

Typical Soil Properties

Bulk Unit Weight (γ)

This is typically 15 kN/m^3 for many top soils but can vary between 11 kN/m^3 for a loose dry soil to 18 kN/m^3 for dense wet soils. Figure 1 shows a range of typically recorded values.

Cohesion (c)

This is almost zero for dry loose sandy soils and can rise to over 100 kN/m^2 for hard dry clay soils. Friable (moist) sandy loam soils are typically in the range 5 to 15 kN/m^2 and moist plastic clay soils 10 to 40 kN/m^2 .

Angle of Internal Friction (ϕ)

Theoretically a pure clay would have a value of 0° and ϕ would rise with increasing sand content and density to approximately 40° for a compact sandy loam soil. Loose sands range between 25 to 30° . As pure clays are rarely found in top soils the typical value for a ‘clay’ soil would be in the range 5 to 10° .

Angle of Soil-Metal Friction (δ)

These values are also related to the frictional content of the soil and linked to the ‘roughness’ of the surface finish. Typical values of δ for a sandy loam soil sliding over a steel surface are 20 to 22° , however, these values can fall as the surface finish becomes ‘polished’ to 15° . These results suggest that the value of δ would lie between 0.5 to 0.7 of the value of ϕ .

Adhesion (Ca)

This can be considered negligible in all but wet “sticky” soils, with high clay contents. As this is a special case the value should be measured directly for any particular study.

Typical default values

The following values are suggested for use if further information is not available.

	Sandy Loam	Loam	Clay loam
Bulk Unit Weight (γ)	15 kN/m^3	15 kN/m^3	14 kN/m^3
Cohesion (c)	10 kN/m^2	20 kN/m^2	30 kN/m^2
Angle of Internal Friction (ϕ)	35°	20°	10°
Angle of Soil-Metal Friction (δ)	22°	10°	6°
Adhesion (Ca)	0	0	0