

Confirmation of Certification

AGRÉMENT INTERIM CERTIFICATE 2019/597

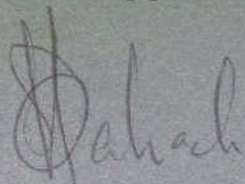
is awarded to:

Polyroads Pavements (Pty) Ltd

in recognition of

**SOILTECH MK III: NON-TRADITIONAL SOIL
STABILIZER**

which certificate provides detailed information on the performance in use and the uses of the subject of the certificate. When presented as proof of certification this document must be accompanied by the abovementioned certificate or by a certified copy of the typescript of the certificate approved by the Board.

A handwritten signature in dark ink, appearing to read 'Mahachi', positioned above the title 'CHAIRPERSON'.

CHAIRPERSON

Dr Jeffrey Mahachi

CERTIFIED COPY

**AGRÉMENT INTERIM
CERTIFICATE
NO 2019/597**

**SOILTECH MK III: NON-
TRADITIONAL SOIL
STABILIZER**



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public works

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Public Works
Republic of South Africa



Polymer Pavements (Pty) Ltd

Interim Agreement Certificate N° 2019/597



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The master copy of this document appears on the website:
<http://www.agrement.co.za>

Validity

Users of any Agrément certificate should check its status: all currently valid certificates are listed on the website. In addition, check whether the certificate is [Active or Inactive](#).

The certificate holder is in possession of a confirmation certificate attesting to his status.

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Subject:
**SOILTECH MK III: NON-TRADITIONAL SOIL
STABILIZER**

Certificate holder:

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Use

This certificate covers the use of SoilTech MK III, a non-traditional soil stabiliser, for road construction of base and sub-base layers in all regions of South Africa. SoilTech MK III is a water based modified bitumen emulsion polymer blend soil bonding agent, which gains strength from mechanical compaction and does not become brittle when cured. SoilTech MK III stabilizers have been purposely designed to penetrate through the road's base layer, into the sub-base layer, via capillary action.

This certificate and Agrément South Africa's assessment apply only to SoilTech MK III made and applied as described in this certificate, and where the terms and conditions of certification are complied with.

General description

SoilTech MK III, a non-traditional soil stabiliser, is a liquid nano-polymer blend soil bonding agent with elastomers. It is a water based modified bitumen emulsion polymer blend soil bonding agent, which gain strength from mechanical compaction and do not become brittle when cured. It is utilized in base and sub-base stabilization using *in-situ* materials for both paved and non-paved roads.

SoilTech MK III has been designed with multiple particle-sized nano-polymers coated with micro surfactants in order to lower surface tension and to utilize water as a medium to penetrate the sub-base layer. SoilTech MK III polymers gain strength from mechanical compaction and do not become brittle when cured. The product penetrates through the road's base layer into the sub-base via capillary action. The E-modulus property of the elastomer allow the pavement to be flexible under heavy load.

The mixing ratios and application rate (mix design) depend on the site specific material and the required road design specifications. SoilTech MK III is applied at ambient temperature and by use of water tanker trucks. It is applied as a form of bitumen stabilizing material and in accordance with the standard design methods detailed in SANRAL's manual SAPEM 2014 and SABITA's TG2 are applicable. Alternatively, Polyroads Pavements (Pty) Ltd.'s guideline documents offer application methods.

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PREAMBLE

This certificate is issued by Agrément South Africa in terms of the Agrément South Africa Act No. 11 of 2015. This certificate:

This certificate:

- has been granted after initial technical appraisal of the performance of SoilTech MK III, a non-traditional soil stabilizer, for the [uses](#) covered by the certificate
- is independent of any patent rights that may or may not subsist in the subject of the certificate
- does not relieve the certificate holder or road contractors from the obligation to obtain the prior approval of the road's authority concerned for the use of the product and
- is subject to the successful conclusion of the two (2) year performance monitoring evaluation of the selected road sections.

Agrément South Africa considers that the quality and performance of SoilTech MK III is satisfactory provided that the requirements stipulated in this certificate are adhered to. However, Agrément South Africa does not on behalf of itself, or the State, or any of its employees or agents guarantee such quality or performance.

Responsibility for compliance with the requirements of this certificate resides with the certificate holder.

No action for damages, or any other claim whatsoever, lies against Agrément South Africa, its members, the State or any of its employees should the said product fail to comply with the standard set out in this certificate.

Roads authorities or users who are in any doubt about any detail or variation, should contact [Agrément South Africa](#).

The validity of this certificate is reviewed every three years. The certificate shall remain valid as long as Agrément South Africa is satisfied that:

- the certificate holder complies with the general and specific conditions of certification and the technical requirements stipulated in the certificate
- the performance-in-use of the product is acceptable, and
- any changes in legislation, regulations, relevant standards or Agrément performance criteria have not invalidated the technical assessment which formed the basis of certification.

Agrément South Africa reserves the right to withdraw the certificate at any time, should reasonable cause exist.

Notices affecting the validity of this certificate will be published in the *Government Gazette*.

PART 1: CONDITIONS OF CERTIFICATION

SoilTech Mk III, as described in this certificate must:

- be used in accordance with the manufacture's guidelines and the requirements of SAPEM 2014 and SABITA's TG2
- comply with the Conditions of Certification.

A registered professional roads engineer must ensure that the use and application of SoilTech MK III is in accordance with the requirements of this certificate.

This certificate is issued after successful conclusion of phase 1 of the assessment process and is subject to successful conclusion of Phase 2. Phase 2 is the long-term performance monitoring of a selected road section constructed using SoilTech MK III and which should commence within one year after approval of this certificate. Monitoring will include inspection of the trial site every six months as well as a final assessment after a period of two (2) years. If and when successful it will validate the findings of the initial technical assessment for final certification.

SoilTech MK III is a liquid nano-polymer blend soil bonding agent with elastomers, for road construction. A change to any one aspect could result in one or more of the other aspects no longer complying with Agrément South Africa's performance criteria. For these reasons, no change may be made to SoilTech MK III, other than those associated with normal mix design, as described in this certificate unless such change is approved in writing by Agrément South Africa before it is implemented.

SANS 17050-1, Conformity assessment-Supplier's declaration of conformity Part 1: General requirements.

SANS 17050-2, Conformity assessment-Supplier's declaration of conformity Part 2: Supporting documentation.

Polyroads Pavements (Pty) Ltd shall be responsible for the accuracy of the information contained within the Material Data Sheets, Technical Data Sheets and Material Performance Specifications, and all other information pertaining to the supply and application of SoilTech MK III: Non-Traditional Soil Stabilizer. Polyroads Pavements (Pty) Ltd shall submit a COA (Certificate of Analysis) and COC (Certificate of Compliance) in terms of the requirements stipulated in **SANS 17050-1** Suppliers declaration of conformity when requested by Agrément South Africa in accordance with the documentation requirements of **SANS 17050-2**. Should Polyroads Pavements (Pty) Ltd change or substitute any ingredient in the formulation of the product in question, then a notification shall be addressed to Agrément South Africa immediately.

General conditions

Reappraisal

- Must be requested by the certificate holder prior to implementing changes to the product.
- Will be required by Agrément South Africa if there are changes to SAPEM 2014 and SABITA's TG2 or to the Agrément South Africa's guidelines.

This certificate may be withdrawn if the certificate holder or a registered licensee fails to comply with these requirements.

Validity

The continued validity of this certificate is subject to a satisfactory review by Agrément South Africa every three years after granting of the final certificate.

Quality monitoring

The certificate holder is required to participate in Agrément South Africa's post-certification quality management system, which requires:

- that the certificate holder shall continue to implement and manage the quality management system approved by Agrément South Africa in the assessment of SoilTech MK III
- the certificate holder to notify Agrément South Africa within 30 days of any change of address of a factory and any new factories brought into operation by the certificate holder, for the purpose of manufacturing the subject of the certificate
- the certificate holder at any time of commencement of each contract, to provide Agrément South Africa with construction sites on which the subject is to be used and
- the co-operation of the certificate holder in facilitating post-certification quality monitoring by Agrément South Africa or its authorized agents.

On behalf of the Board of Agrément South Africa:

Chairperson

June 2019

SoilTech MK III – Non - traditional soil stabiliser

Tested and approved fit- for- purpose when used as specified in

**INTERIM CERTIFICATE
2019/597**



PART 2: ASSESSMENT

Scope of assessment

Agrément South Africa's Guidelines – “A Procedure for fit-for-purpose certification of non-traditional road additives” – 2004.

The scope of assessment procedure was as laid out in the Agrément South Africa's guidelines “A procedure for fit-for-purpose certification of non-traditional road additives” document which consisted of five (5) steps:

- Stage 1 – Appraisal of applicant's application form and documentation
- Stage 2 – Research and development
- Stage 3 – Application and design guidelines
- Stage 4 – Environmental Compatibility and safety
- Stage 5 – Manufacturing and quality management system
- Stage 6 – Test results.

Assessment

In the opinion of Agrément South Africa, SoilTech MK III, a non-traditional soil stabilizer, for road construction, meets the criteria set out in the Agrément South Africa's Guidelines “A procedure for fit-for-purpose certification of non-traditional road additives”.

Laboratory and short term in-situ performances of SoilTech MK III were ascertained as being satisfactory. The product significantly:

- increases the modulus of elasticity, compressive, tensile and shear strength of the road base construction materials, and
- the abrasion and water resistance of the stabilized road base construction materials.

Stage 1– Appraisal of applicant's form and documentation

The following product information was included in the application documentation:

- Application form
- Manufacturing information
- Application and mix design guidelines
- Tests report from accredited test laboratories.

The evaluation panel was satisfied that the supplied information was sufficient and credible for certification process.

Stage 2 – Research and development

The product has been successful on the market since 1998. It was well conceived, developed and supported by sound chemical and engineering principles. Research findings on the performance of SoilTech MK III were published in referral journals.

Stage 4 – System Installation (Application)

The mix design guidelines document provided by Polyroads Pavements (Pty) Ltd provides the following:

- Procedure for applying SoilTech MK III
- SoilTech MK III curing method and
- SoilTech MK III spray on method.

The document provides comprehensive information to allow a competent person to make an informed decision, based on sound engineering judgement, on how and whether or not to use the additive in a particular application.

Stage 4 – Environmental compatibility and safety

SANS 10229: *Transport of dangerous goods – packaging and large packaging for road and rail construction transport – Part 1: Packaging*

SoilTech MK III is a mixture of polymer modified bitumen, water and proprietary catalyst. It is classified as hazardous substance, under United Nations (UN) classification - UN 3082 and **SANS 10229 Part 1 & 2-1**. It is strictly required to adhere to the manufacturer's storing and handling recommendations and the requirements of Health & Safety act. The material is not to be discharged into drains, surface waters or ground water.

SANS 14020: *Environmental labels and declarations - declarations, definitions, environmental engineering, environmental management, labels, legal liability, manufacturers, marking, pollution control, specifications.*

Stage 7 – System performance trial (including laboratory results)

SoilTech MK III is constituted on site by mixing polymer modified bitumen emulsion, water and proprietary catalyst by Polyroads Pavements (Pty) Ltd, in accordance with the requirements of **SANS/ISO 9001** and **SANS/ISO 14020**. It is applied at ambient temperature and by use of water tanker truck.

SANS/ISO 9001: *Quality management systems-Requirements*

All the relevant documentations for quality management system are held by the certificate holder. The certificate holder's quality management system complies with Agrément South Africa's requirements, which are based on **SANS/ISO 9001**. Properly applied it will ensure a good quality product in constituted and applied consistently.

Stage 6– Test results

The following tests (**Table 1**) were performed on samples stabilised with the SoilTech MK III and prepared in accordance with the requirements of the Agrément South Africa's assessment guidelines. The tests were conducted by a SANAS approved laboratory. The test results clearly show that SoilTech MK III non-traditional soil stabilizer improves significantly the modulus of elasticity, compressive, tensile and shear strength and also the abrasion and water resistance of the particulate materials for road base construction.

Test	Parameter	Limit for control test results		SoilTech results	
		Sand	Sand/clay	ST/Sand	ST/Sand/clay
Abrasion resistance	Loss after 500 revolutions (%)	<10	<10	144	399
Erosion resistance	Loss after 5 minutes (%)	<8	<8	< 1	<8
Moisture sensitivity	Time to disintegrate to marker	≥120 (mins)	≥120 (mins)	-	-
Strength increase - CBR	Improvement on control (%)	>35	>100	>93	>120
Strength increase - UCS	Comparison with bitumen emulsion* and lime**(kPa)	≥bitumen emulsion	≥lime	≥346	≥1011
Plasticity change (Atterberg Limits)	Improvement on control (%)	-	>50	10	N/A

PART 3: TECHNICAL DESCRIPTION

General description

SoilTech MK III, a non-traditional soil stabiliser, is a liquid nano-polymer blend soil bonding agent with elastomers. It is a water based modified bitumen emulsion polymer blend soil bonding agent, which gain strength from mechanical compaction and do not become brittle when cured. It is utilized in base and sub-base stabilization using *in-situ* materials for both paved and non-paved roads.

SoilTech MK III has been designed with multiple particle-sized nano-polymers coated with micro surfactants in order to lower surface tension and to utilize water as a medium to penetrate the sub-base layer. SoilTech MK III polymers gain strength from mechanical compaction and do not become brittle when cured. The product penetrates through the road's base layer into the sub-base via capillary action. The E-modulus property of the elastomer allow the pavement to be flexible under heavy load.

The mixing ratios and application rate (mix design) depend on the site specific material and the required road design specifications. SoilTech MK III is applied at ambient temperature and by use of water tanker trucks. It is applied as a form of bitumen stabilizing material and in accordance with the standard design methods detailed in SANRAL's manual SAPEM 2014 and SABITA's TG2 are applicable. Alternatively, Polyroads Pavements (Pty) Ltd.'s guideline documents offer application methods.

Manufacturing

SoilTech MK III is a brand name for a proprietary blend of polymer modified bitumen emulsion and water, which is used for the stabilization of in-situ materials. The components for SoilTech MK III are manufactured in South Africa in compliance with strict quality standards.

SoilTech copolymer is produced through polymerizing various acrylic esters such as methyl methacrylate, butyl acrylate, interlaced with ethylene glycol, styrene, polyvinyl alcohol stabilizer and bitumen emulsion. The required quantities of raw materials are pumped into mixing tanks, which are mounted on load cells for monitoring and measuring.

The materials are mixed for a specific time. SoilTech MK III is then decanted into 1 000 litres Intermediate Bulk Containers (IBC) which are weighed. Each IBC is allocated with a label containing recording date, batch number and weight.

Packaging and Transportation

SoilTech MK III is normally shipped in 1000 litre IBC containers. One 6 m x 3 m container will accommodate 20 000 litres of the product. Alternatively, one can load 32 tons of product per inter-link truck for Southern African deliveries.

Application

The components (polymer bitumen emulsion and a catalyst) and water are pumped into water trucks to form SoilTech MK III which is then sprayed and/ or mixed into the particulate material (e.g. gravel) in the standard acceptable methods (e.g. water spray truck) and compacted in place with a vibratory roller. Typically, the base layer is ripped to a depth of 150 mm. SoilTech polymer, at a ratio of 0.5% per Maximum Dry Density (MDD) of the material is then poured into a water bowser and mixed with water. Using a grader, SoilTech MK III and water are mixed throughout the pavement. More water is added to the base layer in order to bring the material to optimum moisture content (OMC). Once OMC is achieved, the base layer is profiled and compacted to approximately 98% MODAASHTO density. Once the base-layer is stabilised, the nano-polymers, through capillary action, migrate into the sub-base to a depth of up to 15 cm.

The ratios of SoilTech MK III constituents are pre-determined during the laboratory investigation and mix design phase. Product documentation

and calculation spreadsheets are provided to the civil engineers (consultants) and contractors to determine the mixing ratios.

Training is provided by, Polyroads Pavements (Pty) Ltd to the end user on the design and application requirements when using SoilTech MK III.

SoilTech MK III curing

SoilTech MK III nano-particles, which are encapsulated with surfactants and water, need to dehydrate while curing through evaporation and capillary migration in the pavement. As the evaporation takes place, SoilTech polymer chains start to bind with the material particles and effectively glue the soil particles together. The kneading effect of vehicle traffic, further assists in accelerating the evaporation process of water, surfactants and coalescing solutions surrounding the polymer chains. SoilTech particles will start binding when exposed to air and the water and surfactants, aided by an alcohol mix, starts to evaporate. Should water be added to the material during curing process, the dehydration process is retarded, resulting in curing and binding taking longer.

SoilTech MK III stabilization mix design and laboratory testing

1. SoilTech MK III mix design

The mix design procedure for SoilTech MK III varies depending on whether the road is being designed as a gravel road, a surfaced road or a surfaced road which is temporarily operating without a bituminous seal. Detailed supporting documentation offers guidance in regard to the specific application. Polyroads Pavements (Pty) Ltd acts as materials supplier and provides technical support relating to the use of the product but does not construct or design roads. Polyroads Pavements (Pty) Ltd works together with the civil engineering consultants, contractors and laboratories to ensure that the product is applied and used safely and correctly. Independent supply, design, construction and quality assurance helps to ensure that the projects are successful.

Standard design methods are followed when using SoilTech MK III as a form of Bitumen Stabilized Material (BSM). These design methods are detailed in SANRAL's South African Pavement Engineering Manual of 2014 (SAPEM, 2014) and SABITAs TG2, 2009.

The design guideline document "Smart Materials SoilTech MK III Stabilizer" offers an alternative method of pavement design based on the COLTO manuals and TRH manuals.

2. Laboratory testing

Laboratory testing should be done in accordance with the guidelines for the method of design/application being used. In all cases laboratory testing should be conducted in SANAS accredited independent civil engineering materials laboratories.