

Technical application manual

TERRABIND ULTIMATE



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1. Product description and composition

Terrabind Ultimate is a 100% natural premium dust suppressant and road stabiliser and a natural alternative to bitumen emulsion with extraordinary wet-stability and wet-strength. It works via biological binding of particulate matter (e.g. soil) using a natural solidification technology.



Environmental
Benefits

No crude oil
No plastics

100% biological
ingredients

Safe for equipment
and personnel

Biologically
safe

Terrabind Ultimate is delivered as a 30% concentrate. The recommended use concentration for spraying in build-in or spray-on application is 10% or less, depending on soil moisture. Diluting directly in the spray truck or a pre-tank (and pumping into the spray-truck) on-site is possible.

2. Application methods and their advantages

There are two main alternative methods to apply Terrabind Ultimate: **build-in** and **spray-on**. Each method has its advantages and disadvantages for the establishment of a road. For initial application, we advise scheduling a site visit with one of our qualified biological dust control specialists. During this visit, they will assess the road conditions to determine whether ripping or simply spray-on capping is necessary to achieve the optimal or best road surface.

2.1. Advantages of build-in applications

A build-in application is a method where the soil stabiliser is mixed into the soil. High stability, long durability and road stabilisation, fewer maintenance applications, and best dust control are the big advantages of build-in applications. The greater effort in establishment will be compensated by a much higher road quality.

2.2. Advantages of spray-on applications

Spray-on is an easy application, with flexibility and reduced costs. Build-in always delivers a higher performance and longevity while you will have higher maintenance intervals with a spray-on application. However, when applied more frequently and over the years, you will also get the same results as with a build-in.

3. Dose rates

The following table recommends initial dose rates for spray-on, build-in and maintenance application. The volume given in the table is the volume of liquid Terrabind Ultimate required per square metre of road that should be diluted in an appropriate volume of water that give good but not excessive wetting of the road material. The exact volume of water depends on the nature of the road material, climatic conditions and application method, but is usually between 1 and 15 litres per square metre. Please note that the exact dose rates have to be determined onsite. Parameters such as climate, haul road substrate, and traffic volume & load determine the efficacy. A small pre-test can be performed. Bind-X assists with that.

Establishment*	Establishment*	Maintenance**
Spray-on [L/m ²]	Build-in for ~ 12.5 cm [L/m ²]	Spray-on [L/m ²] per month
0.33 - 0.53	1.33 - 2.0	0.33 - 0.53

* establishment is normally applied on a single day.

** maintenance amount is applied usually in 5 to 10 applications per month depending on external factors. The volume given is the monthly total.

4. Spray-on application

4.1. Required equipment for spray-on applications

To apply Terrabind Ultimate as spray-on application, we recommend using the following equipment:

- › A water spray truck including operator
- › A pumping system to handle the biological dust control liquid
- › The working dilution can be prepared in a separate holding tank or directly in the water truck tank
- › A mechanical broom
- › A grader

4.2. Dosing calculations for spray-on applications

For the initial establishment of your haul road, the recommended **volume per m² is 0.33 L of Terrabind Ultimate concentrate mixed with water to a volume of 1 L/m² to 5 L/m² (depending on amount of liquid required to reach semi-plastic state).**

To calculate the total amount of product required, calculate the total surface (m²) you want to treat:

$$\int \text{Road length (m)} \times \text{Road width (m)} = \text{Total area (m}^2\text{)}.$$

$$\int \text{Total area (m}^2\text{)} \times 0.33 \text{ L/m}^2 = \text{Total volume (L)}.$$

Example:

To establish a 10 km road that is 10 m wide, then your total area is 100 ,000 m² (10,000 m x 10 m).

100,000 m² x 0.33 L/m² = 33 ,000 L (33 m³) of Terrabind Ultimate concentrate is needed.

4.3. Step-by-step guide

1

Blade, sweep, and if necessary pre-wet haul road surface.



2

Fill the liquid product and water into to water spray truck.



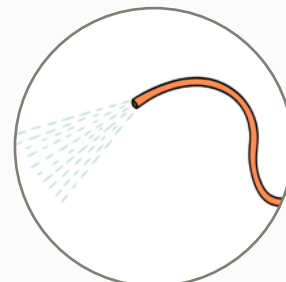
3

Over multiple spray passes apply the calculated volume of the dilute Terrabind Ultimate solution.



4

After completed application, clean the tank by flushing with clean water.



The optimal Terrabind Ultimate product delivery rate is a function of the speed at which the water truck is moving, the width of the spray bar, and the flow rate.

Note for Step 1: Pre-wetting the area/road is not always necessary. You should assess the area/road first. Things to consider will be the moisture content and temperature. If the area has sufficient natural moisture content due to rain, watering or high humidity, pre-wetting may be redundant. Apart from that, the type of road material plays a role, because materials react differently to moisture. Certain gravel or dirt roads may seldom require pre-wetting, while others may need it more frequently.

5. Build-in application

5.1. Required equipment for build-in applications

To apply Terrabind Ultimate as a build-in application, we recommend using the following equipment:

- › A water spray truck
- › A pumping system to handle the biological dust control liquid
- › The working dilution can be prepared in a separate holding tank or directly in the water truck tank
- › Grader including a skilled operator
- › Compactor/roller including a skilled operator

5.2. Dosing calculation for build-in applications

For the initial establishment of your haul road, the recommended **volume per m² is 1.33 L of Terrabind Ultimate concentrate mixed with water to a volume of 4L/m² to 15 L/m² (depending on amount of liquid required to reach semi-plastic state)** on a road ripped to a depth of 12 cm.

To calculate the total amount of product required, calculate the total surface (m²) you want to treat:

$$f \text{ Road length (m) } \times \text{ Road width (m) } = \text{ Total area (m}^2\text{)}.$$

$$f \text{ Total area (m}^2\text{) } \times 1.33 \text{ L/m}^2 = \text{ Total volume (L)}.$$

Example:

To establish a 10 km road that is 10 m wide, then your total area is 100,000 m² (10,000 m x 10 m).

100,000 m² x 1.33 L/m² = 133,000 L (133 m³) of Terrabind Ultimate concentrate is needed.

5.3. Step-by-step guide

Before applying Terrabind Ultimate, it is necessary to determine the optimal liquid volume that the soil can absorb to become a firm but moldable mass (like damp clay) based on the Atterberg limits of your soil optimal moisture content, OMC. Adding an incorrect amount of liquid can negatively affect the product's performance, which is true for any dust control product available.

A soil analysis is conducted in our lab to establish the ideal water volume to be mixed with the soil using Terrabind Ultimate. The result provides an initial indication; however, the exact liquid amount may vary slightly onsite due to additional influencing factors. Therefore, we recommend to always determine this on site. In **chapter 5.4**, we demonstrate how the ideal liquid application volume is determined.

1

Determine the ideal liquid application volume. **See chapter 5.4.**



2

Fill the liquid product and water into to water spray truck.



3

Rip (10-15cm) and grade road surface.



4

Apply 80% to 90% of Terrabind Ultimate spraying solution and mix thoroughly until optimum moisture content is reached.



5

Once thoroughly mixed into the road substrate shape the road to the desired camber and make sure there is sufficient drainage next to the road.



6

Compact with pneumatic tyred or smooth drum roller.



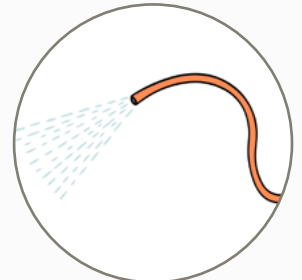
7

Spray-on a sealing application to lock the road.



8

After completed application, clean the tank by flushing with clean water.



5.4. Determination of the ideal liquid application volume for build-in applications

The performance of any dust control product depends on the ideal liquid application volume per volume of soil. With the “mudball” test you can identify the ideal water volume to be added to the soil even on-site.

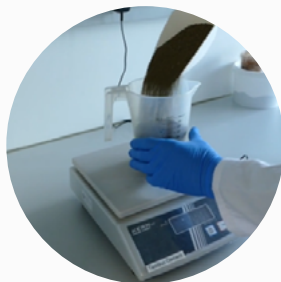
Equipment you need for the mudball test:

- › A 2-litre beaker
- › 1 litre of top-layer soil of the road material
- › A scale (optional)
- › A sturdy 5 litre plastic bag
- › Water in a vessel with scale

Mudball test steps:

1

Fill a 2-litre beaker with a 1-litre sample of top-layer soil of the soil material.



2

Place the soil into a sturdy plastic bag (min. 5 L volume). Add a small amount of water (e.g. 10 millilitres, note down the volume of water added) and mix.



3

Keep adding small amounts of water until the soil exhibits a semi-plastic state (visual inspection: shiny surface, soil is claggy but not muddy, when compressed by hand only a tiny amount of water squeezes out).



This is how the ideal moisture content of the mudball looks like

From your result you can calculate the ideal liquid application volume.



Calculation for build-in application:

- › Assumption: 1 cm of soil layer per square metre = $10 \text{ mm/m}^2 = 10 \text{ L/m}^2$ soil
- › Multiply the volume of water added in the test x 10 to get the application volume in L/m^2 per cm ripping depth
- › Note that if you use a different volume of soil in the test the calculation has to be adapted

e.g., for Paraburoo ER soil we needed 180 millilitres of water per litre of soil for an ideal moisture of 1.8 L/m^2 for 1 cm soil depth

- › 10 cm build-in/build-in would be ideal with 18 L/m^2 liquid volume
- › 3 cm build-in/build-in would be ideal with 5.4 L/m^2 liquid volume

Please note that given numbers are measured in the laboratory and have to be evaluated on-site and can be smaller. Important: Use slightly less volume for your onsite operations! Excessively muddy roads are undesirable, and compaction with a roller could be nearly impossible!

Watch the video here: Determination of the ideal liquid application volume



6. Maintenance applications

Climate, haul road substrate and traffic volume determine the frequency of maintenance application. Monitor the road and re-apply on first signs of dust.

After establishment, you should apply a total of 0.33 L/m^2 of Terrabind Ultimate concentrate per month. Therefore, the amount of product needed to maintain $100,000 \text{ m}^2$ is $33,000 \text{ L}$ (33 m^3) Terrabind Ultimate concentrate per month. Maintenance applications should be applied as a spray-on every 3 days.

The amount of product concentrate used in each of these applications is therefore 0.03 L/m^2 ; this should be applied in a total volume of at least 1 L/m^2 . Per application every 3 days, a total volume of $1 \text{ L/m}^2 \times 100,000 \text{ m}^2 = 100,000 \text{ L}$ of diluted product is required. A total of $0.03 \text{ L/m}^2 \times 100,000 \text{ m}^2 = 3,000 \text{ L}$ (3 m^3) of Terrabind Ultimate product concentrate should be diluted in this volume. This works out to be 600 L Terrabind Ultimate concentrate per $20,000 \text{ L}$ spray truck.



Use step 2 of the **spray-on application 4.3** to maintain the road.

7. Cleaning of equipment

No special equipment is needed to clean your equipment after the application of Terrabind Ultimate. Normal cleaning procedures with water or water and a detergent can be used. Biological dust control products do not clog machinery, unlike polymers or bitumen emulsions.

8. Storage and handling

Terrabind Ultimate concentrate (30%) is stable for more than 12 months under normal conditions. It is not highly temperature-sensitive and can be stored in a shelter with temperatures exceeding 40°C . However, it is recommended to store it in ambient conditions in the shade. Terrabind Ultimate use concentration (10%) should be used within 30 days. Always store the product concentrate with the lid closed. The product can absorb carbon dioxide from the atmosphere that can cause it to set.

FAQ FOR TERRABIND ULTIMATE

How quickly does the product need to be used after dilution?

The product dilution should ideally be used on the same day it is made.

Are there specific requirements for water quality?

No, any regular potable or non-potable water can be used, including brackish water.

How do I store Terrabind Ultimate?

Always keep containers closed and do not store them half full.

How long can I store the Terrabind Ultimate concentrate?

You can store it at least for 12 months.

What if the product has turned gel-like inside the container?

Ensure that the product concentrate is stored with the lid securely closed. Exposure to carbon dioxide from the atmosphere can lead to the product setting. If the product gels, it can be liquified by heating it to 50 degrees Celsius or higher, allowing for pumping in this state. However, this method is not recommended, as the product may re-gel within tubing and piping upon cooling.

How soon can roads be used after applying the product?

Most surfaces can be used immediately after application.

How is the product applied?

Terrabind is typically diluted to specified concentrations and applied using a water bowser. Refer to the instructions provided in the step-by-step guide.

Does the road need to be prepared before spraying the product on the road?

In the best-case scenario, the road is first brushed and freed of loose material.

Is compaction for build-in application important?

Yes, without the right compaction, no product can perform well. Compaction enables proper binding of the soil particles by reducing the pore volume between the particles in the soil. The right moisture is also crucial for proper compaction.

Will rain during the application affect the performance?

Yes, it will, as proper water content is crucial, and the road must be completely dry for optimal results.

Is proper drainage required?

A well-drained road profile is crucial for road construction. Effective drainage systems like ditches, table drains, and culverts direct runoff away from the road. As water can dissolve and erode most materials, managing its flow is vital for the road's durability and success.

What sets Terrabind products apart from most other road stabilising products on the market?

Terrabind is a complete biological product that performs a natural process. Thus, it has no negative effects on the environment. Rehabilitation is much easier afterwards.

YOUR CUSTOMISED CALCULATIONS



Road establishment with Terrabind Ultimate

Establishment spray-on

Establishment build-in

Treated area (m²):

Determined OMC (for build-in):

Water truck volume (L):

Dose rate (L):

Total amount of concentrate (L):

Maintenance spray-on application with Terrabind Ultimate

Treated area (m²):

Water truck volume (L):

Dose rate (L):

Total amount of concentrate (L):

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