Chapter 1

Introduction to Autodesk Revit 2019 for MEP

Learning Objectives

After completing this chapter, you will be able to:

- *Understand the basic concepts and principles of Revit for MEP*
- *Understand various terms used in Revit for MEP*
- *Describe the parametric behavior of Revit*
- *Start the Revit 2019 program*
- *Understand the interface of Revit 2019*
- *Access the Revit 2019 Help*

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INTRODUCTION TO Autodesk Revit FOR MEP

Autodesk Revit is a Building Information Modeling software, which is developed for professionals in the AEC (Architecture, Engineering, and Construction) industry. Revit is used by Architects, Structural Engineers, MEP Engineers, Designers and Contractors for a building project.

The MEP functionality in Revit was introduced in 2006 as a separate software, Revit MEP. It was specifically built for MEP engineers and designers. Since then, it has become very popular in the Building Information Modeling (BIM) workflow. This software provides engineers and designers with tools for the analysis, modeling, and design of various building elements and systems for MEP (Mechanical, Electrical, and Plumbing) services. Since 2017 release of Autodesk Revit, Revit MEP has been discontinued as an individual software and the MEP functionality of this software is now available in the Revit software.

Revit is a BIM software that helps users to coordinate the documentation of MEP designs with other engineering disciplines. Its integrated parametric modeling technology is used to create the information model of a project and to collect and coordinate information across all its representations. In Autodesk Revit, drawing sheets, 2D views, 3D views, sectional view, callout details, and schedules directly represent the same building information model (BIM) as the real one does. Autodesk Revit (for MEP) is developed with an approach to bring the Mechanical, Electrical, and Plumbing engineers together under the BIM framework and make the building services system efficient and interoperable with other systems. In Revit, a designer can not only work with various pre-designed elements of different MEP disciplines but can also model customized elements and add parameters to them. This helps in modeling complex designs with various permutations. Different disciplines of Revit (for MEP) are briefly described next.

Mechanical Discipline

In the Mechanical discipline, you can develop an HVAC (Heating, Ventilation, and Air Conditioning) system, keeping in view the energy requirements of that building. The study of the energy requirements of the building is very essential for developing an efficient and cost effective design. In mechanical discipline, you can design the whole ducting network with the ventilation layout plan. You can also route the piping or ducting networks manually or generate routing solutions by using various tools in this software. In this discipline, you can also develop a Fire Suppression System.

Electrical Discipline

While working with the electrical discipline, you can design an electrical system. In this system, you can add various lighting fixtures, switches, alarms, communication devices, and more as per the requirement of the project. You can also add panels and prepare panel schedules and perform the load analysis. Further, you can connect the devices and fixtures through logical circuits.

Plumbing Discipline

In this discipline, you can design a plumbing system for a project. In the plumbing system, you can add plumbing fittings, accessories, and fixtures as per the requirement of a project. In addition, you can also design fire fighting system for a building and add fire safety components to the system.

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Autodesk Revit AS A BUILDING INFORMATION MODELER (BIM)

The history of computer aided design and documentation dates back to the early 1980s when architects and engineers began using this technology for documenting their projects. Realizing its advantages, information sharing capabilities were developed, especially to share data with other consultants. This led to the development of object-based CAD systems in the early 1990s. Before the development of these systems, objects such as HVAC components, pipes, plumbing fixtures, electrical fixture, and more were stored as a non-graphical data with the assigned graphics. These systems arranged the information logically but were unable to optimize its usage in a building project. Realizing the advantages of the solid modeling tools, the mechanical and manufacturing industry professionals began using the information modeling CAD technology. This technology enabled them to extract data based on the relationship between model elements.

The Building Information Modeling (BIM) provided an alternative approach to building design, construction, and management. This approach, however, required a suitable technology to implement and reap its benefits. In such a situation, the use of parametric technology with the Building Information Modeling approach was envisaged as an ideal combination. In 1997, a group of mechanical CAD technologists began working on a new software dedicated to the building industry. They developed a software that was suitable for creating MEP projects. This led to the development of Autodesk Revit.

Autodesk Revit is a design and documentation platform in which a digital MEP model is created using the parametric elements such as HVAC system, mechanical equipment, plumbing network, fire fighting, and so on. All MEP elements have inherent characteristics, and therefore, they can be tracked, managed, and maintained by using computer.

BASIC CONCEPTS AND PRINCIPLES

Autodesk Revit enables you to envisage and develop an MEP model with actual 3D parametric elements. It provides a new approach to MEP design and implementation process. It replicates the way MEP engineers conceive the structure of an MEP system. For example, the 2D CAD platforms mostly use lines to represent all elements, as shown in Figure 1-1. However, in Autodesk Revit, you can create the MEP model of a building project using 3D elements, such as HVAC components, pipes, plumbing fixtures, electrical fixtures, as shown in Figure 1-2.

Using these 3D elements, you can visualize the MEP project with respect to its scale, volume, and proportions. This enables you to study design alternatives and develop superior quality design solutions. Autodesk Revit automates routine drafting and coordination tasks and helps in reducing errors in documentation. This, in turn, saves time, improves the speed of documentation, and lowers the cost for the users.

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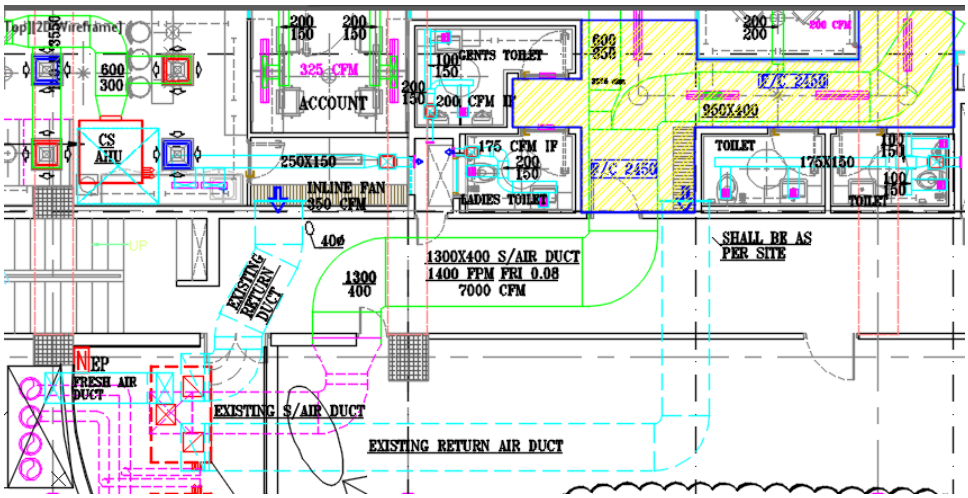

Figure 1-1 *CAD project created using 2D lines*

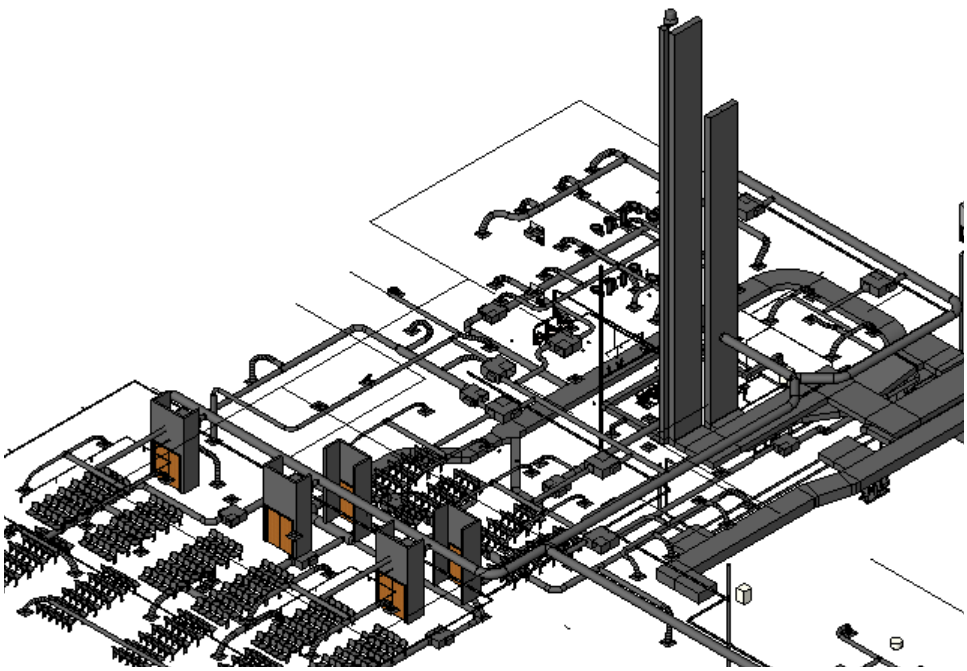

Figure 1-2 *An MEP project created using parametric elements*

Understanding the Parametric Building Modeling Technology

A project in Autodesk Revit is created using the inbuilt parametric building elements. The term 'parametric' refers to parameters that define relationship between various building elements. Some of these relationships are defined by Autodesk Revit itself and others by the users. For example, the relationship between air terminals and ceilings are defined by MEP and the relationship between connectors and ducts are defined by the users.

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In an MEP project, each element has inbuilt bidirectional associativity with many other elements. These elements together form an integrated building information model. This model contains all data needed for the design and development of the project. You can then use this data to create project presentation views such as ceiling plans, sections, elevations, and so on for documentation. As you modify the model while working in certain views, Autodesk Revit's parametric change engine automatically updates other views. This capability is, therefore, the underlying concept in Autodesk Revit.

Autodesk Revit's parametric change engine enables you to modify design elements at any stage of the project development. As changes in the model are reflected immediately and automatically in the project, the time and effort required in coordinating the changes in other views is saved. This feature provides immense flexibility in the design and development process along with an error-free documentation.

Autodesk Revit also provides a variety of in-built parametric element libraries that can be selected and used to create a building model. It also provides you with the flexibility to modify the properties of these elements or to create your own parametric elements, based on the project requirement.

Terms Used in Autodesk Revit for MEP

Before working with Autodesk Revit, it is important to understand the basic terms used for creating a building model. Various terms in Autodesk Revit such as project, level, category, family, type, and instance are described next.

Autodesk Revit Project

A project in Autodesk Revit is similar to an actual project. In an actual project, the entire documentation such as drawings, 3D views, specifications, schedules, cost estimates, and so on are inherently linked and read together. Similarly, in Autodesk Revit, a project not only includes the digital 3D MEP model but also its parametrically associated documentation. Thus, all the components such as the building model and its standard views, MEP drawings, and schedules together form a complete project. A project file contains all the project information such as building and MEP elements used in a project, drawing sheets, schedules, cost estimates, 3D views, renderings, and so on. A project file also stores various settings such as environment, lighting, and so on. As the entire data is stored in the same file, so it becomes easier for Autodesk Revit to coordinate the database.

Levels in a Building Model

In Autodesk Revit, a building model is divided into different levels. These levels may be understood as infinite horizontal planes that act as hosts for different elements such as roof, floor, ceiling, and so on. Each element that you create belongs to a particular level.

Subdivisions of Elements into Categories and Subcategories

Apart from MEP elements, an Autodesk Revit project also contains other associated elements such as annotations, imported files, links, and so on. These elements have been divided into the following categories:

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Model Category : Consists of various MEP elements such as HVAC elements, ducts, air terminals, diffusers, pipes, plumbing fixtures, electrical conduits, and others used in creating systems

Annotation Category : Consists of annotations such as dimensions, text notes, tags, symbols, and so on

Datum Category : Consists of datums such as levels, grids, reference planes, and so on

View Category : Consists of interactive project views such as the architectural, mechanical, and plumbing floor plans, elevations, sections, 3D views, and renderings

In addition to these four categories, other categories such as **Imported**, **Workset**, **Filter**, and **Revit Categories** can also exist if the project has imported files, enabled worksets, or linked Autodesk Revit projects, respectively.

Families in Autodesk Revit

Another powerful concept in Autodesk Revit is family. A family is described as a set of elements of the same category that are grouped together based on certain common parameters or characteristics. Elements of the same family may have different properties, but they all have common characteristics. For example, **Rectangular Diffuser - Round Connection** is an air diffuser family and it contains different sizes of air diffusers. Family files have the *.rfa* extension. You can load additional MEP component families from the libraries provided in Autodesk Revit package.

Families are further divided into certain types. A type or family type, as it is called, is a specific size or style of a family. For example, **Rectangular Diffuser - Round Connection 24x24 - 10 Neck** in Metric (**M_Rectangular Diffuser - Round Connection 600x600- 230 Neck)** is an air diffuser type. Family and family types can also be used to create new families using the **Family Editor**.

Instances are the actual usage of model elements in an MEP model or annotations in a drawing sheet. A family type, created at a new location, is identified as an instance of the family type. All the instances of the same family type have the same properties. Therefore, when you modify the properties of a family type, the properties of all its instances also get modified. The family categorization of Revit elements is given below:

Model Category : Air diffuser
Family : **Rectangular Diffuser - Round Connection**
Family type : **Rectangular Diffuser - Round Connection 24x24 - 10 Neck**
Instance : Particular usage of a family type

The hierarchy of service elements in Autodesk Revit plays an important role in providing flexibility and ease in managing a change in a building model. Figure 1-3 shows the hierarchy of categories and families in a typical Autodesk Revit project.

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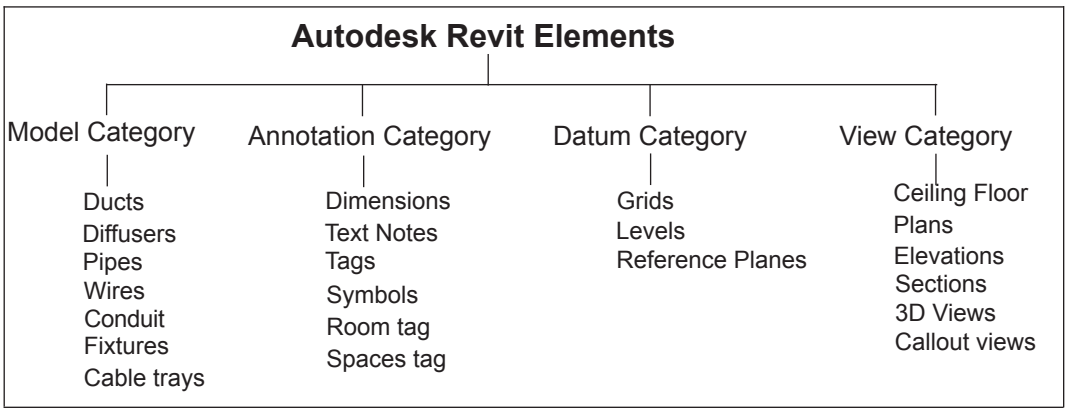

Figure 1-3 *Hierarchy of Autodesk Revit MEP categories and families*

Creating an MEP Model Using Parametric Elements

Another classification of categories of elements followed in Autodesk Revit is based on their usage. Autodesk Revit uses five classes of elements: Host, component, annotation, view, and datum. Hosts are the element categories that form the basic system of an MEP model and include model elements such as ducts, pipes, cables, and more. Components are the elements that are added to host elements or act as stand-alone elements such as air terminals, diffusers, and conduits. Annotations are the 2D, view-specific elements such as dimensions, tags, text notes, and so on that add content to the project documentation. Views represent various orientations of a building model such as plans, elevations, sections, 3D views, and so on. Datum refers to the reference elements that assist you in creating a building model, which include grids, levels, reference planes, and so on.

There is no specific methodology available for creating a services model in Autodesk Revit. It provides you with the flexibility of generating the MEP model based on the project requirement, design complexity, and other factors. However, the following steps describe a general procedure that may be followed for creating an MEP model using the built-in parametric elements provided in Autodesk Revit.

In Revit, you can start designing a project for individual discipline (Mechanical, Electrical, or Plumbing) by selecting the specific template. For example, to design a project for a mechanical discipline, you can select the *Mechanical-Default.rte* (*Mechanical-Default_Metric.rte*) template file. Alternatively, you can start a project to work in all the disciplines by selecting the *Systems-Default.rte* (*System-Default_Metric.rte*) template file.

Once you have started a project, you need to copy the levels of the architectural model to the current project or create additional levels as per the requirement. Next, you can start with any of the disciplines by activating the specific view from the **Project Browser**. For example, to start with mechanical discipline, activate the desired mechanical plan view under **Views** (**Discipline**) **> Mechanical** node from the **Project Browser**.

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In Revit, there are specific workflows for each discipline as per the requirement of the project. The workflow for disciplines generally includes analysis, design, and documentation. For mechanical discipline, you need to analyze spaces to design an appropriate HVAC system. Then, based on the analysis, you need to place air terminals, equipment, and design ducts for the system. Figure 1-4 shows an example of a mechanical system.

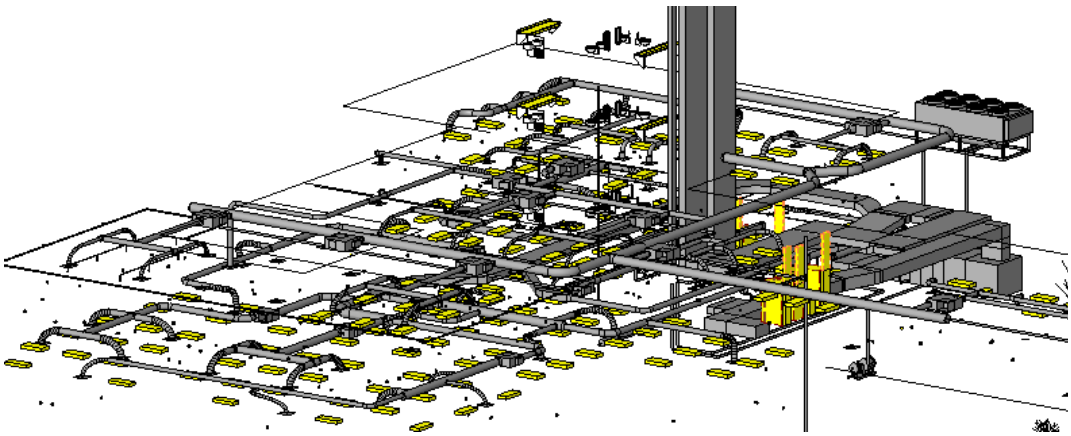

Figure 1-4 *Mechanical system with its elements*

Visibility/Graphics Overrides, Scale, and Detail Level

Autodesk Revit enables you to control the display and graphic representation of a single element or the element category of various elements in the project views. This is done by using the visibility and graphics overrides tools. You can select a model category and modify its linetype and detail level. This can also be done for various annotation category elements and imported files. These settings can be done for each project view based on its desired representation. You can also hide an element or an element category in a view using the **Hide in view** and **Isolate** tools. You can override the graphic representation of an element or an element category in any view using the **Visibility/Graphics** tool.

The scale is another important concept in an Autodesk Revit project. You can set the scale for each project view by selecting it from the available list of standard scales such as **1/16"=1'0"**, **1/4"=1'0"**, **1"=1'0"**, **1/2"=1'0"** for Imperial system or **1: 50**, **1: 100**, **1: 200**, **1: 500** for Metric system. As you set a scale, Autodesk Revit automatically sets the detail level that is appropriate for it. There are three detail levels provided in an Autodesk Revit project: **Coarse**, **Medium**, and **Fine**. You can also set the detail level manually for each project view. Each detail level has an associated linetype and the detail lines associated with it. The details of annotations, such as dimensions, tags, and so on, are also defined by the selected scale.

Extracting Project Information

A single integrated building information is used to create and represent a building project. You can extract project information from a building model and create area schemes, schedule, and cost estimates, and then add them to the project presentation.

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Autodesk Revit also enables you to export the extracted database to the industry standard Open Database Connectivity (ODBC) compliant relational database tables. The use of the building information model to extract database information eliminates the error-prone method of measuring building spaces individually.

Creating an MEP Drawing Set

After creating the building model, you can easily arrange the project views by plotting them on the drawing sheets. The drawing sheets can also be organized in a project file based on the established CAD standards followed by the firm. In this manner, the project documentation can easily be transformed from the conceptual design stage to the design development stage and finally to the construction document stage. The project view on a drawing sheet is only a graphical representation of the building information model. Therefore, any modification in it is immediately made in all associated project views, keeping the drawing set always updated.

Creating an Unusual Building Geometry

Autodesk Revit also helps you conceptualize a building project in terms of its volume, shape, and proportions before working with actual building elements. This is done by using the **Massing** tool, which enables you to create quick 3D models of buildings and conduct volumetric and proportion study on overall masses. It also enables you to visualize and create an unusual building geometry. The same massing model can then be converted into a building model with individual parametric building elements. It provides continuity to the generation of building model right from sketch design to its development. You can also create various custom MEP elements as per the project requirement and then load them to the project.

Flexibility of Creating Special Elements

Autodesk Revit provides a large number of in-built family types of various model elements and annotations. Each parametric element has the associated properties that can be modified based on the project requirement.

Autodesk Revit also enables you to create the elements that are designed specifically for a particular location. The in-built family editor enables you to create new elements using family templates. This provides you with the flexibility of using in-built elements for creating your own elements. For example, using the furniture template, you can create a reception desk that is suitable for a particular location in the design.

Creating Services Layouts

Autodesk Revit provides you with an extensive in-built library of MEP elements that can be used to add elements such as ducts, air terminals, diffusers, conduits, and so on to a project. This helps MEP consultants to include these service elements in the basic architectural building model and check for inconsistency, if any.

Working on Large Projects

In Autodesk Revit, you can work on large projects by linking different building projects together. For a large project that comprises of a number of buildings, you can create individual buildings as separate projects and then link all of them into a single base file. The database recognizes the linked projects and includes them in the project representation of the base file.

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For example, while working on a large educational institution campus, you can create separate project files for academic building, administration area, gymnasium, cafeteria, computer center, and so on, and then link them into the base site plan file. In this manner, large projects can be subdivided and worked upon simultaneously.

Working in Large Teams and Coordinating with Consultants

In Autodesk Revit, worksets enable the division of the MEP model into small editable sets of disciplines such as Mechanical, Electrical, and Plumbing. The worksets can be assigned to different teams working on the same project and then their work can easily be coordinated by sharing the files in the central file location. The effort required to coordinate, collaborate, and communicate the changes between various worksets is taken care of by the computer. Various consultants working on a project can be assigned a workset with a set of editable elements. They can then incorporate their services and modify the associated elements.

For example, a high rise commercial building project can be divided into different worksets with independent teams working on different disciplines such as Mechanical, Electrical, Plumbing, Architecture, Structure, and so on. The structural consultants can be assigned to the exterior skin and the core workset, in which they can incorporate structural elements. Similarly, the rest of the teams can work independently on different worksets.

STARTING Autodesk Revit 2019

You can start Autodesk Revit by double-clicking on the **Revit 2019** icon on the desktop. Alternatively, choose **All Programs > Autodesk > Revit 2019 > Revit 2019**, from the **Start** menu (for Windows 7); the user interface screen is displayed, as shown in Figure 1-5.



Note

The path for starting Autodesk Revit depends on the operating system being used.

The screen interface has three sections: **Projects**, **Families**, and **Resources**. The options in the **Projects** section are used to open a new or an existing project. The options in the **Families** section are used to open a new or an existing family. You can also invoke the Conceptual Mass environment from this section to create a conceptual mass model. If you choose the **Autodesk Seek** option from the **Families** section, you will be directed to *http://seek.autodesk.com/localeTaxBrowse.htm?category=en_us:adsk:revit-mep&locale=en-us&globaldd=globaldropdown.option.b* and the **AUTODESK® Revit WEB LIBRARY - US EDITION** page will open. From this page, you can download various components for your project.

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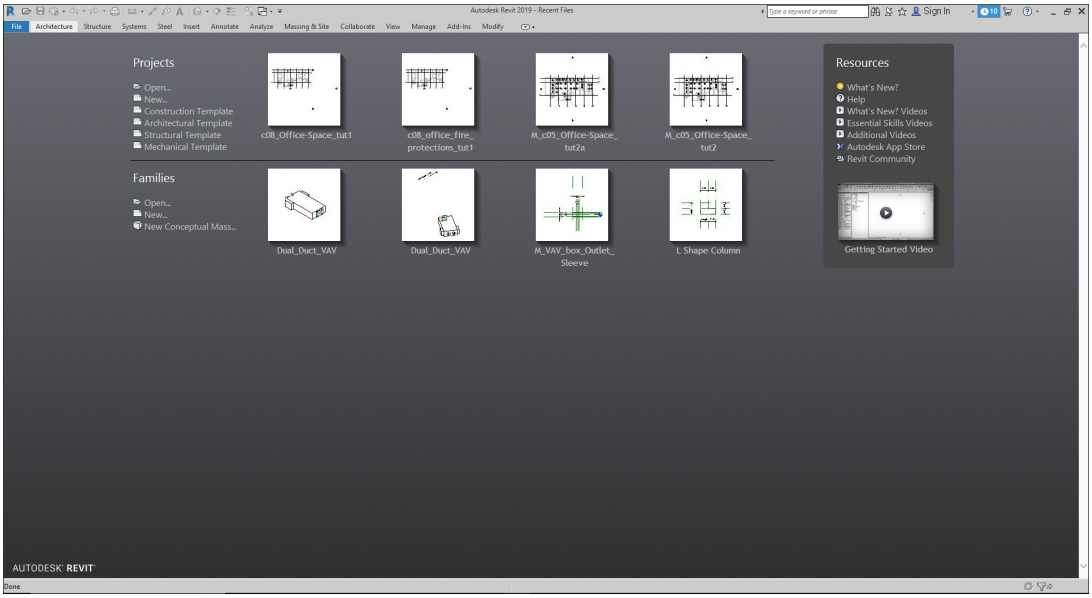

Figure 1-5 *The interface of Autodesk Revit 2019*

In the **Resources** section, you can choose the **What's New?** option to get information about the new tools and features in Autodesk Revit 2019. In addition, you can choose the **Help** option from the **Resources** section. On doing so, you will be directed to the link *http://help.autodesk.com/view/RVT/2019/ENU/*. In this section, you can choose the **Additional Videos** option to view additional video tutorials other than essential videos of working in Revit. On choosing this option, the **Autodesk Revit 2019** page will be displayed. In right section of this page, the various videos related to Revit workflow are listed with headings mentioning the title of the video. You can choose any of the headings and watch the video tutorial related to the topic mentioned in it. In the **Resources** section, you can choose the **Autodesk App Store** option to launch the Autodesk App Store website for Revit. The App Store will provide access to add-ins that will allow you to more efficiently author information-rich Building Information Models in Revit. In the **Resources** section, you can also choose the **Getting Started Video** option to view the videos related to basic and advanced concepts in Autodesk Revit 2019. You can also choose the **Revit Community** option from the **Resources** section to view various online communities related to Autodesk Revit. Various articles on the basic and advanced topics of Revit 2019 posted by members of these communities can also be viewed in this section.

In the **Projects** section, choose the **Open** option; the **Open** dialog box will be displayed. Browse to the desired location in the dialog box and select the file. Now, choose the **Open** button to open the file.

To open a new project file, choose the **New** option from the **Projects** section. Alternatively, choose **New > Project** from the **File** menu; the **New Project** dialog box will be displayed. In this dialog box, make sure that the **Project** radio button is selected, and then choose the **OK** button; a new project file will open and the interface screen is activated.

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USER INTERFACE

In Autodesk Revit, the user interface consists of the Ribbon, Drawing area, Properties palette, Status Bar, and the View Control Bar, as shown in Figure 1-6. In Autodesk Revit, all the tools are grouped in several panels in the ribbon.

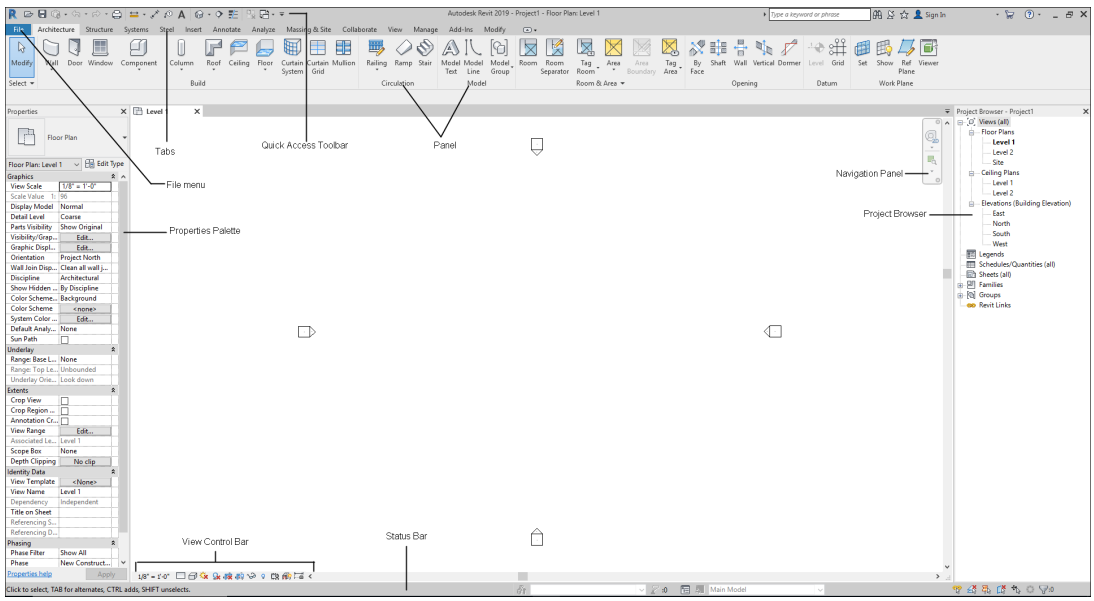

Figure 1-6 *The Autodesk Revit 2019 user interface screen*

The ribbon, which contains task-based tabs and panels, streamlines the structural workflow and optimizes the project delivery time. In Autodesk Revit, when you select an element in the drawing area, the ribbon displays a contextual tab that comprises of tools corresponding to the selected element. The interface of Autodesk Revit is similar to the interfaces of many other Microsoft Windows-based programs. The main components in the Revit interface are discussed next.

Title Bar

The Title Bar, docked on the top portion of the user interface, displays the program's logo, name of the current project, and the view opened in the viewing area. **Project 1- Floor Plan: Level 1** is the default project name and view displayed.

Ribbon

The ribbon, as shown in Figure 1-7, is an interface that is used to invoke tools. When you open a file, the ribbon is displayed at the top in the screen. It comprises of task-based tabs and panels, refer to Figure 1-7, which provide all the tools necessary for creating a project. The tabs and panels in the ribbon can be customized according to the need of the user. This can be done by moving the panels and changing the view states of the ribbon (the method of changing the ribbon view state is discussed later in this chapter). The ribbon has three types of buttons: general, drop-down, and split. These buttons can be used from the panels.

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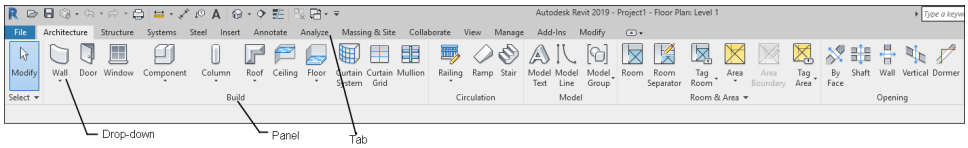

Figure 1-7 *Different components of a ribbon*

In the ribbon, you can move a panel and place it anywhere on the screen. To do so, press and hold the left mouse button on the panel label in the ribbon, and then drag the panel to a desired place on the screen. After using the tools of the moved panel, place the panel back to the ribbon. To do so, place the cursor on the moved panel and choose the **Return Panels to Ribbon** button from the upper right corner of this panel, as shown in Figure 1-8; the panel will return to the ribbon.

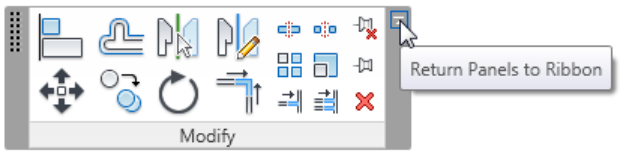

Figure 1-8 *Choosing the* ***Return Panels to Ribbon*** *button*



Tip

Tooltips appear when you place the cursor over any tool icon in the ribbon. The name of the tool appears in the box, assisting you in identifying each tool icon.

Changing the View States of the Ribbon

The ribbon can be displayed in three view states by selecting any of the following four options: **Minimize to Tabs**, **Minimize to Panel Titles**, **Minimize to Panel Buttons**, and **Cycle through All**. To use these options, click on the down arrow located on the right of the **Modify** panel, refer to Figure 1-10; the arrow will be highlighted. Next, click on the down arrow; a flyout will be displayed, as shown in Figure 1-9.

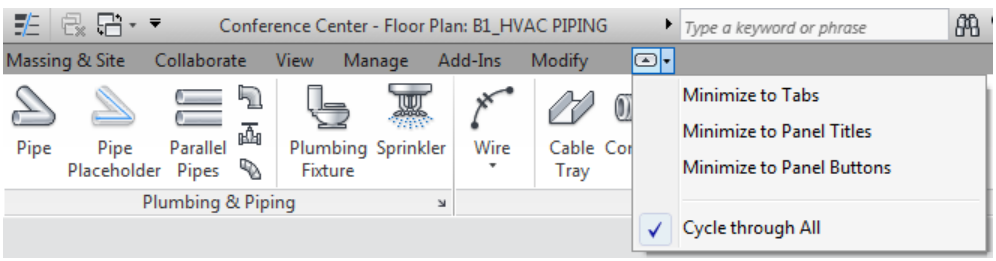

Figure 1-9 *Various options in the flyout for changing the view state of the ribbon*

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From this flyout, you can choose the **Minimize to Tabs** option to display only the tabs in the ribbon. If you choose the **Minimize to Panel Titles** option, the ribbon will display the titles of the panels along with the tabs. You can choose the **Minimize to Panel Buttons** option to display panels as buttons along with tabs in the ribbon.



Note

*If the ribbon is changed to a different view state, then on placing the cursor over the first arrow on the right of the **Modify** tab, the **Show Full Ribbon** tooltip will be displayed. Click on the arrow; the full ribbon will be displayed.*

The following table gives description of various tabs in ribbon.

Tab	Description
Architecture	Contains tools for creating an architectural model
Structure	Contains tools for creating structural model
Systems	Contains tools for creating an MEP model
Steel	Contains tools for the modification of the steel structure
Insert	Contains tools for inserting or managing secondary files such as raster image files and CAD files
Annotate	Contains tools for documenting a building model such as adding texts and dimensions
Analyze	Contains tools for analyzing the structural model
Massing & Site	Contains tools for creating massing and site elements
Collaborate	Contains tools for collaborating the project with other team members (internal and external)
View	Contains tools for managing and modifying the current views, switching views, and so on.
Manage	Contains tools for specifying the project and system parameters and settings
Add - Ins	Contains add in links for interoperability of BIM software
Modify	Contains tools for editing elements in the model

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Contextual Tabs in the Ribbon

These tabs are displayed when you choose certain tools or select certain elements. They contain a set of tools or buttons that relate only to a particular tool or element.

For example, when you invoke the **Duct** tool, the **Modify | Place Duct** contextual tab is displayed. This tab has the following panels: **Select**, **Properties**, **View**, **Measure**, **Geometry**, **Clipboard**, **Create**, **Modify**, **Tag**, and **Placement Tools**. The **Select** panel contains the **Modify** tool. The **Properties** panel contains the **Properties** button and the **Type Properties** tool. The **Mode** panel has tools that are used to load model families or to create the model of a window in a drawing. The other panels, apart from those discussed above, contain the tools that are contextual and are used to edit elements when placed in a drawing or selected from a drawing for modification.

Application Frame



The application frame helps you manage projects in Autodesk Revit. It consists of **File** menu, **Quick Access Toolbar**, **InfoCenter**, and **Status Bar**. These are discussed next.

File Menu

The **File** menu contains the tools that provide access to tools such as **Open**, **Close**, and **Save**, as shown in Figure 1-10. Alternatively, press ALT+F to display tools in the **File** menu.

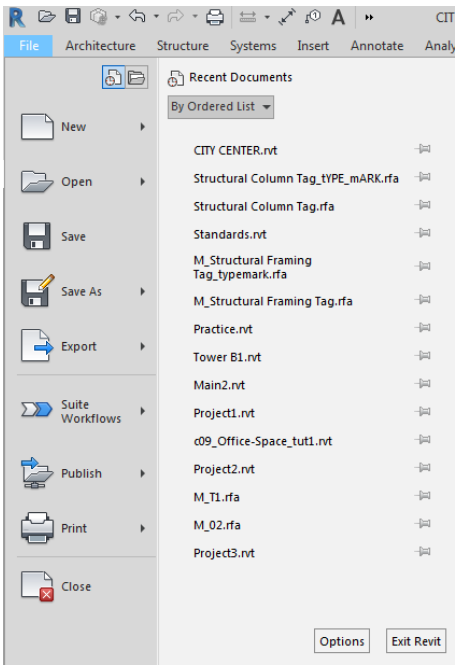

***Figure 1-10** The **File** menu*

Quick Access Toolbar

The **Quick Access Toolbar**, shown in Figure 1-11, contains the options to undo and redo changes, open and save a file, create a new file, and so on.

By default, the **Quick Access Toolbar** contains the options such as **Open**, **Save**, **Redo**, **Undo**, and so on. You can customize the display of the **Quick Access Toolbar** by adding more tools

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and removing the unwanted tools. To add a tool or a button from the panel of the ribbon to the **Quick Access Toolbar**, place the cursor over the button; the button will be highlighted. Next, right-click; a flyout will be displayed. Choose **Add to Quick Access Toolbar** from the flyout displayed; the highlighted button will be added to the **Quick Access Toolbar**. The **Quick Access Toolbar** can be customized to reorder the tools displayed in it. To do so, choose the down arrow next to the **Switch Windows** drop-down in the **Quick Access Toolbar**, refer to Figure 1-11; a flyout will be displayed. Choose the **Customize Quick Access Toolbar** option located at the bottom of the flyout; the **Customize Quick Access Toolbar** dialog box will be displayed. Use various options in this dialog box to customize the display of toolbar and choose the **OK** button; the **Customize Quick Access Toolbar** dialog box will close and the tools in the **Quick Access Toolbar** will be reordered.

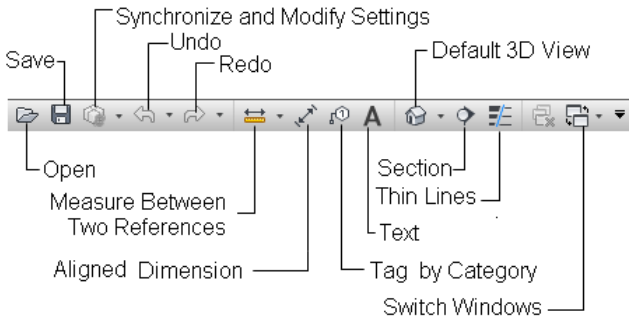

Figure 1-11** The **Quick Access Toolbar

InfoCenter

You can use **InfoCenter** to search for information related to Revit (Help) to display the **Subscription Center** panel for subscription services and product updates, and to display the **Favorites** panel to access saved topics. Figure 1-12 displays various tools in **InfoCenter**.

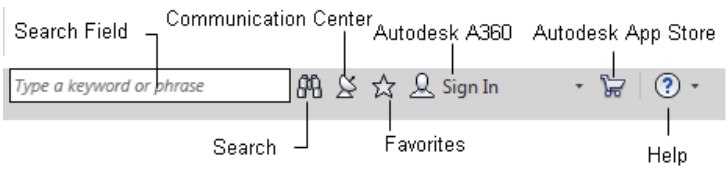

Figure 1-12** The **InfoCenter

Status Bar

The Status Bar is located at the bottom of the interface screen. When the cursor is placed over an element or a component, the Status Bar displays the name of the family and the type of the corresponding element or components. It also displays prompts and messages to help you use the selected tools.

View Control Bar

The **View Control Bar** is located at the lower left corner of the drawing window, as shown in Figure 1-13. It can be used to access various view-related tools. The **Scale** button shows the scale of the current view. When you can choose this button, a flyout containing standard drawing scales

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is displayed. From this flyout, you can then select the scale for the current view. The **Detail Level** button is used to set the detail level of a view. You can select the required detail level as **Coarse**, **Medium**, and **Fine**. Similarly, the **Visual Style** button enables you to set the display style. The options for setting the display style are: **Wireframe**, **Hidden Line**, **Shaded**, **Consistent Colors**, **Shaded**, and **Raytrace**.

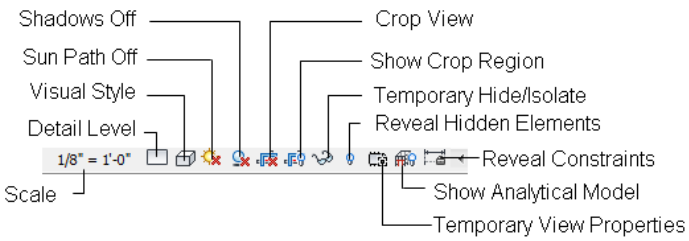

Figure 1-13** The **View Control Bar

Options Bar

The **Options Bar** provides information about the common parameters of a component type. It also displays options for creating or editing them. The options displayed in the **Options Bar** change according to the type of component being created and selected for editing. Figure 1-14 displays the options in the **Options Bar** to create a structural column.

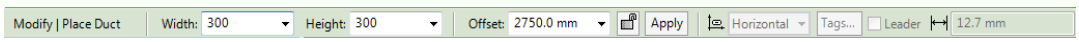

***Figure 1-14** The **Options Bar** with different options to create a structural column*

Type Selector

The **Type Selector** drop-down list is located in the **Properties** palette for the currently invoked tool. On invoking the **Duct** tool, the properties of the duct will be displayed in the **Properties** palette. In this palette, you can use the **Type Selector** drop-down list to select the required type of the beam. The options in the **Type Selector** drop-down list keep changing, depending upon the current function of the tool or the elements selected. The **Type Selector** drop-down list can also be used to specify the type of an element or component while placing that element or the component in a drawing by using the **Place a Component** tool. You can also use this drop-down list to change the type of a selected element.

Drawing Area

The Drawing Area is the actual modeling area where you can create and view the building model. It covers the major portion of the interface screen. You can draw building components in this area. The position of the pointing device is represented by the cursor. The Drawing Area also has the standard Microsoft Windows functions and buttons such as close, minimize, maximize, scroll bar, and so on. These buttons have the same function as that of the other Microsoft Windows-based programs.

PROJECT BROWSER

The **Project Browser** is located below the ribbon. It displays project views, schedules, sheets, families, and groups in a logical, tree-like structure, as shown in Figure 1-15 and helps you to open and manage them. To open a view, double-click on the name of the view, or drag and drop the view in the Drawing Area. You can close the **Project Browser** or dock it anywhere in the Drawing Area.

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Note

*If the **Project Browser** is not displayed on the screen, choose the **View** tab from the ribbon and then select the **Project Browser** check box from **View > Windows > User Interface** drop-down.*

The **Project Browser** can be organized to group the views and sheets based on the project requirement. For example, while working on a large project with a number of sheets, you can organize the **Project Browser** to view and access specific sheets.



Note

*In the **Project Browser**, you can expand or contract the view listing by selecting the '+' or '-' sign, respectively. The current view in the drawing window is highlighted in bold letters. The default project file has a set of preloaded views.*

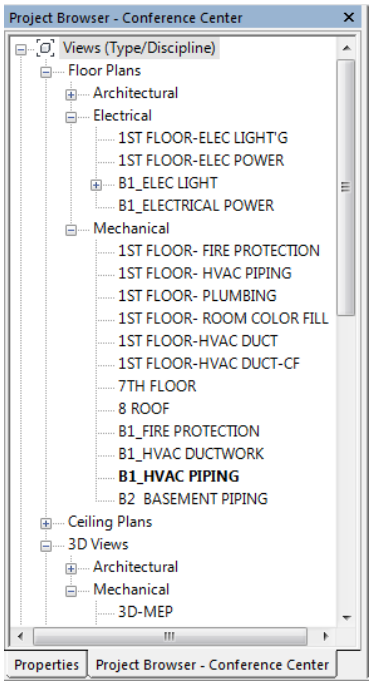

Figure 1-15** The **Project Browser

Keyboard Accelerators

In Autodesk Revit, accelerator keys have been assigned to some of the frequently used tools. These keys are shortcuts that you can type from the keyboard to invoke the corresponding tool. The accelerator key corresponding to a tool appears as a tooltip when you move the cursor over the tool.

Properties Palette

The **Properties** palette, as shown in Figure 1-16, is an interface without model, which displays the type and element properties of various elements and views in a drawing.

The **Properties** palette is dockable and resizable, and it supports multiple monitor configurations. The **Properties** palette is displayed in the Revit interface by default and it shows the instance properties of the active view.



Tip

As you become accustomed to use Autodesk Revit, you will find these Keyboard Accelerators quite useful because they save the effort of browsing through the menus.

When you select an element from a drawing, the **Properties** palette displays its instance properties. You can also access the type properties of the selected element from the **Properties** palette. To do so, choose the **Edit Type** button from the palette; the **Type Properties** dialog box will be displayed. In this dialog box, you can change the type properties of the selected element.

In the **Properties** palette, you can assign a type to the selected element in a drawing using the options from the **Type Selector** drop-down list. In Revit, you can toggle the display of the **Properties** palette in its interface. Choose the **Properties** button in the **Properties** panel of the **Modify** tab to hide it. Similarly, you can choose the **Properties** button to display the palette if it is not visible in the interface.

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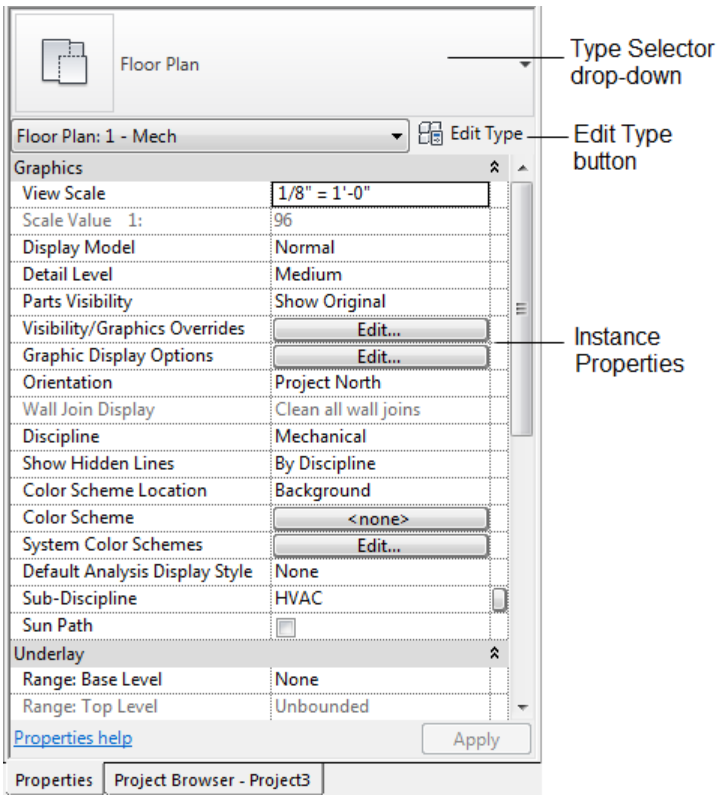

Figure 1-16 *The* ***Properties*** *palette*

DIALOG BOXES

Some Autodesk Revit tools, when invoked, display a dialog box. A dialog box is an interface for accessing, specifying, and modifying the parameters related to that tool. For example, when you choose **Save As > Project** from the **File** menu, the **Save As** dialog box is displayed, as shown in Figure 1-17.

A dialog box consists of various parts such as dialog label, radio buttons, text or edit boxes, check boxes, slider bars, image box, buttons, and tools, which are similar to other windows-based programs. Some dialog boxes contain the **Browse** button, which displays another related dialog box. There are certain buttons such as **OK**, **Cancel**, and **Help**, which appear at the bottom of most of the dialog boxes. The names of the buttons imply their respective functions.

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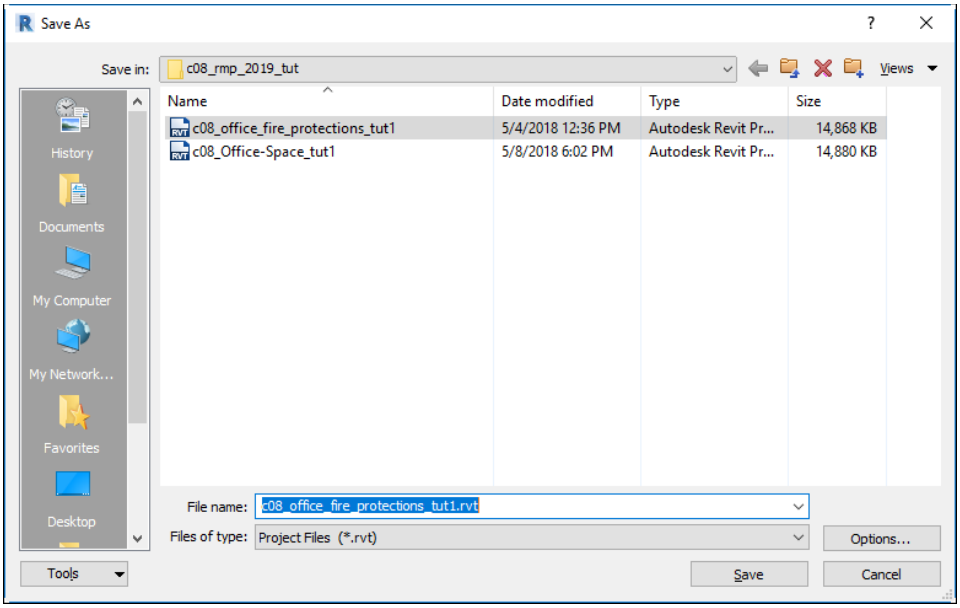

Figure 1-17 *The* ***Save As*** *dialog box*

MULTIPLE DOCUMENT ENVIRONMENT

The multiple document environment feature allows you to open more than one project at a time in a single Autodesk Revit session. This is very useful when you want to work on different projects simultaneously and make changes with reference to each other.

Sometimes, you may need to incorporate certain features from one project into the other. With the help of multiple document environment feature, you can open multiple projects and then use the **Cut**, **Copy**, and **Paste** tools from the **Clipboard** panel of the **Modify (type of element)** tab to transfer the required components from one project to another. These editing tools can also be invoked by using the CTRL+C and CTRL+V keyboard shortcuts.

To access the opened projects, click on the **Switch Windows** drop-down in the **Windows** panel of the **View** tab; the options for the names of different opened project files will be displayed, as shown in Figure 1-18.

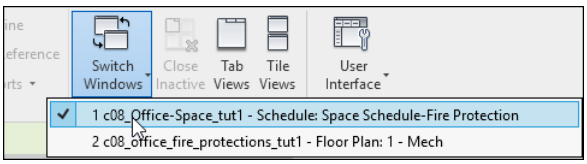

Figure 1-18 *Selecting an option from the* ***Switch Windows*** *drop-down*

Like other Microsoft Windows-based programs, you can select and view the opened projects using the **Tile Views** option from the **Windows** panel of the **View** tab. The tile view of projects is shown in Figure 1-19.

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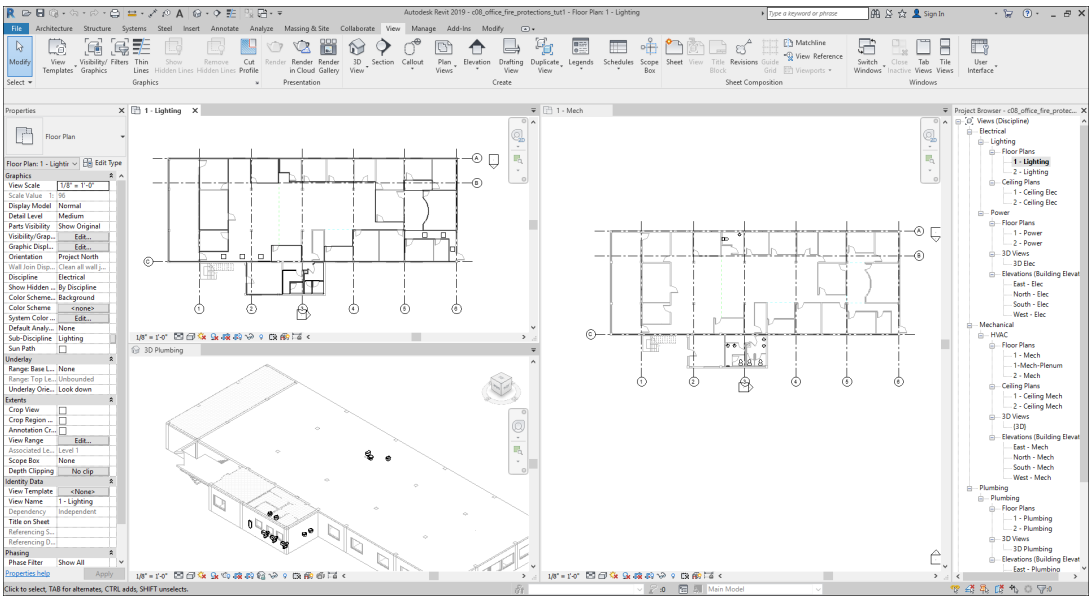

Figure 1-19 *The tiled view of projects*

INTEROPERABILITY OF Autodesk Revit

The models or geometries created in Autodesk Revit can be easily exported to AutoCAD and AutoCAD Architecture in the DWG file format. This enables structural engineers to collaborate with Architects. One of the important aspects of the job of a structural engineer is to collaborate and share information with the rest of the design team including the architect. To facilitate this requirement, Revit 2019 follows a wide range of industry standards and supports various CAD file formats such as *DWF*, *DGN*, *DWG*, *DGN*, *IFC*, *SKP*, and *SAT*. For image files, it supports *JPG*, *TIFF*, *BMP*, *PNG*, *AVI*, *PAN*, *IVR*, and *TGA* file formats. Besides these, the formats that are supported by Revit include *ODBC*, *HTML*, *TXT*, *XML*, *XLS*, and *MDB*. Autodesk Revit is compatible with any CAD system that supports the DWG, DXF, or DGN file format. Revit can import the models and geometries as ACIS solids. This enables engineers to import models from AutoCAD Architecture and AutoCAD MEP (Mechanical, Electrical, and Plumbing) software and to link the 3D information to Revit. This feature makes Autodesk Revit 2019 an efficient, user-friendly, and compatible software.

BUILDING INFORMATION MODELING AND Autodesk Revit 2019

Building Information Modeling (BIM) is defined as a design technology that involves the creation and use of coordinated, internally consistent, and computable information about a building project in design and construction. Using BIM, you can demonstrate the entire life cycle of a building project starting from the process of construction, facility operation, and information about quantities and shared properties of elements. BIM enables the circulation of virtual information model from the design team to contractors and then to the owner, thereby updating them about the changes made in the model at each stage. The ability to keep

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information up-to-date and make it available in an integrated digital environment enables the architects, owners, builders, and engineers to have a clear vision of the project before the commencement of actual construction. It also enables them to make better and faster decisions to improve the quality and profitability of projects. Autodesk Revit 2019 is a specially designed platform based on BIM.

In Revit, the analytical and physical representations of an MEP model are created simultaneously. These representations are different views of a computable building model that contains necessary information for a third-party analysis application which is done with the help of a common modeling interface. You can use Revit API to move data directly from the Revit building information model to the analysis software. Further, you can bring back the analysis reports while keeping the analysis, design, and documentation synchronized. Revit's parametric model represents a building as an integrated database of coordinated information. In Revit, a change anywhere is a change everywhere. A change made in your project at any stage is reflected in the entire project, and also due to the parametric behavior of elements, the project is updated automatically. Also, the integration of Revit with the available in-built commercial tools such as solar studies, material takeoffs, and so on greatly simplifies the project design and reduces the time consumed for analysis, thereby enabling faster decision making.

WORKSHARING USING REVIT SERVER

Worksharing is a method of distributing work among people involved in a project to accomplish it within the stipulated period of time. In worksharing, each person involved in the project is assigned a task that has to be accomplished through proper planning and coordination with the other members of the team. In a large scale building project, worksharing helps in finishing a project in time and meeting the quality requirements that are set during the process. Generally, in a large scale building project, the professionals such as structural engineers, architects, interior architects, and MEP engineers are involved in their respective fields to accomplish the project. So, the distribution of work at the primary stage is made on the basis of the area of specialization. Each professional has his own set of work to perform for the accomplishment of the project. Therefore, worksharing is an important process that is required to be implemented efficiently to complete the project in time. In Autodesk Revit, you can apply server-based worksharing with the help of Revit Server which is a server application. Revit Server uses a central server and multiple local servers for collaborating across a Wide Area Network (WAN). The central server hosts the central model of a workshared project and remains accessible to all the team members over the Wide Area Network. Similarly, the local server is accessible to all team members in a Local Area Network (LAN). The local server hosts a local updated copy of the central model. In the Worksharing environment, the team members are not aware of the local server, as it is transparent in their daily operations. Refer to Figure 1-20 for the network model of Revit Server.

In Worksharing environment, a team member starts working on the local model of the central model. The local model will be saved in the computer of the team member. As the team member works, the local server requests updated information from the central model on the central server, using available network capacity to transfer the data over the WAN. The updated version of the model is stored on the local server, so the updates are readily available when a team member requests for them.

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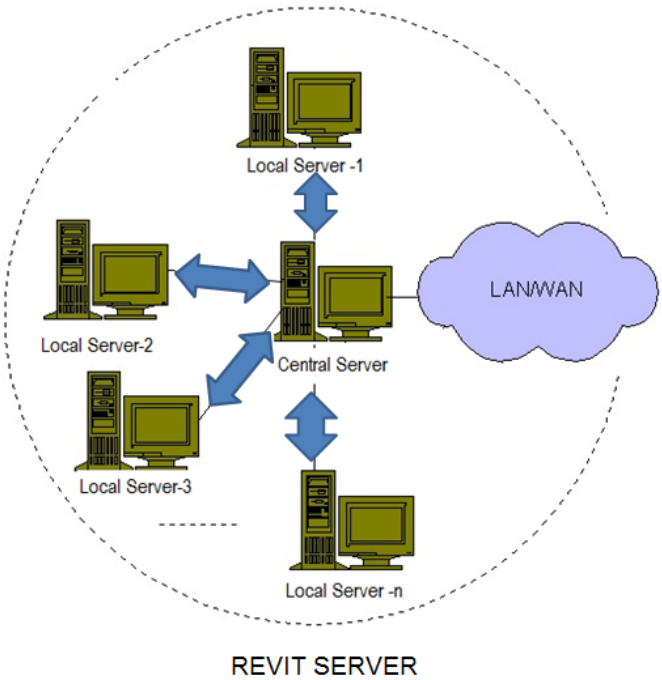

Figure 1-20 *The network model of Revit Server*

Autodesk Revit HELP

In Autodesk Revit, you can access various help topics online by using the **Autodesk Revit 2019** help page. You can access this page by choosing the **Help** tool from the **InfoCenter**, refer to Figure 1-21. In this page, different areas such as **Learn about Revit**, **Resources**, and others are displayed. You can click on the required link from these areas to get the related information. In the **Learn about Revit** area, various help options related to Autodesk Revit are available. You can click on the required option to display the help page corresponding to the option. The **Resources** area contains various learning resources. You can click on the desired option in this area to get the information related to it.

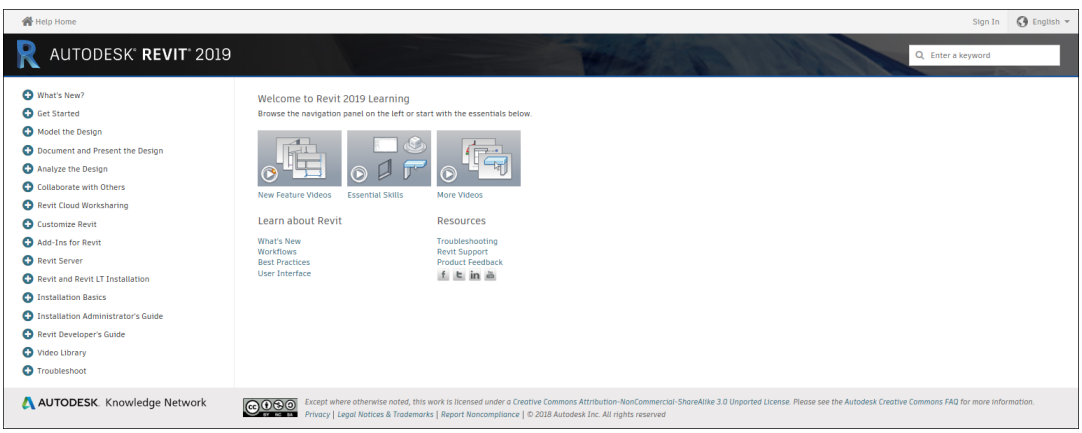

Figure 1-21 *The **AUTODESK REVIT 2019** page*

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Self-Evaluation Test

Answer the following questions and then compare them to those given at the end of this chapter:

1. MEP is the acronym for_____.

2. BIM is the acronym for_____.

3. In the Mechanical discipline, you can develop an HVAC (Heating, Ventilation, and Air Conditioning) system. (T/F)

4. The **View Control Bar** is located at the lower right corner of the drawing window. (T/F)

5. The **Autodesk App Store** option is located in the status bar. (T/F)

Review Questions

Answer the following questions:

1. The_____enable the division of the MEP model into small editable sets of disciplines such as Mechanical, Electrical, and Plumbing.

2. The_____displays the name of the current project.

3. In Revit, the analytical and physical representations of an MEP model are created simultaneously. (T/F)

4. In Autodesk Revit, you cannot apply server-based worksharing. (T/F)

5. You can press ALT+F to display tools in the **File** menu. (T/F)

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Answers to Self-Evaluation Test

1. Mechanical, Electrical, and Plumbing, **2.** Building Information Modeling, **3.** T, **4.** F, **5.** F