SAFE Technical Note 2

Using the Align Vertical/Horizontal Command on the Edit Menu

The information in this document is consistent with SAFE version 6.20 and later

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1. Background

SAFE creates a rectangular mesh for analysis. There is an X and Y direction mesh line passing through each point in the model. The points these mesh lines pass through include point objects, the end points of line objects and the corner points of area objects. As you can imagine, if your points do not align somewhat in an X-Y grid system you can very easily have a large number of closely spaced grid lines. This may not be desirable since it creates a bad aspect ratio for the shell elements, greatly increase the running time for your model and also increase the display time for results.

The Align Vertical/Horizontal command was added to the Edit menu in SAFE version 6.16. The purpose of this command is to assist you in aligning points, lines and area objects in your model.

2. How to Implement the Align Vertical/Horizontal Command

To use the Align Vertical/Horizontal command do the following:

1. Select the point, line and area objects that you want to align.

2. On the **Edit** menu click **Align Vertical/Horizontal** to display the Align Selected Lines/Edges/Points dialog box.

3. In this dialog box either type in the maximum move allowed or accept the default and click the OK button. The value you type in is a distance in the current units. It is the maximum distance any point will move to align with another point.

SAFE will automatically align all of the selected objects as described below. You may want to run through this process three times to cover the structual layer, X-strip layer and Y-strip layer.

3. How the Align Vertical/Horizontal Command Works

When you implement the Align Vertical/Horizontal command SAFE goes through the following sequence of steps in the order specified:

1. SAFE changes the selection from point line and area objects to a group of points. This group of points consists of all of the selected point objects, the end points of all of the selected line objects and the corner points of all of the selected area objects.

2. SAFE steps through the grid lines one-by-one. If one of the selected points is within the specified maximum tolerance of the grid line, then that point is moved onto the grid line. The program first steps through all of the horizontal

grid lines from bottom to top and then through all the vertical grid lines from left to right.

Note that once a point is moved horizontally it will not be moved horizontally again because of another criterion further down the list. Similarly, once a point is moved vertically it will not be moved vertically again because of another criterion further down the list. However, a point that has been moved horizontally can still be moved vertically and vice versa.

3. SAFE goes over all of the column supports in the order in which they were input into the model. If one of the selected points is within the specified maximum tolerance of a vertical line passing through the column support then the point is moved to that vertical line. Similarly, if one of the selected points is within the specified maximum tolerance of a horizontal line passing through the column support then the point is moved to that horizontal line.

   Note that if the point is within the maximum specified tolerance in both the vertical and horizontal directions then it will move right on top of the column support.

4. SAFE steps through each of the unselected points on the structural layer in the order that they were input into the model. If one of the selected points is within the specified maximum tolerance of a vertical line passing through the point currently being considered, then the other point is moved to that vertical line. Similarly, if one of the selected points is within the specified maximum tolerance of a horizontal line passing through the point currently being considered, then the other point is moved to that horizontal line

5. SAFE steps through each of the selected points that can still be moved in the order in which they were input into the model. If one of the other selected points is within the specified maximum tolerance of a vertical line passing through the point currently being considered, then the other point is moved to that vertical line. Similarly, if one of the other selected points is within the specified maximum tolerance of a horizontal line passing through the point currently being considered, then the other point is moved to that horizontal line.

   Note that if a point is moved in one direction to align with the considered point, then the considered point is assumed to have been moved once already in that direction and will not be moved in that direction again.

   Also note that at the end of this sequence there may be some selected points which were not moved at all.

4. Tips on Using the Align Vertical/Horizontal Command

1. From the moment you start your model you should try to align objects as much as possible/practical.

2. We recommend that you align points first for the structural layer, then for the X-strip layer and finally for the Y-strip layer.

3. The best way for you to control where a point moves to is to create a temporary grid line at the location where you want the point to move.

4. You can use the Align Vertical/Horizontal command on local portions of your model or globally on the entire model. Our intent is for you to use it on local areas of your model. If you use the command globally then you should typically use a small value for the maximum move allowed and you should check the model carefully to make sure you did not get any unanticipated aligning.

5. The Align Vertical/Horizontal command may cause some objects to be deleted. If the two end points of a line object move on top of each other then the line object will be deleted. If an area object ends up with no area then the area object will be deleted.

   If two point objects end up one on top of the other then the point object that was moved merges into the other point object. The loads on the moved point object are added to the other point object. If the moved point object has support properties and the other point object does not, then the support properties are transferred to the other point object. If both point objects have support properties then the support properties for the moved point are lost and the support properties for the other point are maintained.

6. The Undo command on the Edit menu does work for undoing the effects of the Align Vertical/Horizontal command.

7. We recommend that when you are learning how the Align Vertical/Horizontal command works you try it on a small test model, not on a large model that you have spent many hours developing. Once you are comfortable with the command on the test model then you can move on to using it in local areas of your real model.

8. It is probably a good idea to make a backup copy of your model right before you use the Align Vertical/Horizontal command in case you later (perhaps the next day) decide you want to go back to the old model.

5. Final Comments

We will be adding additional capability to the Align Vertical/Horizontal command in a future release. Specifically, we will add a feature that allows you to align to any specified line that can be drawn in any orientation. We will also add the capability to align vertically and horizontally separately.