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HOW ROADBOND EN 1™ WORKS

Expansive clay soils are a real problem in the DFW metroplex. They are detrimental not only to building foundations, but to road structures as well. The DFW area seems to have an abundance of that class of clay mineral with a high Plasticity Index known as Smectite. This particular mineral is very complex and has multiple layers and a large number of electrically charged molecular sites. Under an electron microscope it would look like an agglomeration of fish scales. The large surface area per unit weight (as much as 800 square meters per gram) gives it a very large electrical charge. Since water is di-polar with a positively charged hydrogen atom at one end and a negatively charged hydroxyl ion (OH) at the other end, a particle of clay can attract and hold a large number of water molecules. Water can also be contained within the surface layers of the mineral. This characteristic is what gives Smectite clays their expansive properties. The electrical attraction between the hydrogen atom and the hydroxyl ion is what gives water its surface tension. However, water is said to be "weakly ionized" with a valence of only one. The Smectite clays contain relatively large amounts of strongly ionized calcium, aluminum, magnesium, and other compounds.

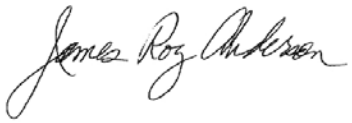
ROADBOND EN 1™ provides strongly ionized acids, soaps and oils which allow an ion exchange process to take place on the surface of the clay minerals in which much stronger bonds are formed and free water is released. Aluminum Silicate, the major component of clay, is soluble at low pH levels, but reforms in closer, tighter bonds as the pH level of the subgrade returns to near neutral and the soil mass is compacted. This characteristic explains why ROADBOND EN 1™ works best in moderate to high plasticity clays as the presence of aluminum silicate is much greater in those clays. In addition, the metals and other materials in the clay combine with the sulphonated materials in ROADBOND EN 1™ to form stable compounds of Calcium sulfate (Gypsum), Aluminum Sulfate (sometimes incorrectly called alum), and Magnesium Sulfate (Epsom Salts). Calcium Sulfate is sometimes used in unpaved roads to provide structure to soils. Aluminum Sulfate is widely used in water treatment as a flocculating agent and Epsom Salts is a stable hepta-hydrate compound which binds a large amount of water. The soaps in ROADBOND EN 1™ break the surface tension of water and allow the process to take place more readily. It also acts as a compaction agent. The process takes place quite rapidly and is controlled to take place just below optimum moisture. Additional water is then added to bring the soil mass to an optimum condition for compaction. This additional water together with the natural alkalinity of the soil

helps bring the pH level of the subgrade back to near neutral, thus making the silicates insoluble again. Curing time is typically less than 24 hours and no remixing is required. Machine time is therefore reduced when compared to Lime stabilization. ROADBOND EN 1™ does not destroy the impermeable nature of clay and typically improves that feature by an order of magnitude. That factor allows sub-grade treated with ROADBOND EN 1™ and properly shaped to shed water quickly.

ROADBOND EN 1™ is applied in diluted form and does not generate the adverse reaction in tree roots that sometimes occurs when sub-grades are stabilized with lime. Tree roots will always react negatively to the highly caustic environment required for the lime equations to work. If they cannot acquire sufficient moisture from the soil, they will take water from the paving material itself, whether it be asphalt or concrete.

ROADBOND EN 1™ does not contain Calcium and the presence of high sulfate soils does not create a problem with “soil heave”: as the Calcium/aluminum/sulfate hydrate known as Ettringite cannot form. Although ROADBOND EN 1™ can be, and often is, used in combination with cement or fly ash to improve the characteristics of those materials and to reduce cost, those materials, all of which contain calcium, should not be used with ROADBOND EN 1™ where high sulfate soils(above 2000 ppm) are known to be present.

ROADBOND EN 1™ was tested extensively at the Texas Transportation Institute (TTI) against lime and several other chemical stabilizers. The project was funded by TxDOT in an effort to find a stabilization material that could be used in the High Sulfate Soils prevalent in the Eagle Ford geological formation. ROADBOND EN 1™ and one other chemical stabilizer outperformed lime and all the other chemical stabilizers in almost every area tested. The results of that study may be found on the ROADBOND EN 1™ website.



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