



SWedge

Surface Wedge Analysis for Slopes

Theory Manual

Basal Joint Wedge Types

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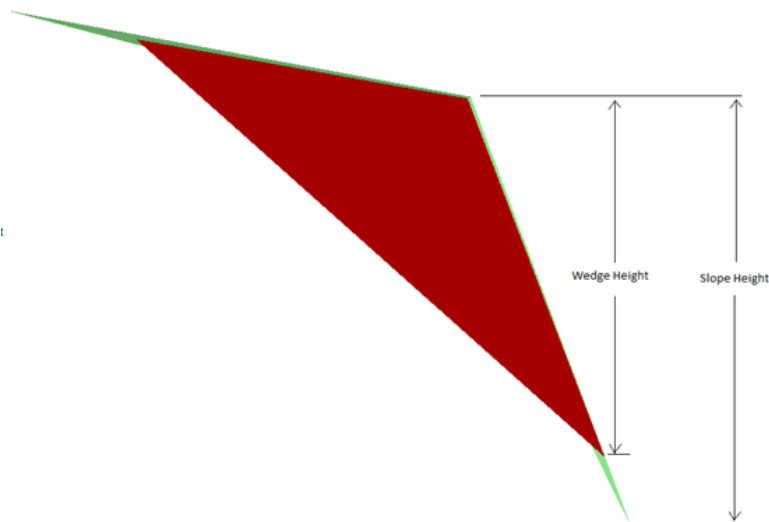
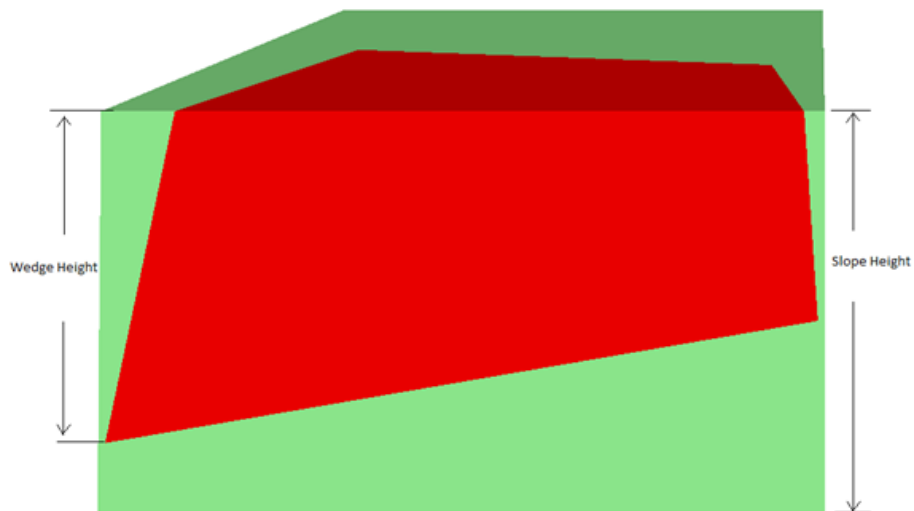
Basal Joint Wedge Types

1. Introduction

If a basal joint plane is considered in the *SWedge* analysis, a wide variety of different wedge shapes can be formed. This document summarizes these different wedge shapes and the definitions of some basic parameters for basal joint wedges.

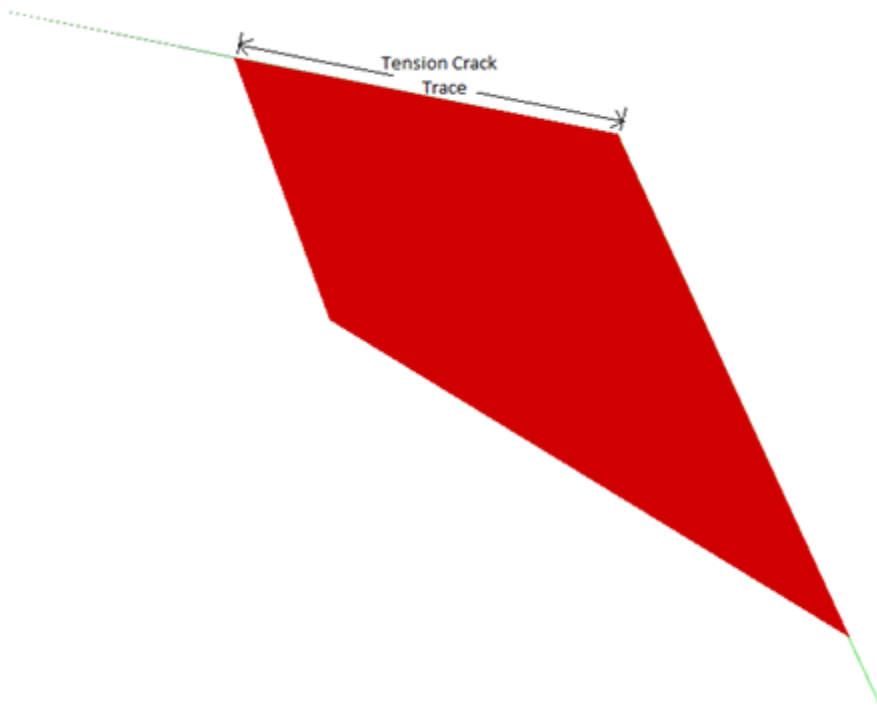
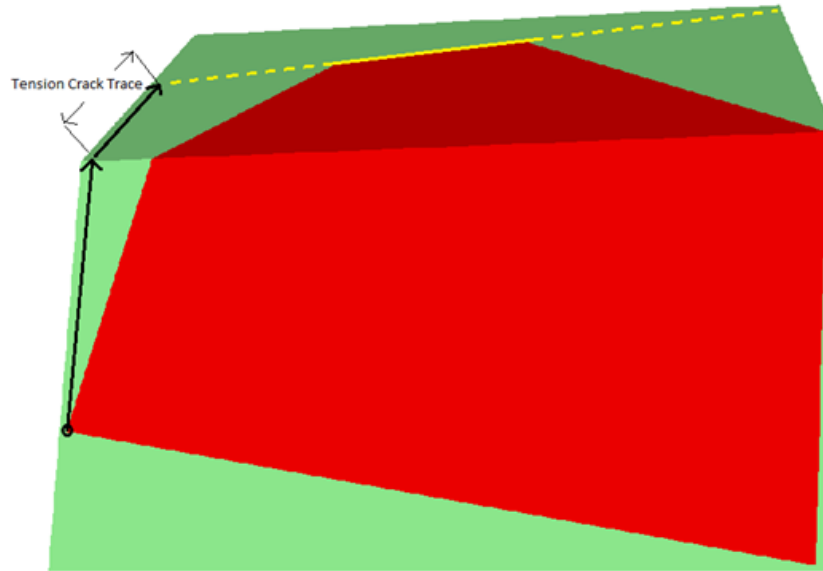
2. Height

1. **Slope Height:** the vertical height of the crest above the ground (this is an input).
2. **Wedge Height:** the greatest vertical distance, on the wedge, between the basal joint and the crest of the slope (this is an output).



3. Tension Crack Position

Take the point of intersection of the basal plane and Joint 1 on the slope face and travel up the slope face to a point on the crest in the direction of the greatest gradient (line of greatest ascent). The tension crack distance is then measured as the distance from that point perpendicular to the line of intersection of the slope face and the upper slope (the crest), going back on the upper slope.



4. Sliding Directions

For basal joint wedges, the assumption is that the block has to be sliding on the basal joint or the line of intersection of the basal joint and one of the other two joints. The block cannot slide on the tension crack or its combination with any of the three other joints.

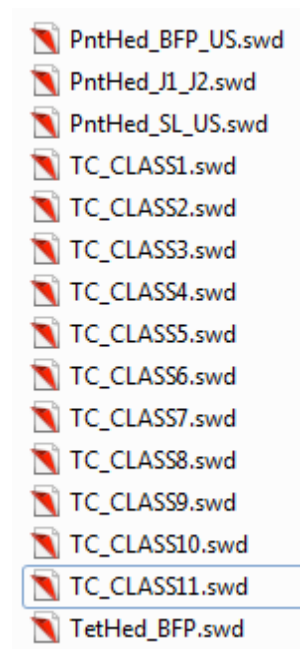
5. Basal Joint Wedge Types

The various basal joint wedge types are listed below, with an example shown for each. There are a total of 15 different shape types that the basal joint can create with the other joints.

1. Simple tetrahedron – formed by joint 1, joint 2 and basal plane.
2. Pentahedron – there are three different pentahedral (5-sided) wedge types which can be formed by the 3 joint planes and two slope surfaces.
3. Wedges with tension crack – with the inclusion of a tension crack, there are 11 additional wedge types which can form.

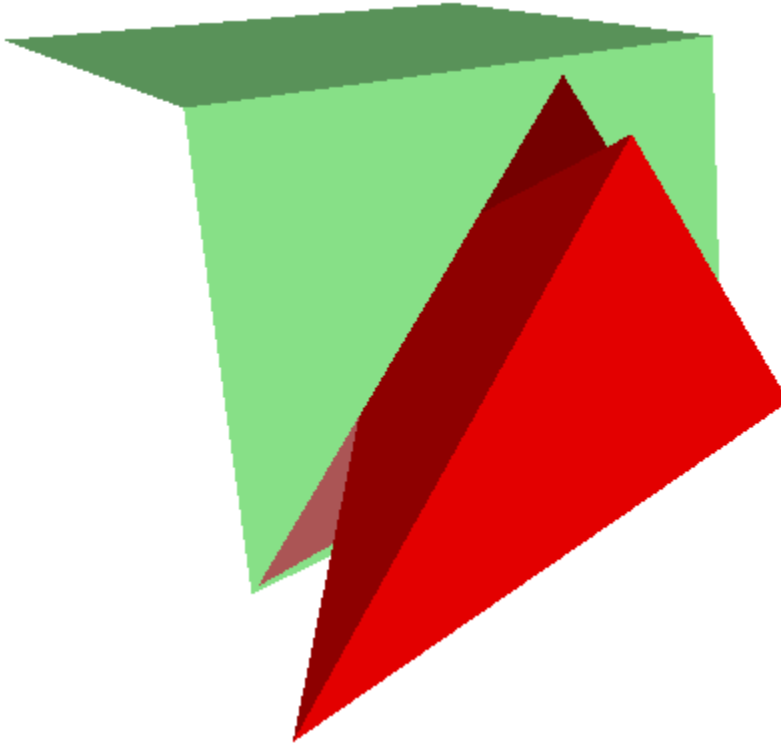
Furthermore, some of these can be socket wedges (wedges which do not intersect the crest) as described at the end of this document.

For each of these basal joint wedge types, a sample *SWedge* file can be found in the *SWedge* installation folder, in a sub-folder named **Swedge Basal Joint Examples**. The file names are as follows:



5.1. Basal Joint Wedge # 1

This is a simple tetrahedral wedge formed by Joint 1, Joint 2 and the basal plane. The basal joint (also called the Basal Failure Plane) forms the base of the wedge.

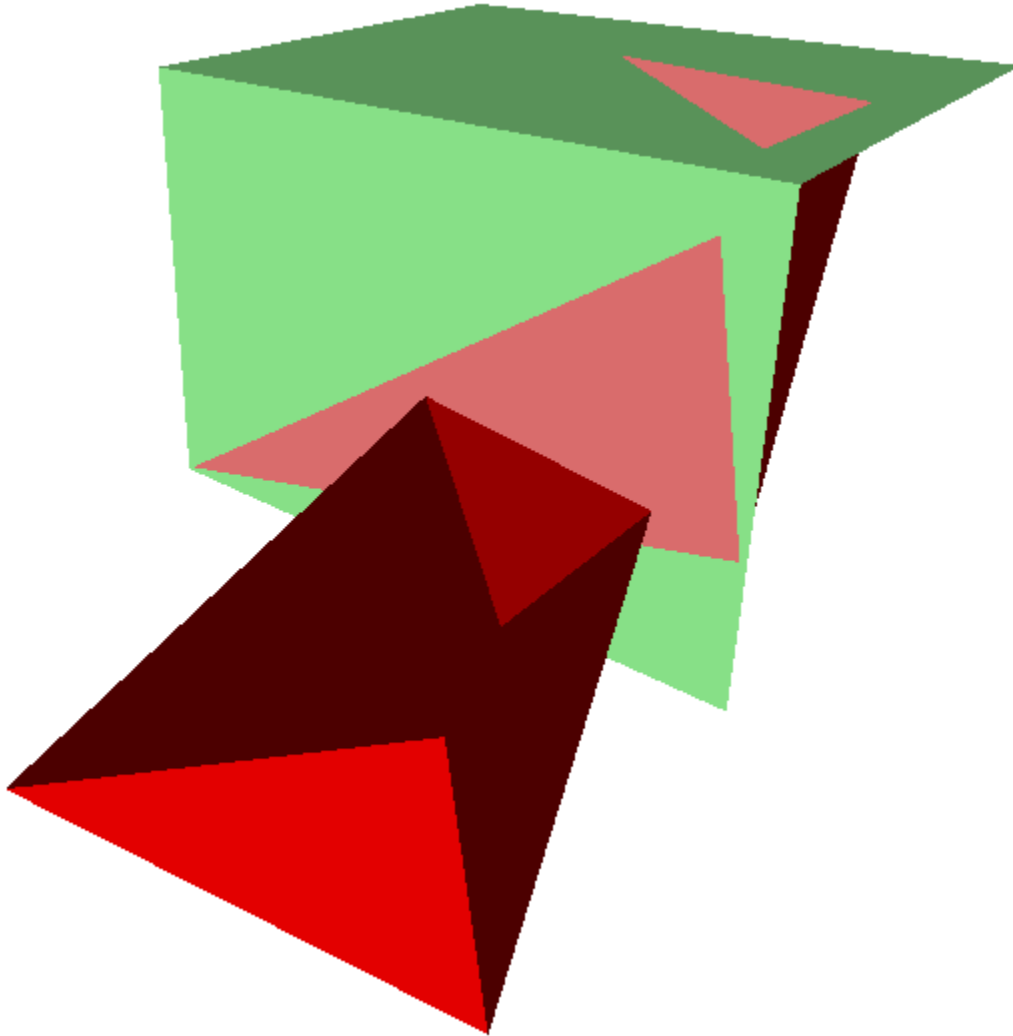


This wedge is a socket wedge (does not intersect crest of slope) and there is no tension crack.

Example filename: **TetHed_BFP.swd**

5.2. Basal Joint Wedge # 2

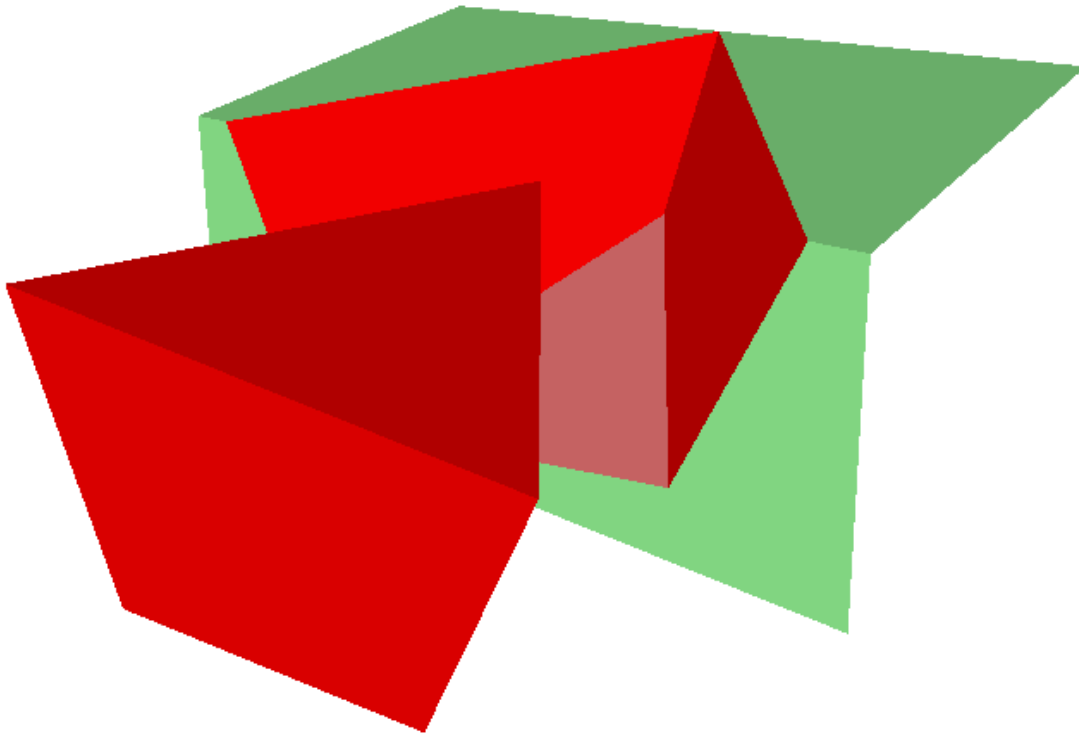
A pentahedral socket wedge (does not intersect crest of slope) formed by J1, J2, basal joint, slope face and upper slope. No tension crack.



Example Filename: **PntHed_SL_US.swd**

5.3. Basal Joint Wedge # 3

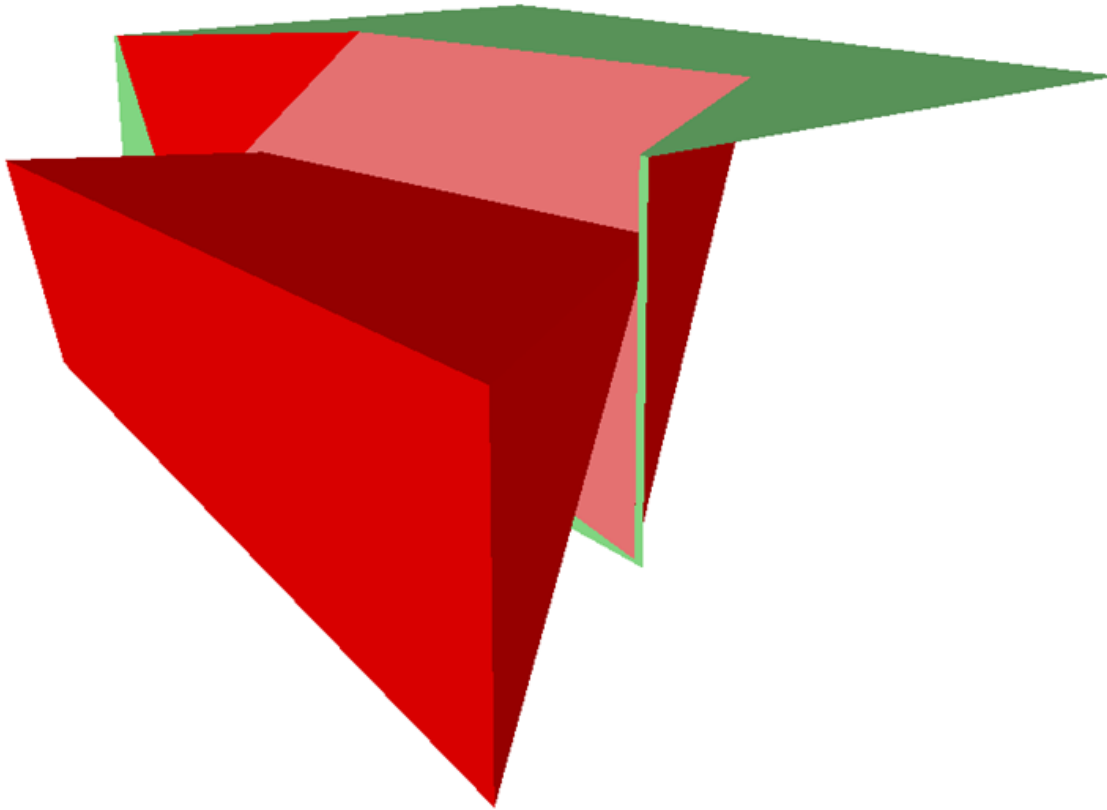
A pentahedral wedge sliding on the basal plane. Joint 1 and Joint 2 intersect. No tension crack.



Example Filename: **PntHed_BFP_US.swd**

5.4. Basal Joint Wedge # 4

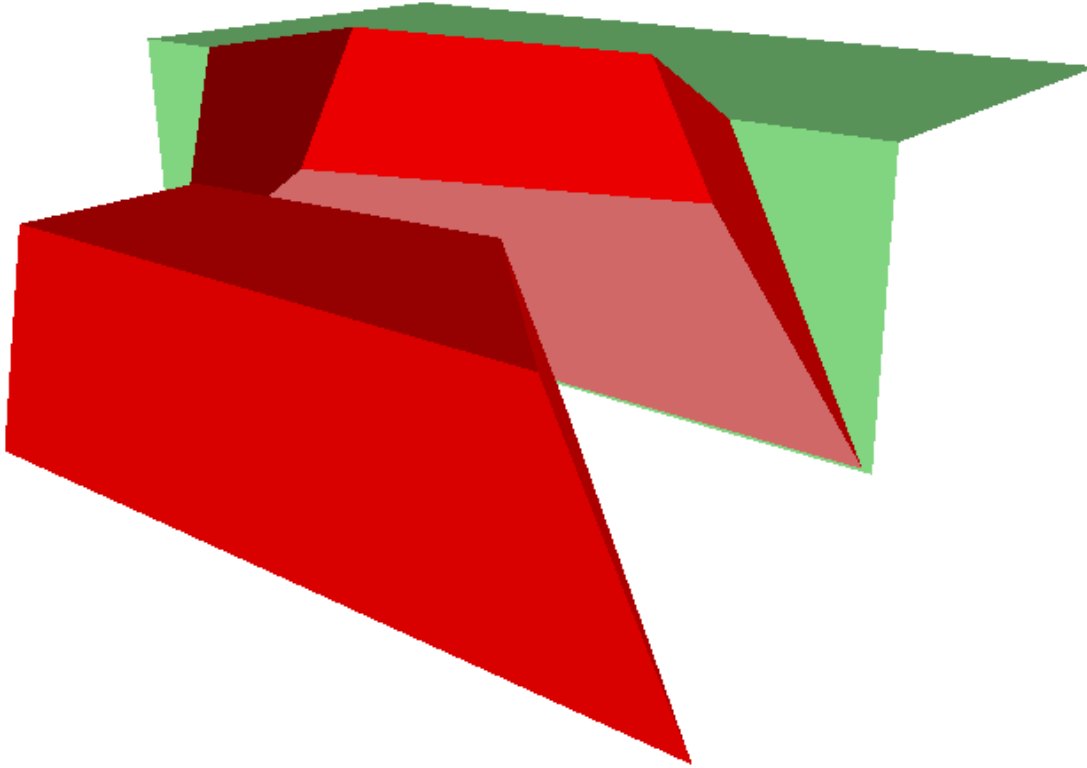
A pentahedral wedge with the basal plane extending from the slope face to the upper slope.
Joint 1 and Joint 2 do not intersect each other.



Example Filename: **PntHed_J1_J2.swd**

5.5. Basal Joint Wedge # 5 (Tension Crack)

This wedge is similar to #4 with the addition of a tension crack as illustrated in the figure below.

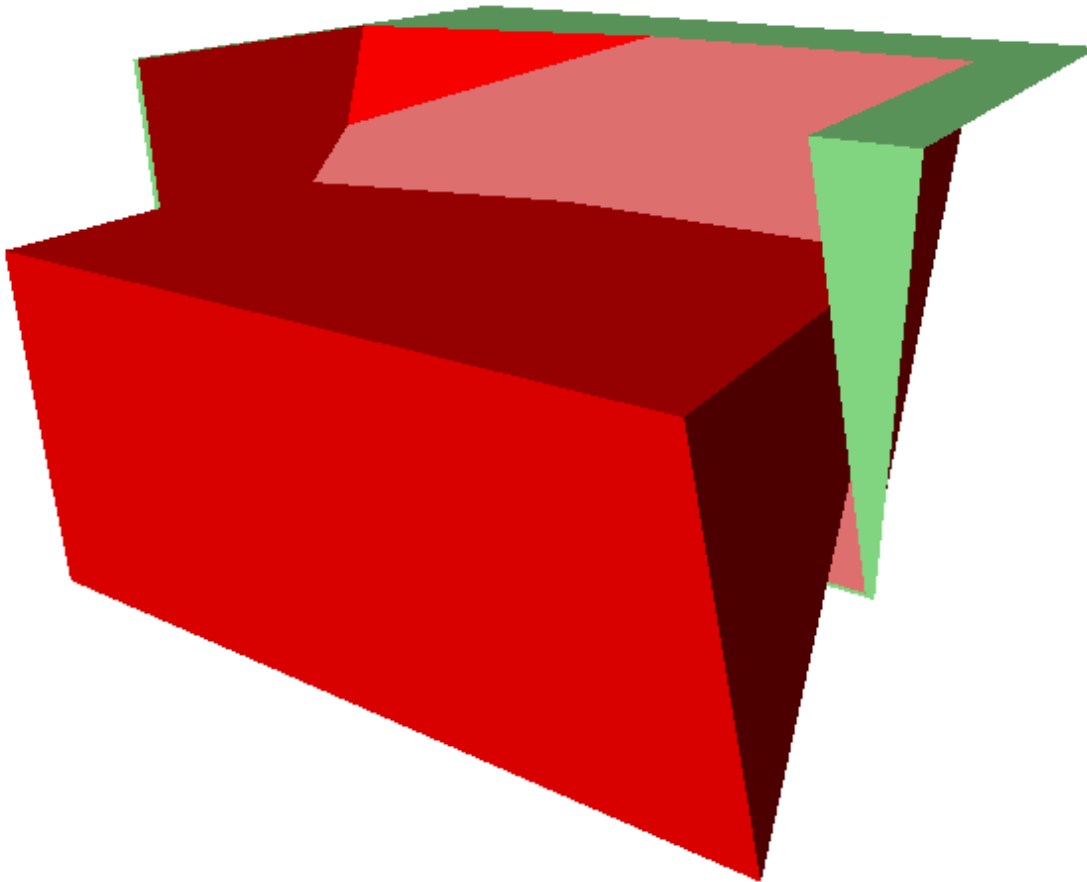


Example Filename: **TC_Class1.swd**

5.6. Basal Joint Wedges # 6 and 7 (Tension Crack)

Wedges #6 and #7 are similar to #5, except the tension crack only intersects one joint (J1 or J2).

- Wedge #6 – tension crack intersects Joint 1 on the upper slope
- Wedge #7 – tension crack intersects Joint 2 on the upper slope

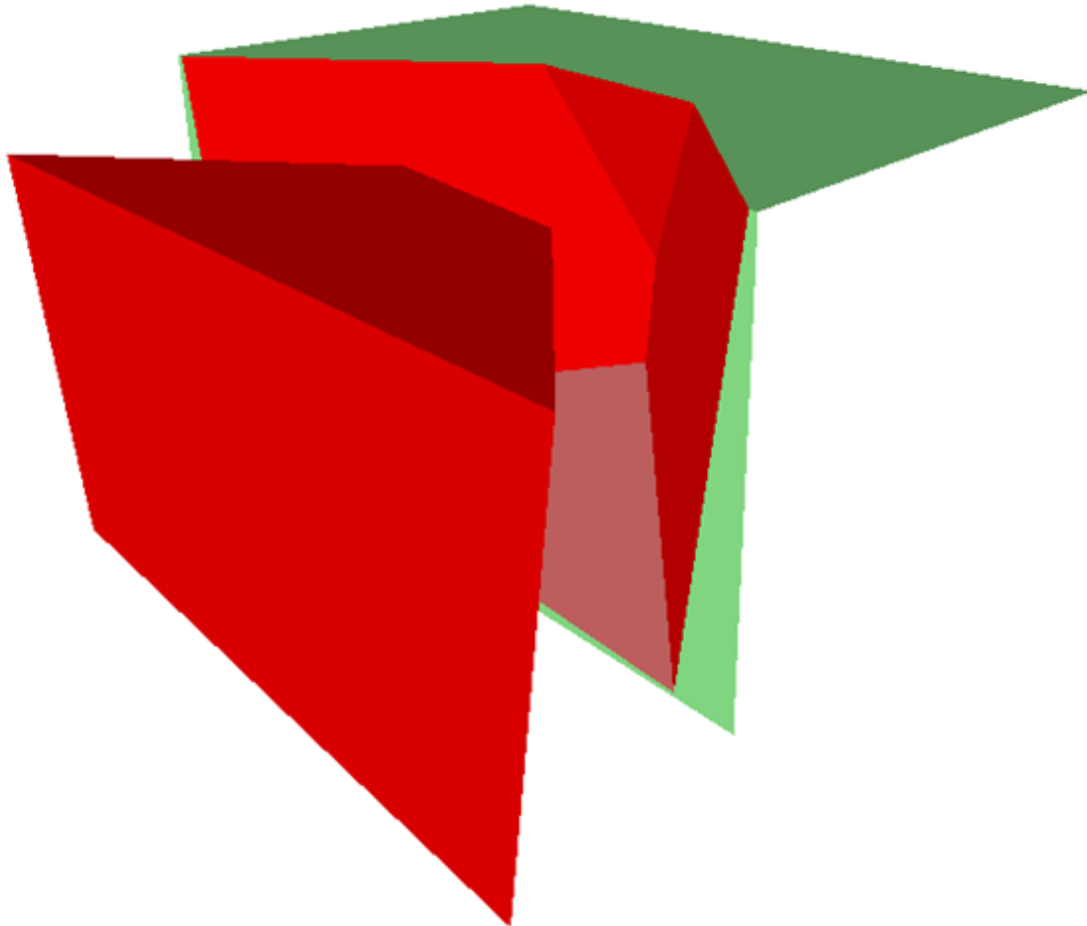


Example Filename: **TC_Class2.swd**

Example Filename: **TC_Class3.swd**

5.7. Basal Joint Wedge # 8 (Tension Crack)

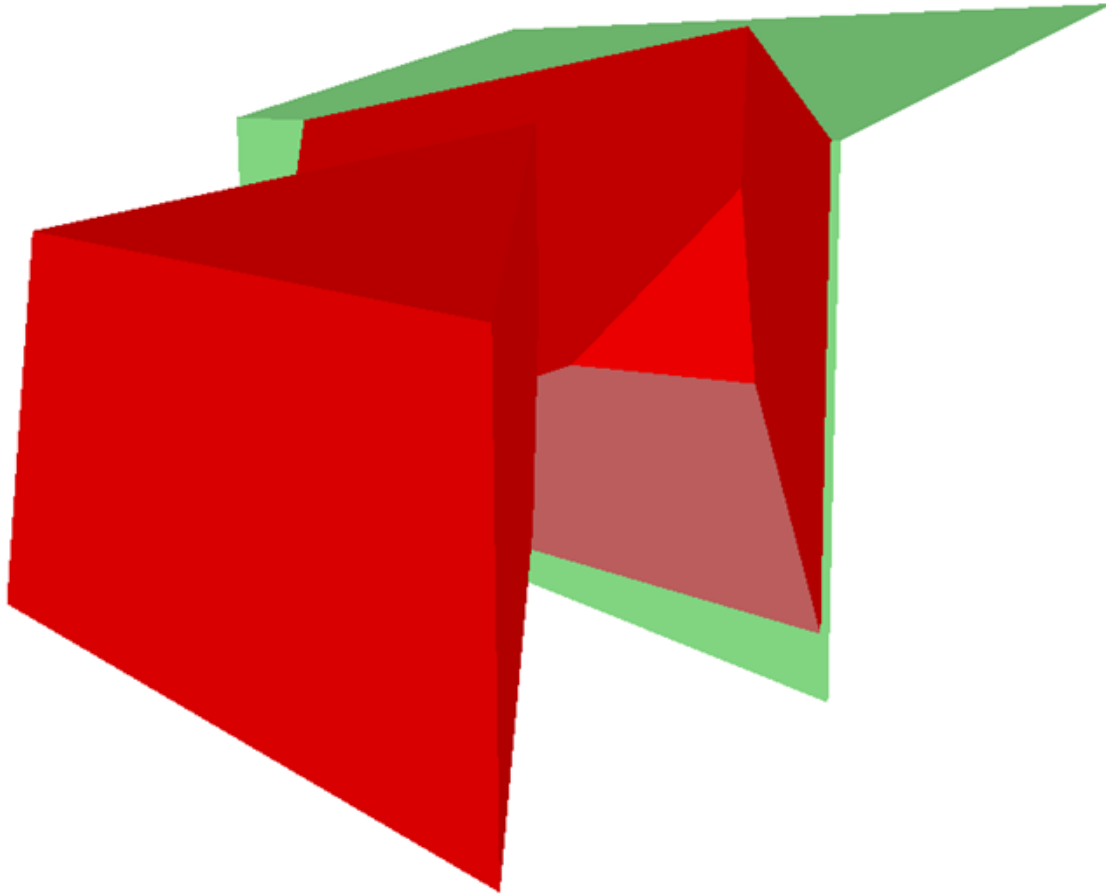
For this wedge, the tension crack intersects both Joint 1 and Joint 2 on the upper slope, but does NOT intersect the basal joint.



Example Filename: **TC_Class4.swd**

5.8. Basal Joint Wedge # 9 (Tension Crack)

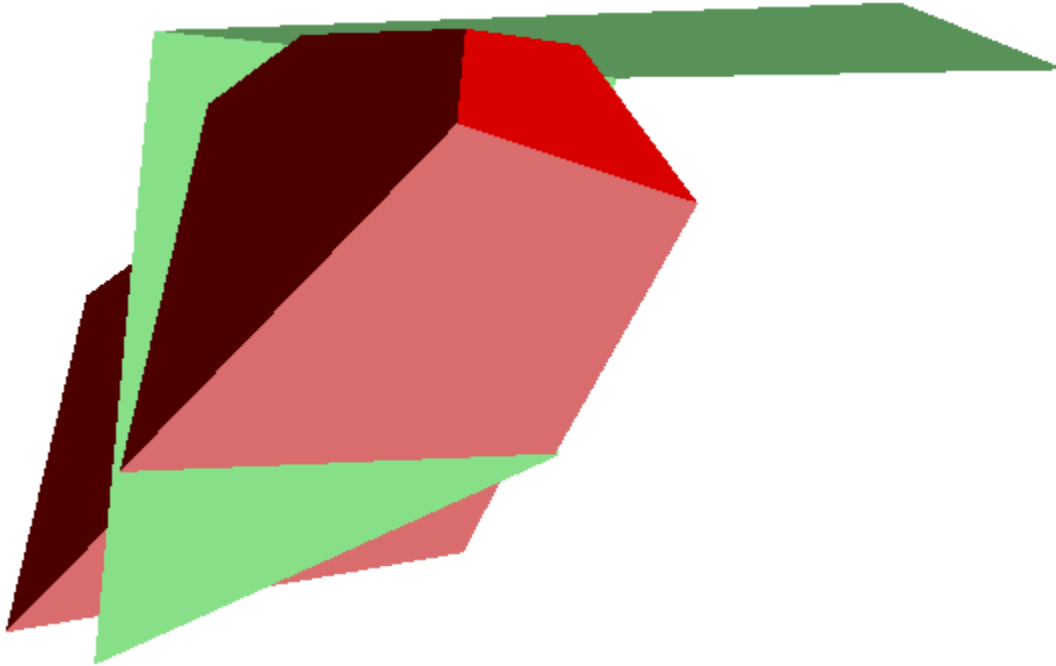
For Wedge #9, the tension crack intersects Joint 1, Joint 2 and the basal plane, but does not daylight in the upper slope.



Example Filename: **TC_Class5.swd**

5.9. Basal Joint Wedge # 10 (Tension Crack)

Wedge #10 is a socket wedge. The tension crack intersects Joint 1, Joint 2 and the basal plane, and also daylights in the upper slope.

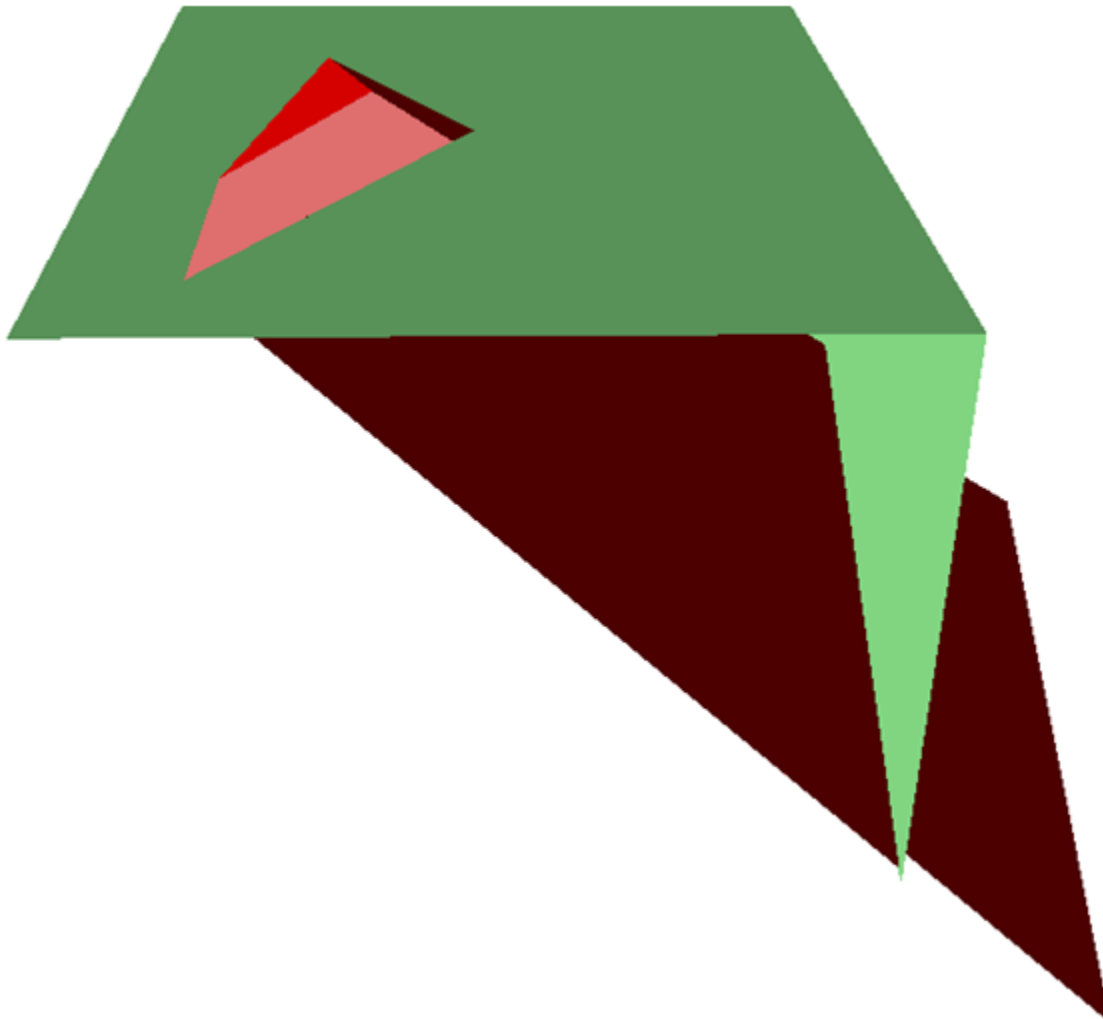


Example Filename: **TC_Class6.swd**

5.10. Basal Joint Wedges # 11 and #12 (Tension Crack)

A socket wedge with tension crack which intersects Joint 1 or Joint 2 (but not both):

- Wedge #11 – tension crack intersects Joint 1 on the upper slope
- Wedge #12 – tension crack intersects Joint 2 on the upper slope

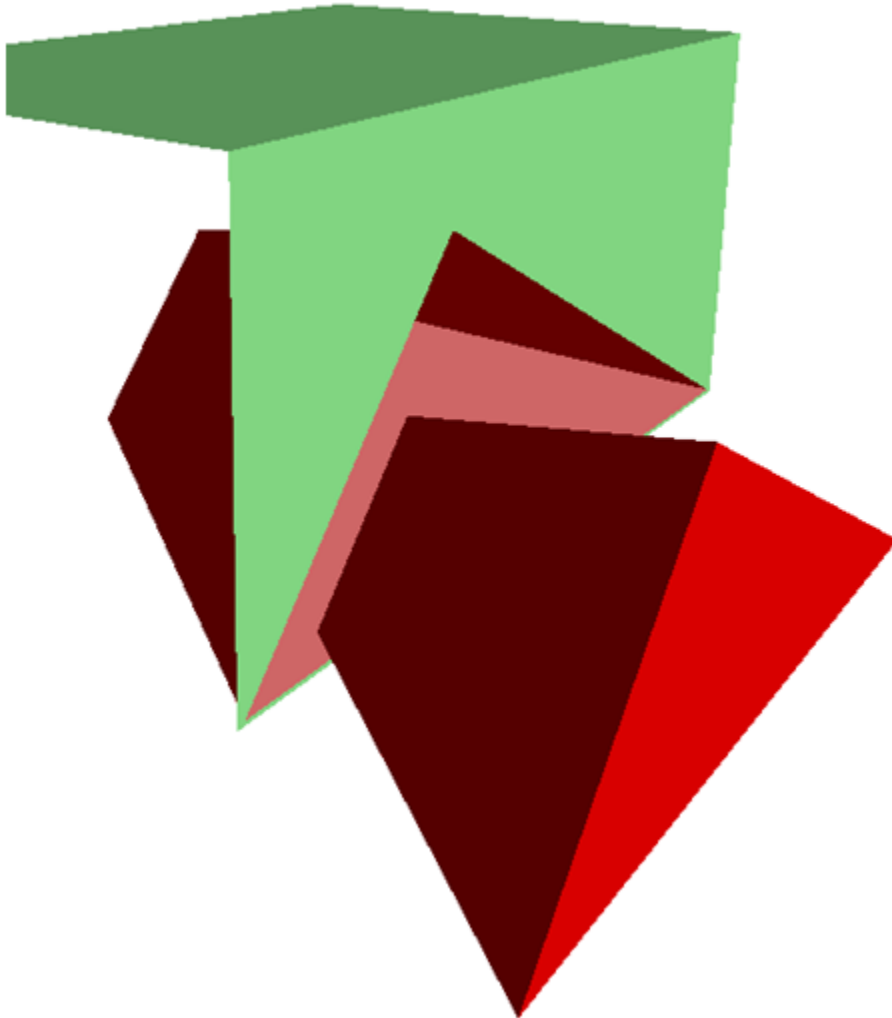


Example Filename: **TC_Class7.swd**

Example Filename: **TC_Class8.swd**

5.11. Basal Joint Wedge # 13 (Tension Crack)

Wedge #13 is a socket wedge similar to tetrahedral Wedge #1, with the addition of a tension crack which truncates the tetrahedron.

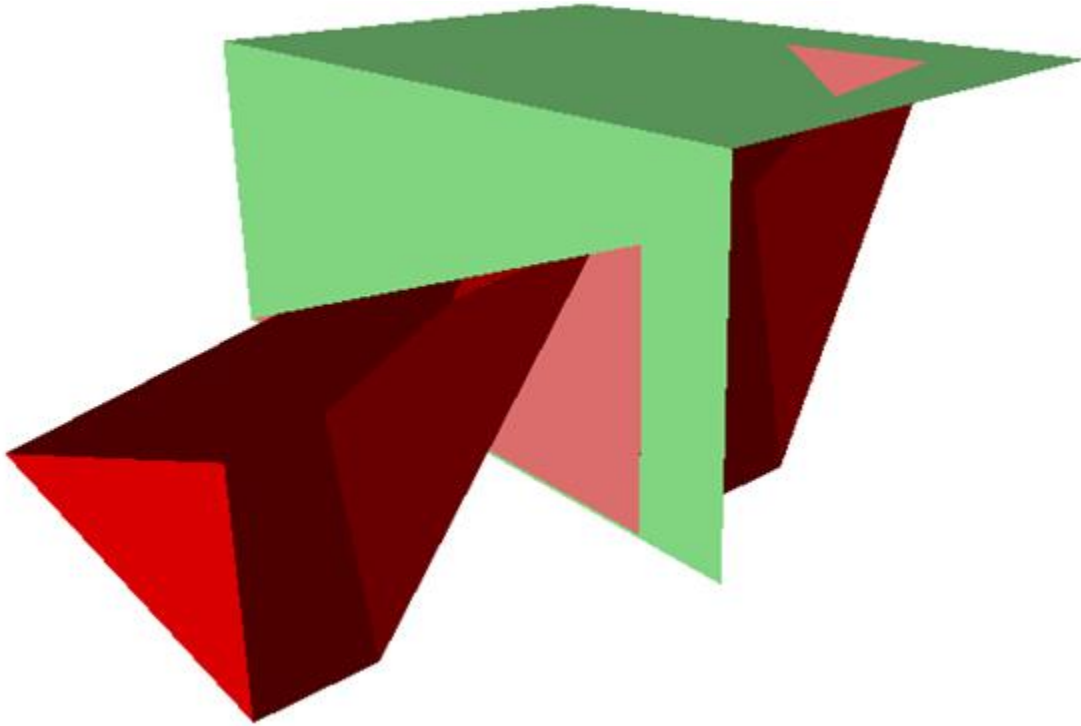


Example Filename: **TC_Class9.swd**

5.12. Basal Joint Wedges # 14 and 15 (Tension Crack)

These wedges are similar to #11 and #12, except that only one Joint daylight on the upper slope.

- Wedge #14 – tension crack intersects Joint 1 on the upper slope
- Wedge #15 – tension crack intersects Joint 2 on the upper slope



At maximum size this is a socket wedge.

Example Filename: **TC_Class10.swd**

Example Filename: **TC_Class11.swd**

6. Socket Wedges

A socket wedge is defined as a wedge whose joints planes do not intersect the crest of the slope. The following shapes are socket wedges:

- Wedge # 1 (**TetHed_BFP_US**)
- Wedge #2 (**PntHed_SL_US**)
- Wedge #10 (**TC_CLASS6**)
- Wedge #11 / 12 (**TC_CLASS7 / TC_CLASS8**)
- Wedge #13 (**TC_CLASS9**)
- Wedge #14 / 15 (**TC_CLASS10 / TC_CLASS11**)

Socket wedges are formed assuming the maximum possible wedge size which can exist within the given slope dimensions (i.e. slope height, length and bench width).

If the Socket Wedges checkbox is unchecked in Project Settings, the resulting wedge size is scaled down until the wedge intersects the crest of the slope (at which point it is no longer technically a socket wedge). Try opening some of the above example files, uncheck the Socket Wedges checkbox, and view the resulting wedge.