

Soil Stabilisation with lime, cement and other binders



bla british lime association





■ Theory

- Why stabilisation
- Chemistry of stabilisation
- Binder choices

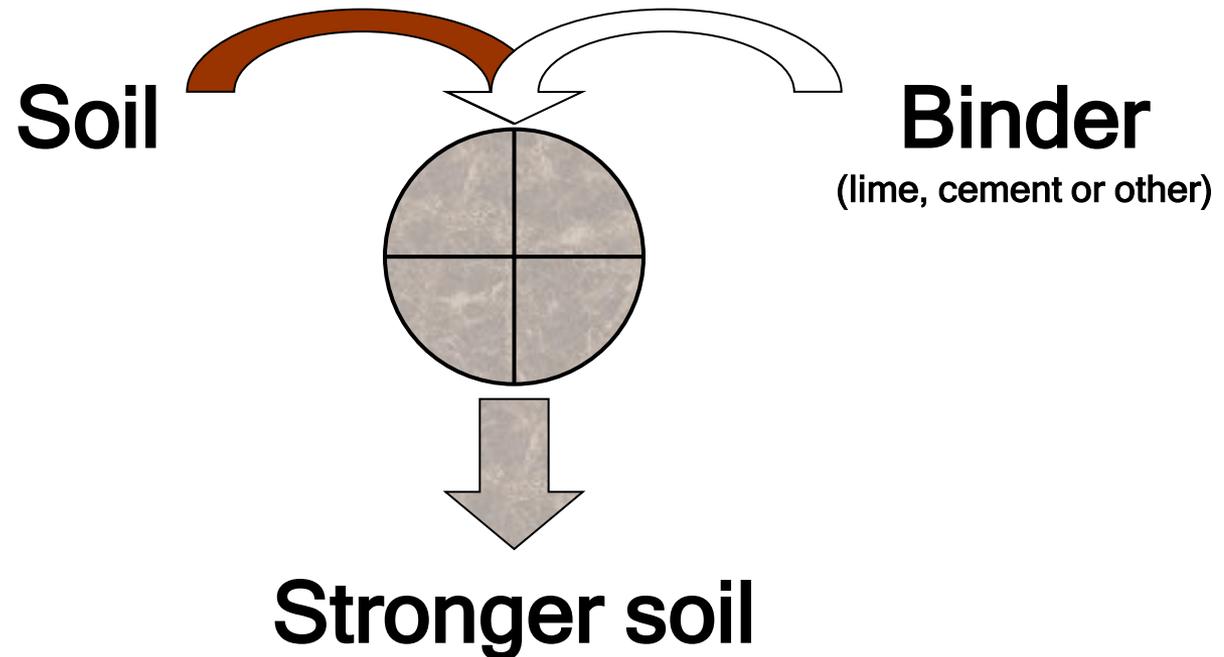
Why Stabilisation ?

- Sustainable process:
 - Use on site materials / achieve recycling targets
 - Reduce waste generation
 - Reduce primary aggregate imports
 - Reduce traffic movements on and around site
- Financial and Operational benefits:
 - Reduce project timescales
 - Ability to work in winter months
 - Reduce landfill tax costs
 - Reduce project costs
 - Increase profitability



Chemistry of stabilisation

- What is soil stabilisation ?
 - The treatment of all types of soils* with a range of binders to provide a material that is fit for a specified purpose or has a specified strength.
 - *Soils can be anything from gravel to clay



Chemistry of stabilisation

■ Stages of stabilisation

Soil Improvement
(instant)

Only with lime
Reversible

Soil Modification
(~ 2 hours)

Clay soils
Non reversible

Soil Stabilisation
(long term)

Clay soils
Non reversible
Granular soils use
cement or mixed
binder

Chemistry of stabilisation

■ Soil Improvement

Soil Improvement
(instant)

Drying reaction

Quicklime + moisture from soil
= chemical reaction + **HEAT**



Add more quicklime and lose more moisture

Lime chemically binds 32% of its own weight of moisture

More moisture lost by evaporation due to heat

Reversible process !

Chemistry of stabilisation

■ Soil Modification

Soil Modification
(~ 2 hours)

Physical change to the soil structure

Clay platelets reoriented

Reduces soil plasticity

Non reversible

Chemistry of stabilisation

■ Soil Stabilisation

Soil Stabilisation
(long term)

Cementitious reaction

calcium + silicates and aluminates from soil = cement like product

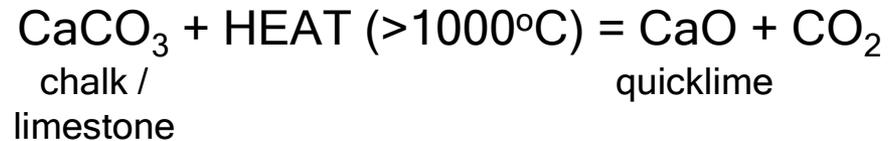
Non reversible

Long term strength gain continues over many years

Binder choices

■ Lime

- Lime is usually quicklime
- Made by heating chalk or limestone in a kiln



- Used in bulk or bags
- Lime for stabilisation should be CE certified to BS EN 459 “Building Lime”



Binder choices

■ Cement

- Cement used to strengthen soils that have been pre-treated with lime.
- Used alone on granular soils
- Sub base material with CBR values in excess of 50
- Greater stiffness
- Frost resistance
- Increased trafficability



Binder Choices

- (GGBS) Ground Granulated Blastfurnace Slag
 - Activated with lime
 - Slower initial set than cement - more working time
 - Can be used to mitigate effects of sulfates
- (PFA) Pulverised Fuel Ash
 - Activated with lime
 - Slow initial reaction but significant final strength
 - Useful filler - used at large percentages

Binder choices

■ Hydraulic Road Binders

- Blends of lime, cement, GGBS or fly ash
- Formulated for specific applications or performance
- Fast setting - cement based
- Slower setting - lime based
- Widely used in Europe and rest of World
- New in the UK, but already widely used.

