

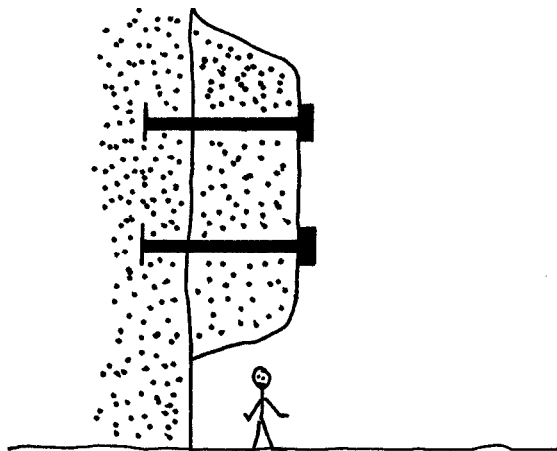
Homework Assignment 10

Rock Slope Stability

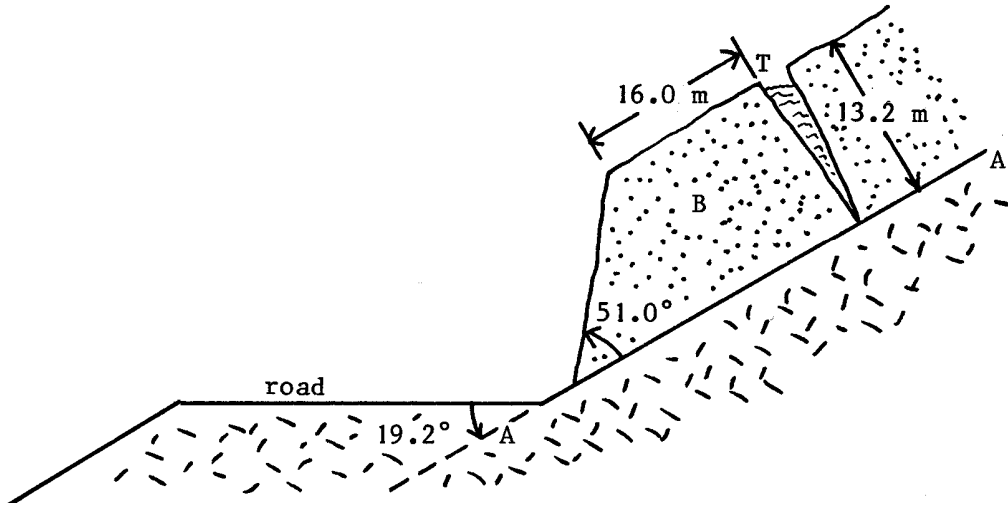
(Problems taken from *Computational Engineering Geology*, by E. Derringham, 1998)

Due Wednesday March 11, 2009

1. A 17.0 m, 5.80 m, 2.40 m block with a density of 2600 kg/m^3 rests on an 18.0° -slope with its shortest dimension normal to the slope. The angle of friction between the block and the slope is 12.0° and the cohesion equals 17.0 kPa. (a) Find the factor of safety against sliding. (b) Find the smallest extra driving force that will trigger sliding.
2. The slab shown in the figure below has a mass of $2.84 \times 10^5 \text{ kg}$, will drop if the vertical joint ruptures. The contact area is 38.0 m^2 . Between the slab and the cliff face, the coefficient of friction is 0.3 and the cohesion is equal to 73.3 kPa. To keep the slab from dropping, cables are installed. Each cable has an area of 8.42 cm^2 and is tightened to a tension of 410 MPa. How many cables are needed to get a factor of safety of 1.50?



3. The figure below shows the cross section of a road cut into the side of a mountain. The line AA is a weak bedding plane along which sliding is possible. The block B, 18.6 m wide, directly above a stretch of the road is separated from uphill rock by a tension crack T normal to AA. The dip angle of the bedding plane is 19.2° and the coefficient of friction between block B and the bedding plane is 0.39. The density of the block is 2.88 g/cm^3 . Ignore cohesion. (a). Show that the block does not slide. (b) Water seeps into the tension crack and freezes, exerting a driving force on the block. What value of this force will trigger a slide?



4. A slab of weight 28.0 MN sits on a 23.0° -incline. The angle of friction between the slab and the incline is 15.0° ; cohesion equals zero. (a) How many tightened rock bolts are needed to get a factor of safety of at least 1.5? The bolt specifications are: shear strength 230 MPa; area 5.80 cm^2 ; tightened to tension 86.4 MPa. (b) Due to an oversight, only 20 of the needed bolts actually are tightened; what is the real factor of safety?

5. Which if any, of the rectangular blocks in the figure below will topple. Assume no sliding.

