
POWERCEM
PCM
MAGAZINE

Mission:
To support our customers throughout their entire project process with intelligent solutions, through quality and continuous improvement, to achieve complete satisfaction.

Vision:
To be the option of choice for the application of "nanotechnology" in the construction sector of ground roads, hydraulic works, petroleum works, and ports, as well as airports, foundations, and containment of highly-contaminated materials, always committed to protecting the environment.

Values:

- Honesty: We behave and express ourselves with consistency, honesty, and transparency. We act with fairness towards our teams and our customers, always respecting the applicable regulations.
- Professionalism: We work as efficiently as possible to achieve optimal results.
- Respect: We develop our business in an environment of deep respect. The integrity and diversity of all people we interact with is essential: acknowledging, accepting, and appreciating each individual's qualities.
- Commitment: We are a team of people committed to our job.
- We do what is necessary, individually, to contribute with our best knowledge towards a common goal.
- Human quality: Professionalism is not enough: we care about having good people enrolled in our company.
- Teamwork: We have put together a team where hard work and cooperation is deeply appreciated.

Philosophy:

Never measure what you accomplish with the only factor success should not be measured with: money. Money hides from whoever is obsessed to find it, and always appears to whoever realized there was no reason to look for it.

Find the most important aspects of yourself and your company, and all else will be given to you in addition.

POWERCEM PCM MAGAZINE

To our dear friends:

More than years ago, we introduced in North and south america an innovative "nanotechnology" solution, which transforms the molecular composition of the soil, significantly improving its qualities and creating a new concrete: the RoadCem Synthetic Zeolite Concrete.

With the use of our Roadcem Synthetic Zeolite Concrete, many infrastructure works are carried out within a sustainable ecologic environment, drastically reducing execution times, with a much longer lifespan and greater strength, far superior to conventional processes. With this new solution, we have managed to reduce the financial burdens generated by execution and maintenance processes in construction works by providing the option of a much more economical project in the medium and long terms.

Thanks to this, a considerable number of solutions have been provided for traffic infrastructure works, platforms, railway lines, airports, toxic waste containment, channels, and dams.

This "nanotechnology" has been assessed and certified by multiple government institutions and entities both in Mexico and globally.

We are committed to generating added value in all our actions, always improving our processes and offering adequate solutions for current challenges.

Expecting to fulfill your project expectations, we welcome you to this new technology.

Sincerely

CEO Robin de la Roij
Powercem Technologies

CEO Lic. Rolando Montero Casillas
PowerCem Mexico America


La Isla - Acayucan Highway, Veracruz, Mexico
PCM
POWERCEM
MAGAZINE
PowerCem®
Magazine

CONTENTS

05 About Us

06 Products

07 Propierties and Advantages

08 Applications

11 Environment

12 RoadCem Synthetic Zeolite Concrete

14 Comparison of distribution of Stress and Deformation

15 RSZC Structure Section

19 Constructive Process

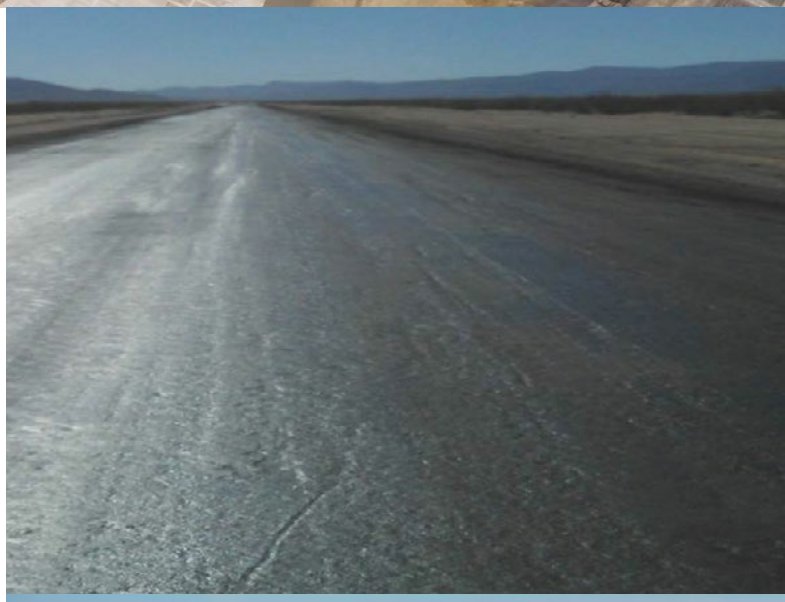
21 Technology Validated in Mexico

24 Normative

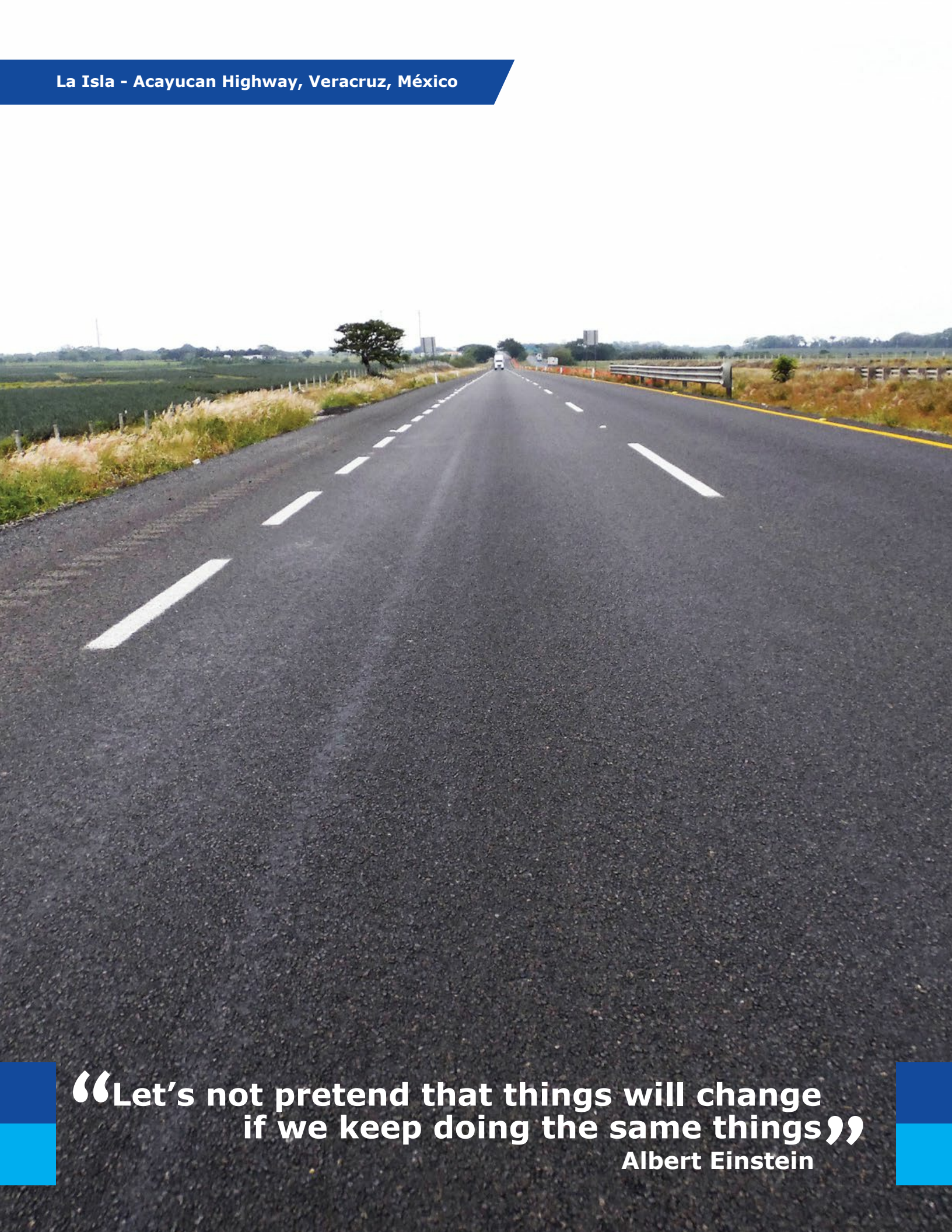
26 Research and Development

43 Portfolio

82 Resume



La Isla - Acayucan Highway, Veracruz, México



“Let’s not pretend that things will change if we keep doing the same things”

Albert Einstein

About Us

With more than 30 years of global experience and 17 years in North and South America, with a **highly-specialized** team that supports the proper operation of our nanotechnology-based products derived from Syntetic Zeolites, alkaline compounds, and patent activators, expressly designed for their application in the **construction** sector, the immobilization of highly-contaminated materials, and the transformation of any type of soil into the creation of RoadCem Synthetic Zeolite Concrete (RSZC).

This "nanotechnology" allows the use of all types of soils, **including** such that are usually not appropriate for construction by modifying the hydration process of Portland Cement, thus improving its crystallization and generating a crystalline and stingy nanostructure, which solves low-resistance soil, granting them **unique** properties, since the final product is **NOT** a granular material, but a **RoadCem Synthetic Zeolite Concrete (RSZC).**

THE ROADCEM SYNTHETIC ZEOLITE CONCRETE (RSZC) is the result of a constructive process consisting of a compacted, monolithic, water-resistant, semi-rigid mixture, made with any type of soil, RoadCem, Portland cement, and water, and capable of being used in land roads, hydraulic works, buildings, or foundations.

Nanotechnology with the use of Synthetic Zeolites.

Resistant to wear and deterioration.

Transformation of any type of soils.

Products

RoadCem®

Resolves soil low-resistance issues by modifying soil with unique mechanical properties, thus creating a RoadCem Synthetic Zeolite Concrete (RSZC), depending on the project application, will be used as Footer Base, Intermediate Base, Subbase, Base, injected or shotcrete.

ImmoCem®

It is a product with similar properties as RoadCem, but focused on the containment of polluting waste.

It short, it is a sustainable solution for transforming highly-contaminated soils into materials suited for constructing pavement structures

ConcreCem®

It is especially designed to improve the properties of Portland Hydraulic concretes, with unforeseen resistances and features, such as:

- Reduction of curing times.
- Temperature reduction during the reaction process
- High strength in Simple Compacting (f'c)
- Incomparable flexural strength (MR)

Properties and Advantages

Properties and Advantages

- Use of on-site materials
- Reduced execution **times**
- Reduced **import** and export **materials**
- Reduced preservation costs
- Reduced direct costs
- Included supervision and technical support
- Application in rain moderate
- Increase in : Axial Elastic Module (E), Resilience Module (Mr), Strength (weariness, abrasiveness, flexural strength (MR), simple compacting (f'c), corrosion, cutting effort, and service life)
- Radical decrease in the Permeability Coefficient k, Poisson's Ratio, and impact deflections (HWD, FWD)
- Cracking and leaching suppression
- Uniformety in stress distribution (σ) and deformations (ε)
- Increase in resistance to extreme temperatures (expansion/contraction)
- Soil avidity neutralization
- Heavy metal isolation
- **Thickness reduction** in pavement structures

Aplications

Aplications

Plan Chontalpa Highway, Tabasco, Mexico

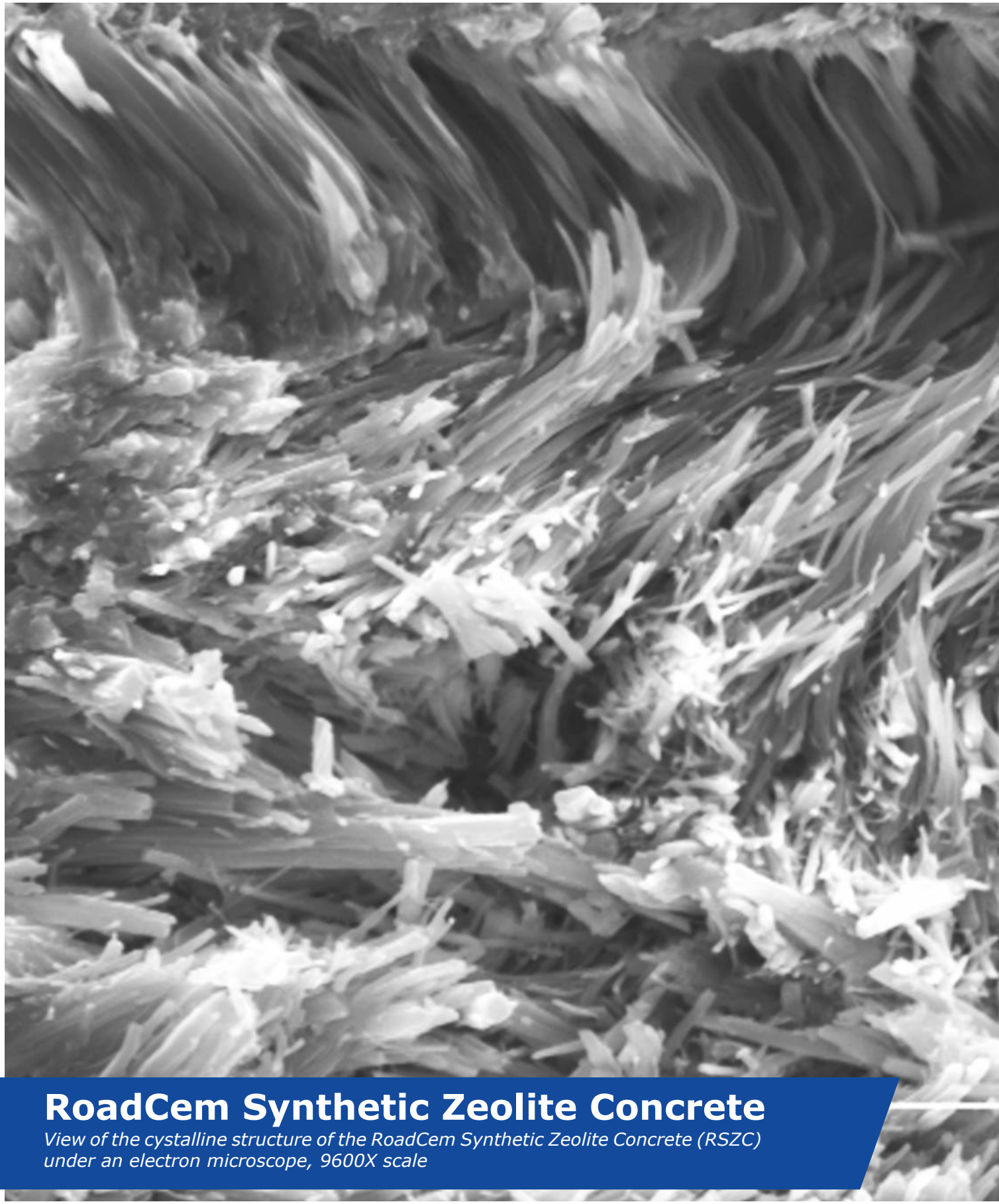
“ PowerCem Technologies,
in harmony with the environment ”

Environment

At PowerCem, we work to ensure that technology dwells in complete harmony with our environment. This is why we have created products that contribute to reducing the polluting reaction of traditional construction systems.

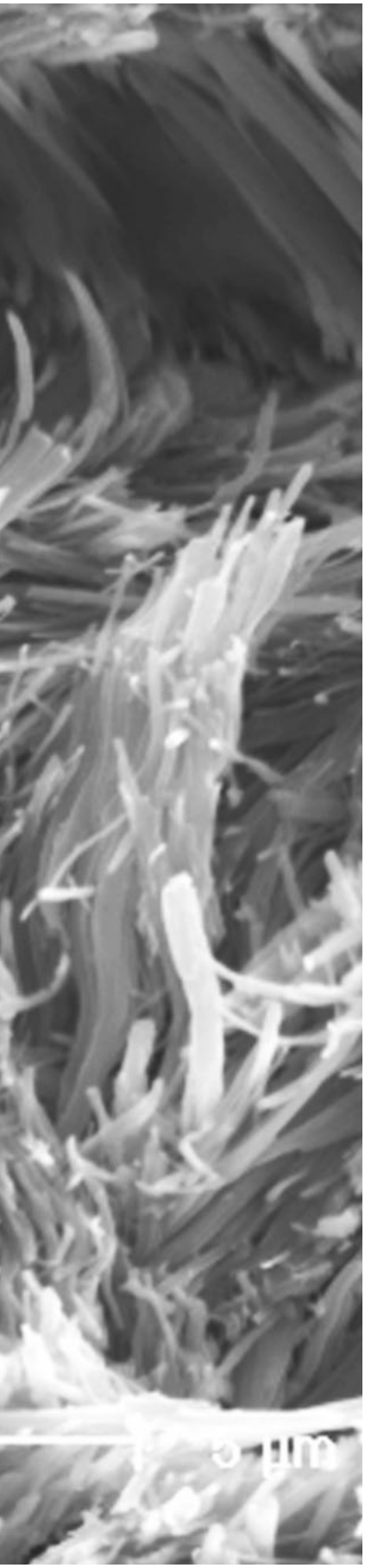
Additionally, our technology is environmentally-friendly, since it can recycle any material on site, and adjusts to the Clinton initiative and to the Kyoto protocol.

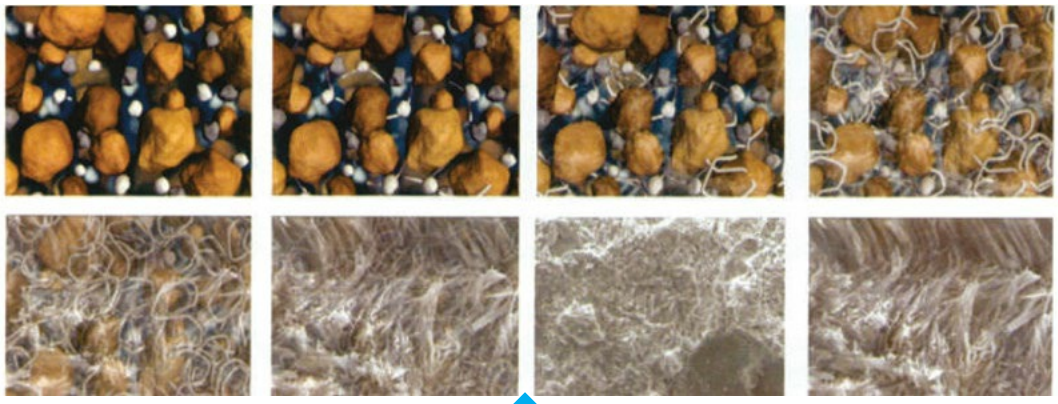
This is only an example of what commitment and responsibility can achieve for future generations.



RoadCem Synthetic Zeolite Concrete

View of the cystalline structure of the RoadCem Synthetic Zeolite Concrete (RSZC) under an electron microscope, 9600X scale



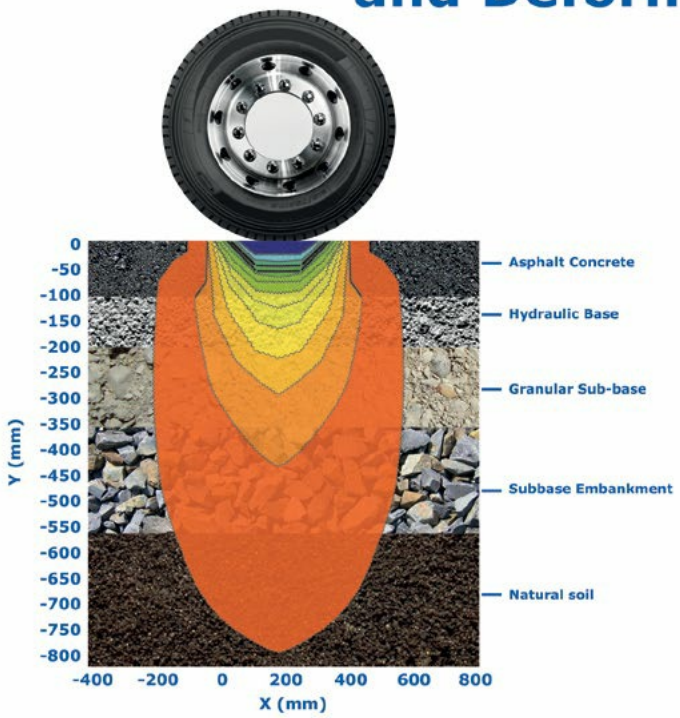


Simulation of the hydration process and the "enveloping" crystallization effect.

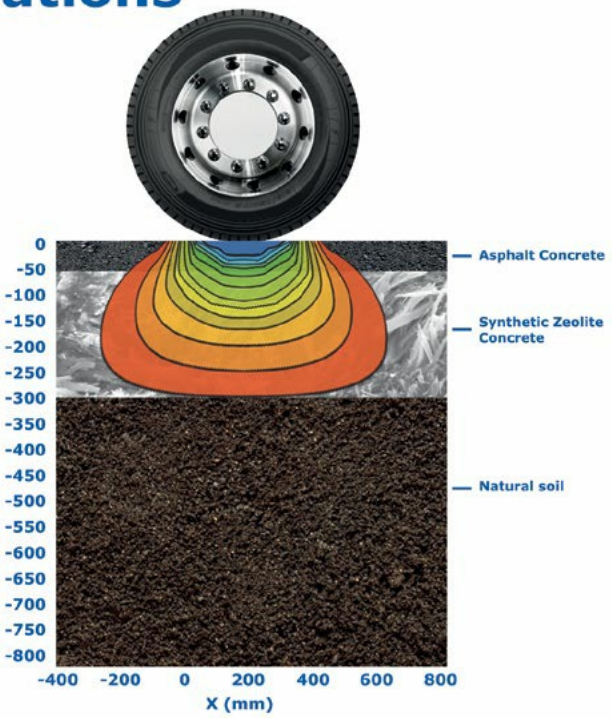
Our "nanotechnology" resolves low-soil strength issues, enabling the use of any soil, including such that are usually not fit for construction. So-called "poor quality" materials (marginal or conflictive), such as expansive or collapsible clay soils, are transformed into a RoadCem Synthetic Zeolite Concrete (RSZC) slab with unique mechanical properties and a non-granular final product.

Specifically designed for its application in construction and redevelopment of land roads, hydraulic works, and foundations for highways, freeways, rural roads, harvesting roads, and access roads. It is also useful in urban roads, parking lots, airport strips, railway roads, slopes, cuttings, bridges, and tunnels, as well as for pipeline bases, aqueducts, channels, dams, embankments, buildings, industrial facilities, maneuvering courtyards, heavy load storage patios, maritime terminals, heavy load containers, and other industrial works.

Stress Distribution and Deformations

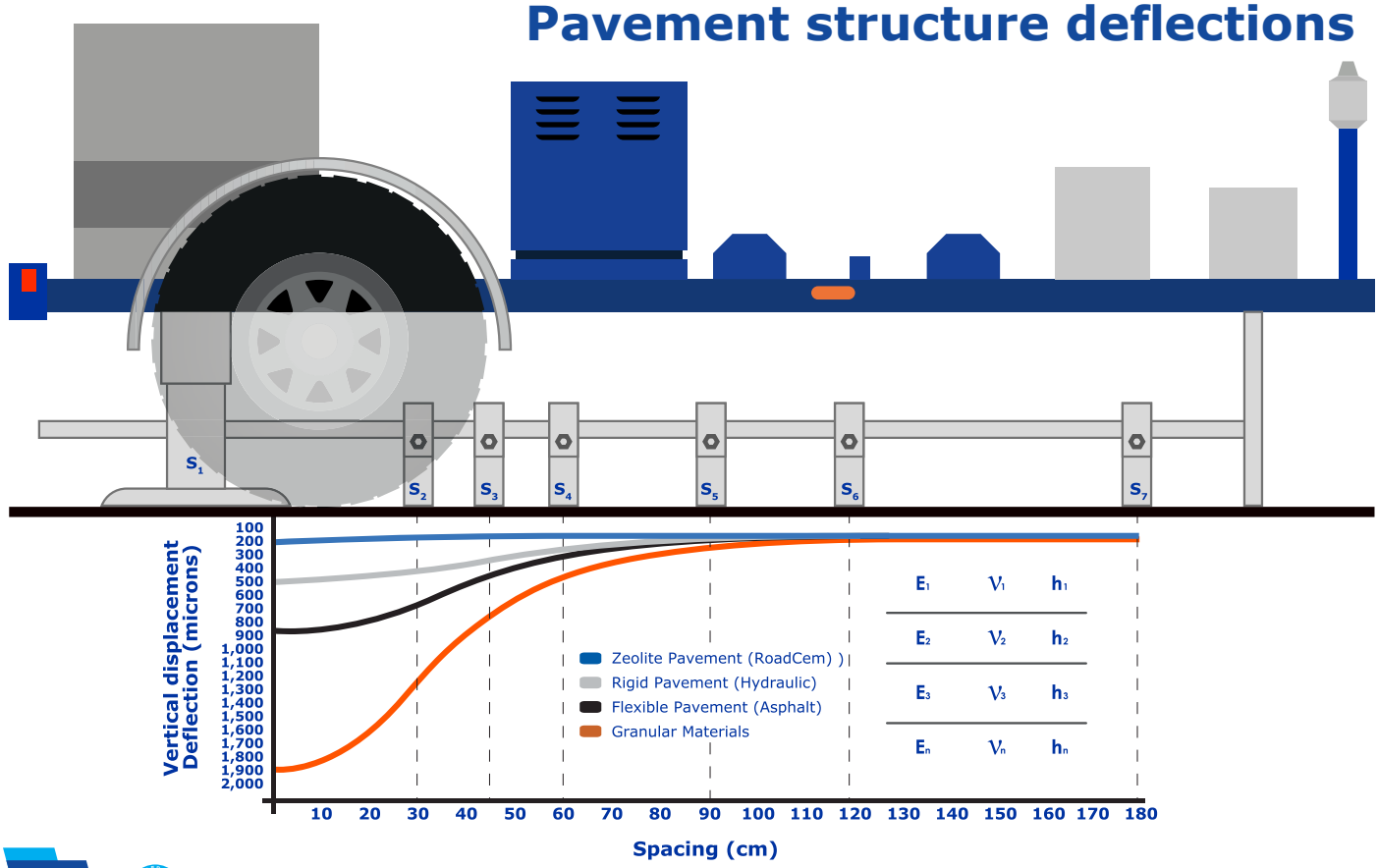


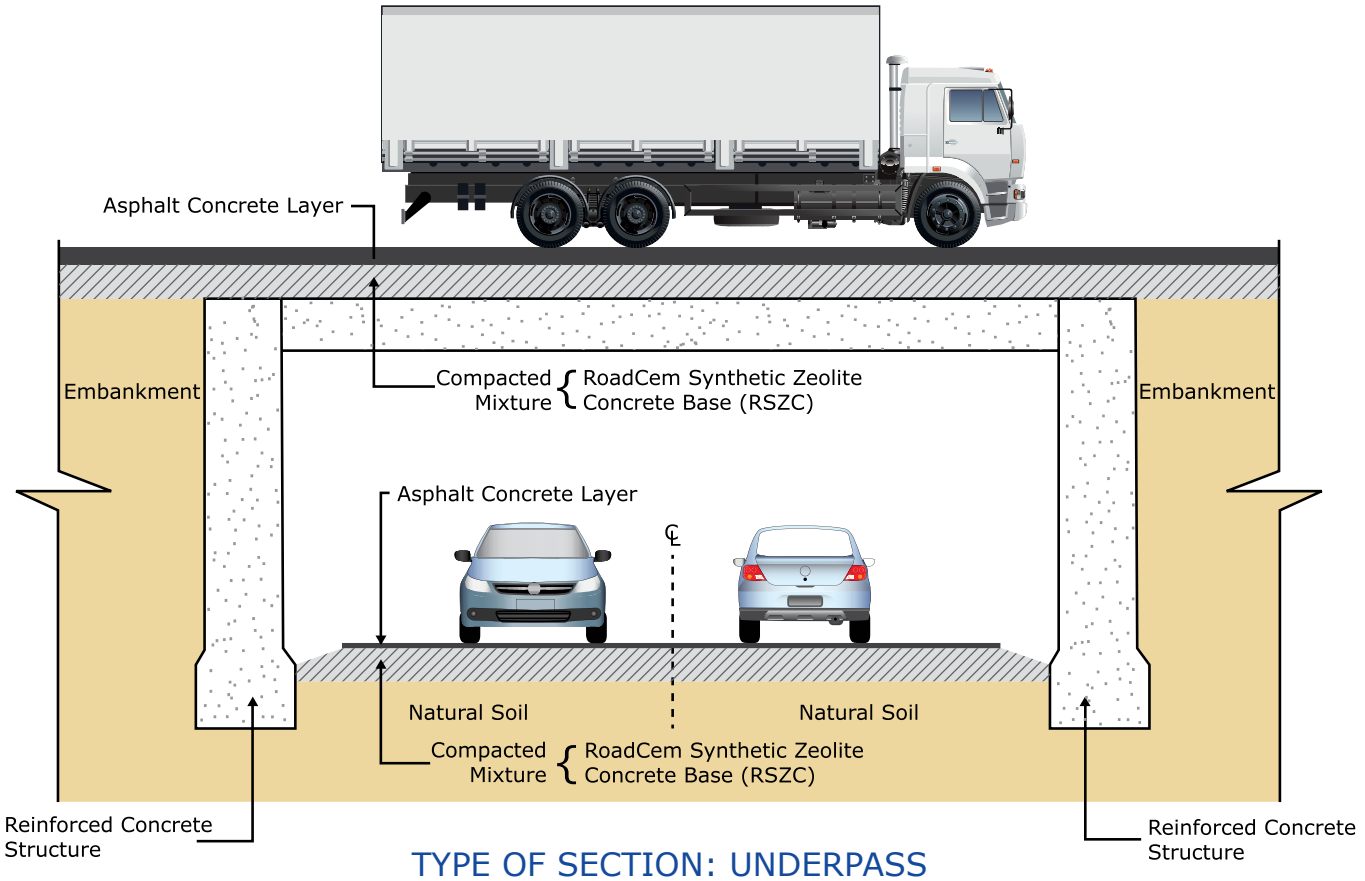
Flexible



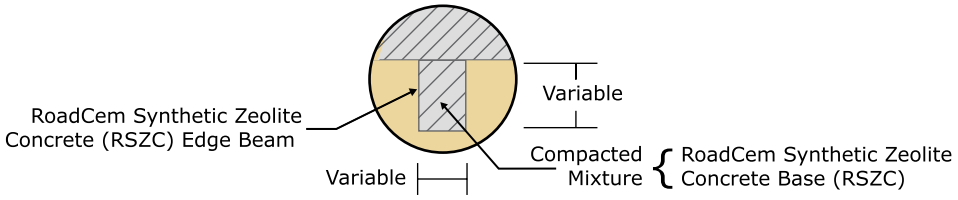
Synthetic Zeolite

Pavement structure deflections

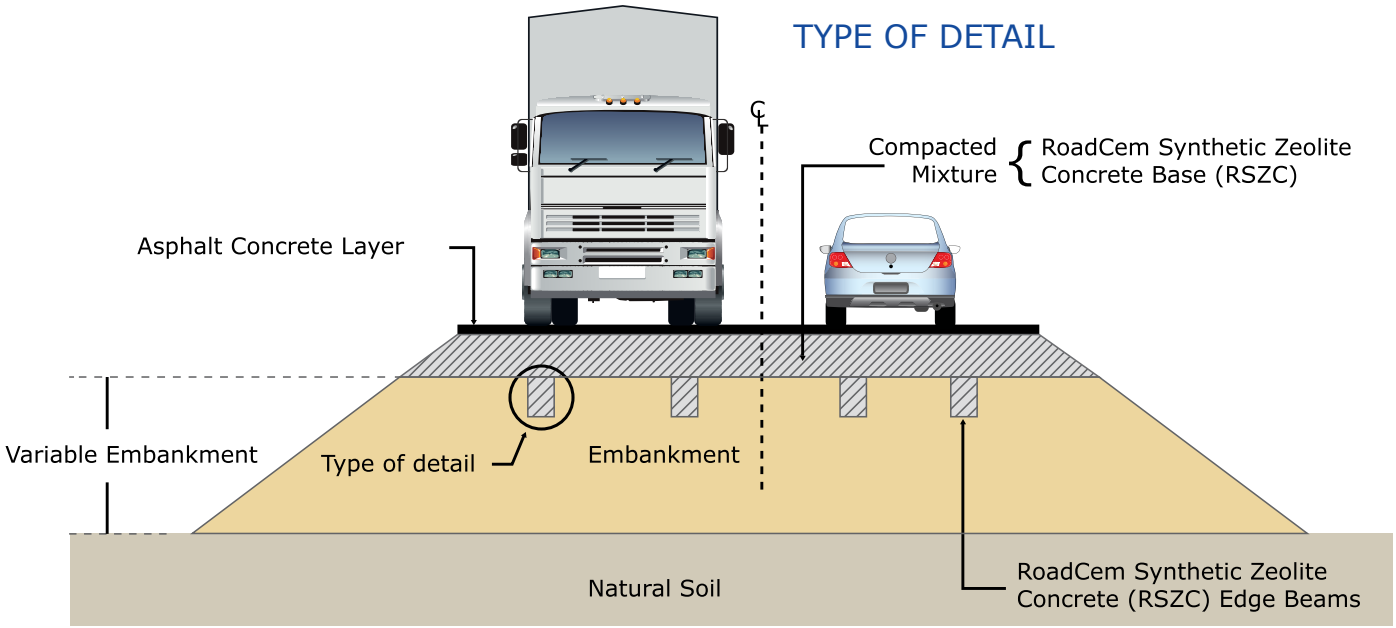




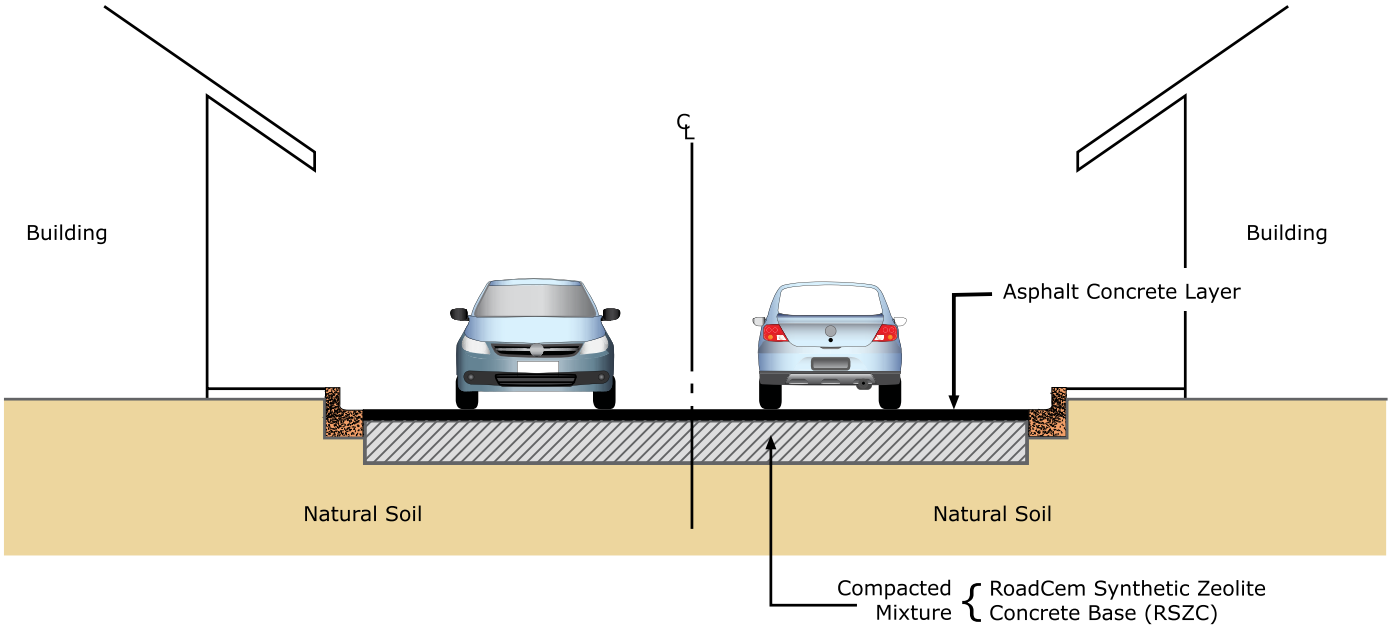
TYPE OF SECTION: UNDERPASS



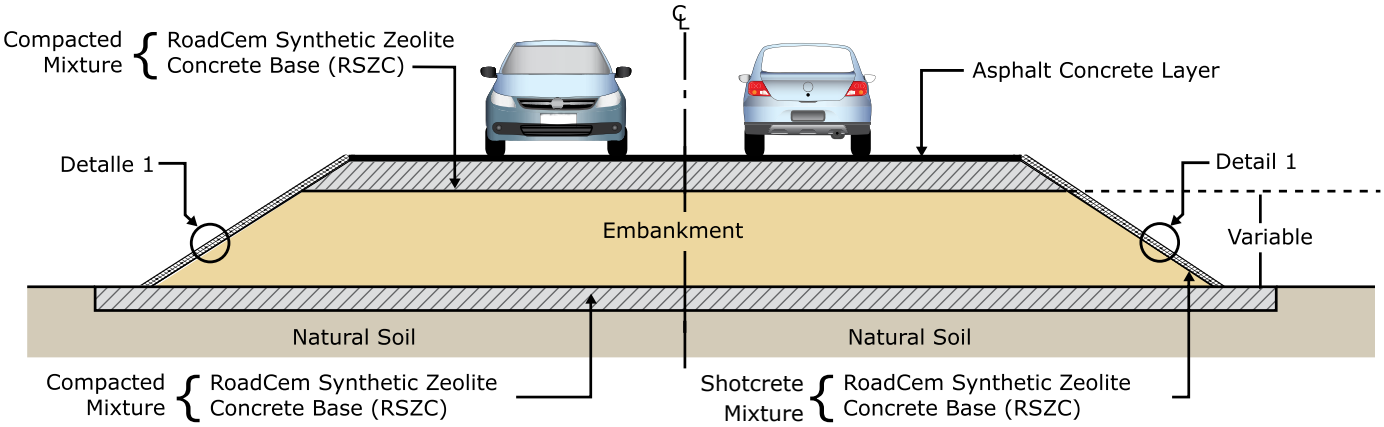
TYPE OF DETAIL

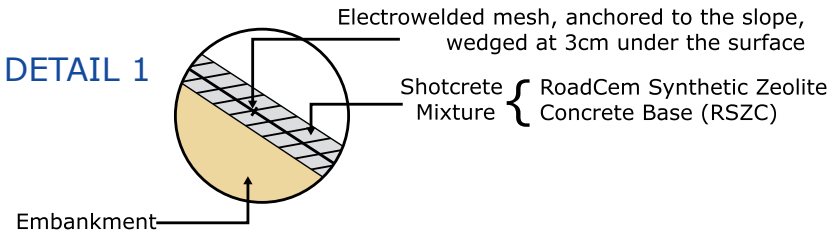


TYPE OF SECTION: HIGHWAYS (RSZC EDGE BEAMS)

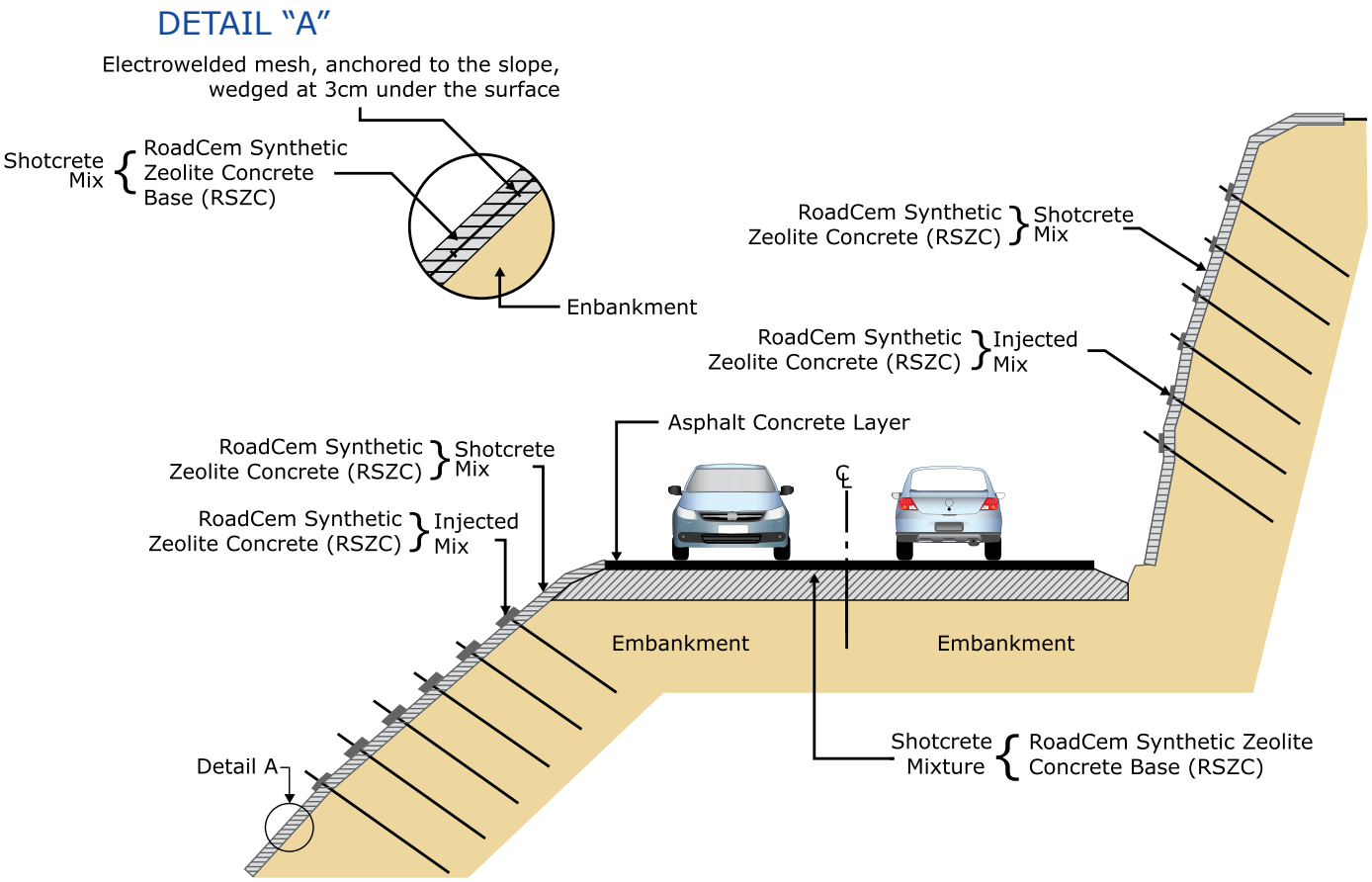


TYPE OF SECTION: URBAN ROADS

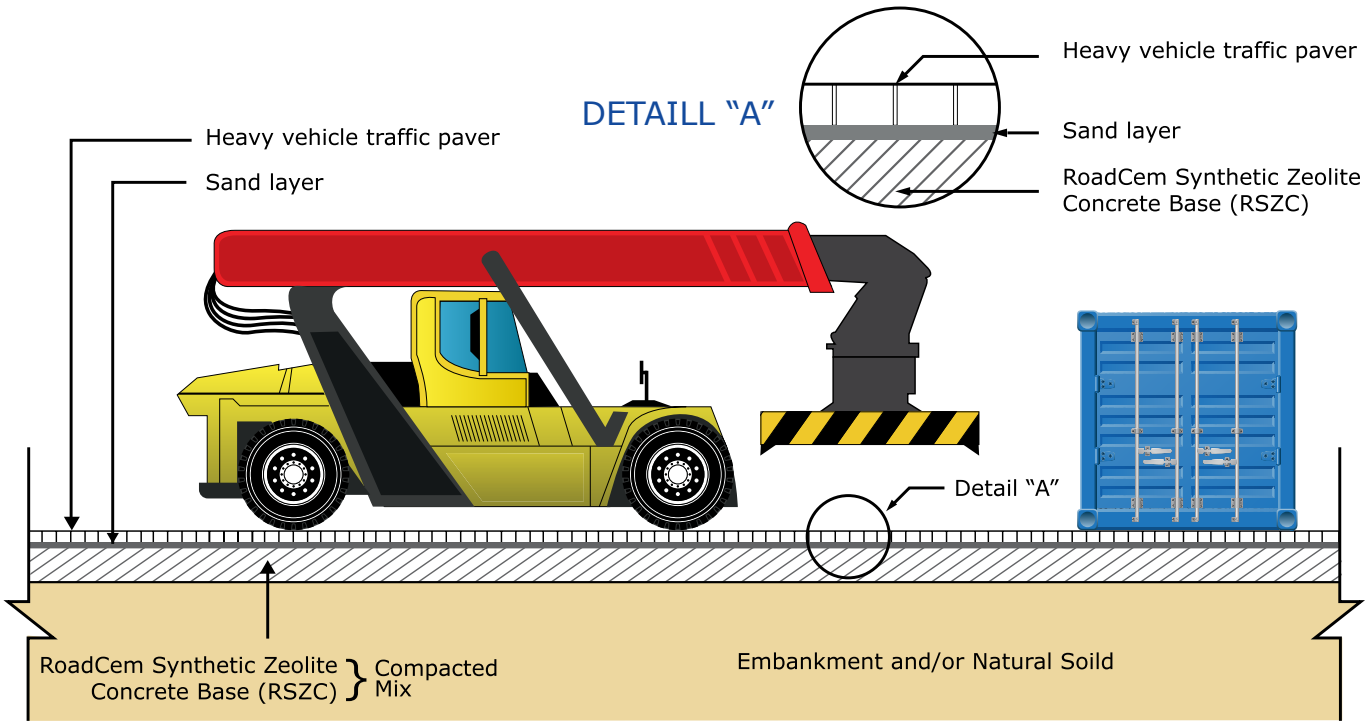




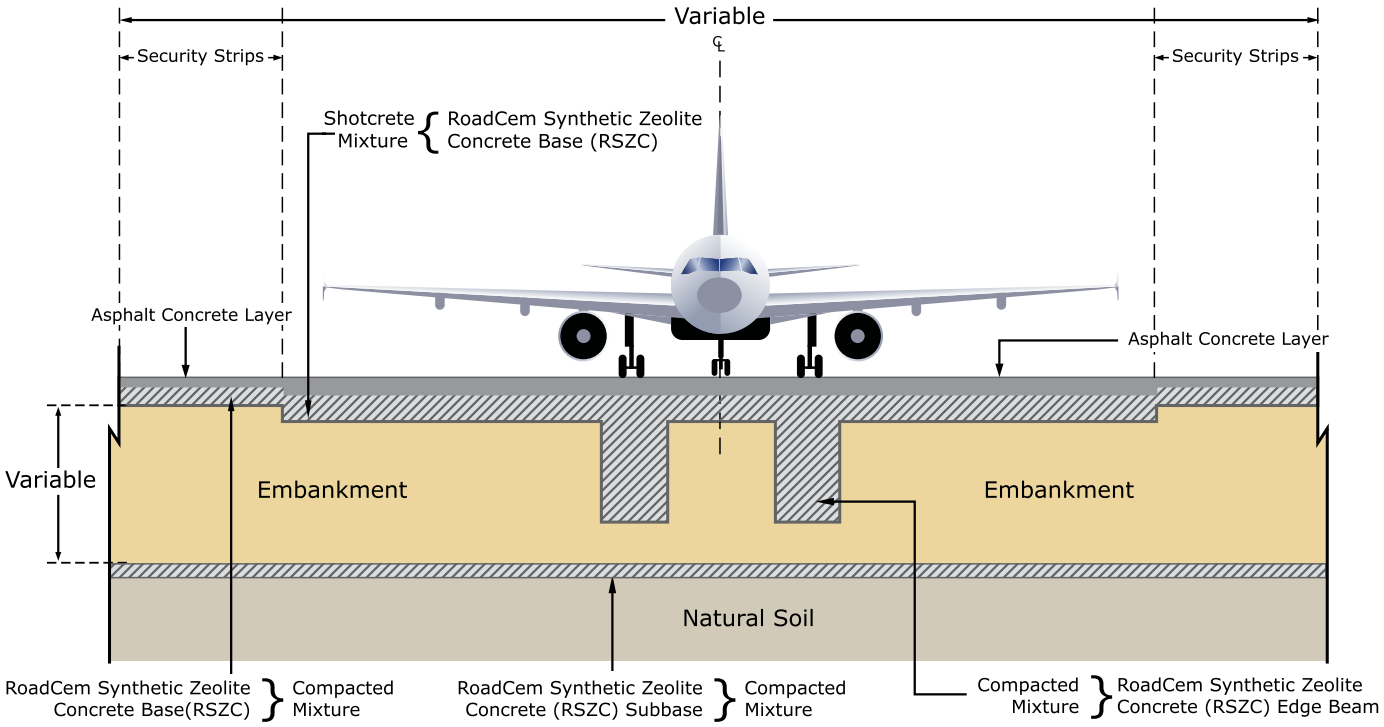
TYPE OF SECTION: URBAN ROADS (FLOODABLE/UNSTABLE SOILS)



TYPE OF SECTION: HIGHWAYS (SLOPE STABILITY)

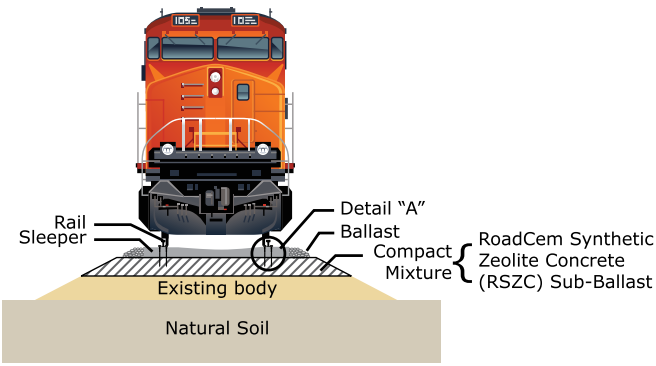


TYPE OF SECTION: PLAFORM FOR CONTAINERS

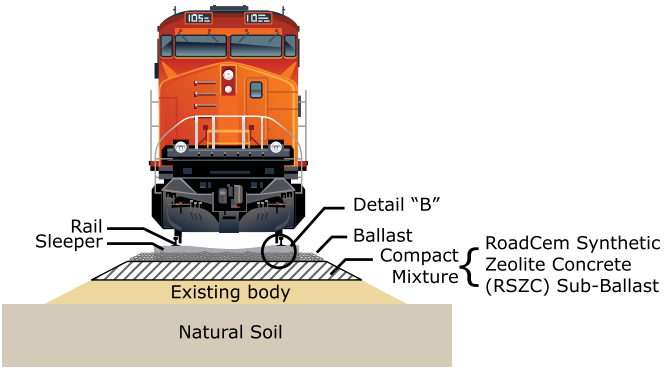


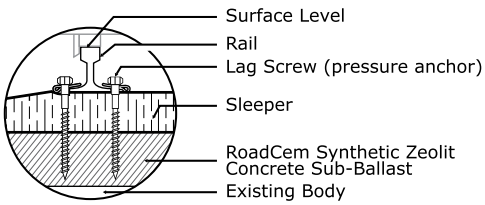
TYPE OF SECTION: TAKE-OFF AND LANDING STRIP

TYPE OF SECTION: RAILWAY A - A' CUTTING

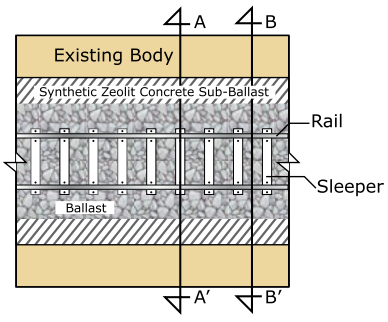


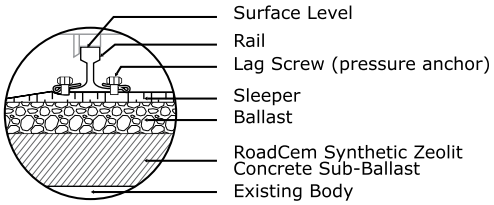
TYPE OF SECTION: RAILWAY B - B' CUTTING





DETAIL "A"





DETAIL "B"

Onsite Construction Process

Mapping and leveling (topography)
Dethatching
Plowing

Base Layer Compating on RoadCem Synthetic Zeolite Concrete (RSZC) Base
Roadcem addition to the plowed material
Unification
(Onsite material plus RoadCem)

Introduction of Portland Cement (CPC-40 or equivalent)
Unification (onsite material, RoadCem, and Portland Cement)
Moistening and mixing

Verification of optimal humidity
Laying
RoadCem Synthetic Zeolite Concrete (RSZC) Base Compacting

Level Testing
Moistening and curing

Construction Process with Mobile Mixing Plant

Mapping and leveling
Base layer compacting

In Plant:
Addition of recycled material and/ or bank to RoadCem and Portland Cement CPC 40 (or equivalent)
Unification of dry mix
Incorporation of water until achieving an optimal humidity and mixture unification

Transportation of the plant mixture to the construction section
Mixture laying
Section homogenization

Road Synthetic Zeolite Concrete Base Compacting
Level Verification
Synthetic Zeolite Concrete Base moistening and curing

Technical Opinion on the use of the RoadCem product in the Federal highway network

The Mexican Transport Institute (IMT, in Spanish) has developed, in the past few years, several research projects to assess some of the properties of the RoadCem product, out of which the following remarks have been compiled:

1. "Regarding the Resilience Module (parameter that significantly impacts the design of pavement structure), the soil samples stabilized with cement and the additive displayed figures superior to those that only contain cement; this remark proves especially evident in samples during early stages, where differences of up to 100% of the resilience module may be found, with better results in samples with the additive. On later stages, the difference between both sample groups is reduced, although a module value better in such with the product added. Accordingly, it was found that samples with the additive continue to increase in value regarding the resilience module, in contrast with samples only containing cement, which will prove particularly useful throughout the service life of the road, since a greater structural capacity will be provided for later stages of the road.

   The above implies a significant benefit, since greater resilience modules lead to more competent structures, with a longer service life over the same layer thickness."

2. "Regarding simple compacting strength, samples stabilized with the additive generally displayed greater resistance than such without the additive. Furthermore, deformations that derived in failure were lower, which indicated an increase in rigidness for samples treated with the additive. This test was performed on silty sands."

3. "For clay soils, greater modules were also observed for the sample group containing the additive, although in lower percentages than limey sands (50%) in early stages (7 days). For ages from 28 days on, resilience modules for samples with the additive are equivalent to such retrieved from limey sand and the researched product, which may represent an advantage for field application since, although being clay classified as CH, the cement and additive achieve MR values similar to such recorded on limey sand with cement and the additive. These results are applicable to the analyzed soils."

4. "Regarding permanent deformation, clay stabilized with cement and the research product presented a lower amount of deformations than clays only mixed with cement, with values up to 20% higher than the sample only stabilized with cement. It is worth noting that permanent deformations, in the case of the additive-enriched sample, decreases with age, representing only 20% of the deformations presented at 7 days of age. These results are of great importance, among other reasons, for reducing rutting in pavements and, evidently, to improve the strength conditions that induce a greater resistance to the fatigue factor on pavements."

5. "Another study carried out researched resistance to disaggregation in moistening-drying cycles, from which it may be noted that samples stabilized with cement and RoadCem displayed a lower disaggregation than samples only containing cement, particularly in samples with zero days of curing; that is, submitted to the cyclical process of moistening and drying immediately following their constitution."

6. "Regarding beams stabilized with cement and RoadCem, greater breakage modules were displayed than such only containing cement, particularly for ages with 90 days of curing. Furthermore, deflections in beams leading to failure were lower in beams treated with cement and RoadCem than such only containing cement. Regarding resistance to fatigue on beams stabilized with cement and RoadCem, the same seem to withstand a greater number of cycles before failing."

7. "From the "Los Angeles" abrasion test, it was observed that only samples containing cement and RoadCem tend to lose less materials than such only containing cement."

Technology Validated in Mexico

8. "Further studies have been carried out with falling weight deflectometer in sections containing layers stabilized with cement and RoadCem, which displayed deflections lower than 0.20 mm for a normalized 700 kPa load, which generated structural figures close to 5. In recent cases, deflections lower than 150 micrometers have been found, with structural figures around 6. The tests were carried out using methodologies in compliance with the AASHTO 1993 proposal, which reveals a significant structural capacity for layers consisting of natural soil, cement, and RoadCem.

9. "Other tests have proven that, for curing times above 28 days, the breakage module of soil-cement-RoadCem beams seems to be greater than such recorded on soil-cement beams; likewise, the elasticity module, calculated from tests of the rupture module with deflection measurement in the lower part of the beam indicate that the soil-cement-RoadCem beams display greater values, even when the dispersion in the data from both tests was significant."

10. "The ratio of number of cycles before failure against the pressure ratio do not indicate any differences between the soil-cement-RoadCem beams and soil-cement beams. The chart displaying the number of cycles before failure against the stress (for 90 days of curing) seems to indicate that the soil-cement-RoadCem beams withstand a greater number of cycles before failure, as opposed to soil-cement beams."

11. "The compacting resistance of soil-cement-RoadCem beams indicate slightly greater resistance than such retrieved from soil-cement samples. Likewise, the elasticity module displays an increase in the soil-cement-RoadCem mixture for curing times greater than 28 days."

12. "Furthermore, the permeability coefficient (measured with the constant-tension, rigid-wall disc permeameter) is reduced when adding cement and RoadCem to the soil, as opposed to the cement-soil sample."

13. "Finally, Table 1 displays some practical recommendations for sizing soil layers treated with the additive for land roads, which corresponds to thicknesses placed in different works on a national scale, as reported by the manufacturer. Furthermore, Table 2 displays dosages applied to various works reported by the product manufacturer."

Source: Mexican Transport Institute

Road classification by the Ministry of Transport and Communication (SCT)

Classification	Type of (vehicles)	Thickness (cm)		
		RSZCB	AC	AS
*	Higher 20,000	SP	SP	SP
A4	5,000 to 20,000	30	8	--
A2	3,000 to 5,000	28	6	--
B	1,500 to 3,000	25	5	--
C	500 to 1,500	23	5	--
D	100 to 500	23	--	2
E	Less than 100	15 a 20	--	1

Note 1:

RSZCB = RoadCem Synthetic Zeolite Concrete Base
AC = Asphalt Concrete
AS = Asphalt Seal
APP = As Per Project

Note 2:

Thicknesses vary according to the type of loads and the project service life. Various factors impact the table parameters, therefore it is necessary to create a pavement design and laboratory tests for each particular case. Such measurements are for reference only (parameters), supported by the tests made to different works and laboratories.

* For roads with TDPA greater than 20,000, the RSZCB, AC, and AS thicknesses should be reviewed against the design methods of corresponding pavements.

Doses employed according to the type of soil

Soil type	Average type of test ranges (kg/cm2)		Dosages (kg/m3)	
	Elasticity Module of the static Axis (E) after 28 days	Geogage Module (MG) 1-3 days	RoadCem	Portland cement type CPC40 RS
GW, GP, GM, GC.	60,000 - 150,000	2,000 - 3,300	1.4 - 1.6	140 - 165
SW, SP, SM, SC, ML, CL, OL.	40,000 - 90,000	1,300 - 2,800	1.5 - 1.9	155 - 190
MH, CH, OH, Pt.	25,000 - 45,000	800 - 1,500	1.9 - 2.4	185 - 225

N·CSV·CAR·4·02·005/14

BOOK: PSV. PRESERVATION
TOPIC: RD. ROADS
PART: 4. RECONSTRUCTION WORKS
TITLE: 02. PAVEMENTS
CHAPTER: 005. SUB-BASE OR STABILIZED BASE CONSTRUCTION

A. CONTENTS

This Regulation contains aspects to be considered for the construction works of sub-bases and stabilized bases for pavement construction.

B. DEFINITION

Refers to the set of activities required to build sub-bases and modified or stabilized bases with asphalt materials, Portland cement, hydrated lime, polymers, organic enzymes, pozzolanic materials, and natural or synthetic materials combined with any of the aforementioned products, among others, as per the project, for the reconstruction or reinforcement of pavements.

N·CTR·CAR·1·04·003/14

BOOK:	**CRT. CONSTRUCTION**
TOPIC:	**RD. ROADS**
PART:	**1. WORK CONCEPTS**
TITLE:	**04. PAVEMENTS**
CHAPTER:	**003. STABILIZED LAYERS**

A. CONTENTS

This Regulation contains all aspects to be considered during the construction of stabilized layers for pavement subgrades, linings, sub-bases, and bases for newly-constructed highways.

B. DEFINITION

The construction of stabilized layers for subgrades, linings, sub-bases, or bases refers to the stabilization by means of a chemical or mechanical treatment of materials, laying, and compacting of such materials. For chemical stabilization, a stabilizing product is incorporated, which modifies some of the physical features of the material to improve its mechanical or hydraulic compacting. Some of the products usually employed for stabilization include, among others, asphalt materials, Portland cement, hydrated line, polymers, organic enzymes, pozzolanic materials, and natural or synthetic minerals combined with any of the aforementioned products, as per the project.

Research & Development

Laboratory Testing Results

"Based on the external research project IE 08/14 recently carried out by the Laboratory Division of the Infrastructure coordinating Office for company PowerCem of Mexico, and after observation of the results produced, the following aspect must be highlighted:

Three types of materials contained in flexible payment layers; in this case, base subbase, and sub-surface. One of the parameters in which the effects of the RoadCem additive were most noticeable was the one corresponding to the Resilience Module. It is worth noting that this parameter is the main input for mechanistic-empirical pavement design methods, and that greater Resilience Modules provide for a greater structural capacity of the pavement, for the same layer thickness laid.

In this regard, It is noted that, for the three materials reviewed, Resilience Modules (Rm) of the floor specimens treated with cement and RoadCem (synthetic zeolites), are greater than the specimens treated only with cement, and significantly superior than untreated flooring materials. (Charts on pages 27, 28, 29)

It was also noted that, for early stages and particularly for base and sub-surface materials, significant increases of the Resilience Module in the zeolite additive test samples were found, as compared to samples without the additive.

The foregoing may represent an advantage in the pavement behavior both for quick opening to road traffic and throughout its service life. Finally, we consider that the additive under examination, with regards to the significant parameter corresponding to design and structural capacity, may propitiate a greater opportunity to resist the loads imposed by traffic during its use and improve its performace throughout its entire service life."

Source. "Atenta Nota" March 10, 2016 by M.S. Rodolfo Téllez Gutiérrez (Infrastructure Coordinator) addressed at M.S. Eng José San Martín Romero (IMT General Manager).

"In the results of the Resilience Module, an overwhelming effect was indeed observed from the use of RoadCem. For all curing times, the mixes that contained the RoadCem displays resilience modules superior than those observed in materials that were only stabilized using cement."

Source: "Project No. IE-08/14: elasticity (E) Module, Risilience Module (Rm), and Permeability (K) Assessment in aggregate samples Stabilized with Portland cement and RoadCem (in) (Synthetic Zeolites, Alkaline Compounds, And Patent Activators)" Report, developed by the Instituto Mexicano del Transporte (Mexican Transport Institute).

Elasticity Module

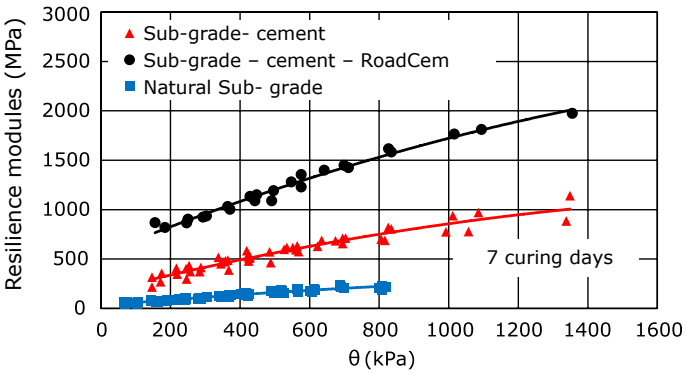
Resilience Module

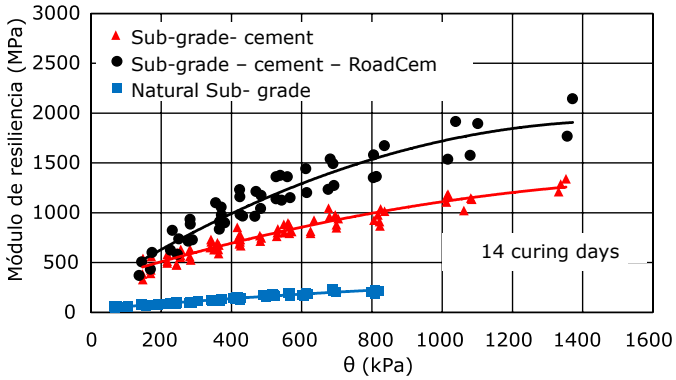
Nucleus Extraction

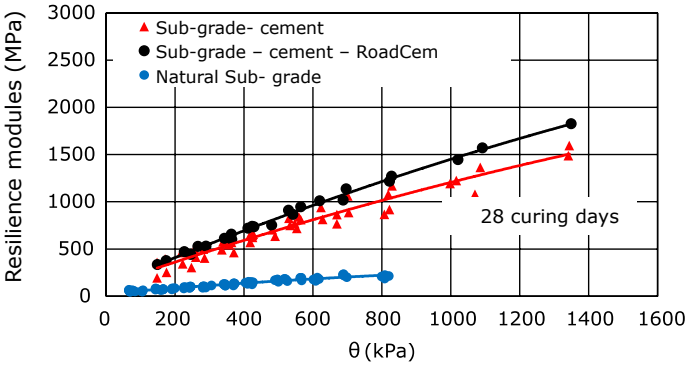
Resilience Modules

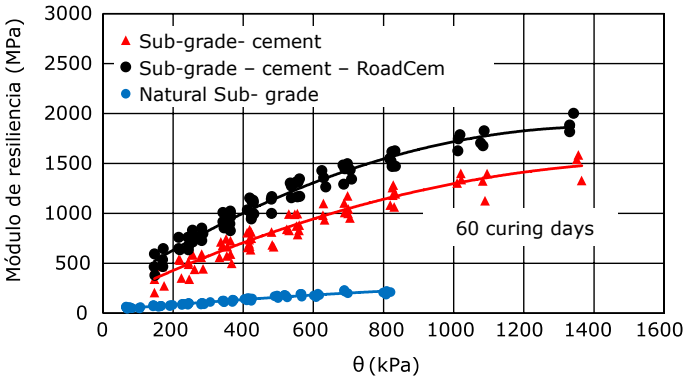
Resilience modules of the natural sub-grade soil, stabilized sub-grade with cement or with cement and RoadCem for the different types of curing.

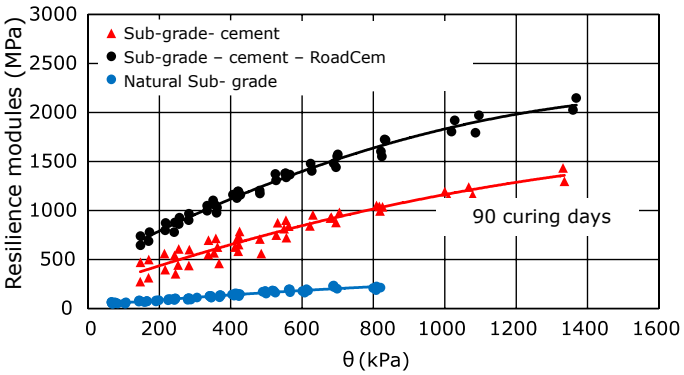
Where 0 in kPa is the medium stress applied to the sample; which is the sum of the confinement stress and vertical stress applied.

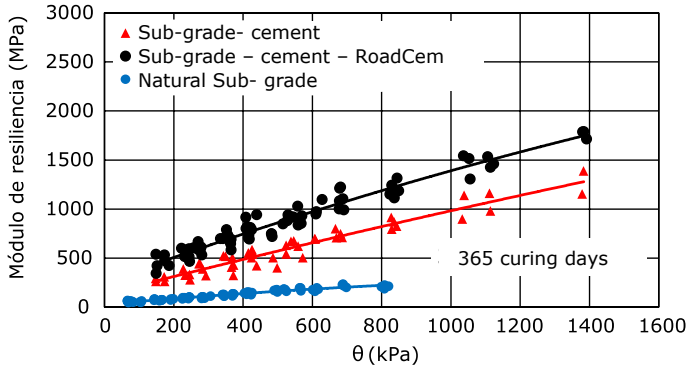








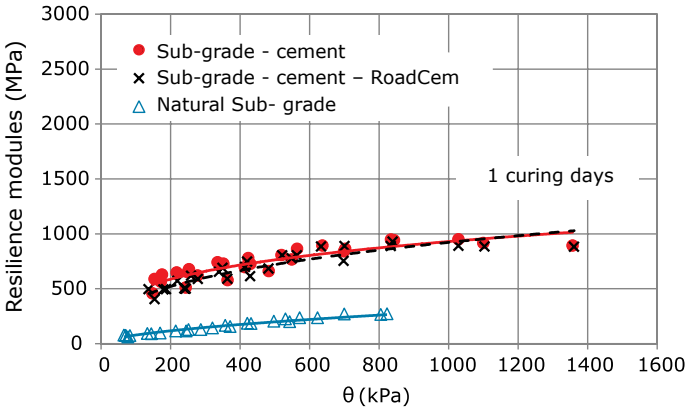


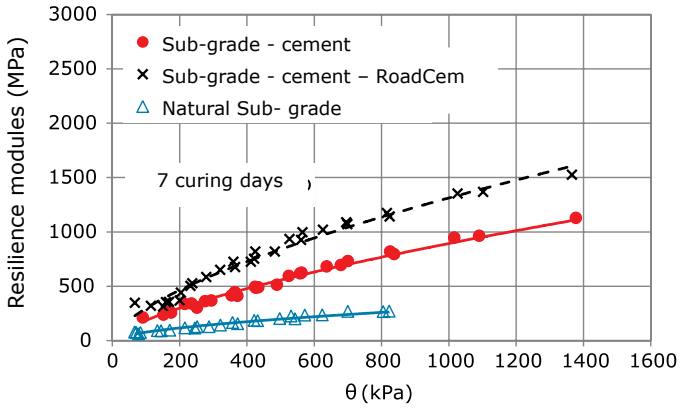


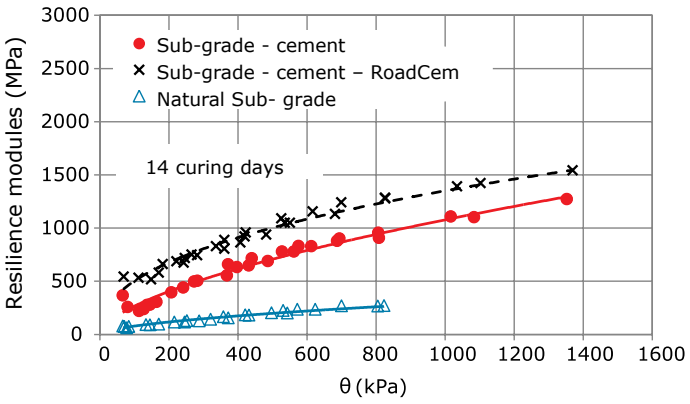
Resilience Module

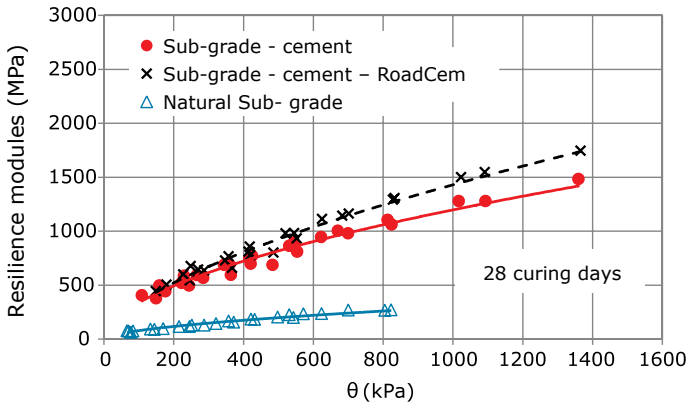
Resilience modules of the natural sub-grade soil, stabilized sub-grade with cement or with cement and RoadCem for the different types of curing.

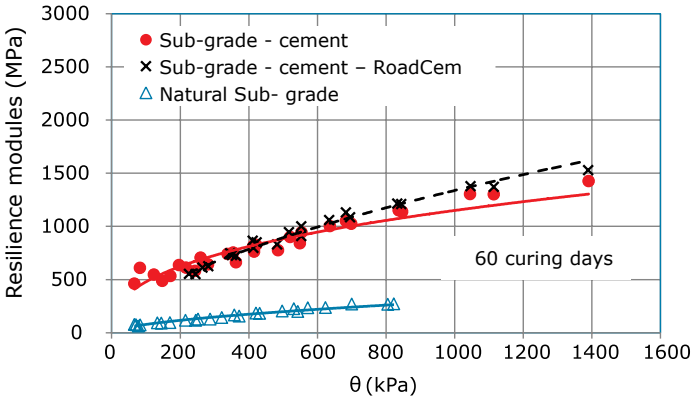
Where θ in kPa is the medium stress applied to the sample; which is the sum of the confinement stress and vertical stress applied.

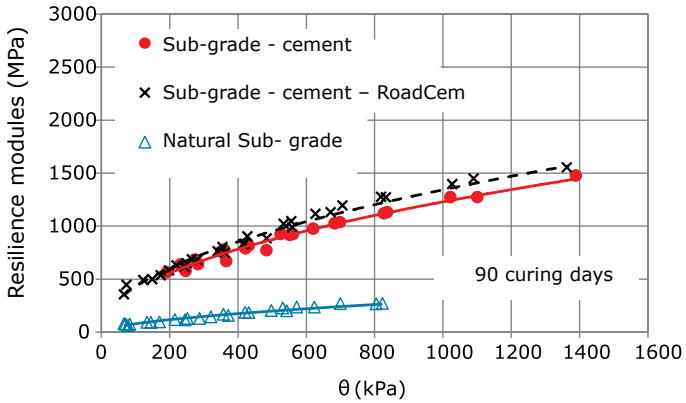








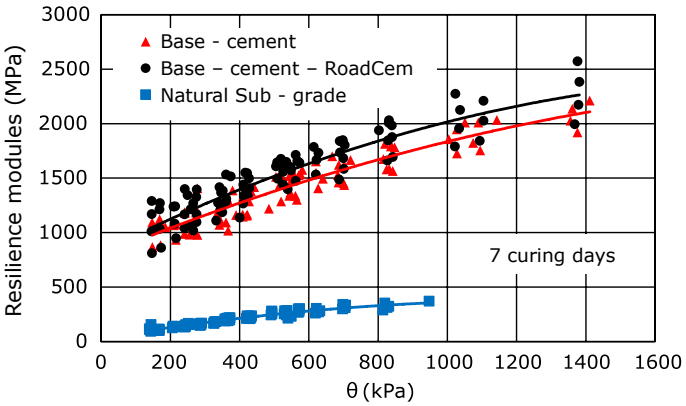


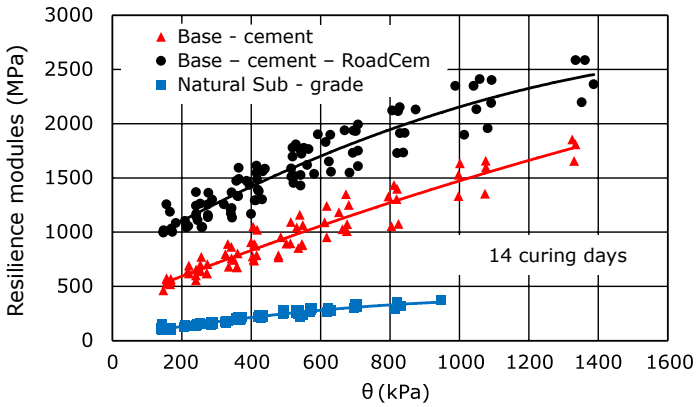


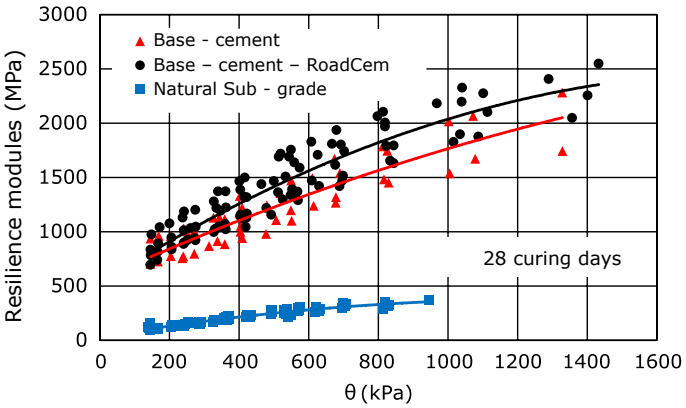
Módulos de Resiliencia

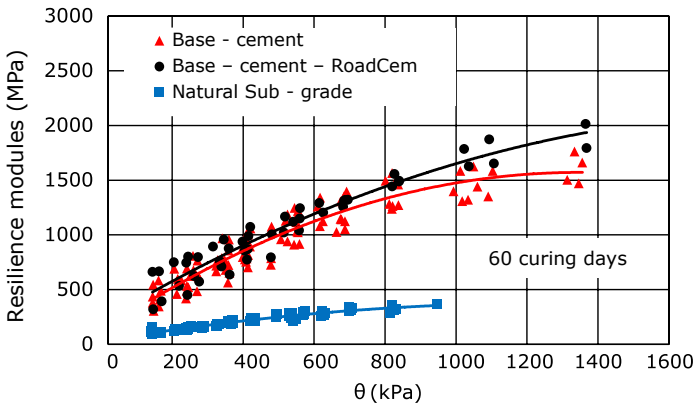
Resilience modules of the natural sub-grade soil, stabilized sub-grade with cement or with cement and RoadCem for the different types of curing.

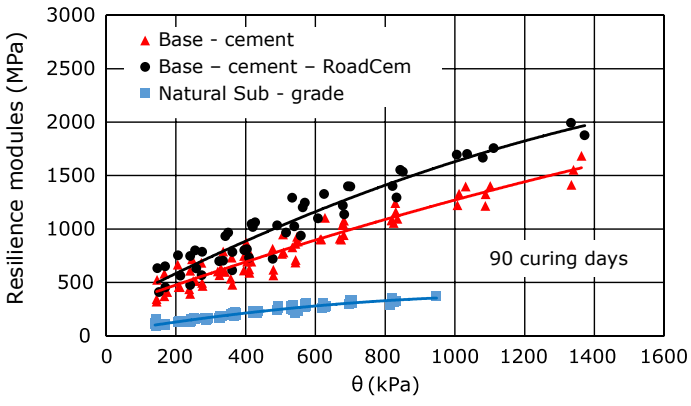
Where 0 in kPa is the medium stress applied to the sample; which is the sum of the confinement stress and vertical stress applied.











Research and Development

Evaluation of the Pavement Structural Capacity

The structural capacity of a paved structure can be determined by means of non-destructive tests, with deflections interpreted by the falling weight deflectometer.

The Heavy Weight Deflectometer (HWD) simulates the behavior of a pavement road against the passing of vehicle traffic through the application of a heavy load over the running surface, thus determining the deflections basin generated from the deformation recorded by its geophones. Deflections recorded by the HWD reflect a global response of the pavement-subgrade system under the given pressure.

From the information gathered by the HWD, the usual interpretation of results can be carried out through a process called retro-calculation, which allows estimating the elastic modules of the main layers that make-up the pavement structure.

The retro-calculation process adjusts the layer modules to reproduce as efficiently as possible the deflections basin recorded with the HWD.

The Mexican Transport Institute (IMT) employs three methodologies to assess the structural capacity of pavements: the YONAPAVE methodology, by Mr. Mario S. Hoffman, the methodology by Dr. Raul Vicente Orozco, and the methodology by Eng. Manuel Zarate Aquino.

The following are the results obtained from a 30 cm RoadCem Synthetic Zeolite Concrete Base (RSZCB) pavement consisting of 5 and 8 cm of asphalt layer (AL) against a traditional, 8cm asphalt layer (AL) pavement with 25 of hydraulic base (HB), 25 cm of subbase (SB), and 40 cm of subgrade (SG), as well as a brief description of such methodologies.

Methodology by Dr. Mario S. Hoffman

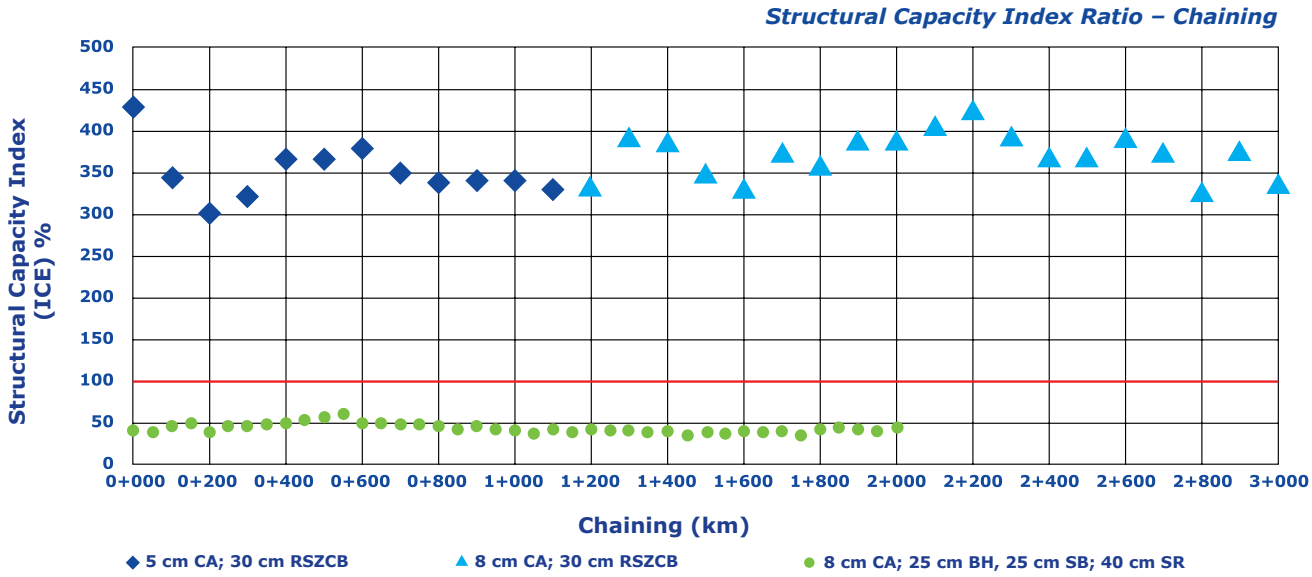
The Hoffman methodology is a simple and direct method (YONAPAVE) to enable the characterization of materials of the pavement-subgrade system so as to structurally assess flexible pavements.

The YONAPAVE method is a method based on the interpretation of the deflections basin through the use of empirical-mechanistic concepts while based on the Hogg model, which is a bi-layer model.

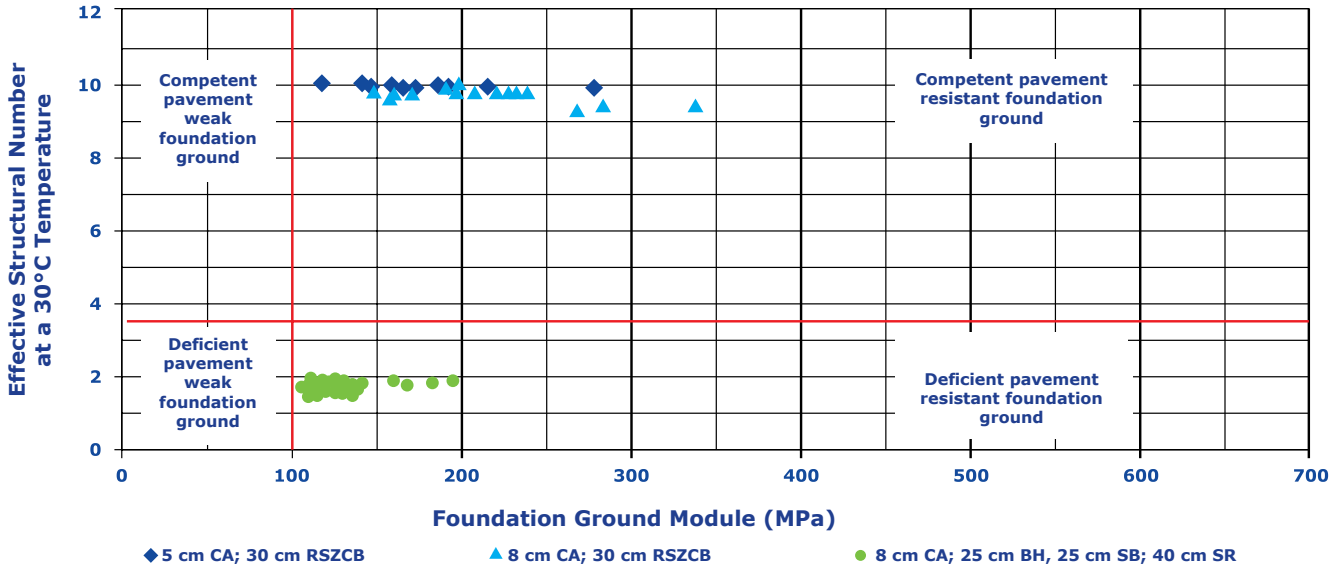
The important variables of this methodology proposed by Hoffman are:

- Temperature
- Deflection basin area
- TDPA analysis

This methodology indicates that the structural capacity index of a pavement greater than 100% does not suffer structural deficiency.



Effective Structural Number at a 30°C Temperature - Foundation Ground Module



Methodology by Eng. Manuel Zárate Aquino

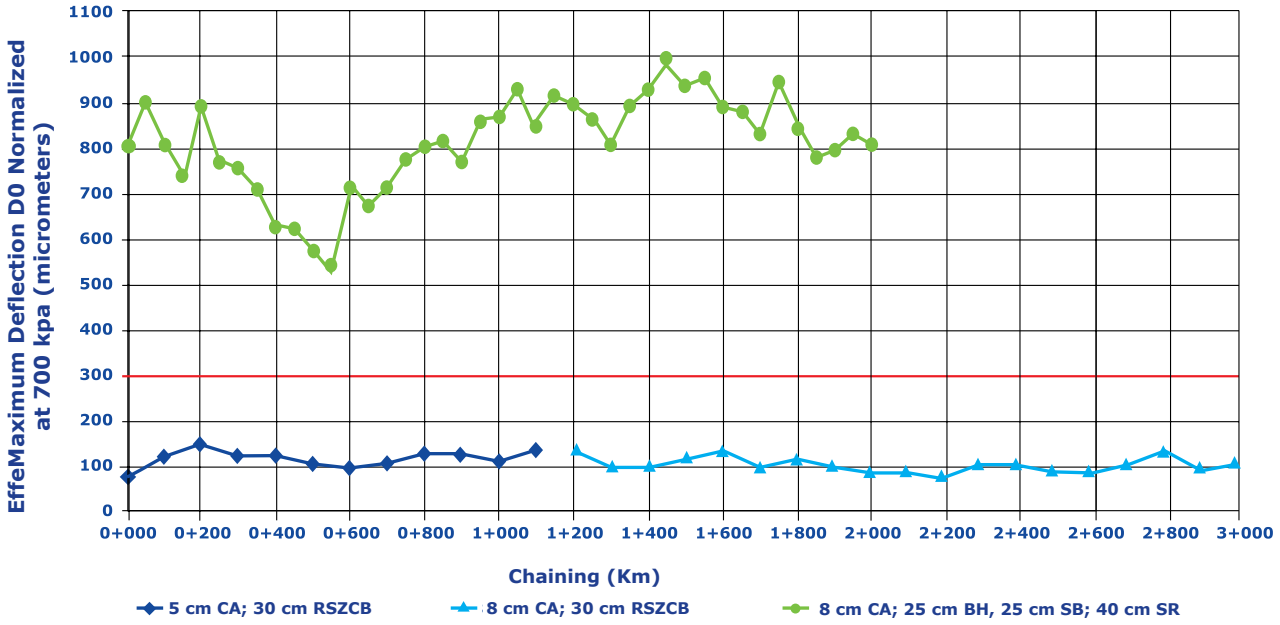
The methodology by Eng. Manuel Zárate Aquino encompasses variables somewhat different from the previous methodology. For instance, for this version, the traffic analysis is not taken into account for assessing a flexible pavement. However, this methodology is based on the analysis of the shape of the deflections basin, and defines parameters such as: Shape Factor, Surface Curve Index, Deflection Ratio, and Dynamic Rigidity Module Calculation.

Therefore, through several deflection tests in different pavements, Eng. Zárate Aquino proposes a table of typical value ranges, which can reflect the pavement status. Such typical values or ranges are indicated below:

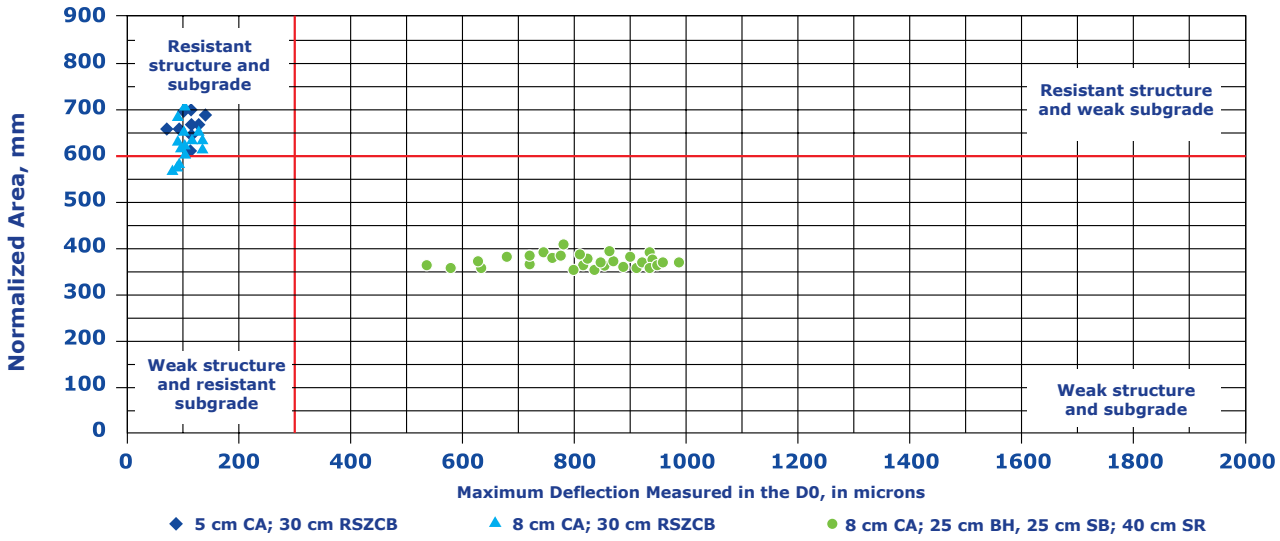
INDICATORS	TYPICAL RANGE OR VALUE
Normalized Area	600 - 880 mm
Maximum Deflection	75 - 300 MICRONS 3 - 12 X 10-3 INCHES
Shape Factor	0.0 - 0.50
Surface Curve Index	0 - 150
Deflection Ratio	0.7 - 1.00
Dynamic Rigidity Module	> 200,000 kg/cm²

Typical ranges of the methodology by Eng. Zarate Aquino

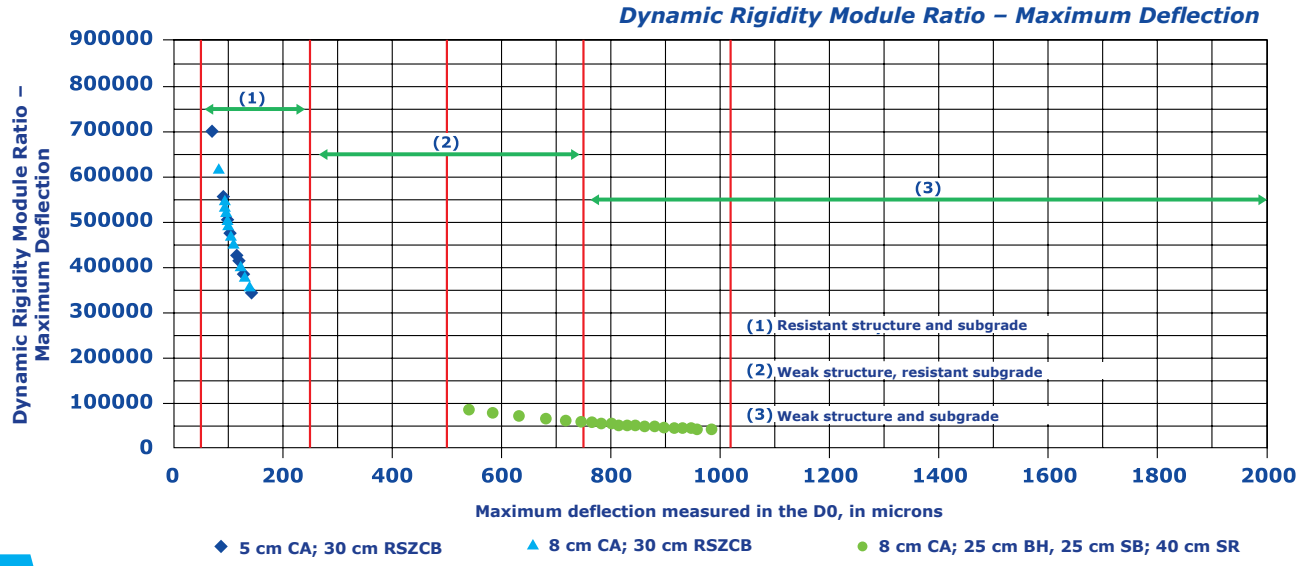
Maximum Deflection Ratio – Chaining



Normalized Area Ratio – Maximum Deflection



Dynamic Rigidity Module Ratio – Maximum Deflection



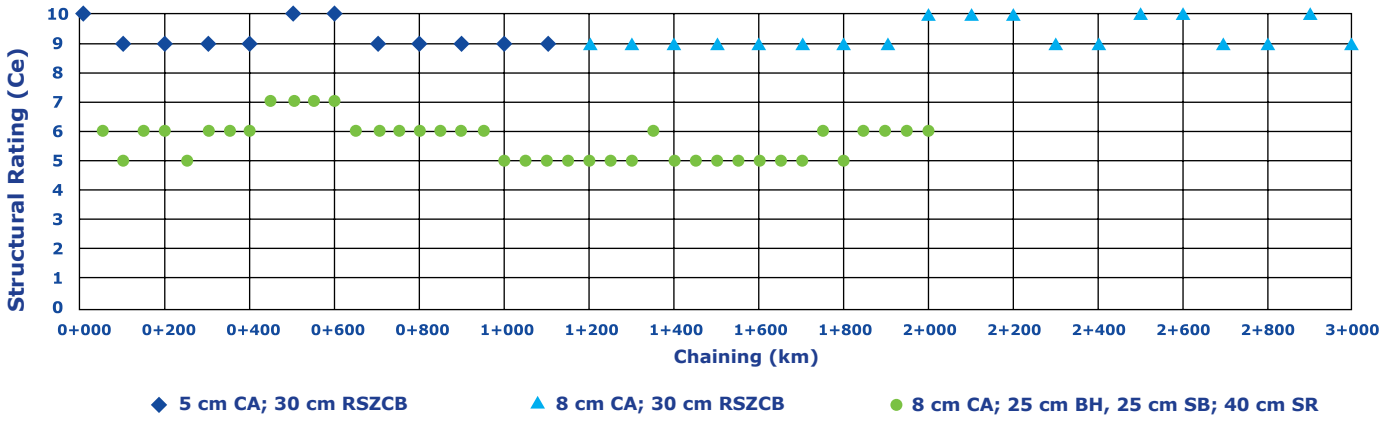
Methodology by Dr. Raúl Vicente Orozco Santoyo

This methodology is based in the assessment of parameters related to the shape of the deflections basin. In general, the pavement non-destructive assessment method proposes a parameter named Structural Index, which is regarded as a useful indicator to review the structural condition of pavements, assigning a structural grade through which the methodology proposes constructive solutions or actions that may be considered to rehabilitating a flexible pavement.

Structural grade		Structural index
10	Excellent	0.00 - 0.05
9	Very good	0.05 - 0.10
8	Good	0.10 - 0.20
7	Regular	0.20 - 0.30
6	Bad	0.30 - 0.40
5	Terrible	> 0.40

Methodology criteria by Dr. Raúl Vicente Orozco Santoyo

Structural Grade Ratio – Chaining



It is worth noting that all three structures were assessed with the same annual average traffic and vehicle distribution.

CONCLUSIONS

The analysis of the structural capacity of sections submitted for this test presented the following results: As per the YONAPAVE methodology, effective structural figures of 10 were retrieved, as well as foundation ground modules greater than 100 MPa, which indicates a competent pavement and a resistant foundation ground for the structure that comprises the RoadCem Synthetic Zeolite Concrete Base (RSZCB). The opposite case is for traditional pavement, with structural figures of 2 and a ground module greater than 100 MPa, which indicates a resistant foundation ground and a weak pavement.

By using the methodology by Eng. Manuel Zárate Aquino, it turned out that most of the points assessed by the Heavy Weight Deflectometer (HWD) corresponds to areas with resistant structure and subgrade for the pavement containing the RoadCem Synthetic Zeolite Concrete Base (RSZCB). For traditional pavement, a weak structure and subgrade are displayed. Likewise, the methodology proposed by Dr. Raúl Vicente Orozco Santoyo determined, for the section under review that comprises the RoadCem Synthetic Zeolite Concrete (RSZCB), a "very good" structural rating, and the traditional pavement displayed a "bad" rating.

In general terms, the pavement with the RoadCem Synthetic Zeolite Concrete Base (RSZCB) structure is competent, structurally speaking, and the foundation ground is resistant, which means that the base displays an adequate structural capacity. From this analysis, we conclude that it is not necessary to perform a structural reinforcement of the section under the current conditions.

With regards to the traditional pavement section, the same does not display an adequate structural capacity, and therefore a structural reinforcement is necessary.

IMT Strip 1 – PowerCem

PowerCem is engaged in the research of the behavior of its products with different types of aggregates. This is why research topics have been developed at the Mexican Transport Institute (IMT) since 2007; one of the most important research is the one being carried out at the Accelerated Pavement Test Laboratory of the IMT Infrastructure Division, which consists in the assessment of a test section (IMT Strip 1 – PowerCem) of RoadCem Synthetic Zeolite using the first Heavy Vehicle Simulator ("HVS").

Heavy Vehicle Simulator (HVS)

The HVS, Mark VI model, with a total length of 32 meter and a 48-ton mass, allows applying a pressure range from 1/2 up to 20 tons at different speeds. The simulator may apply up to 11 tons in half a dual axis and up to 20 tons in one aircraft wheel (Boeing 727). Furthermore, the Mark VI device can be operated in two versions, a short version with a 12-m central beam and a long version with up to 18 m in length. This would allow to increase the test section from 9 to 15 meters, as well as the speed, from a maximum of 12 km/h for the short version to up to 20 km/h in the long version.

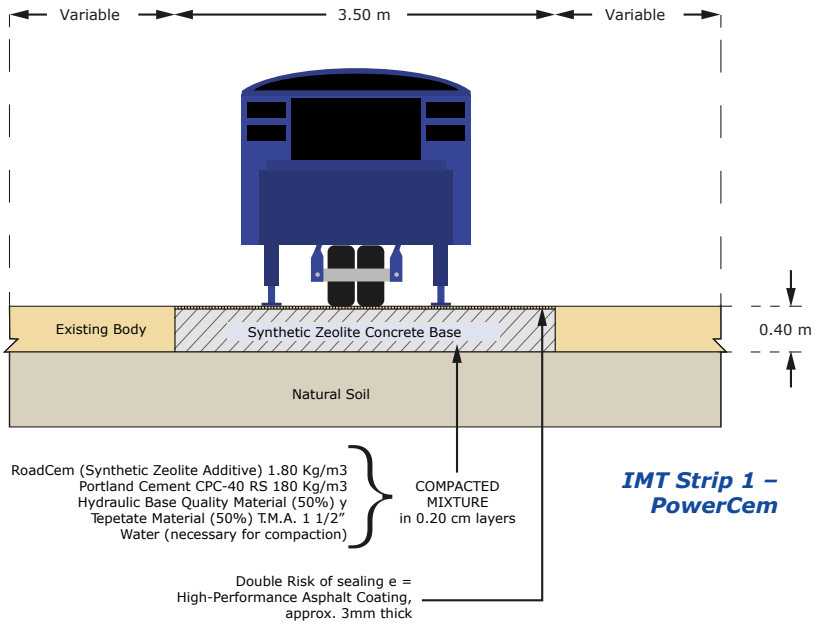
Middle Dual Axis

Aircraft Wheel

The Heavy Vehicle Simulator (HVS) has the purpose of quickly rehearsing multi-layer pavement structures in roads and/or air strips on an actual scale so as to determine its response and behavior under accelerated and controlled damaged in a short amount of time.

The figure displays the geometry and materials employed in the construction of the IMT Strip 1 – PowerCem

Stript 1 IMT – PowerCem was constructed in two 20cm layers each, and is equipped with a group of sensors and instruments used to measure pavement response on load application.



IMT Strip 1 – PowerCem

Nucleus extraction, which displays the fusion of two 20cm layers

The device also includes a comprehensive instrument system, including strain gauges, pressure cells, gasket deflection gauges, thermocouples, and technology also developed by the CSIR (Council of Scientific and Industrial Research) called MDD (Multi-Depth Deflectometer).

The following are some of the main devices employed in the IMT Strip 1 – PowerCem:

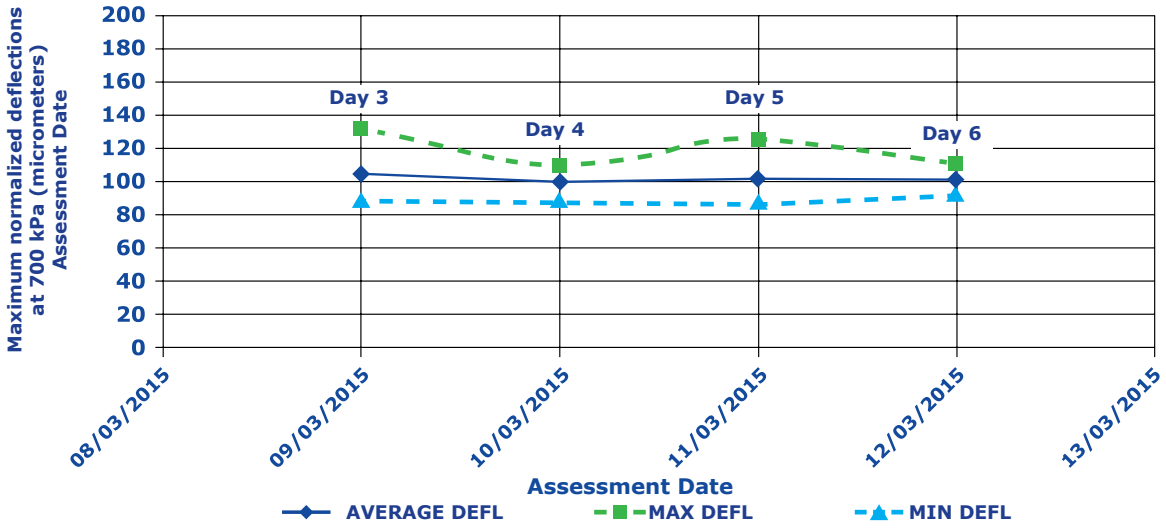
Deformation gauge: Measures horizontal stress and deformations in the pavement

Multiple-Depth Deflectometer: Measures deflections at different depts. Of the pavement structure and complete deflection curves.

Thermocouples: Two cables of different materials joined at one end to measure temperatures.

The different instruments and sensors installed in the pavement allow to review the structural responses generated from the passing of pressure loads, as well as their evolution during pressure accumulation, which will allow the development of behavioral models for each instrumented layer, as well as the evolution of the properties of materials included.

Another test carried out in IMT Strip 1 – PowerCem is the measurement of deflections using the Heavy Weight Deflectometer. The figure below shows the evolution in rigidity of the RoadCem Synthetic Zeolit Concrete base (RSZCB) with regards to time, considering the first six curing days from the date of construction (Construction date: March 06, 2015).



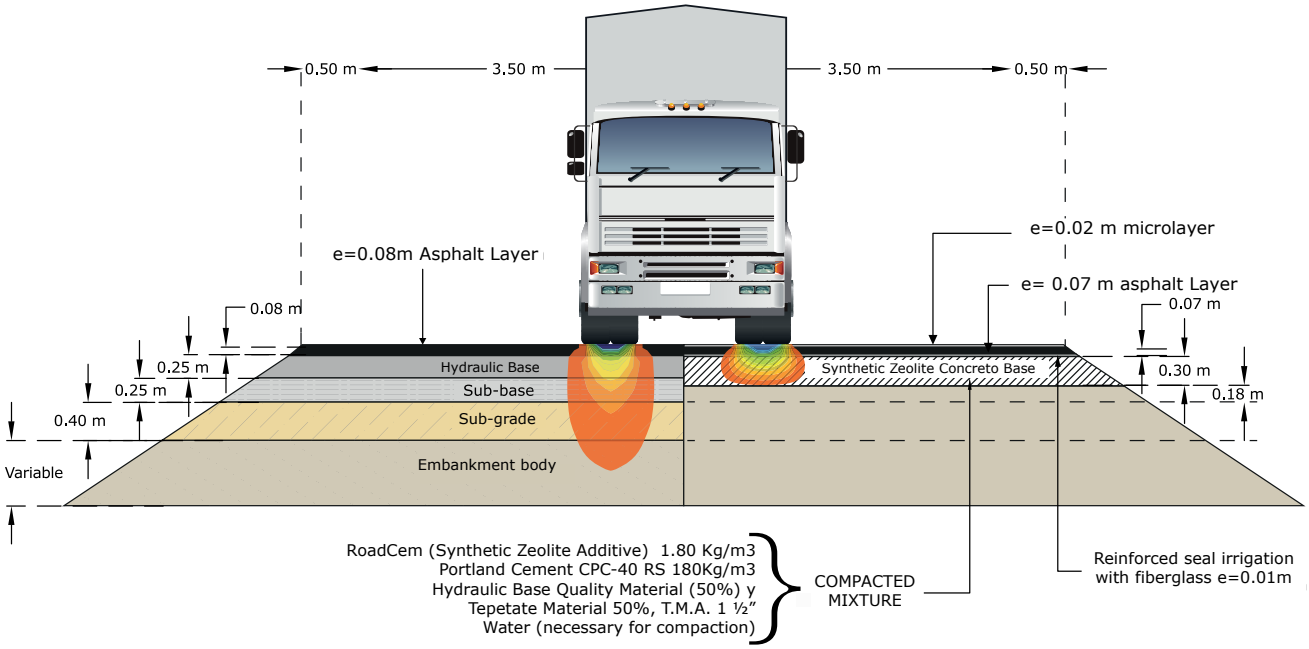
Evolution of rigidity with regards to time for the RSZCB

It is worth noting that PowerCem is a company committed to Research, Training, Innovation, and Continuous Improvement, wherefore who have implemented a Program for constructing new testing sections to continue investigating the behavior of RoadCem Synthetic Zeolite Concrete (RSZC) with different types of aggregates, dosages, thicknesses, olling layers, etc.

Areas assigned for the following test sections.

At the testing strip of the Vehicular Dynamics Laboratory of the Mexican Transport Institute (IMT), a test strip, 35 meters in length by 3.5 width and 0.30 thickness was created, named "IMT Strip 2 – PowerCem". The figure displays the geometry and materials employed in the construction ofboth the IMT Strip and the aforementioned section.

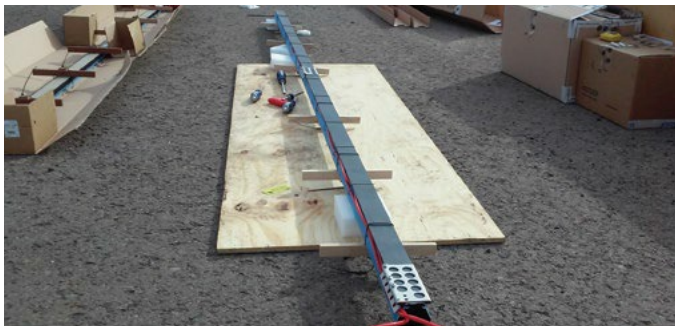
IMT Strip 2 – PowerCem



Transversal section of the structure at the Vehicular Dynamics Laboratory Testing Strip

The tasks carried out were aimed at adapting the structural conditions of the pavement for installing sensors of a dynamic weighing system. Such systems are used for the estimation of a vehicle mass from the measurement of the dynamic interaction pressures between the wheels and the pavement when a vehicle passes through the strip without stopping.

Sensors are embedded in the upper pavement layer, and thus a high rigidity of the system supporting layer and a proper surface uniformity must be guaranteed. This is why we chose to measure the evolution of deflections with regards to time using the Heavy Weight Deflectometer (HWD), and also measured the International Roughness Index (IRI).



(a)

a) Dynamic weighing sensor

(b)

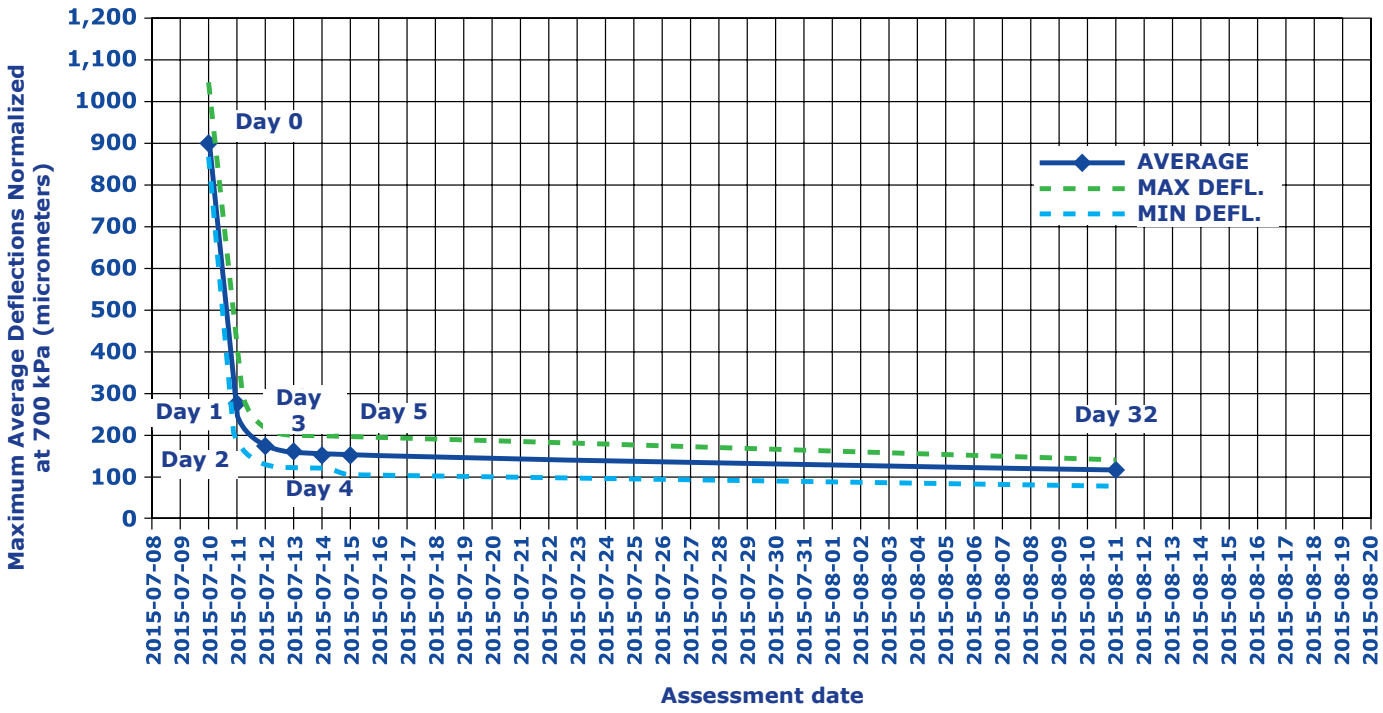
b) Embedded sensors in the asphalt layer of IMT Strip 2 – PowerCem

The table below displays the main requirements to be complied by pavement structures to guarantee that sensors of this kind work appropriately, according to the manufacturer's specifications

	Excellent	Good	Acceptable
Deflection (micrometers)	≤ 200	≤ 350	≤ 550
IRI	0 a 1.3	1.3 a 2.6	2.6 a 4

Main pavement structure requirements for an adequate performance of the dynamic weighing sensors.

The deflection values retrieved with the HWD test at the structure containing the RoadCem Synthetic Zeolite Concret Base (RSZCB) are displayed below:



When reducing deflections, it may be noticed that the rigidity of the RoadCem Synthetic Zeolite Concret Base (RSZCB) quickly increases in the first hours after being construction; while it is also noted than 3 days later values below 200 micrometers were already recorded, which indicates an "Excellent" rating.

Regarding the International Roughness Index (IRI), the section with the RoadCem Synthetic Zeolite Concret Base (RSZCB) was recorded as 1.67 which, according to the parameters established in the above table, falls within the "Good" rating.

Wherefore it may be concluded that the structure is in good conditions for a proper functioning of the dynamic weighing sensors.

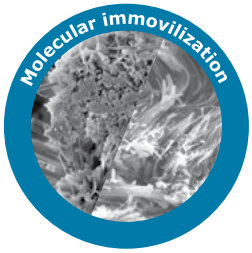
Chablé Highway, Tabasco, Mexico

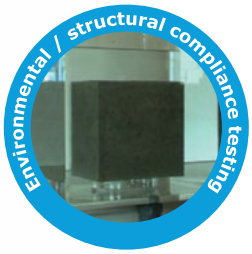
PowerCem® Magazine

ImmoCem

1

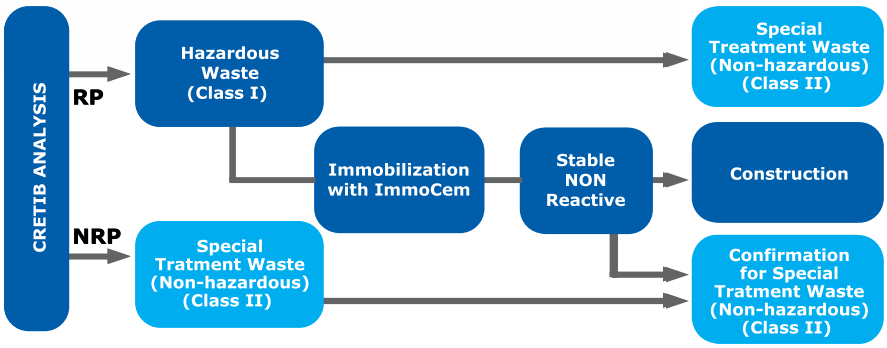
Through "nanotechnology", a reaction is generated between ImmoCem + cement and the contaminated waste, creating crystalline nanostructures that permanently immobilize waste particles inside them.





2

Versatile technology, which provides an ecological, effective, and long-lasting solution for transforming hazardous waste (Class I) into materials suited to be used in construction or confinement for special treatment waste (non-hazardous Class II)



	Hazardous Waste Basic State ppm (mg/L)	Maximum Limit Allowed ppm (mg/L)	Immobilized Waste ppm (mg/L)
Ag	128	5.00	0.05
Cd	1500	1.00	0.0092
Pb	6300	5.00	0.188
As	4960	5.00	0.207
Cr	245	5.00	0.139
Se	95	1.00	0.14
Ba	809	100.00	0.037
Hg	4	0.20	0.000872

Maximum Limit Allowed for toxic particles in the PECT extract (pursuan to the Mexican classification standard NOM 052 SEMARNAT 2005)

4

PowerCem contributes to the protection of the environment by developing solutions for the polluting waste-generating sectors. ImmoCem is a definitive solution for Immobilization.

SOME APPLICATIONS OF IMMOBILIZATION PROCESSES USING ImmoCem

Metallurgy

Petroleum Industry

Contaminated Soil

Chemical Industry

Mining Industry

RESEARCH AND DEVELOPMENT

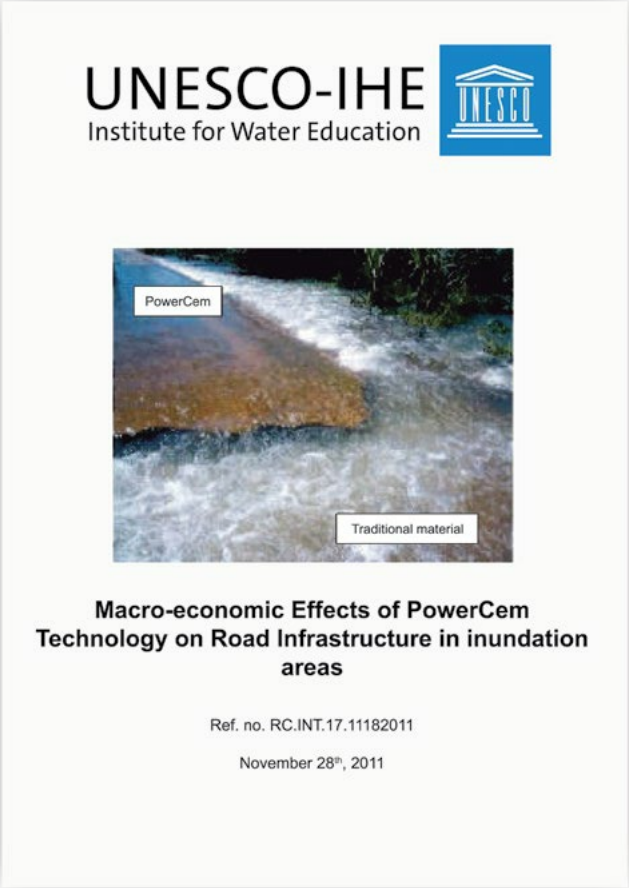
According to a recent research by the United Nations Organization for Education, Science, and Culture, the **UNESCO**, and **PowerCem Technologies** (Netherlands), the possibility of building highways and rural roads that are more resistant to weather changes has been demonstrated.

The study developed by the **UNESCO-IHE** and **PowerCem Mexico** has demonstrated that the resistance and durability of highways constructed using RoadCem allow the increase in the service life of asphalt concrete or hydraulic structures thanks to its high performance, impermeability, and many other mechanical qualities.

The results of the project, overseen by Dr. Chris Zevenbergen of the **UNESCO** Institute for Water Education **(UNESCO – IHE)** and researcher Rauf Slim Montero from **PowerCem Mexico** were reassuring.

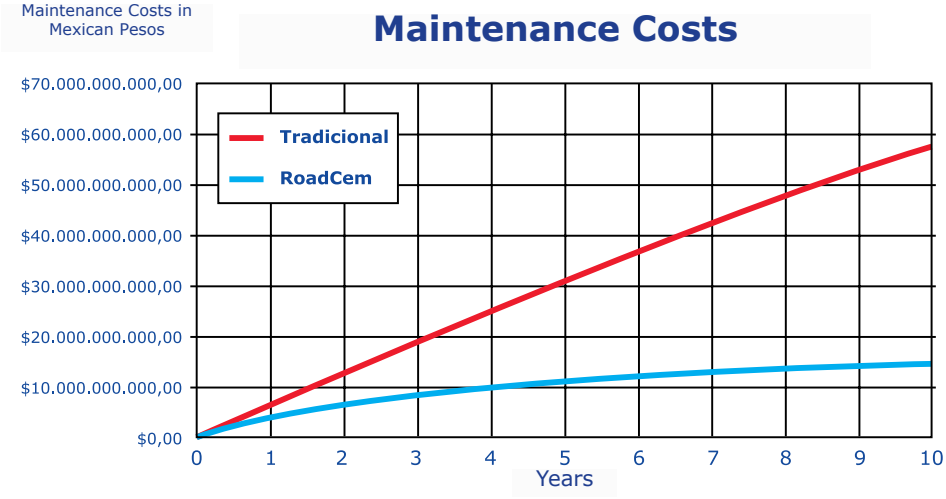
RoadCem applications on Tabasco highways proved that, with the passing of the years (2008-2012), such roads remained in good conditions, with no evidence of erosion, which reduces preventive and corrective maintenance costs to practically zero.

Furthermore, thanks to **RoadCem** allowing the use of materials deemed unsuitable for construction works, both operation and construction costs are reduced, which positively impacts project execution times, and comprehensively optimizes the road construction process.



10-year Financial Forecast of Maintenance Costs

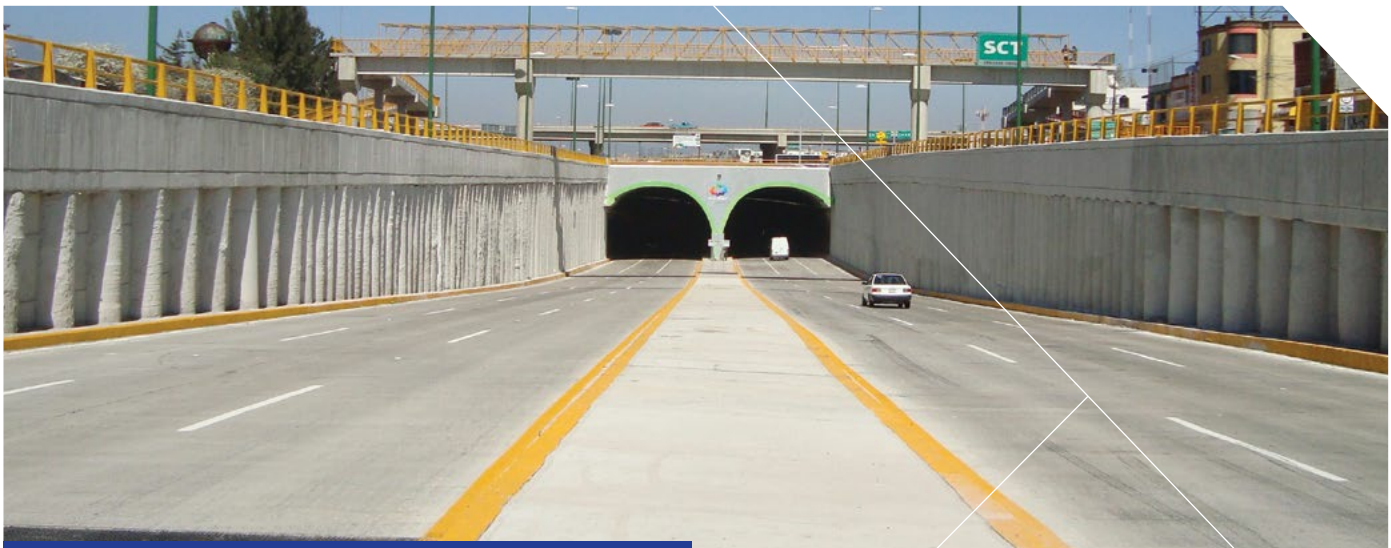
UNESCO – IHE for Water Education
Macroeconomic effects of the Use of PowerCem Technology in road Infrastructure in areas with risk of flooding



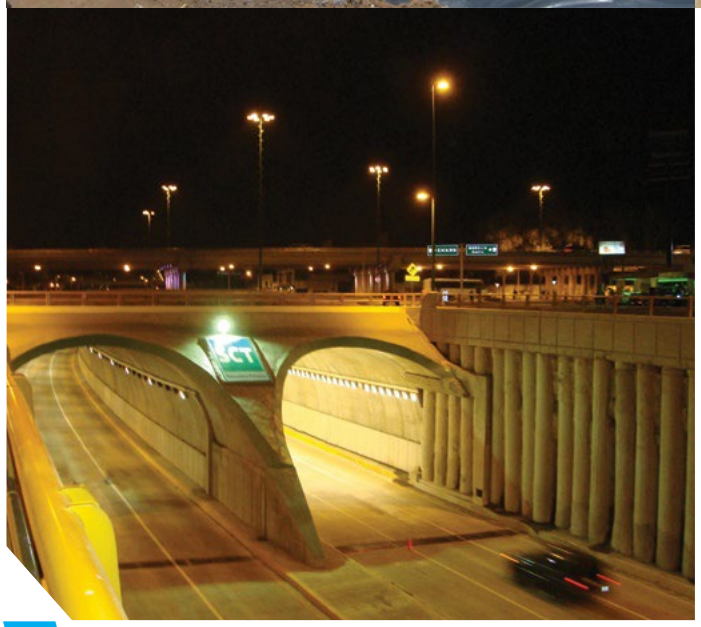
Maintenance costs displayed during a reference period of 10 years.
Source: Macroeconomic effects of PowerCem Technology in road infrastructures in areas with risk of flooding.


Tamuín, San Luis Potosí, Mxico
CD VALLES
SAN LUIS POTOSI
RETORNO

PORTFOLIO



Michoacán - Mexico



Charo Exit Distributor Road

Constructed with the purpose of resolving the complicated vehicle mobility around the crossing located at the "Nueva España" peripheral freeway, the Charo highway, and access to the Industrial city. It is also one of the main accesses to the city downtown, wherefore the vehicle capacity in this area amounts to an average of 35 thousand vehicles per day.

Thanks to the excellent properties of RoadCem, the Ministry of Communications and Transport (SCT, in Spanish) included in the construction process the use of "nanotechnology" based on RoadCem Synthetic Zeolites as an innovative solution by substituting piles by a foundation slab, with a constructed area of 150,000 m2. Dirt roads and hydraulic concrete works were also carried out.

This project ranked third in the infrastructure category of the CEMEX projects award in 2010.

Project: Urban roads foundation and bases 15,000 m^2
Country: Mexico
Location: Morelia, Michoacan
Year: 2008 – 2010
Product: RoadCem

Veracruz - Mexico

Internal Roads and Platforms at the XXI Ethylene Petrochemical Facility

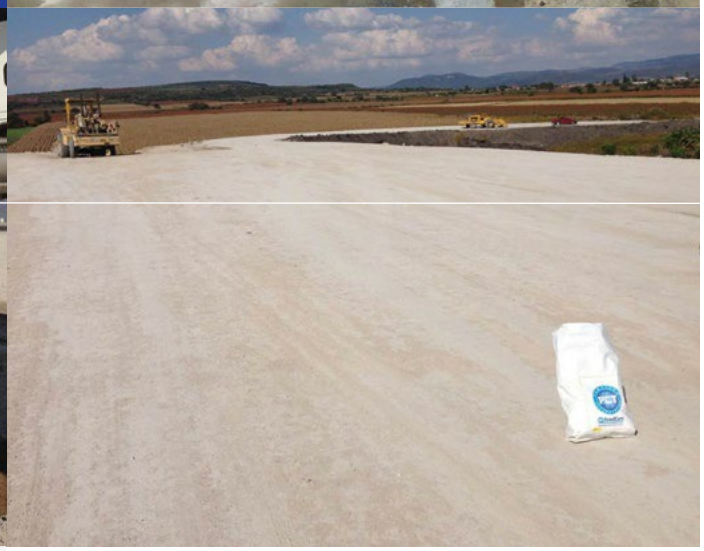
Located around the petrochemical industrial zone in the port city of Coatzacoalcos in the state of Veracruz. Accessed from the Coatzacoalcos – Villahermosa highway, km 10, in front of the "La Cangrejera" petrochemical facility.

The Synthetic Zeolite-based PowerCem technology was present in the construction of:

- Railway lines with sub-ballast system
- Maneuvering courtyards with RoadCem Synthetic Zeolite Concrete base
- Platform for internal project parking
- Parimeter roads around HDPE, LDPE, CRACKER, OSBL NORTH, and OSBL SOUTH facilities.
- Perimeter roads for the LOGISTICS "A", RELATED FACILITIES, and MAIN ROADS areas.
- Provisional platforms STAVANATO I and II.

Project: Internal roads – 191.070 m^2
Platforms – 132,220 m^2
Country: Mexico
Location: Nanchital de Lazaro Cardenas del Rio, Veracruz
Year: 2013 – 2015
Product: RoadCem

Michoacán - Mexico



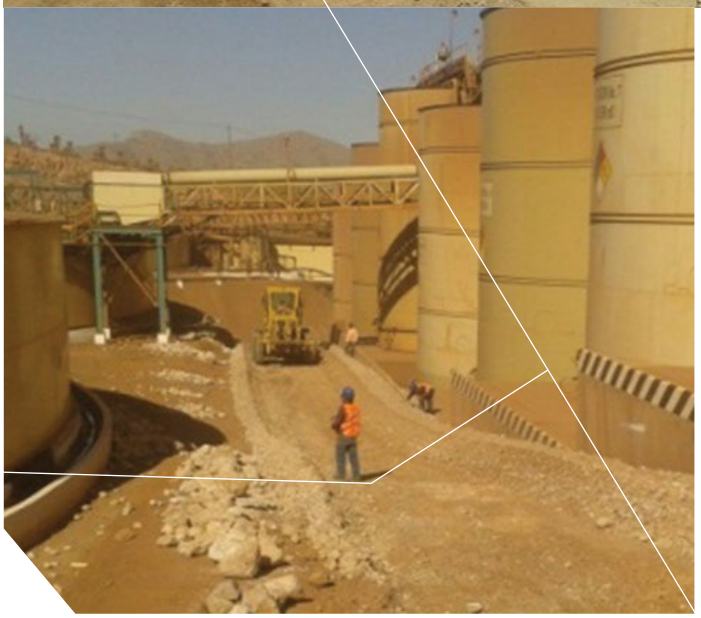
La Piedad – Penjamo Freeway

This project carried out for the Ministry of communications and Transport (SCT, in Spanish) consisted in the Construction of the Irapuato and Numaran junctions, located in the Penjamo, Guanajuato, and La Piedad municipalities, in Michoacan, in the center-west region of Mexico.

For this project, RoadCem was used to conform the highway base, significantly improving construction costs and times, with a better service life expectancy.

Project: Road Bases 66,000 m^2
Country: Mexico
Location: Penjamo, Guanajuato, and La Piedad, Michoacan
Year: 2012 – 2013
Product: RoadCem

Coahuila - Mexico

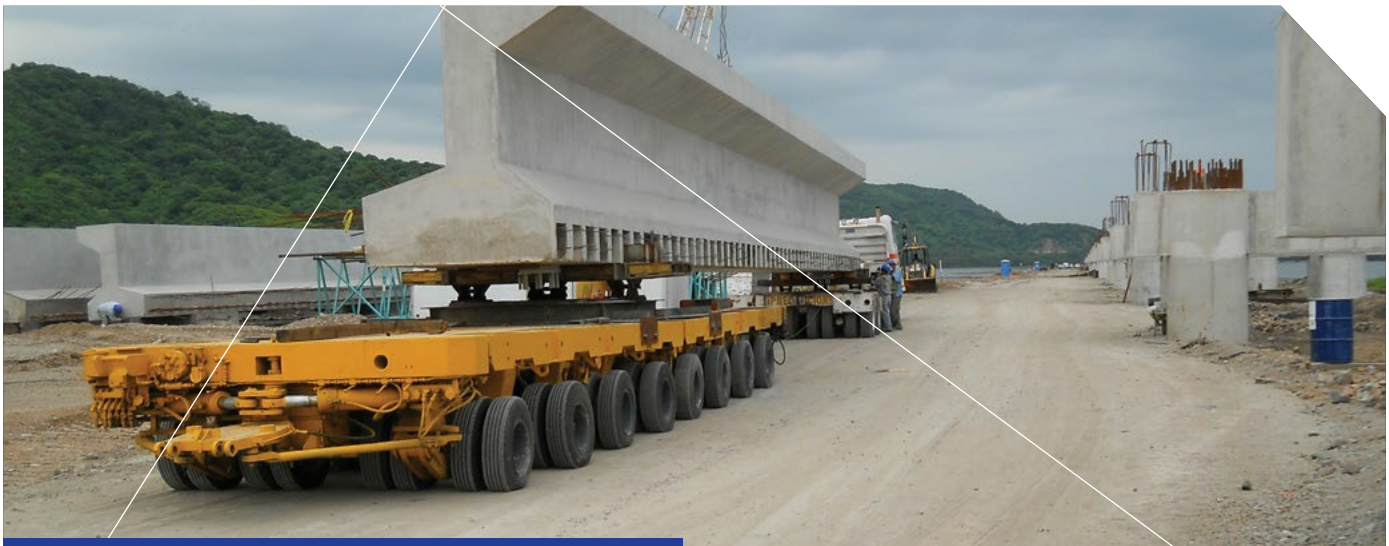


Internal Roads at the "La Encantada Silver Mine"

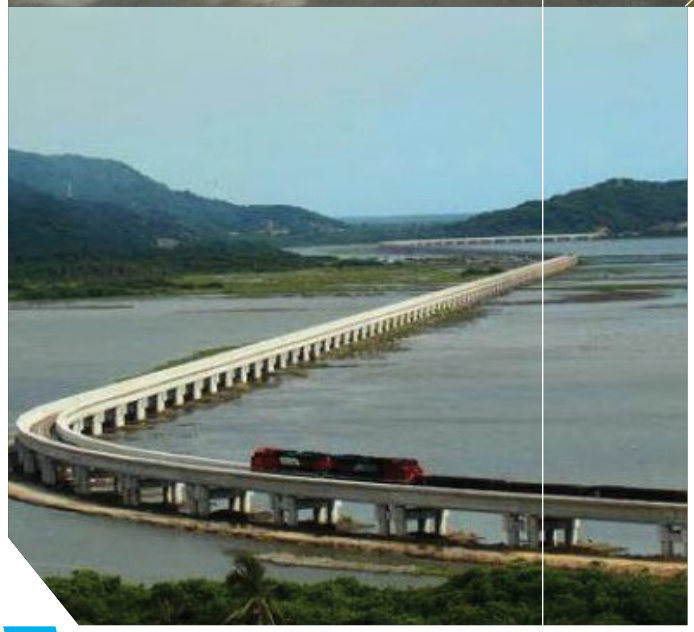
This mine has a surface of 4,076 hectares of mining rights, property of First Majestic Silver Corp., located in the municipality of Ocampo, Coahuila, in Northern Mexico.

Powercem Mexico successfully completed the construction of more than 5,000 sq. meters of internal roads within the mine at the chemical processing area for precious metals, using the materials present on site, and turning them into RoadCem Synthetic Zeolite concrete, achieving the encapsulation of harmful pollutants and transforming them into a semi-rigid slab of monolithic structure, with an impermeable surface with simple and cost-effective construction processes.

Project: Internal road base – 5,000 sq. meters
Country: Mexico
Location: Ocampo, Coahuila
Year: 2012
Product: RoadCem



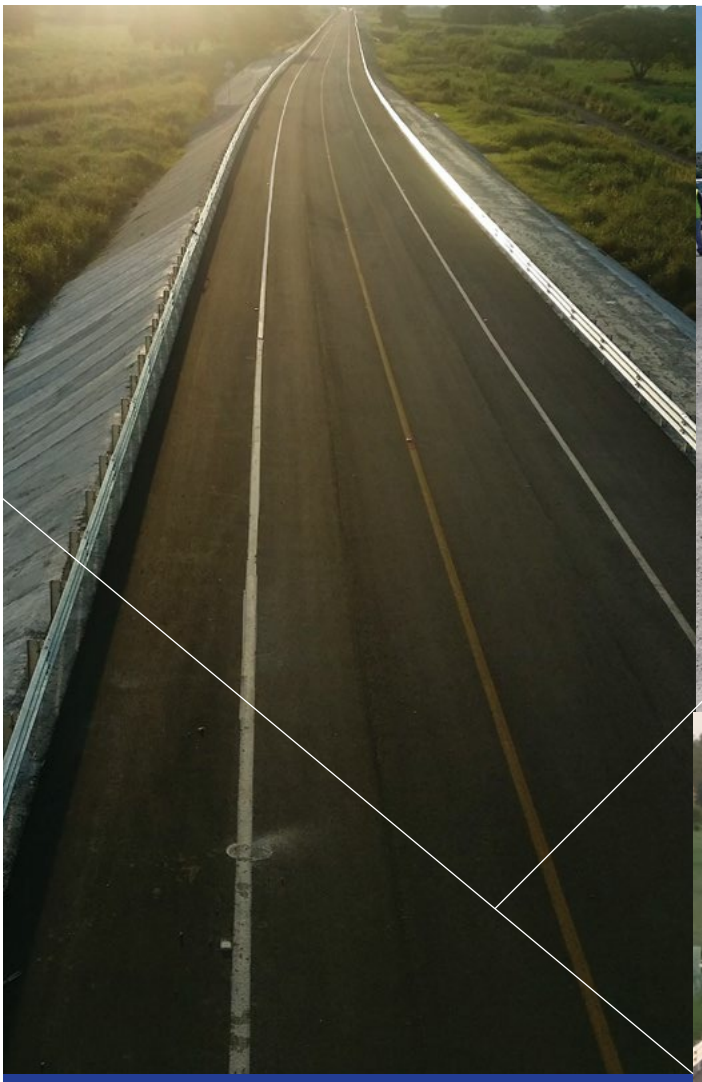
Colima - Mexico



Railway Detour at the Reservoir II of the Cuyutlan Lagoon

This project was regarded as special given its size. RoadCem was employed in the construction of 4.8 km of an access bridge over the lagoon through which heavy load vehicles and 500-ton cranes can pass carrying assembled concrete pre-manufactured pieces of up to 300 tons.

Project: Provisional road for railway tour 4.8 km
Country: Mexico
Location: Manzanillo, Colima
Product: RoadCem



San Luis Potosí - Mexico

18 km Highway Construction

This project consisted of the construction of an 18 km freeway with two lanes, from km 5+000 to 10+640, including the Tampaon II bridge located at km 8+020 and "San Vicente" and "San Juan" junctions at kms 5+572 and 9+869, respectively, of the 6 junctions that conform the total project, as well as 22 vehicle crossings and 4 major structures.

Located in the highway that joins Ciudad Valles with San Luis Potosi in northeastern Mexico.

This project implemented an innovative section, first of its kind, with a slope surface, which acts as foundation for the embankments and the pavement structure, overcoming the 2013 floods and remaining underwater for more than 30 days.

Project: 18 km highway construction
Country: Mexico
Location: Ciudad Valles – Tamuin, San Luis Potosi
Year: 2012
Product: RoadCem

Baja California - Mexico

Sentri Vehicle Lane

The city of Mexicali is located on the northeastern corner of the Mexicali Valley, along the Mexico – US border.

The "SENTRI Line" project consisted in the construction of a second SENTRI line of more than 1 km in length to speed up the crossing to the USA through the Nuevo Mexicali gate.

During the construction of the vehicle lane, traffic flow was not affected, neither from the city nor from the border crossing. This SENTRI lane was constructed at the reserve side intended to expand the infrastructure.

This far left lane at the new gate gives access to four extra lanes for crossing to the US.

Project: Sentril 1 km vehicle lane
Country: Mexico
Location: Mexicali, Baja California, Mexico
Year: 2010
Product: RoadCem

Guerrero - Mexico

Construction of RoadCem Synthetic Zeolite Concrete Base at the El Sol Highway

The Cuernavaca – Acapulco highway, also known as the "Del Sol Highway", along with the Mexico – Cuernavaca highway, connect Mexico City with one of the most visited beach destinations in Mexico: the City of Acapulco in the state of Guerrero.

The Ministry of Communications and Transport (SCT, in Spanish), through Federal Roads and Bridges for Connected Access and Services (CAPUFE, in Spanish) initiated a permanent program of keeping the highway in optimal conditions, therefore PowerCem Mexico participated in three sections for soil transformation.

Project: Construction of RoadCem Synthetic Zeolite Concrete base
Country: Mexico
Location: Guerrero, Mexico
Year: 2008
Product: RoadCem

Nuevo León - Mexico

Transformation of Bases for Secondary Roads

This project completed for the Federal Electricity Commission (CFE, in Spanish) consisted of the construction and transformation of an access road, 6 meters in width by 4,432 meters in length, to connect the new "Termium maneuvers" power substation with 400 KV with km 16+715 of the Pesqueria – Los Ramones state highway near Monterrey, Nuevo Leon in Northern Mexico.

Due to the importance of the substation, such road was to remain in optimal conditions throughout the year, wherefore its construction with RoadCem proved to be the ideal method for this purpose thanks to its unique features.

Project: Transformation of bases for secondary road
Country: Mexico
Location: Monterrey, Nuevo Leon
Year: 2012
Product: RoadCem

Oaxaca - Mexico

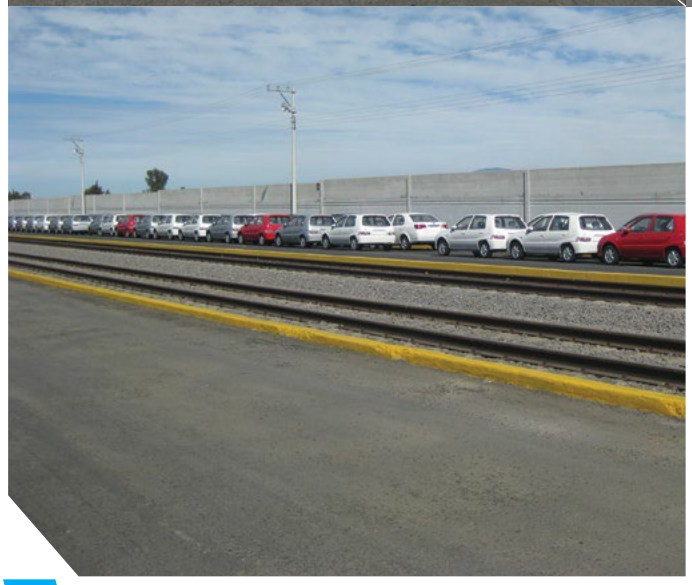
Construction of Bases

Construction of a 7,570 sq. meter RoadCem Synthetic Zeolite Concret Base for maintenance workshops, maneuvering courtyard, and drivers school for the ADO group in the city of Oaxaca.

The use of RoadCem in the development of the platform base allowed direct savings in construction costs, reduced maintenance and execution times, as well as a substantial increase in the service life of the final structure compared to a conventional pavement structure.

Project: Construction of workshop bases, maneuvering courtyard, an driving schools.
Country: Mexico
Location: Oaxaca City, Oaxaca
Year: 2012
Product: RoadCem

Estado de Mexico - Mexico



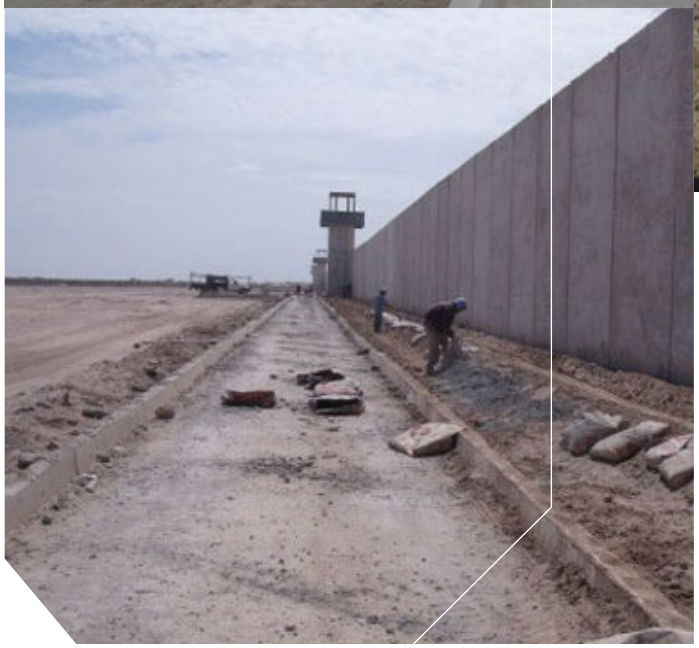
Soil Transfomation and the "Puerta Mexico" Multimodal Customs Terminal

Located in the center of the country, it is a loading terminal with customs office offering intermodal services.

Due to the large volume of operations at this logistics center, an innovative construction solution was necessary to transform the 1,440 square miles in locading and unloading patios. With the application of RoadCem, the pavement resistance was increased, extending its service life, and reducing maintenance and economically-competitive expenses against traditional methods.

Project: Soil transformation at the "Puerta Mexico" multimodal customs terminal
Country: Mexico
Location: Toluca, Estado de Mexico
Year: 2009
Product: RoadCem

Durango - Mexico



Sidewalk Construction

The Federal Center for Social Readaptation (CEFERESO, in Spanish) was designed to hold 2,500 federal convicts, located within 100 hectares at the Ejido 6 of Octubre in Gomez Palacio, Durango, on the side of the Ciudad Juarez, Chihuahua Highway in Northern Mexico.

Project: 40,000 sq. m sidewalk construction
Country: Mexico
Location: Gomez Palacio, Durango
Year: 2012
Product: RoadCem and ConcreCem

Veracruz - Mexico

Highway Rehabilitation

Rehabilitation of the La Tinaja – Cosoleacaque highway, located on the Isla – Acauycan section of km 118+000 to 121+000 in the municipality of La Isla in the state of Veracruz. Consisting of a RoadCem Synthetic Zeolite Concret Base, 30 cm thick and an asphalt layer of 8 cm thick.

Project: Highway rehabilitation
Country: Mexico
Location: La Isla – Acayucan, Veracruz
Year: 2015
Product: RoadCem

Querétaro - Mexico

Soil Transformation for Parking Lots

Due to its location and features, Queretaro is a major industrial city, with at least 18 industrial parks that encompass more than 4,639 industries that supply most of the country.

Among such important industries is General Motors Mexico, for which PowerCem Mexico completed the transformation of 150 thousand square meters for its vehicle distribution center. The construction company and the client determined the convenience of the use of RoadCem in this project thanks to its unbeatable features of durability, low maintenance, and quick construction process.

For this project, the client chose a traditional asphalt coating over a RoadCem Synthetic Zeolite Concret Base, which demonstrates once again that PowerCem technology products are compatible with any traditional construction method.

Project: Soil transformation for parking lot
Country: Mexico
Location: Queretaro, Queretaro, Mexico
Year: 2008
Product: RoadCem

Chiapas - Mexico

Road Reconstruction

The project is located at the Las Limas – Revolucion Mexicana highway section, in the Las Limas – La Concordia highway in the state of Chiapas.

The construction of the road was carried out through the surface elevation, drainage works, recovery of pavement structure layers for creating a stabilized RoadCem Synthetic Zeolite Concret Base, construction of asphalt concrete layer, complementary works, and signals.

Project: Road reconstruction, surface elevation, drainage works, complementary works, and signals
Country: Mexico
Location: Las Limas Revolucion Mexicana, Chiapas, Mexico
Year: 2013
Product: RoadCem

Estado de Mexico - Mexico

RoadCem Synthetic Zeolite Concret Base Highway

Located within the limits of the Tlahuac delegation close to the Valle de Chalco municipality.

This road presented various issues, for instance bumps that provoked waterlogging and damaged the structural stability of the road, wherefore trips could take up to 2 hours.

PowerCem Mexico completed a section with onsite materials for a comprehensive redevelopment of the pavement structure.

Parallel to this project, a test with cemented base was generated to have a benchmark of the behavior. After completion of the works, it was observed that the cemented base presented cracks, while the base built with RoadCem was found in optimal conditions (results can be reviewed through laboratory tests).

Project: Cemented base highway
Country: Mexico
Location: Tlahuac Delegation Limits
Year: 2014
Product: RoadCem

Guanajuato - Mexico

Road Rehabilitation

In March 2010 in Leon, Guanajuato, the Francisco C. Mena Street was rehabilitation, which size is 150 meters in length by 8.00 meters in width. The rehabilitation was carried out with FIDOC (Public Works by Cooperation Trust) resources so as to demonstrate the benefits of the RoadCem Synthetic Zeolite Concret Base in urban roads. Highlighting:

a) Costs
The project had a cost reduction of 16.88%

b) Construction Times
Construction times were significantly reduced, from 45 days with the conventional methods to 2 days with PowerCem products. Such time reduction allowed benefiting the community without impacting the locals and local trade.

Project: Urban Road Rehabilitation
Country: Mexico
Location: Leon, Guanajuato
Year: 2010
Product: RoadCem

Estado de Mexico - Mexico

Deep Drainage Test for Suburban Railroad

The Suburban Railroad has the purpose of connecting several municipalities between Mexico City and Estado de Mexico so as to reduce costs and commuting times, as well as reducing the corresponding pollution. PowerCem was used for the base in which pipelines were laid.

A reduction in costs and execution times was achieved, since only onsite materials and water; achieving a base that is perfectly-stable, impermeable, and resistant to soil contaminants.

Project: Deep drainage test for the suburban railroad
Country: Mexico
Year: 2006
Product: Concrecem

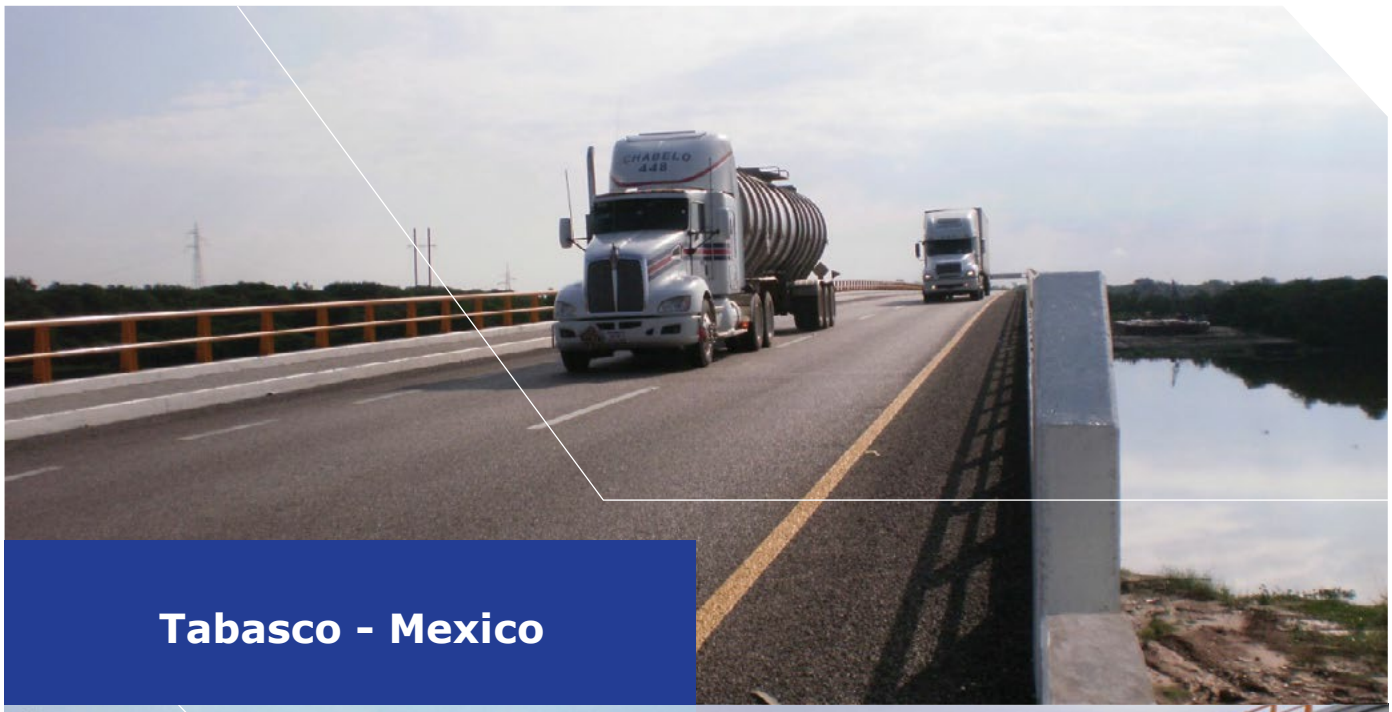
Tabasco - Mexico

State Road Rehabilitation

This section is located in the Zapatero – Jonuta highway, alongside the Usumacinta River: the largest river between Guatemala and Mexico, with a flow of approximately 1,500,00 liters per second; therefore this area records the greatest rainfalls of the entire Mexican territory, causing large floods every year, which severely affects roads and highways in the so-called "zone of the large rivers and swamps".

Due to the serious damage caused to the highway infrastructure and social and economic devastations caused by such floods, the State Office of Roads of the state of Tabasco, through its subcontractors, made use of our technology for rehabilitating this section, since RoadCem has proven, in multiple occasions, to be the only construction method capable of supporting major floods as they occur in such area.

Project: State road rehabilitation
Country: Mexico
Location: Tabasco, Mexico
Year: 2011
Product: RoadCem



Tabasco - Mexico

Vehicle Bridge Reconstruction

The "Tonala" bridge is located in the municipality of Agua Dulce, Tabasco in Southeastern Mexico. With 300 meters in length, it is part of the federal highway 180 and joins the towns of Cardenas in Tabasco and Coatzacoalcos in the state of Veracruz, being one of the most important land communication roads in the Gulf of Mexico, since it connects to the Yucatan peninsula.

According to the Ministry of Communications and Transport (SCT, in Spanish), approximately 36 thousand freight and passenger vehicles cross this bridge every day, which connects more than one million inhabitants from the closest towns. In July 2009, 80% of the bridge collapsed, since the structures were built more than 50 years ago.

The Ministry of Communications and Transport, along with a construction company in charge of the new design, selected RoadCem and ConcreCem due to their features, since their needs included:

Quickly reestablishing vehicle traffic
Extending the service life (which is estimated in 80 years, and may be extended even further with the adequate maintenance).
High resistance to heavy and constant loads, wind, and the aggressiveness of the large Tonala River.

Such unique qualities can only be provided by the PowerCem technology products.

Project: Vehicle bridge reconstruction
Country: Mexico
Location: Tabasco and Veracruz
Year: 2012
Product: RoadCem

Tabasco - Mexico

Follow-up on Projects Completed in Tabasco

Since 2008, PowerCem Mexico has completed transformation projects for municipal roads and highway sections in Tabasco for the Ministry of Communications and Transport (SCT, in Spanish) and for the State Board of Roads, where our leading product, RoadCem, has been widely used.

Thus, follow-up has been given to projects in which our product has participated to find the results of the use of PowerCem technologies. After major flooding, roads constructed with RoadCem continue in excellent conditions, despite undercuts and corrosion produced by high water levels and degrading agents.

For such reason, the Office of Coordination of Projects and Supervision of Federal Roads, a sub-office of the SCT, has extended a wide recommendation of PowerCem for RoadCem to be applied in projects throughout the national territory.

Dominican Republic

PowerCem® Magazine

Bogota, Colombia

Before the application of the RoadCem Synthetic Zeolite Concrete (RSZC)

Road Rehabilitation

Given the need to carry out a rehabilitation of roads that were practically unusable, the Bosa mayor in the Capital District of Bogota, in Colombia, through the Local Development Fund generated the intensive reconstruction of 100 streets in this city.

The PowerCem technology was selected for constructing the bases from a RoadCem Synthetic Zeolite Concrete structure which, due to the difficulty on maneuvering for construction, created an innovative process of mixtures offsite for their final placement with an asphalt rolling surface. RoadCem achieved a quick commissioning of roads with minimum trouble for inhabitants and significant savings in terms of construction with regards to traditional methods.

Project: Road rehabilitation
Country: Colombia
Location: Bosa Locality, Capital District of Bogota.
Year: 2014
Product: RoadCem

Bogota, Colombia

Landing Strip Rehabilitation

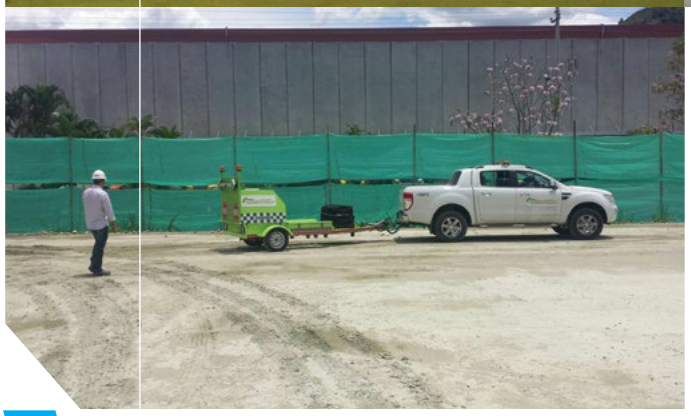
The El Dorado International Airport is located 15 km (9 miles) west of the city of Bogota, and serves the entire metropolitan area in Bogota and the country for international flights. It receives flights from North and South America and the main cities in Europe. Furthermore, it is the most important cargo airport in Latin America, and has one of the longest landing strips in the world.

The airport has two terminals, a national and an international terminal, which connect one to the other through headphones and walkways.

In this airport, PowerCem Technologies participated in the construction of landing strips in May 2000. The Aircrafts that serviced as design bases were the McDonnell Douglas MD-83 with 73,600 kg (160,000 pounds) in weight, with 200,000 repetitions throughout the expected service life of 5 years. After a careful inspection in February 2006; that is, it's been six years or intense use, the landing strips continued in optimal conditions.

Project: Air Strip Rehabilitation
Country – Colombia
Location: Bogota, Colombia
Year: 2000
Product: RoadCem

Girardota, Colombia



Platform for Conconcreto

RoadCem Synthetic Zeolite Concrete base construction at the heavy machinery parking lot of advanced construction systems without wheeling surface, located in Girardota, Antioquia, Colombia.

Project: Conconcreto Platform
Country: Colombia
Location: Girardota Municipality, Antioquia, Colombia
Year: 2014
Product: RoadCem

Antioquia, Colombia

Within the framework of the project **"SURVEY, SELECTION, AND STRUCTURING OF ALTERNATIVE STABILIZATION TECHNOLOGICAL SYSTEMS, HARDENING AND/OR SURFACE PAVEMENTS IN ANTOQUIA PILOT TESTS"** which develop the Antioquia, the Antioquia University, the Medellin University, and the INNOVIAL Network, which purpose is to assess the various stabilization technologies available in the market and monitor the structural response times of the pavement in terms of resistance and durability. We wish to inform you of the application conditions of your product RoadCem® throughout the different testing sections.

The Research was carried out in 5 sub-regions of the Antioquia Department, where the new strips were built, each of them divided by two sub-sections, which have the purpose of evaluating a product performance whenever protected by a welding cape and clothes and whenever the product is exposed.

ROADCEM PRODUCT APPLICATION CONDITIONS

The RoadCem product was applied on March 10, 2015 from km 15+434 to km 16+499 to a depth of 15 cm. Such section does not include any type of additional superficial protection.

The application required a basic machinery set, including mobile concrete grader, backhoe, and compacting vibrator. Furthermore, with the purpose of guaranteeing a proper homogenization of the additive soil, provide better finishing for sections, and complete a techno-economic assessment of the use of an alternative, relatively new, in outer states, and includes a recycling materials"

Dominican Republic

Larimar Wind Park

The Larimar Wind Park is a project located in the crowded province of Barahone. This is where 20,000 sw. meters of operational platforms from assembly cranes, 1,200 tons each, and 7 km of intense weather.

For this project, onsite materials (limestone gravel) were used, which were mixed with Power Cemttechnologies.

Project: Larimar Wind Park
Country: Dominican Republic
Location: Enriquillo, Barahona, Dominican Republic, all easily accessible.
Year: 2015
Product: RoadCem

Dominican Republic

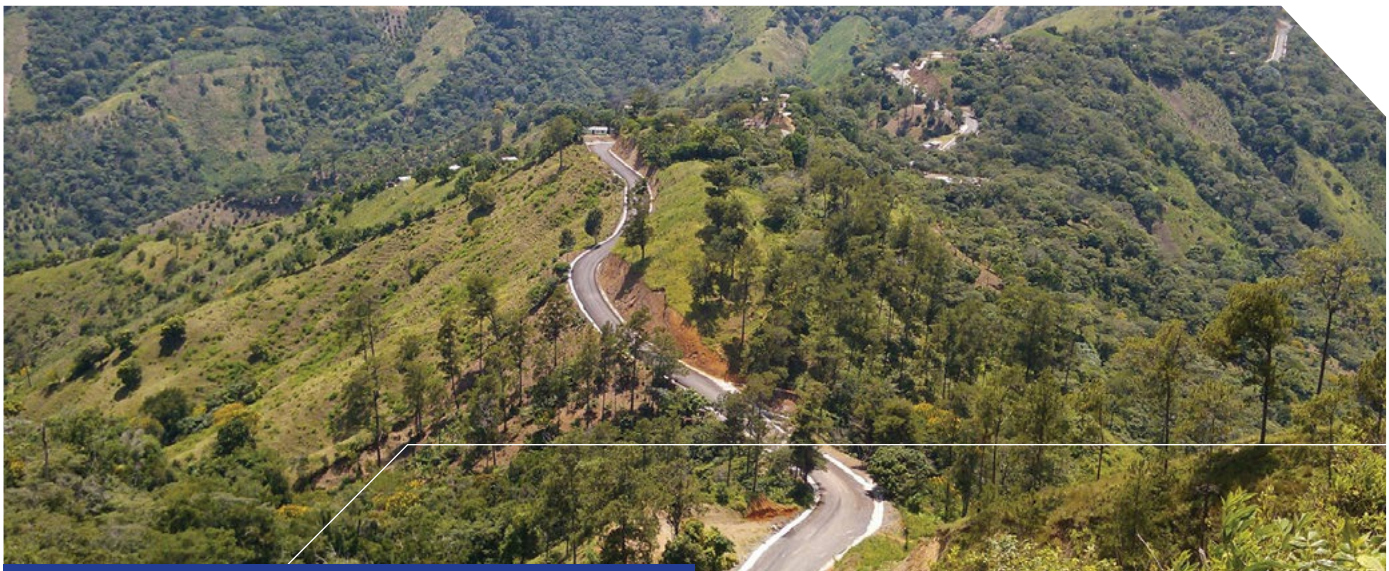
Storage Platform at the Sonsouci Port

The Sansouci Port is located along the Osama river, near the historical downtown of Santo Domingo.

It is highly notable thanks to its geographic location and economic growth.

This port saw the need to house greater vessels, for which purpose our technology was applied in platform and road expansions with which, thanks to RoadCem, now has better stability, durability, and unforeseen features.

Project: Storage platform at Sansouci Port
Country: Dominican Republic
Location: Santo Domingo
Year: 2014
Product: RoadCem



Dominican Republic

Arroyo Cano Highway, Los Montecitos

Arroyo Cano is located in the providence of San Juan. The PowerCem technology presented a solution with an alternative for pavement structure design in areas where plastic clays abound, and where a modification of the traditional pavement structure was proposed contemplated to present a solution with significant savings and guaranteeing the pavement structure stability.

RoadCem allowed us to work with the existing materials in the area to stabilize it, thus achieving a rigid structure that allowed us to use it directly as a wheeling layer. Such structure acts as an assembled plateau and transfers the pressure to the firm extracts searched for when excavating, which provided us with substantial excavation savings and replacement with classified materials to considerably reduce budgets, as well as the environmental impact of searching for mining materials.

Project: Arroyo Cano Highway, Los Montecitos
Country: Dominican Republic
Location: San Juan Providence, Dominican Republic
Year: 2014
Product: RoadCem

Dominican Republic

Urban Roads

This project is located a few kilometers from Santo Domingo, capital of the Dominican Republic, in the town of Boca Chica, where a residential touristic project called "Caribbean Dream" (SueñoCaribeño) was developed; an Italian investment project consisting of summer villas, apartment towers with amenities and facilities to practice various sports, and pools.

Due to the large volume of garbage, waste materials, and gravel, the site materials were not considered useful for construction. However, thanks to PowerCem technology, the successful construction of a road section was achieved using a mixture of RoadCem.

In days subsequent to the project completion, the worked section was tested by passing heavy and loaded trucks over such road; and no type of failure was present, wherefore the client was highly satisfied with the results obtained.

Project: Urban Roads
Country: Dominican Republic
Location: Boca Chica, Dominican Republic
Year: 2010
Product: RoadCem

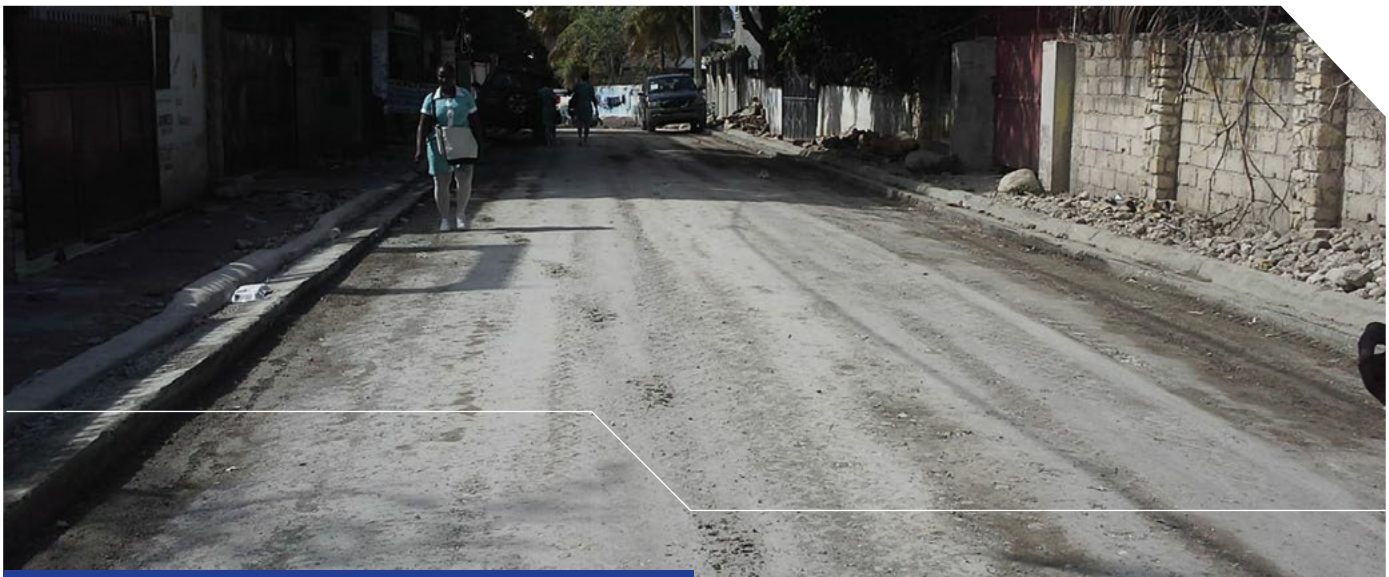
Dominican Republic

Urban Road Rehabilitation

Through the use of minimum machinery equipment, the pavement base was built for rehabilitating the Hato Nuevo highway, in the municipality of West Santo Domingo, in Dominican Republic.

The use of PowerCem technology allowed the recovery of such highway for vehicle traffic, connecting nearby towns and guaranteeing a pavement structure with a longer service life, and maintenance-free.

Project: Urban road rehabilitation
Country: Dominican Republic
Location: Hato Nuevo, Manoguayabo
Year: 2013
Product: RoadCem



Port du Prince, Haiti

Before the application of RoadCem Synthetic Zeolite Concrete (RSZC)

Urban Roads

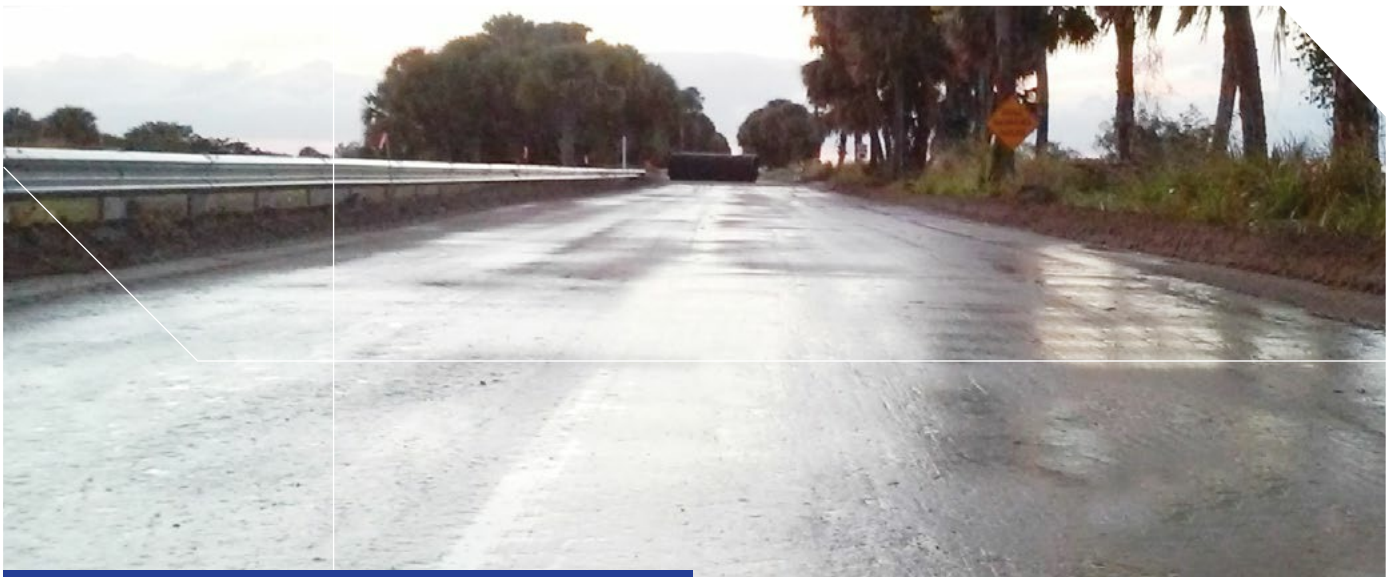
In December 2015 in Port du Prince, Haiti, a 76 m-long road section was built, with a variable width between 5.80 and 7.10 meters, and a thickness of 0.25 m with onsite materials, Portland cement Type I, RoadCem, and water.

The construction was carried out with the purpose of demonstrating the benefits of the RoadCem Synthetic Zeolite Concrete (RSZC) to the Ministry of Public Works, Transport, and Communication (MTPTC, in French).

The section was open for traffic on the day following its construction.

Comments received by the Ministry, as well as by the general public, were all positive, since they were completely satisfied by the results obtained when applying RoadCem Synthetic Zeolite Concrete.

Project: Urban roads
Country: Haiti
Location: Port du Prince
Year: 2015
Product: RoadCem



Florida, EEUU

With RoadCem Syntehtic Zeolite Concrete (RSZC) application

Without RoadCem Syntehtic Zeolite Concrete (RSZC) application

Urban Road

In December 2015 in Fellsmere, Florida, USA, a road section of 110 meters in length by 7.30 meters in width and a thickness of 25 cm was built with the purpose of demonstrating the benefirts of RoadCem Synthetic Zeolite Concrete.

The materials employed were local sand, RoadCem, Portland Cement, and water. The water used for the material mixture was purified. However, for the curing process, contaminated water was used.

The section caused amazement due to its rapid rigidity, achieved in a single day. Comments received subsequent to the completion of the section where that the rest of the road has to receive continuous maintenance, while the RoadCem Synthetic Zeolite Concrete section had not received any maintenance, since it did not seem to need it.

Project: Urban Road
Country: USA
Location: Fellsmer, Florida, USA
Year: 2015
Product RoadCem

Quito, Ecuador

Road Construction

Private urbanization, high-development project, consisting of various types of soils with a vision of a sustainable city. Its nature of mixed soil required a road infrastructure (11 km) with special features, environmentally friendly, and with material durability, demanding for providing a quality road network for nearby users of the 500,000 constructed square meters forecasted to be residential areas, office buildings, a commercial area, and touristic areas.

Project: Road construction
Country: Equator
Location: San Patricio Residencial, Cumbauya, Quito, Equator
Year: 2015
Product: RoadCem

Quito, Ecuador

Road Rehabilitation

An existing road, which allowed connecting the E35 with the E10. This road allows the connection with various towns of the region, strengthening their ties and accessibility by means of passenger transports to this region of Equator.

Project: Carchi station rehabilitation – E10
Country: Equator
Location: Imbaura, Equado
Year: 2015
Product: RoadCem

Basora, Iraq

Checkpoint at the Iraqi Border (Basora Region)

The Iraqi government invited PowerCem Technologies to introduce RoadCem as a globally renowned patented technology, catalogued as number one for its application in safe and long-lasting infrastructures.

Our Middle-East Team and PowerCem Netherlands collaborated in this project in January 2014.

Project: Soil transformation
Country: Iraq
Location: Besora, Iraq
Year: 2014
Product: RoadCem

Freiberg, Germany

Rural Road

The design of the rural road in Freiburg, Germany, was made under the following specifications

- Length: 5 km
- Asphalt 15 cm
- Stabilized base 25 cm
- RoadCem 1.7 K/cubic meter
- Cement 170 Kg/ cubic meter

Cost savings for this project was 37%

Project: 5 km highway
Country: Germany
Location: Freiberg, Germany
Year: 2004
Product: RoadCem

Merkendorf, Germany

Biodiesel Facility

Located in Germany with a negative soil related to local agriculture.

This area suffers from irregular floods, which causes the water level to be close to the surface.
RoadCem provided a solution with a light mixture design with a 200mm thickness.
RoadCem modified the area used for vegetable storage in this bioindustry.

Requirements such as resistance to acids and impermeability were important aspects to take into account.

Project: Biodiesel facility
Country: Germany
Location: Merkendorf, Germany
Year: 2004
Product: RoadCem

Resume

With our "nanotechnology" (CZSR), in Mexico only, more tan 10 million sq. meters been built, among which include new works, redevelopments, and improvements in highways, rural roads, junctions, channels, dams, mines, slopes, ports, and platforms; among other structures. Some of the most significant projects completed and currently under development are:

Projects under development – 2016

LO-009000999-N144-2015 Modernization by means of the expansion of dirt roads, drainage works, paving, signals, and complementary works, road: Fresnillo north access; section: km 62+700 to km 63+800 in the Fresnillo municipality in the state of Zacatecas.- - Rivera y Rivera, S.A. de C.V. – 50,600 sq. meters.

LO-009000999-N145-2015 Modernization by means of the expansion of dirt roads, drainage works, paving, signals, and complementary works, road: Fresnillo north access; section: km 63+800 to km 66+100 in the Fresnillo municipality in the state of Zacatecas. – Rivera y Rivera, S.A. de C.V. – 50,600 sq. meters.

LO-009-000999-T119-2015 Construction of the Acapulco, tr. La Venta – Bajos del Ejido west freeway, km 10+000 – km 18+000, with a 21.0 m crest width, through dirt roads, drainage works, paving, complementary works, overpasses, structures, junctions, vertical and horizontal signaling for an-8 km section in the state of Guerrero. – Group: Acciona Infraestructuras Mexico, S.A. de C.V. and Acciona Infraestructuras, S.A. de C.V. – 160,000 sq. meters.

LO-009000999-N438-2015 Modernization and expansion of the La Paz – Cd. Insurgentes highway, from km 41+000 to km 46+000 through the construction of dirt roads, drainage works, asphalt concrete paving, various works, and signals in the State of Baja California Sur – Constructora de Obras Civiles y Marítimas Ivjadi, S.A. DE C.V. – 69,381 sq. meters.

LO-009000999-N4392015 Modernization and expansion of the La Paz – Cd. Insurgentes highway from km 46+000 to km 51+000 through the construction of dirt roads, drainage works, asphalt concrete paving, various works, and signals in the state of Baja California Sur. – Group: Solmex Ingenieria, S. de R.L. de C.V. and Constructora y Urbanizadora San Isidro, S.A. de C.V. – 69,381 sq. meters.

LO-009000999-N440-2015 Modernization and expansion of the La Paz – Cd. Insurgentes highway, from km 51+000 to km 56+000 through the construction of dirt roads, drainage works, asphalt concrete paving, various works, and signals in the state of Baja California Sur – Talivic Construcciones, S.A. de C.V. – 69,381 sq. meters.

LO-009000999-N441-2015 Modernization and expansion of the La Paz – Cd. Insurgentes highway, from km 196+000 to km 203+000 through the construction of dirt roads, drainage works, asphalt concrete paving, various works, and signals in the state of Baja California Sur – Talivic Construcciones, S.A. de C.V. – 96,700 sq. meters.

LO-009000999-N452-2015 Expansion and modernization of 12 m of the Durango – Hidalgo de Parral highway, section: San Juan del Rio – Matamoros, km 236+000 to km 242+000, including dirt road works, drainage works, asphalt concrete paving, 2 structures: km 237+189 and km 240+150, complementary works and signals in the state of Durango. – Prefamovil, S.A. de C.V. – 72,000 sq. meters.

LO-009000999-N453-2015 Expansion and modernization of 12 m of the Durango – Hidalgo de Parral highway, section: San Juan del Rio – Matamoros, km 242+000 to km 248+000, including dirt road works, drainage works, asphalt concrete paving, 1 structure: km 245+130, complementary works and signals in the state of Durango. – Prefamovil, S.A. de C.V. – 72,000 sq. meters.

LO-009000999-N458-2015 Modernization and expansion of the Federal Highway no. 02, Janos – Agua Prieta section, from km 81+000 to km 87+000 in the state of Sonora.- Construkino, S.A. de C.V. 72,000 sq. meters.

LO-009000999-N459-2015 Modernization and expansion of the federal road No. 02, Janos – Agua Prieta section, km 100+000 to km 107+000 in the state of Sonora.- Group: Pavimentos de Asfalto y de Concreto, S.A. de C.V., and Advisor Techniche Mex-Engineers, S.A. de C.V. – 84,000 square meters.

LO-009000999-N462-2015 Modernization consisting in the construction of dirt roads, drainage works, asphalt concrete pavement, induced works, and highway signals: Manuel-Aldama-Soto la Marina-Rayones; section: Aldama – Soto la Marina. Subsection:km 69+000 to km 73+000 in the state of Tamaulipas.- Group: Comercializadora y Constructora Gabrich, S.A. de C.V., and Construcciones Xallitic, S.A. de C.V. – 48,000 sq. meters.

LO-009000999-N463-2015 Modernization of the Manuel – Aldama – Soto la Marina – Rayones highway; section: Aldama – Soto la Marina; subsection: km 65+000 to km 69+000 in the State of Tamaulipas.- Group: MG Infraestructura, S.A. de C.V. and Marcias Garza Angel – 48,000.

LO-009000963-E1-2016 Modernization consisting in the construction of dirt roads, structures, drainage works, asphalt concrete paving, vertical and horizontal signals, induced works, and complementary works from a 7.0 to 12.0 m section of km 22+500 to km 24+000 of the Villa Victoria – San Jose del Rincon – El Oro highway; Villa Victoria – San Jose del Rincon section in Estado de Mexico.- Placosa, S.A. de C.V. – 18,000 sq. meters.

LO-009000999-E14-2016 Modernization consisting in the construction of dirt roads, structures, drainage works, asphalt concrete paving, vertical and horizontal signals, induced works, and complementary works from a 7.0 to 12.0 m section of km 16+000 to km 19+000 of the Villa Victoria – San Jose del Rincon – El Oro highway; Villa Victoria – San Jose del Rincon section in Estado de Mexico.- Esvami Construcciones, S.A. de C.V. – 36,000 sq. meters.

LO-009000999-E37-2016 Modernization of the km 125+000 – 130+000 subsection, which works consisted in the expansion from 7.0 to 12.0 m crown width through dirt works, drainage works, base development using RoadCem Zeolite Concrete and asphalt concrete layer, complementary works, and signals; located in the Catazaja – Palenque section in the Catazaja – T.C. (Tuxtla Gutierrez – Cd. Cuauhtemoc), in the state of Chiapas.- Ingenieria y Valuacion del Sureste, S.A. de C.V. – 60,000 sq. meters.

LO-009000970-E52-2016 Modernization of the km 15+500 – 18+500 subsection, which works consist in the expansion from 7.0 to 12.0 crown width through dirt works, drainage works, base development with RoadCem Zeolite Concrete and asphalt concrete layer, complementary works, and signals, located in the Catazaja – Palenque section of the Catazaja – T.C. (Tuxtla Gutierrez – Cd. Cuauhtemoc) in the state of Chiapas – GRUPO PAVIMENTOS DEL SURESTE S.A. DE C.V. (April 13, 2016 aaward) – 42,000 sq. meters.

LO-009000999-N422-2015 Execution of missing dirt road works, drainage works, structures, asphalt concrete pavement, complementary works, induced works, horizontal signs, and vertical signs from km 0+000 to km 2+9'' of a section of 7.0 to 22.0 and transition to a driveway of 22.0 m to 12.0 m from km 2+800 to km 6+600, and execution of works for modernizing the expansion of the driveway from 7.0 m to 12.0 m consisting in the execution of dirt roads, drainage works, structures, asphalt concrete pavement, complementary works, induced works, horizontal signals, and vertical signals from km 6+600 to km 8+000, and from km 10+640 to km 12+000 of the Villa Victoria – San Jose del Rincon – El Oro highway in Estado de Mexico – CIACSA, S.A. de C.V. – 18,160 sq. meters.

LO-009000999-T428-2015 Expansion from 4 to 8 lanes in subsection: km 160+700 to km 161+500, as well as the construction of the PSV "Parque Tabasco", including access roads, located at km 161+249, and the construction of 2 PIP at the highway: Coatzacoalcos – Villahermosa, section Reforma – Villahermosa junction in the state og Tabasco – Jaguar Ingenierios Constructores, S.A. de C.V. – 23,838 sq. meters.

Works completed – 2015

Construction of perimeter roads for the Ethylene XXI project of the facilities: HDPE, LDPE, CRACKER, OSBL NORTH, OSBL SOUTH. Construction of perimeter roads of the Ethylene XXI project for the areas: LOGISTICS "A", RELATED FACILITIES, and MAIN ROAD. 191,070 sq. meters.

LO-009000999-T446-2014 Dirt Road construction works, drainage works, structures, paving, complementary works, horizontal and vertical signals; includes Loma de Caballo junction, the Vehicle Underpass located at km 5+249, the "Lomitas" subsection road km 0+000 to km 1+200 with a Vehicle Underpass at km 0+274 and Dren Lomitas Bridge km 0+870 of the highway: Villahermosa Freeway, Section: km 0+000 to km 14+000 and km 18+000 to km 22+700 in the state of Tabasco 136,500 sq. meters.

Bidding N102-2015 (SCT) Modernization and Expansion of the Pachuca-Huejutla highway km 45+000, modernization and expansion of the Pachuca-Huejutla highway, Atotonilco-Zacualtipan section to four lanes, from km 45+000 to km 48+500 (both directions) through dirt road works, drainage works, pavement with asphalt base, and high-performance asphalt laying, complementary and induced works, and one (1) pedestrian bridge at the Atotonilco el Grande municipality, state of Hidalgo. 61,845 sq. meters.

Works completed – 2014

LO-009000999-N109-2014 (SCT) Modernization of border highway from Comitan through the expansion from 7.00 m to 12.0 crown width with dirt road works, drainage works, paving with asphalt concrete layer, premixed seal, structures, complementary works, and signals, from subsection km 210+000 to km 219+000 of the Tuxtla Gutierrez – Cd. Cuauhtemoc highway in the state of Chiapas, contractor – RAGER DE TABASCO, S.A. DE C.V. 103,920 sw. meters

FONDEN – 2014 Rehabilitation of Tlapa – Metlatonoc highway, from subsection km 35+000 to km 80+000 in the state of Guerrero, constractor – CONSTRUCTORA MOTA ENGIL MEXICO, S.A. de C.V. 315,000 sq. meters

FONDEN – 2014 Rehabilitation of Metlatonoc – Tlacoachistlahuaca highway, subsection km 70+000 to km 85+000 in the state of Guerrero, contractor – EPCCOR, S.A: de C.V: 232,365 sq. meters

FONDEN – 2014 Road Reconstruction: Tlapa – Marquella, km 30+000 to km 50+000 section located in the municipalities of Tlapa and Marquella in the state of Guerraro, contractor – TEYA, GRUPO HIG, 140,000 sq. meters

Completed Works – 2013

LO-009000984-N18-2013 (SCT) Modernization and expansion from 7.0 to 12.0 m crown width through paving with asphalt mix in hot, 3-A synced seal, and vertical and horizontal signals, in the section: Santa Cruz – Jalapita – El Bellote, sector to be modernized from km 21+800 to km 18+800, goal 3.0 km, located in the Centla municipality in the state of Tabasco, contractor – ESMA INSTALACIONES, S.A. DE C.V., 36,000 sq. meters.

LO-009000984-N19-2013 (SCT) Modernization and expansion from 7.0 to 12.0 m crown width through paving with asphalt mix in hot, 3-A synced seal, and vertical and horizontal signals, in the section Santa Cruz - Jalapita - El Bellote, section to be modernized from km 21+800 to km 18+800, goal 3.0 km, located in the municipality of Centla, in the state of Tabasco, contractor – ESMA INSTALACIONES, S.A. DE C.V. 36,000 sq. meters

LO-009000984-N20-2013 (SCO) Modernization and expansion 7.0 m to 12.0 m crown width through paving with hot asphalt mixture, synced 3-A, and vertical and horizontal signs, section: Jalpa de Mandez – Cunduacan, Subsection: Jalpa de Mendez – Via Corta Cunduacan, from km 0+000 to 15+000; section to be modernized from km 0+100 to 2+600, gual 2.5 km located at the Cunduacan municipality in the state of Tabasco, contractor – GRUPO INDUSTRIAL MERODIO, S.A. DE C.V., 30,000 sq. meters

LO-009000999-N198-2013 (SCT) Reconstruction of the current road by means of the elevation of surface, drainage works, recovery of existing pavement structure layers for forming a stabilized, zeolite-type base, construction of asphalt concrete layer, complementary works, and signals, from km 0+000 to km 17+000 in subsection: Las Limas – Revolucion Mexicana, from highway Las Limas – La Concordia in the state of Chiapas. Contractor – CM DEL GOLFO, S.A. de C.V. 115,500 sq. meters

LO-009-000999-N199-2013 (SCT) Reconstruction of the current road by means of the elevation of surface, drainage works, recovery of existing pavement structure layers for forming a stabilized, zeolite-type base, construction of asphalt concrete layer, complementary works, and signals, from km 17+000 to km 33+500 in subsection: Las Limas – Revolucion Mexicana, from highway Las Limas – La Concordia in the state of Chiapas. Contractor – R&R EMPRESARIAL, S.A. de C.V. 115,500 sq. meters

LO-009-000999-N200-2013 (SCT) Reconstruction of the current road by means of the elevation of surface, drainage works, recovery of existing pavement structure layers for forming a stabilized, zeolite-type base, construction of asphalt concrete layer, complementary works, and signals, from km 33+500 to km 49+5.00 in subsection: Las Limas – Revolucion Mexicana, from highway Las Limas – La Concordia in the state of Chiapas. Contractor – RAGER DE TABASCO, S.A. DE C.V., 112,000 sq. meters

LO-009-000999-N201-2013 (SCT) Reconstruction of the current road by means of the elevation of surface, drainage works, recovery of existing pavement structure layers for forming a stabilized, zeolite-type base, construction of asphalt concrete layer, complementary works, and signals, from km 49+500 to km 70+000 in subsection: Las Limas – Revolucion Mexicana, from highway Las Limas – La Concordia in the state of Chiapas. Contractor – CUADRO ROJO, S.A. DE C.V., 133,728 sq. meters

LO-009000999-N464-2013 (SCT) Construction of tw lanes, 9.0 m section of the highway: Mexicali, Laguna, Chapala, section: Puentecitos Laguna Chapala, from km 153+500 to km 157+865 and km 158+245 to km 172+880, including: dirt roads, drainage works, asphalt concrete paving, signals, and complementary works; in the municipality of Ensenada, state of Baja California. 171,000 sq. meters.

Completed works – 2012

Consulting and construction of provincial platforms for the project Ethylene XXI in Coatzacoalcos, Veracruz, contractor – Odebrecht – Ica Fluor – 4,203.95 sq. meters

Consulting and construction of the Stevanato I platform for the project Ethylene XXI in Coatzacoalcos, Veracruz, contractor – Odebrecht – Ica Fluor – 46,602.55 sq. meters

Consulting and construction of the Stevanato III platform for the project Ethylene XXI in Coatzacoalcos, Veracruz, contractor – Odebrecht – Ica Fluor – 46,602.55 sq. meters

Consulting and application of RoadCem in the construction of bases and roads for the La Encantada mine in the municipality of Ocampo, Coahuila (Silver and Lead Mine) First Majestic Silver Corp – contractor – RoadCem de Mexico – 5000 sq. meters

Consulting and application of RoadCem in the construction of a provisional road in Jaltipan, Veracruz, Mexichem Fluor – contractor – RoadCem de Mexico – 6,000 sq. meters

LO-009000984 – N51 – 2012 (SCT) Reconstruction of asphalt pavement 9+600 to 11+600 in highway (FONDEN X P: 51): El Guayo Circuit 2nd and 3rd Sections; reconstruction with dirt road and asphalt pavement stabilizer from 0+000 to 3+700, in section (FONDEN X P: 53): Comacalco-Santo Doming-Villa Chichicapa; Reconstruction with coating stabilizer and asphalt paving from 0+000 to 4+000 in section (FONDEN X P: 54): Cuxcuxapa – Nicolas Bravo in the municipality of Comalcalco in the state og Tabasco, contractor – GROUP 1 CONSISTING OF: GMC, S.A., PROSYCCA, S.A., and JORAMO CONSTRUCTORA, S.A: de C:v:, 67,900 sq. meters

LO-009000984-N55-2012 (SCT) Reconstruction of dirt roads and asphalt paving, km 0+000 – km 14+120, 14+820 – km 15,+940, km 16+630 to 20+130, km 35+880 to 36+990, km 39+150 to 40+120, km 40+440 – km 40+830, 41+440 to 41+870, 43+060 – km 44+070, 45+330 to 49+800, km 52+310 to 60+070 in section (FONDEN X P: 94): E.C. (Raudales Malpaso Huimanguillo) – Tierra Nueva Section 2 – Francisco Rueda in the municipality of Huimanguillo in the state of Tabasco, Contractor – CONSTRUCTORA SANTANDREU, S.A. DE C.V. 976,500 sq. meters.

LO-009000984-N36-2012 (SCT) Reconstruction with dirt road stabilization, drainage works, and asphalt paving, sections 2+300 to 2+550, 3+100 to 3+300, 3+800 to 4+170, 4+300 to 4+350, 4+400 to 4+450, 4+600 to 5+000, 5+300 to 5+400, 6+800 to 7+000, 7+500 to 7+800, 8+250 to 8+500, 8+750 to 9+000, 9+100 to 9+500, 11+000 to 11+030, 13+900 to 13+970, 14+000 to 24+000, in section (FONDEN IX P: 50): E.C. (Zapatero-Jonuta) – Boca de Rio Chico – San Antonio in the municipality of Jonuta, in the state of Tabasco, contractor – MERODIO CONSTRUCCIONES, S.A. DE C.V., 89,740 sq. meters

56102001-003-11 (JEC) Reconstruction with dirt road stabilization, drainage works, and asphalt paving in section: Nicolas Bravo – La Cuchilla, km 29+300 to km 56+000, length: 56.00 km; goal: 13.30 km; municipality of Balancan, Tabasco. Contractor – CONSORCIO VANLOP, S.A. DE C.V. – 93,100 sq. meters

56102001-004-11 (JEC) Reconstruction with dirt road stabilization. Drainage works and asphalt paving in section: Tamulte de Las Sabanas – Buenavista, ikm 0+000 to km 12+900; length: 12.90 km; goal: 12.90 km; municipality of Centro, Tabasco, contractor – CONSTRUCTORA CARDIE, S.A. DE C.V. 90,300 sq. meters

56102001-006-11 (JEF) Reconstruction with dirt road stabilization, coating, drainage works, and asphalt paving in section: Acachapan and Colmena – Boca de Escoba, km 3+000 to km 4+000 and km 23+000 to km 43+000; length: 49.90 km; goal: 26.00 km; municipality of Centro, Tabasco, contractor – ARMADORA TABASQUEÑA, S.A. DE C.V. – 182,000 sq. meters

56102001-010-11 (JEF) Reconstruction and dirt road stabilization, drainage works, and asphalt paving in section: Jalpa de Mendez-Soyataco-Mecoacan, km 0+000 to 6+000, km 8+000 to 13+000, and km 16+000 to 19+700; length: 20.50 km; goal: 14.70 km; municipality of Jalpa de Mendez, Tabasco, contractor – CONSTRUCTORA VERVILL, S.A. DE C.V. – 102,900 sq. meters.

56102001-014-11 (JEC) Reconstruction with dirt road stabilization, coating, and asphalt paving in section: E.C. (Vhsa – Escarcega) – Boca de Aztlan, km 6+595 to 6+850, km 6+909 to 7+070, km 7+102 to 7+210, km 9+300 to 25+000, and km 26+000 to 32+300; length: 32.30 km; goal: 22.52 km; municipality of Centro, Tabasco – 157,640 sq. meters

56102001-017-11 (JEC) Reconstruction with dirt road stabilization, drainage works, and asphalt paving in section: Tenosique-La Palma, km 0+700 to 1+000, km 1+100 to 1+701, km 2+900 to 3+000, km 9+236 to 9+550, km 10+000 to 10+240, km 10+700 to 10+800, km 11+410 to 11+600, km 12+510 to 12+780, km 13+262 to 13+300, km 13+400 to 13+480, km 13+913 to 14+520, km 14+600 to 15+250, km 15+450 to 15+540, km 16+700 to 17+300, and km 17+500 to 32+600; length: 32.60 km; goal 19.28 km; municipality of Tenosique, Tabasco-134,960 sq. meters

56102001-022-11 (JEC) Reconstruction with dirt road stabilization, drainage works, and asphalt paving in section: Tenosique - La Palma, km 0+700 to 1+000, km 1+100 to 1+701, km 2+900 to 3+000, km 9+236 to 9+550, km 10+000 to 10+240, km 10+700 to 10+800, km 11+410 to 11+600, km 12+510 to 12+780, km 13+262 to 13+300, km 13+400 to 13+480, km 13+913 to 14+520, km 14+600 to 15+250, km 15+450 to 15+540, km 16+700 to 17+300, and km 17+500 to 32+600; length: 32.60 km; goal: 19.28 km; municipality of Tenosique, Tabasco, contractor – CONSTRUCCIONES Y EMULSIONES DEL SURESTE - 134,960 sq. meters

56102001-023-11 (JEC) Reconstruction with dirt road stabilization, drainage works, coating and paving in section: E.C. (Emiliano Zapata-Tenosique)-Boca del Cerro-La Isla-El Recreo-Chaculji, km 3+200 to 10+050, km 10+300 to 10+400, and km 11+100 to 28+400; length: 28.40 km; goal: 24.25 km; municipality of Tenosique, Tabasco, contractor – CONSTRUCTORA Y ARRENDADORA KALDA, S.A. DE C.V. - 169,750 sq. meters

56102001-031-11 (JEC) Reconstruction with dirt road stabilization, coating, drainage works, and asphalt paving in section: Miraflores-Ismate-Los Piches, km 1+400 to 1+466,km 1+600 to 1+700,km 2+300 to 2+396,km 4+400 to 4+700,km 5+335 to 5+400,km 5+600 to 5+700,km 6+500 to 6+600,km 7+143 to 7+200,km 7+300 to 7+326,km 7+500 to 7+545,km 8+100 to 8+178,km 8+300 to 8+478,km 9+000 to 9+700,km 9+900 to 10+400,km 10+550 to 10+800,km 11+000 to 11+150,km 11+850 to 12+650,km 12+800 to 13+300,km 13+450 to 13+550,km 14+200 to 14+300,km 14+400 to 14+700,km 14+850 to 15+150,km 15+500 to 15+800,km 16+000 to 16+350,km 17+800 to 18+000,km 18+300 to 18+800,km 19+150 to 19+250,km 19+600 to 19+950,km 20+750 to 20+950,km 21+200 to 21+400,km 21+500 to 21+700,km 22+100 to 22+300, and 22+400 to 30+700; length: 30.70 km; goal: 15.81 km; municipality of Centro, Tabasco, contractor – MONTECRISTO CONSTRUCCIÓN, S.A. DE C.V. - 110,670 sq. meters

56102001-032-11 (JEC) Reconstruction with dirt road stabilization and asphalt paving in section: E.C. (Chable-El Triunfo)-colonia Hulería km 0+000 to 1+800, km 2+500 to 2+900, km 3+700 to 3+950, km 4+400 to 5+700, km 6+700 to 7+450, and km 9+400 to 10+800; length: 13.69 km; goal: 5.90 km; municipality of Balancán, Tabasco, contractor – GRUPO INDUSTRIAL MERODIO, S.A. DE C.V. - 110,670 sq. meters

56102001-034-11 (JEC) Reconstruction with dirt road stabilization and coating for section: Chable-Bajo Amatitan, section: Las Vegas-Bajo Amatitan km 5+000 to 6+500, km 6+600 to 9+000, and km 11+000 to 32+100; length: 46.60 km; goal: 25.00 km; municipality of Jonuta, Tabasco, contractor – TABASCO CASA, S.A. DE C.V. - 175,000 sq. meters

56102001-035-11 (JEC) Reconstruction with dirt road stabilization, drainage works, and asphalt paving in section: Provincia-San Pedro km 0+123 to 15+660; length: 16.00 km, goal: 15.54 km, municipality of Balancán, Tabasco, contractor – CM DEL GOLFO, S.A. DE C.V. - 108,780 sq. meters

56102001-036-11 (JEC) Reconstruction with dirt road stabilization and asphalt paving in section: Vicente Guerrero-Jahuactal km 0+000 to 4+000, and km 7+500 to 14+100; length: 14.68 km, goal: 10.60 km, municipality of Balancán, Tabasco, contractor – HANFAT CONSTRUCCIONES, S.A. DE C.V. - 74,200 sq. meters

56102001-060-11 (JEC) Reconstruction with dirt road stabilization, drainage works, and coating for section: (Emiliano Zapata-Tenosique)-Gregorio Mendez-Reforma-Chacamax, kilómetro 0+000 to 11+200; length: 11.20 km; goal: 11.20 km; municipality of Emiliano Zapata, Tabasco, Contratista – CARLOS JORGE SANCHEZ PANADERO VILLANUEVA -
78,400 sq. meters

LO-009000999-N200-2011 (SCT) Construction of a new, 12.00 crown-width body through the development of dirt roads, drainage works, paving, complementary works, induced works, structures, vertical signals, and horizontal signals for the highway: Ciudad Valles-Tampico, section: Tamuin Freeway, subsection; km 5+000 to 10+640, with 5.64 km in length, including

2 junctions and one Bridge, in the State of San Luis Potosí, contractor – GAMI INGENIERIA E INSTALACIONES, S.A. DE C.V. (GRUPO INDI) - 594,000 sq. meters

56102001-005-10 (JEC) Reconstruction in isolated sections of dirt roads, coating, asphalt paving, and horizontal signs from km 0+000 to 16+000 in section: W-58 between N-0 and N-16 (Plan Chontalpa); length: 16.00 km; goal: 9.39 km; municipality of Cárdenas, Tabasco - 65,730 sq. meters

56102001-021-10 (JEC) Reconstruction of dirt roads, asphalt paving in isolated sections, drainage works, and horizontal signs, from km 0+000 to 54+000 in section: Ignacio Gutiérrez Gómez - Ogarrio; Length: 54.00 km; Goal: 14.00 km; Municipality of Huimanguillo, Tabasco - 98,000 sq. meters

00009039-016-10 (JEC) Modernization through paving with asphalt mixture in facility and pre-mixed cold seal in section: Camino a Palankan (Chable-Balancan): Section to be modernized: km 0+000 to km 23+000, Length 23.0 km in the municipality of Balancán, Tabasco - 161,000 sq. meters

00009039-019-10 (JEC) Modernization through paving with asphalt mixture in facility and pre-mixed cold seal in section: Zapatero-Jonuta (Reconstrucción), section to be modernized, from km 0+000 to km 40+000 (10.0 km in isolated sections), Length 10.0 km in the municipality of Jonuta, Tabasco - 70.000 sq. meters

00009039-027-10 (JEC) Construction of dirt roads, drainage works, structures, paving with asphalt concrete layer, complementary works, and signs in the expansion from 10.00 to 21.00 meters crown width, in highway: Raudales de Malpaso-El Bellote, section: Cardenas-Huimanguillo, subsection: km 95+000 to 99+600, in the state of Tabasco - 96,600 sq. meters

56102001-005-09 (JEC) Reconstruction and dirt road stabilization; section: Fco. J. Santa Marií-Federico Alvarez, tramo: Pitahaya-Federico Alvarez Bridge; sections: km 0+000 to 0+060, km 0+490 to 0+720, km 0+830 to 0+940, km 1+660 to 1+790, km 2+450 to 3+080, km 3+200 to 4+150, km 4+170 to 4+210, km 5+140 to 5+300, km 5+410 to 5+590, km 6+700 to 6+880, km 9+100 to 10+370; goal: 4.04 km; municipality of Jonuta, Tabasco 28,280 sq. meters

56102001-012-09 (JEC), Reconstruction and stabilization of dirt roads, asphalt paving, drainage works, and horizontal signs, section: E.W. 0-Chamizal, section 20+000 to 28+300 and km 40+500 to 60+000, goal: 23.70 km, municipality of Balancán Tabasco - 165,900 sq. meters

56102001-018-09 (JEC) Reconstruction and stabilization of dirt roads, paving, and horizontal signals; section: Zapatero-Jonuta, sections: km 21+00 to 24+000, km 28+000 to 29+500, km 31+500 to 33+000, and 45+000 to 46+000; goal: 7.00 km; municipality of Jonuta, Tabasco - 49,000 sq. meters

Completed works – 2010

56102001-005-10 (JEC) Reconstruction in isolated sections of dirt roads, coating, asphalt paving, and horizontal signs from km 0+000 to 16+000 in section: W-58 between N-0 and N-16 (Plan Chontalpa); length: 16.00 km; goal: 9.39 km; municipality of Cárdenas, Tabasco - 65,730 sq. meters

56102001-021-10 (JEC) Reconstruction of dirt roads, asphalt paving in isolated sections, drainage works, and horizontal signs, from km 0+000 to 54+000 in section: Ignacio Gutiérrez Gómez - Ogarrio; Length: 54.00 km; Goal: 14.00 km; Municipality of Huimanguillo, Tabasco - 98,000 sq. meters

00009039-016-10 (JEC) Modernization through paving with asphalt mixture in facility and pre-mixed cold seal in section: Camino a Palankan (Chable-Balancan): Section to be modernized: km 0+000 to km 23+000, Length 23.0 km in the municipality of Balancán, Tabasco - 161,000 sq. meters

00009039-019-10 (JEC) Modernization through paving with asphalt mixture in facility and pre-mixed cold seal in section: Zapatero-Jonuta (Reconstrucción), section to be modernized, from km 0+000 to km 40+000 (10.0 km in isolated sections), Length 10.0 km in the municipality of Jonuta, Tabasco - 70.000 sq. meters

00009039-027-10 (JEC) Construction of dirt roads, drainage works, structures, paving with asphalt concrete layer, complementary works, and signs in the expansion from 10.00 to 21.00 meters crown width, in highway: Raudales de Malpaso-El Bellote, section: Cardenas-Huimanguillo, subsection: km 95+000 to 99+600, in the state of Tabasco - 96,600 sq. meters

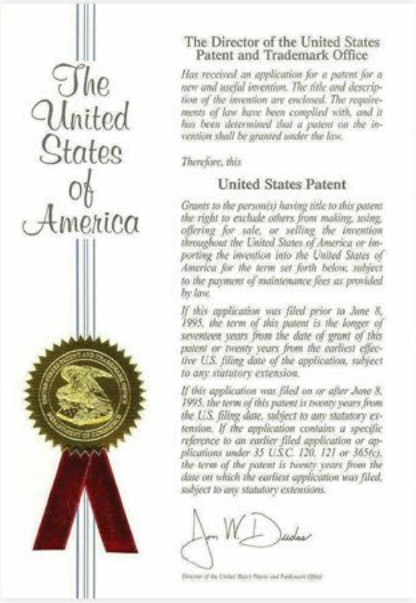
Completed works – 2009

56102001-005-09 (JEC) Reconstruction and dirt road stabilization; section: Fco. J. Santa Marií-Federico Alvarez, tramo: Pitahaya-Federico Alvarez Bridge; sections: km 0+000 to 0+060, km 0+490 to 0+720, km 0+830 to 0+940, km 1+660 to 1+790, km 2+450 to 3+080, km 3+200 to 4+150, km 4+170 to 4+210, km 5+140 to 5+300, km 5+410 to 5+590, km 6+700 to 6+880, km 9+100 to 10+370; goal: 4.04 km; municipality of Jonuta, Tabasco 28,280 sq. meters

56102001-012-09 (JEC), Reconstruction and stabilization of dirt roads, asphalt paving, drainage works, and horizontal signs, section: E.W. 0-Chamizal, section 20+000 to 28+300 and km 40+500 to 60+000, goal: 23.70 km, municipality of Balancán Tabasco - 165,900 sq. meters

56102001-018-09 (JEC) Reconstruction and stabilization of dirt roads, paving, and horizontal signals; section: Zapatero-Jonuta, sections: km 21+00 to 24+000, km 28+000 to 29+500, km 31+500 to 33+000, and 45+000 to 46+000; goal: 7.00 km; municipality of Jonuta, Tabasco - 49,000 sq. meters

CERTIFICATIONS



The United States of America

The Director of the United States Patent and Trademark Office

Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America for the term set forth below, subject to the payment of maintenance fees as provided by law.

If this application was filed prior to June 8, 1995, the term of this patent is the longer of seventeen years from the date of grant of this patent or twenty years from the earliest effective U.S. filing date of the application, subject to any statutory extension.

If this application was filed on or after June 8, 1995, the term of this patent is twenty years from the U.S. filing date, subject to any statutory extension. If the application contains a specific reference to an earlier filed application or applications under 35 U.S.C. 120, 121 or 365(c), the term of the patent is twenty years from the date on which the earliest application was filed, subject to any statutory extensions.

ФЕДЕРАЛЬНАЯ СЛУЖБА ПО НАДЗОРУ В СФЕРЕ ЗАЩИТЫ ПРАВ ПОТРЕБИТЕЛЕЙ И БЛАГОПОЛУЧИЯ ЧЕЛОВЕКА
УПРАВЛЕНИЕ ФЕДЕРАЛЬНОЙ СЛУЖБЫ ПО НАДЗОРУ В СФЕРЕ ЗАЩИТЫ ПРАВ ПОТРЕБИТЕЛЕЙ И БЛАГОПОЛУЧИЯ ЧЕЛОВЕКА ПО ГОРОДУ МОСКВЕ

САНИТАРНО-ЭПИДЕМИОЛОГИЧЕСКОЕ ЗАКЛЮЧЕНИЕ

№ 77.01.03.249.П.003212.01.10 от 25.01.2010

СИСТЕМА СЕРТИФИКАЦИИ ГОСТ Р
ГОССТАНДАРТ РОССИИ

СЕРТИФИКАТ СООТВЕТСТВИЯ

№ РОСС NL.МШ07.Н00621

Срок действия с 26.01.2010 по 25.01.2013

0893103

ОРГАН ПО СЕРТИФИКАЦИИ рег. № РОСС RU.0001.11МШ07
ПРОДУКЦИИ ООО "СЕРТ-ТЕСТ"
РФ, 109044, г. Москва, ул. 1-я Дубровская, д.1, корп.2, тел. (495) 626-21-67, факс (495) 626-21-67

ПРОДУКЦИЯ Строительный материал т. м. «RoadCem»
Серийный выпуск

код ОК 005 (ОКП): 57 4400

СООТВЕТСТВУЕТ ТРЕБОВАНИЯМ НОРМАТИВНЫХ ДОКУМЕНТОВ
ГОСТ 23558-94

код ТН ВЭД: 3824 40 000 0

ИЗГОТОВИТЕЛЬ «PowerCem Technologies B.V.»
Plaza 24, 4782 SK Moerdijk, The Netherlands, Нидерланды

СЕРТИФИКАТ ВЫДАН «PowerCem Technologies B.V.»
Plaza 24, 4782 SK Moerdijk, The Netherlands, Нидерланды

НА ОСНОВАНИИ протокола сертификационных испытаний №09815/сф от 20.01.2010 г. Испытательного Центра Сертико-Полимерного филиала ФГУ «Московский ЦСМ», рег. № РОСС RU.0001.21АА22; санитарно-эпидемиологического заключения № 77.01.03.249.П.003312.01.10 от 25.01.2010 г., выданного Управлением Федеральной службы по надзору в сфере защиты прав потребителей и благополучия человека по городу Москве

ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ Место нанесения знака соответствия: знак соответствия по ГОСТ Р 51450-02 наносится на корпус изделия и/или в эксплуатационную документацию
Схема сертификации 3.

М.П. Руководитель органа Политова Т.И.
Эксперт Лукьянов А.Н.

- **Clinton Initiative**
- **Kyoto Protocol**
- **UNESCO**
- **Mexican Transport Institute**
- **Ministry of Communications and Transport**
- **ISO (9002 y 1401)**
- **TU Delf University (Netherlands)**
- **San Carlos University (Guatemala)**
- **Antioquia University (Colombia)**
- **Witwatersrand University (Johannesburg)**
- **Radboud University Nijmegen (Netherlands)**
- **Arcadis – Infrastructure Environment in Buildings (Massachusetts)**
- **Royal Technology Institute (Sweden)**
- **Kuwait Defense Ministry**
- **AGREMENT SOUTH AFRICA**
- **KIWA · EC-FPC Certificate**
- **Federal Oversight Service (Moscow, Russia)**
- **KOAC · NPC**


Jilotepec – Aculco Highway, Estado de Mexico, Mexico
“ Innovations for better solutions ”

We wish to thank all the company staff, as well as Mr. Robin de la Roij (PowerCem Technologies Netherlands) for their collaboration and support in the development of this project

PowerCem Magazine
Year 1 - 2016

Rolando Montero C.
CEO PowerCem México

Arni Montemayor P.
Directorship General

Cuauhtémoc Montero C.
Rauf Slim Montero
Directorship Editorial

Jesús del Castillo Vélez,
Ernesto Orozco Escoto
Agustín Rodríguez G.
Rodrigo Sánchez Dagnino
Information and Technical Research

Lilia Rodríguez M.
Style Correction

Marysa Casillas S.
Luis Rubén Padilla M.
Marketing

Sergio Mendoza H.
Graphic Design

info@powercem.com.mx www.powercem.com.mx PowerCem México @PowerCemMx