CONSOLID TOPICAL

CONSOLID UK LTD
4 2003
THE REASONS FOR SOIL STABILISATION

How the CONSOLID SYSTEM differs from all other methods in use for this purpose (4)

Going into the depth of soil instability, you will always be confronted with the sensitivity of all – especially cohesive – soils against **water**. Cohesive soils do not pose stability problems when dry, but their compressive and tensile strength deteriorates as soon as it is exposed to water. Therefore let us discuss this matter in details:

Water causes instability of soils, especially if their content of clayey, silty fines is effective.

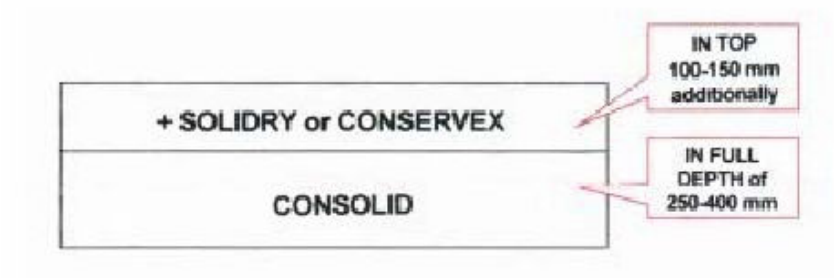
Water causes these fines to swell and destroy any stability. This fact makes such soils unacceptable as sub-base and base course material and even in the subgrade they may cause severe problems. In conventional constructions such soils are excavated and replaced by better material.
This expensive exchange is becoming more and more questionable due to the fact that the resources for exchange material are scarce or are already exhausted and the costs for depositing the excavated material in landfills are skyrocketing.

SOIL STABILISATION CAN BE THE WAY OUT OF THESE PROBLEMS...

... on the prerequisite that it is possible to upgrade the in-situ soil to risk-free construction material, as it is the case with the CONSOLID SYSTEM. And this leads now back to the water influence, which is the most visible negative effect against stable conditions. Water softens the soil from the top as meteor water (rain, floods, etc.) by seeping into the soil, but of equal importance is the capillary rise of water, which can for cohesive soils lead to full saturation and more and destroy the stability completely.

We have to deal with two types of water:
METEOR WATER (surface water, rain)
CAPILLARY SATURATION (caused by capillary rise of water)

METEOR WATER, i.e. water which seeps from the surface BY GRAVITATION into the soil, originates from precipitation (springs, rain, snow, thaw) and should usually not reach the soil layers in a road embankment because, as we discussed in the last issue. Such water should be always be trained away from the construction as the absolute first step in the realisation of an earthwork.



MOISTURE that saturates the soil BY CAPILLARY RISE OF WATER is the other kind of water harming the soil stability from the bottom. The higher the amount of fines in a soil is, the more sensitive is it towards water and the higher is its capillary rise.

Permanent SOIL STABILITY can be reached only if the influence of water can be reduced to a minimum with the aim to keep the moisture content, even in the wet seasons, close to the O.M.C. or below.

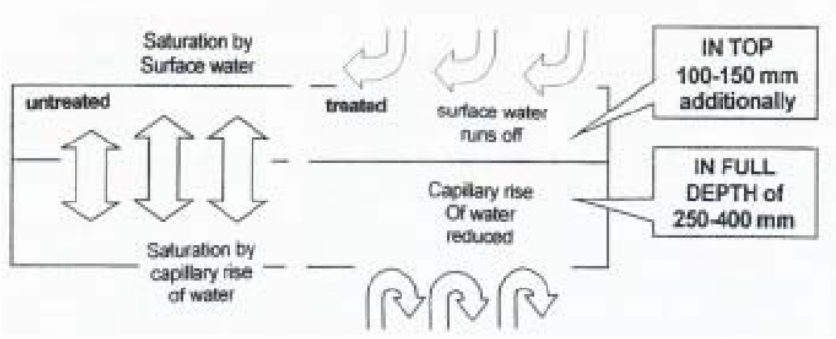
One important aim of the CONSOLID SYSTEM is to obtain as much as possible influence in the behavior of a treated soil against water.

- It seems easy to get control over the water sensitivity of soils – you make the soil water repellent and the problem is solved. This path has often been tried, but it never achieved its goal, because any soil that is really made water repellent disintegrates into dust, if it is not always moist; it even floats away on water, remaining dry.
- Water always reduces the inner friction of a soil and thus reduces the compressive strength and stability, leading to a circle of swelling when moist and shrinking when drying – a behavior which cannot be controlled by binders in a satisfactory manner.
-

The CONSOLID SYSTEM can change the behavior of all kinds of soils in a permanent way and secure a lasting reduction of the softening influence of water, which can be tailored to the local requirements down to total impermeability.

The CONSOLID SYSTEM operates with two alternatives and three additives:
CONSOLID 444 + CONSERVEX or CONSOLID 444 + SOLIDRY.
These two alternatives cover 100% of all kind of soils existing on our globe. CONSOLID 444 "consolidates" the treated soil and is the main prerequisite for all soils to get the desired improvement. CONSERVEX as well as SOLIDRY are the two complementary products which "preserve" the effect of CONSOLID 444. Let us discuss the effectiveness of the additives of the CONSOLID SYSTEM, based on the graph on page 2:

Any soil layer treated with the CONSOLID SYSTEM will be treated in full depth with CONSOLID 444, whilst the additional treatment of this treated soil with CONSERVEX or SOLIDRY may be reduced only to the top 100-150 mm of a treated layer.
The reason is that CONSERVEX as well as SOLIDRY have to protect the top layer from the seeping- in of meteor water, which has to be prevented. The treatment with CONSOLID 444 has reduced the capillary rise of water remarkably, but the capillaries still exist, act as drains and fill up with surface water if there is no protection by the complementary products CONSERVEX and/or SOLIDRY. Which of these two additives will be used has to be decided upon the results of informative laboratory tests.



CONSERVEX and SOLIDRY protects from surface water CONSOLID 444 reduces the capillary rise of water

Acting from both sides, this double action secures the great effectiveness against the destructive influence of water in a permanent way and favours the further and growing increase in soil stability.

The CONSOLID SYSTEM allows a full control of the water sensitivity of any in-situ soil or soil mix as a main supposition for permanent stability without affecting other physical and chemical properties of the treated soils.

- Water plays a main role in the proper handling of soils. Each soil can be compacted to highest possible density only at a determined optimum moisture content (O.M.C.), which always differs due to the changes in the soil composition, the kind of minerals as well as the season.

The CONSOLID SYSTEM cannot only control the behavior of the treated soil with regard to softening by water; the fact that the CONSOLID SYSTEM can be used at any time, even with too wet soils, is another main advantage of this system.

As mentioned above, when used "in place" on the site, the CONSOLID SYSTEM has to respect the physical laws, which allows highest density only by compaction at O.M.C.
But the CONSOLID SYSTEM can be also used "**in plant**", i.e. by treating too wet soils in a central mixing plant (bug mill, concrete mixer, etc.) during the wet season, to stockpile the treated material in heaps until the weather allows to place the treated soil on the site. The full effectiveness can even be preserved over long storage periods. Often waste material from quarries, gravel pits, recycling plants, can be upgraded in this way and be converted into saleable commercial goods.

This Monthly Letter only describes the influence of the CONSOLID SYSTEM in its most visible effect – the control of the water influence to the soil stability – but the system works in a complex way, which secures the permanence in the effectiveness of the CONSOLID SYSTEM and the reliability of the result. This is known ahead, based on informative laboratory tests, before you start working in the field.

This is a very strong argument for using the CONSOLID SYSTEM with any soil.

Next month we will discuss the commercial aspects of the CONSOLID SYSTEM, the possible SAVINGS in DESIGN and CONSTRUCTION as well as MAINTENANCE, compared with conventional construction methods.