Tensile Stress/Strength Worksheet Name

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1. You and your friends perform the trapezoid test in your pit at the study plot on an angle of 45 degrees on a layer 50 cm below the surface. You get the following results:
ρ_{avg}= 210 kg/m^3
wb = 1 m
wf = 0.2 m
l = 1.5 m
What is the tensile strength found with your trapezoid test?

$$T_S = \frac{\rho_{avg} \cdot g \cdot l \cdot (w_b + w_f) \cdot (\sin\psi - \mu \cdot cos\psi)}{2 \cdot w_f}$$

$$T_S = \frac{210\frac{kg}{m^3} \cdot 9.81\frac{m}{s^2} \cdot 1.5m \cdot (1m + 0.2m) \cdot (sin45 - 0.1 \cdot cos45)}{2 \cdot 0.2m} = 5899.7\ Pa$$

2. On an adjacent slope with the same average density and same tensile strength as you found above, a slab avalanche released earlier that morning. The length of the slab was 5.5 m. What is the angle of the adjacent slope?

$$S_T = \rho_{avg} \cdot g \cdot l \cdot sin\psi$$

For failure, $S_T = T_S$

$$\psi = sin^{-1}(\frac{T_S}{\rho_{avg} \cdot g \cdot l})$$

$$\psi = sin^{-1}\left(\frac{5899.7\ Pa}{210\frac{kg}{m^3} \cdot 9.81\frac{m}{s^2} \cdot 5.5m}\right) = 31.4°$$

3. A few days later you go on vacation in Jackson Hole. Before dropping in to a sick line on a 40 degree slope, you stop to calculate the length a slab would have to be for failure in tension above a layer about 30 cm below the surface.
T_s= 8000 Pa
ρ_{avg}= 200 kg/m^3
length = ?

$$S_T = \rho_{avg} \cdot g \cdot l \cdot sin\psi$$

For failure, $S_T = T_S$

$$l = \frac{T_S}{\rho_{avg} \cdot g \cdot sin\psi}$$

$$l = \frac{8000\ Pa}{200\frac{kg}{m^3} \cdot 9.81\frac{m}{s^2} \cdot sin40} = 6.34\ m$$