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Where Science Meets the Earth

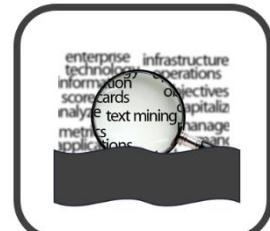
## Grader Applied Products

### Investigation, Design and Specification

#### Step 1

Primary works  
Investigation and  
Testing

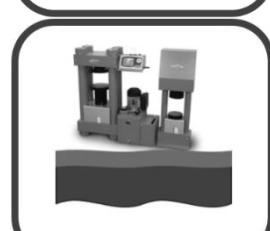
Investigate the pavement for subgrade strength, pavement condition, drainage, shape of road, traffic numbers and load weights



Site inspection. Ensure the required minimum metal depth is in place. Top up with metal if necessary. Collect samples.



Test Samples. Recommended tests: CBR and a Soaked CBR



#### Step 2

Product selection &  
Design

Evaluate the needs of the client and use product selection guide to select product to achieve maximum performance and desired outcomes.



Create pavement design scope of works document and quality control for installation. Specify dose rates and application method.



# Pre-works and site conditions

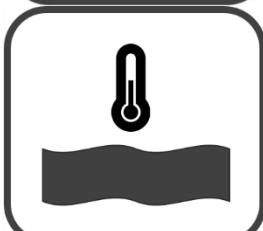
## Step 3

Pre works for application days

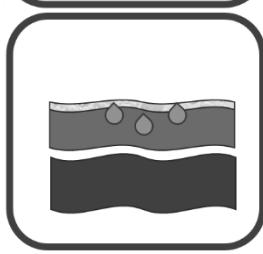
Check weather – ideally no rain forecast within 3 days ( 72 hours ) of the application of the products



Do not carry out application if the temperature is less than 10 degrees C or will drop below within 24 hours of application



Confirm that soil is slightly below optimum moisture content before application. The optimum water content (OWC) of the stabilised materials shall be determined by NZS 4402, test 4.1.3, *New Zealand vibrating hammer compaction test.*



## Equipment required

(\*portable pump), Spreader Truck (alternative is manual application), Grader with rippers CAT 120g or lager Water Cart 8000ltrs or more, Steel Drum Roller 8ton, Pneumatic Roller and Drag Broom.



## Step 4

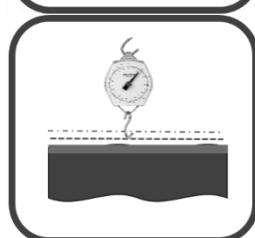
Grader applied

Ensure that the road is shaped correctly and has adequate aggregate.



The stabilizing agent (dry powder) shall be uniformly spread at the specified application rate across the pavement

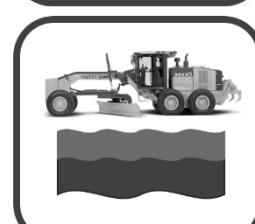
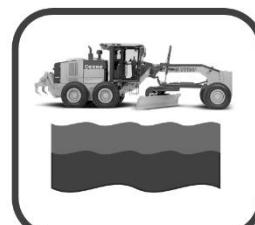
Weigh the dry powder and matt test with a 1sqm canvass every 400sqm. Tolerance allowable within +/- 0.5 kgs per sqm of the specified rate. Compare tons used from delivery document with the measured area.



## Step 5

Grader applied

Grade and winrow to the center of the road while continuously blade mixing in the product.



Continue to blade mix the product into the material until it is evenly distributed throughout the matrix of the material (this may take multiple passes with the Grader).

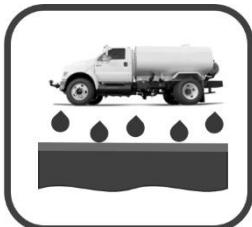
Once mixed Grade and place material at an evenly specified depth and shape the Pavement to the design.



## Step 6

Shaping and finishing

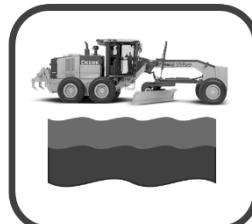
Apply \*liquid with water cart bringing the treated material to just below the OMC



Complete initial compaction this should be undertaken to the point with just enough compaction so that vehicles do not leave tyre marks on the pavement but allow the liquid to penetrate.



Grade the pavement to final design shape and remove large material debris.



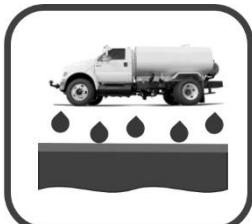
Roll the pavement to final compaction – until tightly bound. The large aggregate is held in place with a matrix of smaller aggregates. The smaller aggregate is held firmly in place by fine material



## Step 7

Shaping and finishing

Apply liquid, flooding the pavement to avoid the roller picking up fine material.  
Roll the pavement to a slurry See note of Flexi-C-Ment below.



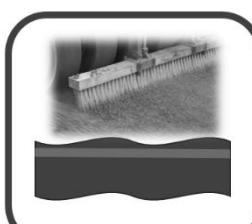
Roll with sufficient Liquid to achieve a slurry. The slurry through compaction, watering and drag brooming shall provide a smooth uniform surface. The final surface must be uniform, smooth and dense, free from voids and holes



## Step 8

Surface finishing

While slurring a drag broom should be towed behind either the Roller or the Water Cart. This will move distribute the fines into the voids in the road.



## Notes

Topically applied

Identify \*boney areas and sweep the slurry into the voids, with a yard broom, so a uniform matrix is created, holding the larger stones in place with the fines.



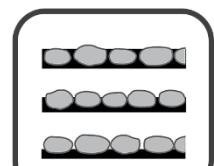
When applying FCM Co-Polymer, apply 50% of the FCM Co-Polymer at Initial Step 6G and then apply the remaining 50% in the process of point 7 slurrying.



\*portable pump – when transferring liquid product into the water cart and diluting them, smaller pumps may struggle with the viscosity of the product.



To lessen the viscosity of the product can be diluted with 50% water in the ICB by decanting half of the product into an empty tote and filling with portable water.



\*boney area – An area defined as an area that shows voids below the surface area. The top picture in the diagram shows sufficient slurry, the images below do not have enough slurry and will cause deterioration.



Shape road and check aggregate depth	Apply the stabilizing agent	Matt test every 400 sqm
		
Blade mix in the product	Multiple passes may be required	Shape road to design
		
Bring pavement up to OMC	Roll and compact the road	Final trim and shape
		
Ensure product is thoroughly mixed	Dry roll and compact to 95%	Wet roll and slurry
		
Ensure the roller drum remains wet	Create good slurry layer	Ensure no boney areas are visible
		

# Glossary

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<b>Applicate</b>	To apply the product to the ground.
<b>Blade Mixing</b>	Using a grader blade or similar to uniformly blend and mix the product to the aggregate. No streaks, clumps or uneven colouring of blended material.
<b>Boney Area</b>	A piece of the pavement which lacks in fines or small aggregate that hold the larger stones in place.
<b>Clay Content</b>	The percentage of clay in the material.
<b>CSC</b>	Co-Polymer Soil Cement
<b>Cut depth/Design depth</b>	Thickness of the stabilization layer and should be measured every 200mtrs along the cut length.
<b>Decanting</b>	To remove liquid from one container to another.
<b>Drag Broom</b>	A towing mechanism made from coarse bristles brooms that are set on 90 and 45 degree angles. Its purpose is to move the slurry around and fill all boney areas and small voids in the pavement.
<b>Equipment</b>	What machinery you will need to applicate products correctly
<b>FCM</b>	Flexi-C-Ment: Gravel Locks Co-Polymer additive
<b>Final Design</b>	Scope of works and specification and design of pavement.
<b>Fines</b>	Small particles of less than 5mm.
<b>Flooding Pavement</b>	Use enough water to saturate the pavement, creating a slurry but not enough to run off into the water tables.
<b>HSC</b>	Hygroscopic Soil Cement
<b>IBC Totes</b>	Intermediate bulk container. A reusable industrial container. Designed for the transport and storage of bulk liquids.
<b>Initial Compaction</b>	Primary compaction to form a uniform, dense layer.
<b>Injection</b>	Where the pre-mixed liquid products are injected into the mill of the pulverizer.
<b>In situ</b>	Existing material
<b>Loose Material</b>	Unbound stones or asphalt.
<b>Matt Test/Weigh Product</b>	To weigh the product applicated with a canvass and scales.
<b>Maximum Life Depth</b>	Maximum depth that effective compaction can be applied to in a single layer.
<b>Methodology</b>	Written instructions.
<b>Mill/Pulveriser</b>	
<b>OWC or OMC</b>	Optimum Water Content. Adding water to the Material so that it becomes self-compacting. OMC of the Material shall be determined by NZS 4402 test 4.1.3 NZ vibrating hammer compaction test.
<b>Optimum Water Content</b>	

<b>Percentage (%)</b>	By weight measurement: for example – if 2kgs is added to 20kgs this = 10%
<b>Portable Pump</b>	A pump with sufficient capacity to transfer 1700UPM viscosity fluid (very thick liquid – FCM).
<b>Pothole</b>	Surface deterioration of the pavement that holds water causing further deterioration.
<b>Pre-Grade</b>	Shape the road, removing corrugations and potholes.
<b>Product Selection Guide</b>	Gravel Lock Product Guide for selection of suitable product for treatment of your pavement.
<b>Quarry</b>	Source of aggregate.
<b>RDC</b>	Road Dust Control
<b>Scarify</b>	To rip the road longitudinally using rippers or picks on the grader.
<b>Slaking</b>	Wetting the product to ensure thorough penetration of the product.
<b>Slurry/Slurrying</b>	To create a paste out of the fine particles of the material being treated to the point where it is free flowing.
<b>Specified Depth</b>	The depth measured in cm or mm of the stabilized, treated pavement.
<b>Stabilizing Agent/Dry Powder</b>	A powdered product: HSC, RDC and Portland Cement (shall be tested in accordance with as 2350.2 or appendix B of NZS3122, it must have less than 3% of loss of ignition).
<b>Stock Pile</b>	A large pile of pre-sized aggregate.
<b>Sufficient Liquid</b>	To bring the material up to the optimum water content.
<b>Tolerance</b>	Allowable variance either side of the set measurement.
<b>Traffic Control</b>	Road traffic management.
<b>Uniformly Mixed</b>	Where the product has been blended sufficiently to create homogeneous (uniform) mix.
<b>Untreated Material</b>	Material without any product in it.
<b>Viscosity</b>	Measurement of fluid thickness and flow rate.
<b>Wacker Packer</b>	An engine driven plate compactor used for the compaction of materials.
<b>Weather Forecast</b>	A guide to determine upcoming weather in your region
<b>Winrow</b>	When the gravel is mounded in a longitudinal inverted “V” shape by the grader.