



CONSOLID UK LTD
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THE REASONS FOR SOIL STABILISATION

How the CONSOLID SYSTEM differs from all other methods in use for this purpose (3)

Last month we dealt with the possibilities of showing on laboratory test results, ahead of any field application, the unique effectiveness of the CONSOLID SYSTEM with any type of soil. This fact makes it possible to consider already in the design of any earthwork the possible upgrading of a treated, in-situ soil and opens the way to a

Performance-based Specification.

The design can make full use of the fact that treated in-situ soil has been upgraded by classes, increasing the loading capacity of the in-situ soil by the factor 3 to 5 and in more than 50% of all cases - especially with lower classes of soils - more than 5 times.

WHAT DOES THIS MEAN?

Certain CBR values (or comparable parameters) are required for certain types of roads. In the base course of rural roads, this is in most cases CBR 35%, whereas highways / motorways ask for CBR 80%.

Owing to the fact that the CONSOLID SYSTEM upgrades an in-situ soil 3 to 5 or even more times, you can realise these required figures already by using soils for rural roads, starting with an untreated soaked CBR of 5 to 7%, while for highways and motorways untreated soils with a soaked CBR value of 20% will allow to get with the CONSOLID treatment the required CBR of 80% and more.

This means reducing the demand for borrowed material to a minimum and generates great opportunities to save costs.

IN DESIGN, THESE IMPROVEMENTS CAN BE FULLY RESPECTED.

As mentioned before, conventionally for rural roads CBR 35% and for highways / motorways CBR 80% are needed. The local requirement can be 3 to 5 times lower for the in-situ construction material, because with the CONSOLID SYSTEM you can upgrade such in-situ soils and obtain these desired figures permanently.

Important for the proper design are the **static suppositions** as well as the **dynamic forces** shown in the vibrations caused by the traffic density – the more traffic, the more vibration energy influences the performance of the road embankment.

The following graph shows the static situation and how to take it into account with the depth of the embankment. The top load is sharply reduced with the depth of the embankment, and in this way, it is possible to respect the low loading capacity of the subgrade. The distribution of the loading, therefore also the reduction of the load per unit, can be calculated for well graded, well compactable construction material in an angle of 90°; for less well graded material this angle will be reduced to 60°.

These improvements of the soil mixtures can easily be carried out on the site. But the system also offers the possibility of realising them in central mixing plants, where soil mixes for all purposes and in any desired quality can be produced – always at the same high quality – by pre-treatment. The CONSOLID SYSTEM offers the unique possibility of pre-mixing and stockpiling the treated material without loss of the permanent improvement of the treated soil mixes.

See in the following a typical cross section of a road embankment. The pavement layers have to be placed on a stable, well-compacted sub-grade, being a natural one of a fill.

In road construction, **the first step** always has to be **the proper drainage** of water away from the embankment. Therefore, before the embankment is constructed, you will have to take care that surface water (meteor water) will be drained off the road. However, it is also necessary, especially in hilly areas, to take care of springs, which may exist in the area of the embankment. On soil roads, such springs can often be spotted by the fact that they are dust-free, even if the rest of the road is dry and dusty. Ditches beside the road embankment should always be constructed in a way that the water cannot 'eat' into the soft soil and hollow out the embankment.

EROSION CONTROL: The CONSOLID SYSTEM offers also for this purpose the possibility of lining the ditches with treated, impervious soil mixes to reduce water erosion to a minimum. Erosion control on the slopes of road embankments is another possibility of using the benefits of the CONSOLID SYSTEM.

THE DYNAMIC FORCES, which develop under the load bearing of the traffic, are responsible for permanent deformation of those layers in an embankment which consist of non-cohesive material (gravel sand and crushed stones). Caused by vibration, there is a permanent movement of the loose material, a sieving and separation of particles of the same size, leading to deformation and deflection.

This effect is sharply reduced with embankment soil layers, treated with the CONSOLID SYSTEM, due to the fact that such soil mixes will contain sufficient clayey and silty fines to fill the voids and allow a dense packing of the treated soil. Such layers are also flexible and remain in the built-in level, because there are no more changes due to periodical shrinking and swelling caused by changing moisture contents.