AUTODESK UNIVERSITY

CES501402

Building Custom Bridge Components....for Idiots

Andrew Manze
Autodesk

Learning Objectives

- Discover the methods available for creating custom bridge components for the InfraWorks-centered workflow.
- Learn how to create custom bridge components using Inventor.
- Learn how to create custom bridge components using Revit.
  Learn about the workflow required to implement and modify the created components for use.

Description

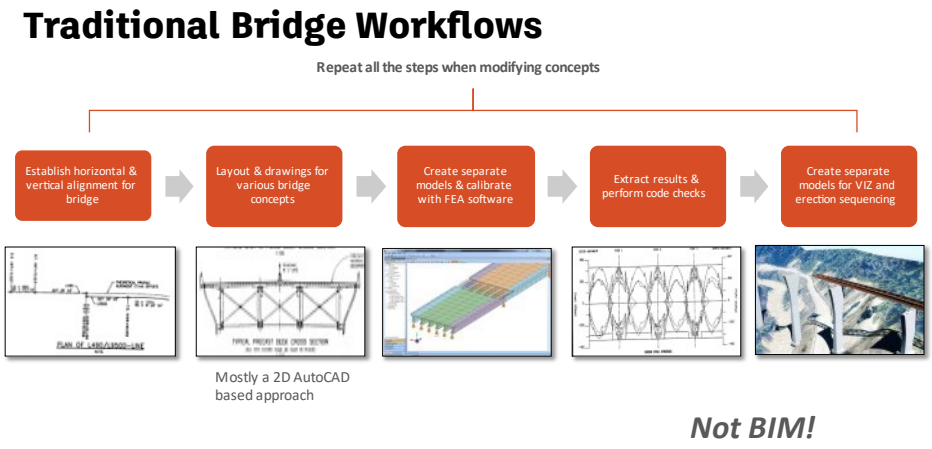
Learn how to start building custom bridge components using both Inventor software and Revit software for use in InfraWorks software. We'll briefly examine the InfraWorks-centered bridge workflow and identify where custom components can be beneficial. We'll work up two specific examples using both of the available methods and covering the benefits of each. Then we'll use those newly created components in InfraWorks and see how they can be manipulated to a final state within the bridge itself ready for the workflow to continue.

Speaker(s)

Andrew Manze has worked in the civil and structural engineering industry for over 30 years, functioning both in industry and in the specialist construction software sector. Over the years Andrew has specialized in unusual and novel international projects in various disciplines and now supports the drive for excellence in Infrastructure at Autodesk.

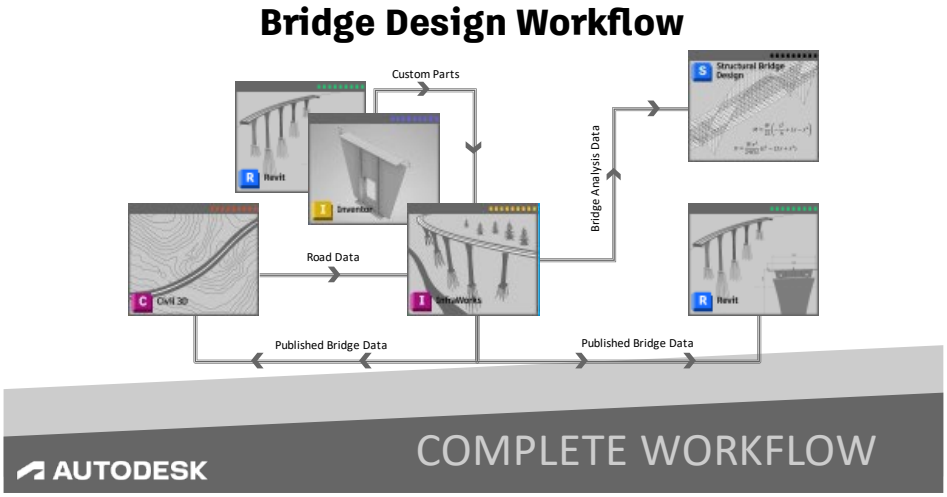
The 'InfraWorks-Centric' Bridge Workflow

The InfraWorks centric workflow is a reimagined bridge workflow built to address the shortcomings of traditional civil structures workflows.



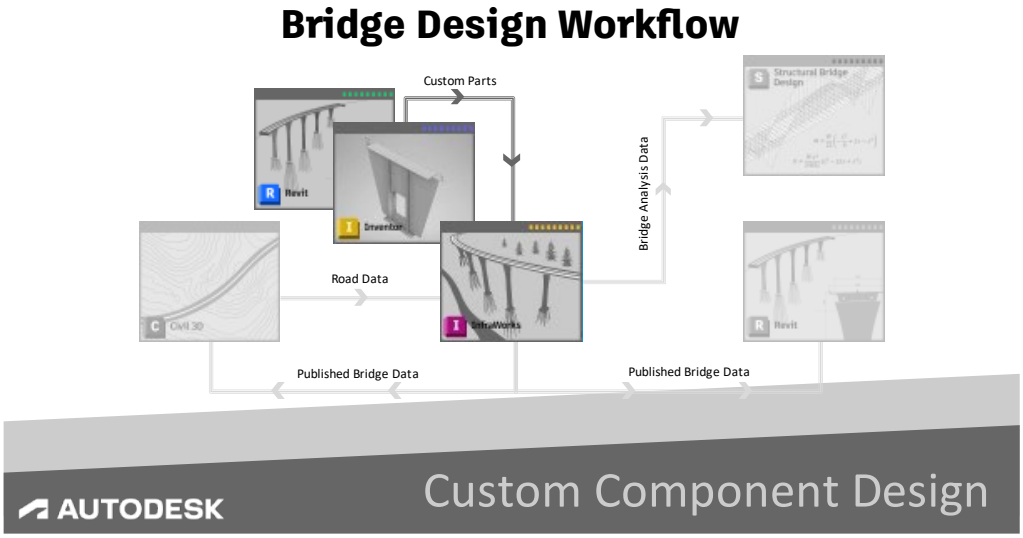
The solution overview of our civil structures workflow looks like this.

- We leverage Inventor to build custom, parametrically controlled components to be used and re-used in your InfraWorks library of bridge parts
- Within InfraWorks you will dynamically design and model in full context of the surroundings and other project constraints.
- Structural Bridge Design provides analytics and validation of your bridge design and,
- Ultimately we finish in Revit to capitalize on free form rebar placement and construction documentation and detailing.



Methods for creating custom content

The custom content stage of the process sits behind InfraWorks and would available at any time during the modelling process.



The two methods are similar in that the new parts are utilized by InfraWorks in the same way. The difference is how the parts are created in the first place…..either in **Inventor** or **Revit**. Regardless of which method is used the end result in InfraWorks will be the same.

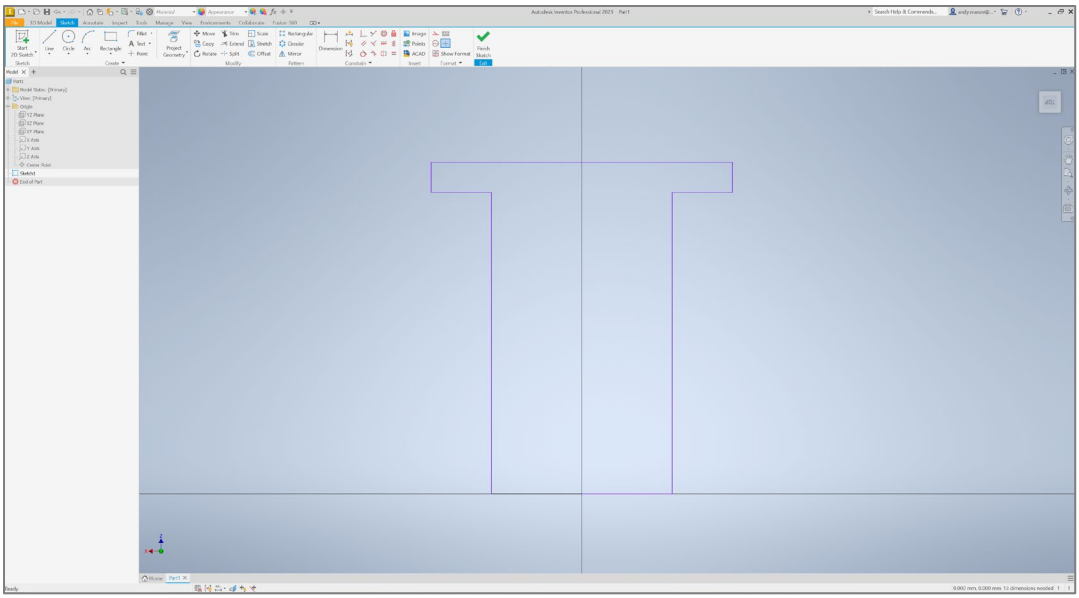
Each part once created is added to the InfraWorks library using the 'Style Palette'. From this point the custom parts will act as native InfraWorks bridge parts.

Method 1 - Inventor

The Inventor method requires 4 basic stages. The creation of sketches within a 2D reference plane or orientation, parametric dimensioning, constraining the sketch elements and finally the extrusion(s). Firstly start Inventor and select a metric or imperial template.

Sketches

For this example, we will create a single sketch setout from the origin. Using the 'Line' tool we just trace the outline of the elevation of the pier in the 2D X-Z plane.

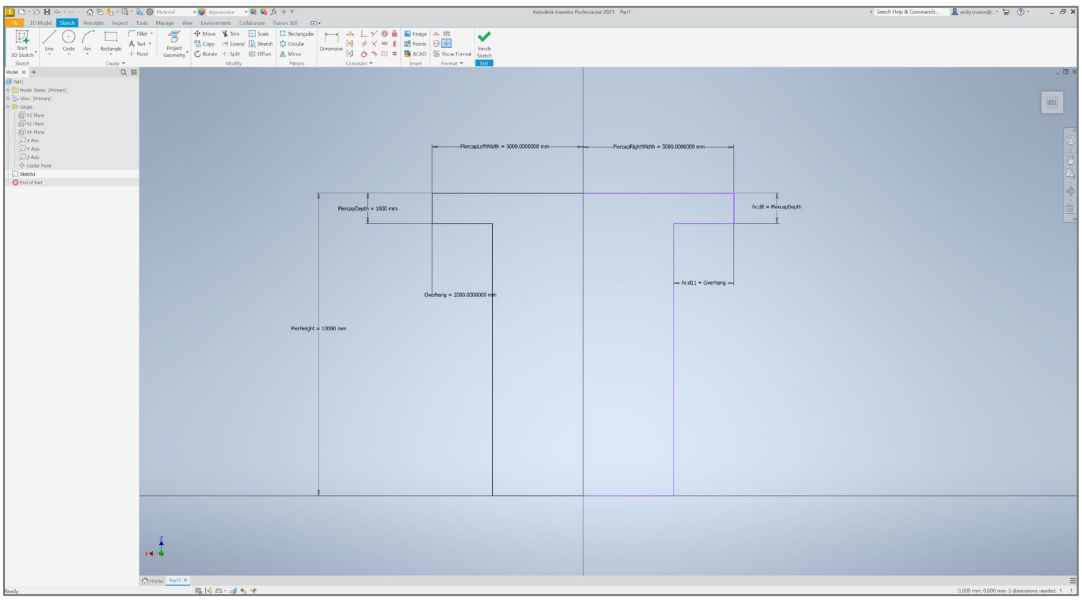


Parametric Dimensioning

Once the outline is in place we can then start dimensioning the shape with the required and user parameters.

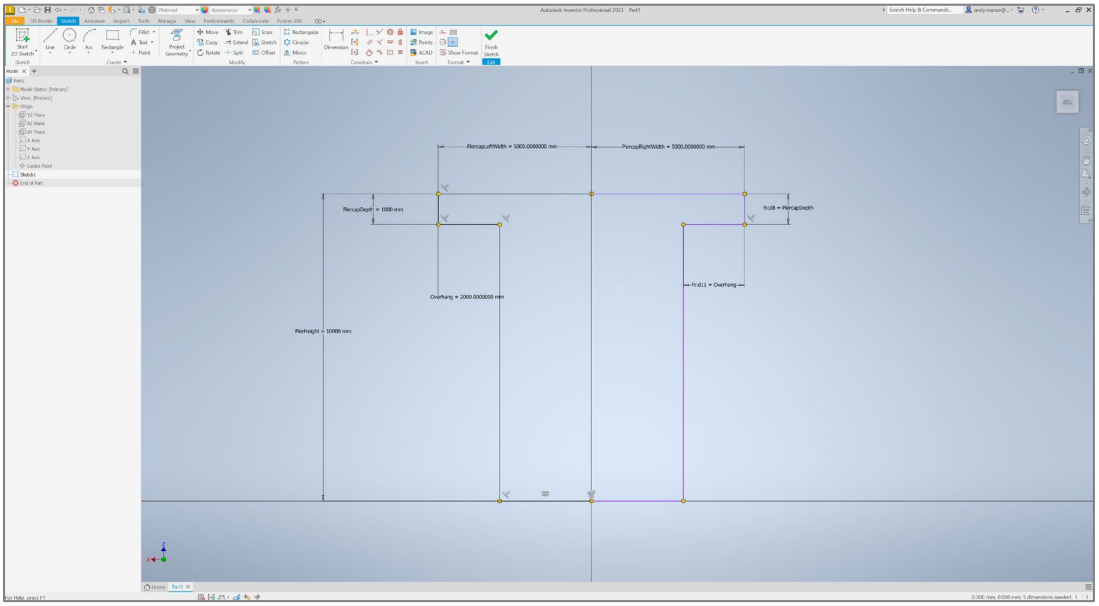
We MUST include the ‘required parameters’ which for our pier are;

PierHeight
PiercapLeftWidth
PiercapRightWidth



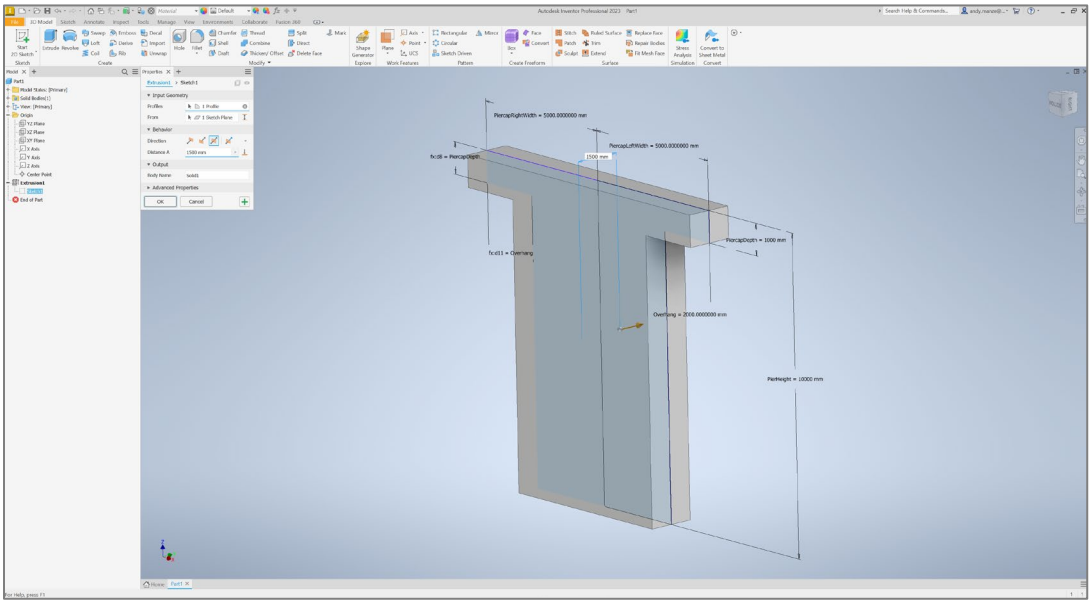
Constraints

We then need to ‘flex’ the model by changing some of the parameter values and see how the model behaves. It may be necessary to add ‘constraints’ to reinforce some of the required behaviour.



Extrusions

Once the shape is performing correctly we can then create the extrusion which creates the full pier geometry.



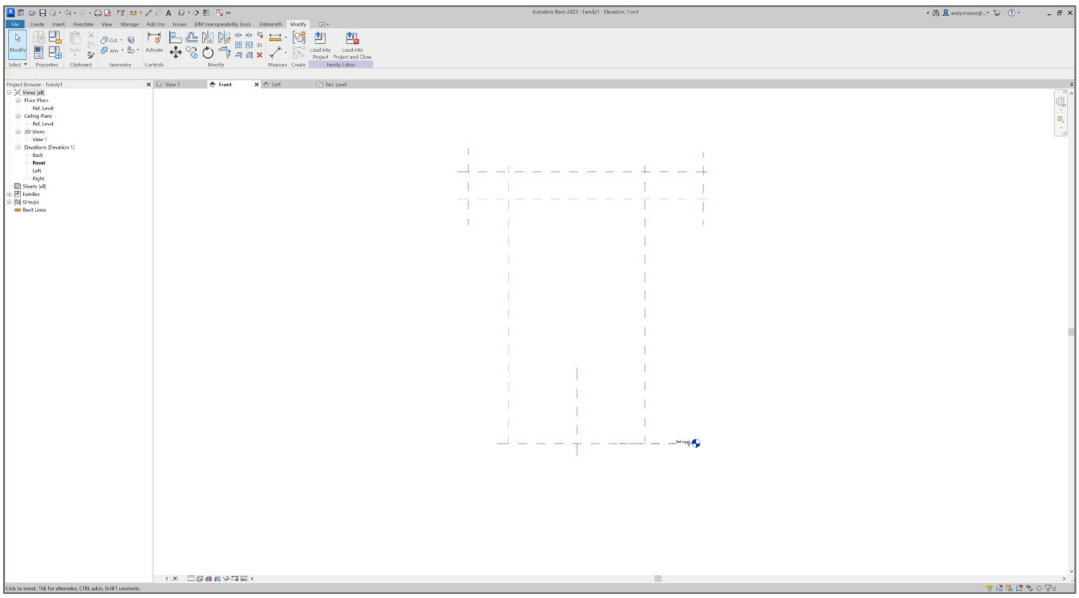
We can then just save the pier ready for use in InfraWorks.

Method 2 - Revit

The Revit method requires a completely different approach. We will create a series of reference planes, dimention those reference planes, create and extrusion and then lock the extrusion geometry to the reference planes. First start Revit and select new family, choose a generic model template.

Reference Planes

Starting with the Front View, we will setout a number of reference planes to define the geometry.

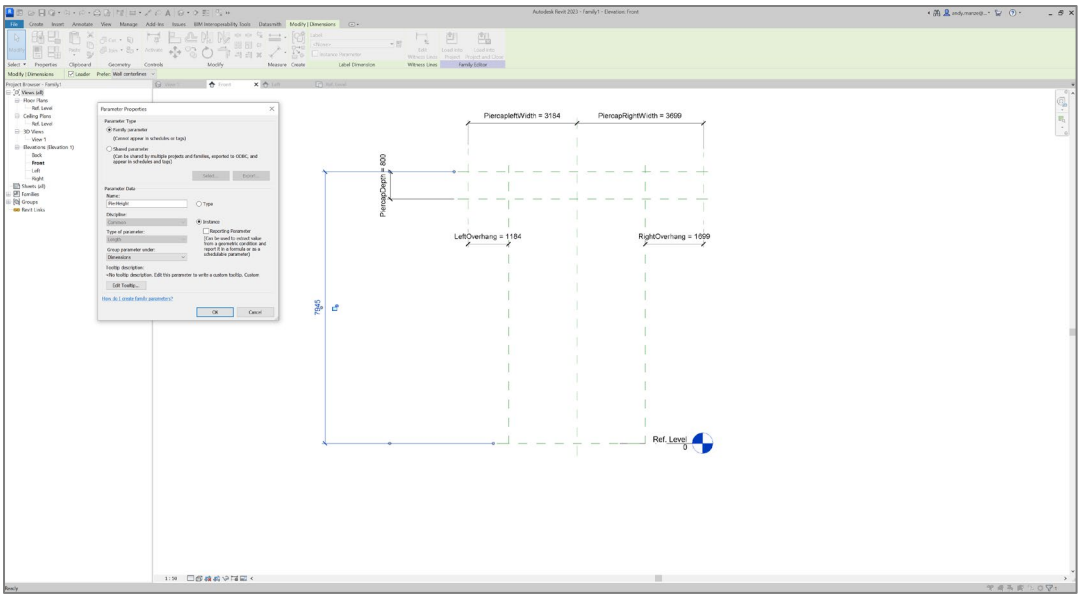


Dimensioning

Once the reference planes are in place we can the start dimensioning them using required parameters again..

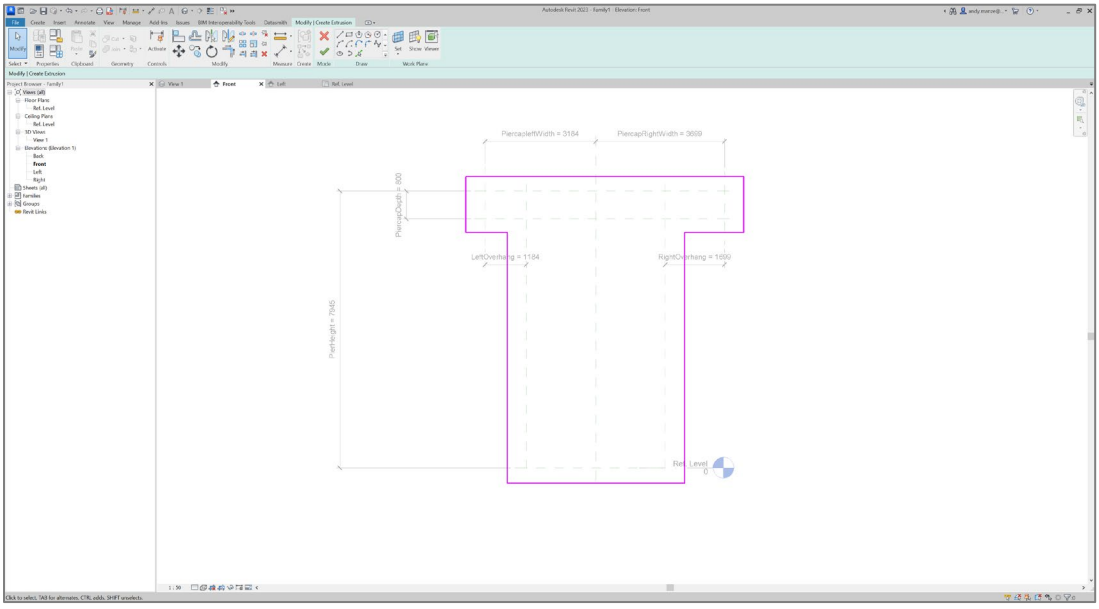
We MUST include the ‘required parameters’ which for our pier are;

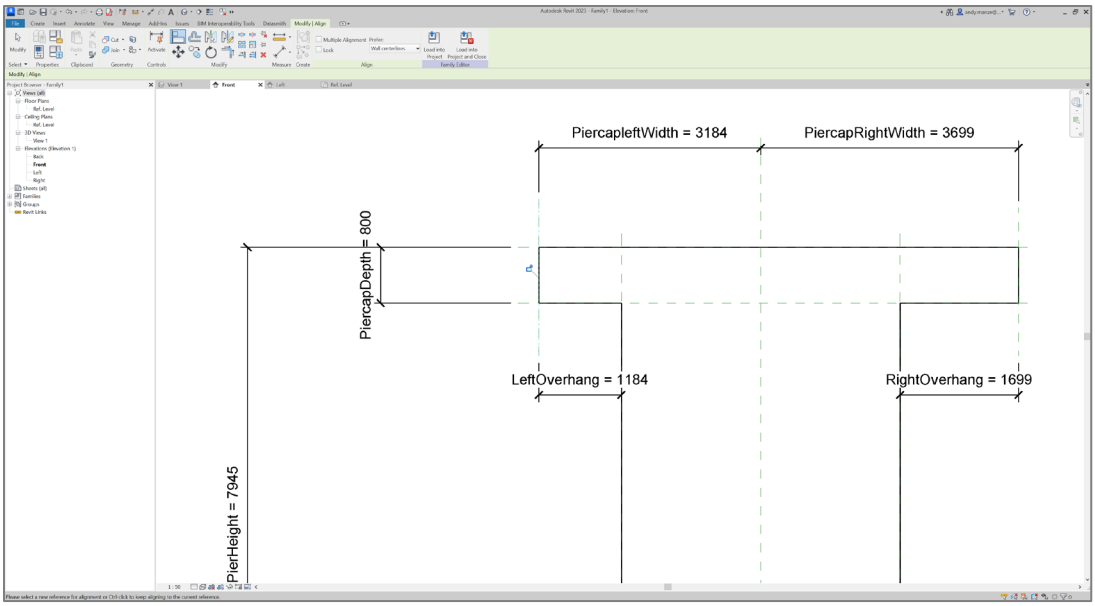
PierHeight
PiercapLeftWidth
PiercapRightWidth



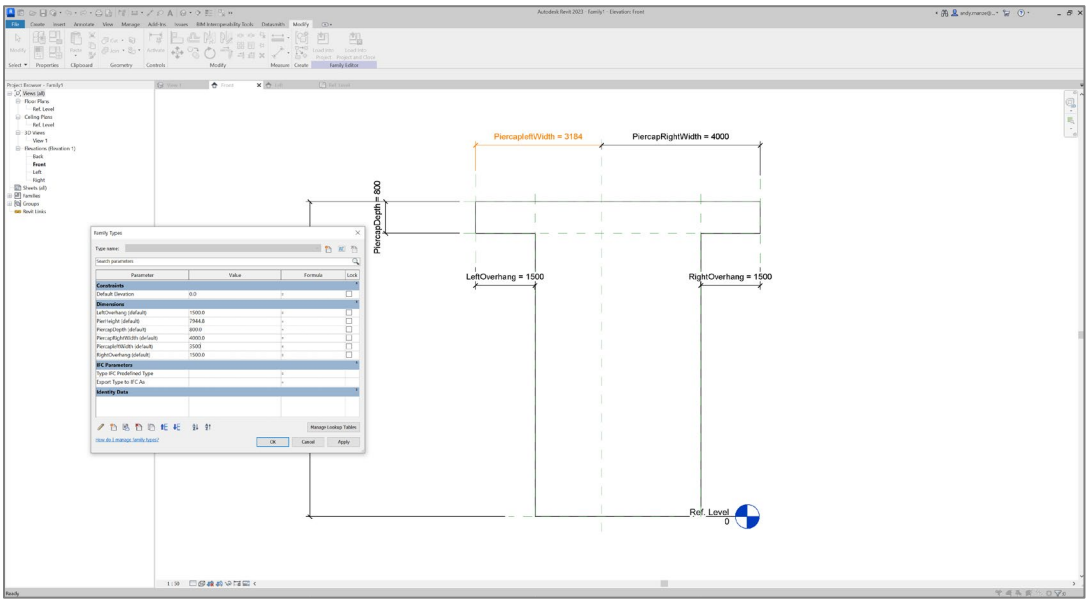
Extrusions

The extrusion can be defined by tracing a line to form the geometry profile and then aligned and locked to each face.

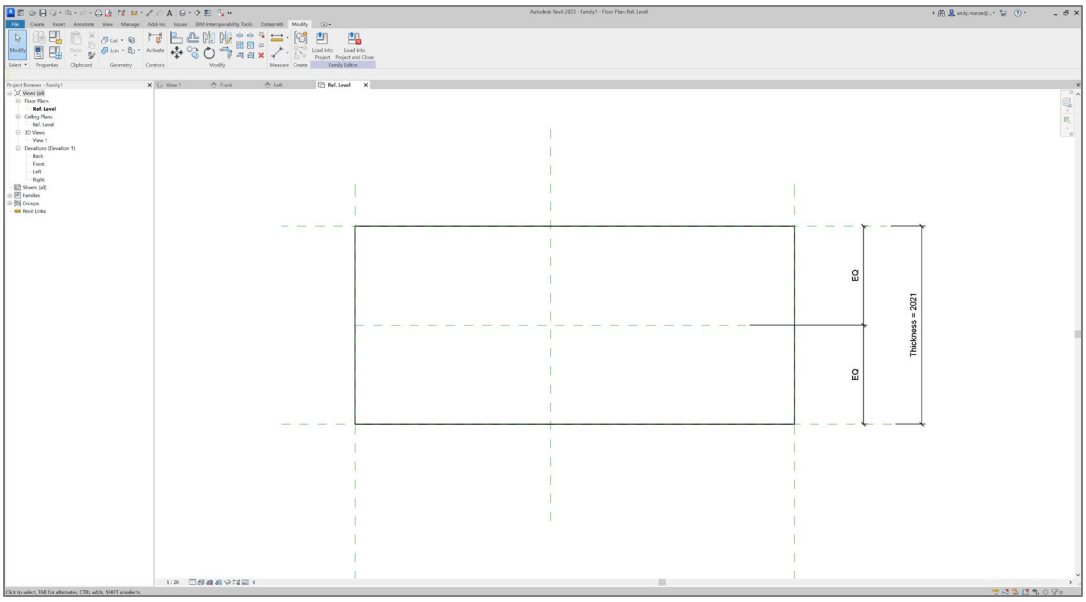




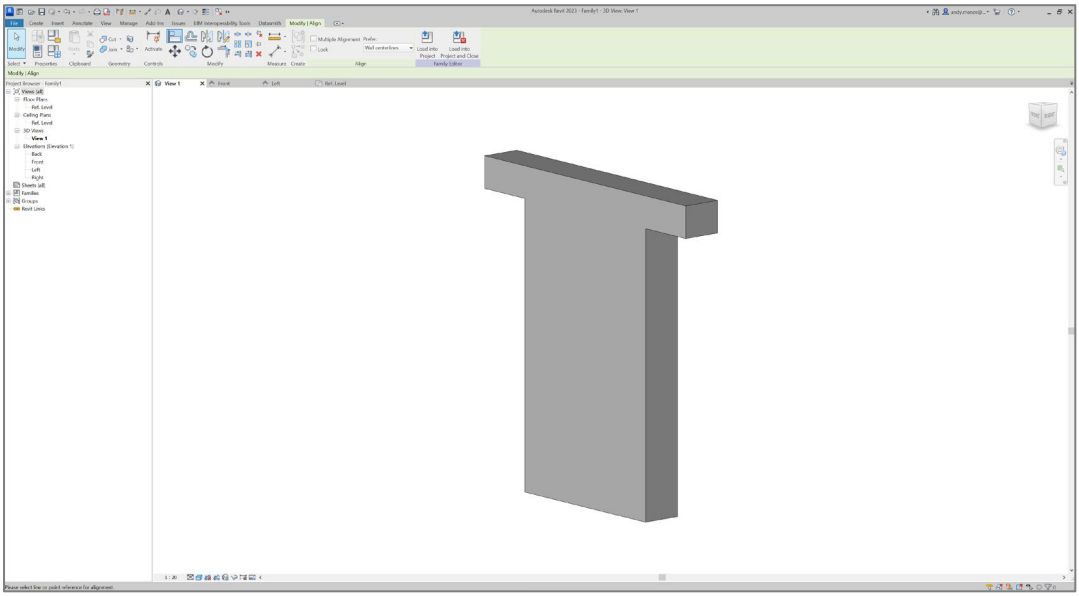
Flex the geometry to check progress



We can then switch to the reference level to repeat the above steps to define the thickness of the pier.



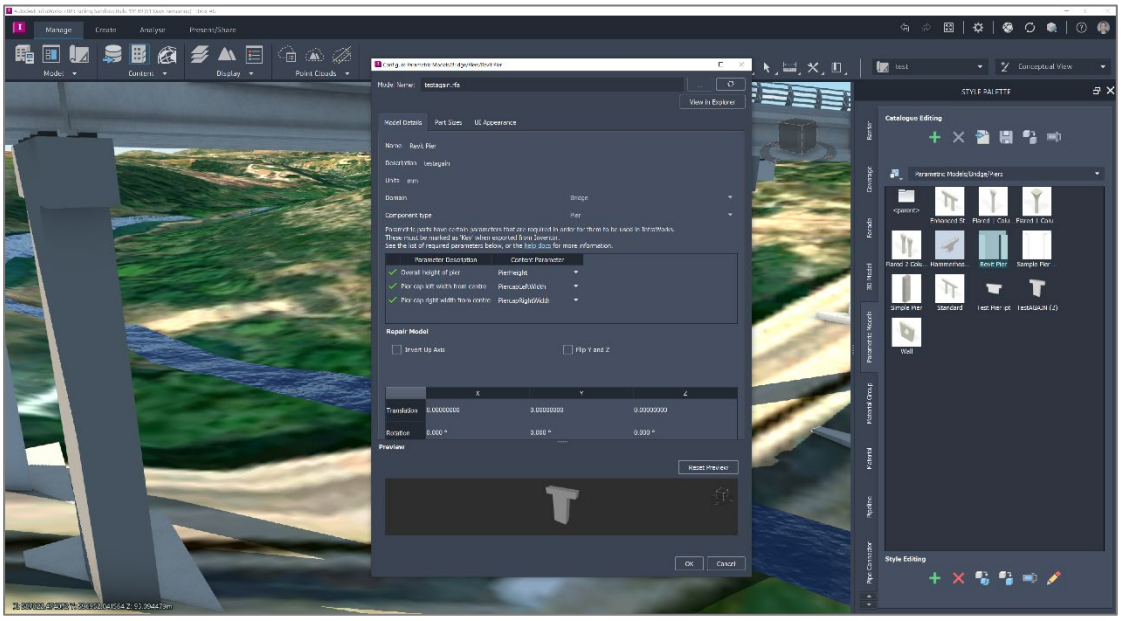
The completed pier can the be viewed in the 3D view.



Use of the custom components

The custom components that have been created can be added to the InfraWorks using the style palette in a similar way for BOTH types.

In InfraWorks open the style palette and navigate to the ‘parametric models’ tab.



The existing pier can then be selected and changed to the newly created component and configured in the panel to suit.