

Generative Component – Integral Abutment

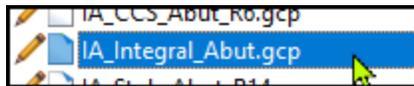
Note, the following guidance may change as technology developments occur with the CADD modeling software and its use affecting workflows for project development.

These instructions are used when an OpenBridge Modeler file is opened with the Generative Component (GC) “Computational Design” Workflow enabled. **See the additional document, “[General Guidance for Generative Components in OBM](#)”** outlining this process.

In **OpenBridge Modeler workflow**, select the **Utilities tab**, select **Import GCP File** in the **GC group**.

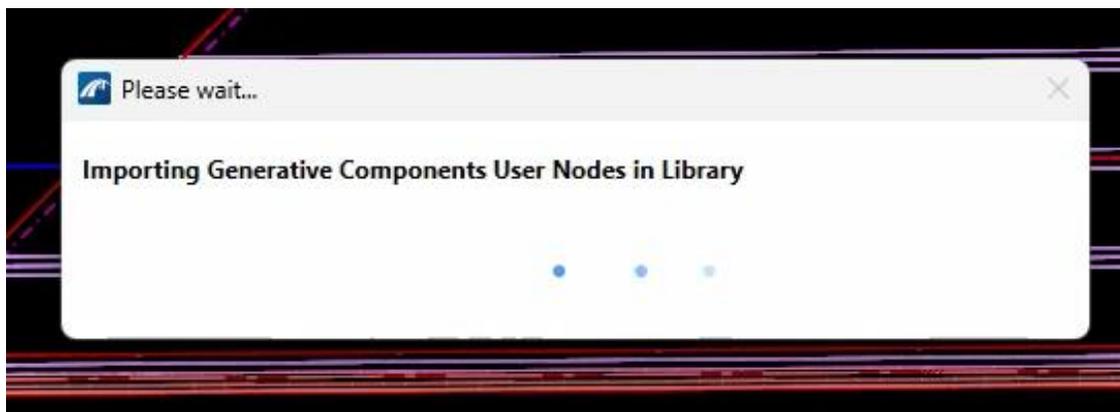


Locate the **IA_Integral_Abut.gcp** file to work with the **IA_BT_Integral** abutment.

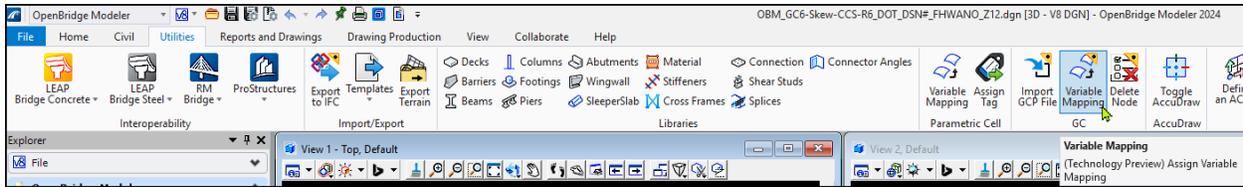


The **IA_Integral_Abut.gcp** file is located on ProjectWise in the following area
pw:\\NTPwint1.dot.int.lan:PWMain\Documents\Resources\ClientWorkspaces\lowaDOT\lowaDOTProduction\Organization-Civil\lowaDOT_Standards\Bridge Templates\GC\IA_Integral_Abut.gcp

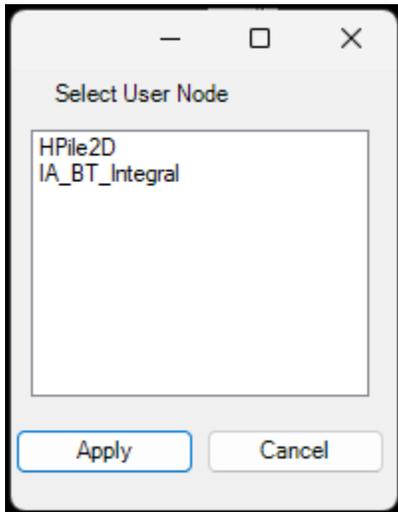
The following dialog box will appear.



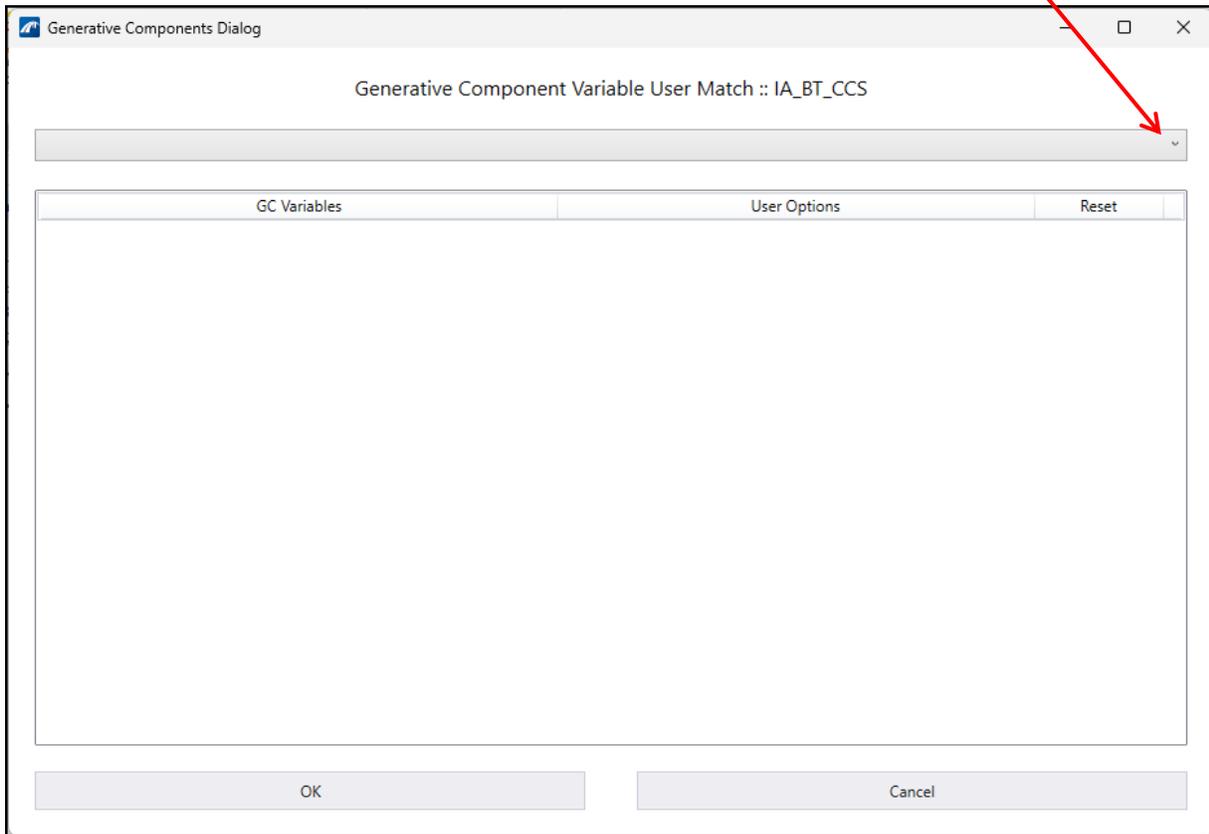
In **OpenBridge Modeler workflow**, select the **Utilities tab**, select **Variable Mapping** in the **GC group**.



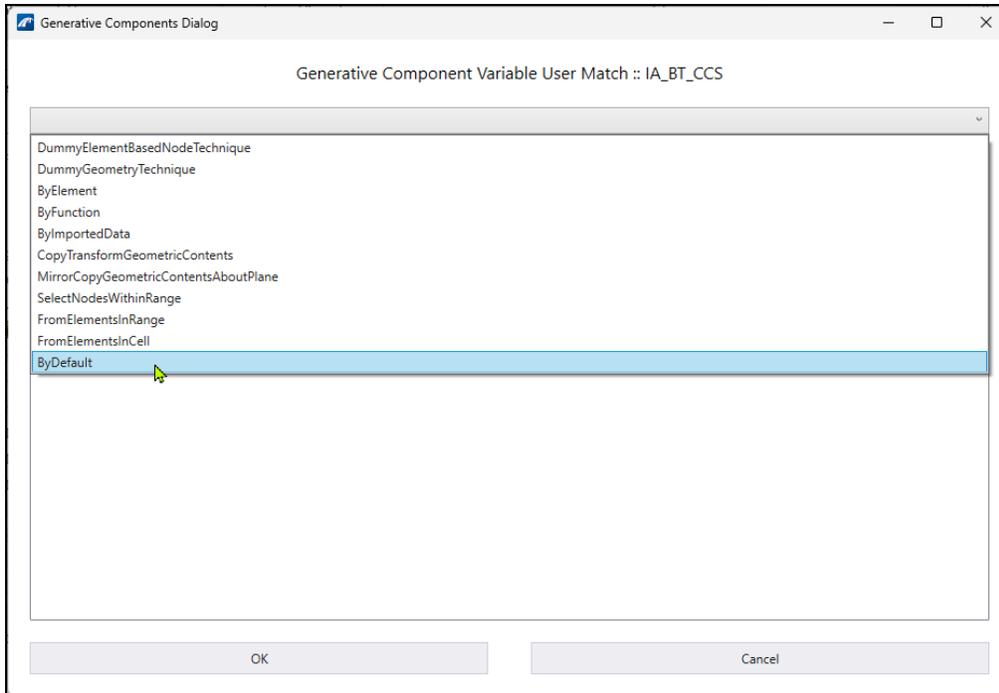
Select **IA_BT_Integral** and “Apply”. Even though the name has “BT” in it, this abutment can be used for BT (Bulb Tee beam) and non-BT beam bridges.



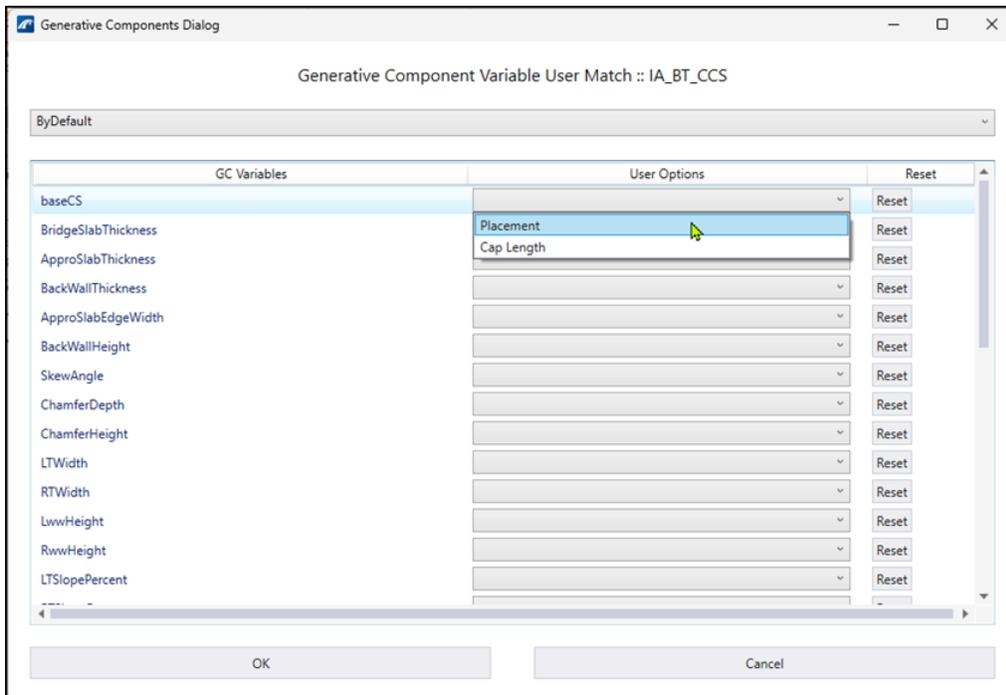
The following dialog box will appear. Select the pull-down arrow in the top gray bar that appears empty, shown below. (The example image is showing IA_BT_CCS, but the pull-down selection is the same for all GC abutments).



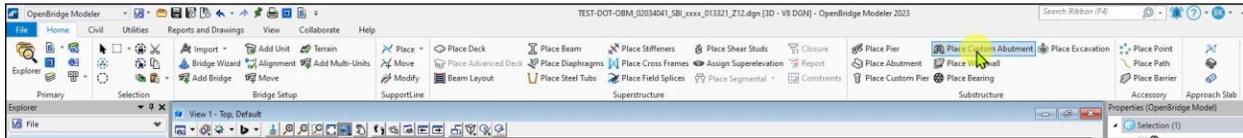
Select **ByDefault**. (The example image is showing IA_BT_CCS, but the pull-down selection is the same for all GC abutments).



From the GC Variables column choose “**baseCS**” and under the User Options column select “**Placement**”. Then select “OK”. (The example image is showing IA_BT_CCS, but the pull-down selection is the same for all GC abutments).

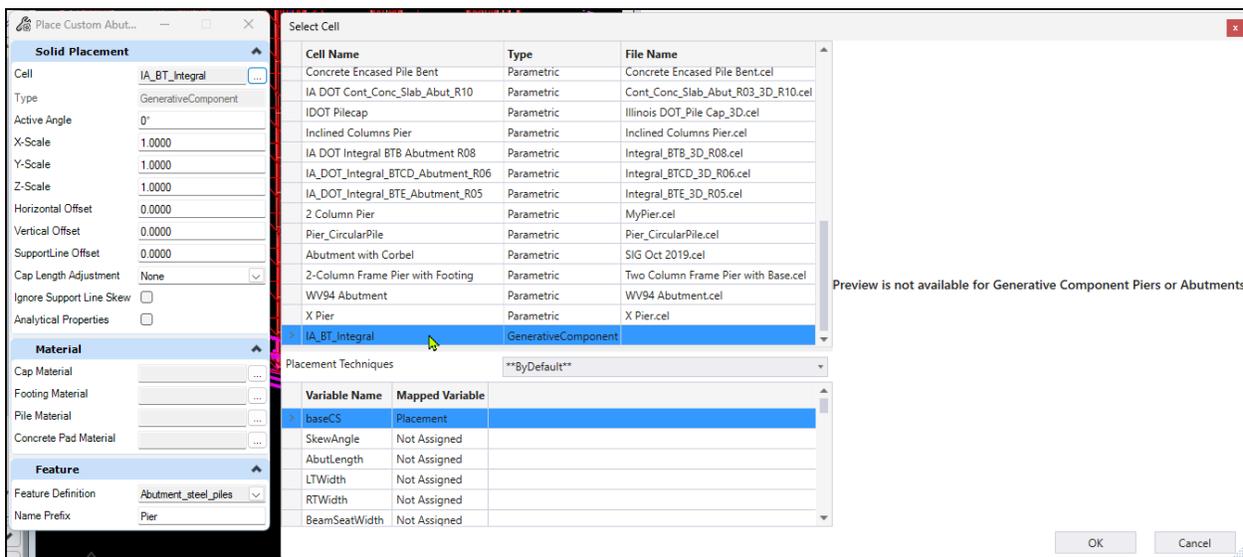


In the ribbon under the **OpenBridge Modeler workflow**, under the **Home tab**, select **Place Custom Abutment**.

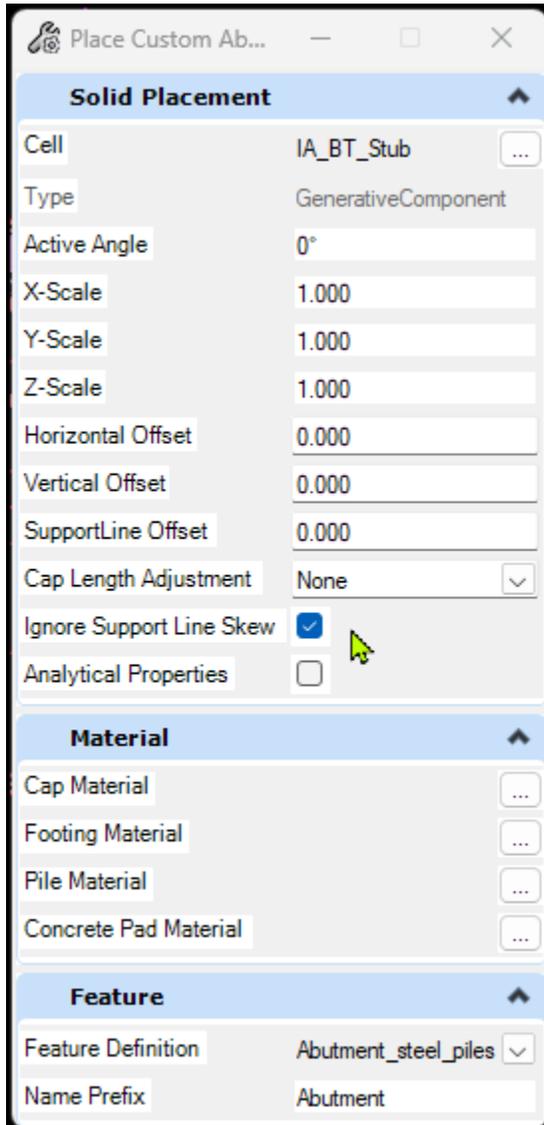


Place Custom Abutment **IA_BT_Integral**.

Note, in the image below the “Cell Type” is “GenerativeComponent” and “Preview is not available for Generative Component Piers or Abutments”. Parametric cell types typically will provide a preview of the cell.



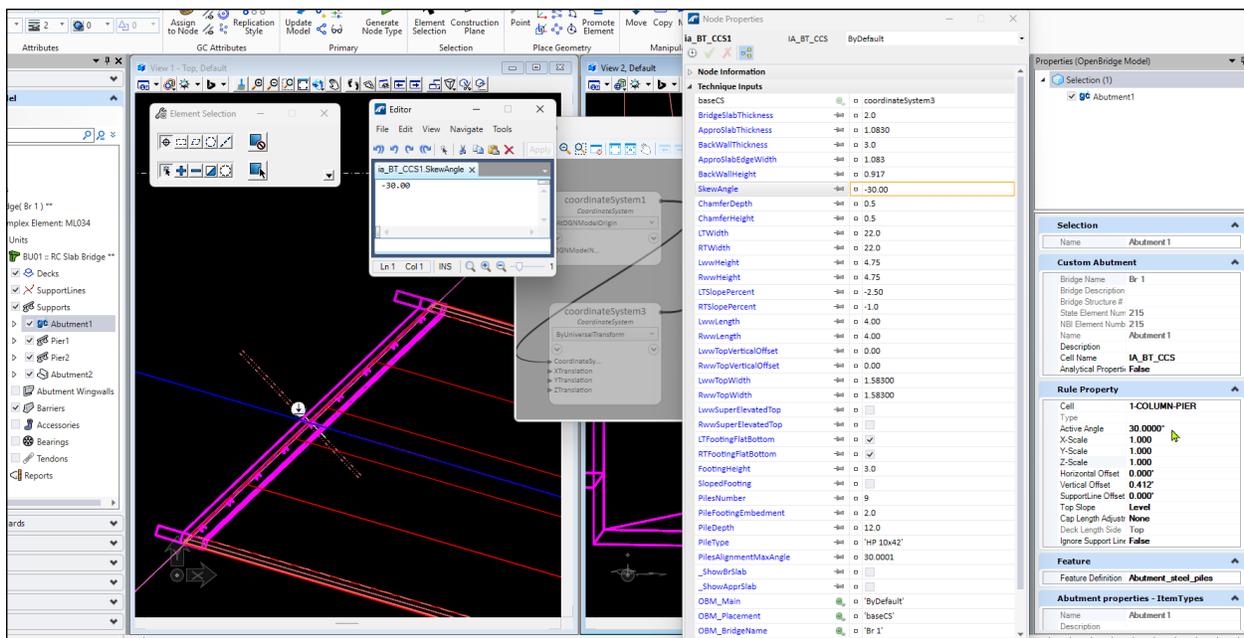
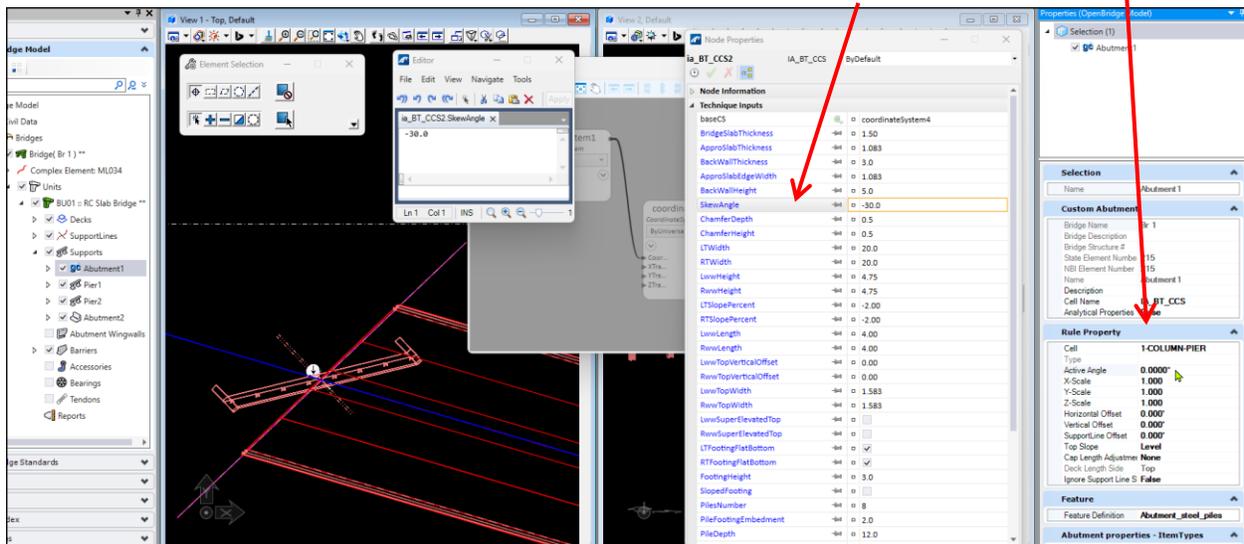
Select the “Support Line” to place the GC abutment on. Set “**Ignore Support Line Skew**” - checked **On**. For the near abutment (down station) the Active Angle is set at zero (0). For the opposite far abutment (up station), the Active Angle is set to 180. The GC abutment skews are applied in the Technique Inputs of the Node Properties. If failing to set this upon placement, the Active Angle may also be changed after the abutment is placed, by selecting the abutment and in the **Properties** under **Rule Property**. (The example image is showing IA_BT_Stub).



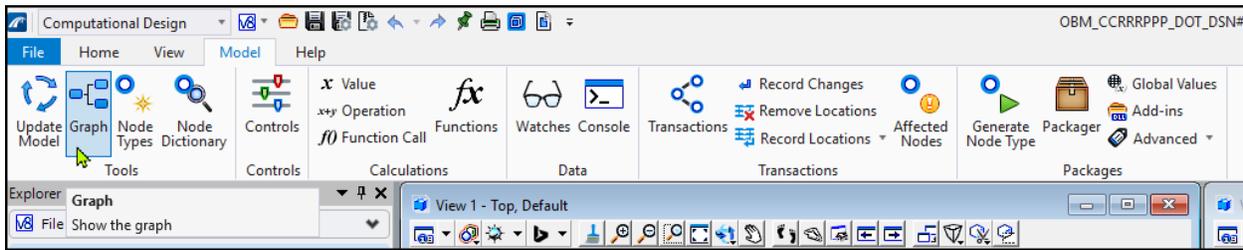
If not setting **"Ignore Support Line Skew"** as checked **On** when placing the custom abutment, the skew may need to be set in two locations, the **Rule Property** and the individual Skew variable in the **Node Properties** of the GC "Technique Inputs". The image below is showing the variables to change for a skewed GC abutment, **Rule Property "Active Angle"** and possibly "Vertical Offset".

The **Rule Property "Vertical Offset"** may need to be changed depending on beam bearing and seat adjustments made during the modelling process in the OBM file.

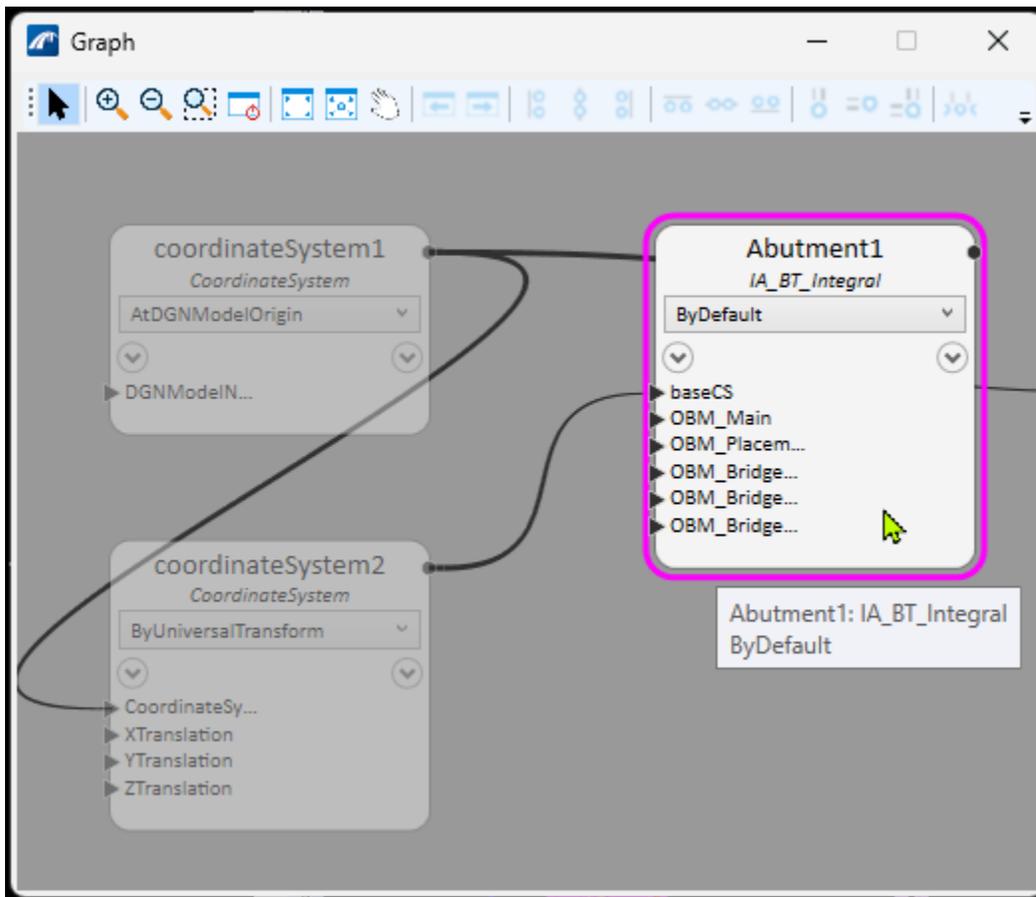
(The example images below are showing the name of the CCS GC Stub Abutment.)



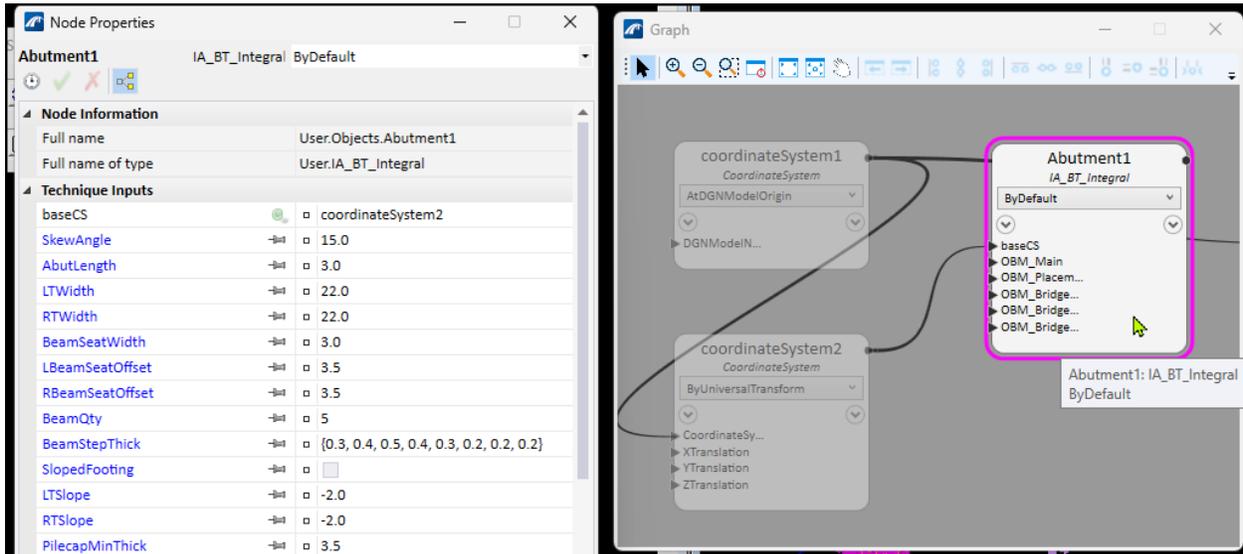
Once the GC custom abutment is placed, in the ribbon change the workflow to **Computational Design** and under the **Model tab**, select **Graph**. Selecting “Graph” will enable the process of editing of the GC abutment geometry. These tools are also located under the **Home tab**.



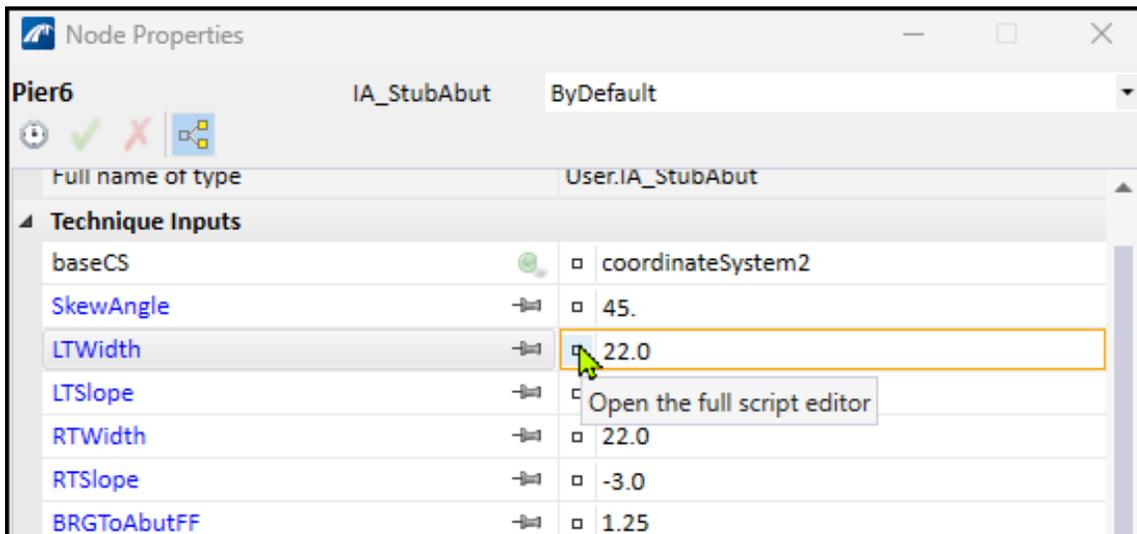
The Graph dialog box will appear, the “Abutment1” box (in this example it was auto-labeled “Abutment1” *IA_BT_Integral* in the OBM model). Double-clicking the selected “Abutment1” graph dialog box will open the Node Properties dialog to enable the process of editing of the GC abutment geometry.



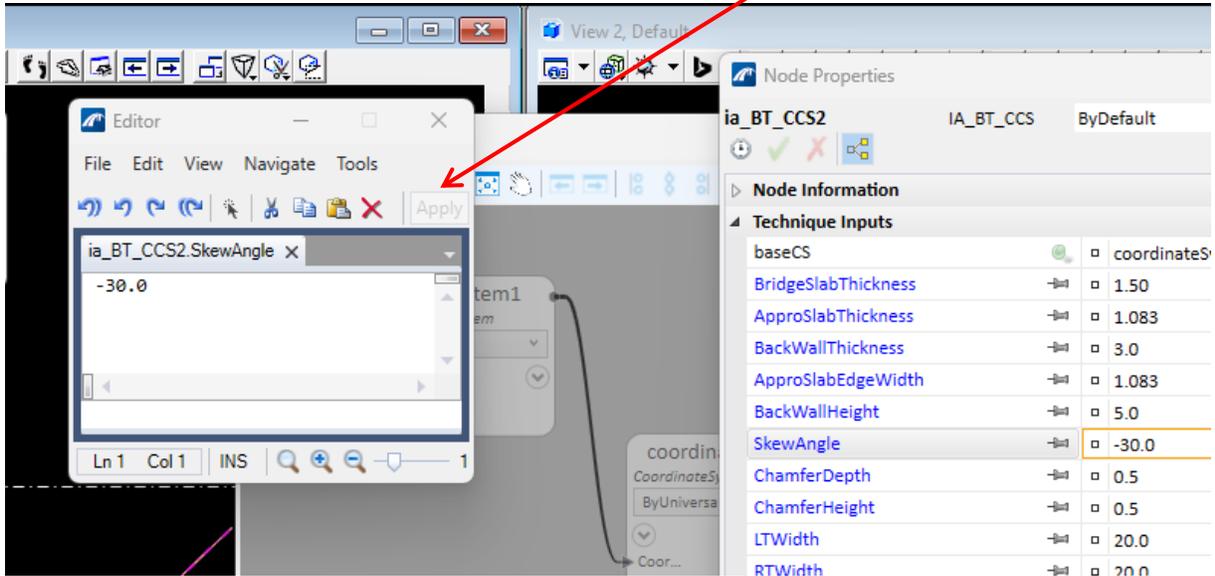
By double-clicking the “Abutment1” Graph box, *IA_BT_Integral*, this will open the Node Properties dialog box.



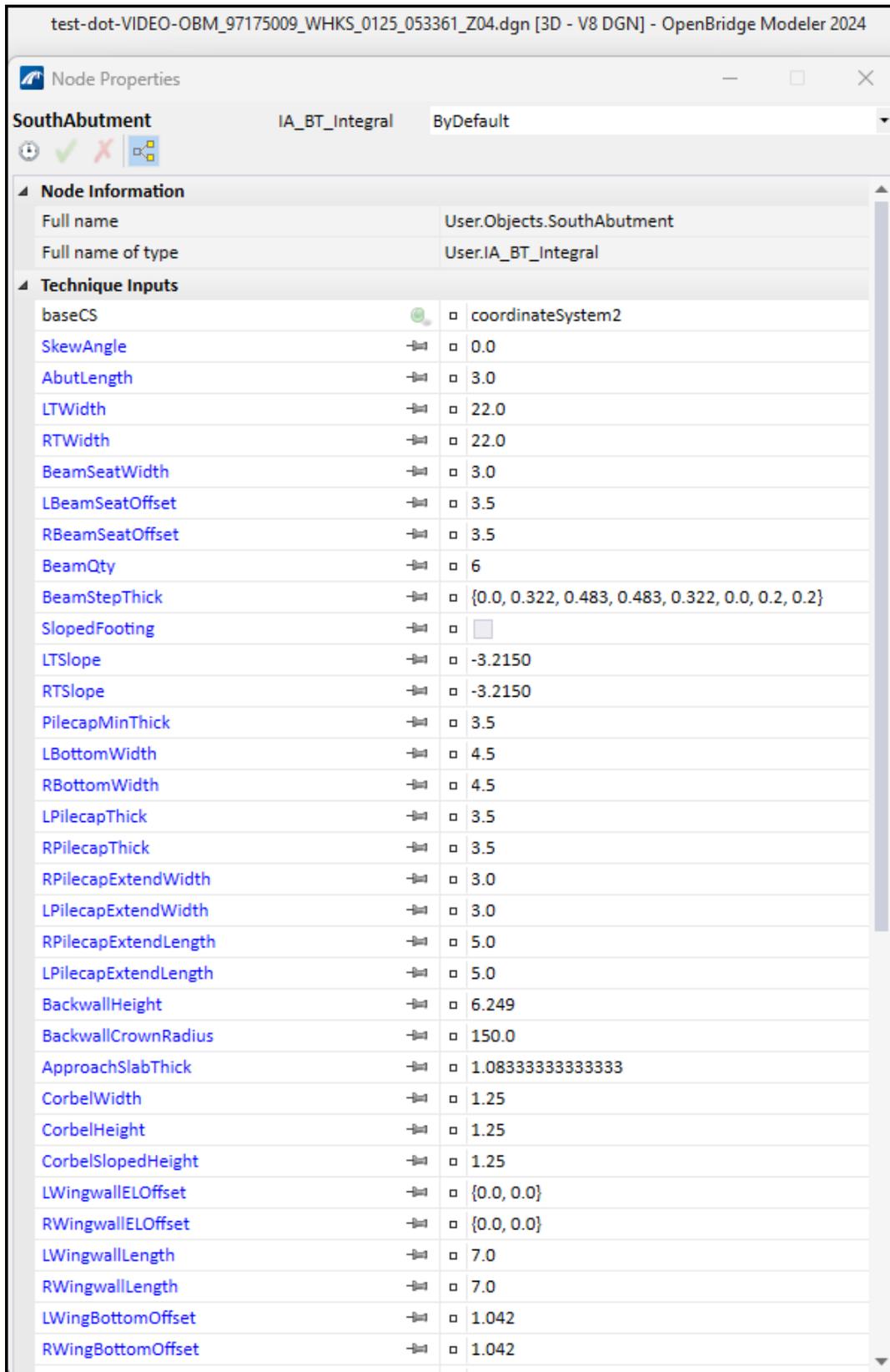
The adjustments of the GC abutment geometry will be made through editing the Technique Inputs in the Node Properties. Edits are done one at a time by either selecting the “box □” to open the full script “Editor” or by selecting the values in each line to directly edit them. It is recommended to use the box □ selection to edit the Inputs, especially for Inputs with multiple values. Opening the full script “Editor” may be more convenient to make edits and prevent any inadvertent entries by providing a preview of what is keyed-in to ensure the proper value is set before “Apply” is selected.



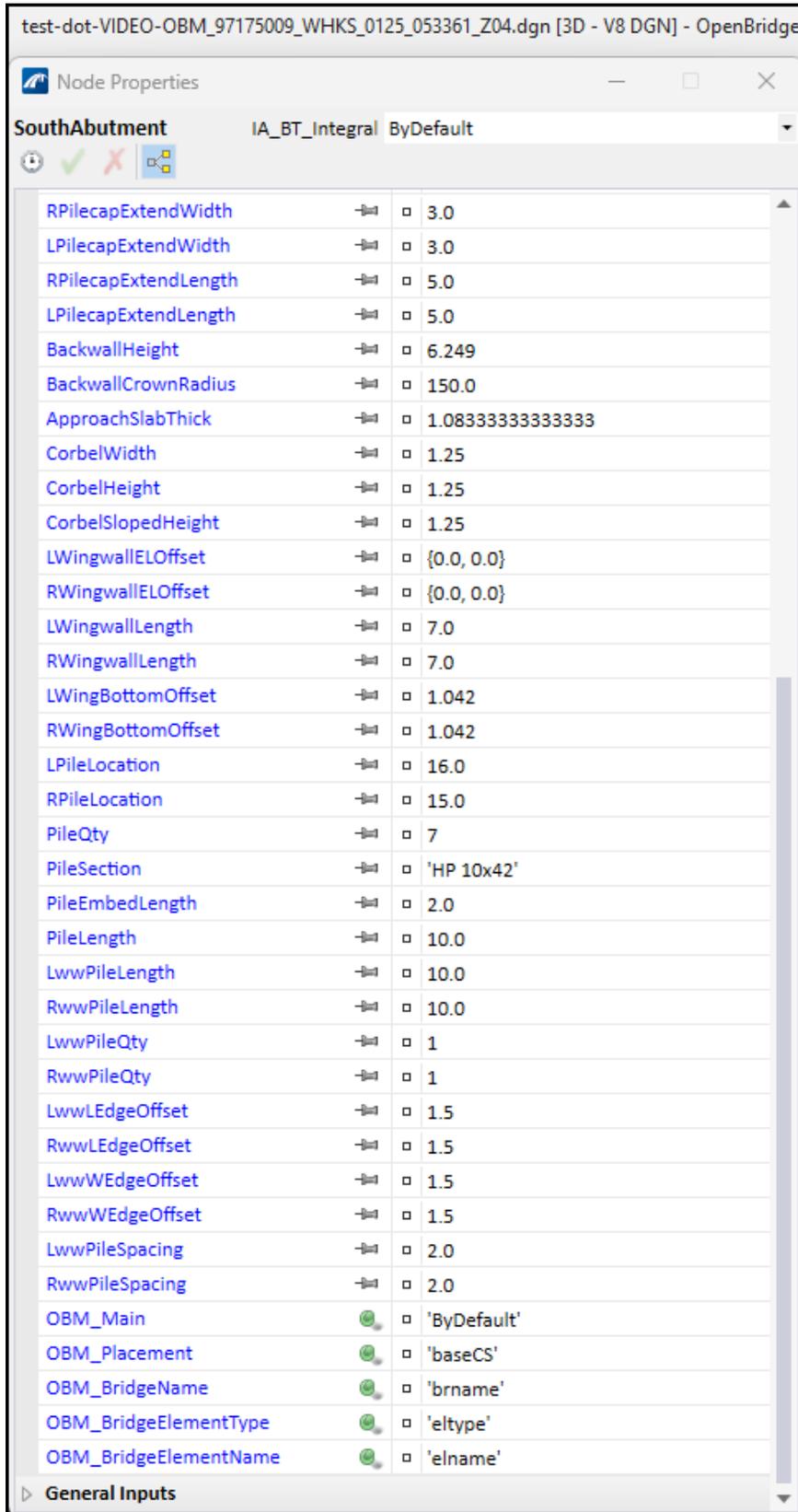
The example image below is showing the full script “Editor” that is used when the box is selected for changes to Technique Input values. Using the full script “Editor” may be more convenient to make edits and prevent any inadvertent entries. Once the value is entered the “Apply” button will become active, select “Apply” to accept the entered values.



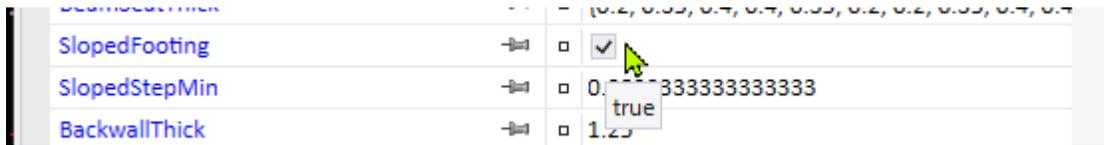
The image below shows a partial list of the “Technique Inputs” available.



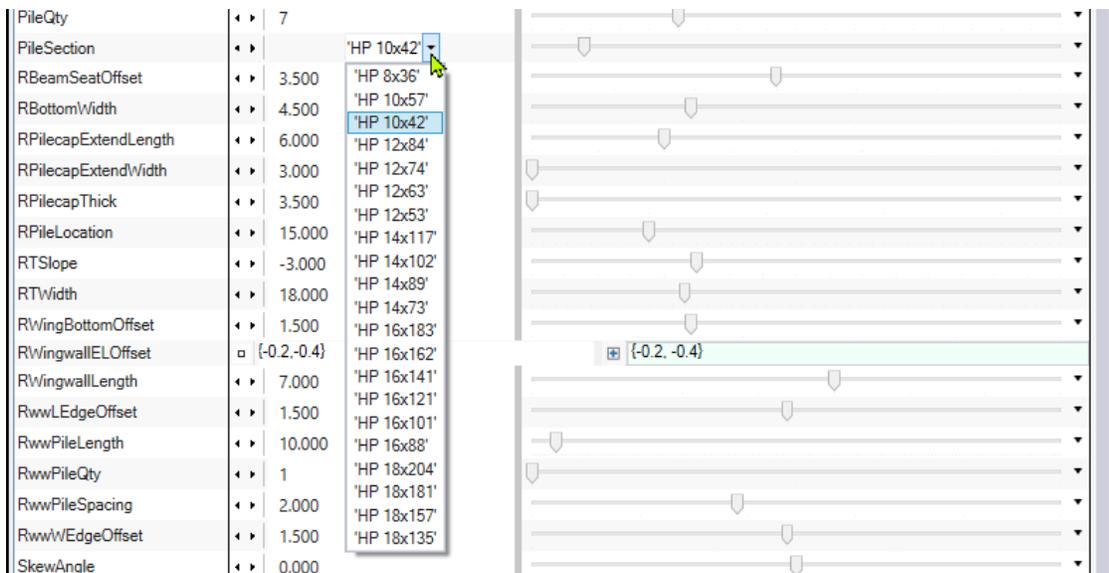
The image below shows a continuation of the partial list of the “Technique Inputs” available.



Checking the box of the **SlopedFooting** “On (true)” will enable the abutment to be used for a superelevation design. The **LTSlope** and **RTSlope** inputs will behave accordingly.

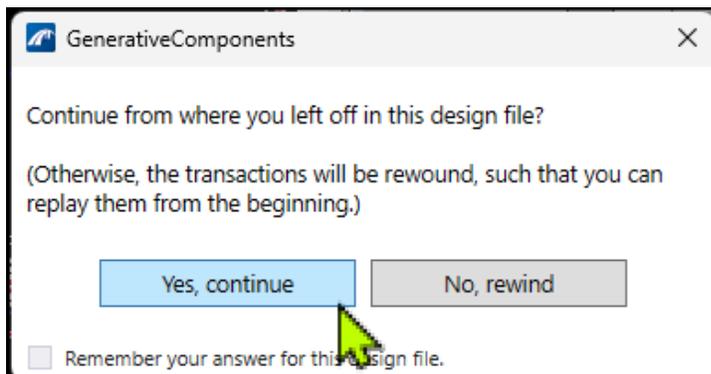


The image below is shown for information only; this example shows the list of **PileSection** sizes for entering in Technique Inputs in the Node Properties. This pull-down list is only visible in the GC cell file itself where the development of the abutment shape is done. The pull-down list is not available when the GC is placed in OBM with the .gcp file. The required pile sizes need keyed-in as listed in the **PileSection** node shown in this document.



When done with edits to the GC abutment and bridge model, “Exit” and “Check In” the OBM file as would be done normally.

When reopening an OBM file with an existing GC abutment that is already placed in the model, the following dialog box will appear. **Select “Yes, continue”.**



List of the Technique Inputs in the Node Properties are as follows; most are showing the Minimum and Maximum values. These are the inputs that are edited after the GC is placed in the OBM file.

The terms left and right are based off the perspective of viewing the abutment from the back-face of back wall elevation orientation. The Node Properties below are listed in the same sequence as they are displayed in the Node Properties dialog entry in OBM, this is not alphabetical.

**_ Note, for bridges using A, B & BTB beams, the abutments do not have wing extensions. This variable will be set at zero (0) to not show a wing extension. Some variables will become irrelevant.*

SkewAngle = Angle of skew along centerline of abutment. A positive value is Left Ahead, a negative value is Right Ahead (*min. value= -45, max. value=45*).

AbutLength = (abutment footing width) Abutment footing length is horizontal distance from front to back faces (*min. value= 1, max. value=5*).

LTWidth = Left Lane Width from centerline (crown) of bridge slab to left gutter line (*min. value=0, max. value=36*).

RTWidth = Right Lane Width from centerline (crown) of bridge slab to right gutter line (*min. value=0, max. value=36*).

BeamSeatWidth = Beam seat/step width is horizontal distance left and right from centerline beam. For Bulb Tee (BTB, BTC, BTD, BTE) beams set at 3.500. For A & B beams set at 2.500. For C & D beams set at 2.833. (*min. value=1, max. value=5*).

LBeamSeatOffset = Horizontal distance of left outer beam seat/step centerline to inside vertical face of abutment wingwall. For typical Bulb Tee (BTB, BTC, BTD, BTE) beam design set at 1.917. For typical A, B, C, D beam design set at 1.500. (*min. value=0.5, max. value=7*).

RBeamSeatOffset = Horizontal distance of right outer beam seat/step centerline to inside vertical face of abutment wingwall. For typical Bulb Tee (BTB, BTC, BTD, BTE) beam design set at 1.917. For typical A, B, C, D beam design set at 1.500. (*min. value=0.5, max. value=7*).

BeamQty = Number of beams (*min. value=3, max. value=15*).

BeamStepThick = Height of beam steps/seats, change these per design, the quantity of beams will determine what values are used/read from left to right in the list. The individual beam step thickness value is based from the top of abutment footing, zero step or low step. (*default values = 0.3, 0.4, 0.5, 0.4, 0.3, 0.2, 0.2, 0.2*).

SlopedFooting = (Unchecked = false, Checked On = true) When Checked On (true), this will enable the abutment footing to be sloped. This would be used for a superelevated design. When Unchecked (false), this will maintain a level abutment footing. The slope will be determined by what the most sloped input is set at, based on the LTSlope or RTSlope values.

LTSlope = Left Lane Slope in Percent from centerline (crown) of bridge slab to left gutter line (*min. value=-8, max. value=8*).

RTSlope = Right Lane Slope in Percent from centerline (crown) of bridge slab to right gutter line (*min. value= -8, max. value=8*).

PilecapMinThick = (abutment footing height) Abutment footing thickness is vertical distance from top to bottom (*min. value=3.5, max. value=8*).

LBottomWidth = This only applies when the bottom of abutment footing is sloped. This is the flat (not sloped) horizontal distance of the left-side bottom of footing. (*min. value=3, max. value=8*).

RBottomWidth = This only applies when the bottom of abutment footing is sloped. This is the flat (not sloped) horizontal distance of the right-side bottom of footing. (*min. value=3, max. value=8*).

LPilecapThick = This only applies when the bottom of abutment footing is sloped. Abutment footing wing extension height on left side (*min. value=3.5, max. value=8*).

RPilecapThick = This only applies when the bottom of abutment footing is sloped. Abutment footing wing extension height on right side (*min. value=3.5, max. value=8*).

RPilecapExtendWidth = Right side abutment footing wing extension horizontal width (*min. value=3, max. value=7*).

LPilecapExtendWidth = Left side abutment footing wing extension horizontal width (*min. value=3, max. value=7*).

* **RPilecapExtendLength** = Right side abutment footing wing extension horizontal length (*min. value=4, max. value=12*). *Note, for bridges using A, B & BTB beams, the abutments do not have wing extensions. This variable will be set at zero (0) to not show a wing extension.*

* **LPilecapExtendLength** = Left side abutment footing wing extension horizontal length (*min. value=4, max. value=12*). *Note, for bridges using A, B & BTB beams, the abutments do not have wing extensions. This variable will be set at zero (0) to not show a wing extension.*

BackwallHeight = Vertical distance at centerline of abutment between top of abutment footing to top of deck (*min. value=3, max. value=15*).

BackwallCrownRadius = This is the parabolic crown at top of deck, typically no need to change this. (*min. value=50.0, max. value=350, default value is 150.0*).

ApproachSlabThick = Paving notch vertical distance at centerline of approach slab (*min. value=0.5, max. value=3*).

CorbelWidth = (paving notch horizontal) Distance of top horizontal face of paving notch, perpendicular to abutment backwall (*min. value=0.5, max. value=3*).

CorbelHeight = Distance of outer vertical face of paving notch (*min. value=0.5, max. value=3*).

CorbelSlopedHeight = Vertical distance of sloped bottom outer face of paving notch (*min. value=0.5, max. value=3*).

* **LWingwallELOffset** = (default values -0.2, -0.4) Left-side Wing Wall vertical distance offset (elevation change) at end of wing extension and abutment wing. This changes the top of wing elevations at construction joints based from the top of backwall, at the front face. A positive value moves the top of wing wall ends, vertically up. A negative value moves the top of wing wall ends, vertically down. This Input does not move the bottom of the wing wall, it remains fixed (*min. value= -10, max. value=10*). *Note, for bridges using A, B & BTB beams, the abutments do not have wing extensions. The first variable may need to be set as zero (0) because of how it interacts with the top of the abutment backwall, while the second variable can be set as needed per design, e.g. (0.0, -0.4).*

* **RWingwallELOffset** = (default values -0.2, -0.4) Right-side Wing Wall vertical distance offset (elevation change) at end of wing extension and abutment wing. This changes the top of wing elevations at construction joints based from the top of backwall, at the front face. A positive value moves the top of wing wall ends, vertically up. A negative value moves the top of wing wall ends, vertically down. This Input does not move the bottom of the wing wall, it remains fixed (*min. value=-10, max. value=10*). **Note**, for bridges using A, B & BTB beams, the abutments do not have wing extensions. The first variable may need to be set as zero (0) because of how it interacts with the top of the abutment backwall, while the second variable can be set as needed per design, e.g. (0.0, -0.4).

LWingwallLength = Left-side abutment wingwall horizontal length (*min. value=3, max. value=10*).

RWingwallLength = Right-side abutment wingwall horizontal length (*min. value=3, max. value=10*).

LWingBottomOffset = Vertical distance from bottom of left-side abutment wingwall to bottom of abutment footing (*min. value=0, max. value=5*).

RWingBottomOffset = Vertical distance from bottom of right-side abutment wingwall to bottom of abutment footing (*min. value=0, max. value=5*).

LPileLocation = Distance measured along centerline of abutment footing from abutment cell origin (working point) to vertical center of outermost end H-pile on left side. This is not measured to abutment wing piling (*min. value=5, max. value=50*).

RPileLocation = Distance measured along centerline of abutment footing from abutment cell origin (working point) to vertical center of outermost end H-pile on right side. This is not measured to abutment wing piling (*min. value=5, max. value=50*).

PileQty = Quantity of main abutment H-pile. Spacing is automatically equal distance between piles (*min. value=2, max. value=20*).

PileSection = H-Pile size options, **input one of the following options exactly as shown**. Example 'HP 10x57'

```
{ 'HP 8x36', 'HP 10x57', 'HP 10x42', 'HP 12x84', 'HP 12x74', 'HP 12x63', 'HP 12x53',
'HP 14x117', 'HP 14x102', 'HP 14x89', 'HP 14x73', 'HP 16x183', 'HP 16x162', 'HP 16x141',
'HP 16x121', 'HP 16x101', 'HP 16x88', 'HP 18x204', 'HP 18x181', 'HP 18x157', 'HP 18x135' }
```

PileEmbedLength = Vertical distance of all H-pile embedment in abutment footing, this includes wing footings, measured from bottom of abutment footing to top of pile (*min. value=0.5, max. value=5*).

PileLength = Vertical distance of H-pile in main abutment footing, measured from bottom of abutment footing to bottom of pile (*min. value=1, max. value=200*).

* **LwwPileLength** = Vertical distance of H-pile in left-side abutment wing footing, measured from bottom of abutment footing to bottom of pile (*min. value=1, max. value=200*). **Note**, for bridges using A, B & BTB beams, the abutments do not have wing extensions. *LwwPileQty* is then set at zero (0). When this applies this variable becomes irrelevant and is not used.

* **RwwPileLength** = Vertical distance of H-pile in right-side abutment wing footing, measured from bottom of abutment footing to bottom of pile (*min. value=1, max. value=200*). **Note**, for bridges using A, B & BTB beams, the abutments do not have wing extensions. *RwwPileQty* is then set at zero (0). When this applies this variable becomes irrelevant and is not used.

* **LwwPileQty** = Quantity of H-pile in left-side abutment wing (*min. value=1, max. value=3*). *Note, for bridges using A, B & BTB beams, the abutments do not have wing extensions, set this variable to zero (0).*

* **RwwPileQty** = Quantity of H-pile in right-side abutment wing (*min. value=1, max. value=3*). *Note, for bridges using A, B & BTB beams, the abutments do not have wing extensions, set this variable to zero (0).*

* **LwwLEdgeOffset** = Left abutment wing, end piling distance along length of wing from vertical center of end H-pile to end of abutment wing (*min. value=0.1, max. value=3*). *Note, for bridges using A, B & BTB beams, the abutments do not have wing extensions. When this applies this variable becomes irrelevant and is not used.*

* **RwwLEdgeOffset** = Right abutment wing, end piling distance along length of wing from vertical center of end H-pile to end of abutment wing (*min. value=0.1, max. value=3*). *Note, for bridges using A, B & BTB beams, the abutments do not have wing extensions. When this applies this variable becomes irrelevant and is not used.*

* **LwwWEdgeOffset** = Left abutment wing piling distance from vertical center of H-pile to left-side outer face of abutment wing (*min. value=0.1, max. value=3*). *Note, for bridges using A, B & BTB beams, the abutments do not have wing extensions. When this applies this variable becomes irrelevant and is not used.*

* **RwwWEdgeOffset** = Right abutment wing piling distance from vertical center of H-pile to right-side outer face of abutment wing (*min. value=0.1, max. value=3*). *Note, for bridges using A, B & BTB beams, the abutments do not have wing extensions. When this applies this variable becomes irrelevant and is not used.*

* **LwwPileSpacing** = This only applies when there is more than one pile in abutment wing. Left abutment wing pile spacing, distance is from vertical center to center of H-pile (*min. value=0.1, max. value=5*). *Note, for bridges using A, B & BTB beams, the abutments do not have wing extensions. When this applies this variable becomes irrelevant and is not used.*

* **RwwPileSpacing** = This only applies when there is more than one pile in abutment wing. Right abutment wing pile spacing, distance is from vertical center to center of H-pile (*min. value=0.1, max. value=5*). *Note, for bridges using A, B & BTB beams, the abutments do not have wing extensions. When this applies this variable becomes irrelevant and is not used.*

UPDATED VERSION (09-03-2024) "BT Integral Abutment GC R04.dgn"

This is for information only.

The image below is showing the "BT Integral Abutment_GC_R04.dgn" GC cell file. This is what appears where the development of the abutment shape is worked on.

