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## Wielding the Power of One AutoCAD Toolsets: Utilize Toolsets Content and Standards

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### Learning Objectives

1. Learn how to insert standard content like doors and windows using AutoCAD Architecture
2. Learn how to generate bills of materials using AutoCAD Mechanical
3. Learn how to create wire diagrams and generate reports using AutoCAD Electrical
4. Learn how to lay the plumbing work within your design using AutoCAD MEP

### Description

[In this class, we will walk you through the procedures using specialized toolsets to design from start to finish. We will learn how to use standard content in AutoCAD Architecture software and AutoCAD MEP software. Then we'll learn how to use Bill of Materials from AutoCAD Mechanical software, along with wiring diagrams and reporting from AutoCAD Electrical software, to simplify and accelerate your design process. We will show you how to transition between different toolsets to achieve optimal design.]

### Speaker

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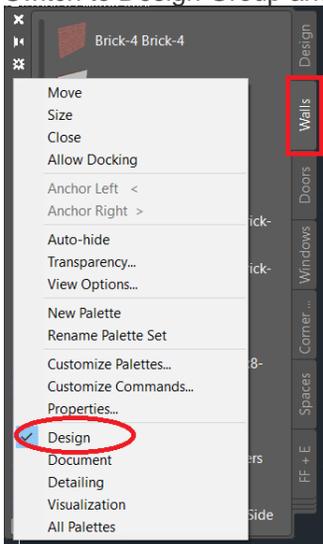
## 1. AutoCAD Architecture

AutoCAD Architecture is one of the toolsets available in one AutoCAD. Architecture adds a specialized toolset that allows architecture, engineering, and construction (AEC) professionals build more detailed construction drawings. Simple lines and arcs are replaced by intelligent windows, walls, and doors. Layer management is automated and simplified, and features like room tags and linked schedules make updates easy.

### 1.1 Convert Linework into intelligent Walls

In AutoCAD Architecture, we may convert lines, arcs, circles or polylines to walls.

1. Launch AutoCAD Architecture using Imperial Profile shortcut.
2. Open sample drawing Example\_Architecture\_MEP.dwg
3. Open Tool Palette using command Toolpalette or press Ctrl + 3
4. Switch to Design Group and Select Walls Palette.

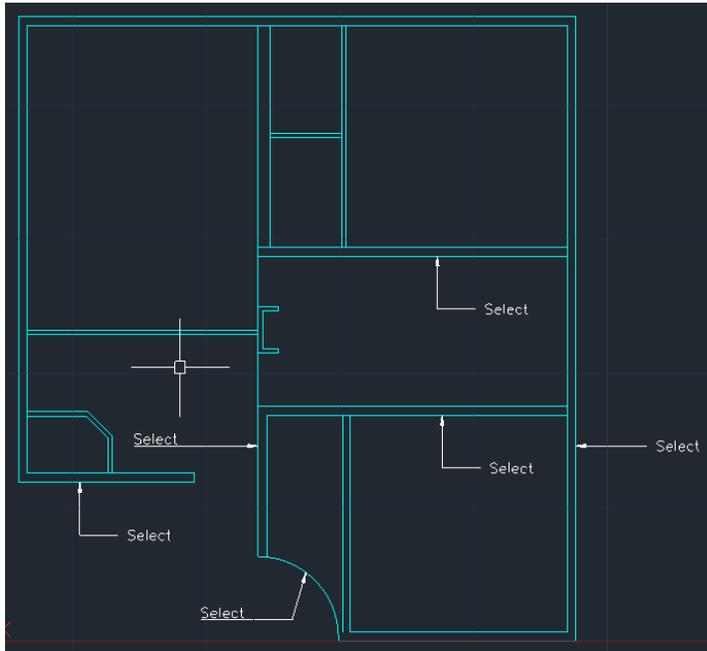


5. From the Tool Palette, select “**Brick-4 Brick-4**” Wall Style>>Right mouse click, select “**Apply Tool Properties to**” and select **Linework**
6. Select the lines shown in the below image to convert the linework into intelligent walls.

**Note:** The steps suggests to select “**Brick-4 Brick-4**”. However, you may select any Wall Style from the Tool Palette that suit your design.

*Tip: You may add more Wall Styles into Tool Palette from the Content Browser. For more information, please refer following links.*

About [Content Browser](#)



7. Let's repeat the same steps to convert interior linework into Walls.
8. From the Tool Palette, select "**Stud-4**" Wall Style>>Right mouse click, select "**Apply Tool Properties to**" and select **Linework**
9. Select the interior lines in the above image to convert them into walls.

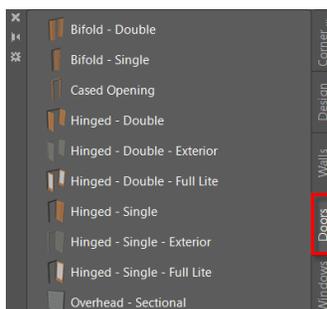
## 1.2 Adding Doors, Windows and Openings

Now we know how to convert our line work into intelligent walls that are based on industry standards.

Let's see how to insert some opening like Doors, Windows and wall openings.

Placing door objects into wall objects in AutoCAD Architecture is extremely easy to do. The doors and walls react to each other. As a door is placed into a wall, an opening is created in the wall to match the door size. When you move the door, this opening moves as well. Similarly, when you delete a door, the opening is removed and the wall heals, or becomes continuous again.

1. Open Tool Palette if it is closed using command Toolpalette.
2. On the Tool Palettes, Design palette, click the **Door** Palette.



3. Select **“Hinged – Double Exterior”** Door type
4. Review different properties like Standard Size, Width, Height, etc. from the property palette
5. Insert the doors on few walls.

**Tip:** Grip select the walls and move along the walls, notice how the doors are anchored to the walls. Move the wall to a different location to see how the door is anchored to the walls. At any point of time, grip select the Architecture object to modify the properties from the contextual ribbon or property palette.

6. From the Toolpalette, Door palette, select **“Hinged – single”** door and insert on any interior wall.
7. On the Tool Palettes, Design palette, click the Window Palette.
8. Select **“Glider”** window type, review the properties from the property palette. Make changes as per your design requirements and start inserting the windows.
9. Like Doors, grip select the window to move to different location or change properties.
10. From the Ribbon, Home Tab, Build panel, select door drop down and pick “Openings” object type.
11. Insert the opening on any wall.
12. Grip select the opening to make changes to the dimensions.

### 1.3 Inserting Multi View Blocks

A multi-view block is an AutoCAD Architecture object that can have different representations in different view directions. They are typically used to represent furniture and fixtures such as tables and kitchen sinks, or schedule tags such as door numbers. MvBlocks are similar to blocks and can be inserted in the drawing using AutoCAD Design Center>AEC Tab, Tool Palette and Content Browser

On the Fixtures, Furnishings and Equipment tool palette, we have a variety of Multi-View blocks that are available. Multi View Blocks can also be inserted from AutoCAD Design Center (AEC Tab) and from [Content Browser](#).

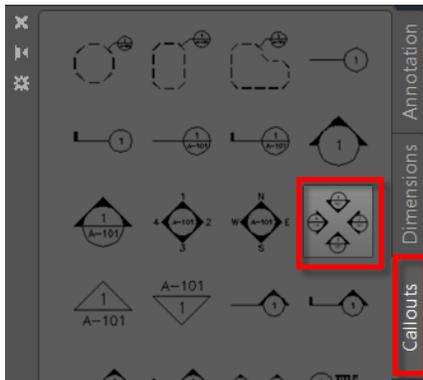
Insert few Multi View blocks from AutoCAD Design Center>AEC Tab, Tool Palette and Content Browser

### 1.4 Creating Sections and Elevation Views

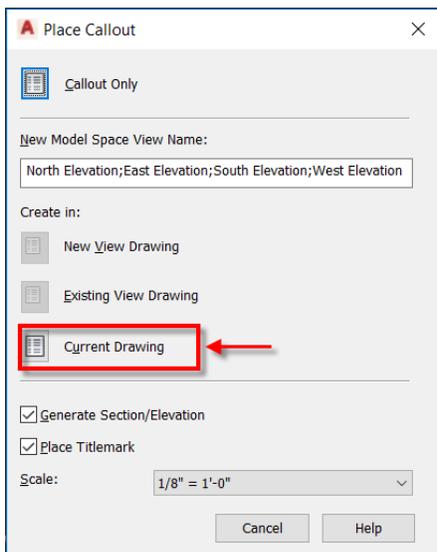
#### 1.4.1 Elevation View

We will use the model to generate the exterior elevation views of the building.

1. Continue with the exercise.dwg file
2. To generate the building elevations, from the Tool Palettes Documentation Group, Callouts palette, click the Exterior Elevation Mark A3 tool.  
*Note: This places an elevation symbol on all four sides of the building, and generates the four elevation views automatically.*



3. At the Specify first corner of elevation region prompt, pick a point above and to the left of the plan. At the Specify opposite corner of elevation region prompt>> pick a point below and to the right of the plan.



4. In the Place Callout dialog box, ensure that Generate Section/Elevation, and Place Titlemark are selected. Also, ensure that the Scale is set to 1/8"=1'-0".

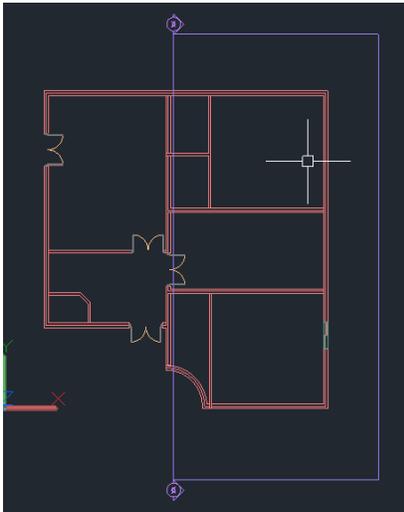
**Note:** The scale will help when you create detail views in the Layout.

5. In the Place Callout dialog box, select "Current drawing".
6. At the Specify insertion point for the 2D elevation result prompt, pick a point above the site boundary and pick a point to specify the spacing and direction of elevations prompt.

## 1.4.2 Creating Section Views

Let's use the same exercise model to generate the section views of the building.

1. Continue with the exercise.dwg file
2. To generate the building sections, from the Ribbon Home tab, Section and Elevations panel, select "Section line"



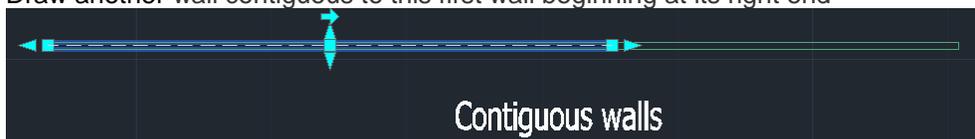
3. At the Specify first point of section line prompt, pick 2 points for the section line as shown in the above image, at the Specify next point of line prompt, pick past the building to the right in plan, press ENTER to insert the Section View.
4. At the Specify insertion point for the 2D section result prompt, pick a point above the site boundary.

## 1.5 Architecture Tips

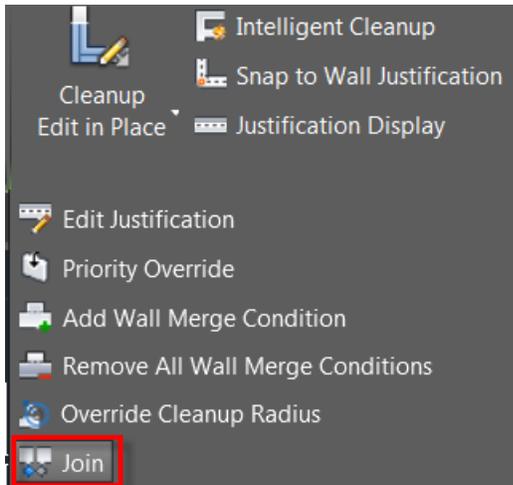
We'll review joining and intersection clean ups, as well as resolving component priority cleanup issues.

### 1.5.1 Joining Cleanup

1. Open a new drawing
2. From Ribbon Home Tab Build Panel, Draw a wall with any style
3. Draw another wall contiguous to this first wall beginning at its right end



4. We now have two walls that may need to be joined.
5. Select the wall on the left
6. From the Wall contextual panel>Cleanup Panel>Slide out>>Select Join



7. Pick the other wall on the right side
8. Notice both walls join into a single wall.

### 1.5.2 Intersection Cleanup



1. Let's continue in the same drawing.
2. Draw a vertical wall below horizontal wall, right-click and click Enter
3. Then another one below and to the left of this same horizontal wall, right-click, and click Enter to end the command.
4. Select the first wall>on the Wall tab>Cleanup panel>Select the Intelligent Cleanup tool for L and T intersection conditions
5. Pick the vertical wall to see the T intersection cleanup done automatically
6. Repeat step-4
7. Pick the other vertical wall to the side of horizontal wall>> on the Wall tab>Cleanup panel>Select the Intelligent Cleanup

### 1.5.3 MvBlocks

Let's review how to toggle between multiple insertion points for MvBlock insertion

1. Open a new drawing file
2. Command: ADCenter or ADC to open AutoCAD Design Center
3. Switch to AEC Content tab
4. Select AutoCAD Architecture>Imperial>Design>Equipment>Food Service>Dish Washer
5. Select any content and Double click
6. Before inserting the content>press the Control Key on the keyboard

- Notice how the insertion point of the content toggles and content preview changing.

## 2. AutoCAD MEP:

AutoCAD MEP helps you build the systems—mechanical, electrical, and plumbing—that connect buildings to the outside world. MEP will help you draft, design, and document these systems.

### 2.1 Adding HVAC Equipment:

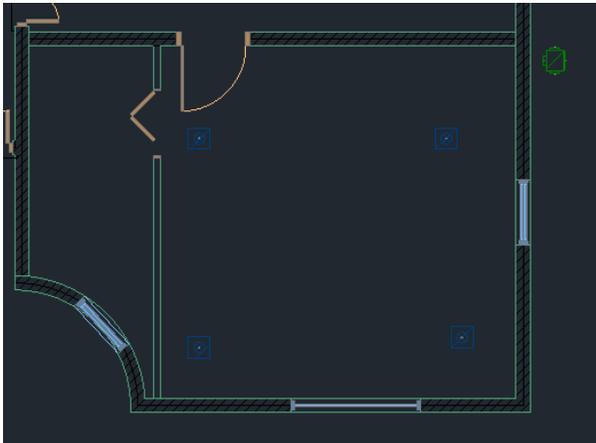
Let's begin by adding HVAC equipment. This equipment is made up of items referred to as targets and sources. These are items that distribute and receive air in a model.

First step is to add air terminals and VAV units to the Master Bedroom. Zoom into this area as shown. To place HVAC equipment, make sure you have the HVAC workspace set current.

Once the workspace is current, you have two places to located equipment commands.

The first is from the ribbon, Home tab, Build panel. The Equipment tool is a flyout, which includes common components, such as an air handler, an air terminal, a fan, a damper, and a VAV unit. The other location is the Tool Palettes, Equipment tab.

- From Ribbon, Home tab, Build panel, Equipment tool flyout, Select the **Diffuser** tool to place a supply **Air terminal**.
- The MvPart dialog appears. The tool from the palette is set to jump directly to the category for supply air diffusers.
- Select the perforated face, **round neck diffuser**.
- Check the elevation. This is the only thing you really need to know about working in 3D. This sets the height or Z elevation of the part, based on the insertion point of the part. Set this to 8'-6", which is the height of the ceiling.
- For the part size name, select the 6" neck, 12x12 face.
- Pick one corner of the room to insert the Air Terminal/Diffuser. Press ENTER to accept a 0-degree rotation.
- Place four diffusers in the room as shown and close the MV part dialog box.



- Repeat step 1 and pick VAV Units, and then select "outlet Plenum Cross US Imperial" VAV Box.
- Note that there are over 200,000 sizes available. You can filter the list down to a more manageable level from the Part Filter tab.
- Pick a point outside the build as shown in the image.

Once these equipments are placed, you are ready to start adding ductwork. You have now placed examples of what are commonly referred to as targets and sources. In this case, the target is the air terminal and the source is the VAV box. This represents a system within an AutoCAD MEP project.

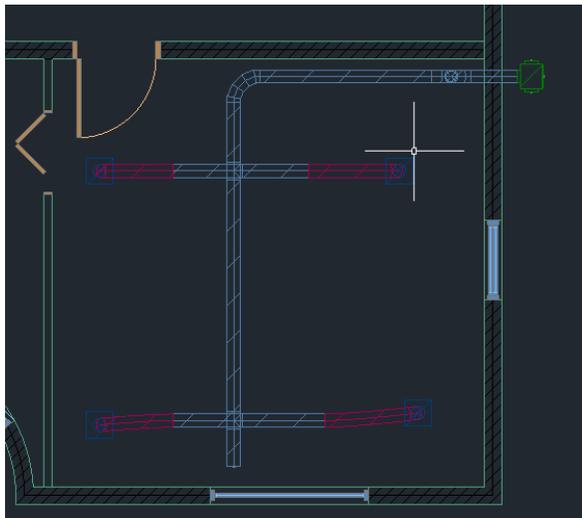
## 2.2 Adding Duct Work:

*You have added your target and source parts. In AutoCAD MEP, Ducts come in rectangular, round and oval shapes. Duct can be created as single line or double line object as needed. But the big thing is to make sure you connect all of these objects together properly.*

*There are several ways to add duct. The first is to pick the Duct tool from the ribbon, Home tab, Build panel. When you pick the tool here, you can choose between regular duct or flex duct. The second is to pick a Duct tool from the Tool Palettes. Some of these tools have predefined settings, such as the Supply Medium Pressure tool.*

*One of the most common ways to add duct is to simply select the Add duct grip, which is indicated by a plus sign when you select an Equipment.*

1. Grip select the VAV box, pick the grip on the left side of the VAV box.
2. Note: The rule about duct layout is this: always check the Properties palette before you pick your second point of duct, which is activated when you start the command.
3. You can make adjustments to any of the following settings. Select Round Duct type, 6" diameter, Elevation as 1' and The "Terminal to duct connection" to Flexible. Flexible option sets to draw flex duct.
4. Pick a short leg into the building. In the Property palette, set the "Elevation" to 9' Select OK to pick the first option in the "Duct and Fittings" dialog box.
5. Enter 8' to draw a duct to the left of the room and enter 14' to draw a vertical duct down the room as shown in the image.



Let's add some branch ducts to connect the Air Terminals to the main Duct.

2. To create a branch, select the Duct tool from the ribbon. Note that the last values you used remain in the tab.
3. Set the diameter to 6", but before you create the duct, open the OSnap settings and turn OFF the AutoCAD snaps. Leave the MEP snaps turned ON.

4. Pick a point on the main duct, select “Round Duct Straight Tee” as the Fittings, Select OK in the next Fittings dialog box, add a short leg for the branch and pick the connection point on the Air Terminal. When you are prompted for a connection, choose Accept.
5. Continue to connect the air terminals and main ducts together.

### 3. AutoCAD Mechanical:

AutoCAD Mechanical is one of the toolsets available in one AutoCAD. AutoCAD Mechanical includes the very best of AutoCAD along with industry-specific libraries of parts and tools for mechanical engineering, making it a must-learn application for anyone involved in the design and construction of machinery.

In this exercise, you will create drawing view and detailed view for geometry of an assembly and parts drawn in model space.

#### 3.1 Create a view port & a drawing view

1. Launch AutoCAD Mechanical
2. Open Example.dwg.
3. From Status Bar, select the view tab, go to Viewports, click New Viewport



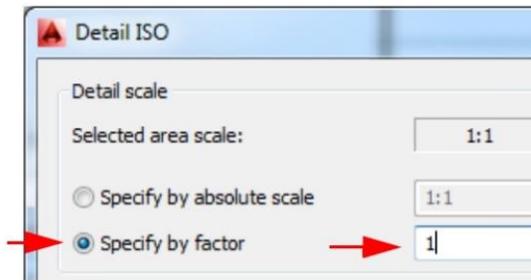
4. On the Status Bar, click Quick View Layouts and select Layout1.
5. To begin creating a viewport to show a part in model space.
  - a. Click on Layout tab > Viewports panel > Viewport drop-down list > Viewport.
6. In the drawing window, pick 2 corner points to define a rectangular
7. In the View dialog box, in the Scale list, select 1:2



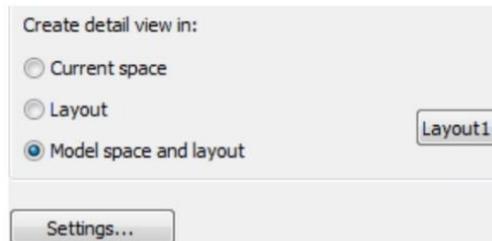
8. To set the geometry to display in the viewport.
9. In Model space, click Midpoint. In the drawing window, click the midpoint.
10. In the View dialog box, Click OK.
11. Save Drawing.

#### 3.2 Create a Detail View

1. On the Status Bar, click Quick View Layouts and select Model to make it current.
2. To begin creating a detail view of an area in the assembly and have a viewport created, On the Home tab, click Detail panel > Detail View.
3. In the drawing window, specify the detail view area by defining a circular area.
4. In the Detail dialog box:
  - a. Under Detail Scale area, click Specify by Factor.
  - b. In the Scale by factor field, enter 1.



5. In the Detail view area, click Model space and layout, and be sure that the drop-down list is set to Layout1. Click OK.

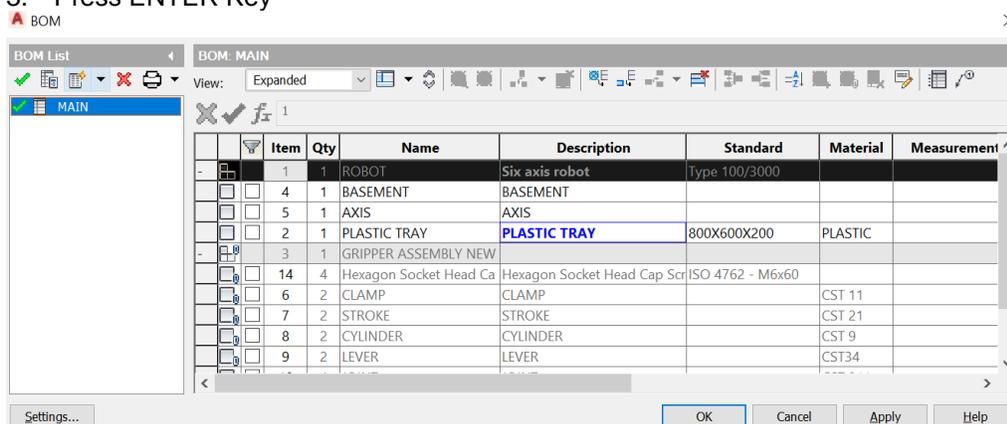


6. In the drawing window, click to position the copy above the base view.
7. Click to position the view
8. On the Status Bar, click Quick View Layouts and select Model to make it current.
9. Save drawing.

### 3.3 Insert Parts list from BOM for the drawing

In this exercise, we will create a simple parts list from an existing in the drawing.

1. Open Example 2.dwg.
2. To display the BOM dialog box, click Annotate tab, BOM panel, BOM.
3. Press ENTER Key



4. OR Click Annotate tab, Table panel, Parts List to invoke Parts List dialog box from Ribbon
5. At the Command prompt, enter MAIN or BOM name if you have already defined a BOM name in the BOM dialog box.

**Parts List ISO - MAIN** [Close]

Layout settings

Parts list name:  Insertion point:

Insert header  Insert title  Show grip frame Line spacing:

Parts list style:   Filter empty references

Part list contents

4

Item	Qty	Description	Standard	Material
4	1	BASEMENT		
5	1	AXIS		
2	1	PLASTIC TRAY	800X600X200	PLASTIC
6	2	CLAMP		CST 11
7	2	STROKE		CST 21
8	2	CYLINDER		CST 9

Filters and groups

Column splitting

Enable column split

Wrap around title block

Wrap left  Number of rows:

Wrap right  Number of sections:

Settings... [OK] [Cancel] [Apply] [Help]

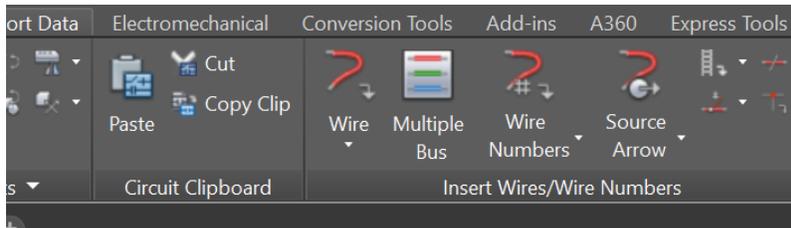
6. Click OK. The dialog box closes, and a preview of the parts list appears in the drawing area.
7. In the drawing area, select a location to click and indicate where to place the parts list. The program inserts the parts list into the drawing.
8. Select Insert Title to add name of the parts list
9. Select Insertion Point to Bottom left
10. Select line spacing to Double
11. Enable column split – \*use when parts list is lengthy\*
12. Click Setting to Modify Parts List Color & Style.
13. Click Ok to save Changes.

#### 4. AutoCAD Electrical:

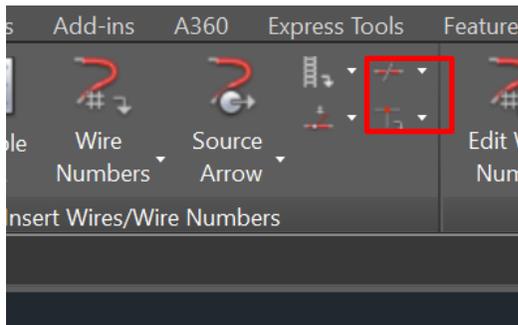
##### 4.1 Introduction to wiring diagram in Electrical drawing

In this exercise, you will learn how to add wires and insert component in an electrical drawing.

1. Launch AutoCAD Electrical
2. In project manager, Press Open Project
3. Select AU.wdp file
4. Expand the AU folder in Project Manager
5. Open Example 3.dwg
6. Go to Schematic tab, Insert wire, select Multibus



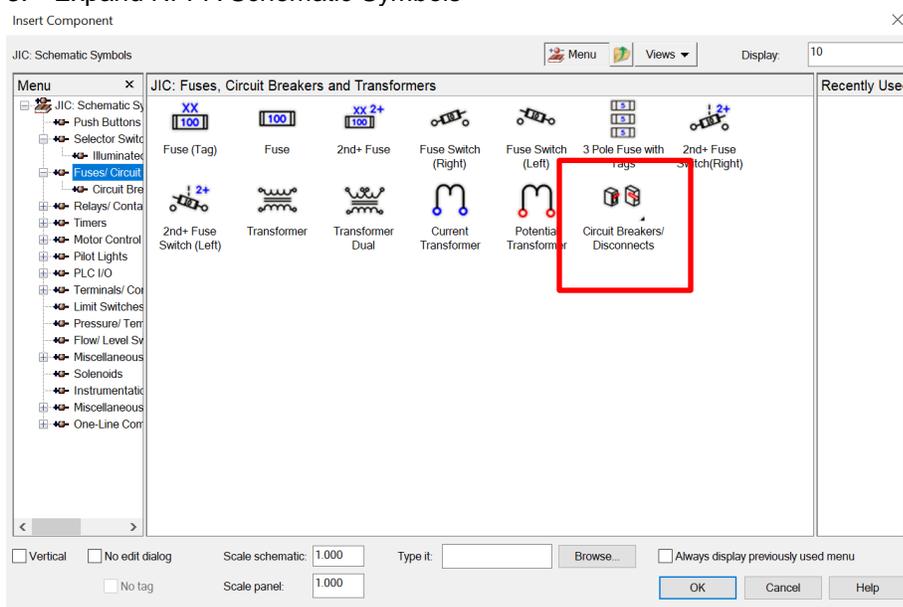
7. Select Empty Space, Go Horizontal
8. Set Number of wires to 3 (Positive, Neutral & Ground)
9. Press Ok and drag cursor to place the wires
10. Under Insert wires, select Insert Ladder



11. Select 1 Phase, press Ok
12. Place a three-rung ladder by dragging the line
13. Save Example 3.dwg

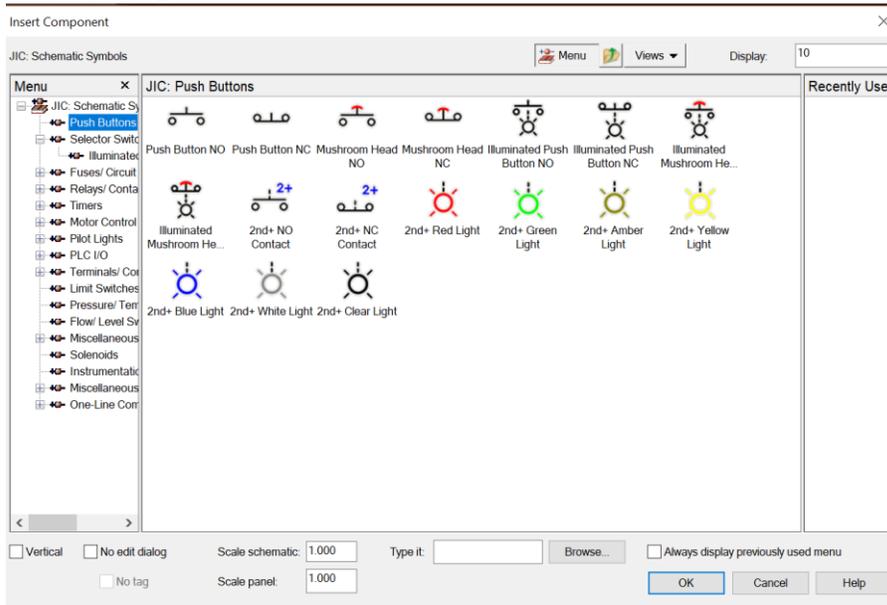
## 4.2 Using Icon Menu – Insert Component to place components

1. Open Example 3.dwg
2. Go to Schematics, Insert Component > Icon Menu
3. Expand NFPA Schematic Symbols



4. Select Fuses, Circuit Breakers and Transformers

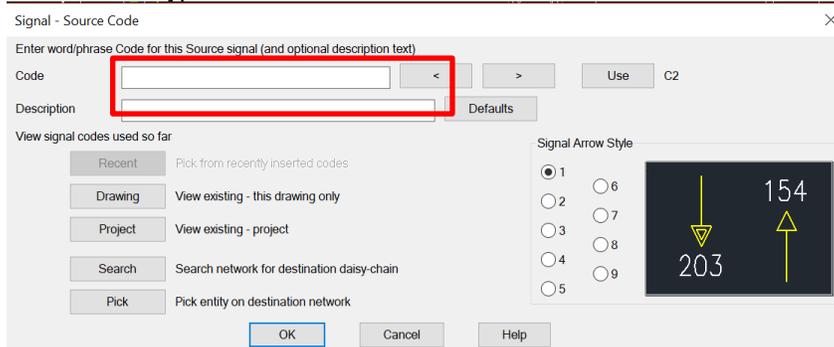
5. Select Circuit Breakers / Disconnects
6. Select Circuit Breaker 1 Pole
7. Place the Circuit Breaker to first wire created by Multibus command
8. Press Ok
9. Go to Icon Menu
10. Expand NFPA Schematic Symbols
11. Select Push Buttons



12. Select Push Button No
13. Drag over the ladder on the left side. It will continue to place push buttons on each rung.
14. Go to Icon Menu
15. Expand NFPA Schematic Symbols
16. Select Selector Switches
17. Select 2 Position Maintain, NO
18. Drag over the ladder on the right side. It will continue to place push buttons on each rung.
19. Save drawing

### 4.3 Creating Source and Destination for wires and components

1. Open Example 3.dwg
2. Select the first Multibus wire (Positive)
3. Go to Insert Wires, Source Arrow
4. In the Code field type "PBSW Pos". Press Ok

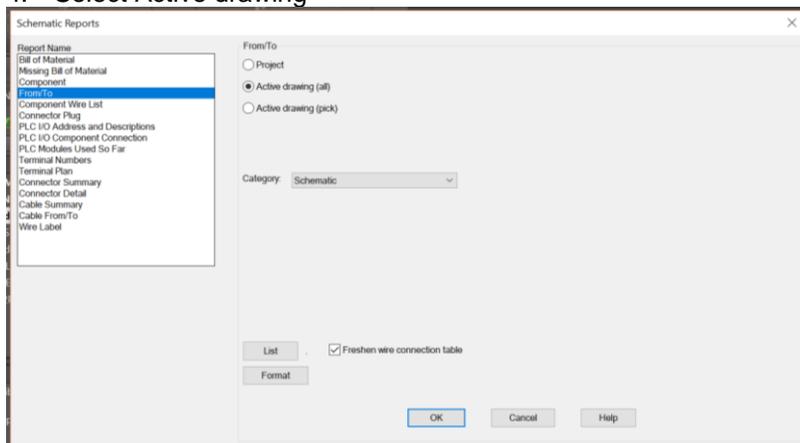


5. When prompted "Insert matching Destination arrows now". Press Ok

6. Select the left side top of the ladder. It will place the destination for the wire
7. Select the second Multibus wire (Neutral)
8. In the Code field type “PBSW Neu”. Press Ok
9. When prompted “Insert matching Destination arrows now”. Press Ok
10. Select the right-side top of the ladder. It will place the destination for the wire
11. Save drawing
12. Go to Insert Wires, select Wire Numbers
13. Pick Drawing wide
14. You will see that wire numbers are auto populated for your Multibus and ladder
15. Save drawing

#### 4.4 Create From – To report for your drawing

1. Open Example 3.dwg
2. Go to Reports tab – Select Schematic report
3. Select From/To
4. Select Active drawing



5. Press Ok
6. Selection location code “Bedroom” on both From and To field
7. Press Ok
8. Report will be generated with all the necessary field values
9. Press Save to file
10. Select Excel Spreadsheet format (Xls) to export.