The treatment of soils with Quicklime to produce subbase and roadbase materials.

As an additive to soils, quicklime is an effective material for stabilising the soil's properties. It can enhance the soil's strength and plasticity, making it suitable for use in pavement layers. This is achieved by first conditioning the soil with lime, and then adding the binders. The process is therefore a two-shot operation (two stage).

The properties that quicklime produces in the soil are beneficial in the following ways:

- It reduces to minimum content that occur as the quicklime reacts with moisture.
- It reduces the change in properties due to physical-chemical reactions. The soil stabilisation process is in the drying of clays and in the soil water.
- It improves the soil water stability.

In summary, adding quicklime to the soil improves its properties in the following ways:

- Soil can be treated using quicklime and binders to produce materials suitable for subbase and roadbase materials.
- The properties that quicklime produces in the soil are beneficial in the following ways:
  - It reduces the change in properties due to physical-chemical reactions. The soil stabilisation process is in the drying of clays and in the soil water.
  - It improves the soil water stability.
- The treatment of soils with Quicklime to produce subbase and roadbase materials.

Considering these points, the values given below are a guide for these types. There will be varying to account for the specific requirements of each application and should be adjusted by the designer as appropriate.

**Performance requirements**

- Long term structural performance such as strength and/or stiffness.
- Resistance to frost.
- Moisture stability.

**Notes**

- Compaction stress for long term performance should not be less than 1.5 MPa for subbase and 3.5 MPa for capping. Corresponding stiffness values as determined in the Nottingham Asphalt Tester (NAT) would be 1000 and 500 MPa.

**Laboratory**

- The compressive strength for frost resistance will vary according to the properties of the material and the thickness of the overlying cover. If specific frost resistance tests are to be carried out, a compressive strength of 0.5 MPa should be used. This value is determined in the Nottingham Asphalt Tester (NAT).

**Performance requirements**

- Correlating all the type of application being considered, the material requirements will include:
  - Long term structural performance such as strength and/or stiffness.
  - Resistance to frost.
  - Moisture stability.

- Compaction stress for long term performance should not be less than 1.5 MPa for subbase and 3.5 MPa for capping. Corresponding stiffness values as determined in the Nottingham Asphalt Tester (NAT) would be 1000 and 500 MPa.

- Flexibility requirements will vary according to the material age when testing will start and the degree of performance afforded by any subsequent treatment. For long term performance, the minimum compaction stress of 0.5 MPa is recommended.

- Compressive strength for frost resistance will vary according to the properties of the material and the thickness of the overlying cover. If specific frost resistance tests are to be carried out, a compressive strength of 0.5 MPa should be used. This value is determined in the Nottingham Asphalt Tester (NAT).

**Notes**

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This process may be carried out in situ or ex situ depending on the type of soil. Granular materials and low plasticity soils can usually be mixed in situ with a rotovator or ex situ in a pugmill and are generally processed in situ. The following steps are required for in situ construction.

1. **Site preparation to approximate levels.**
2. **Rotovate the lime into the soil to achieve thorough mixing.** Adjust the water content to ensure the lime hydrates fully.
3. **Spread the second binder at the predetermined rate and thoroughly mix this into the soil layer.**
4. **Remix after the lime has mellowed the soil and the necessary pulverisation can be achieved.** Lightly roll after the re-mixing.
5. **Fully compact within the time limits for the additive used and trim to level.**

Note: When two-stage mixing is used samples that are being conditioned shall be kept in sealed containers in a compacted state. Where two-stage mixing is used site testing is required to confirm achievement of the specified pulverisation. Lightly compact the mixed layer to seal the top surface.

Control testing
The parameters that dictate the properties of the processed material will be determined from the laboratory testing. These must be conducted on site to ensure that the material is being handled in a manner that results in properties that meet the specification. The material must be transported and laid within 2 hours.

**References**
13. **www.britishlime.org**

**Results**
Pavements
Technical information techniques are therefore associated with the ability to work on the environment. The number of different uses depend on the material used. These techniques are all associated with applying a material and importing or exporting it. The use of lime allows the manufacturer and the user to alter the material to suit their requirements. Lime is particularly useful in the fine granular soil as the relationship is linear. It is particularly useful in trafficing. The following will determine the percentage of lime required to condition the soil. This will affect the moisture content, plasticity and pulverisation. Pulverisation should be in excess of 12/13 in accordance with BS1924 for mixtures of granular materials. The material must be stored in sealed conditions for one hour prior to the process both in terms of the periods of maturing and the temperatures at which samples are stored.

It will provide structural stability to the mix immediately after compaction is required. At 28 days it may produce a greater strength than OPC but is significantly less resistant to the effects of sulfates. As with GGBS care must be exercised in cold weather to ensure that sufficient moisture content is present to prevent damage. It has the slowest strength gain and can be used as a matrix providing the moisture content is within correct limits. It has some resistance to the effects of sulfates. As with OPC and GGBS, care must be exercised in cold weather to ensure that sufficient moisture content is present to prevent damage.

The accelerated CBR test is a way of reducing the maturation time required to achieve the specified pulverisation. Lightly compact the mixed layer to seal the top surface. Check that the moisture content is sufficient to hydrate the second binder and also allow the required degree of pulverisation.

Fully compact within the time limits for the additive used and trim to level. Beats the addition of lime to the soil to achieve conditions that will effect the moisture content.

Reference