



SOILFORM
NANO-TECHNOLOGIES

GE-NANO

TECHNICAL INFORMATION SHEET

NANO-TECHNOLOGY SOLUTIONS FOR THE ROAD CONSTRUCTION INDUSTRY

Road construction methodologies have not kept pace with transportation needs for most of the last century. Construction equipment has improved, but material stabilization methodologies have remained focused on cementitious stabilization. Every couple of decades a new technology arrives, that impacts the way we live and manage our lives. Soilform Nano-Technologies brings you the future of road construction.....TODAY.....with our flagship product **GE-NANO**.

GE-NANO is a polymer engineered emulsion with Nano-Technology which is going to revolutionize the road construction industry. Used for stabilizing the base and sub-base layers of roads, mine haul roads, parking lots, hard stands and container depots. **GE-NANO**, because of its engineered Nano-Technology, is able to bind and waterproof previously unsuitable materials into usable road construction aggregate.

GE-NANO changes the hydrophilic (water absorption) nature of clay materials to hydrophobic (total water repellent character). As such its application not only assists in the expulsion of water from soils, but it also aids the lubrication of material particles. The effect of **GE-NANO** on soils is permanent.

Cutting edge **GE-NANO** a polymer engineered down to a particle size of 0.001 micron. That's one-thousandth of a micron which is in turn 1000 times smaller than a millimeter, and when one considers that the human hair is 75 microns, pollen is 40 microns, household dust is 4 microns, then that is very, very small.....Nano small.

BENEFITS OF USING GE-NANO

- No thermal or stabilization cracks are introduced into the pavement layer.
- **GE-NANO**, within the pavement layer has more flexibility than that of a cement or lime treated pavement layer.
- Dosage rate is between 0.5% to 2% of the MDD of the material.
- The inclusion of **GE-NANO** typically improves the compactability due to the adhesion improvement of the mortar of the material.
- The use of **GE-NANO** in bypasses reduces the high cost of construction of deviations.
- Since **GE-NANO** is dispersed amongst the finer aggregate particles, the fines are encapsulated and immobilized causing a reduction in 'pumping'.
- **GE-NANO** improves the moisture sensitivity and durability of the treated materials. This extends the life of the layer by reducing the exposure to weathering.

GE-NANO USED FOR PAVEMENT LAYER STABILIZATION: Application and Handling Information

- GE-NANO is used with a wide range of materials from G1 - G4 crushed aggregates to G5 - G8 natural gravels.
- GE-NANO does not require heat for any material handling, storage or pumping.
- GE-NANO is added to the compaction moisture at ambient temperatures.
- Very short curing time after the layer work is completed.
- Due to the reduced amount of GE-NANO used in a layer comparison to the traditional emulsion treated layer, storage facilities can be reduced.
- Lower dosage rates / m³ are required as compared to the traditional BSM's (bitumen emulsion and cement).

Nano-Modified Emulsion (NME) Material Specification Design Guideline

Test or Indicator	Material ¹	Material Classification			
		NME1	NME2	NME3	NME4
Soaked CBR (%) (Unstabilised material)	CS (98%)	> 80 (G4)	> 80 (G4)	> 25 (G6)	> 15 (G7)
	NG	> 45 (G5) or > 25 (G6) and ACV < 30% or 10% FACT > 110 kN	> 45 (G5) or > 25 (G6) and ACV < 30% or 10% FACT > 110 kN	> 25 (G6)	>15 (G7)
Plasticity Index (PI)	CS	< 10	< 10		
	NG	< 12	< 12	< 16	< 16
	GS		< 12	< 16	< 16
	SSSC				< 16
P0.075 (%) (test when OMC > 8% and % passing 0.075mm sieve > 10%)	CS	< 15	< 15	< 25	< 40
	NG	< 20	< 20	< 25	< 40
	GS	< 20	< 20	< 25	< 40
	SSSC	< 20	< 20	< 25	< 40
MOD AASHTO density		> 100%	> 100%	> 97%	> 95%
DCP DN (mm/blow) Material compacted to spec. (before stabilization)		< 3.6	< 3.6	< 9.0	< 13.5
DCP DN (mm/blow) Material compacted to spec. (after stabilization)		< 1.5	< 1.8	< 3.7	< 5.5
Friction Angle (°)		> 40	> 40	> 30	> 30
Grading Modules	NG	> 1.9	> 1.8	> 1.2	> 0.45
	GS			> 1.2	> 0.75
ITS (dry) (kPa)	150mm Specimen	> 180	> 140	> 100	> 70
ITS (wet) (kPa)	150mm Specimen	> 140	> 100	> 70	> 50
UCS (rapid curing method 24h at ambient temp + 48h at 45°C + 6h water cooling) (kPa)	All	> 3 000	1 500 to 4 000	700 to 3 000	450 to 2 500
Retained Cohesion ITS Wet/Dry (%)	All	> 80	> 70	> 60	> 50
GE-NANO % to be applied		1.5% - 2.0%	1.0% - 1.5%	0.7% - 1.0%	0.5% - 0.7%

* Refer TG2 published by the Asphalt Academy

** As per TG2 published by the Asphalt Academy

¹CS - Crushed Stone; NG - Natural Gravel; GS - Gravel Soil; and SSSC - Sand, silty sand, silt, clay