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SOIL AND ROCK MINERAL CONTACT AREAS REVISITED

by

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The total normal force on any plane or wavy surface through saturated soil, sediment, concrete or rock is composed of force in the mineral fabric or matrix and the force in the water. These forces may be conceptualized as products of stresses and areas if the total area is very small. Of course, the sum of the two areas must equal the total area. Therefore

$$F_T = F_m + F_w$$

$$\sigma a_T = \hat{\sigma} a_C + u a_W$$

$$\sigma = \hat{\sigma} \frac{a_C}{a_T} + u \frac{a_W}{a_T}$$

and
$$\sigma = \hat{\sigma} A_C + u A_W$$

where F_T = total normal force acting on
 a_T = area total
 σ = total normal stress
 F_m = force in the mineral matrix acting on
 a_C = mineral contact area
 $\hat{\sigma}$ = mineral normal stress
 F_w = force in the water acting on the
 a_W = water area