



**WATER RESISTANT
SOIL BASES**

INNOVATING FOR SUSTAINABILITY



ABOUT US

Established in 1997, Zydex is a speciality chemicals company with the purpose of innovating for sustainability.

Our patented pavement technologies address challenges in all the sub-layers of the pavement. Zydex bitumen additives enable lower paving temperatures, enhanced workability and improved adhesion, while our gravel and rural road technologies enable water resistance, longer life cycles and reduced dust emissions. Our technologies have been recognized by the International Road Federation (IRF), and have been globally adopted in over 40 countries.

AWARDS & RECOGNITIONS

**IRF Global Road
Achievement Award**

**CII 25 Most Innovative
Companies of India**

India Inc. Innovative 100 Award

**Marico Innovation Award for
Best Business Innovation**

**FGI Award for Research
in Science & Technology**

WE OFFER A RANGE OF TECHNOLOGIES FOR SOIL IMPROVEMENT AND MODIFICATION

**SUB BASE
STABILIZATION**

**SUBGRADE
STABILIZATION**

**DUST
CONTROL**

Water Resistant Soil Bases



Moisture damage is the leading cause of failure for soil sub layers and dirt/gravel roads. Infiltration of water can cause the soil to expand and loose cohesion, leading to ruts, corrugations, cracks and ravelling. TerraSil is an easy to apply soil modifier that permanently eliminates infiltration of water in to soils. Making soil bases/dirt roads impervious to water has a significant impact on overall life cycle costs.

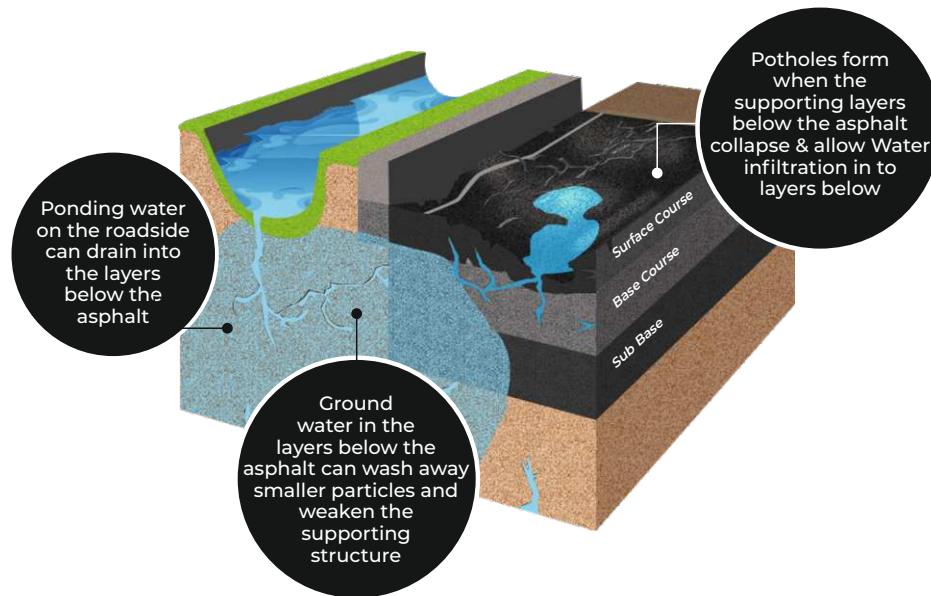
BENEFITS

- ✓ Permanent Water Resistance
- ✓ Eliminates Capillary Rise
- ✓ Prevents Freeze Thaw
- ✓ Reduces PI and Expansivity
- ✓ Improves Compaction Density
- ✓ Improves Load Bearing Capacity
- ✓ Water Dilutable & Easy to Apply
- ✓ Non Leaching
- ✓ Environmentally Friendly

www.zydexindustries.com

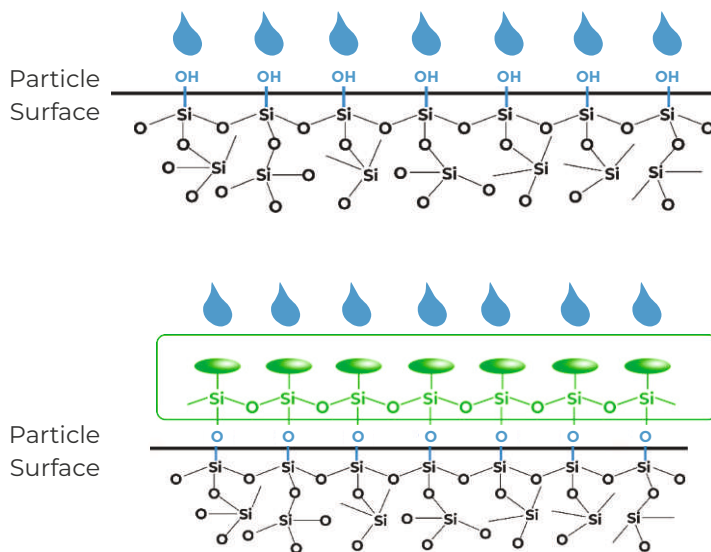
CHALLENGES

Moisture damage is the leading cause of failure for soil sub-layers and dirt / gravel roads. Infiltration of water can cause the soil to expand and lose cohesion, leading to ruts, corrugations, cracks and raveling. Ultimately water damage drastically increases the life cycle cost of a pavement.



CHEMICAL ACTION OF TERRASIL

Terrasil is a reactive soil modifier that permanently modifies the soil surface, making it hydrophobic. It chemically converts water absorbing hydroxyl groups to water resistant alkyl groups. Terrasil is a non-leachable and safe chemistry, and works with all soil types.



-OH groups make surface very hydrophilic (water loving):

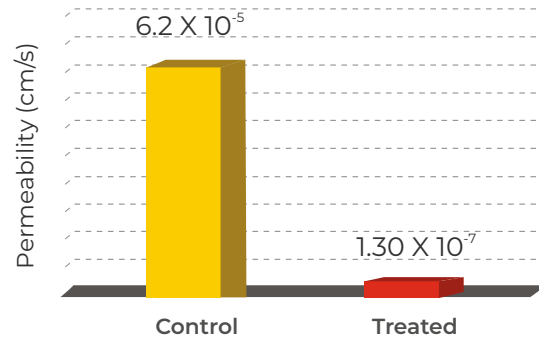
High water permeability leads to capillary rise and shoulder ingress, leading to pavement damage.

Molecular level hydrophobic zone (water repellent):

Terrasil reacts upon contact with soil, and creates a permanently water repellent layer on its surface. The soil is subsequently rendered impermeable to water ingress.

REDUCES WATER PERMEABILITY

A Terrasil solution (1:200 dilution) when spray applied and mixed can reduce water permeability by a factor of 500, thereby significantly decreasing the rate of water infiltration and capillary rise into the soil layer. As a result, Terrasil treated soil bases remain significantly dry throughout periods of rain. Additionally, Terrasil treated soil is breathable and allows for the escape of any trapped water in the soil base in the form of vapour.



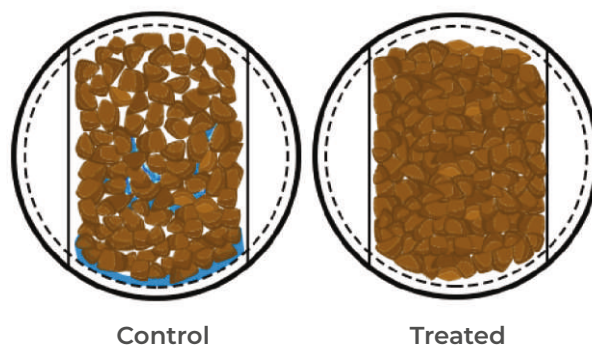
REDUCES EXPANSIVITY

Hydrated soil expands horizontally and vertically creating swelling pressure in the soil bases due to water absorption. This causes undulation and can also lead to cracking of pavement layers. Terrasil reduces expansiveness by up to 90 % at dosages of 0.5 to 1 kg per cubic meter of soils (Plasticity Index of 5 to 25). Cement addition ensures additional quick wet strength, and addition of ZycoBond improves soil cohesion and flexibility.

Sample	CBR 5 mm (4 days soak)	% Water Absorption	Expansion (inches)
Control Soil	10.50	3.5	1.83
Soil + 1 Kg/ m ³ Terrasil + 1 Kg/ m ³ ZycoBond	28.10	0.5	0.31
Soil + Terrasil (1 kg/ m ³) + Cement (3%)	57.10	0.8	0.08

INCREASES COMPACTION

In addition to making soil bases waterproof, Terrasil improves the ease of compaction such that field proctor densities of 100 – 105 are easily achieved. The net result of making soils water resistant and improving soil compaction is the attainment of dry CBR values even under wet conditions. The improved compaction is a result of chemically bonded alkyl chains that provide lubricity and charge shielding to the soil particles during the compaction process.



STORAGE & SHELF LIFE

Store Terrasil between 5 – 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. In case the product freezes at low temperatures, allow it to thaw and unfreeze.

FLEXIBILITY OF SOIL BASES



Terrasil is designed to be utilised with ZycoBond - a UV and heat stable, cross-linkable soil modifier that chemically binds soil particles together into a flexible crosslinked network. Chemical binding and nano size of the polymer leads to improved load bearing capacity and flexibility of the soil base.

BENEFITS

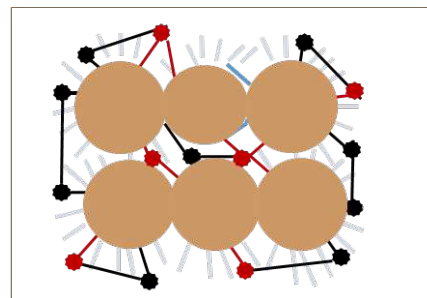
- ✓ Imparts Flexibility
- ✓ Improves Load Bearing Capacity
- ✓ Water Dilutable & Easy to Apply

ZYCOBOND MECHANISM

ZycoBond is a 80 nm flexible acrylic co-polymer that has a very high surface area available for bonding. The higher number of contact points ensure flexible bonding at a nano level, leading to improved fatigue resistance in stabilized soils.

ZycoBond in combination with Terrasil imparts higher strength and enhanced flexibility, thereby enabling dimensionally stable non-deforming bases.

Flexible Cement-ZycoBond Network



 ZycoBond Particles  Cement Particles

INCREASES STRENGTH

Soil bases that are modified with Terrasil and ZycoBond are superior in strength and have reduced water permeability. This leads to much higher durability, especially under simulated wet conditions.

Sr.	Parameters	Measure	Soil w/o additive	Soil + Cement 3%	Soil + Silane 0.75 kg/m ³ + ZycoBond 0.75 kg / m ³ + Cement 3%
1	CBR	%	7	67	125
2	UCS	Mpa	0.27	1.02	2.43
3	Durability (Wet – Dry Cycles)	No. of cycles	0	4	12
		IS : 4332 (Part 4)	Fails	Fails	Passes (Simulates 20 years life)

ZYDEX DESIGN

When TerraSil and Zycobond are incorporated as part of the stabilized base, significant reductions in pavement thickness can be accomplished, while simultaneously enhancing the overall load bearing capacity. (3-5x enhancement in MSA)

This is accomplished by replacing the granular sub base and Wet Mix Macadam layers with a single soil-aggregate layer that is waterproofed and flexibly bonded.

CONVENTIONAL DESIGN

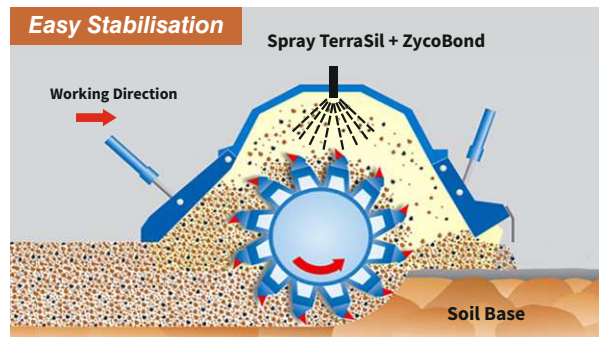


ZYDEX DESIGN



STABILIZATION METHODOLOGY

TerraSil and ZycoBond are mixed in situ with the soil as part of the water of compaction (OMC Water). Due to their ability to be introduced through water, the solution mixes and distributes into the soil extremely efficiently. The liquid nature of the products also helps avoid dusting issues typically associated with cement or lime. Furthermore, due to the low dosage rates of TerraSil and ZycoBond, transportation costs to site are significantly reduced as compared to cement or lime.



STORAGE & SHELF LIFE

Store TerraSil between 5 – 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. In case the product freezes, allow it to thaw and unfreeze.

ABOUT ZYDEX

Established in 1997, Zydex is a specialty chemicals company with the purpose of innovating for sustainability.

Beyond pavement products, Zydex offers a diverse set of chemical technologies for the textile, agriculture and civil construction industries. We were recently recognised as one of the 25 Most Innovative Companies in India by the Confederation of Indian Industries (CII).

Sustainable Green Chemistry

Zydex is deeply committed to sustainable chemistries that ensure a greener future for everyone. Our commitment has made us a pioneer in introducing non-polluting and non-hazardous technologies that conserve, protect and enhance the environment. Pursuing chemical innovations that would mean a greener, purer and more resource renewable world is our passion. Our technologies have been recognized by the International Road Federation (IRF), and have been globally adopted.

GLOBAL PRESENCE

