www.cemex.com

THE LEADING **CONCRETE** PAVEMENT PROVIDER **IN THE WORLD**

CEMEX

Alberto Motta Highway, PANAMA
CEMEX Conventional Concrete

As the world's largest producer of ready-mix concrete we have unrivalled expertise in cement-based pavement solutions.

WE ARE CEMEX

WE ARE a global solutions and material provider for the construction industry. Our strong expertise in pavement projects, our comprehensive commercial offer, and the intrinsic advantages of our materials make us a global leader in pavement solutions.

OUR WORLD RANKINGS

#1
CONCRETE

1,900
ready-mix concrete facilities

#3
AGGREGATES

476
aggregates quarries [sand and gravel]

#4
CEMENT

57
cement plants

From 2010 CEMEX has built more than 33 million square meters of pavements. This is equivalent of a 5,000 km two-lane road.

Alberto Motta Highway, PANAMA – CEMEX Conventional Concrete

CEMEX

WE ARE THE LEADING CONCRETE PAVEMENT PROVIDER IN THE WORLD

OUR IMPRESSIVE GROWTH IN PAVEMENT PROJECTS

	OPERATING COUNTRIES	# OF PROJECTS	MLN SQUARE METERS**
2010	3	153	7.9
2011	7	188	8.0
2012	7	315	8.3
2013*	15	400	9.5
CUMULATIVE		**1,056**	**33.7**

AFTER THE establishment of a first infrastructure project division in Mexico in 1992 our pavement-related activities have expanded over time and seen explosive growth in the last two years.

* Forecast

**:1 mln square meters is the equivalent of 150 km of a two-lane highway

When it comes to safety, durability, and environmental impact, CEMEX's concrete paving is the best choice for street paving and construction.

WE PROVIDE CONCRETE PAVEMENT SOLUTIONS WHICH HAVE SIGNIFICANT ADVANTAGES AGAINST ASPHALT

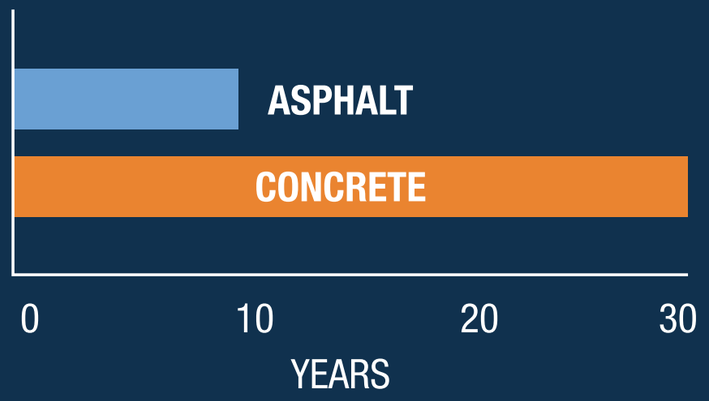
- ✓ *Superior Durability at Minimum Maintenance*
- ✓ *Significantly Lower Cost Over the Full Life Cycle*
- ✓ *Reduced Heat Island Effect*
- ✓ *Reduced Vehicle Fuel Consumption*

Concrete's superior durability ensures minimum maintenance costs.

CONCRETE vs. ASPHALT
DURABILITY

The superior durability of concrete over asphalt ensures low and predictable maintenance costs.
This is the main reason why there are more than 80,000 km of concrete highways in the US and almost 4,000 km of concrete autobahn in Germany.

TIME TO FIRST REHABILITATION (Highways, indicative)



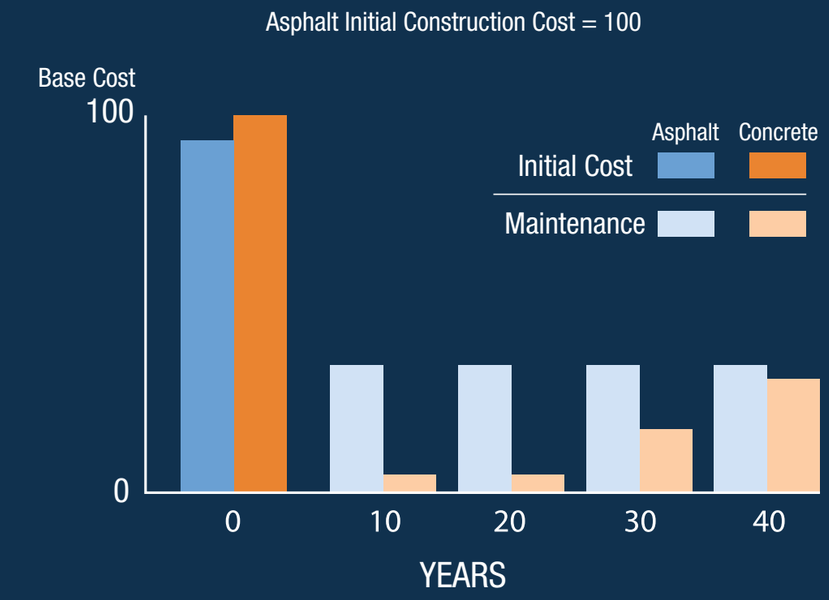
Concrete roads can be designed for 50 years or more, and they last around three times longer than asphalt roads before a first major rehabilitation is required.

The durability of concrete makes it the smarter choice.

CONCRETE vs. ASPHALT
LIFE-CYCLE COST

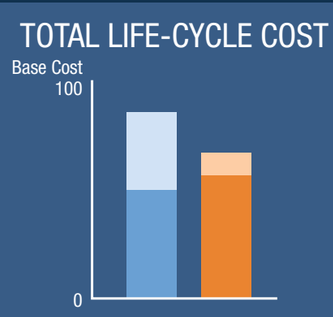
Including the full life cycle of the project, concrete has significant lower total cost versus asphalt despite its slightly higher initial cost.

SCHEMATIC COMPARISON OF INITIAL AND MAINTENANCE COST[1]



[1] Excluding minor repair of asphalt roads between maintenance cycles.

Comparison of total discounted cost over the full life cycle:



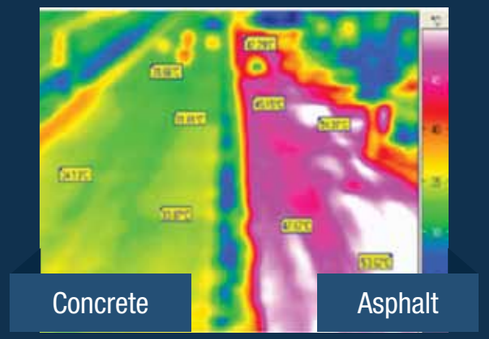
Concrete can be more than 15°C (27°F) colder than asphalt on a warm day.

CONCRETE vs. ASPHALT
HEAT ISLAND EFFECT

Cities are warmer than their surroundings, which in summer leads to discomfort, medical conditions, and higher air conditioning use. Light-colored surfaces such as concrete reduce this so-called Urban Heat Island Effect.

Concrete | Asphalt

Normal (Top) and thermographic (Bottom) pictures of pavements:



Concrete | Asphalt

Average Temperature Concrete: 33°C (92°F)

Average Temperature Asphalt: 49°C (121°F)

Converting a city like Los Angeles from asphalt to concrete would reduce summer temperatures by around 0.6°C (1°F), resulting in annual savings of USD 90 MM for air conditioning energy.

Source: US Environmental Protection Agency: Reducing Urban Heat Islands: Compendium of Strategies – Cool Pavements, www.epa.gov/heatisland/resources/pdf/CoolPavesCompendium.pdf

According to the MIT concrete pavements can reduce fuel consumption by up to 3%.

CONCRETE vs. ASPHALT
FUEL CONSUMPTION

On the rigid surface of a concrete pavement the wheels do not sink in as much as they do on flexible, i.e. asphalt pavements. This effect, called deflection, is invisible to the naked eye, but has a noticeable impact on fuel efficiency.

Rigid Pavement - Concrete

Flexible Pavement - Asphalt

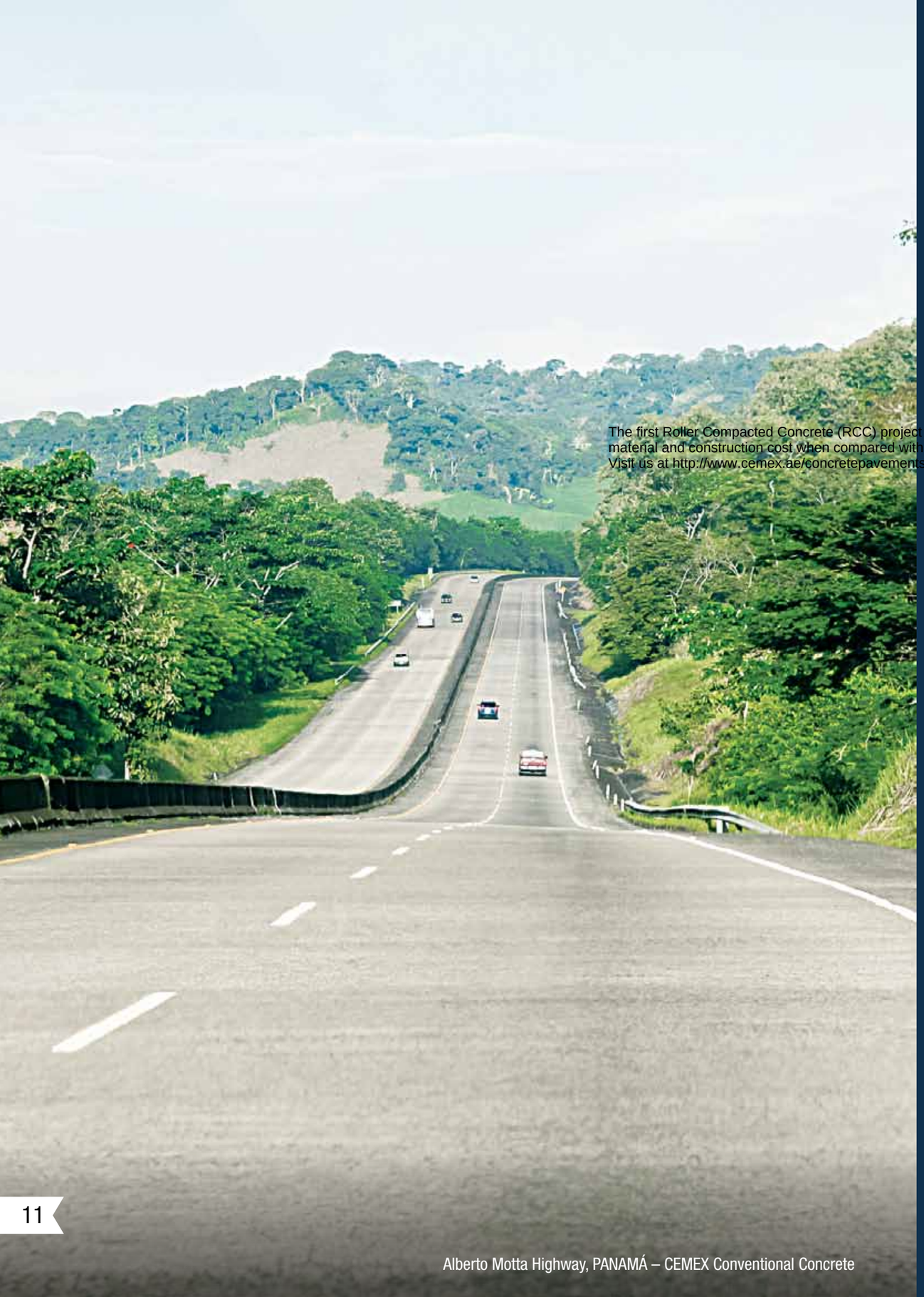
Note: Deflection not to scale

The deflection-induced fuel consumption on asphalt is more than twice as high as that on concrete of same thickness.

A 3% improvement of US fuel consumption would save around 46.5 MMt of CO_2 yearly, the equivalent of a country like Denmark.

3%
Improvement on vehicle fuel consumption

Source: Massachusetts Institute of Technology: "Civil engineers find savings where the rubber meets the road", May 2012, http://web.mit.edu/press/2012/pavement-savings-tires.html



The first Roller Compacted Concrete (RCC) project executed in UAE thru a strategic partnership with a local road contractor. CEMEX UAE was able to deliver significant savings for the client both on material and construction cost when compared with traditional asphalt solutions.
Visit us at http://www.cemex.ae/concretepavements.aspx to find out more.

Alberto Motta Highway, PANAMÁ – CEMEX Conventional Concrete

CEMEX

OUR PAVEMENT SOLUTIONS

CONVENTIONAL CONCRETE PAVEMENT

The classic solution for all applications: durable, low life-cycle costs and flexible design

THIN CONCRETE PAVEMENT

An innovative solution to reduce construction costs for pavements with less traffic

ROLLER COMPACTED CONCRETE

A new solution that combines the durability and strength of concrete with the ease of asphalt paving

CONCRETE OVERLAY/WHITETOPPING

The best rehabilitation for existing pavements

CEMENT TREATED BASE

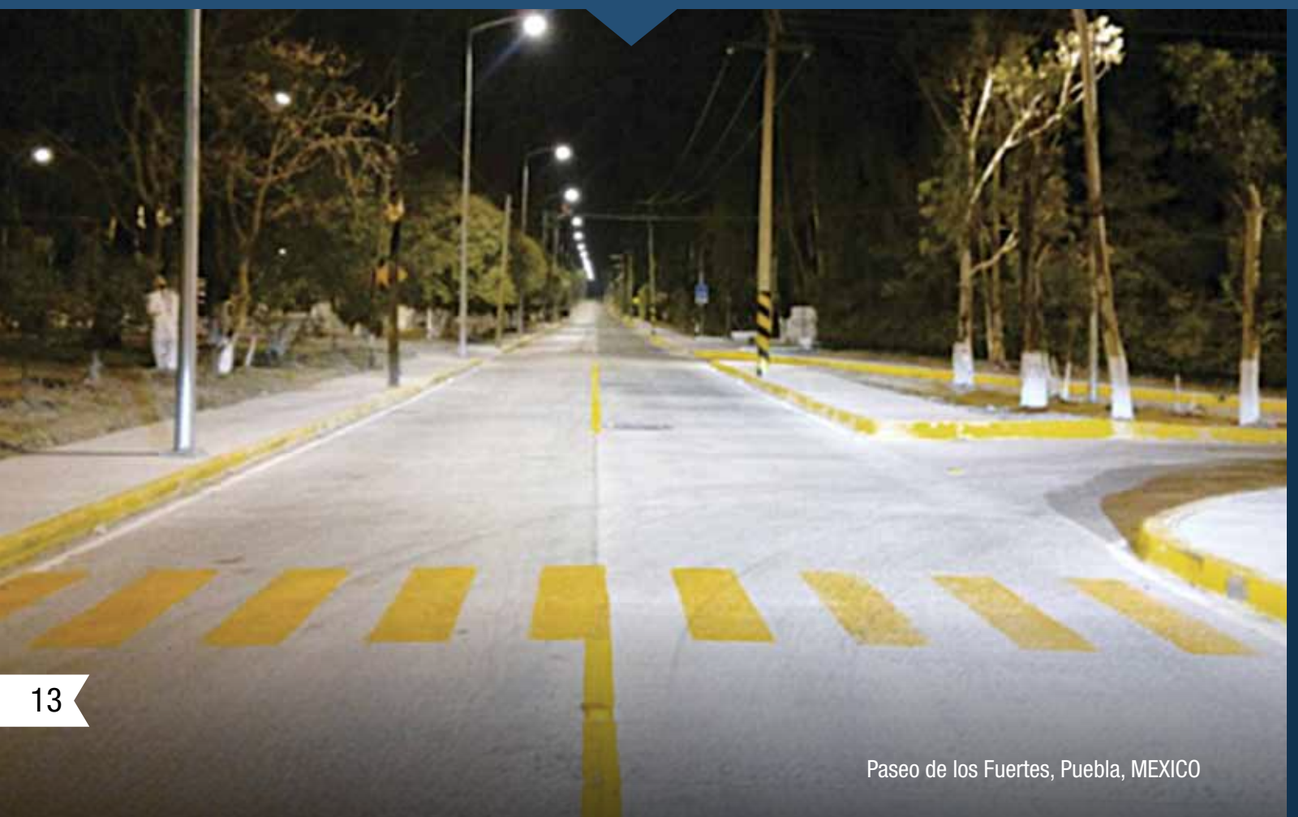
The perfect foundation for every type of pavement

SOIL CEMENT

The absolute low-cost solution for light to medium traffic

Before:
ASPHALT

After:
CONCRETE



Paseo de los Fuertes, Puebla, MEXICO

CONVENTIONAL
CONCRETE PAVEMENT

Rigid pavement with minimum recommended thickness 12 cm based on established design methodologies.

CHARACTERISTICS

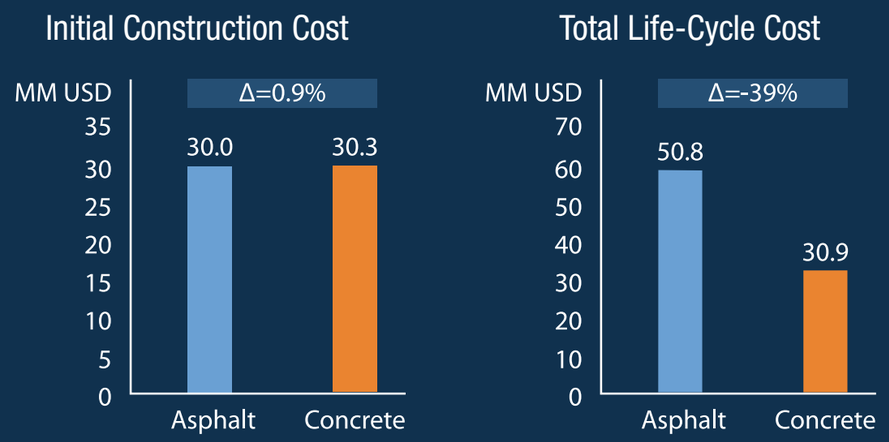
- Superior lifetime
- Excellent surface finish
- Very little maintenance
- Competitive initial cost
- Special solutions[1]

BENEFITS

✓ Reduction of support structure
✓ Low maintenance cost
✓ Optional decorative pavements

Conventional Concrete Pavements offers competitive first cost and substantial life-cycle savings and demands very little maintenance over the full life cycle.

Cost Comparison for 10-mile (16 km) 4-lane Highway Project in Florida



[1] e.g. decorative pavements, low-noise surface, pervious surface

Small Slab size on the Río Blanco – Mulukuku road in NICARAGUA

THIN CONCRETE PAVEMENT

Alternative pavement design with optimized slab thickness due to reduced slab size, particularly suitable for low-traffic pavements.

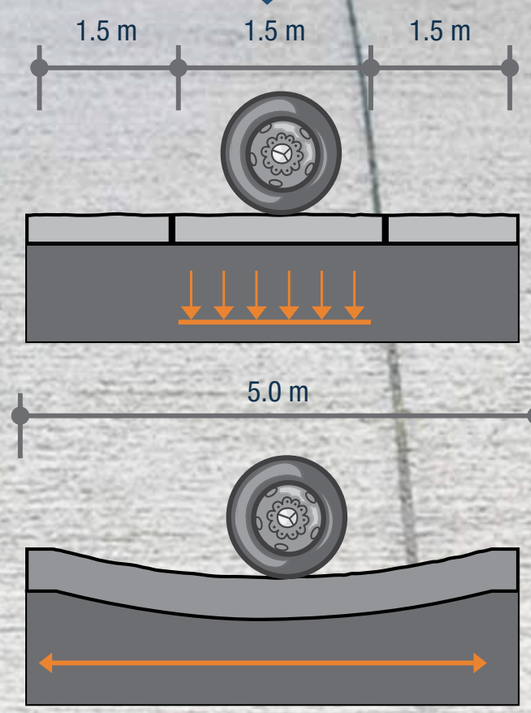
CHARACTERISTICS

- Slabs designed with 1.5 to 3 m joint spacing to minimize flexural stress; allows for thinner slabs
- Successful combination with cement-treated base

BENEFITS

- ✓ Low maintenance cost
- ✓ Up to 20% lower construction cost compared to conventional concrete
- ✓ Less construction materials needed

WHY CAN SHORTER SLABS BE THINNER?

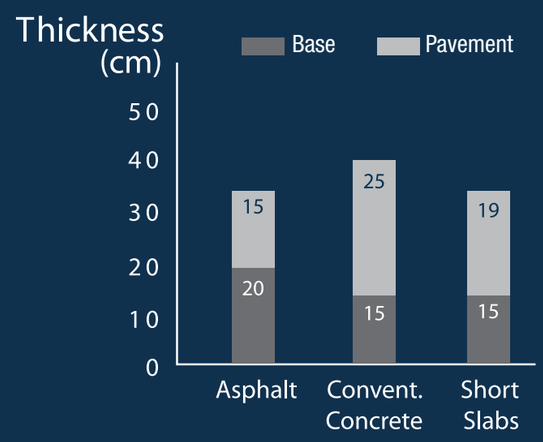


Shorter joints means slabs bend less and deflect more.
Lowers concrete stress

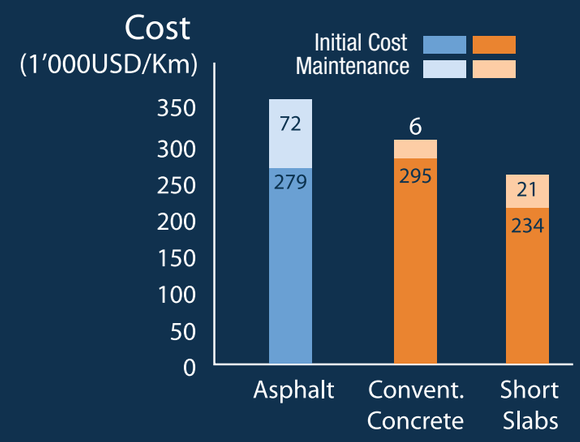
Standard (longer) slabs curl & warp, and bend with loading.
Higher flexural stress

Optimal Thin Concrete Pavement reduces construction costs by 16% and life-cycle cost by 27% compared to conventional asphalt.

Pavement Thickness



Total Life-Cycle Cost



Birmingham Bus Lay-by, UK

Paving with Conventional Paver

Compacting with Drum Roller

Tattershall Access Road, UK

ROLLER COMPACTED CONCRETE

Zero-slump concrete placed with asphalt paver with same design methodology and support structure as conventional concrete.

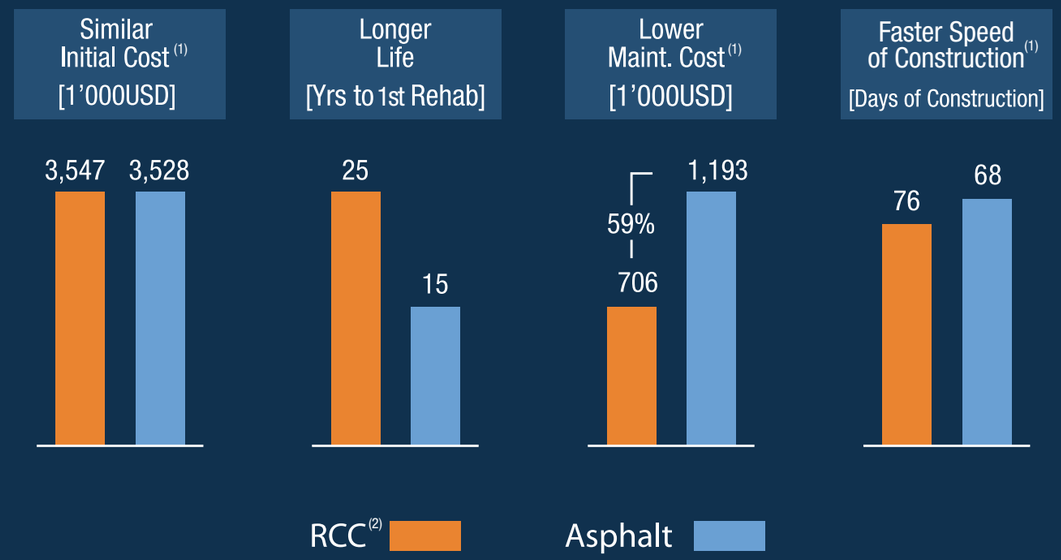
CHARACTERISTICS

- Very innovative solution
- Short construction time
- Surface finish not as smooth as conventional concrete

BENEFITS

✓ Initial cost similar to asphalt or even significant savings for heavy-duty applications
✓ Use of conventional equipment and teams

Roller compacted concrete offers life-cycle cost savings of 10% or more compared to asphalt at similar initial cost.



(1) New construction 6" RCC/8" Stab. SG versus 2" HMAC/10 Gran. Base/8" Stab. SG
(2) Roller Compacted Concrete

Before:
ASPHALT

After:
CONCRETE

Av. 18 de Noviembre, Puebla, MEXICO

CEMEX

CONCRETE OVERLAY WHITETOPPING

Rehabilitation of an existing pavement with a concrete overlay with the purpose to extend the pavement life at least 15 more years.

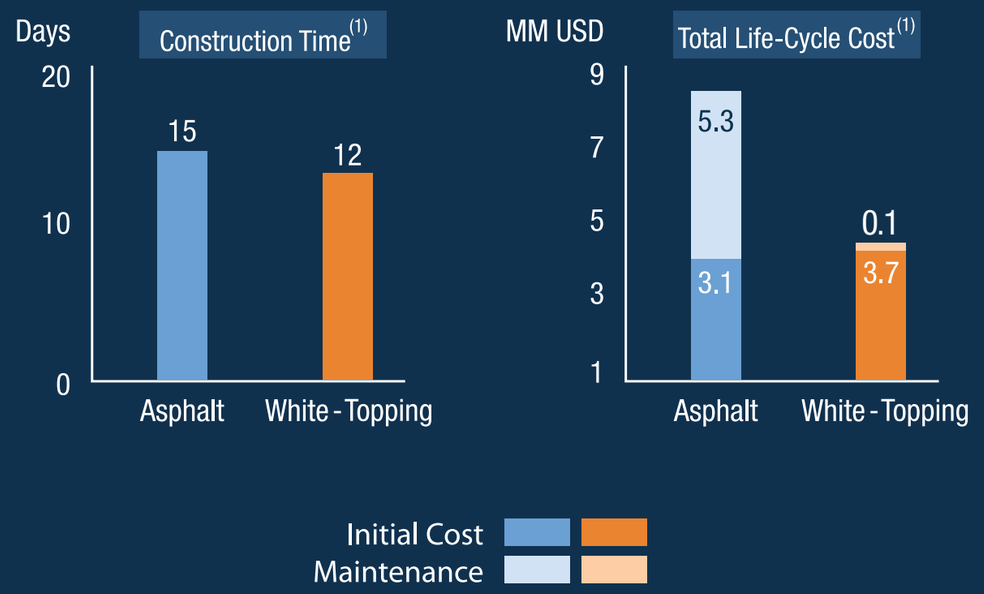
CHARACTERISTICS

- Well established technology
- Can be applied to all kinds of existing roads as long as the base is intact
- Overlay over asphalt requires at least 5 cm (2“) of existing asphalt layer

BENEFITS

✓ Most cost-efficient solution for rehabilitation of roads
✓ Use of existing pavement as base structure
✓ Much faster than complete reconstruction

Whitetopping brings significant life-cycle savings compared to asphalt pavement plus 20% shorter construction time, a crucial advantage for an urban artery.



(1) 4.2 km urban artery, average width 21 m

Full-depth reclamation in Huesca province, SPAIN

CEMENT TREATED BASE

Strong uniform base for current and future loading conditions. Stabilize a variety of soils with a single stabilizer (cement).

CHARACTERISTICS

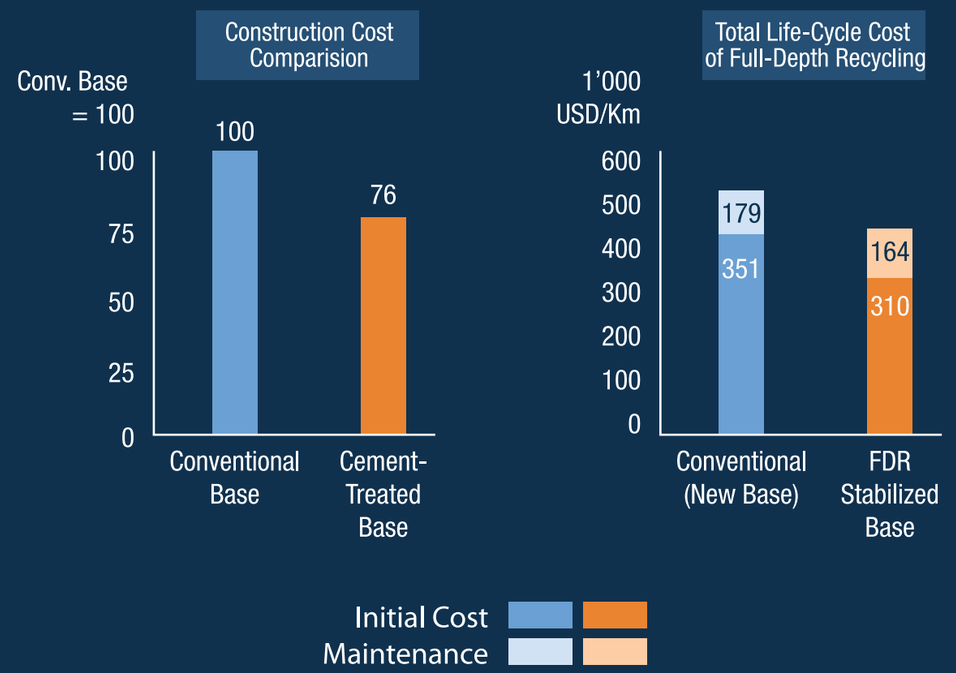
- Well established solution
- Low cement content
- Option to recycle worn out asphalt pavements (Full-depth Reclamation, FDR)

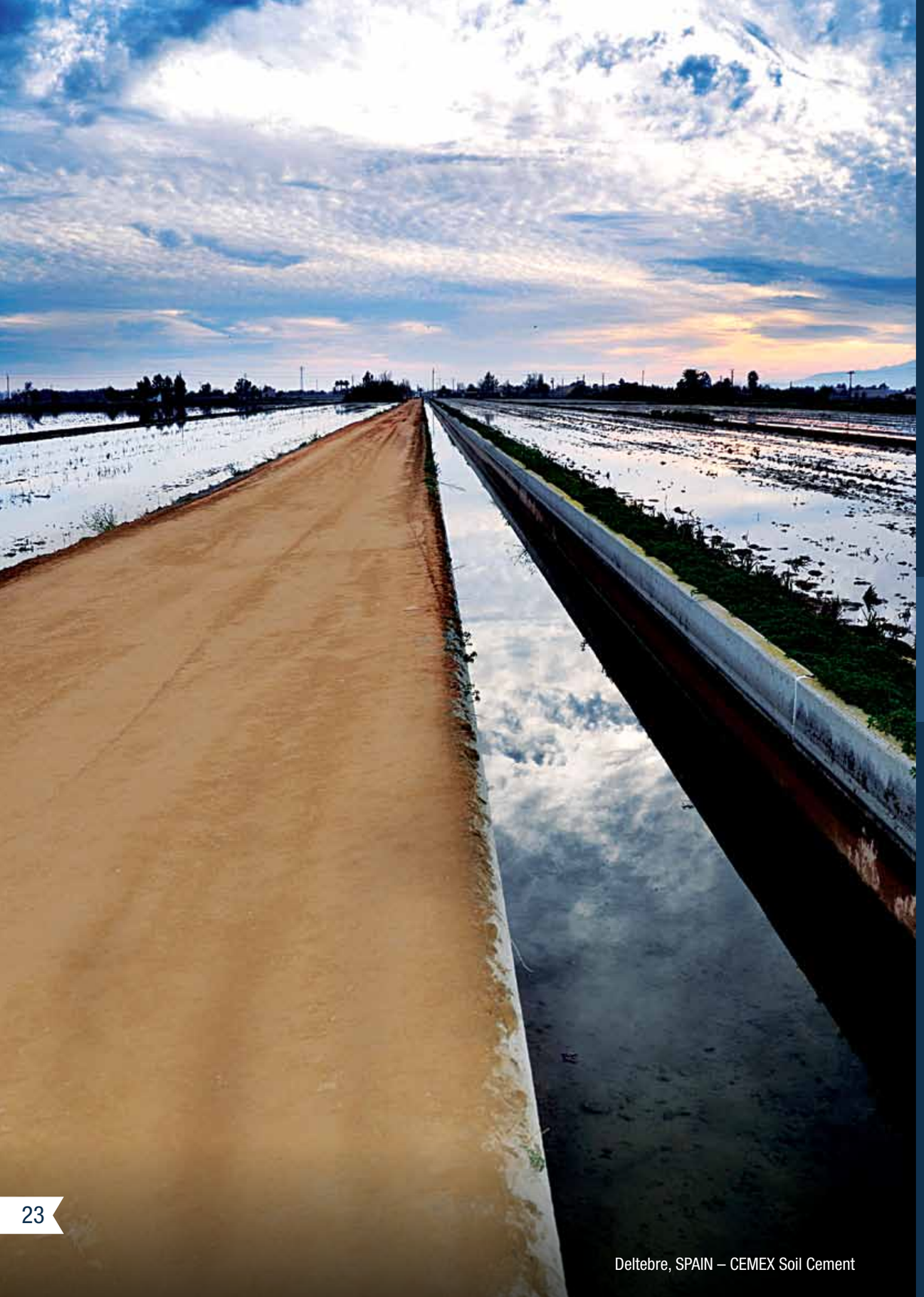
BENEFITS

✓ Reduced thickness of both base and surface course
✓ Cost-effective recycling of existing pavements (FDR)

A cement treated base brings significant savings compared to a conventional alternative.

Full-depth reclamation in Huesca province, SPAIN





Deltebre, SPAIN – CEMEX Soil Cement

SOIL CEMENT

Addition of cement into existing soil for low- to medium-traffic roads. Also provides an excellent base for further upgrades.

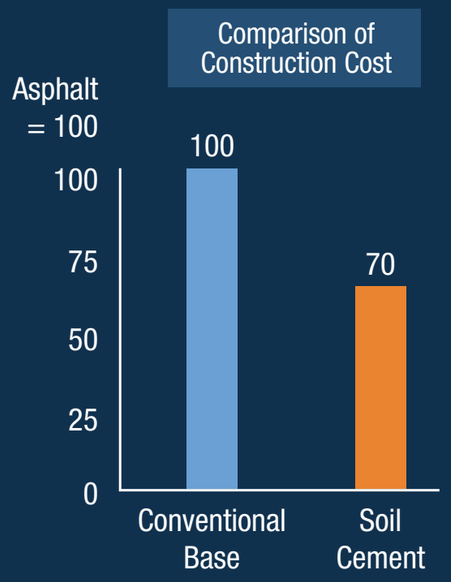
CHARACTERISTICS

- Extended pavement life and reduced base thickness compared to unbound solution
- Reduce soil plasticity index and potential expansion

BENEFITS

✓ Absolute low-cost solution for rural applications
✓ Open to light traffic after 24 hours
✓ Excellent base for later upgrade of top layer

Soil cement is a very cost effective solution for rural roads.

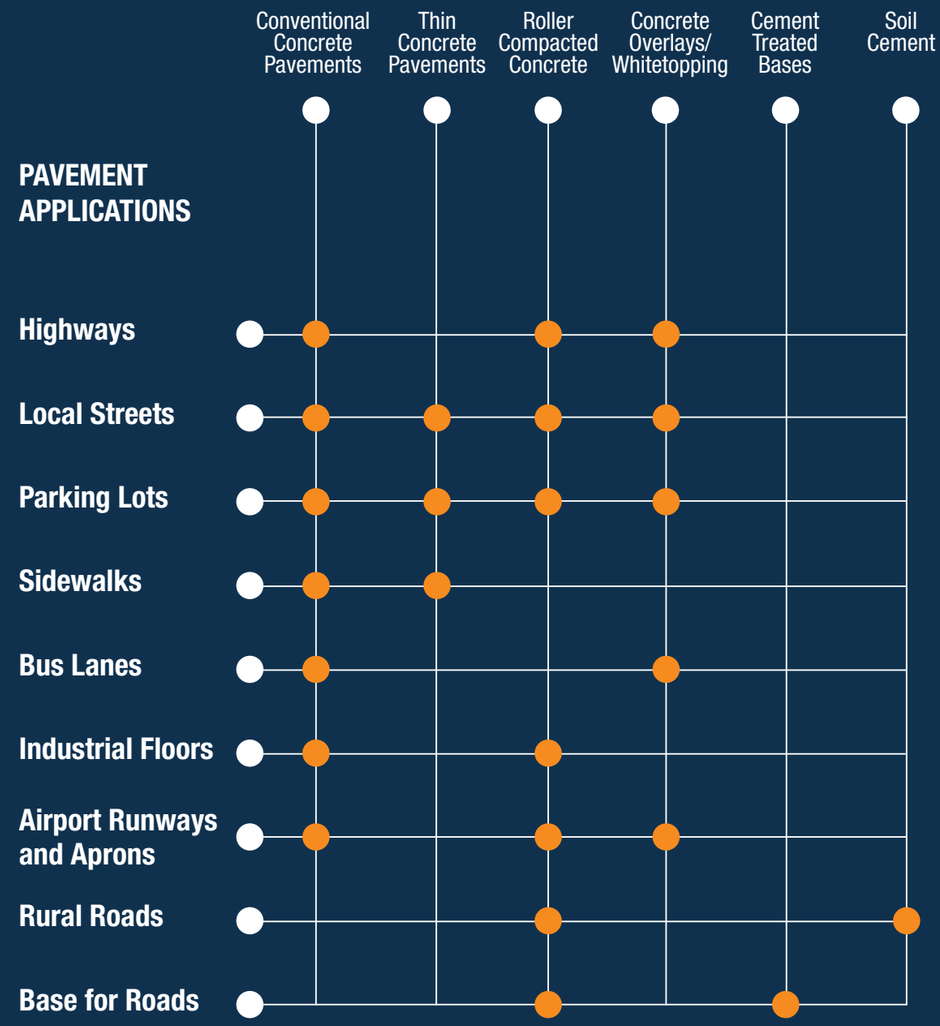


Unicapa is a recent variation of soil cement with higher cement content, extending the applicability of this very cost-efficient solution to more sophisticated applications.

Cali, COLOMBIA – CEMEX Conventional Concrete

OUR SOLUTIONS MATCH ALL PAVEMENT APPLICATIONS

CEMEX PAVEMENT SOLUTIONS



A classical application of concrete pavements; the excellent surface finish, superior durability, and low total cost over the full life cycle make it the material of choice.

Houston, Texas, USA – CEMEX Conventional Concrete

HIGHWAYS

Puebla, MEXICO

This urban highway of 5.3 km was completely reconstructed in **conventional concrete** in order to put an end to the constant maintenance and repair work that the previous asphalt surface required.

Tijuana, MEXICO

Disappointed with the quality of its asphalt-paved road network the city of Tijuana asked CEMEX to rehabilitate more than 160 km of 4-lane highways with **whitetopping**. In addition, CEMEX provided support for the financing of the project under a PPP scheme.

Guadalajara – Colima, MEXICO

A 34.5 km stretch of the highway with a total surface of 528‘000 m^2 was rehabilitated in full-depth reclamation, i.e. **a cement treated base** using the pre-existing asphalt layer as aggregates, resulting in almost 12% savings in cost and around 30% less construction time.

Dortmund – Kassel, GERMANY

This stretch of autobahn built in **conventional concrete** used some 9’000 metric t of CEMEX cement that was not only optimized for pavements but also reduced the carbon footprint of the project by some 2’500 metric t CO_2.

New developments such as roller-compacted concrete or short slabs further enhance concrete's superiority over asphalt. In addition, its versatility allows for different design approaches, enhanced aesthetics.

Av. Usminia, Bogotá, COLOMBIA – CEMEX Conventional Concrete

STREETS, SIDEWALKS, PARKING LOTS

Puebla, MEXICO

A 120'000 m² **whitetopping** project to rehabilitate a worn-out asphalt pavement; apart from the life-cycle cost saving of 54% compared to an asphalt rehabilitation, construction time was cut by 20%.

San Angelo, Texas, USA

The **roller compacted concrete** design for this 12'800 m² project convinced the city engineer: 41% less cost for rehabilitation and maintenance, first major rehabilitation after 25 years, and 10 days less construction time.

Solin, CROATIA

The application of **conventional concrete** with exposed aggregates gives this 1'635 m² parking a distinctive and elegant look while ensuring superior durability.

Cali, COLOMBIA

Another example of decorative **conventional concrete** is this park featuring 9'800 m² of colored concrete, built by CEMEX as a turnkey project with a fixed and guaranteed price per m², effectively eliminating cost risks for the municipality.

Bus lanes particularly profit from the load-bearing capacity that concrete offers; in addition, the low levels of maintenance ensure minimum service interruptions.

Bogotá, COLOMBIA – CEMEX Conventional Concrete

CEMEX

DEDICATED BUS LANES

Puebla, MEXICO (BRT)

40 buses operate on this 18.5 km line built by CEMEX in **conventional concrete**. This kind of Bus Rapid Transit systems offers a performance similar to that of a train line, but with more flexibility and at lower cost.

Bogotá, COLOMBIA

CEMEX supplied the concrete for the city's TransMilenio bus network which is recognized by the United Nations for reducing CO_2 emissions by almost 250'000 t per year.

Mexico City, MEXICO

Line 3 of the Metrobus, built in **conventional concrete**, is a key element of the city's BRT system that improves access to public transport, shortens travel times and reduces CO_2 emissions by 110'000 t per year, the equivalent of taking more than 35'000 vehicles off the road.

Birmingham, UK

Roller compacted concrete was the best solution for this bus lay-by. Apart from the significant savings in both initial cost and maintenance it was particularly the short construction time of 2 days that convinced the city officials.

Industrial pavements often have to carry very high loads, which makes concrete the most appropriate solution.

CTCC Warehouse, Mexico City, MEXICO – CEMEX Conventional Concrete

INDUSTRIAL FLOORS

Augsburg, GERMANY

The high racks in this warehouse lead to extreme loads on the pavement. CEMEX helped solve this challenge with the use of fiber-reinforced **conventional concrete** for the 10'000 m^2 floor space.

Washwood Heath, UK

The challenging combination of high loadings and poor soil in this train loading yard asked for 15'000 m^2 of **roller compacted concrete** on a **cement-treated base** – for little more than half the cost of an asphalt-based pavement.

Alexandria, EGYPT

The Savola Sugar Refinery had CEMEX build around 60'000 m^2 of in-plant roads in **conventional concrete**. In light of the heavy trucks the client did not even consider asphalt as an alternative.

Huehuetoca, MEXICO

Casting large surface areas requires special know-how and experience, like in the "CEDI Liverpool" Distribution Center that features 47'000 m^2 of **conventional concrete**.

Concrete with its superior load-bearing capacity, durability, and low life-cycle costs is the best choice for these very sophisticated applications.

La Maiquetia Airport, VENEZUELA – CEMEX Conventional Concrete

CEMEX

AIRPORT
RUNWAYS AND APRONS

Mexico City, MEXICO

The use of a rapidly hardening concrete that was developed by CEMEX allowed the use of the apron just a few hours after the placement of the **conventional concrete** slabs in this recent rehabilitation work at Mexico's largest airport.

Pie de la Cuesta, MEXICO

This air base on the Pacific coast of 70'000 m^2 was particularly challenging due to the poor soil quality. CEMEX solved the problem by designing and building in **conventional concrete** over a **cement-treated base**.

Panama City, PANAMA

In order to prepare for the expected growth Panama City's international airport chose **conventional concrete** as the most durable solution for heavy aircraft and tropical conditions, and contracted CEMEX to pave 163'000 m^2 in a turnkey project.

Victor Peace Airbase, EGYPT

This 50'000 m^2 job is not only notable due to the climatic conditions 30 km west of Cairo, but also because it satisfies the challenging standards of the US Army Corps of Engineers.

Low-cost solutions such as soil cement are the optimal solution for low-volume roads; roads with higher traffic volumes are best served by roller-compacted concrete or short slabs.

San Francisco de Asís, NICARAGUA – CEMEX Soil Cement

RURAL ROADS

Deltebre, SPAIN

Soil cement technology is the effective solution for mud and erosion that enables this road to be used year-round, and at the same time was some 30% cheaper than an equivalent asphalt road.

Cebu, PHILIPPINES

High quality aggregates are scarce in some parts of the country. The durability of cement-based pavements like **conventional concrete** can mitigate this problem and at the same time save money.

Mulukuku, NICARAGUA

Short slabs reduced initial cost by 16% and life-cycle cost by 27% compared to asphalt; based on the success of this project CEMEX has been involved in a dozen of similar projects in this country.

Tattershall, UK

This rural access road of around 3‘200 m^2 was one of the first uses of **roller compacted concrete** in the country. Initial cost was reduced by 15% compared to an asphalt alternative, and maintenance is expected to be negligible.

Bogotá, COLOMBIA
CEMEX Conventional Concrete

WE ALWAYS PROVIDE THE MOST COST-COMPETITIVE SOLUTION FOR EVERY NEED

NEW PAVEMENTS

For all applications such as highways and urban streets.

PAVEMENT REHABILITATION

For all applications such as highways and urban streets.

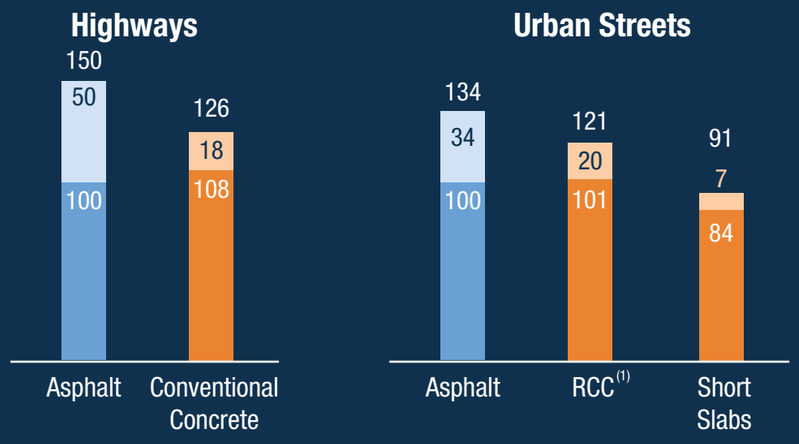
RURAL ROADS

For light to medium traffic.

ROAD BASES

For all applications, particularly for heavy traffic and poor soil conditions.

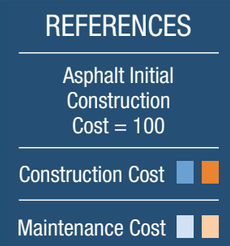
INDICATIVE COST COMPARISON
NEW PAVEMENTS



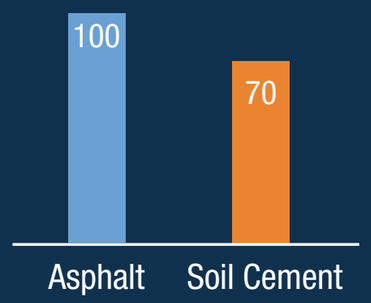
(1) Roller Compacted Concrete

Note: Design life for highways 50 years, for residential roads 40 years (20 years for short slabs)

Concrete is the most economic pavement solution; project-specific characteristics determine which of our solutions is the best.

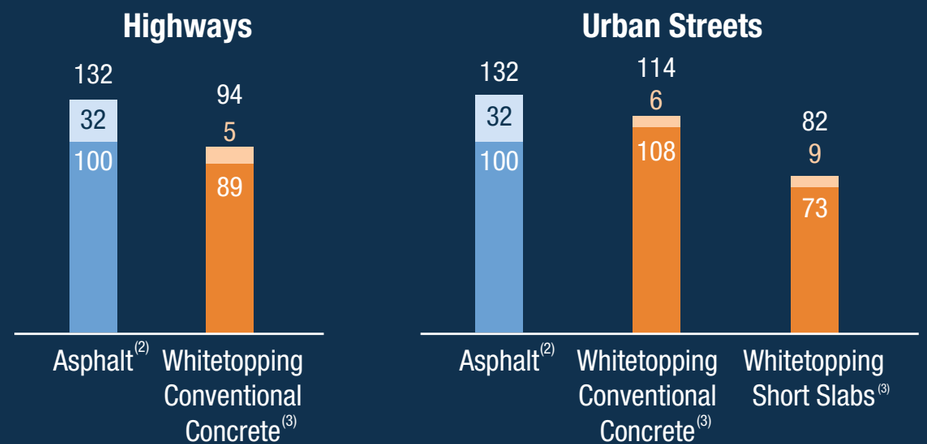


RURAL ROADS



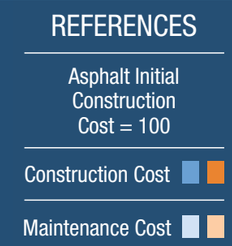
Note: Design life for asphalt and cement-treated base of 15 years and for soil cement of 7 years.

INDICATIVE COST COMPARISON
PAVEMENT REHABILITATION

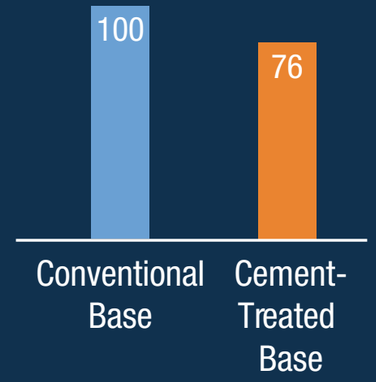


(2) Design life 15 years
(3) Design life 30 years

With solutions such as whitetopping, short slabs, and cement treated base concrete beats asphalt even on initial construction costs.



ROAD BASES
Highways with Different Bases



Note: Design life for asphalt and cement-treated base of 15 years and for soil cement of 7 years.

Mexico City, MEXICO – CEMEX Conventional Concrete

OUR FULL COMMERCIAL OFFER

DESIGN & EVALUATION

- ✓ *Evaluation of existing pavements*
- ✓ *Pavement designs with different technical solutions*
- ✓ *Develop final plan set*
- ✓ *Life-cycle cost analysis*
- ✓ *Life-cycle assessment of environmental impacts*

EXECUTION

- ✓ *Materials (concrete, cement, additives, aggregates)*
- ✓ *Construction: pavements, structure layers, curbs, sidewalks, others*
- ✓ *Maintenance & rehabilitation*
- ✓ *Project supervision, technical training and support*

FINANCIAL SCHEMES

- ✓ *Identify public and private resources opportunities*
- ✓ *Develop financial scenarios*
- ✓ *Potential facilitator of financial schemes: public private partnership, public infrastructure financing, road concession*

WE CREATE

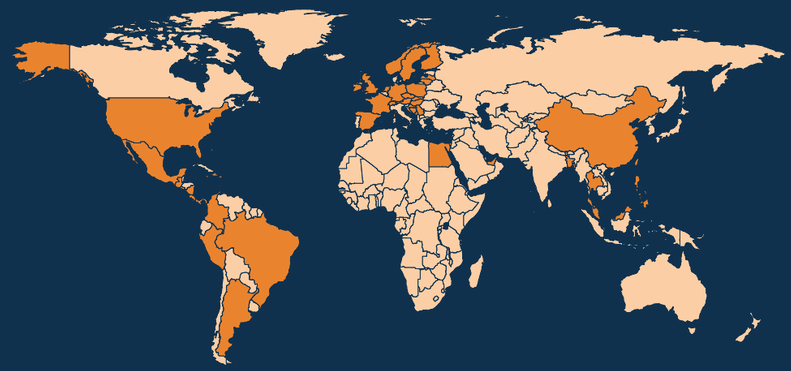
PRODUCTS, SYSTEMS & SOLUTIONS
AT OUR R&D CENTERS
IN **SWITZERLAND** AND **MEXICO**

AND ADAPT THEM TO

OUR CLIENTS' LOCAL
NEEDS & REQUIREMENTS
IN EACH COUNTRY

WE HAVE

UNRIVALLED EXPERIENCE
DELIVERING SYSTEMS AND SOLUTIONS
FOR PAVEMENT PROJECTS
WORLDWIDE



WE HAVE operations in 50 countries throughout 4 continents.

ARGENTINA AUSTRIA BAHAMAS BANGLADESH BARBADOS BERMUDA BOSNIA AND HERZEGOVINA BRAZIL CHINA COLOMBIA COSTA RICA CROATIA CZECH REPUBLIC DOMINICAN REPUBLIC EGYPT EL SALVADOR FINLAND FRANCE GERMANY GUADELOUPE GUATEMALA HAITI HUNGARY IRELAND ISRAEL JAMAICA LATVIA LITHUANIA MALAYSIA MARTINIQUE MEXICO MONTENEGRO NETHERLANDS NICARAGUA NORWAY PANAMA PERU PHILIPPINES POLAND PUERTO RICO SLOVAKIA SPAIN SWEDEN SWITZERLAND TAIWAN THAILAND TRINIDAD AND TOBAGO UNITED ARAB EMIRATES UNITED KINGDOM UNITED STATES