
Alignment design options in Bentley MX

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Anyone who has used MX will be familiar with some form of the Alignment tools whether it be Full Alignment, Quick or from CAD. What may not be as clear is how these interrelate and how a combination of methods can be used to best suit specific applications.

Whatever method is used the outcome is the same – a Master string with a corresponding Geometry string. If vertical alignment is applied the Master string will also have levels. The Alignment tools, including using CAD, are interactive but there are also other ways to create master strings - from input files and possibly more obscure by using *Modify > Strings > Convert to a 6D master string*. The last method does not create a geometry string.

A Master string is the basic design string from which all other feature strings are generated. This is the only string type in MX that has chainages and can be regarded. As an aside there is however in InfraTools, **Regrade any string**, which allows any string to be regarded using the Quick Vertical tool. InfraTools is contained in MXTools which is available as a separate download for MX



Figure 1 Regrade any string on the InfraTools Toolbar

While input files to create master strings can be written from scratch it is generally easier to generate them initially from the alignment tools. Typically the major option **Halign** is used for horizontal alignment and **Verat** for vertical.

Both Full Alignment and Quick Alignment retain the alignment history to allow editing but in different ways. Full Alignment uses a special type of model called a GDS model. This is automatically created and is transparent to the user. This model only contains alignment history. Quick alignment uses text files, **hip** files for horizontal and **vip** files for vertical. These files are given the name of the model and master string and are usually not directly edited.

Well that was the way it used to be. Both Quick and Full Alignment can now retrieve alignments from the Geometry string and this holds the key to moving between different methods.

Full ALIGNMENT can be found from **Design > Alignment** and while it supports IP and Spine fit design methods it is generally used with the Element method for the horizontal and vertical Alignment design.

If no GDS model exists display the master string to be edited and simply select the design model in the panel, when clicking **Next** the GDS model is created. If a GDS model already exists but does not contain the alignment for the master string to be modified again display the master string to be edited, select the design model, click **Next** and then **Display all the alignments** (if there are any others).

From the **Begin Alignment** panel select **Horizontal Design**. If prompted **Create New Alignment**. Tick the **Retrieve Alignment** box and then select master string of alignment to be retrieved.

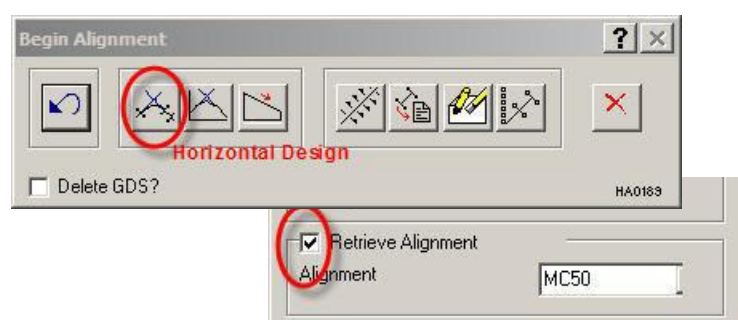


Figure 2 Begin a Horizontal Alignment and Retrieve an Alignment from the Geometry string.

In this way a master string created in Quick alignment, from CAD or even an input file can be edited in Full Alignment. Remember after any editing the master string must be created or recreated.



Figure 3 Create Alignment Master String and Create Data output file.

Full Alignment does not record anything in either the journal or log file. To save in input file format select **Create data output**. This need to be done for both horizontal and vertical. Horizontal design using the element method saves as a **Halign** file. Vertical design is usually done in Full Alignment with the element method and must be saved as a **Valgn** file.

If the **Verat** format is required (IP method, chainage, elevation, curve length) even if designed using element method, you must first go back to **Begin alignment > Vertical Design** select **IP** method and **Next**. At IP design panel go **Back** and **Back** again returning to **Begin Alignment** panel. Select **Create Data output** and now save as **Verat** file. Note that if vertical design contains alignment elements not valid for IP design it cannot be saved in this format, for example compound curves.

QUICK ALIGNMENT can be found from **Design > Quick Alignment**. The alignment history can be retrieved from either the hip file or the Geometry string.

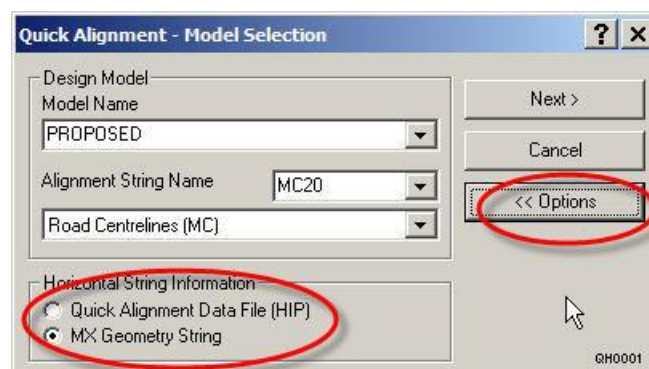


Figure 4 Quick Horizontal Alignment Options

Quick Alignment now defaults to the Geometry string but by opening up the **Options** the Hip file can be used. This similarly applies to the Quick Vertical Alignment with the Vip file.

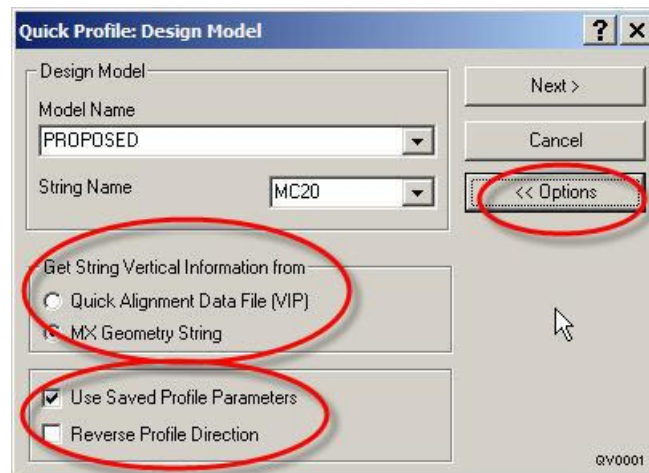


Figure 5 Quick Vertical Design Options

Note that as there is a bit of setup required for vertical these are saved as a profile allowing quicker editing by remembering settings. If any of the prior values change an error may occur and to correct simply uncheck **Use Saved Profile Parameters** and respecify.

Halign input can be found in both the journal and log files. **Verat** input can be found in the log file only.

If alignments are created in CAD with either Smartlines or Polylines and converted into MX, **Halign** input can be found in both the journal and log files. No levels can be carried over from CAD on M strings, if they exist, and thus there are no vertical file information.

Alignment design can now be done in the most convenient method. A horizontal alignment created in CAD can be graded with Quick Vertical or the horizontal can be done in Full Alignment, graded with Quick Vertical and then later amended from a verat input file. The choice is yours.

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