Road Bases are conventionally stabilized additives like Cement / Lime. However, there are still some challenges, which Zydex nanotechnology helps overcome.

**KEY CHALLENGES OF SOIL STABILIZATION**

- Poor Flexibility (Cracks tend to form when cement addition is above 4-5%)
- Inconsistent Densities
- Swell under wet conditions
- Loss of strength due to Wet & Dry Cycles (Carbonation & ASR) and cyclic loading.

**ZYDEX NANOTECHNOLOGY - PRODUCTS & FEATURES**

- **TerraSil** is a water soluble, UV and heat stable, reactive soil modifier to reduce swelling. Spray of TerraSil solution waterproofs compacted soil surface up to 10 mm depth.
- **ZycoBond** is a UV and heat stable, cross-linkable soil modifier. It is a nano sized acrylic co-polymer dispersion in water. It complements conventional stabilization methods by imparting water resistance and flexible bonding to the soil.

**ZYDEX NANOTECHNOLOGY - BENEFITS**

**Improved flexibility with strong bonding**

- **ZycoBond**, the new generation nano polymer (particle size < 90 nm), at its typical dosage per m³ of soil, has almost the same number of polymer particles as soil particles.
- This leads to higher number of contact point for flexible bonding, which improves the fatigue resistance of cement and lime stabilized soils.

**Higher Compaction and Consistent Densities**

- TerraSil chemically converts water absorbing silanol groups to water resistant alkyl siloxane surfaces at ambient temperature.
- Nano layer of alkyl siloxane chains on the soil particles provides charge shielding to reduce the repelling effect between soil particles and Alkyl chains give better lubrication for compaction compared to water alone.

**Reduced Swell Potential**

- TerraSil restricts swelling to < 5 % for expansive soils. The resultant lower swelling pressure substantially reduces undulations and cracking and maintains low hydraulic conductivity.

_The net result will be a stabilized soil base which is flexible with higher density, low swelling pressure and water resistant, resulting in improved durability._
GRANULAR - SOIL MIX (GSM) FOR OPTIMIZED ROAD BASES

Concept of GSM

Baring a few exceptions, in most parts of the world, soil CBR falls in the range of 4% to 20%.

For most of these soils, it is possible to achieve adequate structural strength, by mixing local soils with Zydex additives (Terrasil and ZycoBond) and granular materials (proportion may vary according to the soil type and type of local granular materials) to form a Granular-Soil Mix, which we call as GSM. This GSM can now replace conventional structural layers of the road bases, like GSB or stone layers and enables optimization of pavement layer design, because the GSM forms strong, flexible and water-resistant layers.

Design of Road Bases with GSM

Consult Zydex engineer for optimized pavement layer design, to achieve strength (CBR, UCS etc) and the structural numbers required, for each layer individually and final target structural number of the pavement.

Once the GSM recipes for each layer are determined, prepare mixes in the laboratory and test the parameters like CBR, UCS, water permeability, swell index, wet-dry durability etc. Fine tune the recipes for each layer, in consultation with Zydex engineer, until all target parameters are achieved in the laboratory.

Once the optimum pavement design is finalized and recipes for different layers are validated by lab testing, pavement construction at the site may be undertaken.

Pavement construction

For rural or low traffic roads, in most cases, it is possible to build a single GSM layer in-situ if soil CBR is >4%, according to the GSM recipe determined. At the time of construction,

• Measure the in-situ soil moisture and calculate additional water quantity to be sprayed to bring the mix to OMC (predetermined in the lab) level.

• Prepare Terrasil and ZycoBond solution in this additional water quantity and keep it ready for spray.

• Spread granular material and cement on the surface as per the recipe, and spray the solution at a rate, so as to administer Terrasil and ZycoBond dosage as per the recipe.

If soil mixing and stabilization equipment is available, this layer can be built in-situ, in one operation, as illustrated above. If not, mix the granular material and cement with soil with agricultural rotavators. Go for the 50% of the quantity of Terrasil-ZycoBond spray. Scourify and mix well after spray. Repeat this with the balance 50% Terrasil-ZycoBond solution.

• Before compaction, ensure by ‘ball formation method’ that the mix is at OMC and go for roller compaction.

• Keep rolling until minimum 98% proctor density is achieved in the field.

In case of highways or high traffic roads, road bases may have multiple GSM layers, each layer having its own recipe as determined earlier. Build each such layer according to the recipe, following the same procedure as above. Go for prime coat and asphaltic layers, as per the design.

Note: For soils of CBR below 4%, consult Zydex engineer.

NOTE: With cement restricted to 3%, typical target values achievable for stabilized soil and GSM, with Zydex technology are 300+ MPa and 800+ MPa, respectively, corresponding to layer coefficients of 0.2 and 0.3 per inch.

STORAGE & SHELF LIFE

Store Terrasil between 0 to 45 °C (32 – 113 °F) in a shaded, dry area away from sunlight, heat, source of sparks, rain and standing water. Fasten the container lid securely after every use. Its shelf life is 48 months.

Store ZycoBond between 5 to 45 °C (41 – 113 °F) in a shaded, dry area away from sunlight, heat, source of sparks, rain and standing water. Fasten the container lid securely after every use. Its shelf life is 48 months.

DISCLAIMER

Whilst the information contained herein is true, accurate and represents our best knowledge and experience, no warranty is given or implied with any recommendations made by us, our representatives or distributors, as the conditions of use and the competence of any labour involved in the application are beyond our control.

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