

AUTODESK **UNIVERSITY** 2015

MSF12001-L

Advance Steel: Hands on the Basic Functionality

Stephen Bessette
Autodesk, Inc.

Learning Objectives

- Become familiar with the basic functionality of Advance Steel
- Learn how to create advance objects for modeling purposes
- Gain the ability to construct 3D models of your designs
- Discover the flexibility that parametric connections provide to a model

Description

This class will provide hands-on instruction regarding how to layout out and construct your steel building. Learn how to create a 3D model of your 2D design by using the functionality in Advance Steel software. You will also learn how to make the most of intelligent structural objects, parametric connections, stairs and railings, and more.

Your AU Experts

Stephen Bessette *is a Technical Sales Specialist for Autodesk, Inc., providing technical support for Autodesk AutoCAD, Autodesk AutoCAD Verticals, Autodesk Revit, and Autodesk Advance Steel software. He is a graduate of the NHTI Architectural Engineering Technology program as well as a certified computer-aided draftsman. Stephen has over 15 years of experience within the design and construction industry, including fire protection design, residential design, construction management and estimating, land surveying, quality control of construction materials, and structural steel inspection. In addition, Stephen has instructed technical classes for AutoCAD software and its 3D functionalities at NHTI in Concord, NH.*

Become familiar with the basic functionality

Elements of the 3D Model

- **Beams**
  - Beams are created as section classes, simple sections, compound sections, or curved sections
- **Plates**
  - Plates as rectangular plates or as polygon plates with any contour (polyline)

Beams and plates are created directly in the model and are displayed, by default, in the "wireframe" visual style

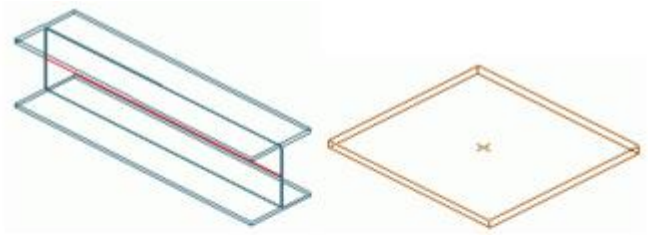
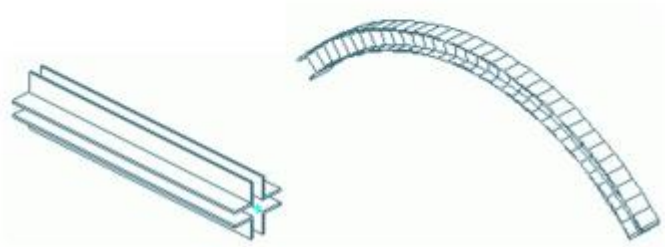


Figure 4: Beam and Plate (standard representation)



Basic elements (Beams, Plates, and etc.) have features that can be modified / processed. Processing of existing basic objects will be displayed as green processing contours within the object. These objects cannot exist alone and are directly linked to the base element. Various processing can be created

- Beams
  - Trimming, coping, miter cuts, rectangular and circular contour cuts, or any time of contour
- Plates
  - Corner finishes, chamfers, outer plate contours and inner contours, etc.

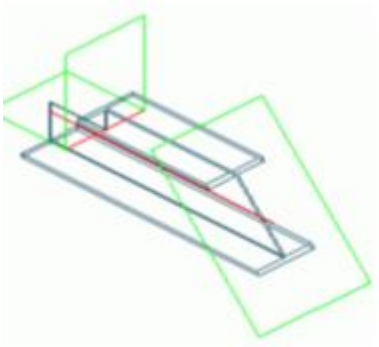
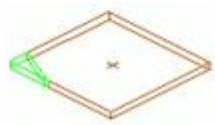


Figure 6: Contour processing – cope and corner section



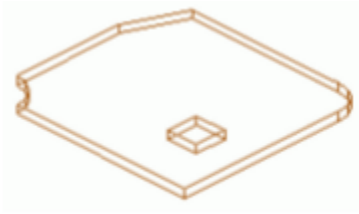
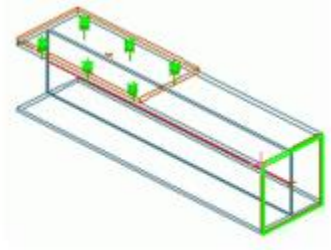


Figure 7: Plate processing

- **Bolt patterns & Welds**
  - Basic elements (objects) can be connected using Bolt Patterns (or holes only) and Welds. These objects establish a connection. This information is stored on the object including any bolt pattern (with its definition) or welds (with its relevant properties).
  - A bolt pattern can describe one or several bolts, which are automatically created in any plane together with the appropriate holes



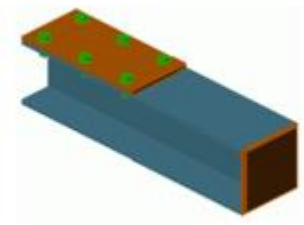
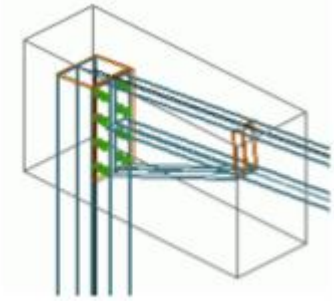


Figure 8: Bolt Pattern, Weld Point

- **Joints**
  - Complex elements that consist of basic elements and dependent elements that are controlled by a construction rule. These are used to connect other basic elements in Advance Steel. All elements in a joint, including their properties and processing objects, are held together and represented as a gray box (connection object). All connections objects and definitions are included in the gray box.
    - Example: Haunch connection
      - A portal column and a rafter are connected with an intelligent rule-based joint. This haunch connection includes plates, stiffeners, and bolts



    - Some other examples are:

        - Gable wall connections and pin-ended column connections
        - Ridge connections and splices
        - Platform connections, end plates, web connections, and shear plates
        - Gusset plates, and diagonal bracing
        - Base plates and stiffeners
        - Tube connections
        - Turnbuckle bracing
    - The rules and structure of joints are stored in MS-Access tables. Adjustment of these rules according to the user requirements (or creation of new rules) is possible with knowledge of Advance Steel's macro programming language. In addition to the joints provided in the standard Advance Steel package, interactive (or custom / manual) joints can be created, stored, and reused.
- **Structural Elements**
    - Intelligent group of basic elements and dependent elements classified as follows:
        - Symmetrical goal post frames and portal frames
        - Single-span bracings
        - Purlin positions
        - Various stairs
        - Pylons
        - Joists
        - Half trusses
    - These elements are created as a group of several basic elements with relationships to each other. Elements and their relationships are held together and stored with a connection object.
        - Example: Portal Frame
            - Consists of four sections: two grouped columns and two grouped rafters connected using a structural element macro

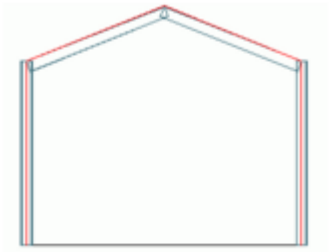


Figure 10: Portal Frame

    - All changes to one element affect the entire group. If a rafter section is changed then the section rafter section will also be changed. The column sections of the frame behave in the same way. A change in the total height or column height affects the entire structural element.
- **Auxiliary Objects**
    - Auxiliary objects are Grid Axes or Level Symbols. They do not belong directly to the frame but support the construction process. Nevertheless, they are important objects
        - Example: Building Grid

- A building grid that corresponds to the dimensions of the construction forms the basis of 3D modeling and helps with the orientation in a three-dimensional space

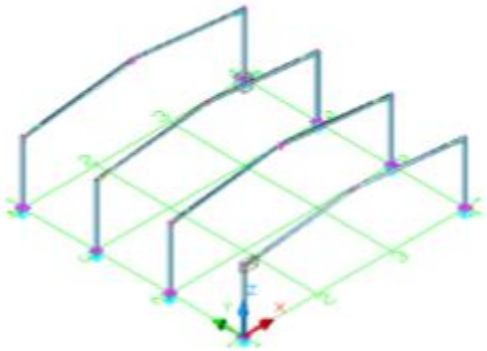
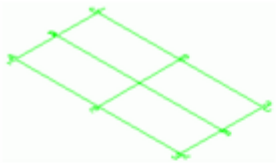


Figure 11: Building grid with portal frame

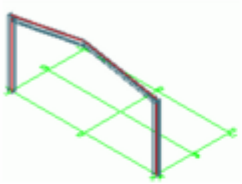
- **Special Parts**
  - Objects that are not Advance Steel standard objects can be created as special parts. When Advance Steel created drawings and bills of materials with special parts they are handled like standard objects. If these objects (special parts) are to appear in the bill of material (BOM), they must be provided with Advance Steel properties. The information that can be attached is:
    - Weight
    - Material
    - Coating
    - Name
    - Commodity
    - Lot / Phase
    - Part mark (single part and assembly)
    - Model Role
    - Other

3D Modeling workflow



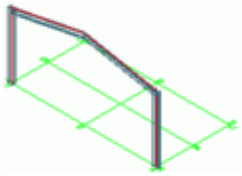
Create a building grid

⇩



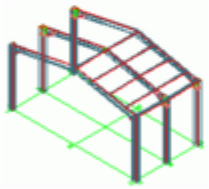
Create beams, plates, structural elements

⇩



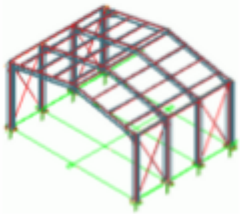
Edit beams / plates (processes)

⇩



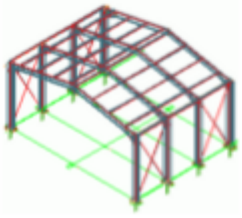
Add Advance Steel elements with joints / interactive connections

⇩



Add other interconnecting members

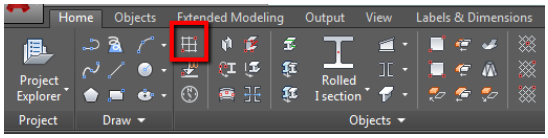
⇩



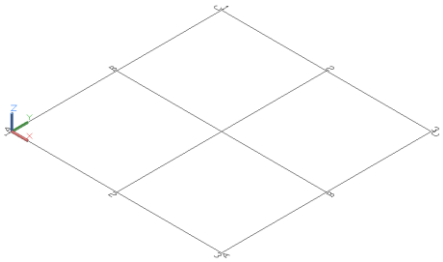
Controls / checks for collisions and measurements

Learn how to create an Advance Steel Model

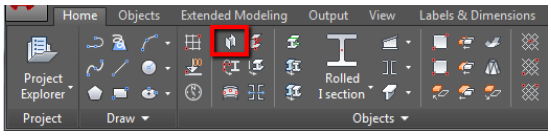
- **Create a 40'x40' Grid**



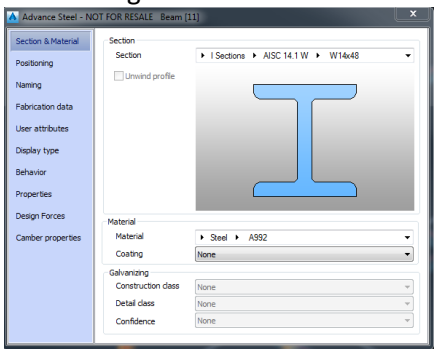
  - On the "Home" Ribbon tab, select "Grid"
  - Select "**0, 0**" as the first point
  - Enter "**40', 40'**" as the second point
  - Select the grid line following the "X" axis and right click
  - Select "Advance Properties"
    - In the "Total" tab, change the "Label type" to capital letters
    - In the "Group" tab, under the "Definition" header, change the "Number" to 3
      - The "Distance (D)" will change from 13'4" to 20'
    - Close the Advance Properties dialog box.
  - Select a grid line following the "Y" axis and right click
  - Select "Advance Properties"
    - In the "Group" tab, change the "Number" to 3
    - Close the dialog box



- **Create W14x48 Columns**



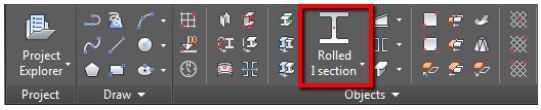
  - On the "Home" Ribbon tab, select "Column"
    - Home > Objects
    - Objects > Beams
  - Place a column at each grid intersection along column line 1. By default the columns will be 16' tall
  - In the Advance Properties Dialog Box > Section & Material, change the shape to a W14x48



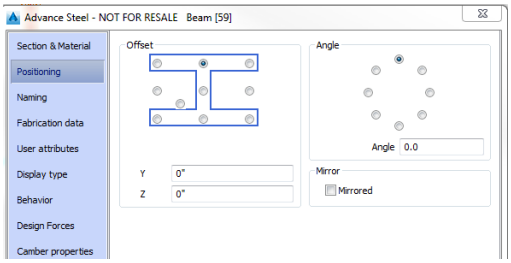
    - *HINT: You can place a single column, and then use the **COPY** or **ARRAY** command to place the remaining columns of similar shape*

- Using the **Copy** command, select the three columns and copy them to column lines 2 and 3
  - Use the intersection of column line 1 and A as the reference point

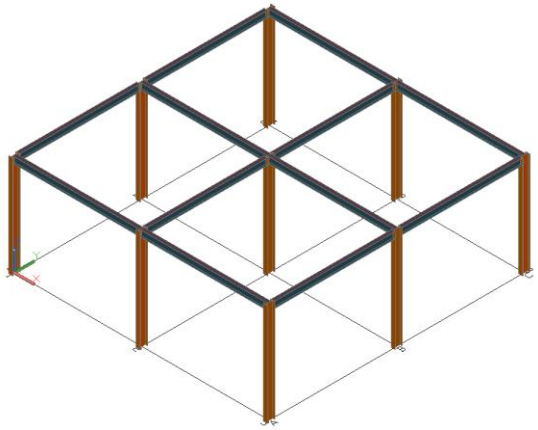
- **Create 12x26 Beams**
  - On the "Home" Ribbon tab, select "Rolled I section"
    - Home > Objects
    - Objects > Beams



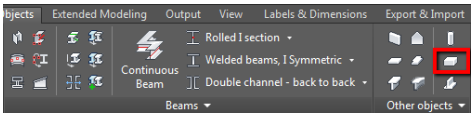
  - Place the beams at the top of the columns along column lines 1 & A. Use the "Node" snap point for each beam
    - Advance Steel allows for placing the start and end of each beam within a single command
  - In the Advance Properties Dialog Box > Section & Material, change the shape to a W12x26
    - Click the Positioning tab, and select the "top" offset
      - This will place the object system line at the top of the object



  - Using the **Copy** command, select the beams along column line 1 and copy them to column lines 2 and 3. Do the same for the beams along column line A
    - Use the grid intersections as reference points

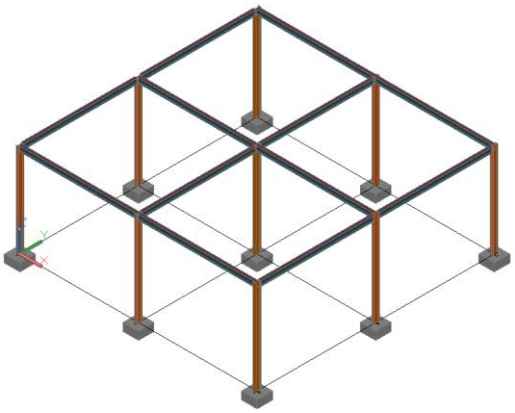


- **Draw column footings**
  - On the "Objects" tab, select "Isolated footing"
    - Place the object at the endpoint of Column Line 1 & A
  - Within the Advance Tool Palette > Tools, select "Array"
    - Alternatively, you can type **ARRAY** into the command line and press Enter. This is a core AutoCAD command
    - Select the isolated footing placed and press Enter
    - Enter **3** for the number of lines on the X axis



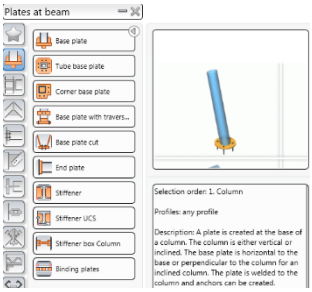


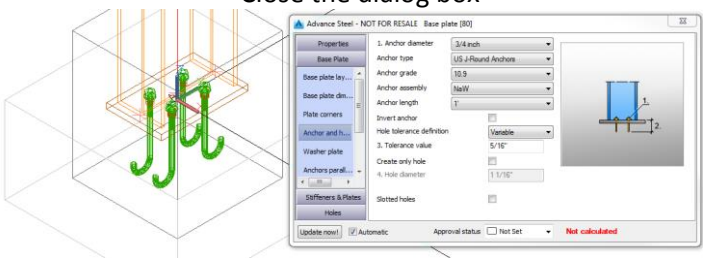
- Enter **3** for the number of lines on the Y axis
- Enter 1 for the number of lines on the Z axis
- Enter **20'** for the distance on the X axis
- Enter **20'** for the distance on the Y axis
- Enter 0 for the distance on the Z axis



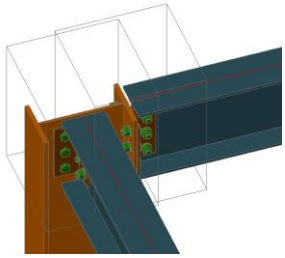
- Use the **EXPLODE** command to explode the Array Group

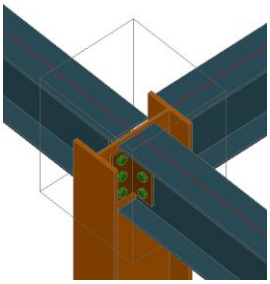
- **Build Steel Connections**
  - Within the "Connection Vault" palette, select "Plates at Beam"
    - If the "Connection Vault" palette is not visible, click the icon in the Home > Extended Modeling location
  - Select "Base plate"
    - Select "towards" the bottom of the column at line 1 & A and press Enter
    - Within the Advance Joint Properties dialog box
      - Base Plate > Base plate dimensions, change the "Projection 1" value to 1"
      - Base Plate > Anchor and holes, change the "Anchor type" to "US J-Round Anchors"
      - Close the dialog box





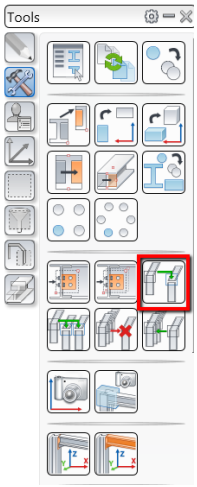
  - Within the "Connection Vault" palette, select "Platform beams"
  - Select "Clip Angle"
    - Select "towards" the top of the column at line 1&A and press Enter
    - Select the beam from 1&A to 2&A and press Enter
    - Close the Advance Joint Properties dialog box
  - Select "Clip Angle"
    - Select "towards" the top of the column at line 1&A and press Enter
    - Select the beam from 1&A to 1&B and press Enter



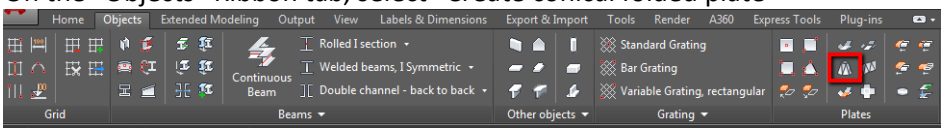


        - Close the Advance Joint Properties dialog box
    - Select "Double side clip angle"
        - Select the column at 2&A
        - Select the beam from 1&A to 2&A
        - Select the beam from 2&A to 3&A
        - Close the Advance Joint Properties Dialog box

- **Copy Steel Connections**
    - Within the Advance Tool Palette, select "Tools"
    - Click the "Create Joint in joint group button"
    - Select the joint box for the "Base plate" connection and press Enter
    - Select another column to "copy" the joint to said column / footing
        - Once all of the columns are selected, press Enter to complete the command
            - *HINT: This can be done for all of the connections made. The selection order for each specific joint will be the same. Also, all copies must be made to a connection that shares the parameters. For instance, use clip angle for when a single beam meets a column.*

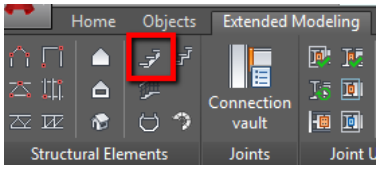


- **Place the Missing Cross Beams**
    - On the "Home" Ribbon tab, select "Rolled I section"
    - Trace the lines shown in the model
    - Within the Advance Properties dialog box, set the size to W10x22
        - Note; only have one beam extend through the center. There should be a total of 3 separate beams
    - Use a "Shear tab" connection to connect the beams
- **Place a folded conical plate**
    - On the "Objects" Ribbon tab, select "Create conical folded plate"

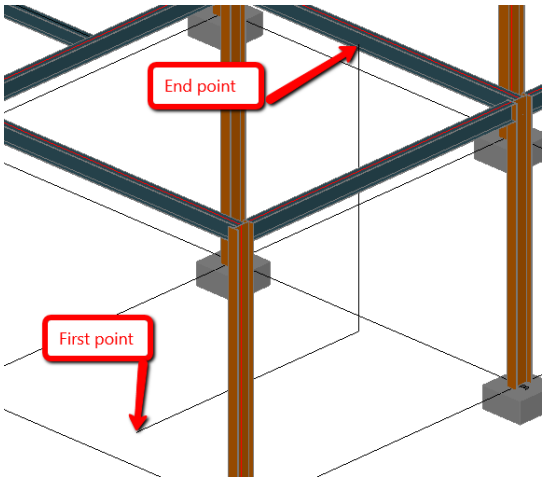


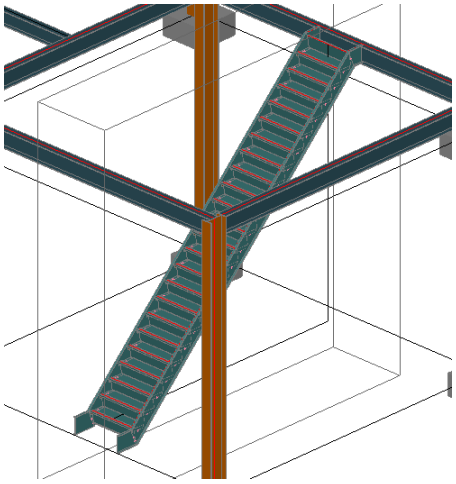
        - Select "Contour" for the "start shape type"
        - Select the upper circle
        - Select "Contour" for the "end shape type"
        - Select the lower circle
        - In the advance dialog box, change the "Facets per corner" value to 16 and press OK

- **Create a Stair Case assembly**
  - On the "Extended Modeling" ribbon tab, in the "Structural Elements" panel, select "Straight Stair"

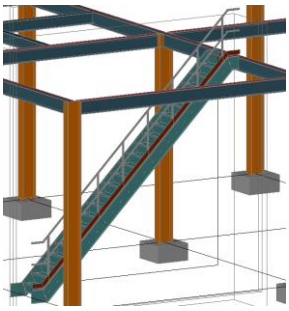


    - Press Enter to retain the default justification of the stairs
    - Select the first point of the stair
    - Select the end point of the stair
    - Press Enter

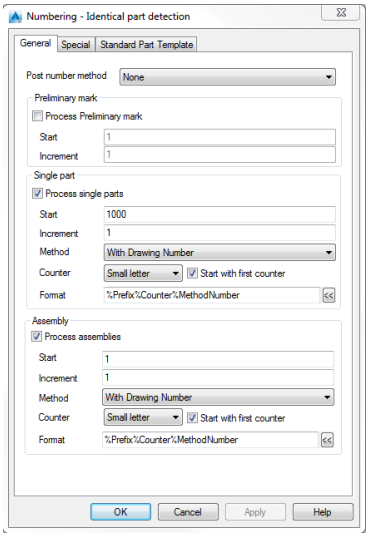




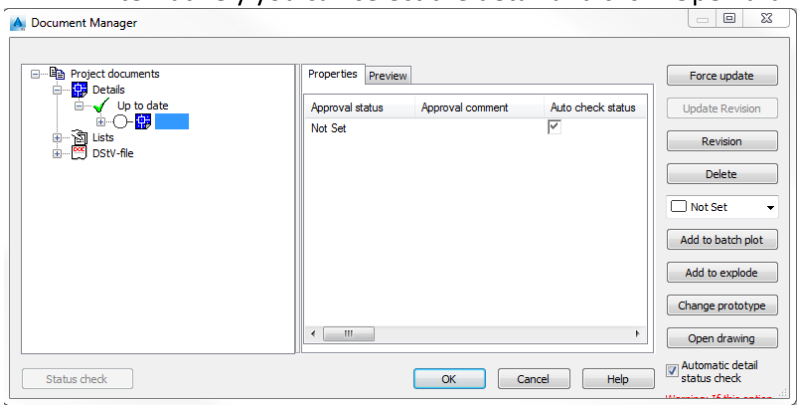
- **Add Railing to Stair Case**
  - On the "Extended Modeling" ribbon tab, in the "Structural Elements" panel, select "Hand Railing"
    - Select all parts to have a railing added
      - For instance, all beams that make up the stair stringer
    - Select the lower starting point of the railing
    - Select the end point of the railing

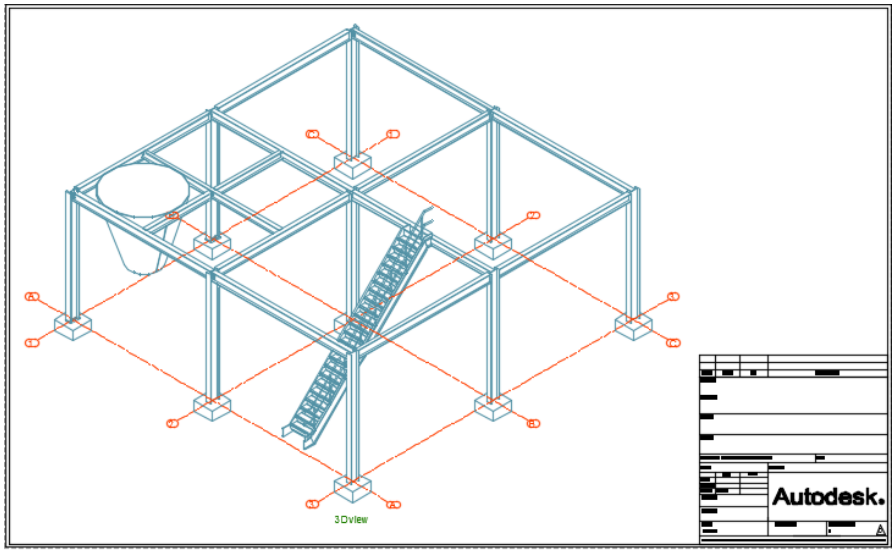


- **Number the parts in the drawing**
  - On the "Home" ribbon tab, in the "Documents" panel, select "Numbering" 
  - In the "Numbering" dialog box, check the box next to "Preliminary mark" and "Process assemblies"
  - Change the "Method" to "SP: 1000,1001…;MP:1,2,3"
  - Click OK to start the Numbering process

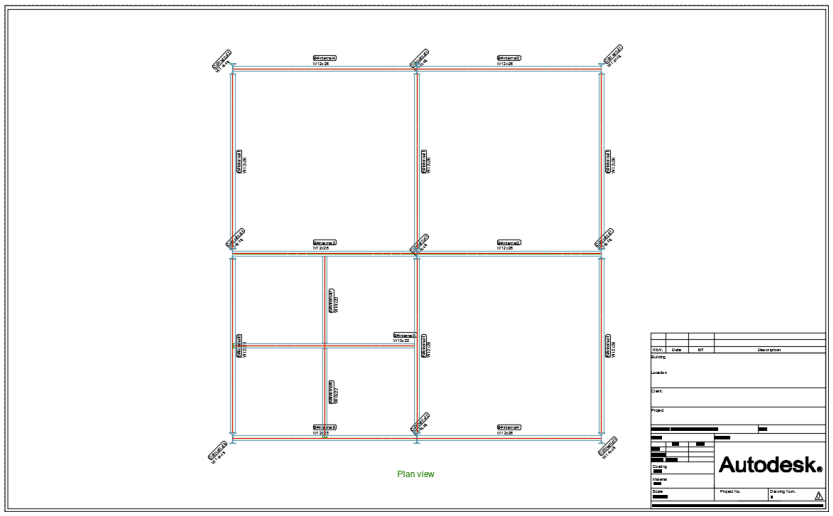


- **Create Detail Drawings**
  - Create a "3D View – Model – W/O Labels" drawing
    - In the Advance Tool Palette, select the UCS tab
    - Set the UCS to align with your current view 
      - Make sure that you are in a custom (3D), or isometric view
    - In the Drawing Styles Tool Palette, select "1- 3D GA View"
      - If the Drawing Styles palette is not open, Home > Documents, click the "Drawing styles" icon
    - Select "1 – 3D View – Model – W/O Labels"
    - Click OK in the Advance Properties Dialog box
    - In the "Select destination file" dialog box, select the ASDETPROTO-ANSI-D.dwg prototype and click OK
  - Open the detail created
    - Open the Document Manager (Home > Documents)
    - Under the "Project documents" header, expand the "Details" and "Up to date" menus
    - Double-click **1.dwg** to open the detail
      - Alternatively you can select the detail and click "Open drawing"

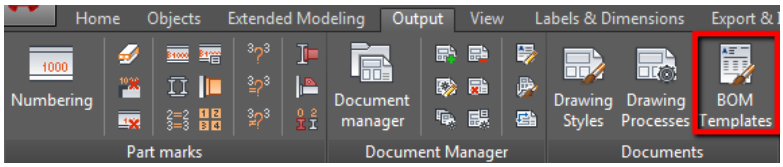




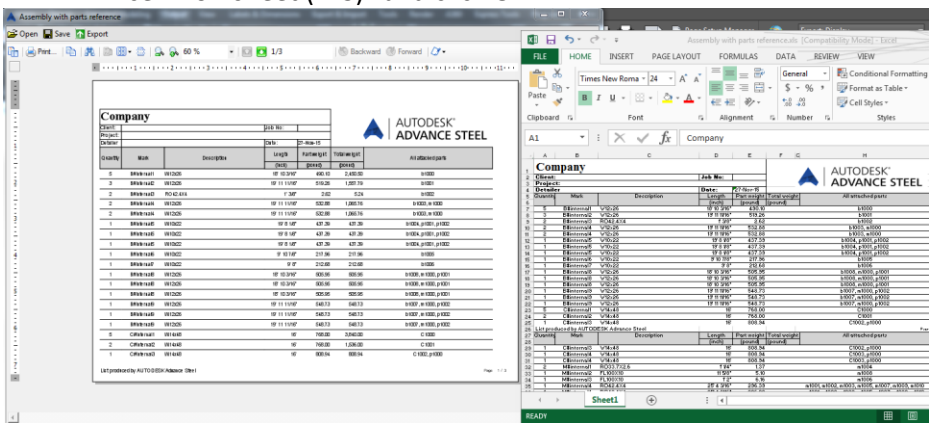
- Create a "3- Plan View – Full" detail
  - In the model, set the UCS to World
    - Advance Tool Palette > UCS > World 
  - Move the UCS to the top of the column at line 1&A
    - Advance Tool Palette > UCS > Move
  - In the Drawing Styles Palette, select "3 – GA Plans, Elevations"
    - Select "3 – Plan View – Full"
    - Click OK in the Advance Properties Dialog box
    - In the "Select destination file" dialog box, select the ASDETPROTO-ANSI-D.dwg prototype and click OK
    - Select the first corner of the detail window (lower left hand corner)
    - Select the second corner of the detail window (upper right corner)
  - Open the detail from the Document Manager (2.dwg)



- **Create Bill of Materials (BOM)**
  - Within the Model, expand the “Templates” palette
    - If this palette is not shown, open it via the Output Tab > Documents > Bom Templates



  - Under “Assembly List” select “Assembly with parts reference”
  - In the “BOM” dialog box, select “Save”
  - In the “BOM” dialog box, select “Export”
    - In the “Report Export” dialog box, change the “Export Format” to “Microsoft Excel Worksheet (XLS)” and click OK



- **Helpful Links**
  - [Advance Steel Help]
  - [Autodesk Knowledge Network: Autodesk Advance Steel]
  - [Autodesk Forums: Autodesk Advance Steel]