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Autodesk® Advance Steel 2020 Fundamentals

Learning Guide

1st Edition

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Autodesk® Advance Steel 2020
Fundamentals

1st Edition

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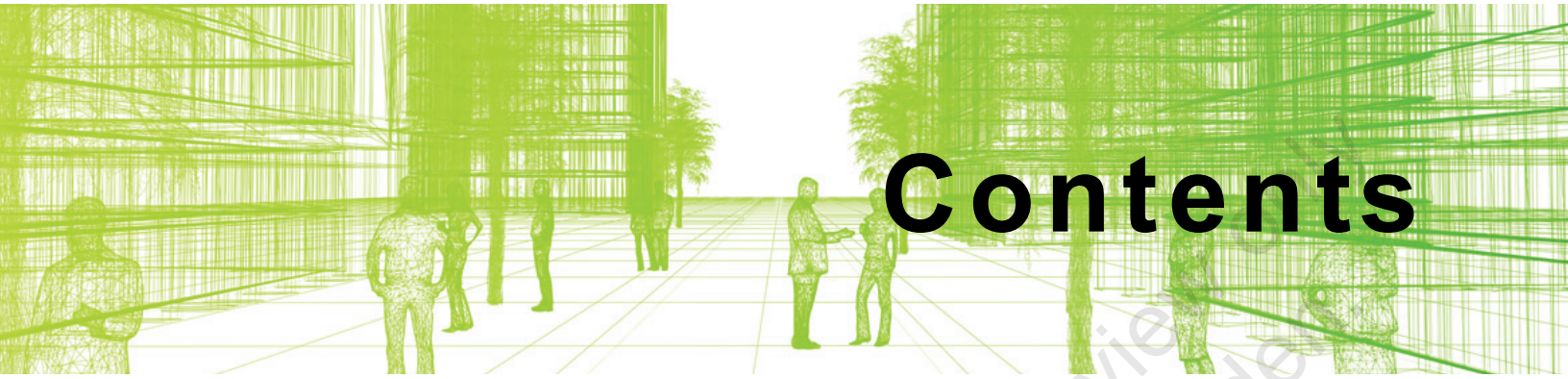

Contents

Preface

The Autodesk® Advance Steel software is a powerful 3D modeling application that streamlines the fabrication process through the use of a 3D model, which is used to create fabrication drawings, Bill of Materials (BOM) lists, and files for Numerical Control (NC) machines.

Since structural steel projects are extremely complex, the Autodesk Advance Steel software is also complex. The objective of the *Autodesk® Advance Steel 2020: Fundamentals* guide is to enable you to create full 3D project models at a high level of detail and set them up in fabrication drawings. This guide focuses on the basic tools that the majority of users need. You begin by learning the user interface, basic 3D viewing tools, and the standard AutoCAD® tools that are routinely used. Specific Autodesk Advance Steel objects, including structural columns, beams, bracing, plates, bolts, anchors, welds, and additional 3D objects are also covered. You will also learn about the powerful model verification tools. To complete the guide, you will learn to edit and generate all of the required documentation files that enable your design to accurately and effectively communicate the final design.

Topics Covered

- Understand the process of 3D modeling and extracting 2D documentation from a model in the Autodesk Advance Steel software.
- Navigate the Autodesk Advance Steel interface.
- Work with 3D viewing tools.
- Review helpful AutoCAD tools.
- Work with the User Coordinate System (UCS).
- Use the Autodesk Advance Steel Modify commands.
- Add structural grids.
- Create levels.
- Model columns and beams and add bracing.
- Create connections using the Connection Vault.
- Create special parts.
- Verify models using Clash Checking tools.

- Modify a drawing prototype.
- Work within the Drawing Style Manager.
- Create custom connections.
- Create plates and add bolts, anchors, and welds.
- Add grating and cladding.
- Model ladders, stairs, and railings.
- Create concrete objects such as footings.
- Number objects.
- Extract 2D drawings from the model using Drawing Styles and Drawing Processes.
- Review and modify 2D drawings using the Document Manager.
- Modify 2D details with parametric dimensions.
- Revise models and drawings.
- Create BOM lists.
- Export data to .NC and .DXF files.

Prerequisites

- Access to the 2020.0 version of the software, to ensure compatibility with this guide. Future software updates that are released by Autodesk may include changes that are not reflected in this guide. The practices and files included with this guide might not be compatible with prior versions (i.e., 2019).

Note on Software Setup

This guide assumes a standard installation of the software using the default preferences during installation. Lectures and practices use the standard software templates and default options for the Content Libraries.

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Note: Free products are subject to the terms and conditions of the end-user license and services agreement that accompanies the software. The software is for personal use for education purposes and is not intended for classroom or lab use.

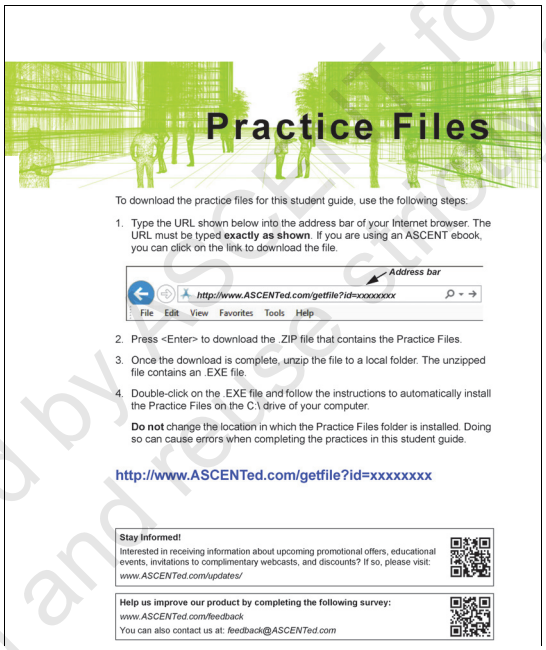
Lead Contributor: Cherisse Biddulph

Cherisse is an Autodesk Certified Professional for Revit as well as an Autodesk Certified Instructor. She brings 15 years of industry, teaching and technical support experience to her role as a Learning Content Developer with ASCENT. With a passion for design and architecture, she received her Associate of Applied Science in Drafting and Design and worked in the industry assisting several firms with CAD Manager needs and getting others up to speed on the latest software. In 2004 she joined IMAGINiT as an Application Engineer (AE), where she developed custom training and provided support for customers. She transitioned from her work as an AE to the IMAGINIT Solution Center as a Senior Technical Support Specialist where she became proficient in AutoCAD, BIM 360, Navisworks, and Revit. Today, Cherisse continues to expand her knowledge in the ever-evolving AEC industry and the software used to support it.

Cherisse Biddulph has been the Lead Contributor for *Autodesk Advance Steel: Fundamentals* since 2019.

In this Guide

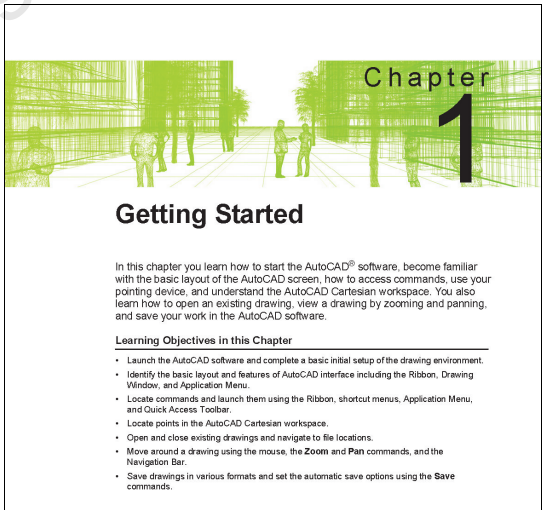
The following images highlight some of the features that can be found in this guide.



Link to the practice files

Practice Files

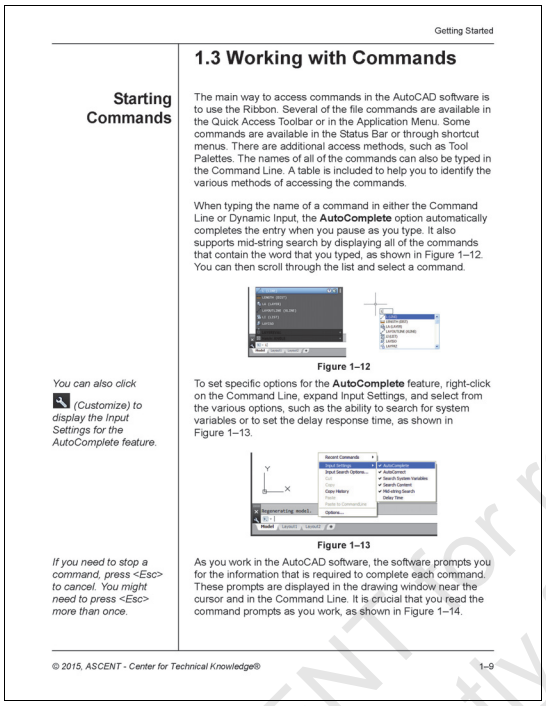
The Practice Files page tells you how to download and install the practice files that are provided with this guide.



Learning Objectives for the chapter

Chapters

Each chapter begins with a brief introduction and a list of the chapter's Learning Objectives.



Getting Started

1.3 Working with Commands

Starting Commands

The main way to access commands in the AutoCAD software is to use the Ribbon. Several of the file commands are available in the Quick Access Toolbar or in the Application Menu. Some commands are available in the Status Bar or through shortcut menus. There are additional access methods, such as Tool Palettes. The names of all of the commands can also be typed in the Command Line. A table is included to help you to identify the various methods of accessing the commands.

When typing the name of a command in either the Command Line or Dynamic Input, the **AutoComplete** option automatically completes the entry when you pause as you type. It also supports mid-string search by displaying all of the commands that contain the word that you typed, as shown in Figure 1–12. You can then scroll through the list and select a command.

Figure 1–12

You can also click (Customize) to display the Input Settings for the AutoComplete feature.

To set specific options for the **AutoComplete** feature, right-click on the Command Line, expand Input Settings, and select from the various options, such as the ability to search for system variables or to set the delay response time, as shown in Figure 1–13.

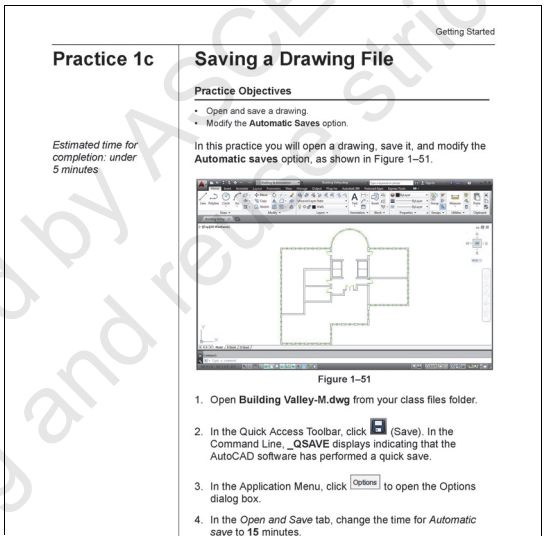
Figure 1–13

If you need to stop a command, press <Esc> to cancel. You might need to press <Esc> more than once.

As you work in the AutoCAD software, the software prompts you for the information that is required to complete each command. These prompts are displayed in the drawing window near the cursor and in the Command Line. It is crucial that you read the command prompts as you work, as shown in Figure 1–14.

Side notes

Side notes are hints or additional information for the current topic.



Getting Started

Practice 1c Saving a Drawing File

Practice Objectives

- Open and save a drawing.
- Modify the **Automatic Saves** option.

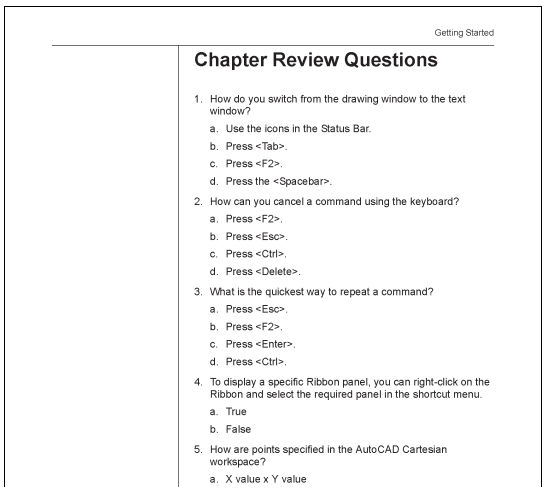
Estimated time for completion: under 5 minutes

In this practice you will open a drawing, save it, and modify the **Automatic saves** option, as shown in Figure 1–51.

Figure 1–51

1. Open **Building Valley-M.dwg** from your class files folder.
2. In the Quick Access Toolbar, click (Save). In the Command Line, **_QSAVE** displays indicating that the AutoCAD software has performed a quick save.
3. In the Application Menu, click Options to open the Options dialog box.
4. In the *Open and Save* tab, change the time for *Automatic save* to **15** minutes.

Practice Objectives



Getting Started

Chapter Review Questions

1. How do you switch from the drawing window to the text window?
   a. Use the icons in the Status Bar.
   b. Press <Tab>.
   c. Press <F2>.
   d. Press the <Spacebar>.
2. How can you cancel a command using the keyboard?
   a. Press <F2>.
   b. Press <Esc>.
   c. Press <Ctrl>.
   d. Press <Delete>.
3. What is the quickest way to repeat a command?
   a. Press <Esc>.
   b. Press <F2>.
   c. Press <Enter>.
   d. Press <Ctrl>.
4. To display a specific Ribbon panel, you can right-click on the Ribbon and select the required panel in the shortcut menu.
   a. True
   b. False
5. How are points specified in the AutoCAD Cartesian workspace?
   a. X value x Y value

Instructional Content

Each chapter is split into a series of sections of instructional content on specific topics. These lectures include the descriptions, step-by-step procedures, figures, hints, and information you need to achieve the chapter's Learning Objectives.

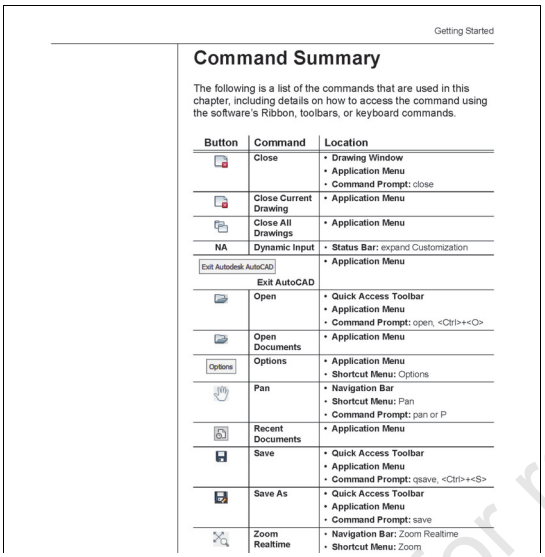
Practices

Practices enable you to use the software to perform a hands-on review of a topic.

Some practices require you to use prepared practice files, which can be downloaded from the link found on the Practice Files page.

Chapter Review Questions

Chapter review questions, located at the end of each chapter, enable you to review the key concepts and learning objectives of the chapter.



Getting Started

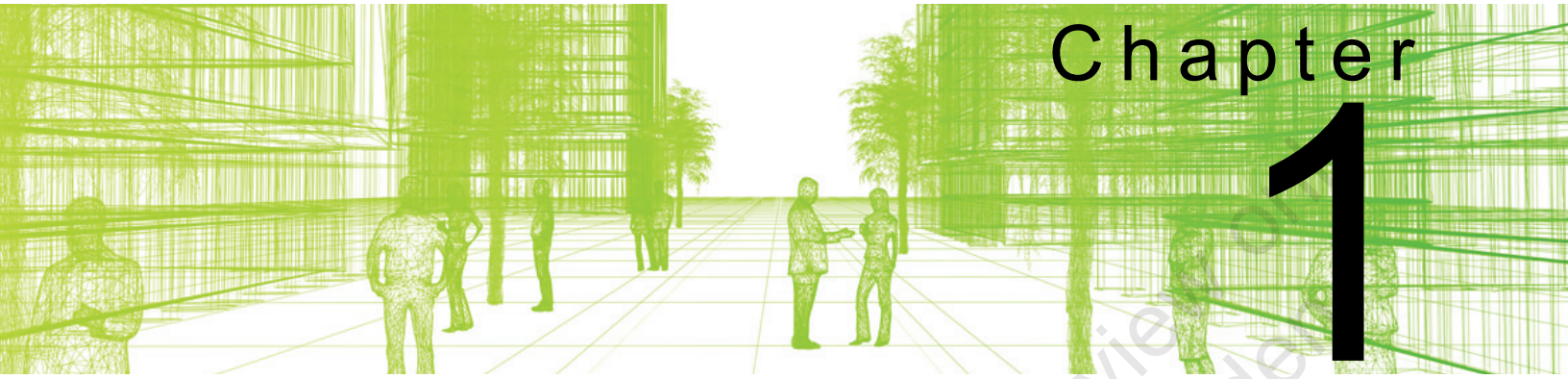
Command Summary

The following is a list of the commands that are used in this chapter, including details on how to access the command using the software's Ribbon, toolbars, or keyboard commands.

Button	Command	Location
	Close	• Drawing Window • Application Menu • Command Prompt: close
	Close Current Drawing	• Application Menu
	Close All Drawings	• Application Menu
NA	Dynamic Input	• Status Bar: expand Customization
Exit Autodesk AutoCAD	Exit AutoCAD	• Application Menu
	Open	• Quick Access Toolbar • Application Menu • Command Prompt: open, <Ctrl>+<O>
	Open Documents	• Application Menu
Options	Options	• Application Menu • Shortcut Menu: Options
	Pan	• Navigation Bar • Shortcut Menu: Pan • Command Prompt: pan or P
	Recent Documents	• Application Menu
	Save	• Quick Access Toolbar • Application Menu • Command Prompt: qsave, <Ctrl>+<S>
	Save As	• Quick Access Toolbar • Application Menu • Command Prompt: save
	Zoom Realtime	• Navigation Bar: Zoom Realtime • Shortcut Menu: Zoom

Command Summary

The Command Summary is located at the end of each chapter. It contains a list of the software commands that are used throughout the chapter, and provides information on where the command is found in the software.



Chapter 1

Introduction to the Autodesk Advance Steel Software

The Autodesk® Advance Steel software is a program designed for steel fabricators that enables you to create a 3D model of steel parts and connections, and then extract 2D shop drawings and database files for Bills of Materials (BOMs) and Numerical Control (NC) machines. The software is based on the AutoCAD® software, but includes many additional tools and palettes designed specifically for steel fabrication.

Learning Objectives in this Chapter

- Describe the concepts and workflow of Autodesk Advance Steel.
- Navigate the user interface.
- Use navigation commands to display the model in 2D and 3D views.
- Review the AutoCAD tools that are helpful in the Autodesk Advance Steel software.
- Understand and modify the User Coordinate System (UCS).
- Move, copy, and mirror objects using Advance Copy.
- Trim and extend objects using the Autodesk Advance Steel commands.

1.1 Introduction to Autodesk Advance Steel

The Autodesk Advance Steel software expands on the features and functionality of the AutoCAD software to create 3D models of detail-heavy steel structures, as shown in Figure 1–1. It includes beams, columns, plates, and bolts, along with miscellaneous steel objects, such as stairs, railings, and ladders. The documentation for fabrication shop drawings is created automatically from the 3D model, as shown in Figure 1–1.

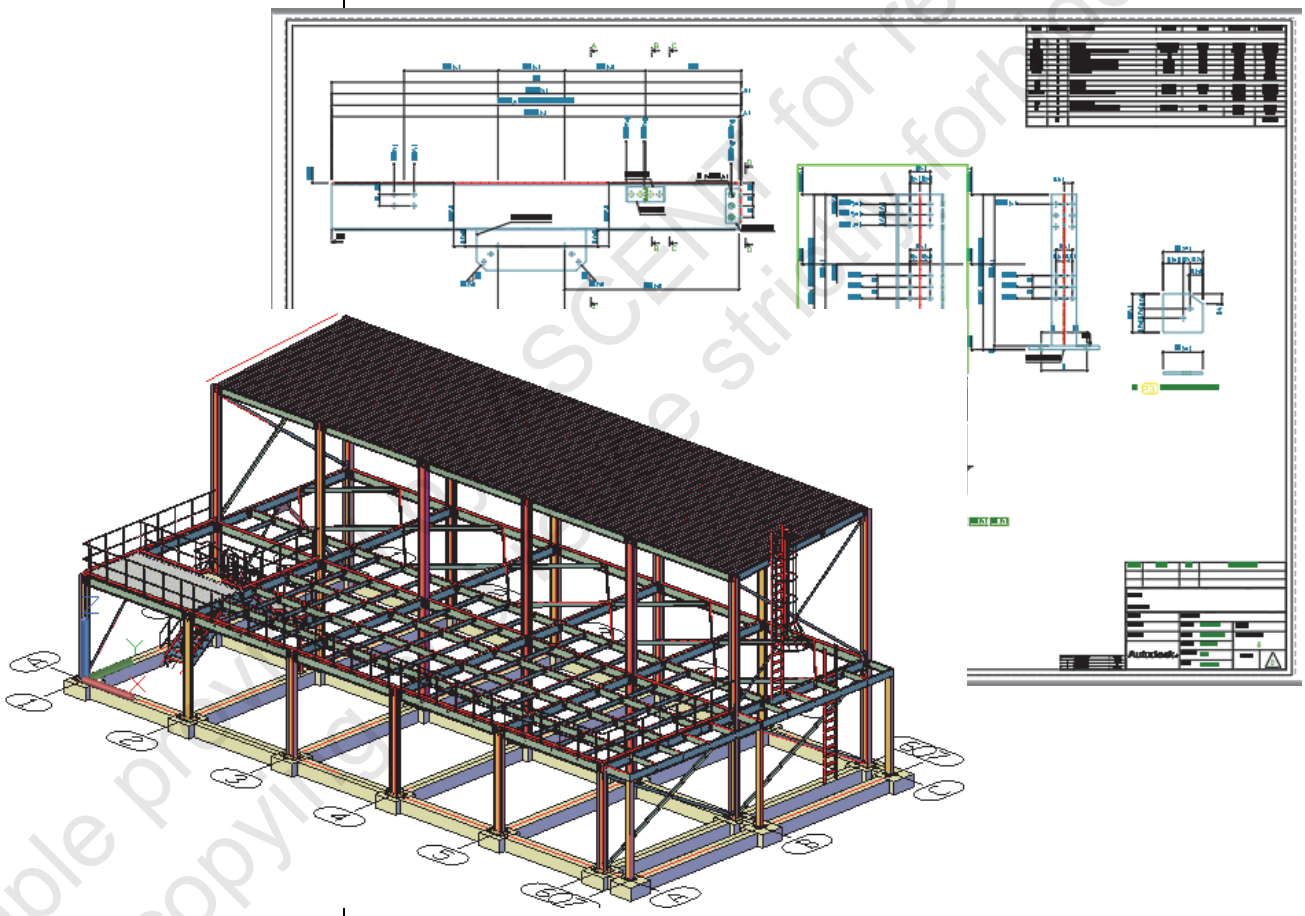


Figure 1–1

A lot of the work that you do in the Autodesk Advance Steel software is done using macros that are a series of standard AutoCAD commands, in addition to specific Autodesk Advance Steel commands and components to create the model and documentation. Therefore, most of the work done in Autodesk Advance Steel uses specific tools and tool palettes, rather than the standard AutoCAD commands.

- Autodesk Advance Steel projects are created from one of the specific Autodesk Advance Steel templates (i.e., ASTemplate.dwt or mm_ASTemplate.dwg) or a customized template created from one of these.
- The main drawing file contains the 3D model. Additional folders and files are created automatically for details and databases (e.g., for BOMs and NC files) as they are added, as shown in Figure 1–2.

Figure 1–2

1.2 Overview of the Interface

Note: The Drawing Window color has been changed to white for printing clarity.

The Autodesk Advance Steel interface is designed for intuitive and efficient access to commands and special macros built specifically for Autodesk Advance Steel modeling. The interface includes the ribbon, Quick Access Toolbar, and Status Bar, which are common to most Autodesk® software. Similar to the AutoCAD software, Autodesk Advance Steel includes the Command Line, drawing windows, and layout tabs. It also includes tools that are specific to the Autodesk Advance Steel software, including the Advance Tool Palette, the Connection Vault, and the Project Explorer. The interface is shown in Figure 1–3. Shortcut menus and Autodesk Advance Steel dialog boxes are also an important part of using the software.

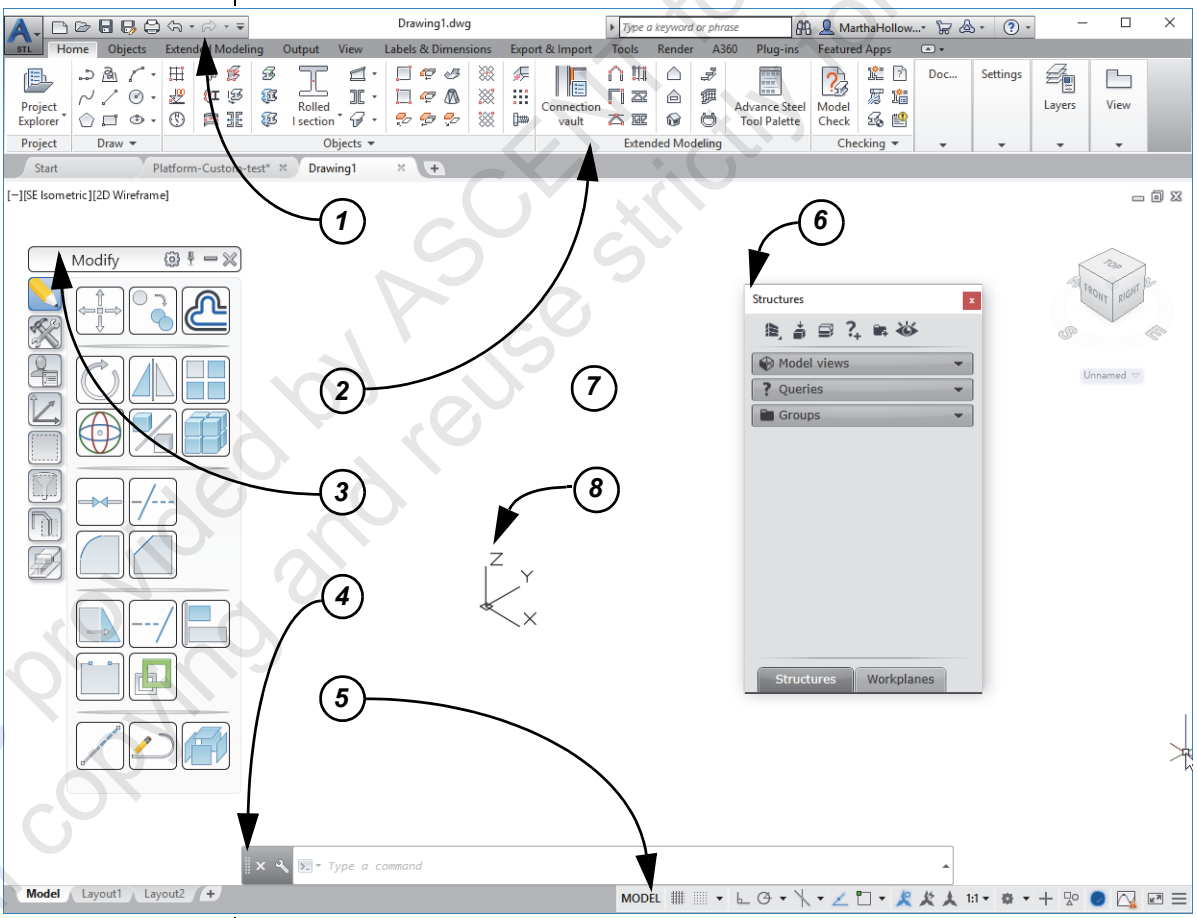


Figure 1–3

1. Quick Access Toolbar	5. Status Bar
2. Ribbon	6. Project Explorer
3. Advance Tool Palette	7. Drawing Window
4. Command Line	8. UCS Icon

1. Quick Access Toolbar

The Quick Access Toolbar (shown in Figure 1–4) includes several frequently used commands, including **New**, **Open**, **Save**, **Print**, **Undo**, and **Redo**. These commands are also available in the Application Menu ( ).

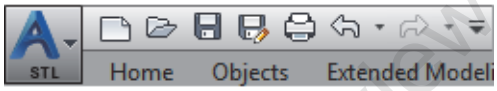


Figure 1–4

- Note that Undo and Redo often do not work as expected in the Autodesk Advance Steel software because many of the commands are actually macros that run multiple commands. This means that you might have to undo several processes to fully undo a single command.

2. Ribbon

Instead of the standard AutoCAD tools, the Autodesk Advance Steel ribbon includes specific tools used by the program, as shown in part of the *Home* tab in Figure 1–5.

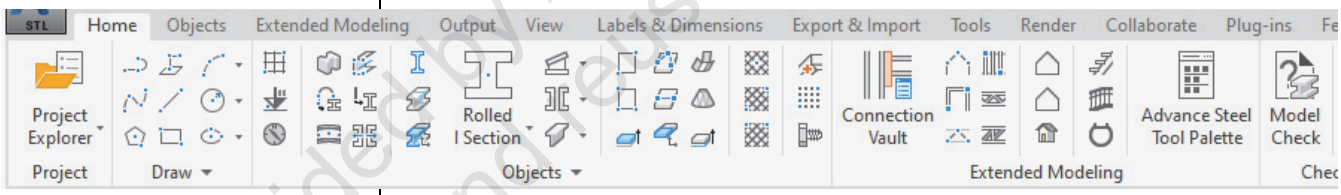


Figure 1–5

- Hover the cursor over a button to display the name of the tool.

3. Advance Tool Palette

The Advance Tool Palette is unique to the Autodesk Advance Steel software and holds many important tools, including some of the standard AutoCAD modify tools (shown in Figure 1–6) and Advance Steel modify tools (shown in Figure 1–7).

- Note that AutoCAD modification tools are not included on any of the ribbon tabs.
- To open the tool palette, in the *Home* tab>Extended Modeling panel, click (Advance Steel Tool Palette).

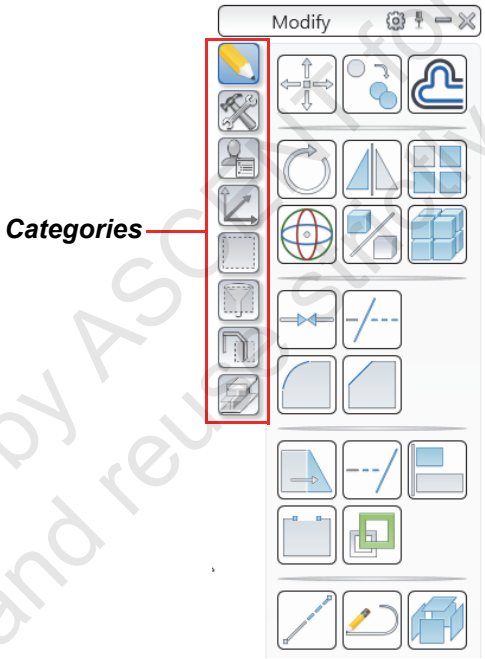


Figure 1–6

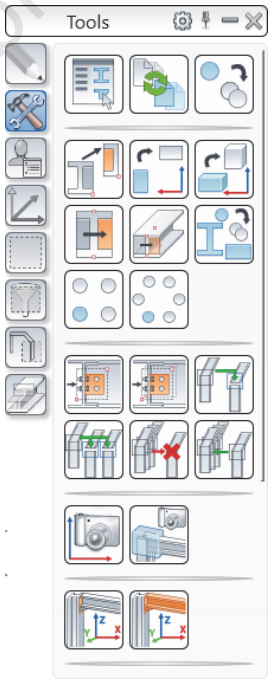


Figure 1–7

- Click on the buttons in the left column (called Categories) to access the different tools on the right.
- The Tool Palette can float or be pinned into place. You can also minimize it (as shown in Figure 1–8), hide it, and modify the Theme Settings.

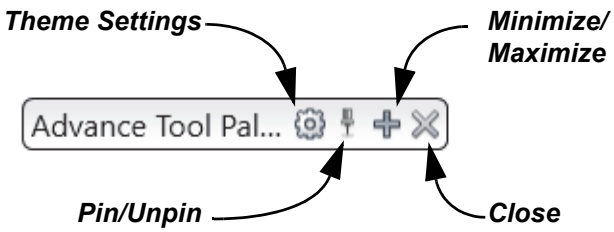


Figure 1–8

Advance Tool Palette Categories

	**Modify**	Includes standard AutoCAD modification commands, such as Move, Trim, and Fillet. These tools are most often used with standard AutoCAD objects (such as lines and polylines) or individual Autodesk Advance Steel objects that are not connected to other objects.
	**Tools**	Includes tools specifically created to use with Autodesk Advance Steel objects and objects that are connected together. It includes modification tools and ways to create groups.
	**Custom connections**	Includes tools to create individual custom connectors, including plates and bolts. Tools can also group and reuse custom connections.
	**UCS**	Includes tools that define the location and orientation of the User Coordinate System (UCS). Having a defined UCS is critical for many Autodesk Advance Steel commands.
	**Selection**	Includes tools that enable you to search, display, and mark objects by certain criteria.
	**Selection filters**	Includes tools that enable you to select specific types of elements, including all beams, or just curved or concrete beams, among other objects including slabs and bolts.
	**Quick views**	Includes tools that enable you to create views based on certain objects to help you modify the view by toggling all objects on, or selected objects off, etc.
	**Features**	Includes tools for modifying plates and beams (including miters, corner cuts, and copes), as well as cutting holes in objects.

- Commands found in this palette are referenced like this:

  In the Advance Tool Palette>  (Tools) category, click  (Advance Copy)

- Note that many of these tools are actually macros of multiple commands.

- Other tool palettes (including the Connection Vault) are similar and can be docked on top of each other.

4. Command Line

The command line is the same in the Autodesk Advance Steel software as it is in the AutoCAD software. Autodesk Advance Steel commands are much more complex (as seen in Figure 1–9), so they are rarely typed.

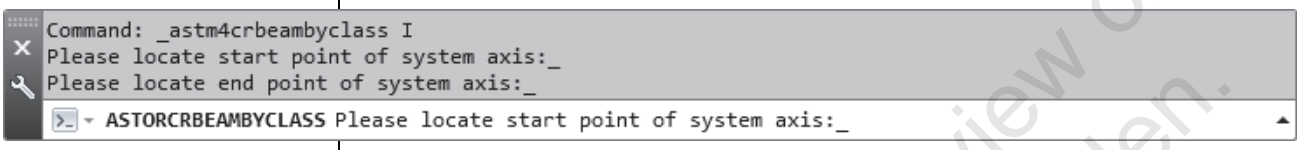


Figure 1–9

- The prompts for Autodesk Advance Steel commands can be complex. If you are having trouble following a process, expand the command line to display multiple lines of prompts.

5. Status Bar

The Status Bar (shown in Figure 1–10) is essentially the same as in the AutoCAD software. Important tools found here include **Ortho**, **Object Snaps**, and **Isolate Objects**.

Figure 1–10

6. Project Explorer

The Project Explorer (also known as the Structures palette) enables you to create Levels and Model views, and access other tools. This palette can remain floating on the screen (as shown in Figure 1–11) or be docked.

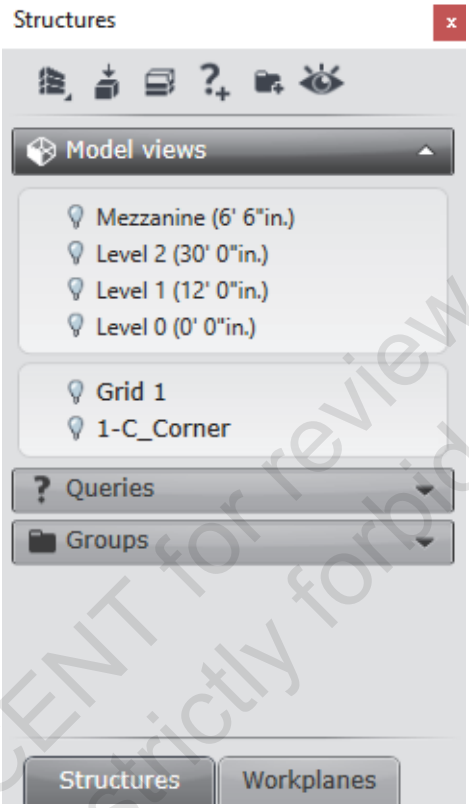


Figure 1–11

- To display the Project Explorer, in the *Home* tab>Project panel, click (Project Explorer).
- If you have toggled off objects, you can toggle them all back on by clicking (Show All Elements).

7. Drawing Window

The drawing window is the area of the screen in which the drawing displays. Several drawing windows can be open at the same time. They can be resized, minimized, and maximized.

The drawing's File tabs (shown in Figure 1–12) are located near the top of the drawing window. They provide a quick way of switching between open drawings, creating new drawings, or closing drawings. The *Start* tab is always the first tab and persists in the File tabs bar. Clicking the start tab displays the Start window.

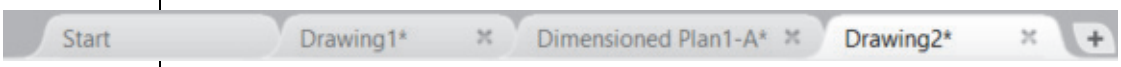


Figure 1–12

- The *Model* and *Layout* tabs display at the bottom of the drawing window. Most of your work in the Autodesk Advance Steel software is done in the *Model* tab. Layouts are automatically created when you run the documentation tools.

8. UCS Icon

In the drawing window, the UCS icon indicates the current drawing planes. This is an important part of the Autodesk Advance Steel software as it controls the orientation of elements, such as plates and stairs. The style of the UCS icon changes with the visual style, as shown in Figure 1–13.

2D Wireframe ***Conceptual***

Figure 1–13

- To toggle the UCS icon on and off, in the *View* tab>Viewport Tools panel, click (UCS Icon).
- If you change the UCS and want to return to the base location, in the command line, type **UCS**, press <Enter>, then type **W** (for World) and press <Enter>. Alternatively, in the Advance Tool Palette>UCS category, click (UCS World).

Shortcut Menus

When you right-click, a shortcut menu usually displays next to the cursor. The menu that displays depends on what you are doing in the software and where you right-click. For example, when no objects are selected and you right-click in the drawing window, the menu in Figure 1–14 displays. When you have an Autodesk Advance Steel object selected, the menu in Figure 1–15 displays.

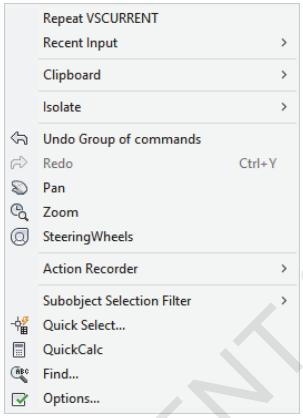


Figure 1–14

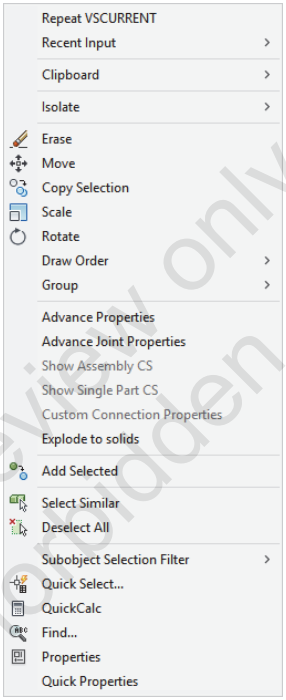


Figure 1–15

Autodesk Advance Steel Dialog Boxes

Two dialog boxes are critical parts of using the Autodesk Advance Steel software: **Advance Properties** (as shown for a beam in Figure 1–16) and **Advance Joint Properties**. These dialog boxes are accessed through the shortcut menu when you have certain objects selected. The critical part of understanding these dialog boxes is that they are live (i.e., any changes that you make in the dialog box are instantly and automatically applied to the model).

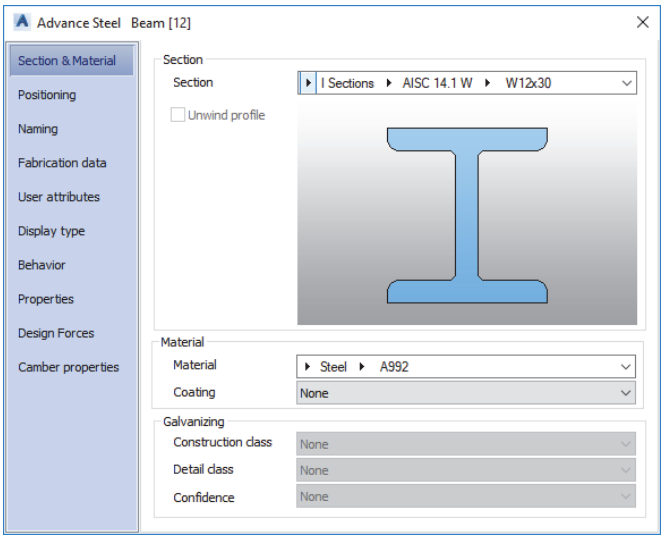


Figure 1–16

- **Advance Properties:** Displays the options for selected objects, such as beams, columns, or individual bolts.
- **Advance Joint Properties:** Displays the options for a full connection, such as the Base plate shown in Figure 1–17. This includes options for the plate, stiffeners, holes, and bolts as a group.

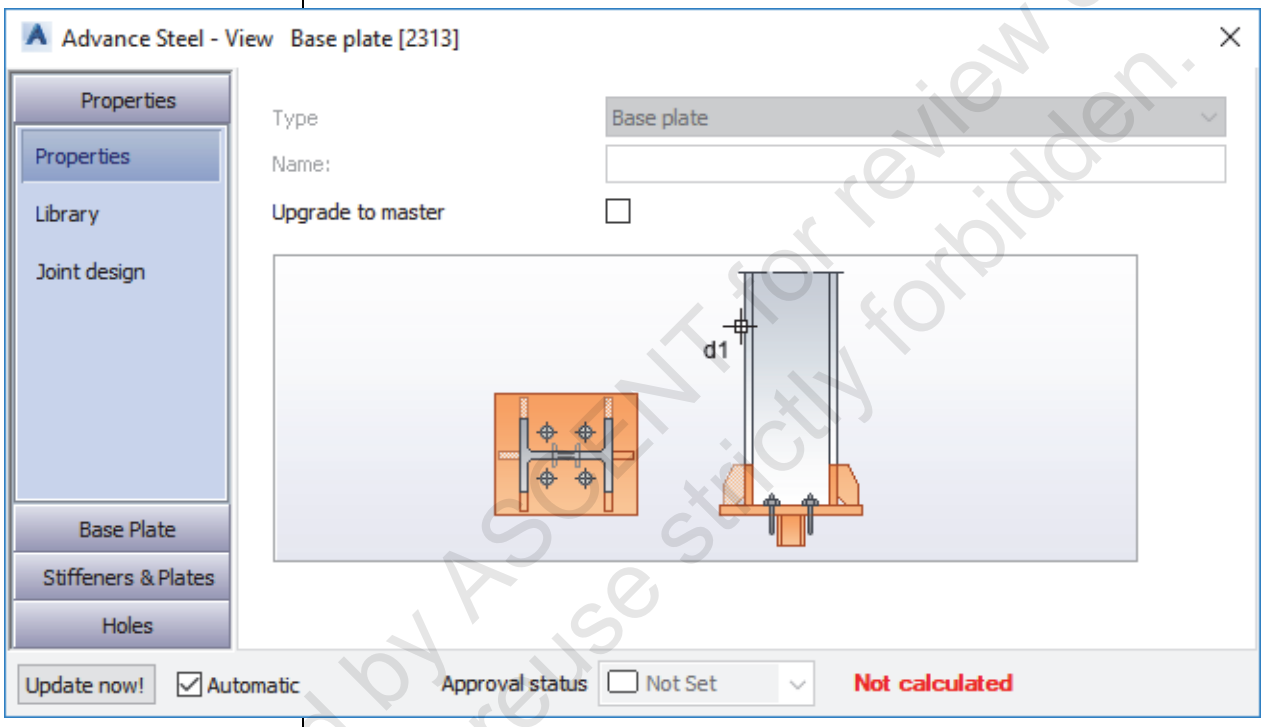


Figure 1–17

- Select the tabs on the left to display information on the right.

1.3 Viewing the Model

In Autodesk Advance Steel you are primarily working in 3D, and so you need to be able to view objects from all directions. There are several basic tools that enable you to do so: preset 3D views, the ViewCube, and Visual Styles, as shown in Figure 1–18.

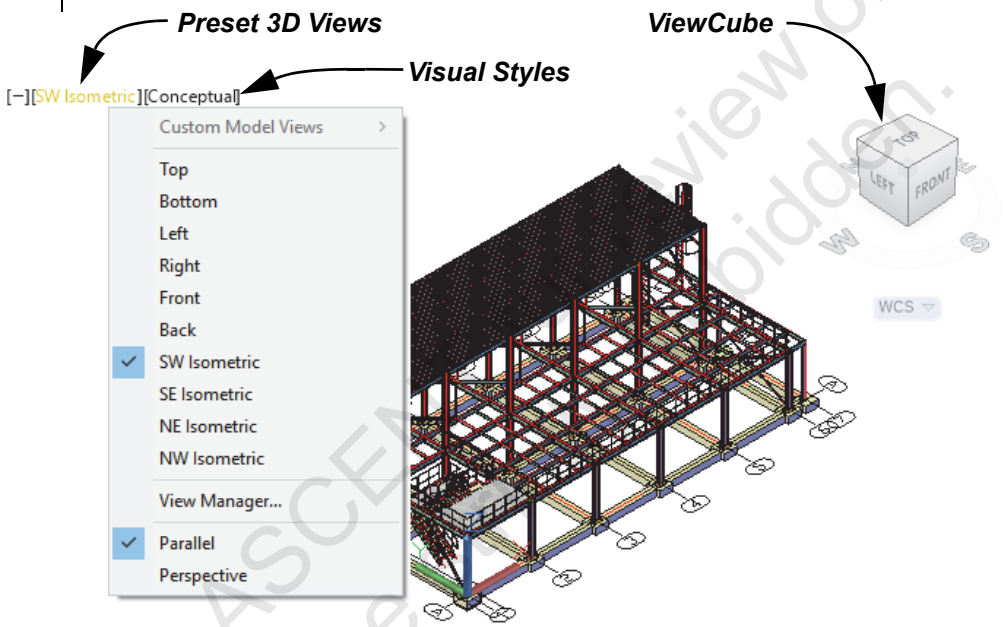


Figure 1–18

Accessing Preset 3D Views

There are several preset 3D views (shown in Figure 1–19) that enable you to quickly change the viewing angle. These presets include both orthographic and isometric views, and can be accessed in the top left corner of the drawing window, as shown in Figure 1–20.

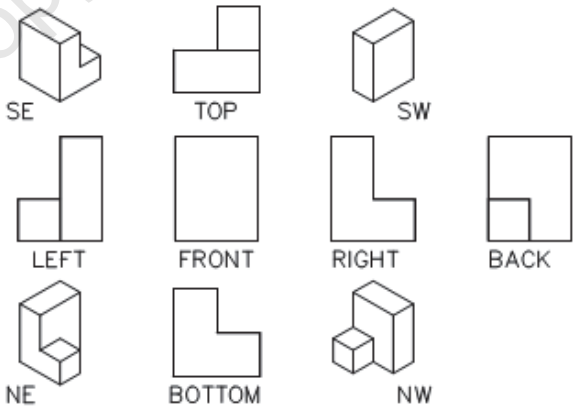


Figure 1–19

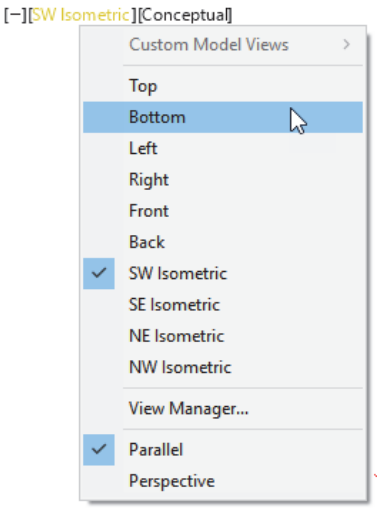


Figure 1–20

- Orthographic views display as if you are facing one side of a part. Isometric views typically display three sides, as if you are facing a corner.
- Orthographic views change the active drawing plane (UCS) of the view, while isometric views do not. To return to the flat drawing plane, select the **Top** view before continuing with a non-orthographic 3D view.

Using the ViewCube

The ViewCube provides visual clues as to where you are in a 3D drawing and makes it easier to navigate to standard views, such as **Top**, **Front**, **Right**, **Left**, **Corner**, and directional views. Move the cursor over one of the highlighted options and select it. You can also click and drag on the ViewCube to rotate the box, which rotates the model. The ViewCube is shown in Figure 1–21.

*To change the default **Home** view, set the view you want, right-click on the ViewCube, and select **Set Current View as Home**.*

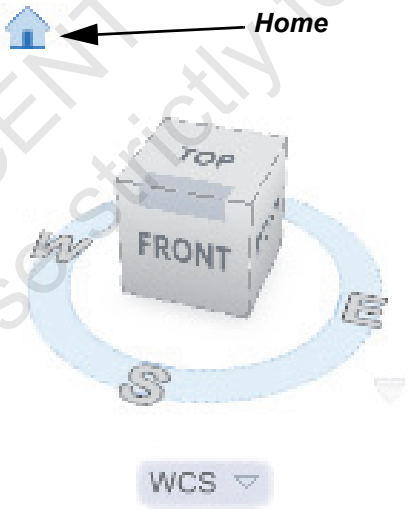


Figure 1–21

- (Home) displays when you hover the cursor over the ViewCube. Click it to return to the view defined as **Home**.
- To toggle the ViewCube on and off, in the *View* tab>Viewport Tools panel, click (ViewCube).

Orbiting in 3D

The best tools for navigating a model in 3D are the mouse and keyboard. You can zoom in and out using the mouse wheel, and can pan by holding the mouse wheel and moving the mouse. Both methods are useful in 2D and 3D. However, in 3D you also need to view the model from all sides. Hold <Shift> and the mouse wheel to orbit the objects in your drawing, as shown in Figure 1–22.

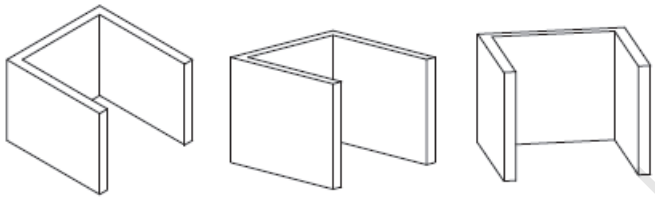
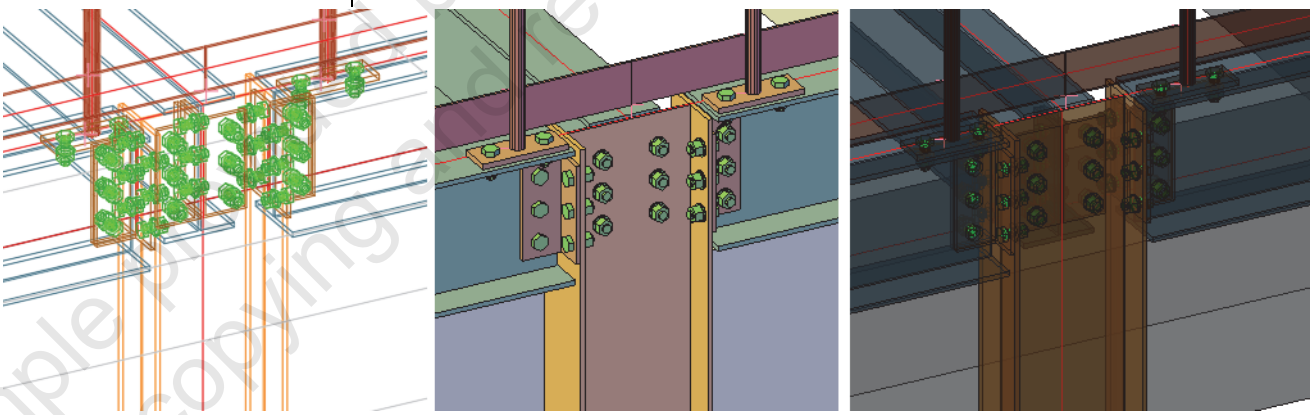


Figure 1–22

- When you orbit, the target (what you are viewing) stays stationary while the camera (your viewpoint) moves.
- You can also hold <Ctrl> and the mouse wheel to swivel. This is similar to panning the camera as you drag the mouse. The target of the view changes.
- If you select objects before you start orbiting, only those objects display as you move around the drawing. This can be useful in complex drawings, because limiting the number of objects results in a smoother rotation of the view.

Using Visual Styles

While viewing a model, setting a visual style can help you gain a clearer understanding of the model. Visual styles control how elements display in a view. You can add and modify objects and orbit in any of the visual styles. Three useful visual styles include the 2D Wireframe, Conceptual, and X-ray styles, as shown in Figure 1–23.



2D Wireframe ***Conceptual*** ***X-ray***

Figure 1–23

- The visual styles list is available in the upper left corner of the drawing window, next to the 3D view presets.

Practice 1a Open a Project and View the Model

Practice Objectives

- Review typical Autodesk Advance Steel project layouts.
- Open an Autodesk Advance Steel drawing.
- Review the user interface.
- View the 3D model.

In this practice, you will review the folder structure of a typical Autodesk Advance Steel project. You will open a drawing and review the user interface. You will then use the 3D viewing tools to display the model you will be creating in the practices, shown in Figure 1–24.

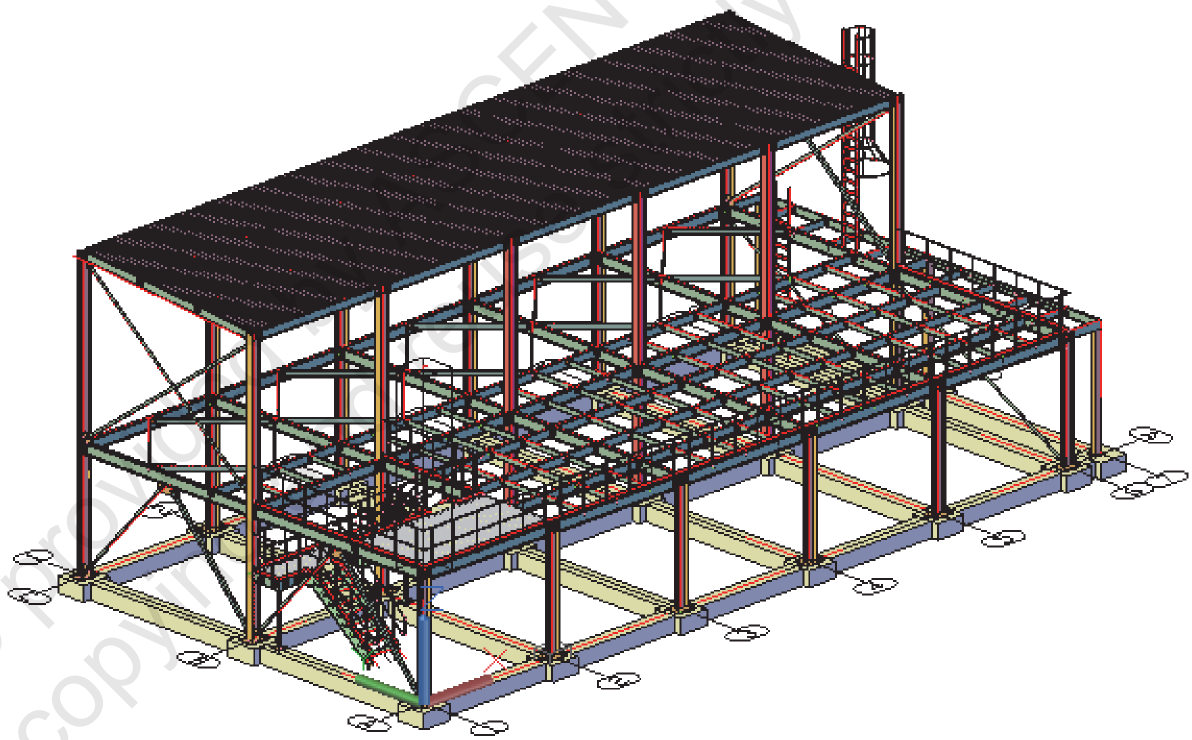


Figure 1–24

Task 1 - Review files and open an Autodesk Advance Steel model.

1. In the Quick Access Toolbar, click (Open).
2. In the Open dialog box, navigate to the practice files folder.

3. Click once on **Platform-Introduction.dwg** to display the preview as shown in Figure 1–25. This is the primary model you will be working on.

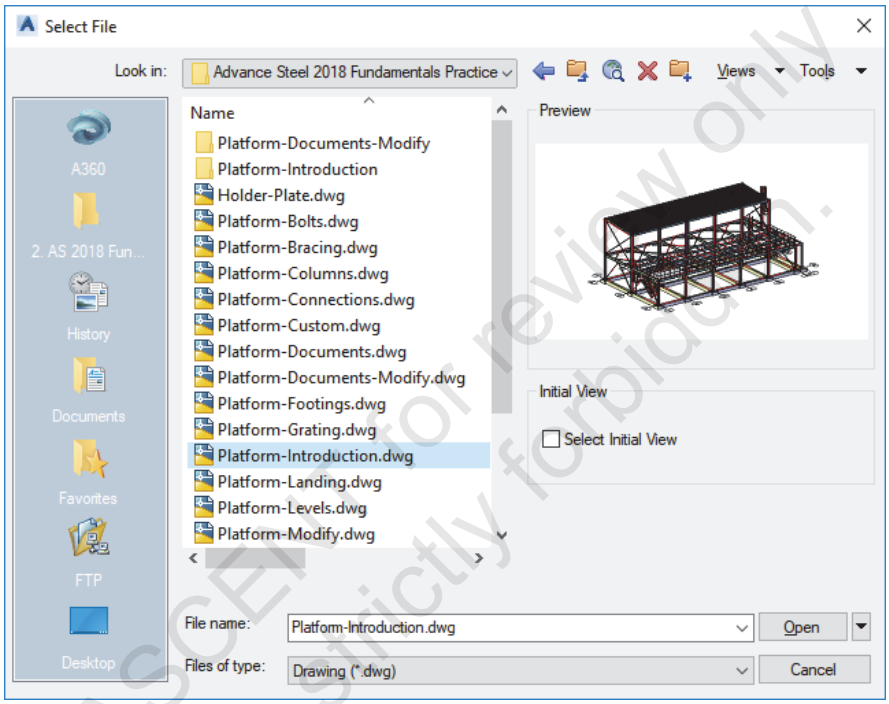


Figure 1–25

4. Scroll up the list and double-click on the *Platform-Introduction* folder. It contains two folders: *Databases* and *Details*. These folders were automatically created when the documentation files were processed.

5. Open the *Details* folder. Note that there are a number of detail drawings, but that they do not preview, as shown in Figure 1–26. These files are not typically opened directly, but rather are accessed through the Document Manager when you are in a model.

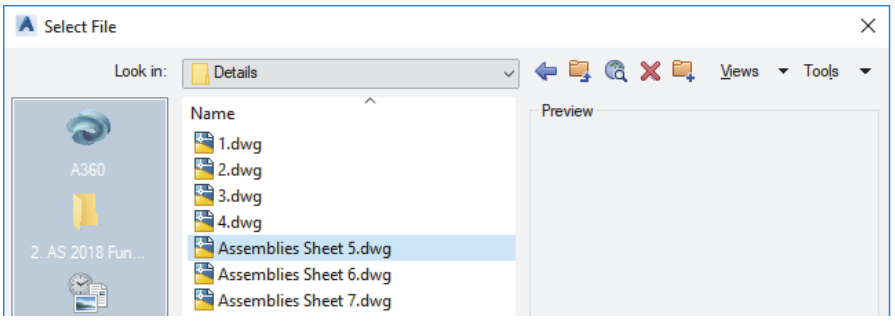
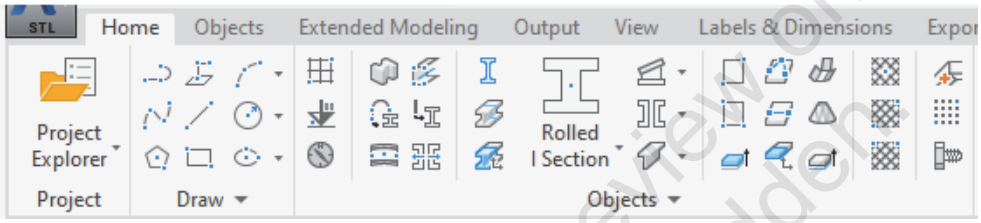


Figure 1–26

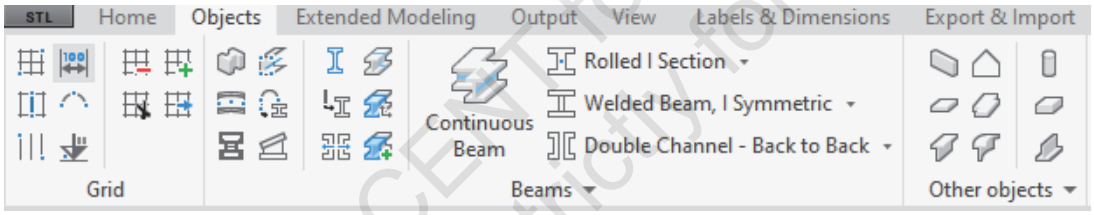
6. Return to the main folder and open **Platform-Introduction.dwg**.

Task 2 - Review the user interface.

1. Review the different tabs of the ribbon. Note that many tools on the *Home* tab>Objects panel are also found on the *Objects* tab, as shown in Figure 1–27.



Home tab>Objects panel



Objects tab

Figure 1–27

2. In the *Home* tab>Extended Modeling panel, click (Advance Steel Tool Palette) to toggle it on.
3. In the Advance Tool Palette, click through the various categories to review the available tools.
4. In the *Quick views* category, click (All Visible). Additional elements display in the view, as shown in Figure 1–28.

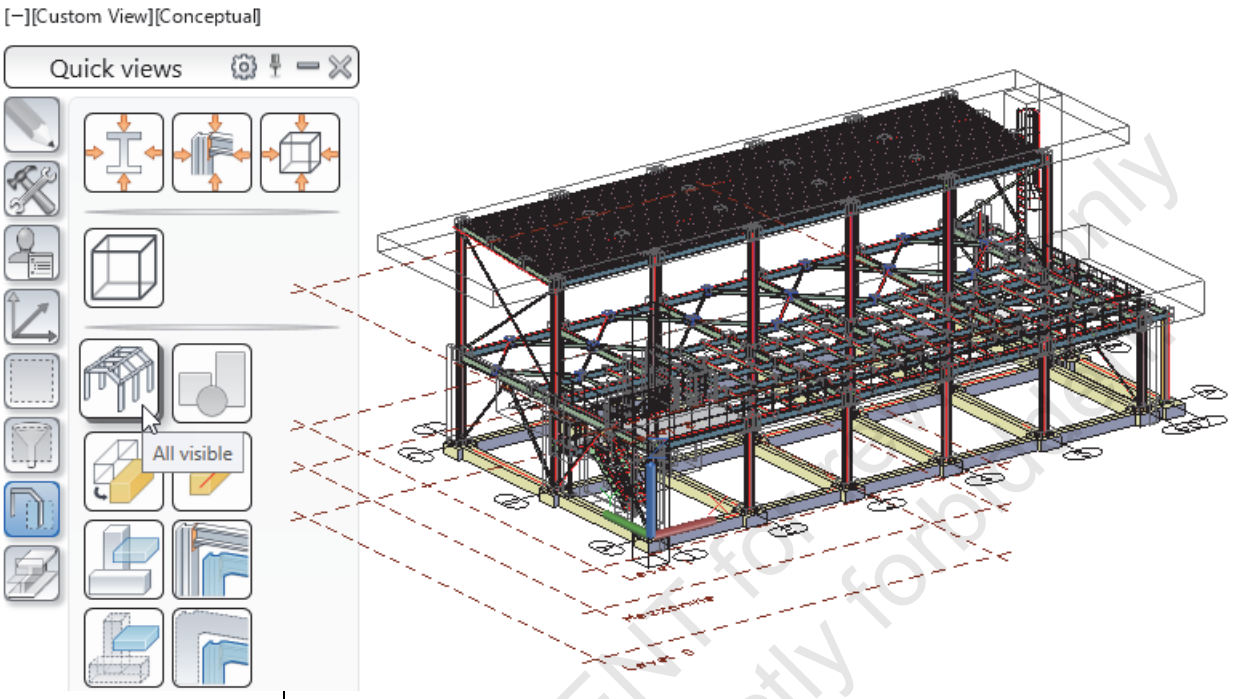


Figure 1–28

5. Select the object labeled **Level 0**. Hover the cursor over the object to display information about the layer it is on, as shown in Figure 1–29. Objects are automatically placed on the appropriate layer in the Autodesk Advance Steel software.

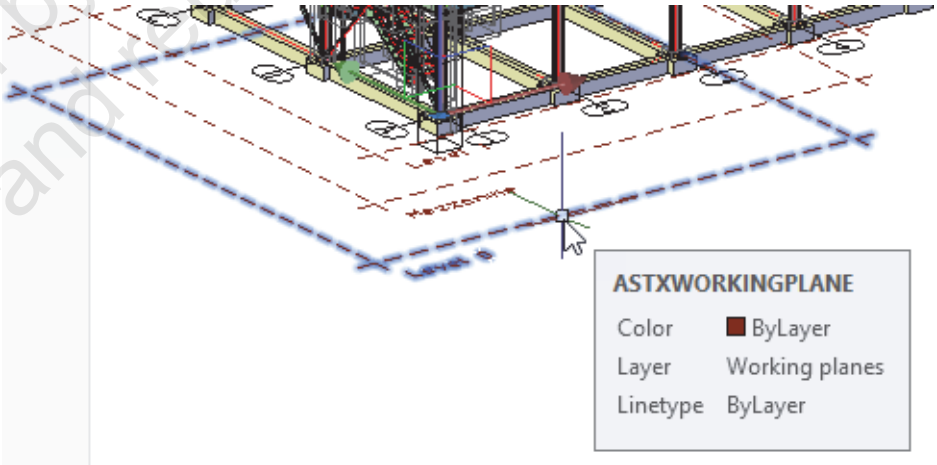


Figure 1–29

6. Right-click in the drawing window and select **Select Similar**.

7. In the Advance Steel Tool Palette>  Quick Views category, click  (Selected Objects off).

*Columns are made from beams, but they have the Model Role of **Column**, and are typically placed on the **Column** layer when created with the appropriate Advance Steel command.*

8. In the model, double-click on a column. The Advance Properties command displays, as shown in Figure 1–30. Click through the tabs on the left and note the different options.

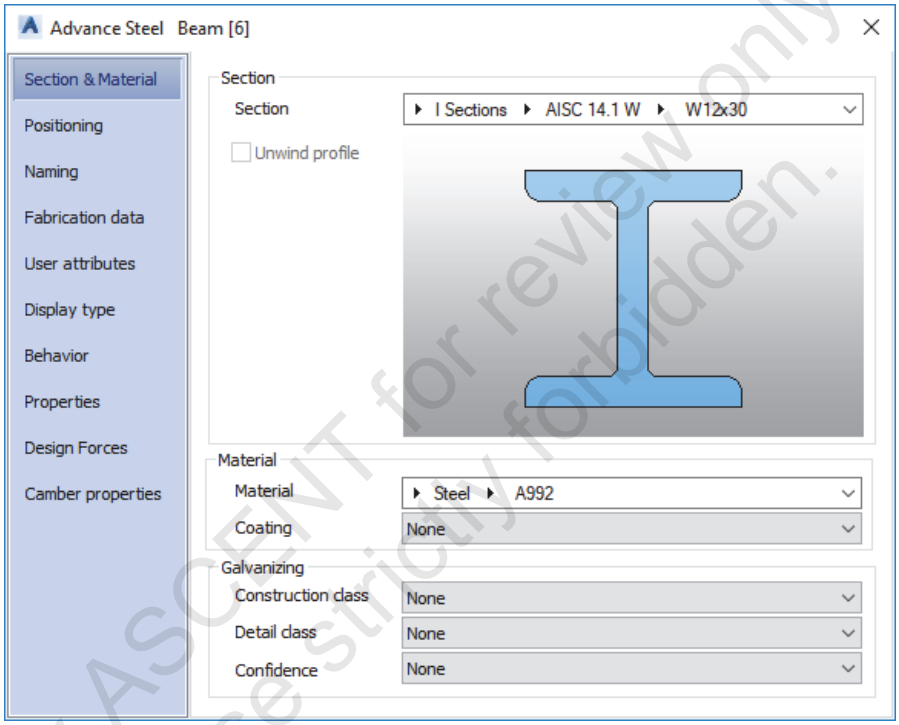


Figure 1–30

9. Close the dialog box.

10. Zoom in on the base of column A2. Note that there is a box around the base plate on the **Connection boxes** layer, as shown in Figure 1–31.

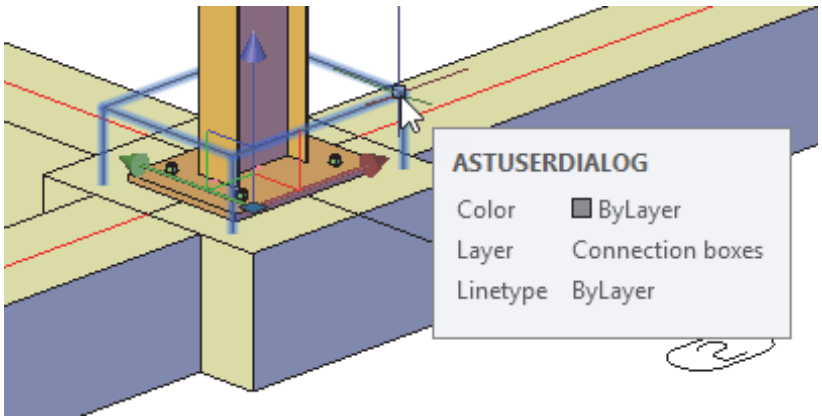


Figure 1–31

11. Double-click on the box to open the Advance Joint Properties dialog box, shown in Figure 1–32. The information in this dialog box controls the connection elements for the column.

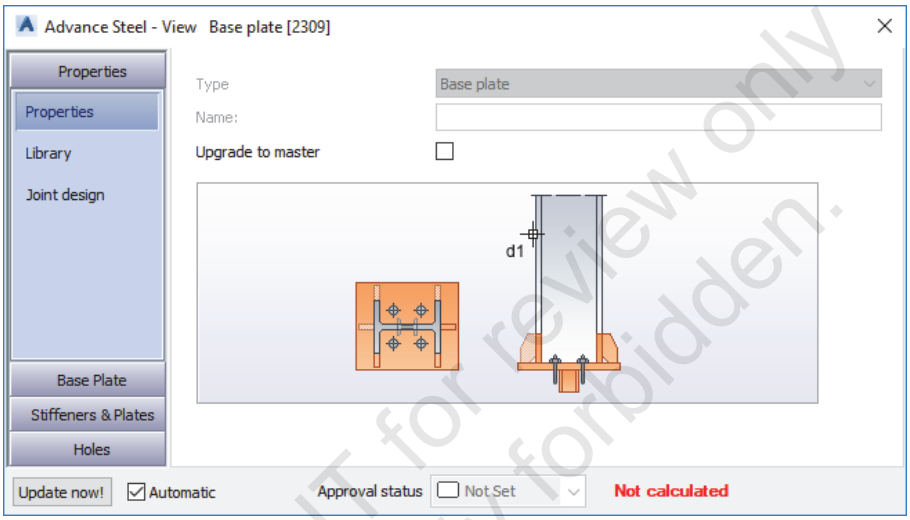


Figure 1–32

12. Close the dialog box.

13. Select the connection boxes (also called joint boxes) and toggle them off using the same process as you did for the layer symbols in Steps 5 to 7.

14. Double-click on the base plate. Note that the Advance Properties dialog box for the plate displays, but now you cannot make many changes to the plate because it is part of a connection object.

15. Close the dialog box.

16. Select the base plate again. Right-click (ensuring that you do not touch the UCS gizmo) and select **Advance Properties**, as shown in Figure 1–33. The same dialog box displays as when you double-clicked on the plate.

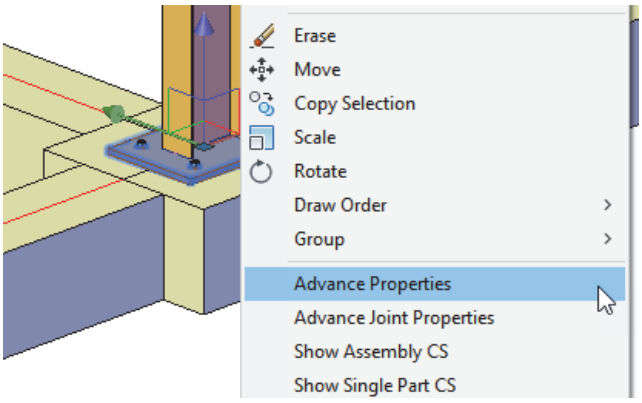


Figure 1–33

17. Right-click on the base plate again and select **Advance Joint Properties**. This opens the full connection dialog box. It also turns the joint box on for this connection only.

18. Close the dialog box.

19. Use the cursor to pan around the drawing and select one of the smaller blue connection boxes (these are custom connections) and toggle them off.

20. In the command line, type **Z** <Enter> **A**<Enter> to return to the full model view.

21. Save the drawing.

Task 3 - View the 3D model.

1. Locate the UCS icon in the lower left of the model at column A1, as shown in Figure 1–34. Note the direction of the X, Y, and Z-axes.

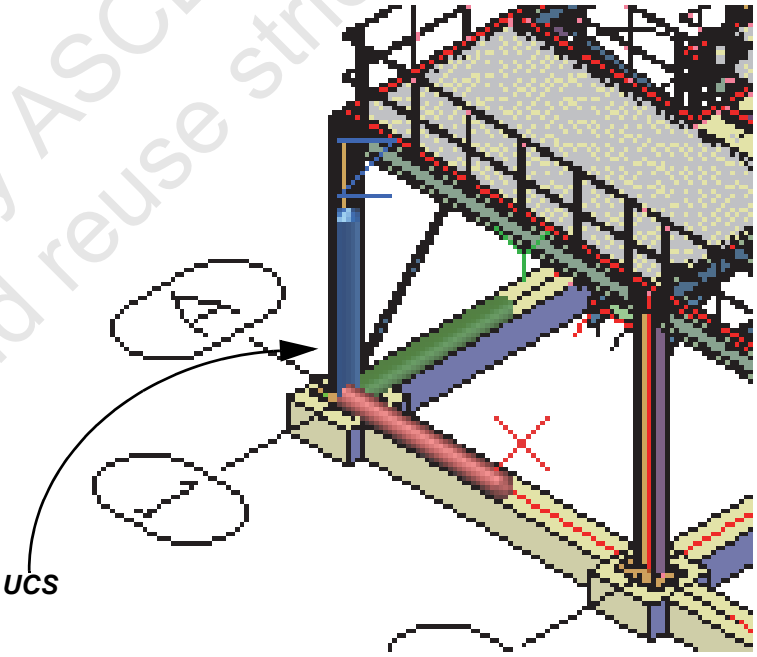


Figure 1–34

2. Click on various parts of the ViewCube to rotate the model. Note that the UCS does not change.

3. In the upper left of the drawing window, test the four preset isometric views. Note that the UCS still does not change.

4. Set the view to the **Left** preset. Note that the UCS now changes, as shown in Figure 1–35. The **Top**, **Bottom**, **Left**, **Right**, **Front**, and **Back** views change the UCS to that orientation.

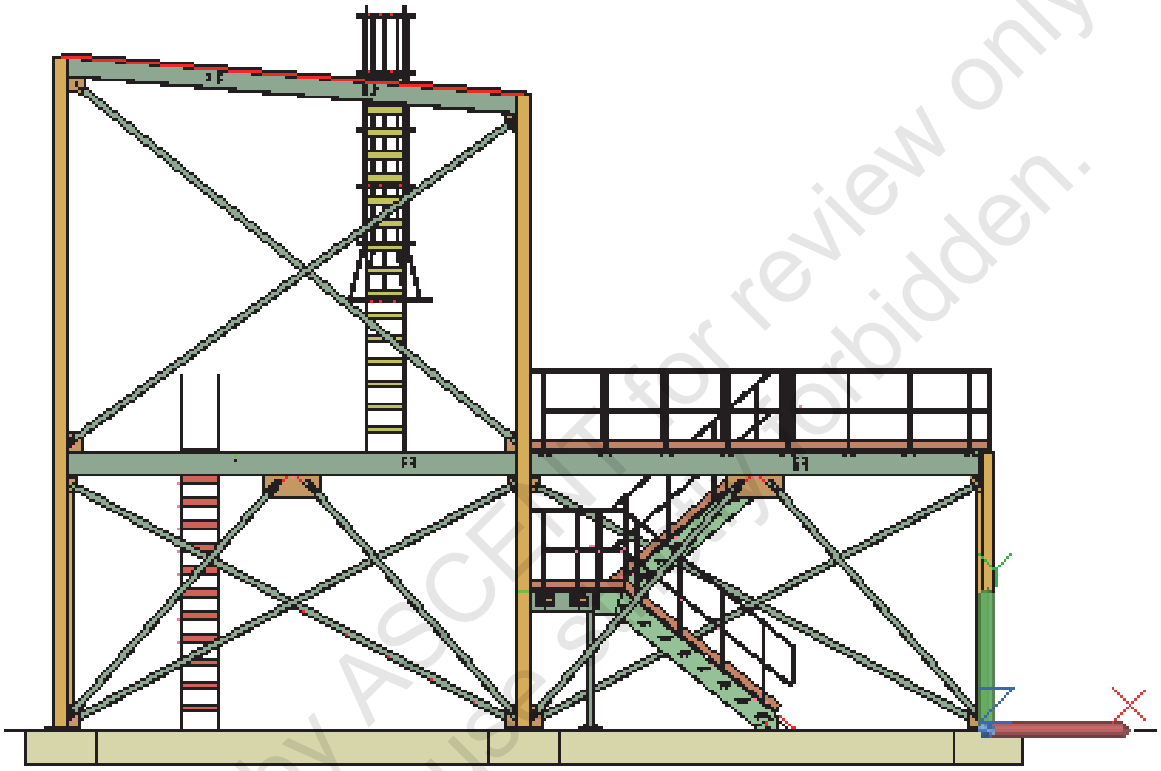


Figure 1–35

5. Hold <Shift> and the mouse wheel and rotate the model in the view. Even though you were in what looked like an elevation view, note that you are still in a 3D view.

6. In the Advance Steel Tool Palette>  *UCS* category, click  (UCS World), or in the command line, type **UCS** <Enter>, **W** <Enter>.

7. Zoom in on the UCS icon.

8. In the upper left corner of the view window, change the *Visual Style* to **2D Wireframe**, as shown in Figure 1–36. Note that the UCS icon changes with the rest of the model.

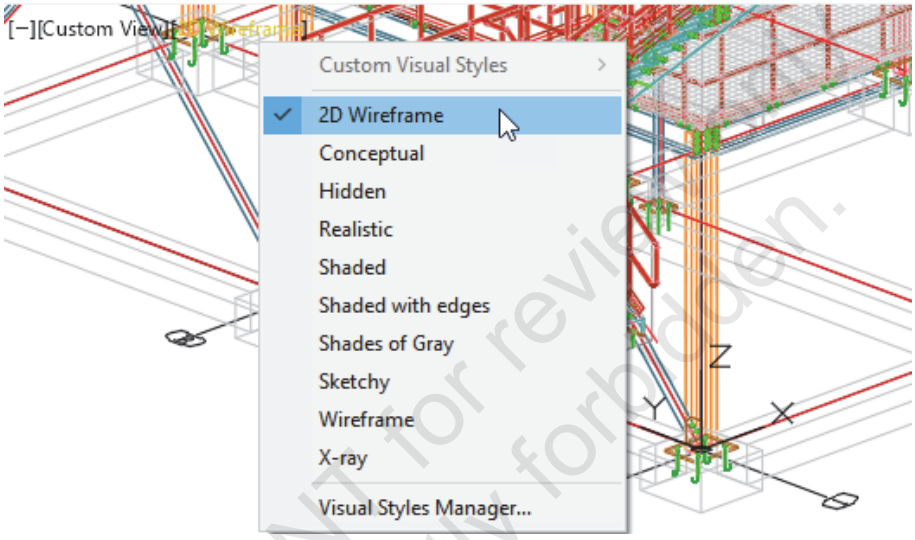


Figure 1–36

9. Test out other Visual Styles. Which one gives you the best view of the j-bolts in the footing?
10. Set the *Visual Style* set to **Conceptual**.
11. Zoom out to display the entire model.

1.4 Helpful AutoCAD Tools

Most of the tools that you use in the Autodesk Advance Steel software are customized macros that create complex objects and connections. Since the software is based on the AutoCAD software, there are some useful tools that you can use as you are drawing and modifying the Autodesk Advance Steel objects, including object snaps, Ortho, Polar Tracking (shown in Figure 1–37), basic modify tools such as Move and Copy, grips on objects, and the 3D Gizmo.

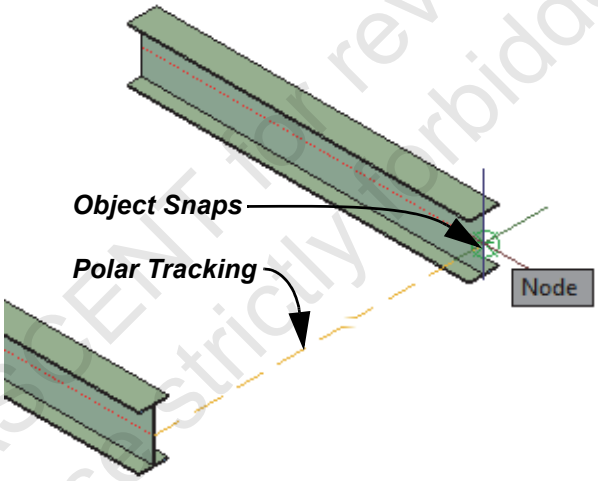


Figure 1–37

- **Warning:** One tool that does not work as expected in the Autodesk Advance Steel software is the **Undo** command. As many Autodesk Advance Steel commands are actually macros of many commands, pressing **Undo** once often does not do much. You might need to use the Undo drop-down list (shown in Figure 1–38) to undo numerous steps.

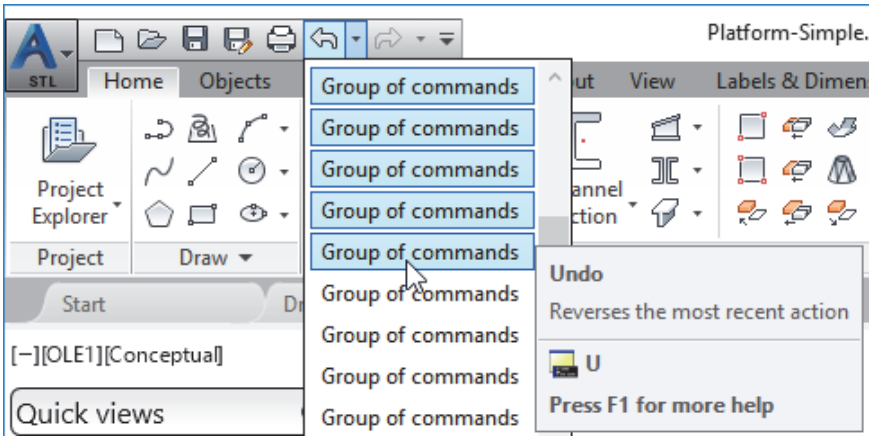


Figure 1–38

Status Bar Tools

Several tools on the Status Bar (shown in part in Figure 1–39) can help you as you are drawing and modifying objects, including the Ortho, Polar Tracking, and Object Snap Tracking tools. You can also toggle on the drawing view grid to help you visualize the space better. Object Snaps are probably the most critical of the tools.

Figure 1–39

Object Snaps

There are a lot of objects that you can snap to in Autodesk Advance Steel models, so it is important to use only the ones you need. For example, there are a lot of endpoints on an I-beam, but only one node at the end of each beam. It is safer to use object snap overrides (as shown in Figure 1–40) more frequently than setting the objects snaps (as shown in Figure 1–41).

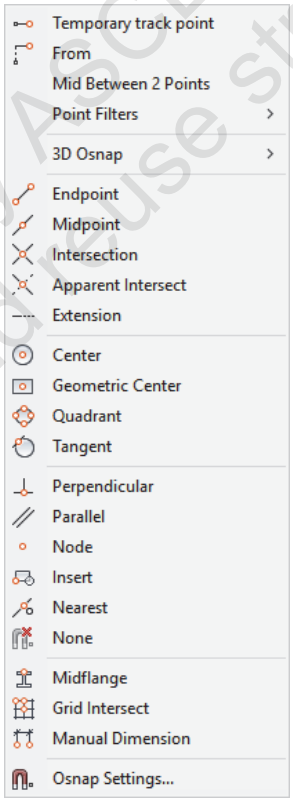


Figure 1–40

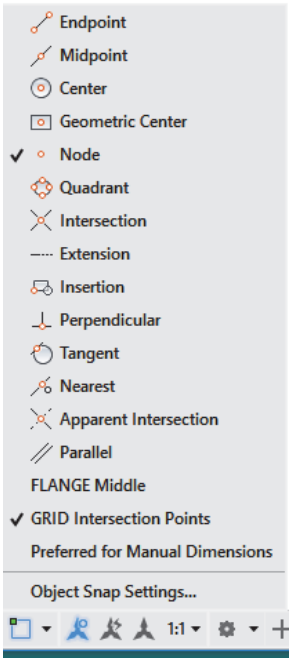


Figure 1–41

- The **Node** object snap and **GRID Intersection Points** object snap can be preset. Toggle off object snaps if they get in the way of what you are trying to do.

Basic Modify Tools

These AutoCAD tools can be used as long as there are no joints connecting objects.

Basic AutoCAD modification tools (such as **Move**, **Copy**, and **Rotate**) are accessed in the Advance Tool Palette> (Modify) category, as shown in Figure 1–42. These tools can be used if you are working with standard AutoCAD objects (such as lines) or when you are manipulating individual Autodesk Advance Steel objects (such as columns or beams).

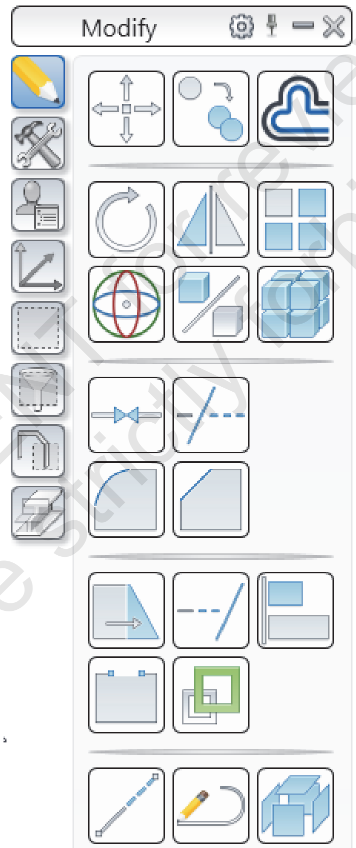


Figure 1–42

- Once you start making connections so that columns and beams work together with plates and bolts, you need to start using the Autodesk Advance Steel modify tools.

Hint: AutoCAD Break vs. Autodesk Advance Steel Split Beam

Not all of the standard AutoCAD tools will work with Autodesk Advance Steel objects. For example, the **Break** command does not work on beams. Instead, use the Autodesk Advance Steel command **Split Beam** to break a beam into separate parts, as shown in Figure 1–43.

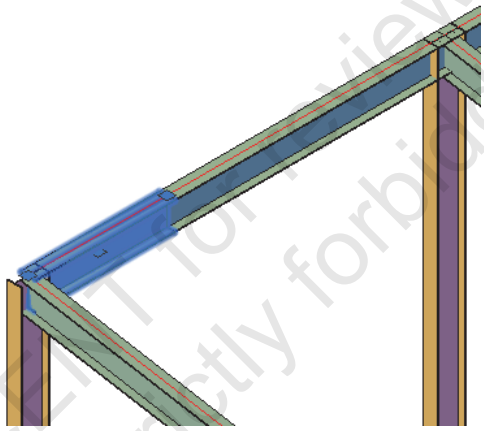


Figure 1–43

1. In the **Objects** tab>Beams panel, click (Split Beam).
2. Select the beam you want to split and press <Enter>.
3. Select the point or points along the beam where you want it to split.
4. Press <Enter>.

Using Grips and the 3D Gizmo

You can use grips to modify objects, such as the length of beams or size of plates. They work in 2D and in 3D with added power when you use the 3D Gizmo, as shown in Figure 1–44.

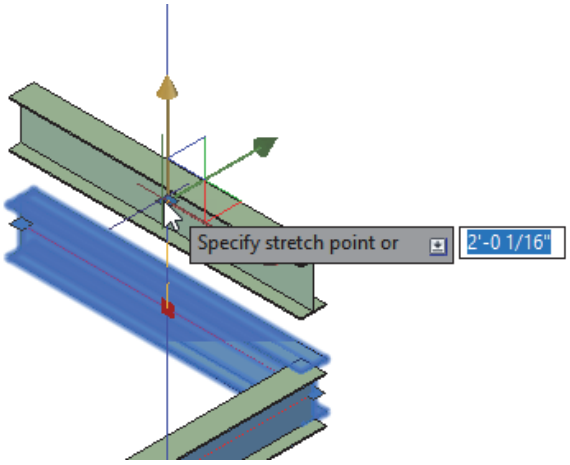


Figure 1–44

- 3D Gizmos can be used with both 2D and 3D objects. The Gizmo is primarily used to move and rotate, but can also scale objects, as shown in Figure 1–45.

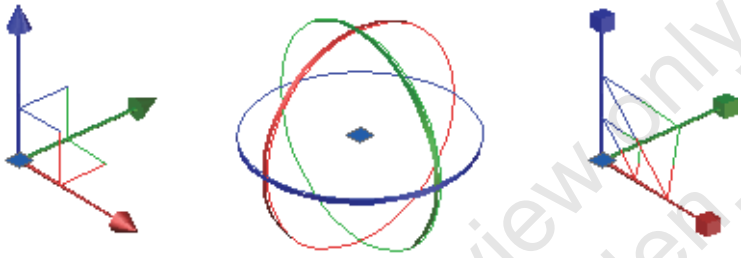


Figure 1–45

- When you select objects in a 3D view, the UCS icon turns into the Gizmo tool. This tool enables you to limit the movement of objects along an axis or plane and to rotate in 3D space. When you hover the cursor over a Gizmo, it automatically jumps to a location or vertex grip. It can also be used as a grip without being moved to another grip.

- The color-coded icon displays in the current UCS. Red indicates the X-axis, green the Y-axis, and blue the Z-axis.

- As you move the cursor over one of the axes on the Gizmo tool, the active axis highlights in gold and displays a guideline in the axis color. If you move the cursor over a plane, the plane highlights in gold, as shown in Figure 1–46.

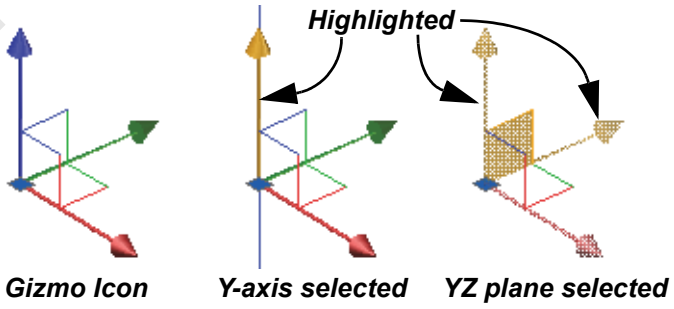


Figure 1–46

How To: Use the 3D Gizmo

1. In a 3D view, select the objects you want to modify.
2. Move the Gizmo tool to a base point, if required.
3. Select an axis or plane on the Gizmo tool.
4. You can right-click on the Gizmo to display a menu and pick move, rotate, or scale.
5. When a Gizmo operation is in progress and you need to switch to a different Gizmo, press <Spacebar> or <Enter> to cycle through the options.
   - To move an object, move the cursor along the axis or in the plane. You can type coordinates or select a point to end the command.
   - To rotate an object, move the cursor along the axis. Type an angle value or select a point to finish the command.
   - To scale an object, select the center triangular plane between the three axes in the Gizmo tool, and move the cursor towards or away from the center of the Gizmo.

Practice 1b

Helpful AutoCAD Tools

Practice Objectives

- Use Object Snap, Ortho, and other AutoCAD drawing aids.
- Use grips and the 3D Gizmo to copy, move, and modify objects.
- Understand the difference between the AutoCAD Break command and the Autodesk Advance Steel Split Beam command.

In this practice, you will use grips and Ortho to shorten grid lines and lengthen beams. You will use the AutoCAD Copy command and Node object snap to copy columns and beams. You will then test the difference between the AutoCAD Break command and the Autodesk Advance Steel Split Beam command. Finally, you will use the 3D gizmo to copy beams in 3D and then use grips and node snaps to change the height on one end of the beams. The final model is shown in Figure 1–47.

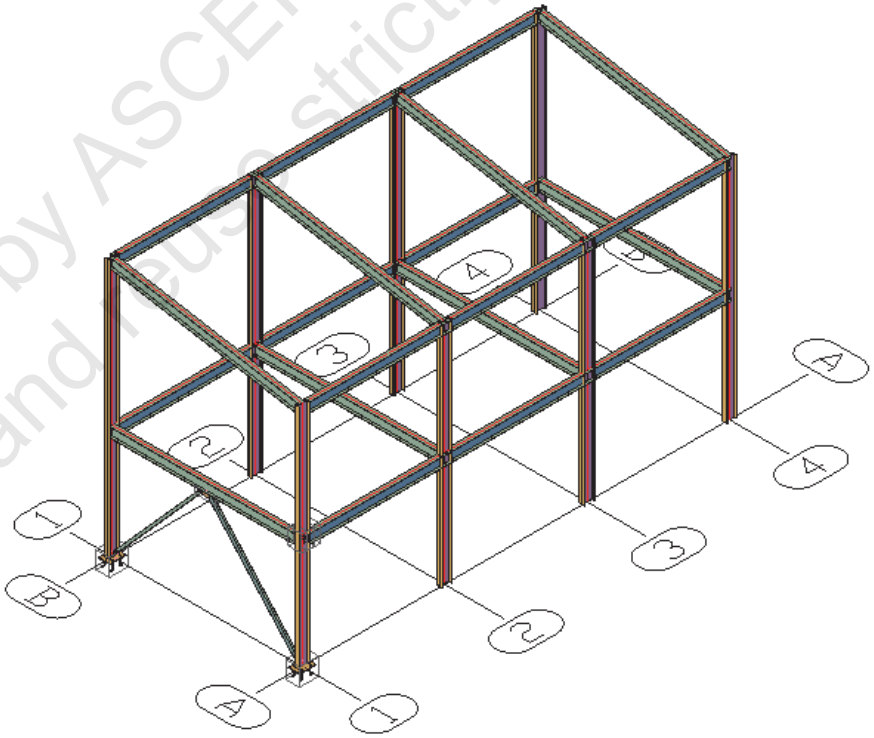


Figure 1–47

Task 1 - Use grips and object snaps to modify and copy objects.

1. In the practice files folder, open **Platform-Simple.dwg**.

2. In the Status Bar, ensure that (Ortho) is toggled on and (Object Snaps) are toggled off.
3. Select the AB Grid object. Click on the grip for Grid A and move it in **30'-0"**, as shown in Figure 1–48.

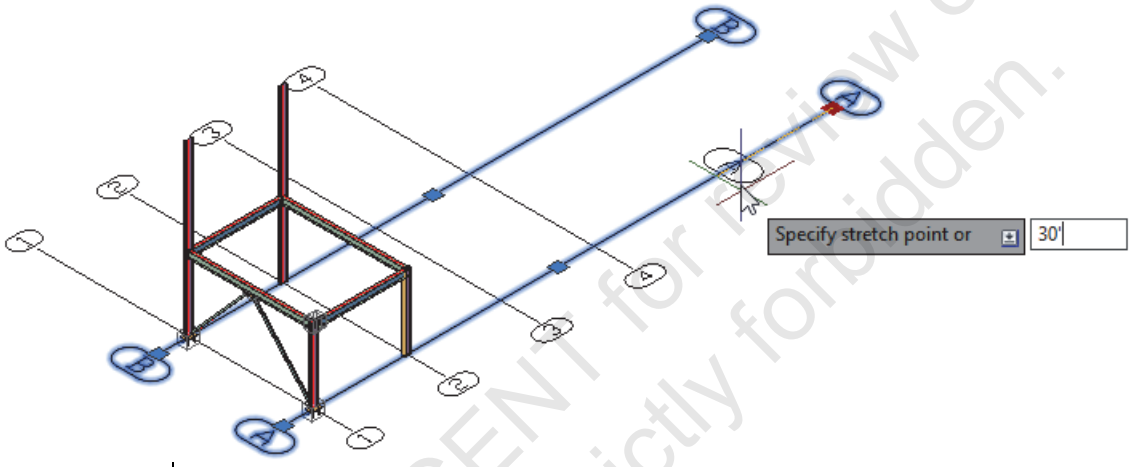


Figure 1–48

4. Repeat the process with Grid B.
5. Move Grids 1-4 in **20'-0"**, as shown in Figure 1–49.

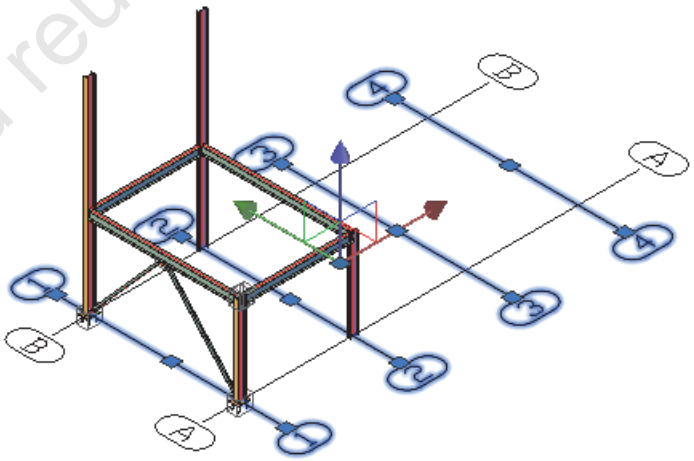


Figure 1–49

6. Toggle on Object Snaps and set the Object Snaps to **Node and GRID Intersection Points**. Ensure that no other object snaps are on.

7. In the Advance Tool Palette> (Modify) category, click (Copy). Select the columns on Grid 2 and copy them to Grids 3 and 4 using the node object snap at the end of the grid lines.

8. Use grips to extend the beams along Grid A and B to Grid 4, as shown in Figure 1–50.
   - You can use the Node object snap for the beam on Grid A with the short columns, but you need to use the Perpendicular object snap override with the taller column on Grid B.

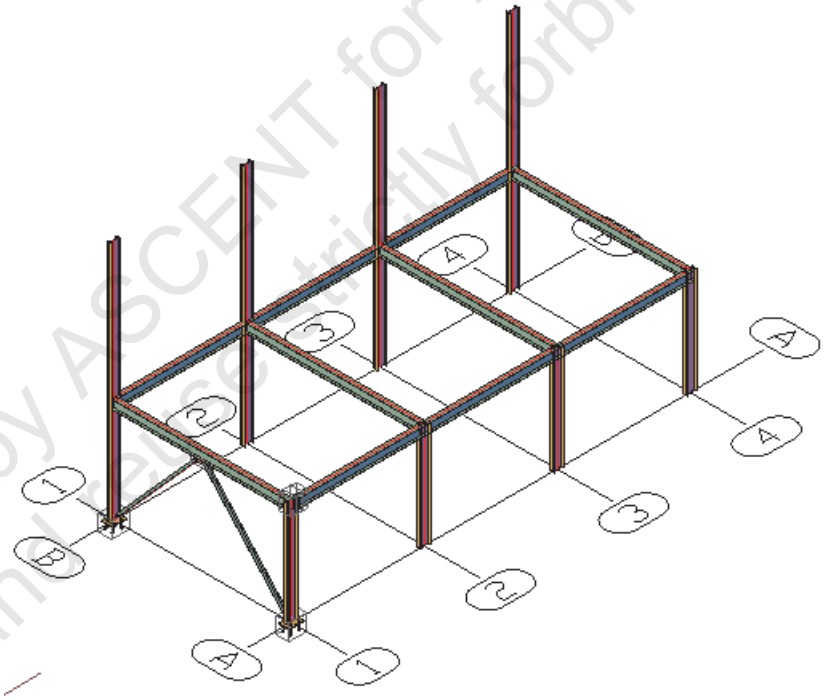


Figure 1–50

9. Copy the rest of the beams into place.

10. Save the drawing.

Task 2 - Test Break vs. Split Beam.

1. Extend the Command Line so that at least 3 historical prompts display.

2. Zoom in on the top of Column A2 and select the beam. Note that the beam is all one piece.

3. In the Advance Tool Palette>  *Modify* category, click  (Break).

4. Select the beam. In the Command Line, note that the object cannot be broken, as shown in Figure 1–51. Press <Esc>.

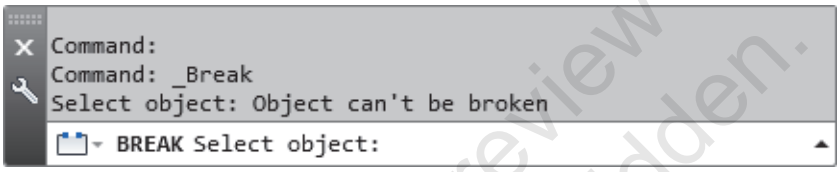


Figure 1–51

5. In the *Objects* tab>Beams panel, click  (Split Beams).

6. Select the beam and press <Enter>.

7. Select the Node object snap at the top of the beam, then pan over to Column A3 and select the Node there as well, and then press <Enter>. The beams are now separated, as shown in Figure 1–52.

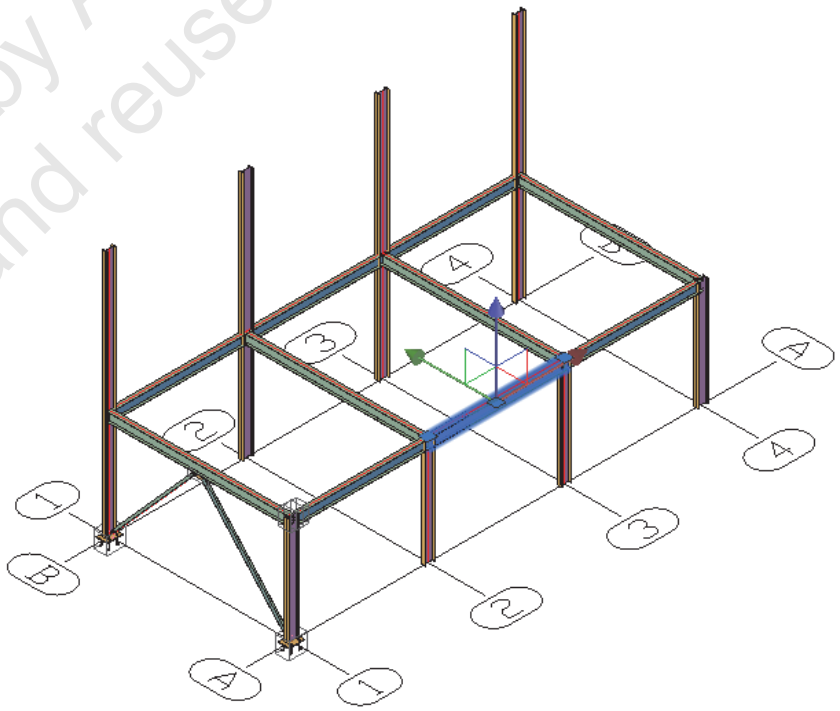


Figure 1–52

8. Repeat the process for the beam on Grid B.

9. Save the drawing.

Task 3 - Copy objects in 3D.

1. Select one of the beams. Right-click and select **Select Similar**. Note that all of the beams and braces are selected.
2. Hold <Shift> and clear the selection of the two diagonal braces.
3. Move the cursor over the Z-axis (blue) of the 3D Gizmo and select it.
4. In the Command Line, type **CO** (for Copy).

Note that Ortho should still be on for this step.

5. Move the cursor up, enter **12'**, and press <Esc> to finish the command, as shown in Figure 1–53.

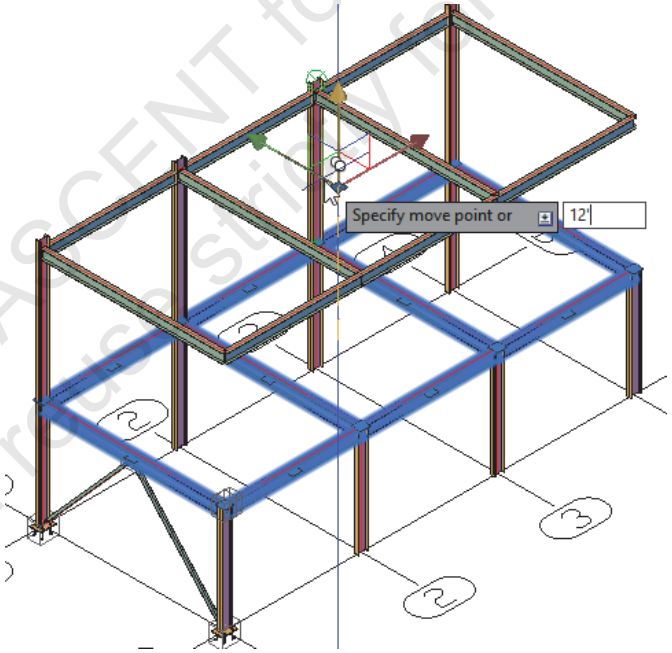


Figure 1–53

6. Use grips to extend the shorter columns up **12'-0"**.
7. Use the AutoCAD **Move** command to move the back beams **3'-5 1/4"** up to the top of the columns (for a total of **16'-0"**).

8. Use grips and the Node object snap to angle the columns as shown in Figure 1–54.

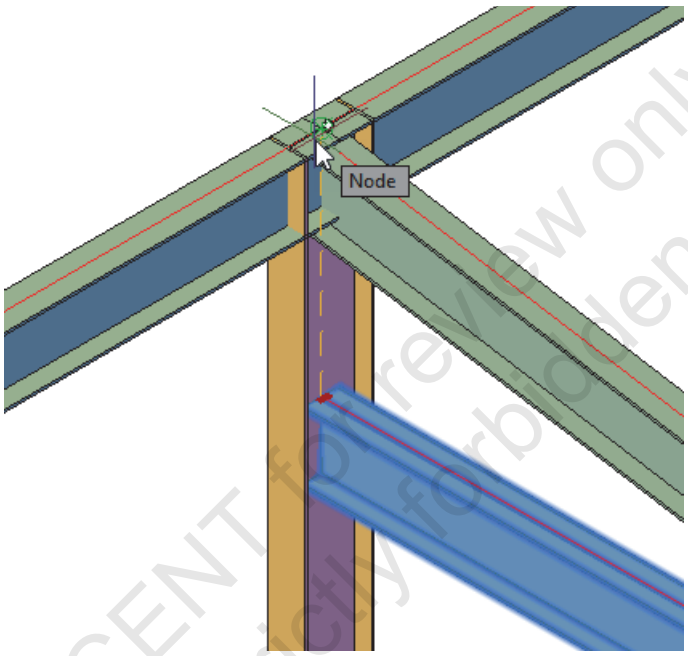


Figure 1–54

9. Zoom out to display the entire model.
10. Save the drawing.

1.5 Working with the User Coordinate System (UCS)

In the AutoCAD software, 2D objects are created on a single flat plane, which is usually the XY plane. In Autodesk Advance Steel most of your work occurs in 3D and you need to be able to specify the XY plane (as shown in Figure 1–55) for a number of commands, such as when you draw plates or bracing members.

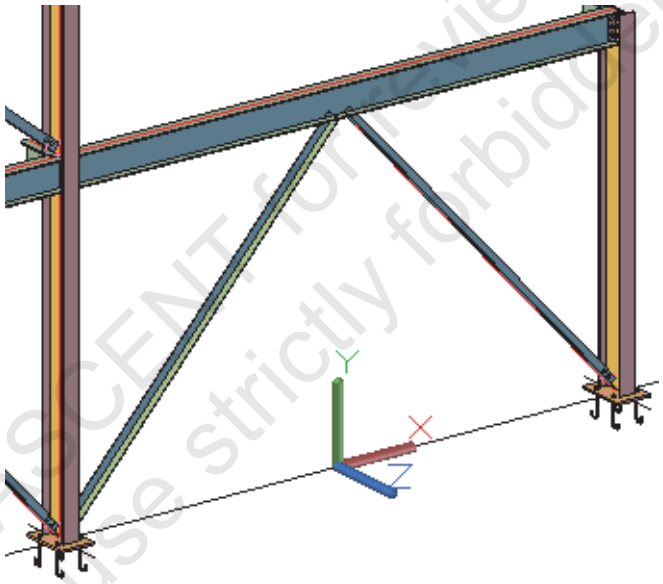


Figure 1–55

- There are three axes: the X-axis, Y-axis, and Z-axis. Three planes are also automatically created by the intersections of these axes. They are the XY plane, the YZ plane, and the XZ plane. Together these three axes and their planes form a user coordinate system, or UCS.
- The UCS is a user-defined working plane with X,Y coordinates that can be positioned at any location or orientation in space.
- Do not confuse the UCS position with the viewing direction. The position from which you view your drawing, known as the viewpoint, determines how you see your drawing. The UCS determines where you are drawing. It sets the position of the working plane.
- The POLAR, OTRACK, and ORTHO commands work with dynamic input in the Z-axis direction.

UCS Commands

UCS commands are found in the Advance Tool Palette>  (UCS) category, as shown in Figure 1–56. Some of these are the same tools as found in AutoCAD, and a few are specific to the Autodesk Advance Steel software.

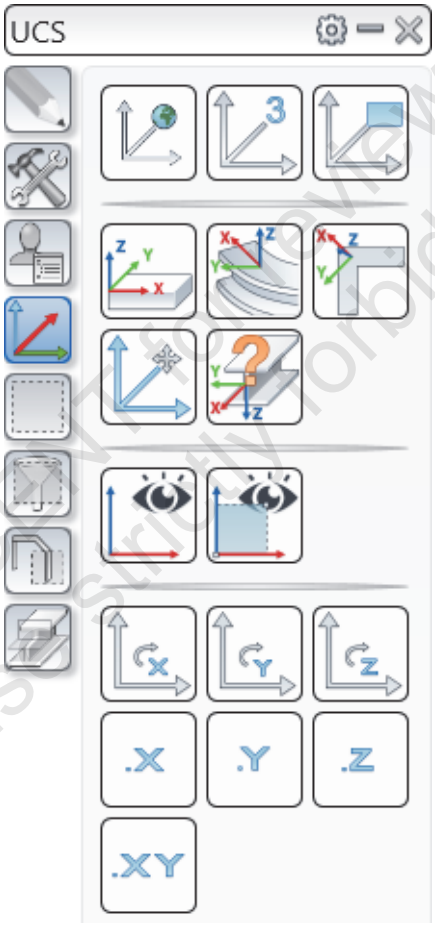


Figure 1–56

- Most of these tools can also be accessed using commands typed into the command line, as shown in Figure 1–57. Type **UCS** and then the method you want to use. **World** is the default for the UCS command.

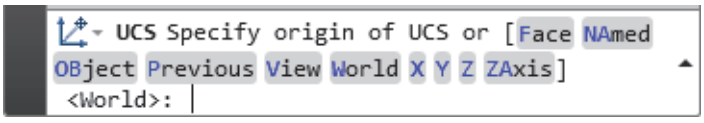


Figure 1–57

Commonly Used UCS Commands

	**UCS World**	Returns the UCS to the **Home** position at 0,0,0 in the drawing.
	**Move UCS**	Specify a new origin point. The axes are not modified
	**Rotate UCS around X, Y, Z**	Frequently used after moving the UCS. Click on these tools to rotate the other axes around the X, Y, or Z axis.
	**UCS at object**	Identify an object and then click on the line which you want to specify as the Z-axis (Autodesk Advance Steel only).
	**UCS 3 points**	Specify the new origin point, the positive direction of the X-axis, and the positive portion of the Y axis.
	**UCS View**	Orients the UCS to the current view.

1.6 Using the Autodesk Advance Steel Modify Commands

While you can use the standard AutoCAD modify commands for individual objects in the Autodesk Advance Steel software, there are times when these tools are not going to work, as shown in Figure 1–58. This is especially true once you start working with connections or if you want to copy features that have been cut into columns. In these cases, it is best to use the **Advance Copy** command found in the Advance Tool Palette> (Tools) category, as shown in Figure 1–59. There is also a specific tool to Trim or Extend Autodesk Advance Steel objects, such as beams and columns.

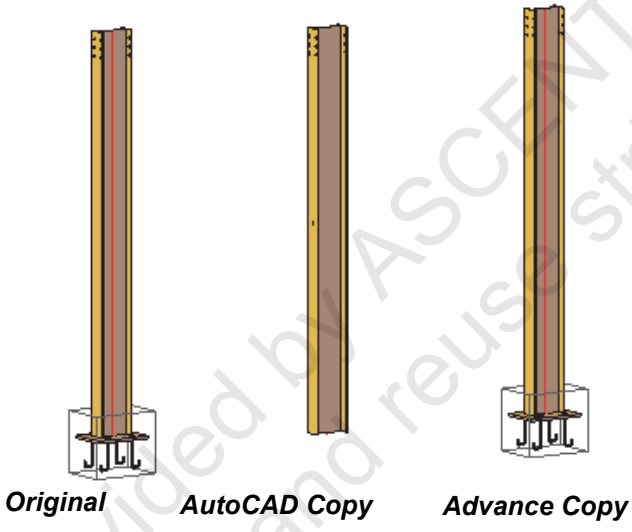


Figure 1–58

Figure 1–59

- The **Advance Copy** command includes options for **Copy**, **Move**, **Array**, **Polar array**, **Mirror**, **Rotate**, **Align**, and **Adapt**. You can also access some of these options directly using the other buttons in the Tools category.

How To: Transform Elements Using Advance Copy

1. In the Advance Tool Palette> (Tools) category, click (Advance Copy).
2. In the Transform elements dialog box (shown in Figure 1–60), click (Select objects).

3. In the drawing window, select the base objects (such as columns or beams) you want to use, and press <Enter> to return to the dialog box.
   - If you want to include the relationships between connected objects (such as a base plate on the bottom of a column), select **Include additional connections**, as shown in Figure 1–60.

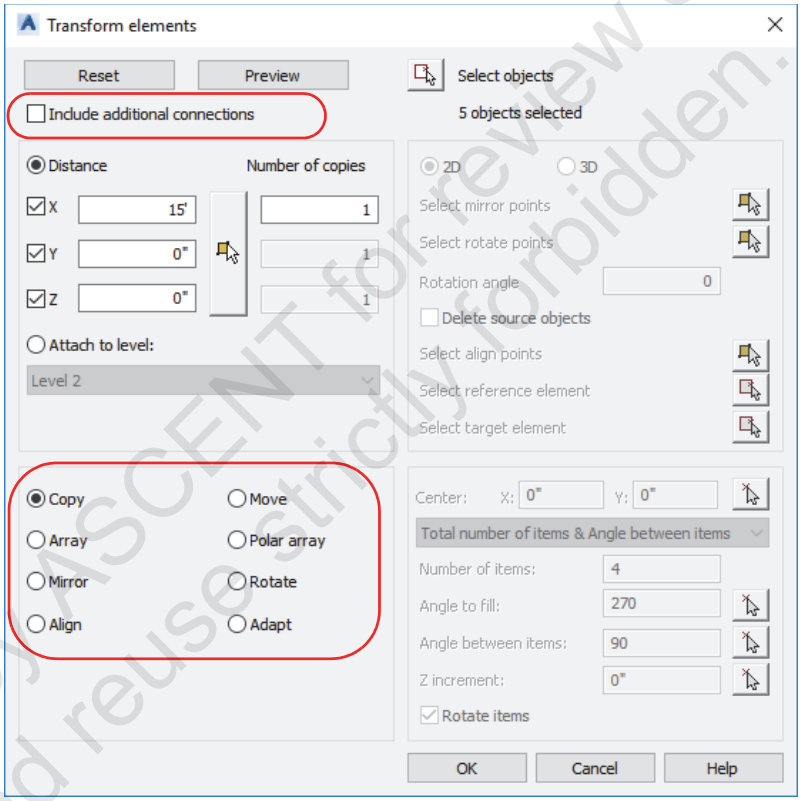


Figure 1–60

4. Select the type of command you want to use, as shown in the red box in Figure 1–60, above.
5. Depending on the type of command you select, various parts of the dialog box are available. Click  to specify distances or other points.
6. Click **Preview**.
7. Review the model to ensure that everything is placed as expected. When you are finished, in the Preview dialog box (shown in Figure 1–61), click **OK**. If you need to make changes, click **Modify** to return to the dialog box or **Cancel** to exit the command.

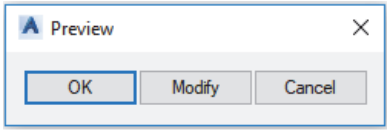
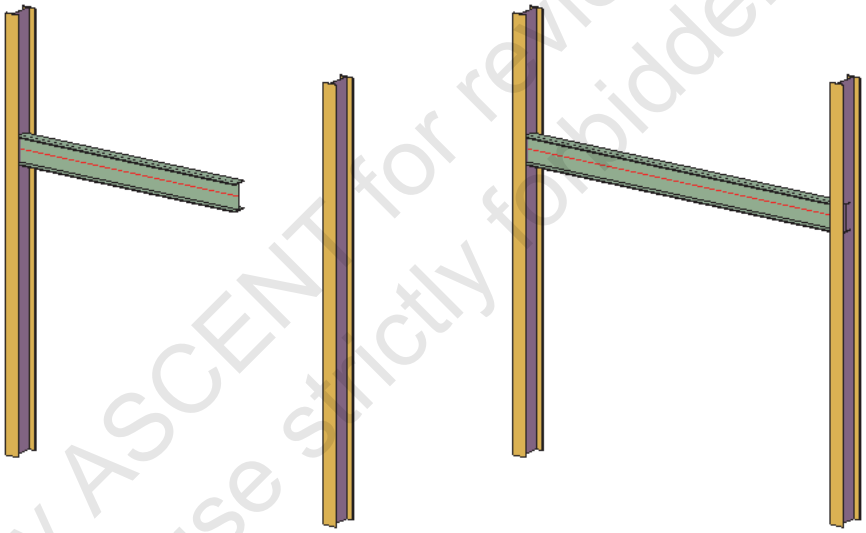


Figure 1–61

- It is safer to preview the function, rather than just hoping that it works. Remember that commands in the Autodesk Advance Steel software are often macros of many commands, and trying to undo an operation might take many steps.

Using Advance Trim/Extend

The standard AutoCAD Trim and Extend commands do not work with Autodesk Advance Steel objects, but you can use the Advance Trim/Extend command, as shown in Figure 1–62.



Advance Trim/Extend command

Figure 1–62

How To: Trim or Extend Autodesk Advance Steel Objects

1. In the Advance Tool Palette> (Tools) category, scroll down and select (Advance Trim/Extend).
2. Select the **Trim**, **Extend**, or **Auto** operation mode (the default is **Auto**).
3. Select one of the following Select options:
   - **System:** The system line of a beam. This is the default.
   - **Center:** The center line of a beam.
   - **Face:** The face of a beam.
   - **Line:** An AutoCAD object.
4. Select the boundary object and press <Enter>
5. Select the object to be trimmed or extended.
6. Continue selecting other objects, or press <Enter> to finish the command.

Practice 1c

Use the Autodesk Advance Steel Modify Commands

Practice Objective

- Use Advance Copy to copy, move, and mirror Autodesk Advance Steel objects.

In this practice, you will use the Advance Copy command to copy and mirror columns, beams, and braces, with their connections. You will copy beams in 3D space and then extend columns to meet the new beam locations. Finally, you will move beams to a new location and use grips to modify the connecting beams. The final model is shown in Figure 1–63.

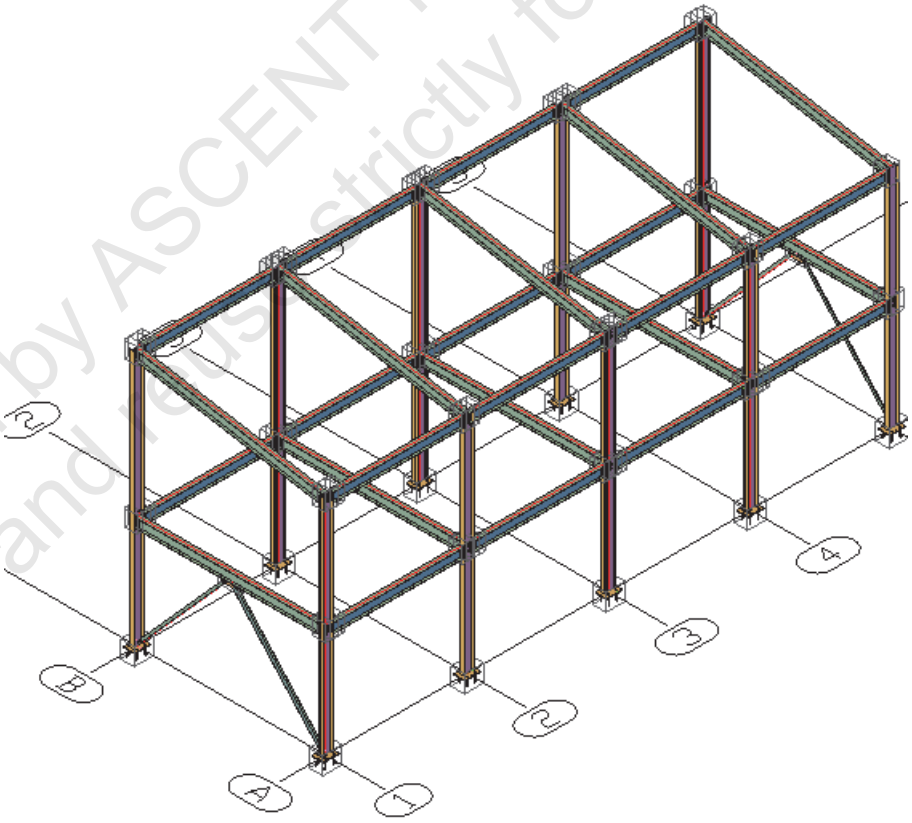


Figure 1–63

Task 1 - Use Advance Copy to copy and mirror objects and their connections.

1. In the practice files folder, open **Platform-Modify.dwg**.

2. Investigate the existing objects in the model. Note that they all have connections where they intersect, as shown in Figure 1–64.

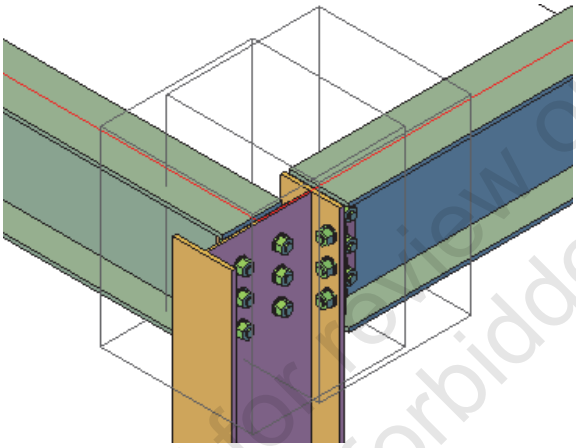


Figure 1–64

3. In the Advance Tool Palette> (Tools) category, click (Advance Copy).

4. In the Transform elements dialog box, click (Select objects).

5. In the drawing window, select the two columns on Grid 2 and the three connecting beams, as shown in Figure 1–65, and press <Enter>.

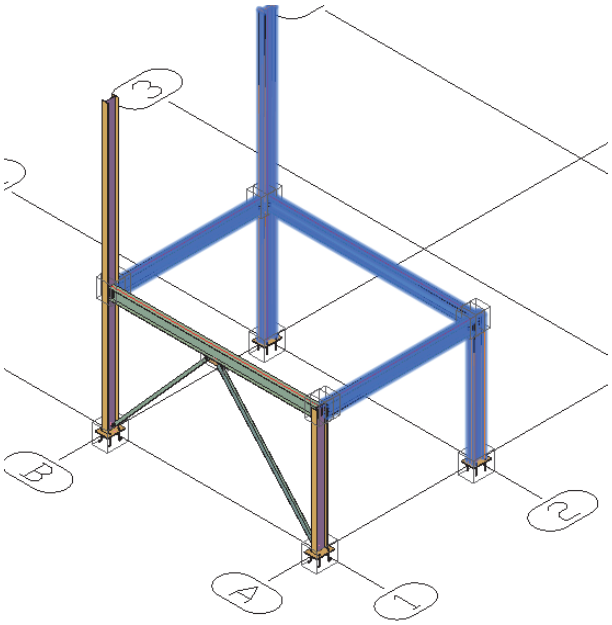


Figure 1–65

6. In the Transform elements dialog box, select **Include additional connections**.
7. Ensure that the **Copy** option is selected.
8. In the Distance area, set the *X* distance to **15'** and the *Number of copies* to **2**, as shown in Figure 1–66.

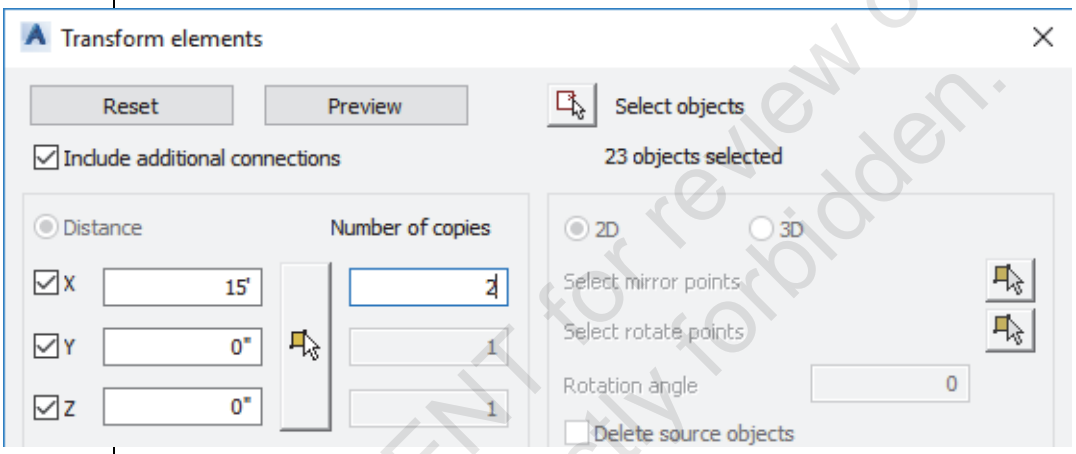


Figure 1–66

9. Click **Preview**. The copies and appropriate connections display as shown in Figure 1–67.

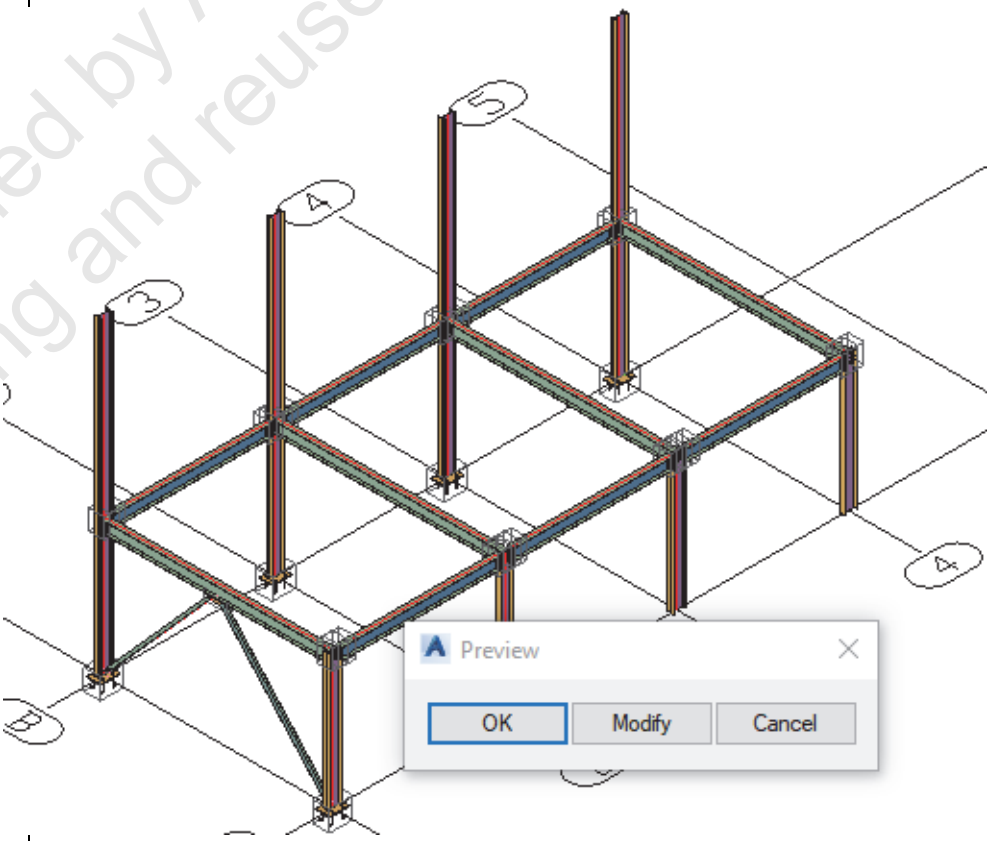


Figure 1–67

10. In the Preview dialog box, click **OK**.
11. Start the **Advance Copy** command again.
12. In the dialog box, click (Select objects) and select the columns, beams, and braces that are highlighted in Figure 1–68.
13. In the dialog box, select the **Mirror** option. In the Mirror area, ensure that **2D** is selected, and then click (Select mirror points).
14. Select the two end node points of Grid 3.
15. In the dialog box, click **Preview**. The mirrored objects should display as shown in Figure 1–68. Click **OK**.

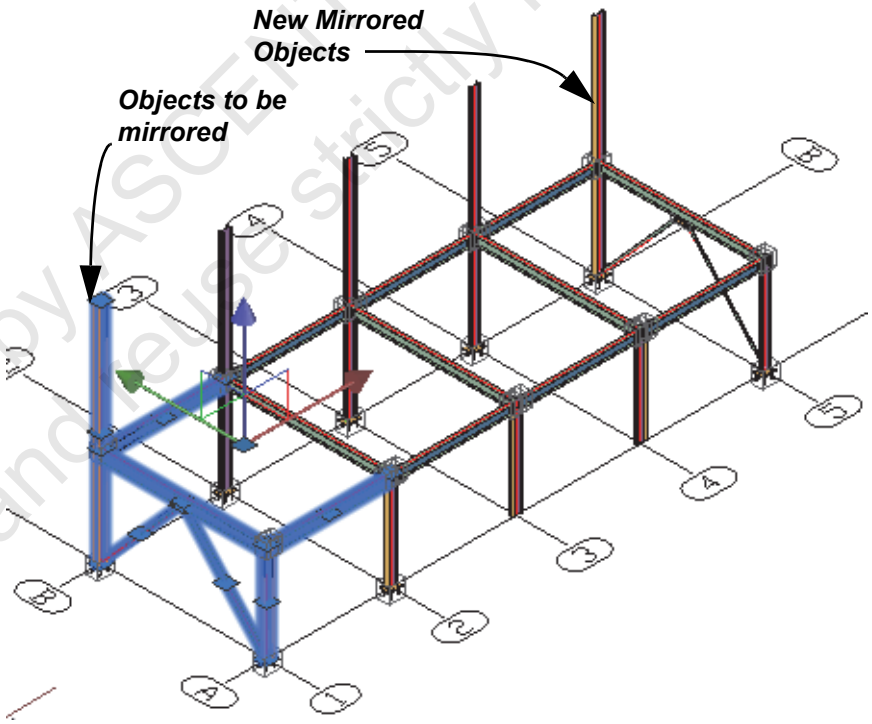


Figure 1–68

16. Save the drawing.

Task 2 - Copy and extend objects in 3D space.

1. Start the **Advance Copy** command.
2. Select all of the beams in the model, but not the braces and columns.

3. Set the *Z* distance to **12'-0"** (as shown in Figure 1–69) and click **Preview**.

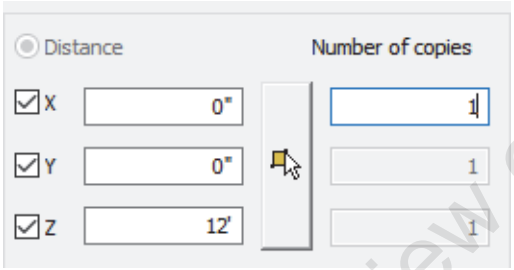


Figure 1–69

4. Select the highlighted columns (corresponding entities) or press <Enter> to accept the highlighted column, as prompted and shown for the first column in Figure 1–70. The connectors are added even though the columns do not yet reach that location. Click **OK**.

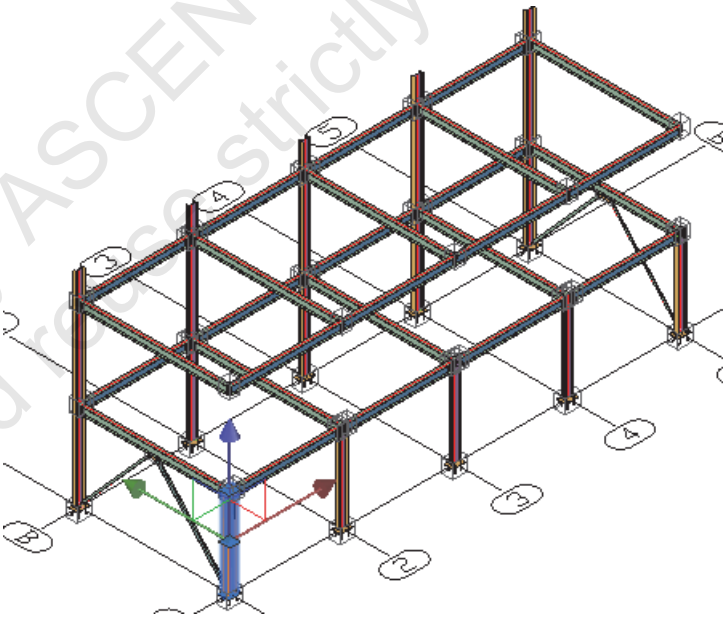


Figure 1–70

5. In the Advance Tool Palette> (Tools) category, scroll down and click (Advance Trim/Extend).
6. At the *Please select operation mode* prompt, select **Auto**.
7. At the *Please select option* prompt, select **System**.

8. Select the beams along Grid A on the second level. Press <Enter>, select the corresponding columns, and then press <Enter>. The columns are extended, as shown in Figure 1–71.

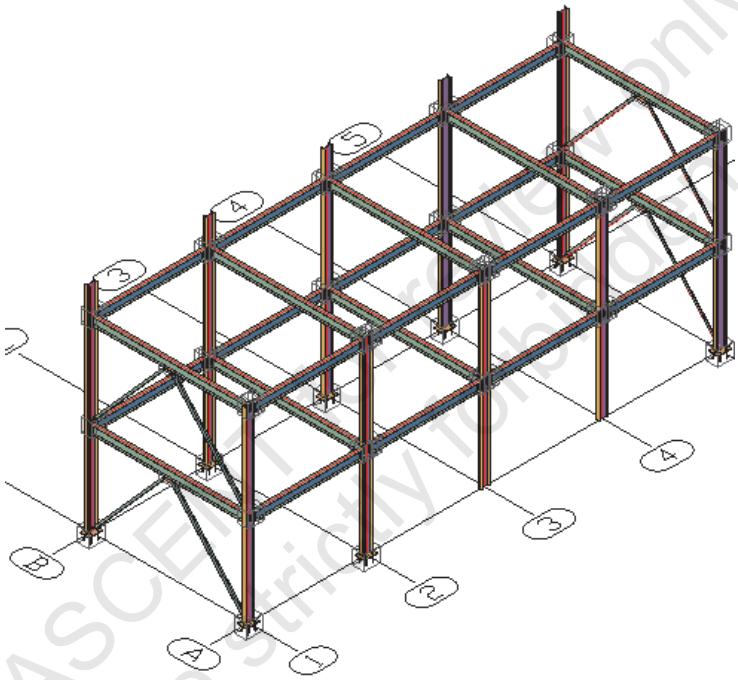


Figure 1–71

9. Press <Esc> to finish the command.
10. Use Advance Copy to move the beams along Grid B to the top of the 16'-0" columns, and then use grips to modify the crossing beams so that they are at an angle, as shown in Figure 1–72.

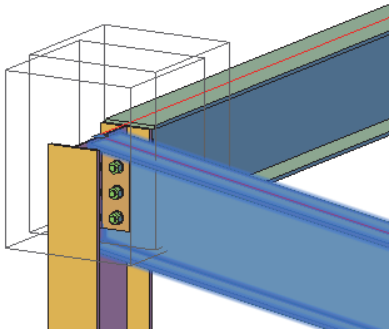


Figure 1–72

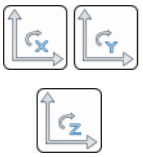
11. Save the drawing.

Chapter Review Questions

1. Which of the following describes the Autodesk Advance Steel workflow?
   a. Start from an existing project and draw in 2D and 3D.
   b. Start from a template, draw the objects in 3D, and automatically create 2D drawings from the model.
   c. Start from an existing 2D drawing and extrude 3D elements.
   d. Start from a template and create 2D working documents.
2. When you are working in a 3D view, you need to change to a 2D view before you can add any objects.
   a. True
   b. False
3. Where do you find Autodesk Advance Steel specific tools in the User Interface? (Select all that apply.)
   a. Ribbon
   b. Advance Tool Palette
   c. Quick Access Toolbar
   d. Shortcut menu
4. In AutoCAD you can use many different object snaps as drawing aids. Which one of the following object snaps do you typically leave active in the Autodesk Advance Steel software?
   a. Endpoint
   b. Midpoint
   c. Node
   d. Center
5. Which of the following commands duplicates both the selected objects and any connections (such as clip angles).
   a. Copy
   b. Advance Copy
   c. Array
   d. Advance Trim/Extend

Command Summary

Button	Command	Location
General Commands		
	**Advance Copy**	• **Advance Steel Tool Palette:** *Tools* category
	**Advance Steel Properties**	• **Advance Steel Tool Palette:** *Tools* category • **Double-click:** On an Advance Steel object • **Shortcut Menu:** Select objects, Advance Properties
	**Advance Steel Tool Palette**	• **Ribbon:** *Home* tab>Extend Modeling panel
	**Advance Trim/Extend**	• **Advance Steel Tool Palette:** *Tools* category
	**All Visible**	• **Advance Steel Tool Palette:** *Quick Views* category
	**Break**	• **Advance Steel Tool Palette:** *Modify* category
	**Copy**	• **Advance Steel Tool Palette:** *Modify* category
	**Open**	• **Quick Access Toolbar** • **Application Menu:** Open>Drawing
	**Project Explorer**	• **Ribbon:** *Home* tab>Project panel
	**Selected Objects off**	• **Advance Steel Tool Palette:** *Quick Views* category
	**Split Beam**	• **Ribbon:** *Objects* tab>Beam Tools panel
	**ViewCube**	• **Ribbon:** *View* tab>Viewport Tools panel
UCS Commands		
	**UCS Icon**	• **Ribbon:** *View* tab>Viewport Tools panel
	**UCS World**	• **Advance Steel Tool Palette:** *UCS* category
	**Move UCS**	• **Advance Steel Tool Palette:** *UCS* category

	**Rotate UCS around X, Y, Z**	• **Advance Steel Tool Palette:** *UCS* category
	**UCS at object**	• **Advance Steel Tool Palette:** *UCS* category
	**UCS 3 points**	• **Advance Steel Tool Palette:** *UCS* category
	**UCS View**	• **Advance Steel Tool Palette:** *UCS* category