StaBuilt™
Soil Stabilization

StaBuilt™ is an all organic potassium-formate solution that also contains a cationic polymer to stabilize and prevent movement of soil containing as little as 2% and up to 70% clay content. It contains no harmful chemical compounds, such as chloride, which can be harmful to plant and animal life. It has been used for 35 years in the oil industry to stabilize the well walls of holes drilled over 1 mile deep. It can now be used for fixing soils in roads, dams, mines, and pipelines. It can also be used to prepare soil for foundations and parking lots.

In areas that experience drastic weather changes water can invade tiny spaces and then freeze, causing an expansion of penetrated areas. As the water freezes and expands the soil's mass, anything placed on top of it will crack. This problem is commonly seen in roadways where fissures run from high to low elevations, and in housing foundations. In places where water has not drained thru the soil and remains, these freeze/thaw conditions result in sink holes, pot holes, and erosion. Erosion of loose, damp soil can cause many problems, including shifting of railroad ties and tracks, which could lead to derailment and delays in the movement of transit of people and commercial products. Movement of cellular towers, telephone and electrical poles can cause outages or interruptions in service.

Our products are available in wet or dry form wet or dry depending on the needs of the project. **StaBuilt**™ is a solution that can be sprayed onto dry road beds to control dust, walls of old mines, or in preparation for laying pipe. **AddSorb** is a dry formula that can be mixed in with wet soils to prevent additional water accumulation and to adsorb water that slows down the construction process. To prevent soil expansion and contraction from freeze/thaw conditions the product can be mixed or injected into soil below the freeze line to prevent damage to structural integrity. Like calcium chloride products, the integration of this product improves compaction density and strength of constructed roadbed. However, unlike Calcium chloride, the potassium formate formula has a lower acid base and is not destructive to plant and animal life.

StaBuilt™ can be injected into loose soil with a pre-existing structure. This high pressure injection method is particularly useful in fixing soils around faulty foundations where erosion may cause foundations to slip or slide from their center. The treated soil becomes permanently fixed with a covalent bond reducing damage to structural supports. The product is completely organic and can be injected deep into the hillside without contaminating natural aquifers. High pressure injection can be used for securing dam walls, retaining walls, or road cut aways.

StaBuilt™ can also be used to treat sub-surface excavation, such as basements of building structures, tunnels, or below ground parking garages. Depending on soil composition and water saturation levels, StaBuilt can be sprayed onto or injected into the walls of the dig to prevent loose soil from slipping during the construction phase. For saturated soil, however, the product may be more efficient in dry form. Addsorb is a dry product that can be mixed into water logged soils to absorb moisture and fix soils. In dry form AddSorb will absorb the excess moisture in marshy soils where roads and railways are typically laid down and once dry will prevent further saturation. By adding AddSorb to the wet soil, the soil becomes fixed to the polymer, leaving no room for water to attach. No more construction delays while waiting days for soil to dry out.

Addsorb can be mechanically mixed into soils where high moisture content creates greater vulnerability to freeze/thaw conditions. Once soil is fixed it will not expand and contract, or move as water flows across it and not thru it.

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How the Product Works

Both forms work well with either clay and/or shale soils and in areas vulnerable to freeze/thaw conditions. Soil becomes vulnerable when exposed to natural elements, such as wind and rain. Depending on whether soil is wet or dry the proper mix of product in the soil creates a tight bond between cationic polymer and soil to fix it into. The covalent bond formed once product has dried is impenetrable and permanent.

Treatment	Moisture Content	Dry Density	Swell	Applied Pressure	Control Soil Sample
10% Stabuilt	31.5	88	1.7	1000	90% Bentonite/ 10% Sand
15% StaBuilt	31.5	88	0.9	1000	90% Bentonite/ 10% Sand
20% StaBuilt	28.4	85	-0.1	1000	90% Bentonite/ 10% Sand
20% StaBuilt, Dried and Re-wet w/ tap water	28.4	85	-0.7	1000	90% Bentonite/ 10% Sand
Control I	32.3	85	25.6	1000	90% Bentonite/ 10% Sand
Control II	32.3	85	22.2	1000	90% Bentonite/ 10% Sand
Control Dried and re-wet w/tap water	32.3	85	9.3	1000	90% Bentonite/ 10% Sand

Negative values indicate consolidation.

The dehydration of clays reduces hydrostatic concerns and inhibits the ingress of water. The anchored cationic polymer inhibits cation exchange and blocks water from bonding to particulates in soil. Once the bond is formed it is permanent and the solution cannot be diluted or wash out.

StaBuilt™ comes in an easy to use liquid form that can used with standard spray equipment. In dry form **AddSorb** can be folded directly into soil or substrate. Either product can be used in reclamation or new construction.

Depending on the needs and condition of the project the dry product can be mixed onsite to the dosage required for permanent stabilization.

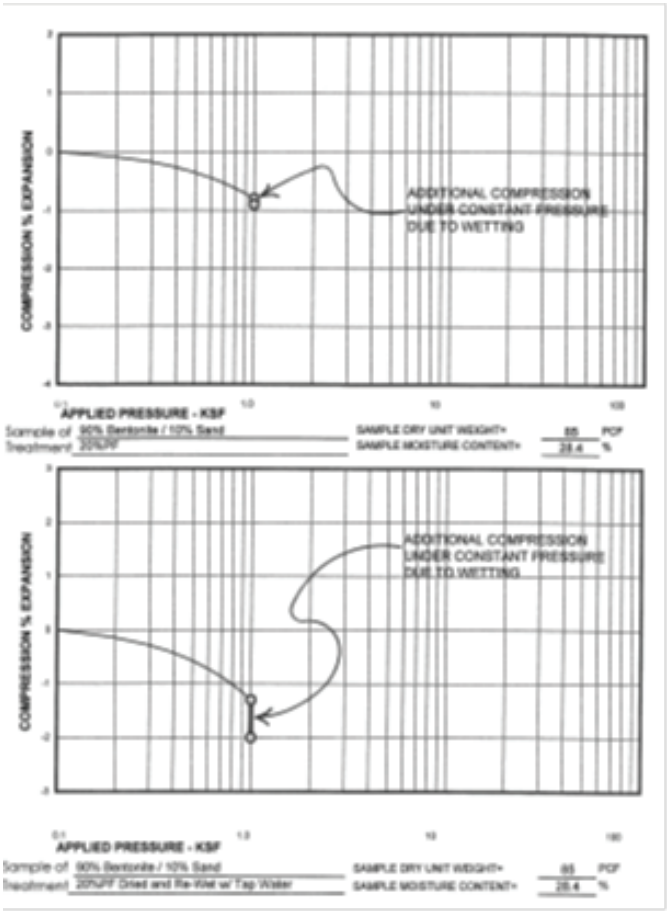
Water Absorption

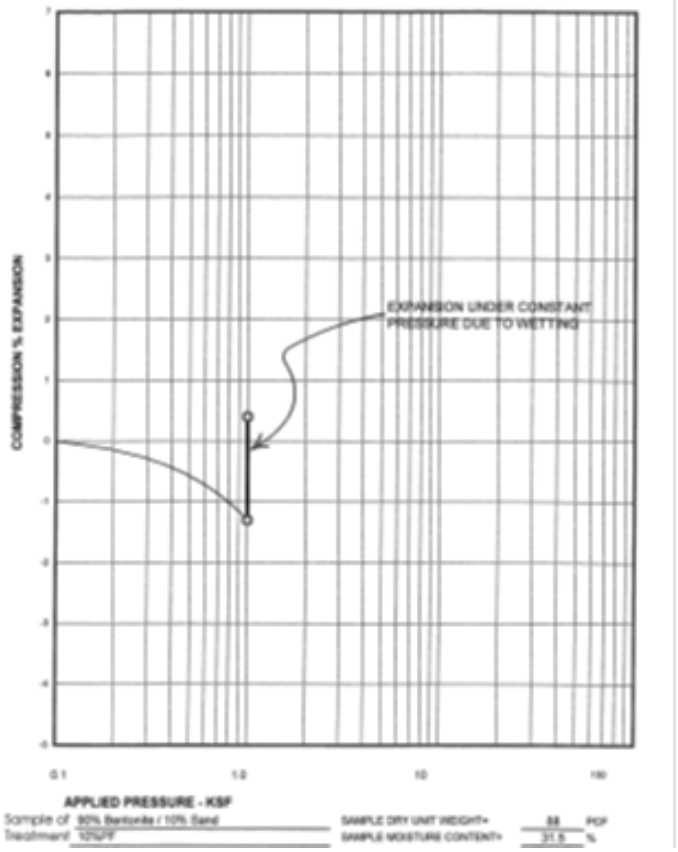
When water is absorbed into soil the soil emulsifies and can be carried with the water away from its original source. As snows melt in the northern regions the force of the water can create significant soil damage.

Severe damage can close down transit systems until roads are repaired. It can also wash away foundations, asphalt, and other debris that can clog existing creeks and other drainage systems. Once the soil is carried away it cannot be replaced and the rift will remain unstable until it has been properly germinated with a stable root system.

StaBuilt™ prevents swelling of soils by attaching to the clay particulates and preventing water from breaking the bond and entering the fixed soil. By fixing the soil, water cannot enter the soil and roadbeds remain secure.

Depending on the types of project, the proper mix of product to soil actually permanently condenses soils. The following charts demonstrate the swell to condensation rates based on percentage of potassium-formate mixed in with the soil.





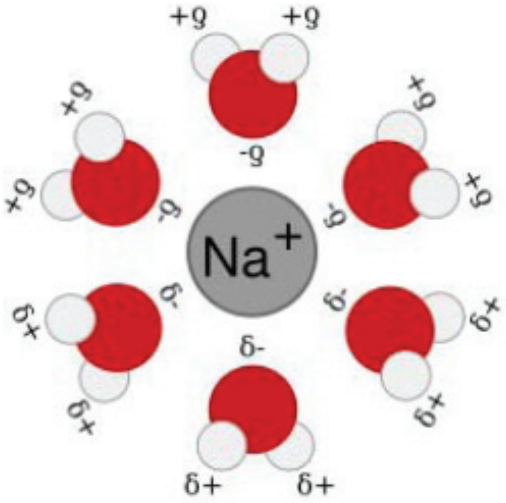
Optimal Chemical Solution

Typical methods of treating soil that use organic and inorganic solutions can be less effective and more costly than **StaBuilt**™. The organic, chemical structure of the **StaBuilt**™ and **AddSorb** replaces calcium, magnesium, and sodium with potassium to inhibit swelling. Potassium can be used as a fertilizer so there is no negative impact on the environment.

Esters used in the production of formates are naturally occurring in the environment and can often been found in fruit that put off a sweet fragrance, essential oils and pheromones. They are also found in pharmaceutical medications.

The procedure used in the creation of esters is called esterification. Esters contain a carbonyl center, which gives rise to 1200 C-C-O and O-C-O angles. They serve as hydrogen bond acceptors and do not self-associate. This means that they will not bond with each other, but will readily bond with other molecular structures.

The hydrogen bond created is flexible allowing for some movement, but will not expand or contract like most organic compounds. This flexible compound has more polar properties than that of chloride based products and has a benign environmental impact. With one more cationic polymer added the bond with soil particles is invulnerable to freeze/thaw dynamics.



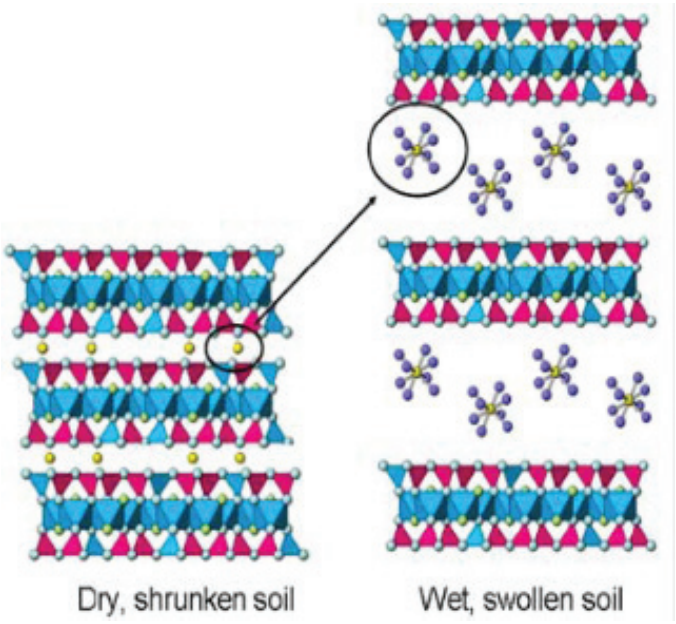
The molecular structure allows product to tightly fix to soils and create a permanent covalent bond. This increases the strength and density of compacted soil.

Although **AddSorb** is an organic compound it does not swell or take on water like wood pulp and lime, commonly used to absorb water in preparation for roadbeds. Unlike cement-based products and silicates, soils fixed with **StaBuilt**™ do not become brittle.

Once the water is integrated into the product the hydrogen and oxygen atoms become fused in a covalent bond and change characteristics. The water that enters the solution cannot bond to other structures, including other water molecules. This means water will not freeze or thaw and there is no room for expansion.

Once the solution has dried and the bond has fused it will not take on additional water. Depending on the mix of solution to water ratio, test show that soil will condense slightly, creating greater compaction. The amount of water in the soil determines the amount of **AddSorb** to use to create the desired ratio.

By absorbing the water into **AddSorb** the water becomes part of the solution instead of the problem.



Features, Advantages, and Benefits

- Completely organic and non-toxic solution is not hazard ous to wildlife or water supplies.
- Can absorb excess water and use it as a portion of the product solution.
- Creates a permanent covalent bond with the soil to prevent movement.
- Can be injected, sprayed or folded into soil using standard equipment.
- Has the potential for negative swell capacities depending on solution mix.
- Can prevent cracks, sink holes, pot holes, and soil erosion.
- Is not vulnerable to freeze/thaw conditions once fixed.
- Can reduce construction timelines by reducing delays due to wet soil conditions.