

**RELATIONSHIP BETWEEN DIRECT SLIDING COEFFICIENTS AT  
100% COVERAGE RATIO ( $C_{ds100}$ ) AND  
AN ARBITRARY COVERAGE RATIO ( $C_{dsx}$ )**

**DEFINITION OF  $C_{ds100}$**

$$C_{DS100\%} = \frac{\sigma_n \tan \delta + a}{\sigma_n \tan \phi + c} \quad [1]$$

where:

- $\sigma_n$  = effective confining stress;
- $\delta$  = soil-geosynthetic interface friction angle at 100% coverage;
- $a$  = soil-geosynthetic interface adhesion at 100% coverage
- $\phi$  = soil friction angle; and
- $c$  = soil cohesion.

**INTERFACE DIRECT SHEAR TEST SETUP  
AT 100% COVERAGE RATIO**



Figure 1. Soil placed in the upper shear box and compacted on top of Parawebs to a specified unit weight. Cover ratio = 100%.

**DIRECT SLIDING COEFFICIENT AT AN ARBITRARY COVERAGE RATIO  
X<100%**

The coverage ratio, X, is defined as the ratio of the strip surface area  $A_R$  to the total representative area A (area ABCD in Figure 2):

$$X = \frac{A_R}{A}(100\%) \quad [2]$$

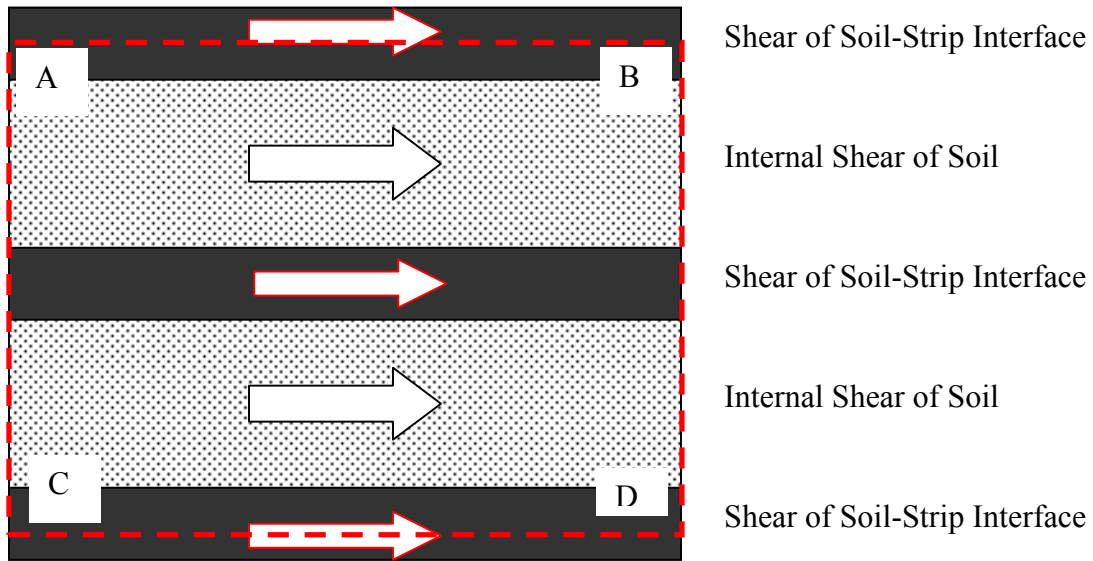


Figure 2. Plan view of soil and strip reinforcement.

The total shear force over area A is the sum of two shear forces: (i) soil/soil shear force and (ii) soil/strip interface shear force.

$$C_{DSX\%} = \frac{A_R(\sigma_n \tan \delta + a) + A_S(\sigma_n \tan \phi + c)}{A(\sigma_n \tan \phi + c)} \quad [3]$$

where:

$A_R$  is the strip surface area;

$A_S$  is the soil surface area; and

A is the total area.

Rearranging equation (3) results in the following equation:

$$C_{DSX\%} = 1 - X(1 - C_{DS100\%}) \quad [4]$$

The above equation shows at 0% coverage,  $C_{DS0\%} = 1$  (i.e., soil shear over soil)

The above equation shows at 100% coverage,  $C_{DS100\%} = C_{DS100\%}$  (math verification)

For the GreenWall system, assuming the “V” shaped Parawebs are spaced at 34” in the horizontal direction, strip width is 3.25”, then the actual coverage ratio X is approximately  $(6.5/34) = 19\%$ .

Based on the interface direct shear test results, the peak  $C_{DS}$  at  $x = 100\% > 0.7$ , then

$$C_{DS19\%} = 1 - 19\%(1 - 0.7) = 0.94 \quad [5]$$