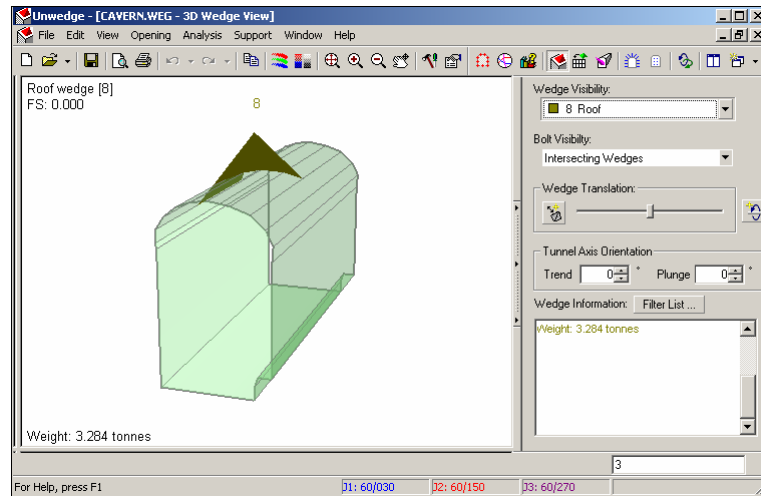## Tutorial Summary

This tutorial will examine the application of pattern bolt support in Unwedge to increase wedge stability. It will include:
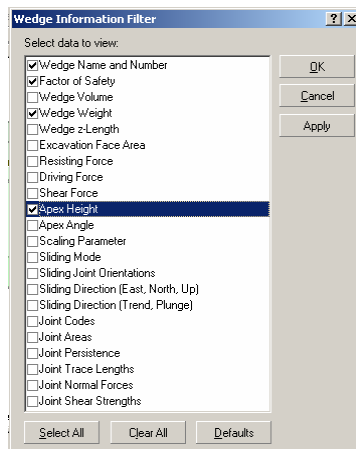
1. Applying pattern bolts to a roof wedge

2. Editing pattern spacing

3. Changing bolt type

Tutorial Steps

1. From the Unwedge Examples folder, open the file (cavern.weg).

2. In the Wedge Visibility drop-list in the sidebar, select the Roof Wedge.
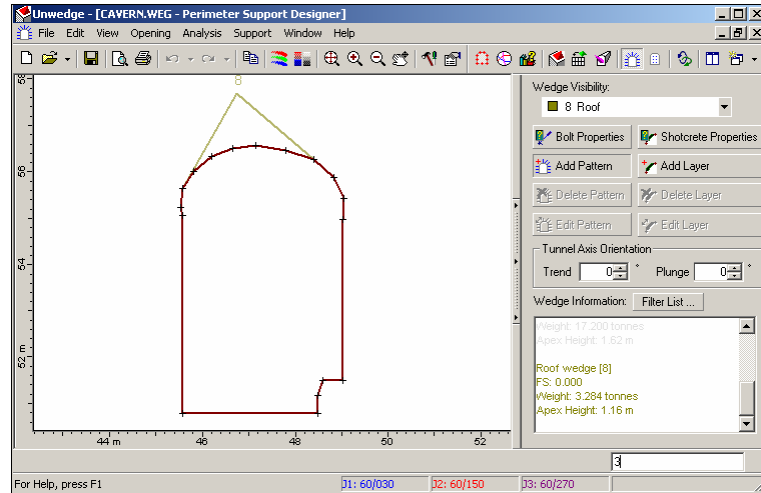

3. Click on the Filter List button in the sidebar. Turn on the Apex Height option in the Wedge Information Filter dialog.
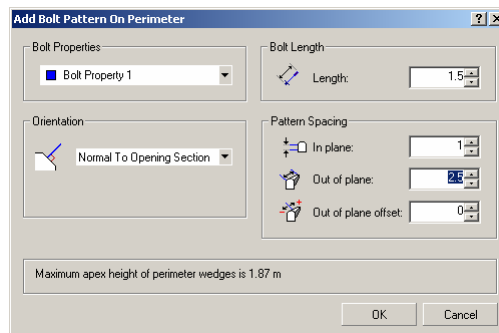
Note that the apex height of the Roof Wedge (shown in the Wedge Information panel in the sidebar) is 1.16m.

4. Now, click on the Perimeter Support Designer icon ![icon] on the toolbar, and choose the Add Pattern option ![Add Pattern] from the sidebar.
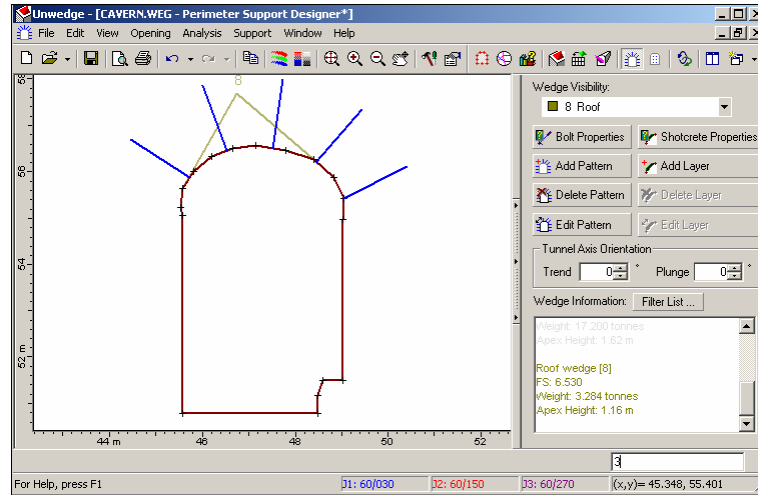

5. In the resulting dialog, enter a bolt length of 1.5m, an in-plane spacing of 1m, and an out-of-plane spacing of 2m.
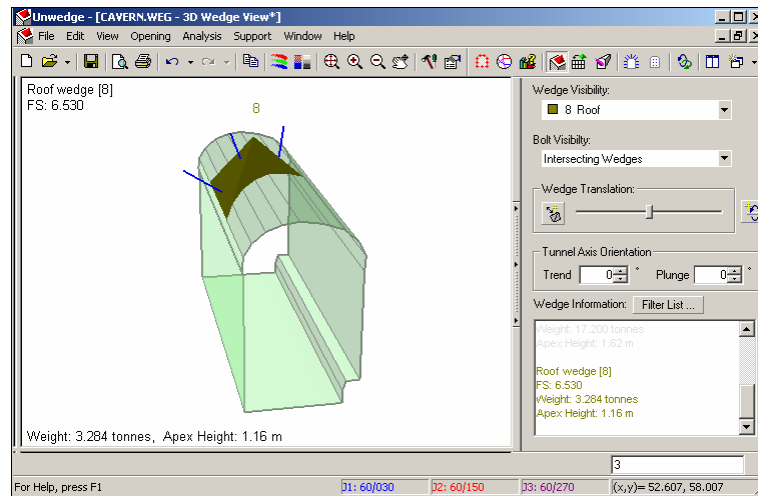

6. On the excavation cross-section, select the start and end points of the boundary along which the pattern should be installed. (To install bolts along the excavation boundary, you must proceed in the counter-clockwise direction.) You can enter the vertex location from the prompt line or you can click on the vertex with the mouse.
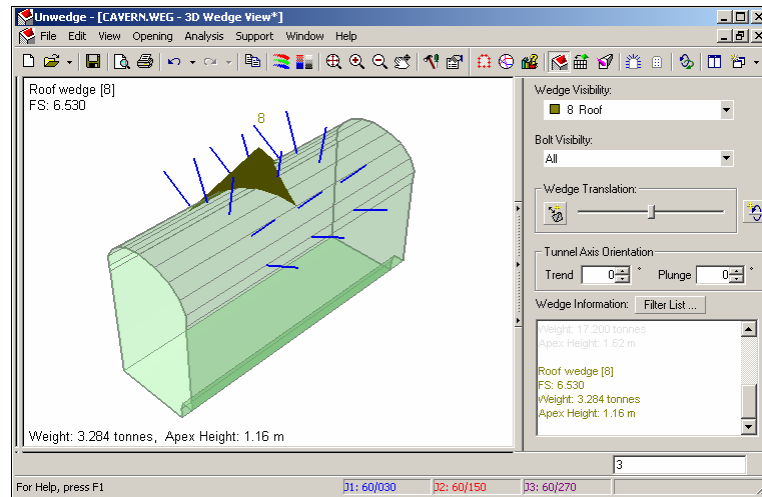
For this tutorial, click on the vertex location with coordinates (49, 55) to start the bolt pattern, and click on the vertex with coordinates (46, 56) to end it.
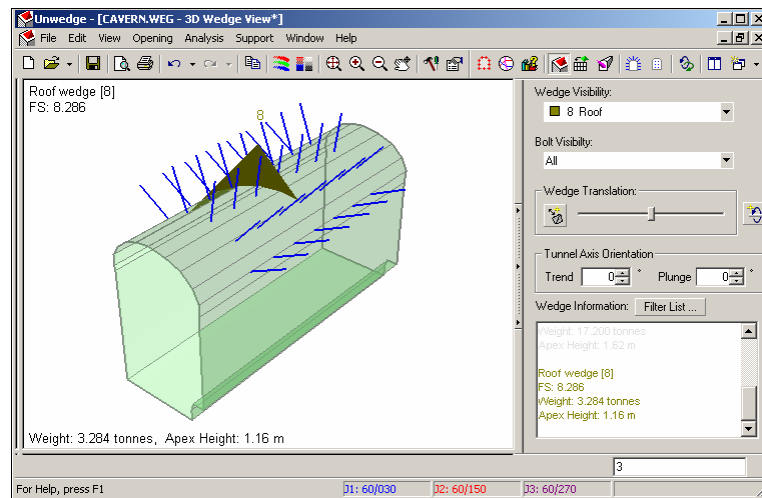
7. Click on the 3D wedge view icon ⬚ to see the bolt pattern in 3 dimensions. By default, only bolts that intersect wedges are displayed.
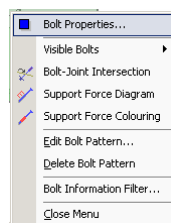

8. From the Bolt Visibility drop-list in the sidebar, select the All visibility option. All bolts in the pattern will be displayed.
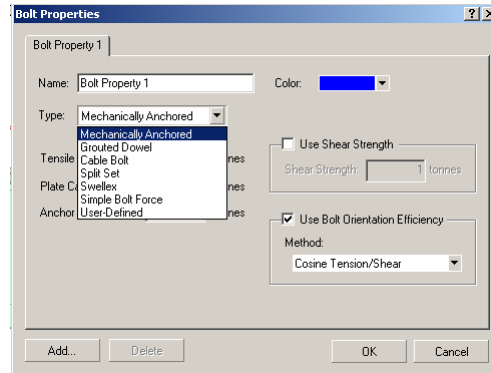
9. You can change the pattern spacing by clicking the right mouse button directly ON any bolt in the pattern, and selecting the Edit Bolt Pattern option from the resulting pop-up menu. Enter a pattern spacing of 1x1m.
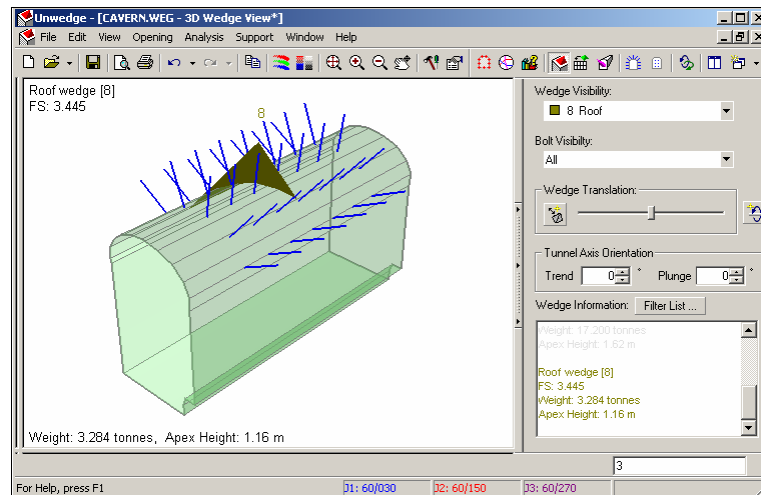

10. You can explore the effects of different bolt types on the wedge Factor of Safety. Right click the mouse directly ON any bolt in the pattern, and choose the Bolt Properties option from the popup menu.

11. From the Bolt Properties dialog, select the Swellex bolt type instead of the default Mechanically Anchored bolt. Retain the default Swellex bolt properties.

Notice that the Factor of Safety changes from 8.28 to 3.445.

This concludes our Adding Pattern Bolts Tutorial