

ECORROADS®

World finest product for the environment responsible road construction and soil stabilization



Rock Solid Soil Stabilization at a Fraction of the Cost

- **Public, Rural & Countryside road networks**
- **Access Roads / Haul Roads**
- **Green energy projects**
- **Mining & Timber Roads**
- **Dust reduction**
- **Airstrips**

What Is ECORoads® ?

ECORoads® is a breakthrough multi-enzyme product for road construction and soil stabilization. Our innovative product harnesses the power of a multi-enzyme formula that transforms local soils, resulting in enhanced strength, density, and longevity of roads / road bases in a cost-effective manner. With its efficient, 100% environmentally safe and economical approach, ECORoads® offers a sustainable solution for building durable and reliable road infrastructure.

Welcome to ECORoads, the 21st Century way to build permanent roads...

- **ECORoads Is Cost-Effective**
By significantly reducing or eliminating the need for imported aggregate material, ECORoads saves 40% – 60% on the cost of building a road. ECORoads can solidify and stabilize soils in situations where other materials, i.e. asphalt and concrete, would be cost prohibitive. Due to increased soil strength and stability, in some cases, a thinner topping may be applied resulting in additional cost savings.
- **ECORoads Uses Local Soil**
If at least 15% cohesive fines (silts and clays) are present, ECORoads can be mixed directly with the top 6" of soil to produce a strong road base virtually impervious to water penetration. If importing material is required, a less expensive, non-graded dirty aggregate can be used. Roads with ECORoads and a capping have gone as long as 10 years with no maintenance.

- **Increases Soil Density and Load Bearing Capacity.** The application of binds soil particles into a highly dense base, increasing strength and load bearing capacity (as measured by CBR, UCS and MR). The road base will resist the damaging effects of erosion and mechanical forces.
- **ECORoads Is Easy to apply and requires no special equipment or application procedures.** Simply add the ECORoads liquid concentrate to water, apply with a sprayer truck and mix into the soil. It can be used with reclaiming machines or applied with regular road building.
- **Reduces Maintenance and Labor**
Secondary roads without an asphalt topping require frequent maintenance (up to several times per year). With ECORoads, maintenance can be reduced by at least half, and in some cases, far more.
- **Resists Water Penetration, Weathering and Wear**
Soil material treated with ECORoads prevents water penetration, frost heaving, pot holes, and rutting, reducing maintenance costs overtime while increasing safety.

- **Cuts traditional road building costs by as much as 60%**
- **Reduces road maintenance costs by upwards of 50%**
- **Reduces carbon footprint of construction process up to 95%.**
- **Entirely non-toxic and completely eco-friendly**
- **Proven technology with over fifteen years of lab and field tests**

ECORoads is non-toxic, non-corrosive and non-caustic — it does not corrode equipment. It requires no special handling and no special containment procedures.

ECORoads contains no any combustible, non-explosive materials, and can be used near open flames.

It is non-gaseous and can be stored in poorly ventilated areas. It will not harm humans, animals, fish or vegetation under normal use.



What Is ECORoads® ?

ECORoads® is the product of several years of research and development by a team of scientists, engineers and road construction professionals from USA and Europe of both the biological and lab-engineered components of ECORoads®. We proudly offer a biomass-based, ecologically responsible road construction and soil stabilization product that helps clients save money, simplify construction processes and reduce their environmental impact.

Why ECORoads

While the soil stabilization have been around for decades, until now, no product has proven itself for consistent, reliable and effective performance. Only ECORoads' multi-enzyme formulation increase the compressive strength of soil, acting as a catalyst to accelerate and strengthen road material bonding, creating a denser, cohesive and stable soil. The multi-enzyme formulation in ECORoads also reduce the compaction effort and improve soil workability while lubricating the soil particles. This makes the soil easier to grade and allows the compactor to achieve targeted soil density with fewer passes.

What ECORoads Is Made Of

ECORoads is a complex non-bacterial, concentrated, multi-enzymatic formulation that alters the properties of earth materials, providing one of the most cost-effective methods to construct or stabilize roads and road base. While enzymes are a core part of the ECORoads formulation, the product contains additional organic compounds designed to accelerate bonding of ionic, charged soil particles.

ECORoads increases the soil bearing characteristics by promoting a closer binding of soil particles. This reduces the tendency of the soil to expand after compaction and results in a strong, stable earth layer that resists the migration of water.

What Is the “Eco” In ECORoads?

ECORoads is made entirely from organic materials, non-toxic, non-caustic, non-corrosive and is. The production of ECORoads requires no heating or fire processing, and produces hardly any carbon output whatsoever.

ECORoads® reducing the carbon footprint of road construction

CONVENTIONAL CONSTRUCTION, ROAD 1km x 7m				
	BASE LAYER 0.3m		SUB-BASE LAYER 0.3m	
	Approximate required volume	Emission	Approximate required volume	Emission
EXCAVATION OF ORIGINAL MATERIALS ON THE CONSTRUCTION SITE	2100 cubic meters	1240 kg CO2	2100 cubic meters	1240 kg CO2
TRANSPORTATION, REMOVAL OF ORIGINAL MATERIALS FROM THE CONSTRUCTION SITE	3570 metric ton	2433 kg CO2	3570 metric ton	2433 kg CO2
MINING OF AGGREGATE MATERIALS	2800 metric ton	14000 kg CO2	2800 metric ton	14000 kg CO2
TRANSPORTATION, DELIVERY OF AGGREGATE MATERIALS TO THE CONSTRUCTION SITE	4200 metric ton	8890 kg CO2	4200 metric ton	8890 kg CO2
DISBURSEMENT AND LEVELING OF THE IMPORTED AGGREGATE MATERIALS	7000 square meters x 4200 metric ton	558 kg CO2	7000 square meters x 4200 metric ton	558 kg CO2
COMPACTION	7000 square meters	860 kg CO2	7000 square meters	860 kg CO2
TOTAL		27981 kg CO2		27981 kg CO2
CONSTRUCTION WITH ECORoads, ROAD 1km x 7m				
	BASE LAYER 0.2m		SUB-BASE LAYER 0.2m	
	Approximate required volume	Emission	Approximate required volume	Emission
RIPPING AND GRADING ORIGINAL MATERIALS	1400 cubic meters	278 kg CO2	1400 cubic meters	278 kg CO2
APPLICATION OF ECORoads, WATER TANK TRUCK	7000 square meters	268 kg CO2	7000 square meters	268 kg CO2
MIXING, GRADIND, LEVELING	7000 square meters x 1400 cubic meters	558 kg CO2	7000 square meters x 1400 cubic meters	558 kg CO2
COMPACTION	7000 square meters	860 kg CO2	7000 square meters	860 kg CO2
TOTAL		1964 kg CO2		1964 kg CO2
USE OF ECORoads CAN REDUCE UP TO 93% OF THE CARBON FOOTPRINT IN BASE OR SUB-BASE CONSTRUCTION				



Key Applications

Anyone who wants to take advantage of cost savings, expedited road building, and lower environmental impact can benefit with **ECORoads®**. It is easy to apply and highly suitable for a variety of road building applications.

ECORoads' Uses

- Public Roads & Road Networks
- Rural & Countryside Roads
- Road Maintenance
- Mining and Timber Roads
- Access Roads /Dirt Roads / Haul Roads
- Dust Reduction
- Parking Lots & Driveways
- Green energy projects
- Pipe Bedding & Cut Back Fill
- Hard Shoulders & Securing Slopes
- Airstrips



Road Building

No matter what state the world economy is in, ECORoads provides the needed cost-savings solutions for local and broad infrastructure projects.



Real Estate Development

ECORoads provides deep value in accelerating building time, and reducing complexity and time to market, while making projects more attractive to buyers, investors and financial institutions.



GREEN ENERGY PROJECTS

With its reduced environmental footprint, cost savings and rapid road construction, ECORoads is the natural choice for access roads in the green energy market.



Rural Roads

For ecologically sensitive projects that seek environmentally safe product and cost saving processes to keep their projects green, ECORoads becomes an easy choice.



Mining Roads

ECORoads has been successfully used on mining haul roads since 2010 with stellar performance and results.



PARKS & TIMBER ROADS

Forest roads provide the most important means of accessing forests for timber harvesting, recreation, and hiking. They should be placed and maintained with extreme care to prevent any possible negative impact on soil or ecological balance.

How It Works

ECORoads is easy to use and requires no special equipment or complicated training. Simply add ECORoads to the water used to reach Optimum Moisture for Compaction and mix well with the road subgrade material prior to compaction.

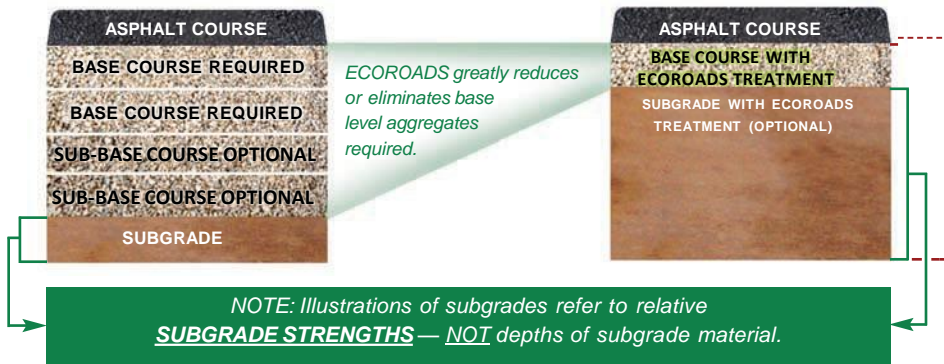
Our formula acts upon the cohesive fines contained in the soil through a natural bonding process. This promotes a closer binding of soil particles, which in turn results in a stronger, more stable, longer-lasting earth layer. The greater bonding density creates a base that prevents pot holes, wheel ruts and soil migration, is almost impervious to water penetration and is significantly resistant to frost heaving.

Depending on the Traffic Index or designed use of the road, the improved strength that ECORoads creates allows you to **significantly reduce the amount of aggregate base rock required**, reducing total construction costs up to 60%. For even greater durability, treated road bases should be topped with a material of choice, including asphalt, chip seal or bitumen primer.

ECORoads accelerates the bonding of cohesive fines within the local soil, creating a harder, more lasting base

- Increases the compressive strength of the soil
- Acts as a catalyst to accelerate and strengthen road material bonding, creating a denser, cohesive and more stable soil
- Reduces the compaction effort and improves soil workability while lubricating the soil particles
- This makes the soil easier to grade and allows the compactor to achieve targeted soil density with fewer passes

ECORoads Cost Savings



Reach a higher CBR, MR or UCS level just using the existing subgrade and ECORoads

This allows you to use far less aggregate base rock without sacrificing strength or durability

Saves cost, time and complexity

Building Element	Cost Per 1km x 7m	Cost Per 1km x 7 m with ECORoads
Excavation and Preparation	\$ 200,000	\$ 50,000
Sub-Base Course Construction	\$120,000	\$ 40,000
Base Course Construction	\$ 400,000	\$ 40,000
Asphalt Pavement	\$ 200,000	\$ 200,000
Miscellaneous	\$ 80,000	\$ 80,000
Total Cost Per Mile	\$1,000,000	\$ 370,000

Use of ECORoads reduce over 60 % in cost of construction



The ECORoads® Process

ECORoads is easy to apply and requires no special equipment or application procedures. It can be used with reclaiming machines or applied with regular road building machines. ECORoads should be used with soils that contain at least 15% cohesive fines. It is mixed with water used for compaction during normal building techniques.

How ECORoads Is Applied

How ECORoads Is Sold

ECORoads is sold in a liquid concentrate form. This eliminates bulk storage, pre-mixing, and handling of large amounts of materials. ECORoads is easy to apply and requires no special equipment or application procedures. It can be used with reclaiming machines or applied with regular road building equipment.



1. Grade the road according to the road design specifications desired, placing graded material to the side in a windrow.



2. Add ECORoads to the water truck and spray ECORoads/water solution onto the road base and windrow, as you would to bring soil to optimum moisture for compaction.



3. Mix applied ECORoads treated material in a windrow using a grader blade or soil mixer. Blade treated soil mix to create road level and crown surface.



4. Compact and cap the road with topping materials, making sure to crown road for proper drainage.

After 72 hours of drying with normal dry weather, the road is ready for use or for application of any desired topping, such as asphalt or other surface coating.



FREQUENTLY ASKED QUESTIONS

ECORoads® is a proven, innovative multi-enzyme based soil stabilization product that increases the strength, density, and durability of roads, road bases and construction site foundations efficiently and economically. ECORoads® multi-enzyme based liquid formula hardens the local soil into a solid and durable road base to reduce or eliminate the aggregates needed.

What is enzyme stabilization and why is it important?

Enzymes increase the compressive strength of soil. The enzyme acts as a catalyst to accelerate and strengthen road material bonding, creating a dense, more cohesive and stable soil. Enzymes also reduce the compaction effort and improve soil workability while lubricating the soil particles. This makes the soil easier to grade and allows the compactor to achieve targeted soil density with fewer passes. Enzyme stabilization also:

- Increases soil density: helps reduce voids between soil particles by altering electro-chemical attraction in soil particles and releasing bound water. The result is a tighter, dryer, denser road foundation
- Lowers water permeability: Tighter soil configurations discourage the migration of water that normally occurs in the voids between particles. Greater resistance to water penetration deterioration.
- Is environmentally safe: Enzymes are natural, safe (organic) materials. These materials are non-toxic and will cause no harm or danger to humans, animals, fish or vegetation.

How is ECORoads® different than traditional methods?

Use of the **ECORoads®** allows constructing road bases quicker and less expensive than traditional methods. **ECORoads®** multi-enzyme based formulation alters the properties of earth materials to increase the soil bearing characteristics by promoting a closer binding of soil particles. This reduces the tendency of the soil to expand after compaction and results in a strong, stable earth layer that resists water migration. **ECORoads®** helps prevent pot holes, increase wheel load strength, resist moisture and prevent frost heaving. Roads made with **ECORoads®** last longer with less maintenance, saving time and money..

As time goes on will ECORoads® reduce or increase in bonding strength?

ECORoads® treated soils achieve their greatest strength during the 2-3 months period after compaction. Bonding of the soil particles takes place in the presence of moisture and compaction force. This condition will last as long as the material resists external forces. Heavy wheel loads, water, freeze-thaw cycles ultimately have an effect on all roads. **ECORoads®** treated soils resists these forces due to the bonded, high density of the road material. The road will resist the detrimental effects of erosion and mechanical forces. Note that when the clay fines (minus 200 mesh) exceed 25% or are highly expansive, some surface cracking will occur. Generally the cracks are superficial, often filling in with road particles during normal traffic use. This condition is often referred to as "Alligator Cracking" and does not significantly affect the stability of the road base. Rain or other moisture will moderately swell the clay fines and the cracks will close. If the clay material is highly expansive, then the amount of fines should be kept low to reduce the amount of cracking. Prior to placement of any surface material, **ECORoads®** treated soil should be lightly sprayed with a dilute solution of water and **ECORoads®** to assist in the bonding of the new surface material (i.e. asphalt) to the road base. Moisture will close many of the cracks.





Proven effective around the globe

ECORoads has proven to be effective and been successfully used for many kinds of roads in projects around the globe from the freezing north to the hot and dry south climates, from rainy tropical forests to mountain tops, and from the deepest mines to the busiest cities.

ECORoads has excelled in numerous independent lab tests across the globe.

According to independent tests completed by government and non-government civil engineering laboratories ECORoads proved to increase CBR of a local soils from 50% up to 350%.

ECORoads has been used with various soil types and geological conditions and has been recognized with considerable success by government authorities, road builders, general contractors, and geotechnical consultants all over the world.



Tanzania, DR Congo, Ghana, Kenya, Cameroon, Angola, Brazil, Venezuela, Costa Rica, Panama, Colombia, Peru, Morocco, Malawi, Zimbabwe, Botswana, Comoros, Spain, Croatia, Slovenia, Russia, Ukraine, Georgia, Kazakhstan, Thailand, Uzbekistan, Mongolia and etc...

Who Benefits

From its easy implementation to its cost savings and low eco-footprint, all parties can agree that ECORoads adds value at every step in the road construction supply chain.

Road Designers and Engineers

ECORoads offers road designers and engineers a new choice in soil stabilization. Whether your desired metric is California Bearing Ratio, Resilient Modulus, Unconfined Compressive Strength, or Gravel Index, ECORoads should be part of your materials mix.

ECORoads stabilizes subgrades and bases on projects ranging from public and private roads to parking lots, embankments and even low height building pads. It can drastically reduce the amount of aggregate base rock required for your pavement or base designs – and lower your client's cost by a factor of up to 60%.

Geotechnical Consultants

Geotechnical consultants like the fact that ECORoads acts as a catalyst to accelerate and strengthen road material bonding, creating a denser, cohesive and more stable soil. And they appreciate that ECORoads has been proven effective on a variety of soil types around the world.

An additional benefit is being able to significantly improve the environmental profile of your project, helping your clients attain valuable LEED points, tax credits and public recognition.

General Site Contractors General Site Contractors will be relieved to find a construction solution that eases the costs and logistics of road construction.

Traditionally, outside aggregates needed to be trucked in to provide material for strengthening the road base. ECORoads reduces or eliminates outside trucking of material. ECORoads soil stabilizer is mixed with water and applied to the in situ soil to create a strong, durable road base. So you work with your local soil instead of having to haul it away. With a typical mile of road requiring over 10,000 tons of mined rock per mile, considering the cost of materials, trucking and gas, the cost savings with ECORoads can add up.

ECORoads can also be used to harden other surfaces on the work site including parking lots, hard shoulders, haul roads, stabilization of clay foundations, and staging areas.

Public Works Officials

Public works officials interested in speeding up time to deliver services to taxpayers look to ECORoads soil stabilizer to reduce road construction time, save money, and set a standard for environmental consciousness.





With soil stabilization constituting a significant portion of total construction costs, use of ECORoads can reduce overall costs significantly.

ECORoads' effectiveness in reducing pot holes, rutting and heaving of roads reduces long-term road maintenance costs drastically. And with environmental sensitivity growing as a differentiator, ECORoads will help raise the environmental and safety profile of your road to set or comply with local or national environmental standards.

Government

ECORoads soil stabilizer is a welcome solution to governments faced with the need to do more with less. When it comes to national or local infrastructure, ECORoads can help reduce the cost and accelerate the pace of road building — build more roads for the same budget.

A country's productive use of its natural resources can determine its future, but a lack of working roads connecting its resources to its population hubs can keep a country's development stalled for decades.

ECORoads has begun to reverse this dynamic, helping forward-thinking governments to build out a lasting road network at a fraction of the cost to help countries thrive.

ECORoads is at the forefront of the growing green roads movement, providing a needed solution at a time when environmental issues, such as global warming, are at a critical stage. As one step in the broader trend toward lower-impact solutions, ECORoads helps build a 21st century infrastructure in an environmentally-responsible way.

In the United States

Despite unprecedented stimulus funds for infrastructure, federal, state, municipal and county budgets remain stretched to their limits, and experts believe \$2 trillion will be needed over the next several years to modernize America's infrastructure. In this context of broader support for infrastructure and green jobs, ECORoads will allow for a greater number of projects to be green lit, with significant cost savings, resulting in more durable, longer lasting roads being built.



Around the World

As the world grows in population and becomes increasingly interconnected, infrastructure needs grow ever more important. In developing countries, road networks have deteriorated and will require significant investments over the next several years. And many countries have a strong need to build out their transportation networks to connect growing cities, ports and villages. ECORoads provides the needed solution to accomplish this cost-effectively, bringing modern infrastructure within reach throughout the developing world.





TERRAFUSION

I N T E R N A T I O N A L



MEMBER



MEMBER



MEMBER



MEMBER

TERRAFUSION INTERNATIONAL, INC, an American enterprise, is renowned worldwide in the road construction industry for its unparalleled standards and dedication to exceptional quality in both products and services. Through years of unwavering commitment and profound expertise, it has cultivated strong cooperation with esteemed organizations and corporations across the globe, solidifying its status as the foremost authority in its domain.

TERRAFUSION INTERNATIONAL, INC 's mission is to offer environmentally safe, sustainable, innovative products and solutions for road construction and soil stabilization that help reduce the use of harsh toxic chemicals, lessen the carbon footprint, and minimize the total project cost.

TERRAFUSION INTERNATIONAL, INC has delivered customized solutions to many road construction and road maintenance projects in communities throughout the Americas, Europe, Africa, and Asia. Our professional network around the globe is committed to deliver the best solutions for any challenging projects in any difficult circumstances. TFI's integrated customer service provides an ideal platform to satisfy any customer's needs.



While anyone can sell you a product, we are the only soil stabilization company with trained, experienced, and highly qualified technical and quality assurance support team to provide testing of local soils for compatibility, training local teams anywhere around the globe, and assisting in redesigning roads to include ECORoads® as a core component. Rigorous testing of ECORoads®, together with independent evaluations by third party agencies and feedback from our customers, has resulted in a soil stabilization product you can trust.

Whether your project is small, medium, or large, our team looks forward to working with you to support your next project. Our innovative approach and the global network of technical expertise will deliver an experience that is as strong and lasting as our product. It is our job to make sure that our product performs for you every time.

The **TERRAFUSION INTERNATIONAL, INC** team is committed to its mission to provide environmentally safe developments and improvements of road infrastructures and improving the quality of people's lives around the world.



TERRAFUSION
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TERRAFUSION INTERNATIONAL, INC offers a range of biomass-based construction products that help clients save money, simplify construction processes and reduce their environmental impact. TERRAFUSION INTERNATIONAL, INC is proud to be a leader on the cutting edge of environmentally responsible construction technology.

TERRAFUSION INTERNATIONAL, INC has established distribution and partnerships all around the world. If you're seeking a distributor nearby, or if you're interested in exploring the possibility of becoming a distributor yourself, please don't hesitate to contact us at contact@ecoroads.com.



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