



## The Environmental advantages of using RoadCem for Soil Stabilisation:

RoadCem is an engineered modifier for use with cement and other pozzolans, manufactured in Holland by PowerCem BV it comprises a mix of alkali earth metals with no hazardous ingredients present.

RoadCem is environmental friendly. This is confirmed and reported by Dutch accredited laboratories after investigating the leaching behaviour of composite materials for a simulated period of 100 years.

Composite materials stabilized/solidified using RoadCem treated materials have also successfully passed the Dutch Environmental Tests and have been certified to be used as Category One Building Materials according to the Dutch Building Materials Decree.

RoadCem will not harm the ecology. It works with excellent results in alluvial soil, high plasticity soils, sandy soils and organic/inorganic waste streams, both toxic and low level radioactive.

It is currently being used in countries across Europe, Asia, Africa and America, improving the performance of cement for use in stabilising soils.

One of the most important advantages of RoadCem soil stabilisation is the capability to treat all types of in-situ site soils to form strong durable working platforms for both temporary and permanent use. Avoiding the need for the import of stronger soils or aggregates to site to replace existing soils and materials. A concept that should be considered unsustainable, as in addition to increasing traffic to and from site, it impacts on carbon footprint, local toxicity levels and virgin material input reduction targets.



Compared to traditional construction methods RoadCem has been shown in a study by NIBE Environmental to reduce environmental impact by up to 240%, CO2 emissions by over 118% and Human Toxicity levels by over 300%.

## The Application of RoadCem:

RoadCem is mixed with soil and Portland cement and/or PFA or other pozzolans to proportions to be determined by:



- The soil characteristics: These are determined by laboratory analysis which identifies the amount of organic matter, pollutants, particle size, pH, and moisture holding capacity.
- The characteristics of the site of the work: the climate, the frequency of rainfall, average temperature, etc.,
- The load bearing requirement and longevity of the project.

RoadCem unlike other stabilisation technologies is strong enough to be used without any surface protection, an important consideration for cost, sustainability, construction efficiency and site reinstatement implications.

RoadCem technology is 100% recyclable, stabilised soils and materials can after installation be simply milled back to nature with nothing removed from site. Initially there will be an increase in pH.

But should will revert to normal for the site if adjacent top soils are combined with the reclaimed soils and water and/or rain re-hydrates the very dry exposed soils.



## RoadCem Stabilisation causes a temporary increase in pH values

*Concerning the alkalinity of the treated samples we have to mention that the pH during the treatment and curing period rises temporarily due to the characteristic / reaction of the cement used as binder.*

*This temporary side effect is subsequently overcome by the carbonization of the treated materials caused by uptake of atmospherical CO<sub>2</sub> .*

*The RoadCem treated soils serves as a mere CO<sub>2</sub> sink.*

*When the carbonization is complete the pH should stabilise in a range at pH = 7 – 8.*

*This a process however, could be accelerated by addition of CO<sub>2</sub> from biologically active organic soils stored in the immediate vicinity of such materials.*

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When stabilising soils with cement alone, the molecules of carboxylic and hydroxylic type (R-COOH and R-OH) organic compounds generated during decomposition of organic materials form a surface film that inhibits the cement from fully hydrating, potentially leaving residual pockets of dry cement, with frequently as much as 30% remaining trapped in the stabilisation.

RoadCem removes these molecules through an ion exchange process which neutralizes the effect of organic compounds and allows the full 100% hydration of the cement binder.

Ensuring the full use of the cement binder is most important for temporary works, as in addition to reducing carbon footprint, it allows reinstatement of the treated soils back to nature. Avoiding any need to remove materials from site on completion of project, and significantly reducing time and cost.

Another important advantage with RoadCem over traditional cement stabilisation is the effective stabilisation of clays, as ions are exchanged in the clay particles allowing them to adhere more firmly reducing water permeability and still preventing any untreated clumps from forming during stabilisation.

Because the hydration of the calcium silicates cations (negatively charged ions related to positively charged ions such as calcium cement) help prevent any phase locking taking place and allow total encapsulation. The distance between the soil particles in a RoadCem stabilisation is reduced with RoadCem exchanged ions and water molecules forming a stable form of "honeycomb", so no voids occur in the final stabilisation.

Voids are created with conventional soil stabilization, as the cement alone does not react efficiently in organic



The substances formed in the decomposition of these organic materials are macromolecules of the form R-COOH and R-OH (carboxylic and hydroxylic) dissolved in the water between the soil particles, potentially creating these voids.

Most importantly these RoadCem modified cement particles introduced into the spaces between soil particles will not be damaged or degraded by the organic materials during the lifetime of the stabilisation, reducing the need for ongoing maintenance of RoadCem stabilisation's.

This is a real sustainable advantage, which should be taken into account when calculating the overall cost of temporary works on a cradle to cradle basis.

When RoadCem is used for permanent structures such as foundation or road base, there will be little or no degradation or damage for 10 years and upwards.

With no propensity to crack or shrink RoadCem stabilisation solves the problems of moving on to a site with soils that are too weak to achieve the stability and strength for your high load bearing engineering requirements and does it in the most predictable and environmentally friendly way.

RoadCem takes all the risk out of stabilisation as organic soils and clays even in contaminated land can now be stabilised and immobilized with cement just by adding RoadCem to the mix.



Un-surfaced simple RoadCem soil stabilisation, after two years use.



Thin Gravel laid directly on a RoadCem soil stabilisation.



Tar and chip finish bonded directly to RoadCem soil stabilisation.