CONNECTICUT DEPARTMENT OF TRANSPORTATION

DIGITAL DESIGN ENVIRONMENT GUIDE

CONNECT EDITION

Volume 12 – Other Applications

Volume 12 – Other Applications

Section 1 – OpenBuildings Designer

OpenBuildings Designer is a multi-discipline Building Information Modeling (BIM) solution that combines architectural, structural, mechanical, and electrical design into a single application.

This application addresses the following project needs:

- Preliminary Planning
- Placement of structures, walls, windows, doors, casework, HVAC systems, and electrical systems
- Production of drawings, schedules and reports
- Analysis and Simulation capabilities
- Visualization

Base Models and the Federated Project

OpenBuildings Designer uses a federated approach to assemble the 3D building model. A design should be divided into several DGN files so it can be worked on simultaneously by the entire project team. This means the project team will create several different working models (also known as base models), these will be referenced together to create a discipline master model, and that will ultimately be referenced with other discipline models to create the final building master model. An added benefit is that repetitive portions of the building, such as typical architectural floors, need only be modeled once. A project Floor and Grid System will be used to help keep the various model files aligned in 3D space. These referenced models typically include Building (architectural) models, a Structural model, a Site (civil) model, a Plant model, and a Mechanical model (HVAC and plumbing).
The capability of referencing carries over into all Bentley DGN based applications, for example, OpenSite, OpenRoads and OpenBridge.

Master models may also be created for specific purposes, for example separate clash detection and rendering master models.

The master models will be used to create the drawings. When an element is placed in the model it appears as a 3D element and becomes the source for all extracted 2D information. That information can take form as plans, elevations, sections, reports, schedules, and other documentation. The entire design process, from Schematic Design to Presentation, evolves and originates from this data. All design revisions are made in the model and the 2D data is automatically updated.

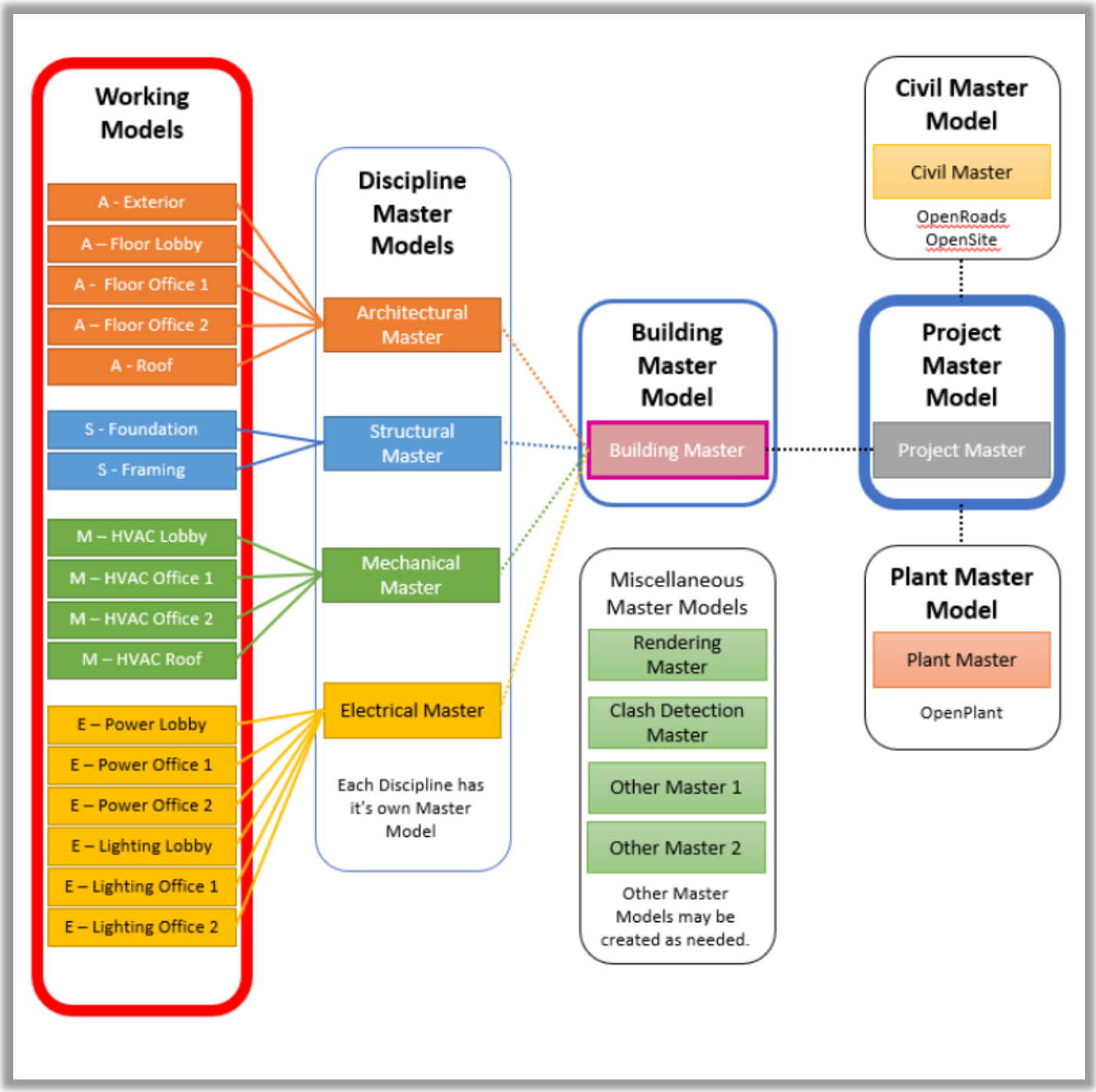


Figure 1 *Federated Project*

1.1 Base Model Creation

This module contains exercises for setting up the Floor and Grid System used with the 3D modeling environment in OpenBuildings Designer.

Skills Taught

- Learn how to use the Floor Selector
- Learn how to use the Floor Manager
- Discover ways to set up the Building Grid System
- Discover Grid Display Options

1.1.1 Startup

Before attempting to open or create DGN files users should make sure the following is in place:

1. CTDOT users should have the CTDOT CONNECT DDE synced through SharePoint with the COMPASS Project Synced along with the CAD Configuration.
2. Consultants should have CTDOT DDE properly installed or be syncing to the CTDOT DDE SharePoint/COMPASS system.
3. Log on to the CONNECTION Client. Bentley Connect licensing requires users to log into their Bentley account to secure a software license. CTDOT users should log in using your CTDOT email address and Bentley password. If you do not see the dialog box, select the ∧ icon on the bottom Windows Screen. Click on the Connection Client Icon and select **Open**.

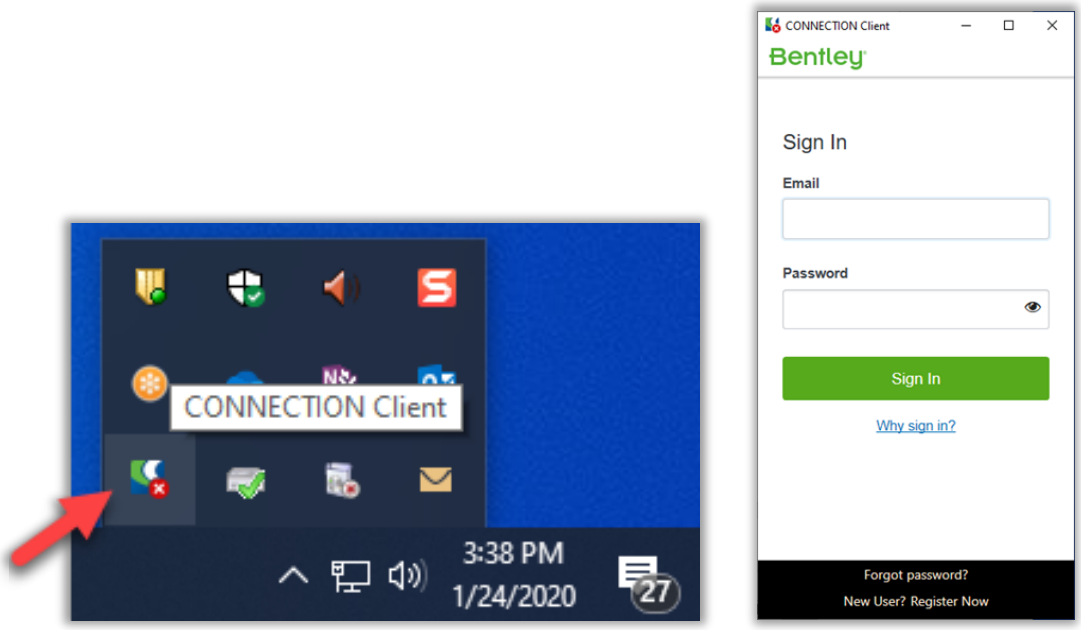


Figure 2 CONNECTION Client System tray

4. Launch the Application.
   - **Consultants**
     Start the software via an appropriate **CTDOT DDE** icon
   - **CTDOT employees**
     On your desktop double click on the **CAD Accounting** icon.
5. On the CT DOT Accounting Menu there will be several applications to pick. Select ***Compass OpenBuildings CE***.
6. In the ***Run Program*** field select the needed program, the ***Available Account*** (funding source) and ***Resource Type***. Click on the **Start** button to load the program.

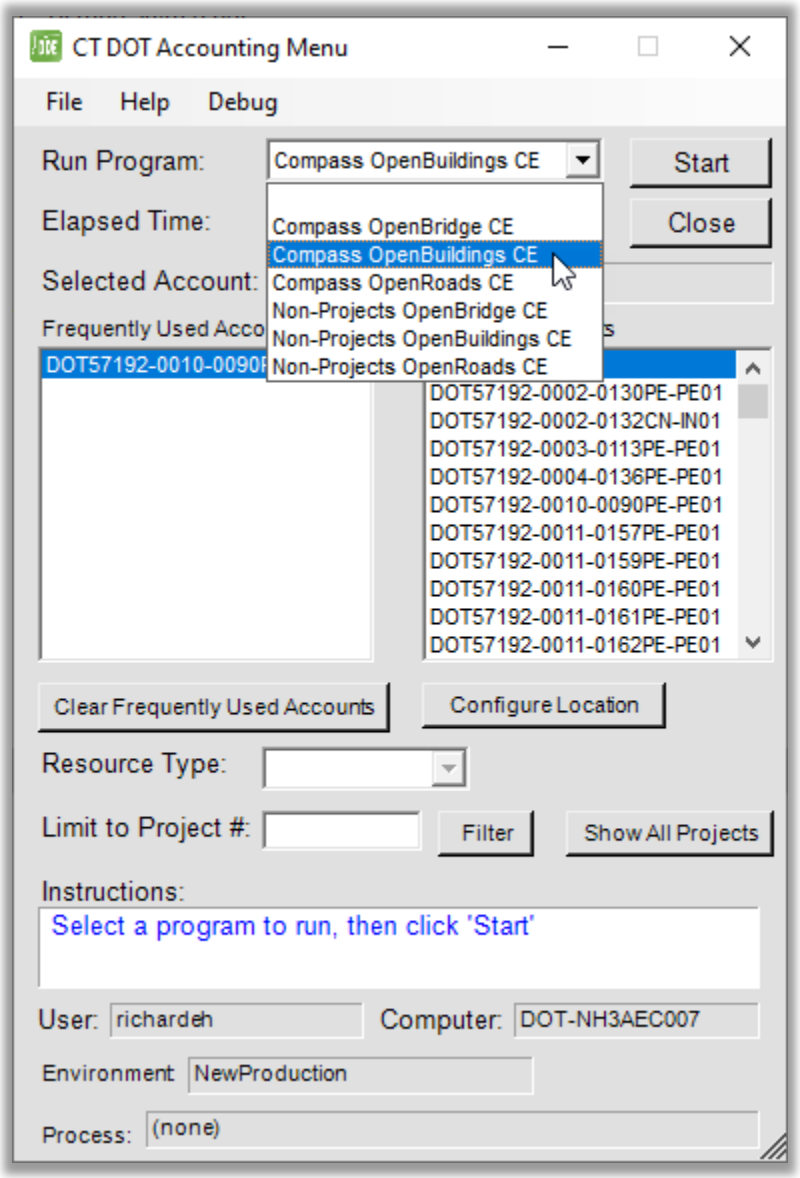


Figure 3 CAD Accounting dialog box

1.1.2 File Creation

1. After launching the program, the following a Welcome Screen will appear.
2. Ensure you are using the **Custom Configuration** and **CT_WorkSpace**, then select the relevant **WorkSet** and **Role**.

   Note: *If you do not see the Project Number listed, please request a Compass/CAD Setup using this link* [*New CAD Project Request*]

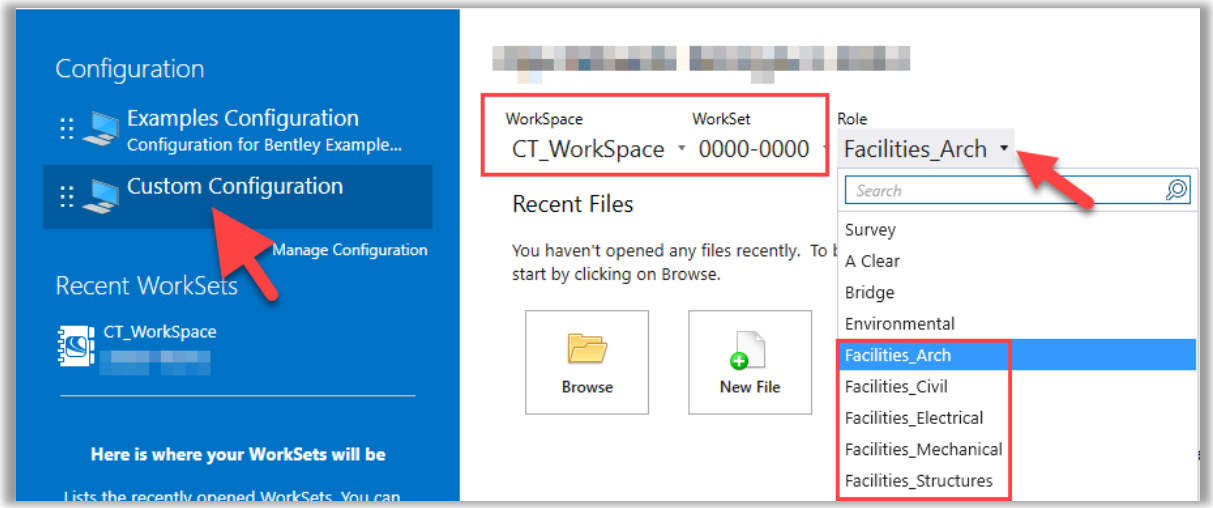


Figure 4 OpenBridge Welcome Splash Screen

10. Select the **New File** Icon. In the New dialog box browse to the one of the Facilities folders:
    - *F_Arch/Base_Models*
    - *F_Civil/Base_Models*
    - *F_Elect/Base_Models*
    - *F_Mech/Base_Models*
    - *F_Struct/Base_Models*
11. The Seed file should be set to

    …CT_Configuration\|Organization\|Seed\|Buildings\|Seed3D – CT BuildingsDesign.dgn.

    This can be changed to a 2D seed by selecting the ***Browse*** button and selecting the ***Seed2D – CT BuildingsDesign.dgn*** file in the same directory.
12. In the ***File name*** field enter a name for your file using the CTDOT File Naming structure.

    Example: SB_CB_1234_1234_BuildingDescription.dgn
13. Select **Save** and the new file will open.

14. After the DGN file is created open File Explorer and browse to the file, **right click hold** and select **View online**.

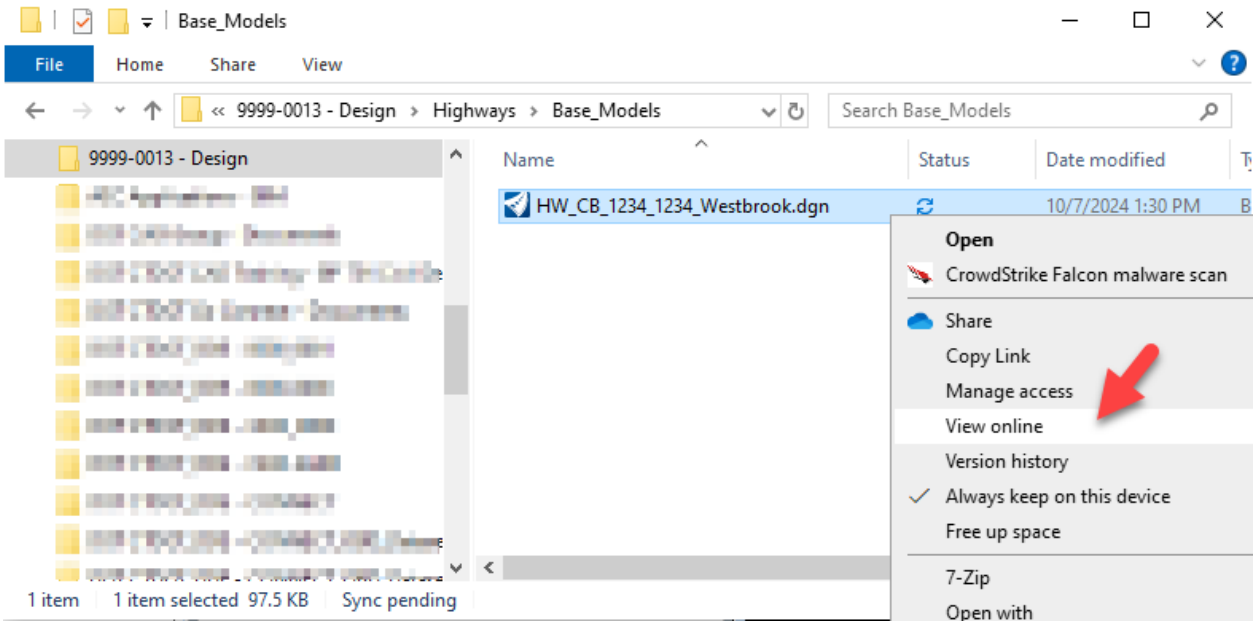


Figure 5 File Explorer View online tool

15. The Projects SharePoint site will open, sort by **Date**, click on the **three dots**, select ***More › Check Out.***

    Note: *When you are done working on the DGN file, exit the program and go back to the SharePoint Site and* ***Check In*** *the file.*

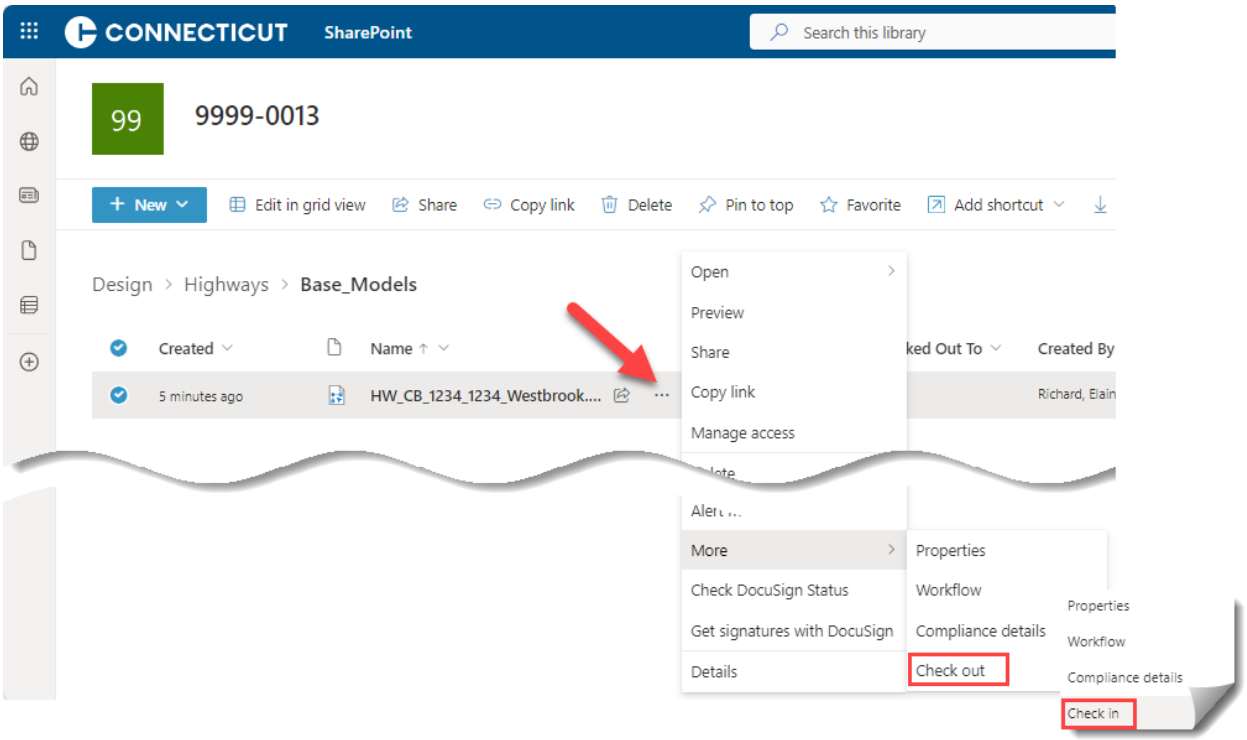


Figure 6 SharePoint Check out

16. Select the OpenBuildings and the CTDOT Workflows to become familiar with the interface and ribbon.

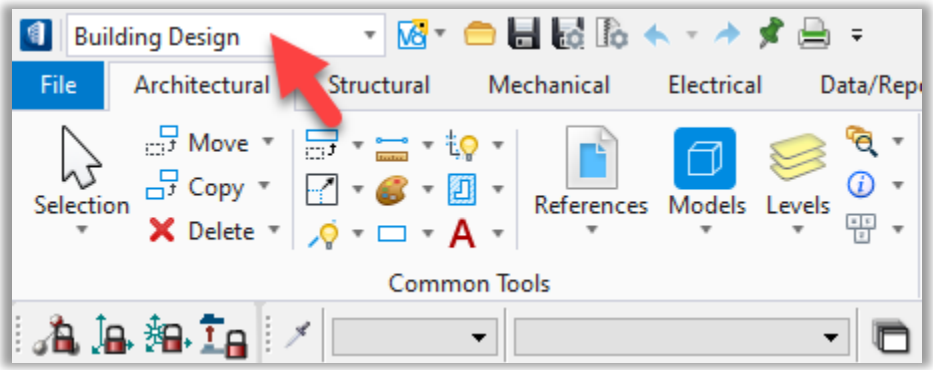


Figure 7

1.2 The Interface

This section contains exercises for getting familiar with the OpenBuildings Designer interface and terms.

Skills Taught

- Explore the Interface
- Learn about the Floor Manager, Parts and the Datagroup System

1.2.1 Workflow and Ribbons

OpenBuildings Designer's ribbon interface helps to easily find tools and commands. Ribbons are organized by workflow and Building discipline in the **Building Design** workflow. Each workflow consists of multiple tabs, which are organized by tasks.

- Architectural Ribbon
- Structural Ribbon
- Mechanical Ribbon
- Electrical Ribbon
- Data/Reporting Ribbon
- Attach Ribbon
- Drawing Production Ribbon
- View Ribbon
- Analysis Ribbon
- Drawing Aids Ribbon
- Help
- Modify Ribbon

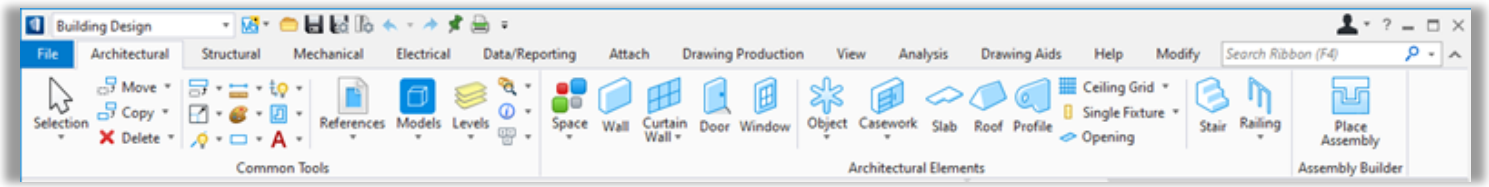


Figure 8 Architectural Ribbon

Legacy 2D Lines and Cells can be accessed by using the **CTDOT Workflow**, **Facilities** tab. Custom CTDOT Sheet Production and Annotation tools can be found on the **CTDOT** tab. Sheet Production tools are covered in Volume 13.

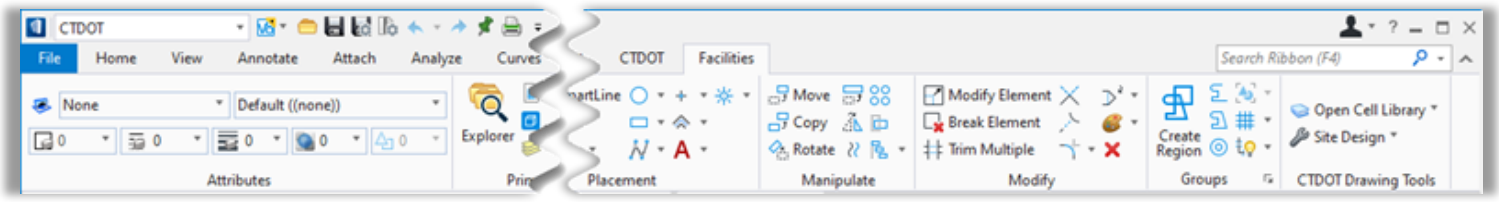


Figure 9 CDOT Custom Workflow / Facilities tab

1.2.2 The Floor Manager System

OpenBuildings Designer uses **Floors** as a means of organizing, designing, and reporting building information. By this method, designated floors define the physical location of portions of the building, relative to reference and site elevations. The floor serves as a type of container for building elements and components in the model that include walls, doors, windows, fixtures, furnishings, equipment, structural members, mechanical components (HVAC and plumbing), and electrical equipment at a given elevation.

Users can define a set of floors and associated reference planes and sub-planes on a project-by-project basis using the floor management system. Sets of floor planes (and associated reference planes) can then be shared by the team for all designs created within a specific project. The floor management system provides these two tools:

- The Floor Manager is used to create and edit floors and reference planes, including typical floors.
- The Floor Selector is used in the project models as an aid in modeling components on the proper floor elevation.

The **Floor Selector** is docked by default along the bottom edge of the application window. It deals with multiple Buildings, Floor definitions and Grid Systems. A floor/floor reference plane can be set as active floor by double clicking. Various tools to display grid model or setting grids active and accessing grid systems are integrated in floor selector interface.

 **Floor Manager** — accesses the Floor Manager list to set either the active Building or to create a Floor definition.

Adjacent to the Floor manager icon is the **Set Active Floor** list box which contains a hierarchical list of all selectable building and floors, and displays the active Building, Floor and Floor elevation when collapsed. The active floor elevation is displayed in-line with active Building (**Building Name** > **Floor Name**).

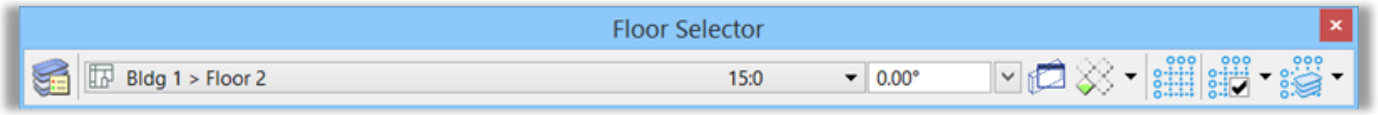


Figure 10 Floor Manager

1.2.3 The Family and Part System

The Family and Part system describes the graphical representation of the components, this includes the symbology of the modeled components: color, line style, line weight, and the CAD level. It also includes settings for the symbology of the components in drawings generated from the model, such as the cut plane symbology, forward and reflective view symbology and patterning, for example concrete patterning when a concrete element is cut. The Family and Part dataset is considered to control the CAD standards.

Families are the main heading of components and Parts are specific components under the Family, for example, in mechanical design “Duct” is a Family and “Supply-New”, and “Return-New” are Parts under the “Duct” Family. Each part in the list is set to be placed on a specific level using different graphical attributes.

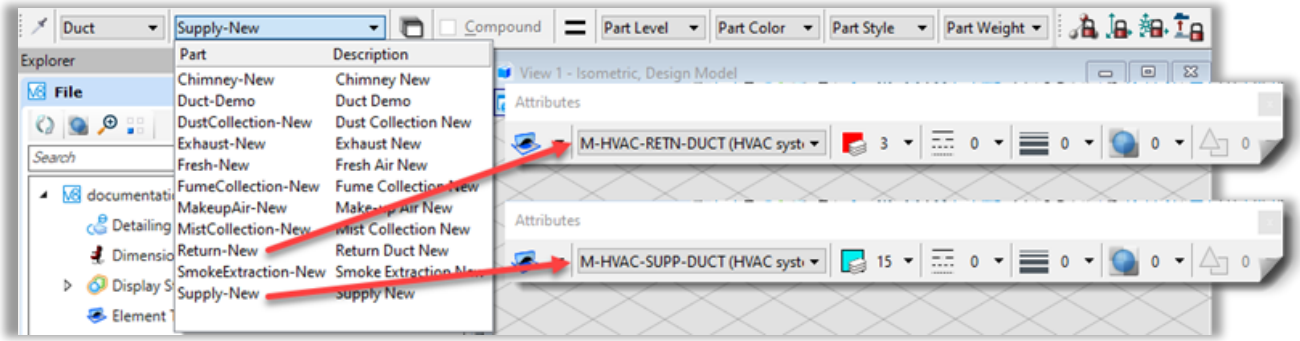


Figure 11 Family and Part System

1.2.4 The DataGroup System

The DataGroup system assigns catalog property data to modeled components. Each catalog type has specific data assigned to it. Most OpenBuildings Designer placement tools include DataGroup information inherent to the object being modeled: walls, doors, windows, columns, beams, ductwork, HVAC equipment, lights, receptacles, etc.

The DataGroup system is organized by:

- Catalog Type - Any Building object or space having attached data, e.g., Walls, Beams, Ducts…
- Catalog Item - Any Building predefined sub-classification of object or space, e.g., Duct - Flat Oval, Flexible, Rectangular, or Round
- Catalog Instance - Any Building object or space placed in a model. The objects are considered as unique instances of the catalog items

1.3 Managing Floors

This module contains exercises for setting up the Floor and Grid System used with the 3D modeling environment in OpenBuildings Designer.

Skills Taught

- Learn how to use the Floor Selector
- Learn how to use the Floor Manager
- Discover ways to set up the Building Grid System
- Discover Grid Display Options

1.3.1 Verify the Configuration

Before the Building Design begins, a team member should set up the WorkSet Building Template. This will include setting up a hierarchy of Sites, Buildings and Floors as well as Grid Systems through the Floor Management and the Grid Management Tools.

1. In Search Type in ***Configuration Variables***, click to select and the Configuration Variables dialog box will open.
2. In the Configuration Variables dialog box **Search** Field Type in ***BB_FLOORMASTER_DGN***
3. Users should make sure the BB_FLOORMASTER_DGN Configuration Variable is preset correctly to ***The Workset Folder\Facilities\Dgnlib\CT_FloorMaster.dgnlib***
4. If this is not configured properly please submit a CAD Support Ticket.

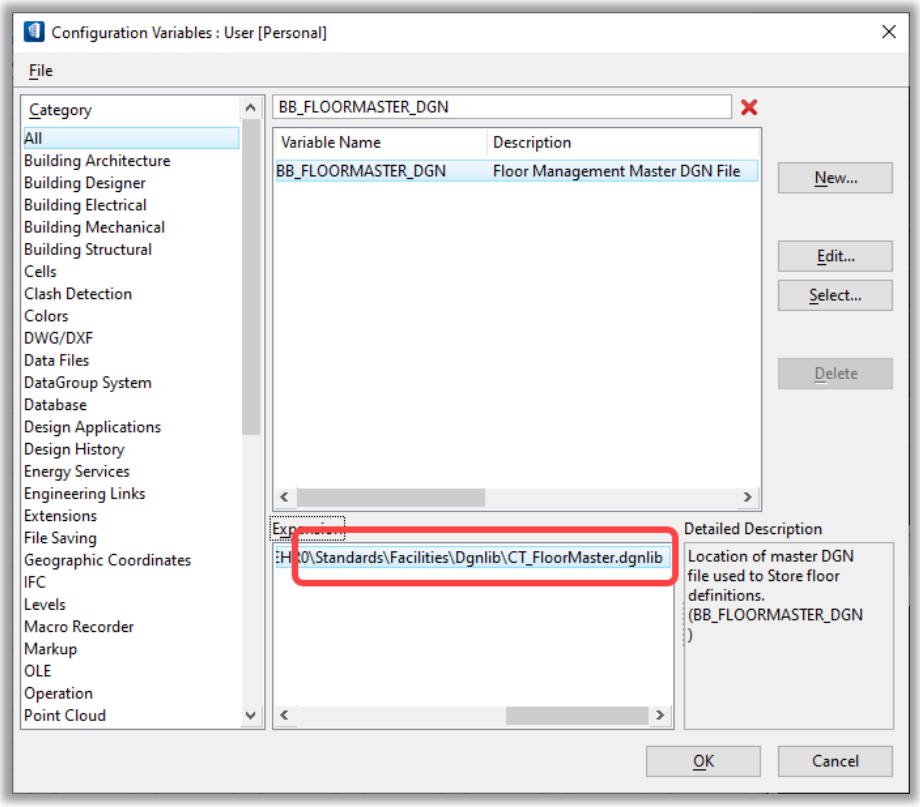


Figure 12 Configuration Variables

1.3.2 Set Up the Floor System

OpenBuildings Designer uses Floors as a means of organizing, designing, and reporting building information. By this method, designated floors define the physical location for portions of the building relative to reference and site elevations.

The Floor Manager creates a series of Auxiliary Coordinate System (ACS) that are used to represent floors in a building, or reference planes at a site. The Floor Manager utility is available for use by building design professionals who generally think in terms of floors and not auxiliary coordinate systems. Reference planes for floor elevations, and sub-floors within a floor (ceilings, raised platforms, and top of structure for example), are created with the floor management system to manage elements and components located within floor elevations.

Note: *The floor management system is available across all workset DGN files, meaning an ACS defined in one file can be shared by other files.*

1. From the bottom of the interface select the **Floor Manager** icon. The Floor Manager dialog will open.

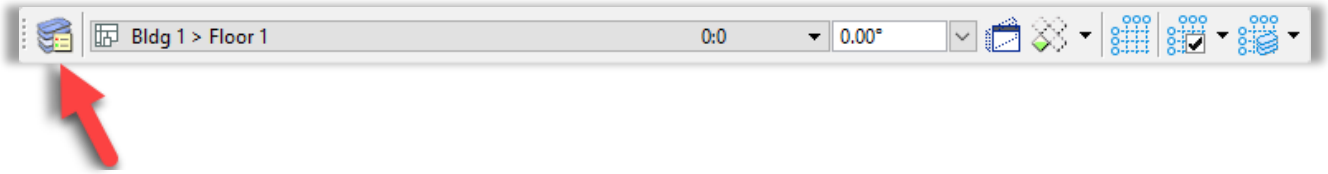


Figure 13 Floor Manager icon

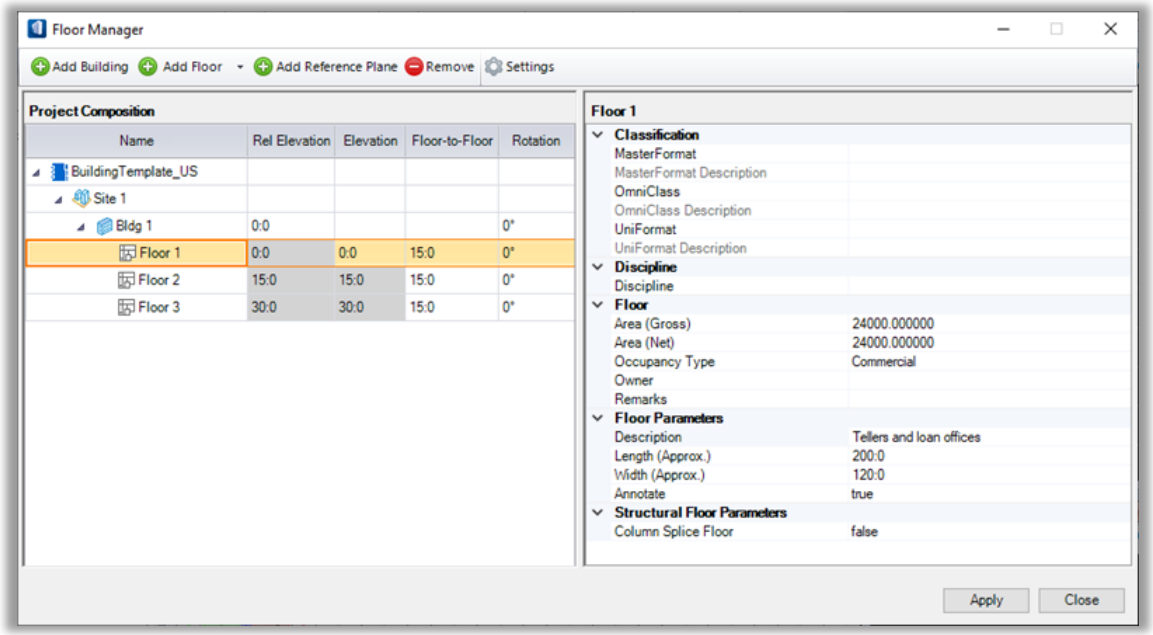


Figure 14 Floor Manager

2. Expand the ***BuildingTemplate_US|Site|Building 1*** to show the floors that have already been set up. Existing Sites, Buildings and Floors should be edited and renamed. Additional Sites, Buildings and Floors can also be created. Information should also be entered into the left side Data Fields. The configuration comes with a 3-story building, floors can be added or deleted. The Heights should also be adjusted as needed.
3. Click **Apply** and **Close** the Floor Manager.
4. From the bottom of the interface set the **Active Floor** to the different floors available. The ACS Triad changes its vertical location based on the ***Floor Selector***. This indicates the ACS plane for modeling. In addition, the ACS Plane and ACS Snap Plane are toggled to the locked position, this will be the default whenever a floor is selected from the Floor Selector. Locking the ACS Plane and the ACS Snap Plane means the elements you model will be placed on the active ACS plane or Floor.

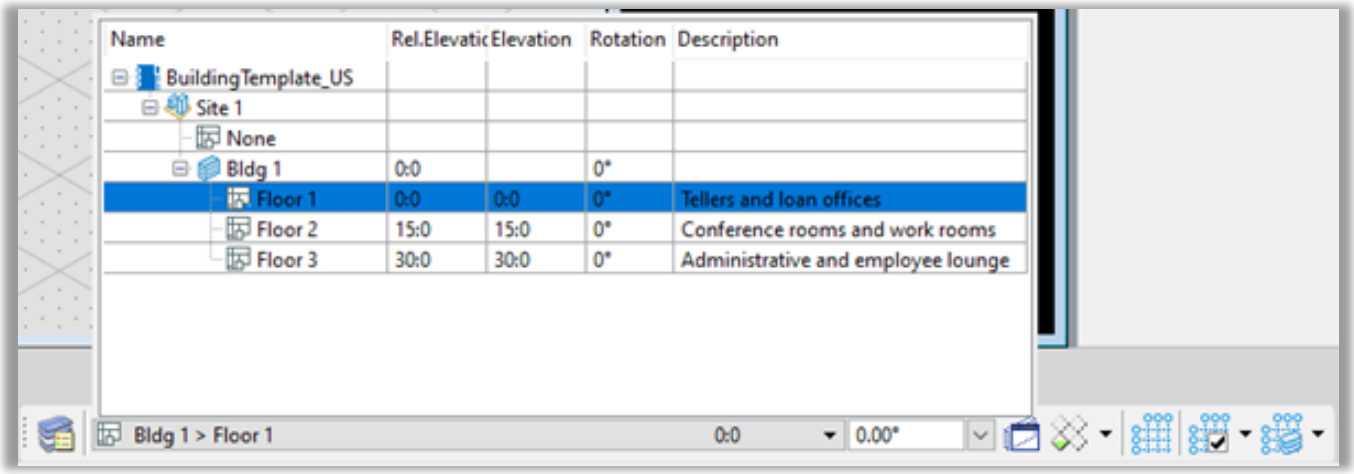


Figure 15 Floor Selector

5. Set the **Active Floor** back to the ***Floor 1***.
6. Its best practice to perform a **Save Settings** after selecting the Active Floor. This maintains the Floor Selector's most recent setting.

1.3.3 Set up the Grid System

OpenBuildings Designer provides a comprehensive set of Grid Systems in which buildings can have multiple grids (orthogonal, radial and sketched) applied to specific floors or ranges of floors in specific buildings. The Grid Systems utility effectively integrates grids into the OpenBuildings Designer workflow, including integration with the 3D model and the Floor Manager system. The Grid Systems Manager dialog contains settings for adding, copying and removing grids, inserting grid lines, manipulating grid line spacing, rotating grids, and setting grid line symbology and other preferences.

Column grids are associate to the floors/levels set up in the Floor Manager using the Grid Systems manager. In this exercise, you will set up the column grid for the office building we

are modeling. Once a Grid System is created for a project it can be displayed in 3D models and is used to automatically create properly labeled grid lines on your drawings for floor plans, elevations, sections and details.

There are two utilities in OpenBuildings Designer used for managing and setting floors and levels which define the Z elevations in our building: the Floor Manager and the Floor Selector. The Floor Manager is used to create and edit the floors and levels of the project. The Floor Selector is used to set the Z elevation in our models and aids us in modeling at the correct elevation. For our office building the Floor Manager is already setup for us.

1. Select the **Grid Systems Manager** icon on the **Floor Selector**.

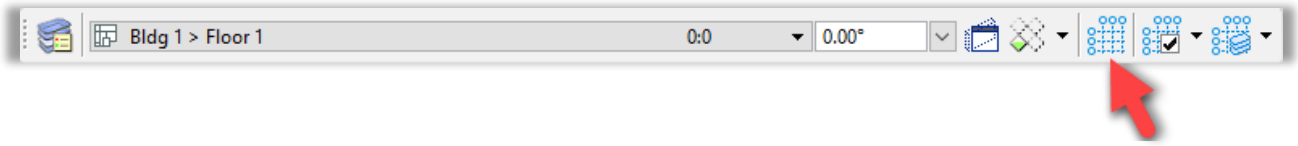


Figure 16 Grid Systems Manager icon

2. In addition to creating grid systems, you can exchange grid systems via XML files or Structural Synchronizer (ISM) for grid systems originating in external applications such as RAM Structural System. In the next steps you will import a structural grid system created by the structural engineer and provided via an XML file. From the **Import/Export** *pull-*down select ***Import Grid(s) from XML***.

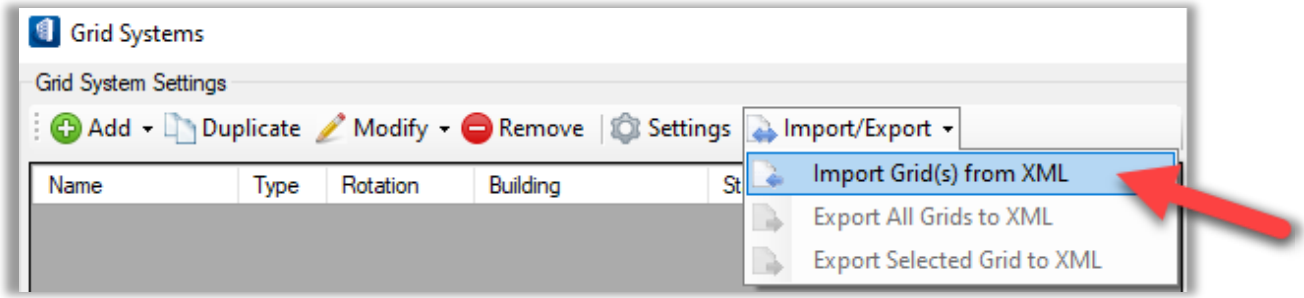


Figure 17 Import/Export Grids

3. Navigate to the ***C:\ProgramData\Bentley\OpenBuildings CONNECT Edition\Configuration\WorkSpaces\Building_Examples\worksets\TrainingTemplate_US\Designs*** and select the file ***Office Grid.xml***.
4. A Warning dialog will open, select the **BuildingGrid** for Import. An orthogonal grid is imported into the Grid Systems dialog.
5. The Grid System Settings is defined in the upper half of the dialog along with the Rotation, and association to a particular Building and range of floors defined by the Start Floor and End Floor.

6. Left-press on the name field and rename the grid as needed.
7. The Start Floor will be set ***FLOOR 1*** and the End Floor to **Floor 3**, edit as needed.
8. The Grid Line Settings defines the spacing between the horizontal and vertical grid lines in the lower half of the dialog. Edit the Horizontal (U) and Vertical (U) tabs as needed.
9. Select **OK**. A Building Grid should now be displayed in the model at a floor plane.

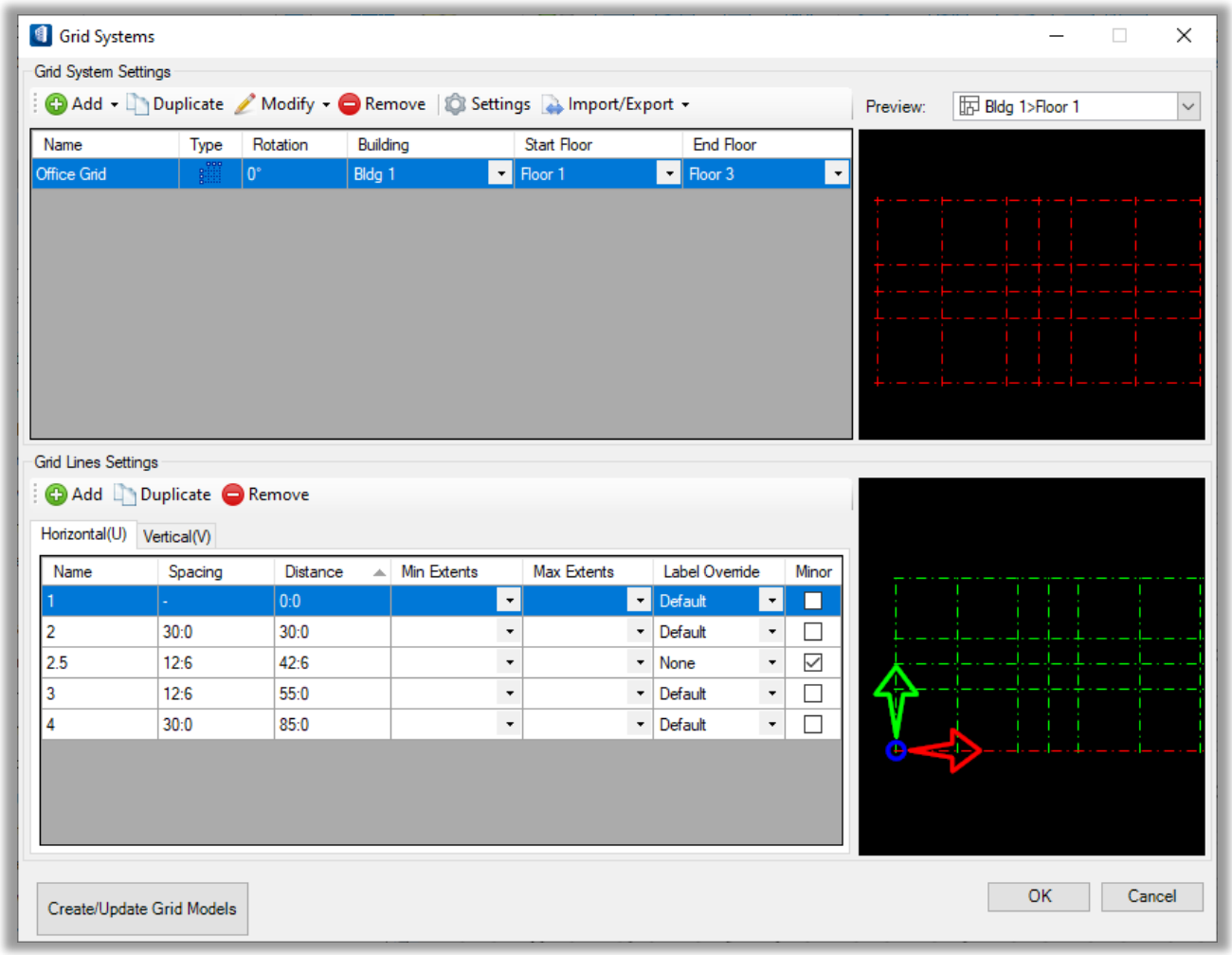


Figure 18 Grid Systems

1.3.4 Explore Grid Display Options

The column grids appear in 3D views. Controls for the display of the grids are available in the Floor Selector utility: Set Active Grids and Grid Model Display Options.

1. In the Floor Selector window click the **Set Active Grids** option and un-check the ***(Select All)*** option. Datapoint (left-click) in a view to apply the change. The grid we created turns off in the views.

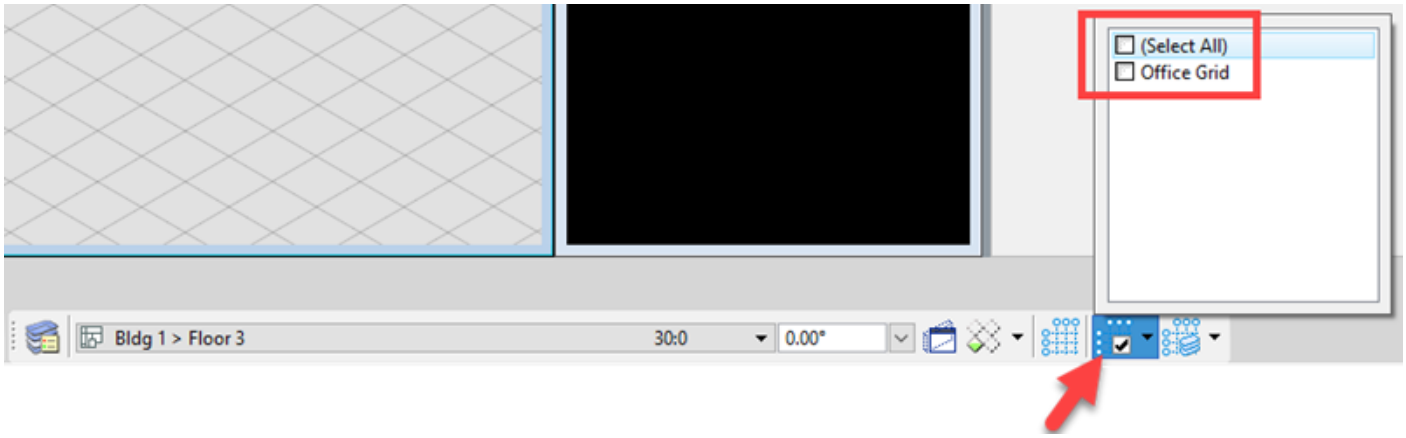


Figure 19 Set Active Grids

2. In the Floor Selector utility click the **Set Active Grids** option and check the ***(Select All)*** option back on. **Datapoint** (left-click) in a view to apply the change.

3. In the Floor Selector utility click the **Grid Model Display** option and select ***Full Grid (Follow Active Building)***.

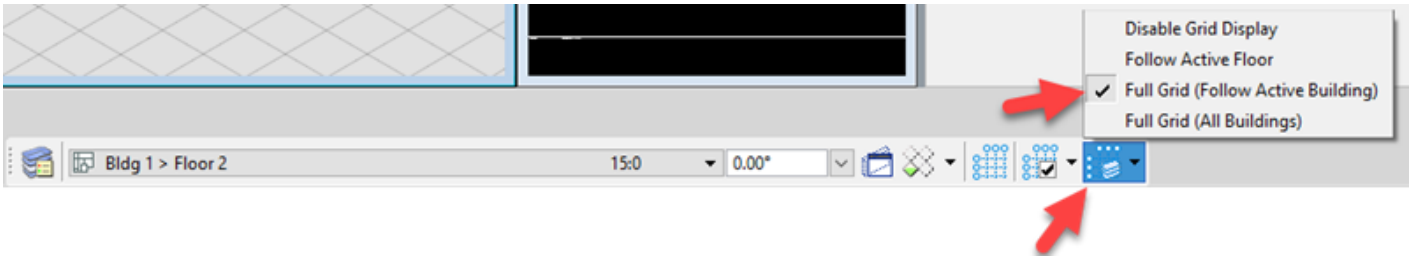


Figure 20 Grid Model Display

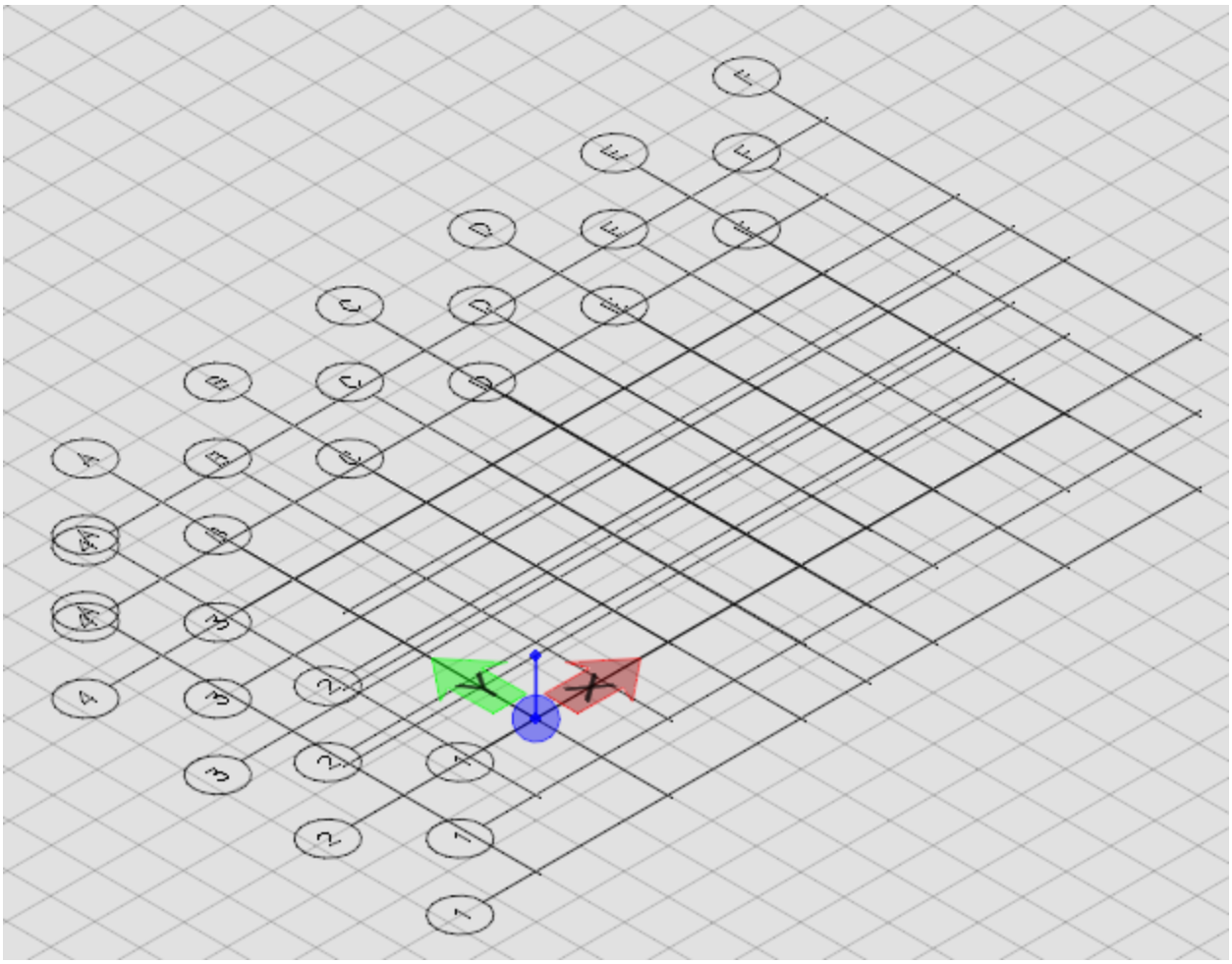


Figure 21 All Grid System in View Window

4. The views now display the grids for every floor. In our case the grid is the same for all the floors of the office building. Some designs will have different grids for different levels of the project. This is managed in the Grid Systems manager with the Start Floor and End Floor settings.

5. In the Floor Selector utility click the **Grid Model Display** option and select ***Follow Active Floor***. The views now display the Active Floor of the building.

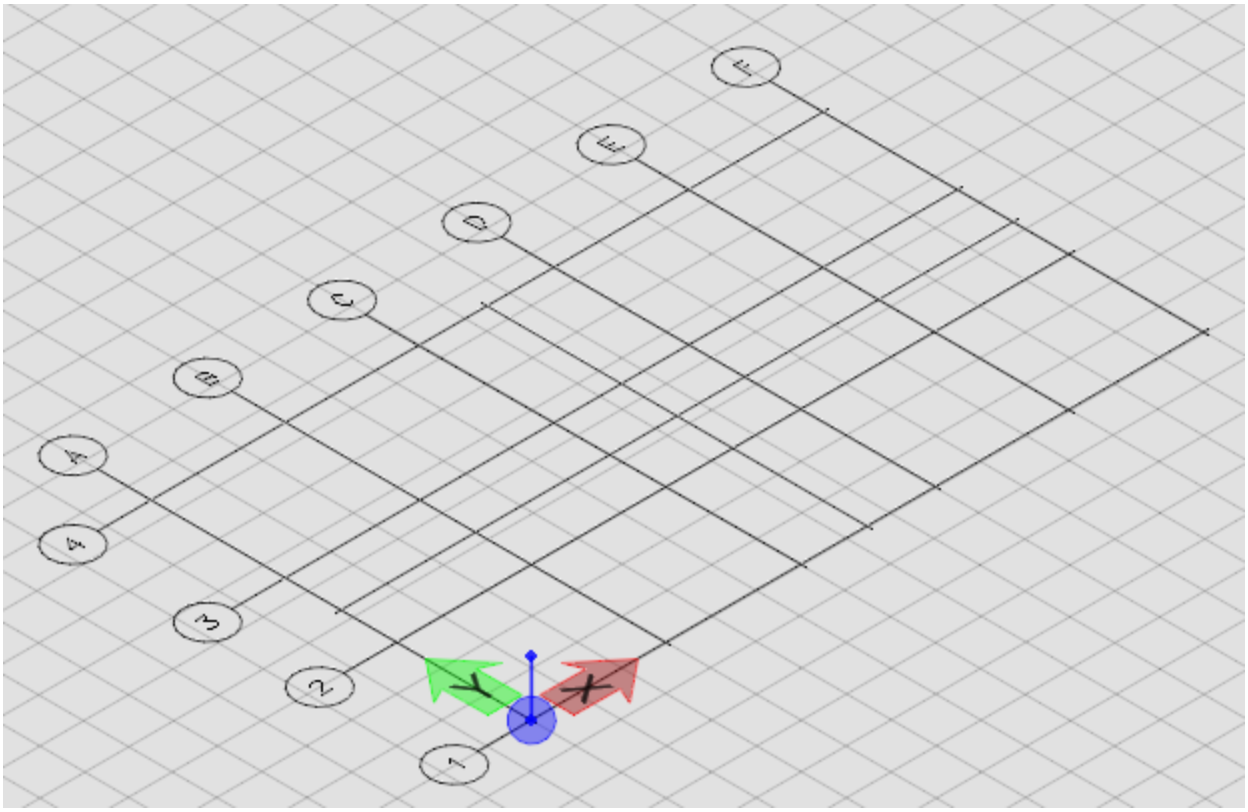


Figure 22 All Grid System in View Window

6. In the Floor Selector utility select different floor. Notice the Grid display with the active floor.
7. After adjusting these settings as desired, **Save Settings**.
8. Now that the Floor and Grid System are in place other team members can move forward creating additional Base Models for their Working Models, Discipline Master Models, and Building Master Models.

1.4 Online Learning

The following two links will help users get started with Bentley's Learning Program

1. Getting started with Bentley Learn
2. All Courses - Bentley Learn

Section 2 – OpenRail Designer

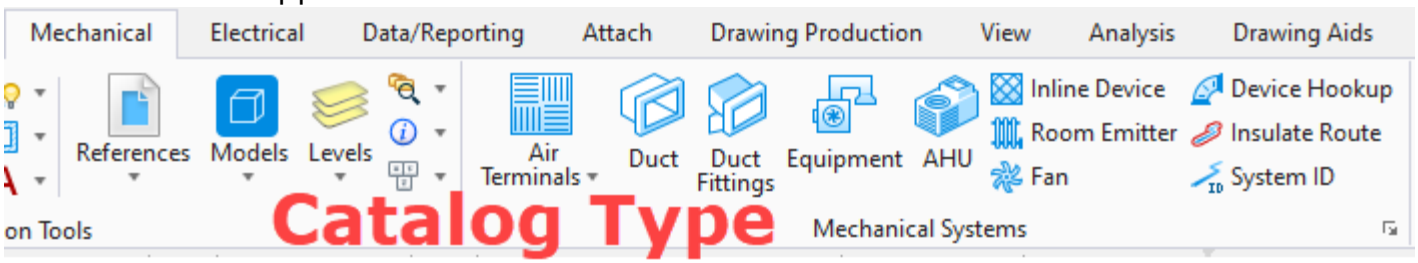
Coming Soon

Section 3 – AutoTURN

Coming Soon

Section 4 – GuideSIGN

Coming Soon


Mechanical
Electrical
Data/Reporting
Attach
Drawing Production
View
Analysis
Drawing Aids
References
Models
Levels
Air Terminals
Duct
Duct Fittings
Equipment
AHU
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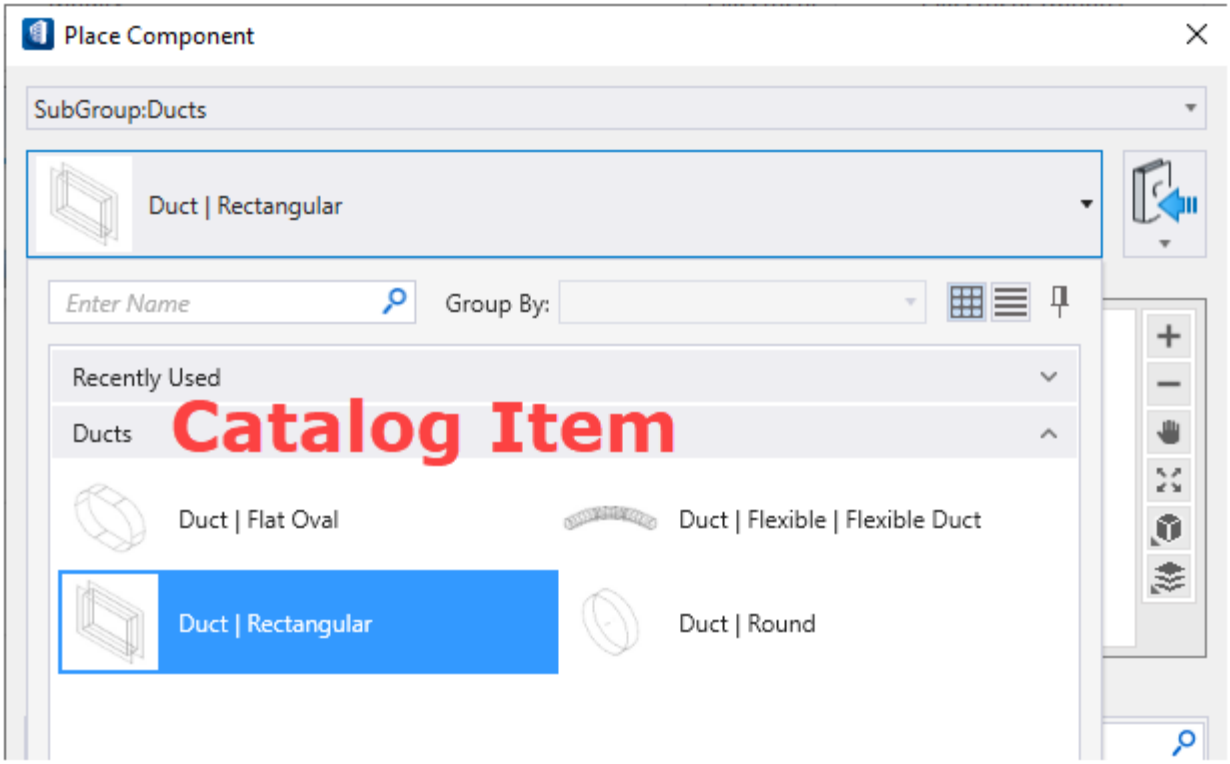
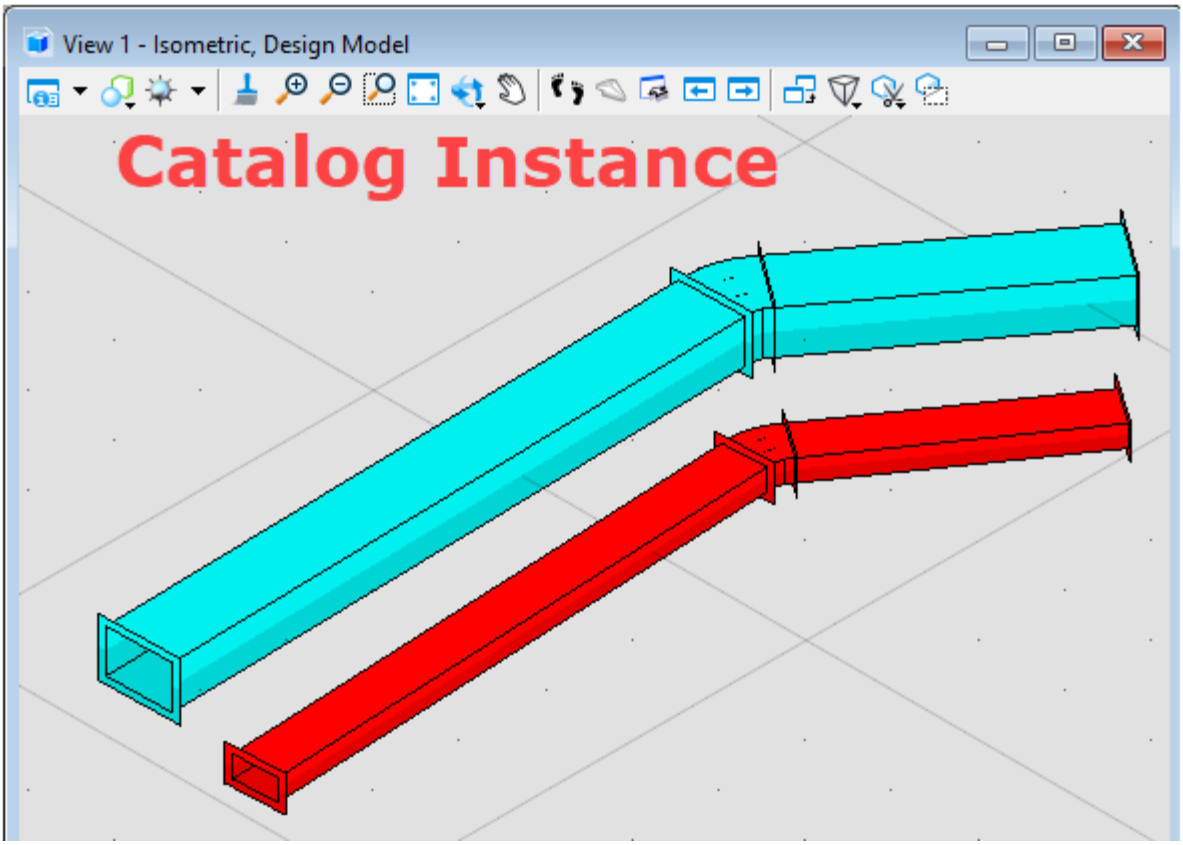
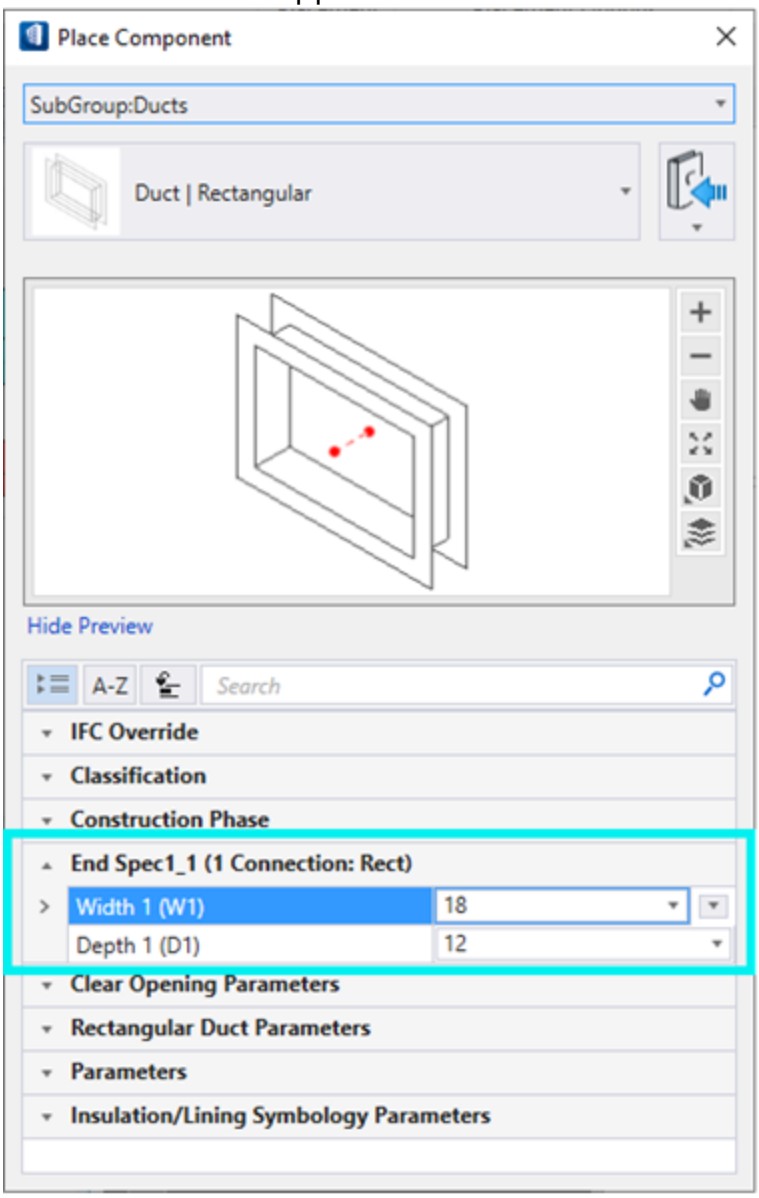
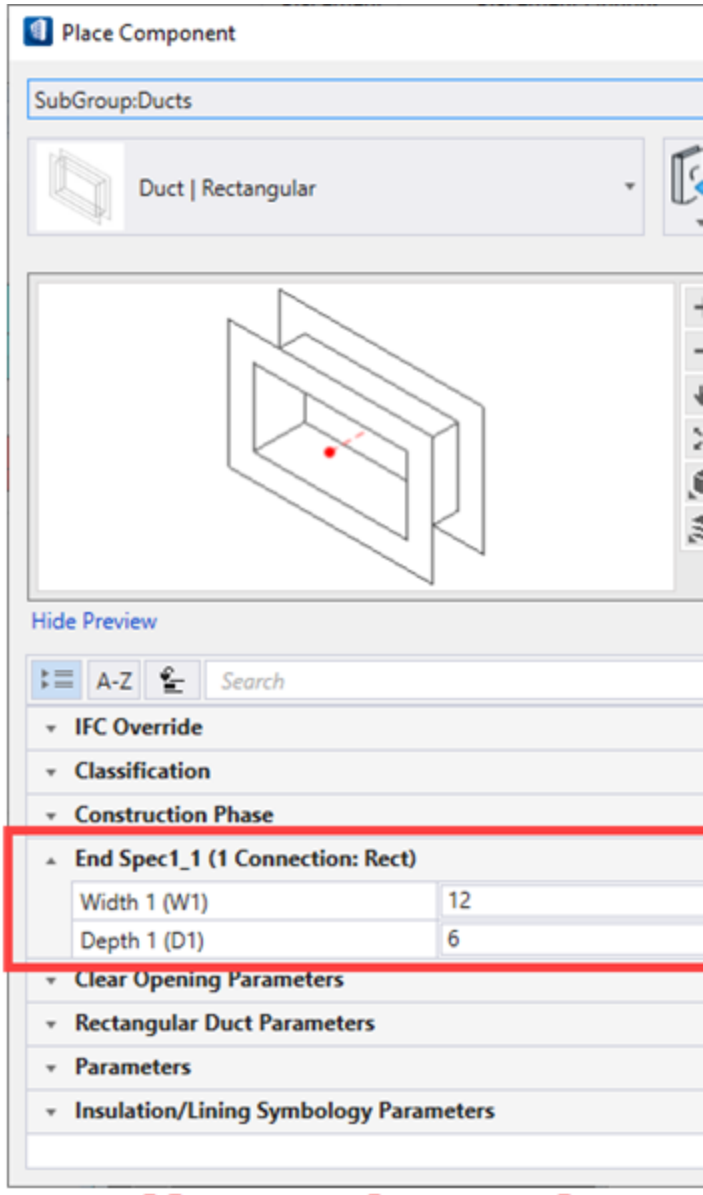
Insulate Route
System ID
on Tools
Catalog Type
Mechanical Systems


Place Component
SubGroup:Ducts
Duct | Rectangular
Enter Name
Group By:
Recently Used
Ducts
Catalog Item
Duct | Flat Oval
Duct | Flexible | Flexible Duct
Duct | Rectangular
Duct | Round


View 1 - Isometric, Design Model
Catalog Instance

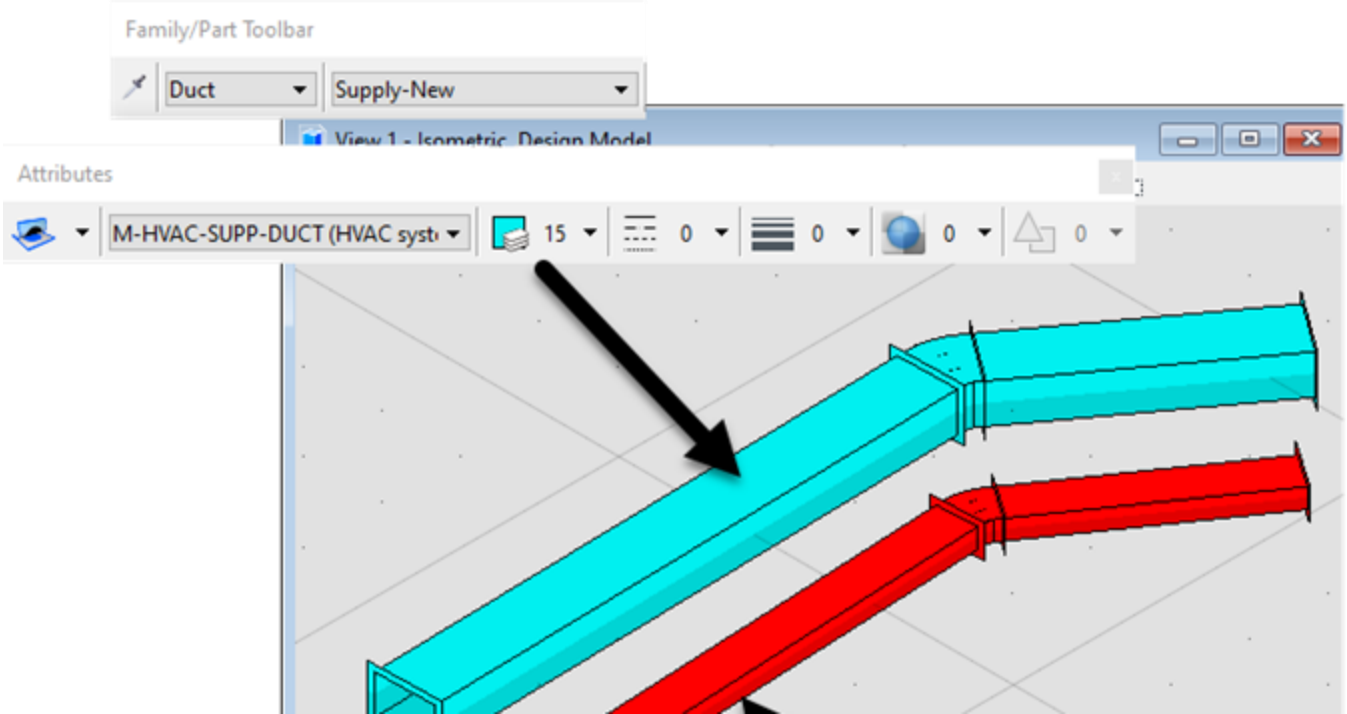
Each Catalog Type and Catalog Item will come programed with initial dimensions and settings; the user will edit this as needed before placement. In the Duct example the **Size** was adjusted as well as the **Part**. A Duct is preset to place as a Supply-New Part, but this **Part** can be changed as required.





Default Settings

Adjusted Settings



Section 5 - Revisions