On-site Soil Testing

GENERAL CONSTRUCTION PRACTICE

Various **non-scientific** soil tests can be conducted on a construction site. These are 'indicator' tests that can be used to identify potential soil issues. If the tests indicate a potential problem, then a representative soil sample should be sent away for **official** scientific testing.

Soil texture

A ***general soil description*** may be inferred from the following soil properties.

Table 1 – Typical indicator properties for various soil textures

Soil texture	Indicator properties
Sandy soil/gravel	A coarse grained soil Soil grains are clearly visible Easy to shovel and break-up when compacted Very difficult to form a clod of soil when compressed in the hand
Sandy loam	Soils have a rough texture in the hand Easy to shovel and break-up when compacted Moist soils may form a clod when compressed in the hand Usually a well drained soil
Clay loam	Soils feel smooth in the hand, but some soil grains can be felt Difficult to break-up when compacted Easy to form a clod when moist soil is compressed in the hand Slightly sticky when wet
Clay	Soils feel very smooth and sticky when wet Very difficult the shovel and break-up when compacted Readily forms a clod when compressed in the hand Usually a poorly drained soil

Soil pH

Soil pH is an indicator of potential revegetation problems. A representative soil sample is formed by mixing at least five samples from holes dug in different part of an area of interest. If the soil being tested is a topsoil, then collect each sample such that it is representative of the top 10cm of soil, but do not include any material that is obviously a subsoil.

After mixing the collective soil sample well, place a level teaspoon of the mixture on a test plate (supplied with the pH test kit). Add drops of the indicator liquid until the sample can be stirrer into a thick paste. Then dust the sample with the white powder supplied in the test kit, wait one minute, and read from the colour card the soil pH based on the colour nearest to the sample.

Photo 1 – Soil pH test kit

Photo 2 – Tested soil sample

Acid sulfate soils

Soil pH is **not** a good indicator of potential acid sulfate soils. In in-risk areas (i.e. soils obtained from land with a surface elevation less than 5m AHD), professional soil testing and the adoption of strict soil management procedures are essential.

Soil moisture

Ensuring the correct soil moisture is important when mechanically working a soil. If the soil is too dry it will pulverise the soil, if too wet it may lead to clodding or hardsetting—particularly if the soil has a high silt or clay content. Prior to conducting earth works, the soil should be wet enough to form a clump when squeezed by hand, but not wet enough to drip water while being squeezed.

Settling properties

The 'jar settling test' is primarily used to indicate the settling qualities of a soil, but it can also identify a soil that may be dispersive. The test involves placing a crushed soil sample in a clear jar containing distilled (de-ionised) water. The sealed contents are shaken vigorously to further break-up the soil sample. The jar is then left undisturbed for up to 5 days. If the suspended soil settles leaving the water clear, then there is a low risk that the soil is dispersive (Photo 5).

If the settled soil sample leaves the water 'slightly' cloudy after 5 days, then the soil may be dispersive. If the water remains significantly cloudy after 5 days (Photo 6), then there is a high risk that the soil is dispersive.

The test can also be used as an indicator of the percentage fraction of fine and coarse sediments within a soil sample (Photos 3 & 4). A soil sample that settles very slowly (Photo 4) indicates that the clay may not be dispersive, but instead has a very fine grain size that settles very slowly—these soil may or may not respond favourably to chemical coagulation.

Photo 3 – Separate layers of clay, silt and sand visible in settled sample

Photo 4 – Slow settlement after 1-day indicates a very fine clay

Photo 5 – Good settlement indicates soil is unlikely dispersive

Photo 6 – Poor settlement indicates a high risk of dispersive properties

Soil dispersion

There are two on-site tests that can identify if dispersive soils may be present. The most common and reliable test is the *Aggregate Immersion Test*. The other less reliable test is the *Jar Settling Test* (discussed above).

The testing procedure involves filling a dish or jar with distilled water to a depth sufficient to cover the soil samples. Several dry, hard clumps of soil (about 5mm square) are gently placed in the water (don't put the soil in the dish before the water is added). The sample is then observed after being left undisturbed for an hour.

Non-dispersive: Water remains clear though particles may slightly collapse. The boundary of clumps remains clearly defined (Photo 7).

Slightly dispersive: Discolouration surrounding particles or distinct cloudiness surrounding some. Boundary of clumps vaguely defined (Photo 8).

Dispersive: Dispersive and cloudiness surround most or all particles (extending vertically). Boundary of clumps not able to be defined.

Highly dispersive: Discolouration extending vertically throughout most or all water. Highly dispersive or slaking soils will collapse in less than 10 minutes. A cloudy ring will be seen around the collapsed soil when it is dispersive (Photo 9).

Slightly slaking: Water remains clear. Boundary of clumps vaguely defined.

Slaking: Water remains clear. Boundary of clumps not able to be defined. The clumps completely collapse and spread horizontally (Photo 10).

If the soil sample collapses as air rushes out of the sample, then this does not necessarily indicate a slaking soil. Such a response is typical when testing disturbed, poorly compacted soil clumps. What is more important is what happens to the clumps **after** all the air has escaped.

Photo 7 – Typical response of a non slaking, non dispersive soil

Photo 8 – Typical response of a slightly dispersive soil

Photo 9 – Typical response of a dispersive or highly dispersive soil

Photo 10 – Typical response of a slaking soil