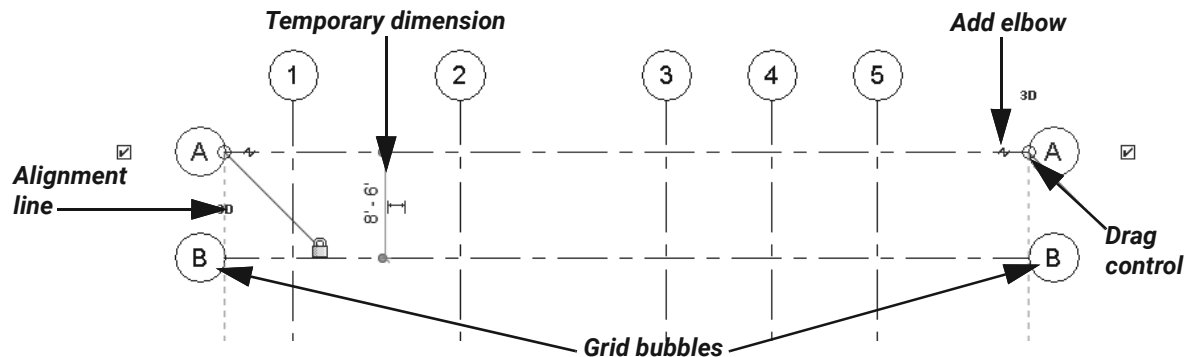

Figure 2–74

To modify the length of the grid line, select the grid line and click and drag the ⊕ (Modify the grid by dragging its model end) control to the new location, as shown in Figure 2–75.

Figure 2–75

In 3D views, grid lines can be edited just like in plan views – you can rename them, adjust their length using the drag control, and change the spacing by modifying temporary dimensions. To change how the grid symbols appear at each end of the grid line, use the *Type Properties* dialog box, where the first pick point is *End 1* and the second is *End 2*, as shown in Figure 2−76.
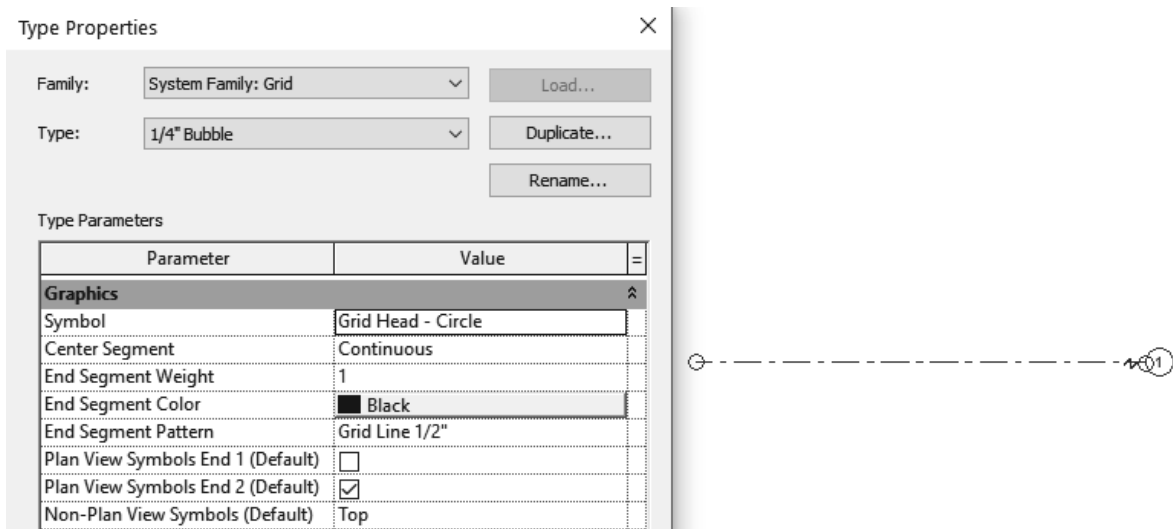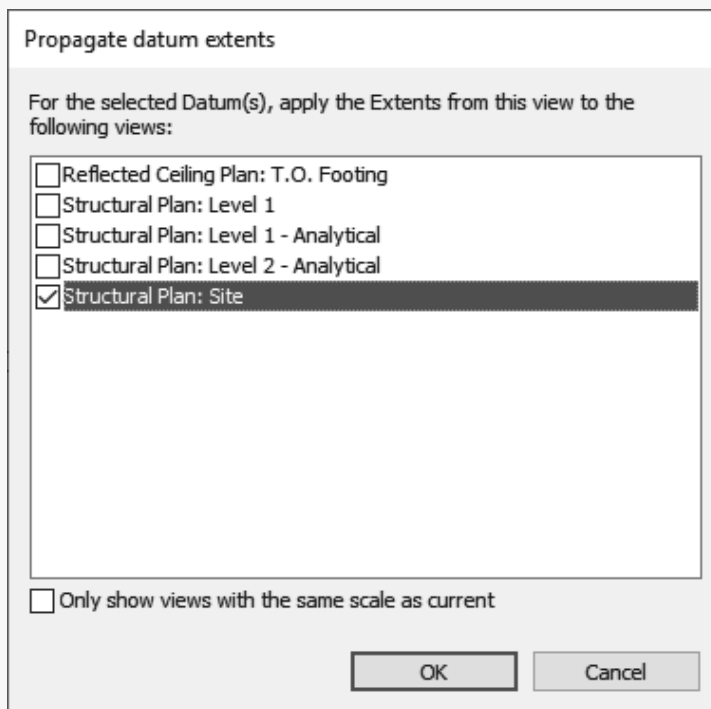

Figure 2−76

💡 Hint: Propagating Datum Extents

If column grids do not display in a view, this might be due to adding a level after the grid lines were added. To display the grid lines in plan views, select the grid lines in a view in which

they are displayed. In the *Modify | Grids* tab>*Datum* panel, click 🔲 (Propagate Extents). In the *Propagate datum extents* dialog box (shown in Figure 2−77), select the views to project the grid lines to.

Figure 2−77

- This also works for levels.

- 🔲 (Propagate Extents) is particularly useful to make grid lines display the same in all views.

Practice 2c
Add Grids – All Disciplines

Practice Objectives

- Add and modify grid lines.
- Modify grid properties in a 3D view.

In this practice, you will place grid lines using the linked CAD model as a guide. You will then turn grid lines on in a 3D view. Figure 2−78 shows a 3D view of the completed practice. Grids are being used in this practice only so you can learn how to place them in a project; they do not appear in other practices in this guide.
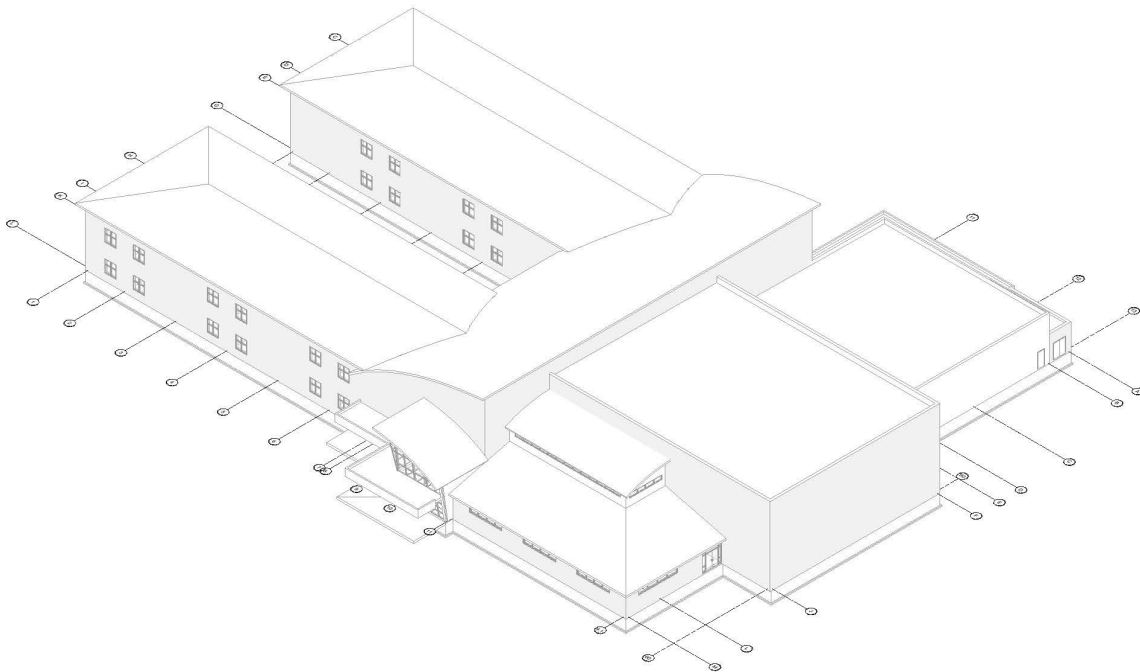

Figure 2−78

1. Open **Gen-Grids.rvt** from the practice files *Working Models>General* folder.
2. From the Project Browser, open the Coordination>All>FloorPlans>**Level 1** view.

3. Type **VV** to open the *Visibility/Graphic Overrides* dialog box. On the *Revit Links* tab, in the *Visibility* column, clear the checkbox next to **School-Arch.rvt**, as shown in Figure 2−79, to turn off the linked Revit file in the view.
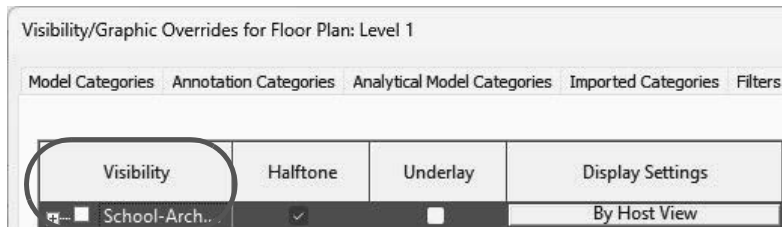

Figure 2−79

4. Click **OK**.

5. The linked architectural model is turned off in the view and only the DWG's grid displays.

6. Zoom and pan to the upper-right corner of the horizontal grids A and B that are indented to the right.

7. In the *Architecture* tab>*Datum* panel, click (Grid).

8. In the *Modify | Place Grid* tab>*Draw* panel, click (Pick Lines).

9. Using the linked DWG as a guide, select grid line **A** on the linked file to create a grid line in the host project. Note that there is a grid bubble on each end of the grid line.

10. Click (Modify).

11. Zoom in to one of the grid heads and click inside the bubble, then type **A** and press <Enter>. Zoom out so you can see both ends of grid line A and note that both grid bubbles show **A**.

12. Click (Modify). Note that the host grid line is darker than the grid lines in the linked DWG file.

13. Start the **Grid** command again and select **Pick Lines** from the *Draw* panel.

14. Starting from the next horizontal grid line, which is **B**, continue selecting the rest of the horizontal grid lines in alphabetical order. Note that the grid lines for **G**, **H**, **I**, and **K** are indented to the left. The letters automatically increment. When you get to grid line **M**, pan up to the upper-left corner.

15. Click the first vertical grid line on the linked file and change the letter in the bubble to **1**. Note that you do not need to end the command to change the grid bubble value.

16. Continue selecting the vertical grid lines. The numbers automatically increment. Pay close attention as you get to grid lines **10** and **11** − grid line **10**'s bubble is down by grid line **F** and grid lines **11**, **12**, and **13** are up by grid line **A**.

17. Zoom in to the lower-right corner and note that there are grid lines **4.1** and **60** in this linked file.

18. You should still be in the **Grid** command. Select grid line **4.1** to place a grid line in the host project. Zoom in to the grid head and click inside the bubble, type **4.1**, and press <Enter>.

19. Repeat this for grid line **60**.

20. Click ⬓ (Modify) to end the command.

21. The grid lines in the host should all be the same length as the DWG's grid lines and each end of the grid lines should have a bubble, as shown in Figure 2−80.
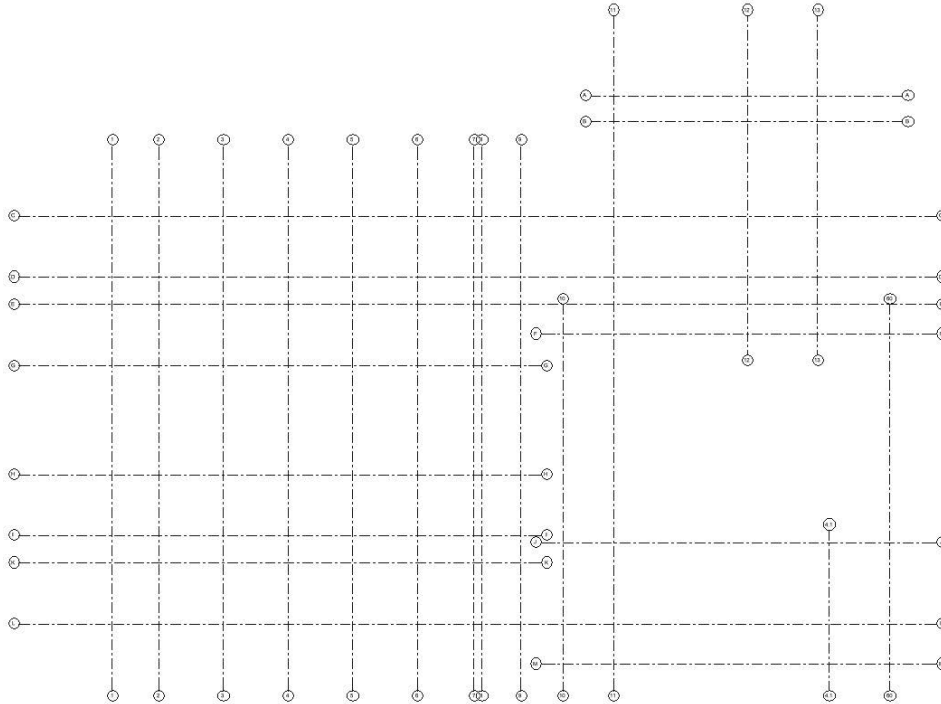

Figure 2−80

22. In the Quick Access Toolbar, click 🏠 (Default 3D View).

23. Click ⬓ (Modify) to ensure nothing in the view is selected.

24. In Properties, in the *Graphics* section, click **Edit...** next to *Show Grids*.

25. In the *Show Grids* dialog box, select **Level 1** and click **OK**.

26. The grids now display as shown in Figure 2–81.
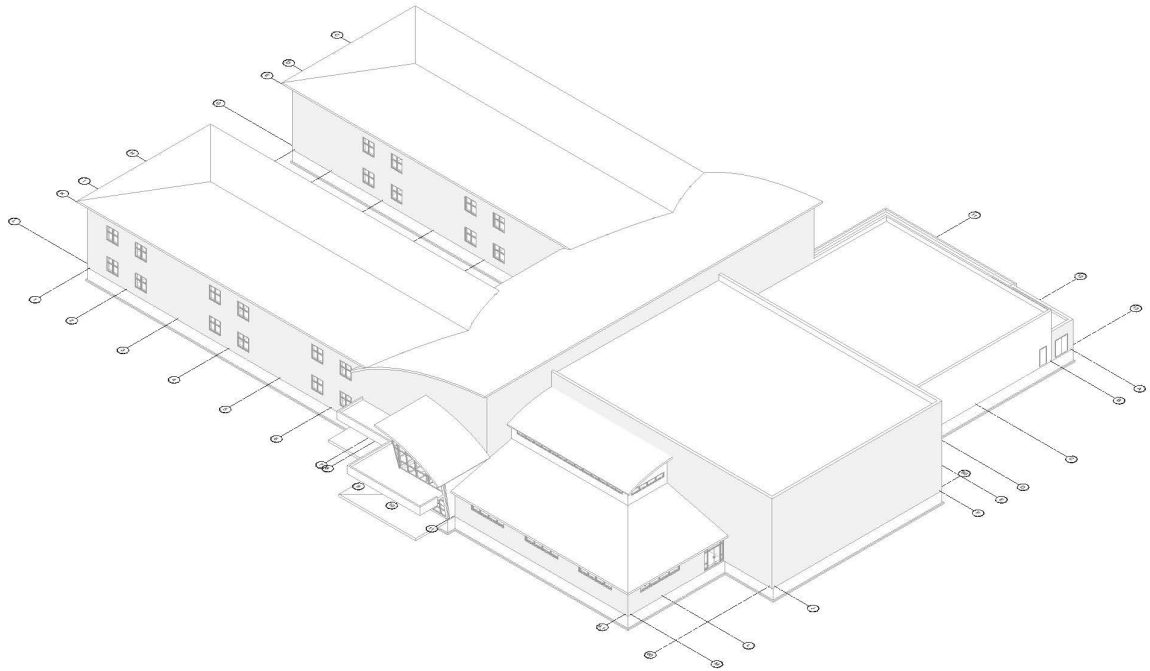
Figure 2–81

27. Save and close the project.

End of practice

Chapter Review Questions

1. What type of view do you need to be in to add a level to your project?

    a. Any 3D view.

    b. As this is done using a dialog box, the view does not matter.

    c. Any plan view.

    d. Any section or elevation view.

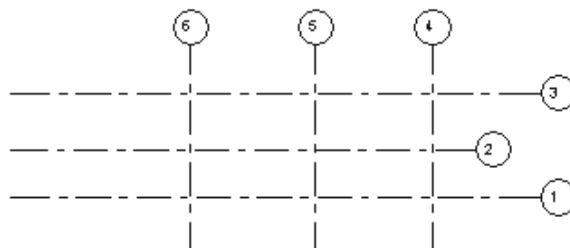2. How do you line up grid lines that might be different lengths, as shown in Figure 2–82?

Figure 2–82

    a. Delete and redraw the grid lines.

    b. Select the grid line and use the drag control to line up with the other grid lines.

    c. Select the grid line, right-click, and select **Auto-Align**.

    d. In Properties, change the *Length* to get them into position.

3. Grids can be displayed in a 3D view.

    a. True

    b. False

4. Which of the following types of CAD formats can you import into Revit? (Select all that apply.)

    a. .DWG

    b. .XLS

    c. .SAT

    d. .DGN

5. Imported CAD files can be reloaded in the *Manage Links* dialog box.
   a. True
   b. False

6. To modify linked CAD files, you need to open what dialog box?
   a. Type Properties
   b. Link CAD
   c. Manage Links
   d. Insert from File

7. When linking a Revit model, what should be done to keep the linked model from moving?
   a. Lock the model.
   b. Pin the model.
   c. Center the model.
   d. Coordinate the model.

8. How many times can one project file be linked into another project?
   a. Once
   b. It is limited by the size of the link
   c. As many as you want

9. When creating a new level, you have to change all corresponding views.
   a. True
   b. False

10. Where can you change a level's name?
    a. In the Options Bar.
    b. Within the plan view and in the Options Bar.
    c. In the Project Browser, in Properties, or in an elevation view by clicking on the level's name.
    d. You cannot change the name after the level has been placed in the view.

11. If imported with the **Current view only** option selected, you can set the imported DWG to be in the foreground or background throughout the project's life cycle.

    a. True

    b. False

Command Summary

Button	Command	Location
	Grid	• **Ribbon:** *Architecture* tab>*Datum* panel • **Shortcut:** GR
	Import CAD	• **Ribbon:** *Insert* tab>*Import* panel
	Import PDF	• **Ribbon:** *Insert* tab>*Import* panel
	Level	• **Ribbon:** *Architecture* tab>*Datum* panel • **Shortcut:** LL
	Link CAD	• **Ribbon:** *Insert* tab>*Link* panel
	Link PDF	• **Ribbon:** *Insert* tab>*Link* panel
	Link Revit	• **Ribbon:** *Insert* tab>*Link* panel
	Manage Links	• **Ribbon:** *Insert* tab>*Manage* panel or *Manage* tab>*Manage Project* panel • **Ribbon:** (with link selected) *Modify	RVT Links* tab>*Link* panel
	Multi-Segment (Grid)	• **Ribbon:** *Modify	Place Grid* tab>*Draw* panel
	Propagate Extents	• **Ribbon:** *Modify	Grids* or *Modify	Levels* tab>*Datum* panel
	Temporary Hide/Isolate	• **View Control Bar**