Pavements are an important part of our life; they literally form the basis for most of our economic and social activities. It is therefore crucial to select the most appropriate material for the construction of pavements.

Evidence proves that CONCRETE is the OPTIMAL material. READ ON TO LEARN WHY!
WHY CONCRETE STANDS ABOVE ASPHALT?

ECONOMIC ADVANTAGES
- Durability at minimum maintenance, predictable material prices, savings in operational costs
- Evidence proves CONCRETE PAVEMENTS are the BEST SOLUTION
- Inherent safety features, noise reduction, versatility and aesthetic qualities
- Fuel savings, less emissions and lower surface temperatures

ENVIRONMENTAL ADVANTAGES

SOCIAL ADVANTAGES
CONCRETE VS ASPHALT
ECONOMIC ADVANTAGES

- Higher DURABILITY
- Less MAINTENANCE
- Competitive INITIAL COSTS
- Significantly Lower OPERATING COSTS
- PREDICTABLE PRICES that Move in Line with Inflation
- Lower Cost Over the Full LIFE CYCLE of the Project
Concrete roads offer you a double dip on maintenance: much less frequent maintenance cycles, plus each cycle is normally cheaper. Society will profit as well: Every time you need to repair a pavement you need to close at least one lane, causing traffic congestion, lost time, and an additional danger of accidents.

While asphalt requires regular maintenance and frequent reconstruction, concrete will last for decades with relatively minor repair.

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 superior durability of concrete over asphalt ensures minimum 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.

Concrete pavements can be designed for 50 years or more. Concrete pavements require less traffic interruption.

**DURABILITY**

**CONCRETE ROADS LAST FOR GENERATIONS TO COME**

**MAINTENANCE**

**MINIMUM MAINTENANCE BRINGS MULTIPLE ADVANTAGES**

**TIME TO FIRST REHABILITATION**

*Highways, indicative*

**SCHEMATIC MAINTENANCE SCHEDULES**

While asphalt requires regular maintenance and frequent reconstruction, concrete will last for decades with relatively minor repair.

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The superior durability of concrete over asphalt ensures minimum 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.
Roller compacted concrete (RCC) combines the durability of concrete with a simpler and more cost-efficient construction process.

Modern solutions reduce the thickness of the concrete pavement, offering significant cost savings compared to alternative solutions.

New constructive solutions such as roller compacted concrete, short slabs or soil cement offer additional reduction potential over conventional concrete.

INITIAL COSTS
COMPETITIVE FROM DAY ONE

Increased experience with concrete pavements and modern design methods have brought down the initial cost of concrete to levels comparable to asphalt.
Industrial flooring with fiber-reinforced concrete for high static and
dynamic loads

Waste transfer station with advanced pavement saved the client time
and money

**INITIAL COSTS**

**CONCRETE SOLUTIONS CAN EVEN BE CHEAPER THAN ASPHALT**

Heavy-duty applications such as roads in industrial plants and logistics yards with their high loads and moderate requirements for surface finish can be very cost-efficiently paved with roller compacted concrete.

Rule of thumb: “The more challenging your project, the higher the advantage of concrete pavements in initial cost.”

<table>
<thead>
<tr>
<th>INITIAL COST COMPARISON(^1): RCC(^2) VS ASPHALT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BASELINE</strong></td>
</tr>
<tr>
<td>Asphalt = 100</td>
</tr>
<tr>
<td>Project A</td>
</tr>
<tr>
<td>54</td>
</tr>
</tbody>
</table>

\(^1\) Heavy-Duty Applications
\(^2\) United Kingdom
\(^3\) Roller-Compacted Concrete
Concrete is naturally brighter and more reflective than other pavement surfaces.

Lighting Reflection on Concrete Road

The superb durability of concrete roads does not only lead to significantly lower maintenance costs compared to asphalt, it also ensures minimum interruption of operation, which is a crucial factor particularly for toll roads. In addition, the physical characteristics of concrete result in potential savings in operating costs.

As concrete reflects up to three times more light than asphalt the lighting intensity can be reduced by up to 30% without compromising night vision.

Concrete roads require 30% less light than asphalt roads.

OPERATING COST FOR LIGHTING

BASE LINE
Asphalt = 100

<table>
<thead>
<tr>
<th></th>
<th>Asphalt</th>
<th>Concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASE LINE</td>
<td>100</td>
<td>70</td>
</tr>
</tbody>
</table>
A recent study at the Massachusetts Institute of Technology [MIT] confirms the significant risks related to the volatility and increases in asphalt prices.

The price of asphalt is closely tied to that of international oil prices - it is volatile and rises faster than the overall inflation rate. Concrete, on the other hand, follows local dynamics.

Including the full life cycle of the project, concrete has significantly lower cost versus asphalt despite its slightly higher initial cost.
The Case of Mérida, MEXICO:
55% less maintenance at competitive first cost leads to savings of more than 30% over the full life cycle.

TOTAL COSTS OVER THE FULL LIFE CYCLE
REHABILITATION OF ASPHALT ROAD

BASE COST
Asphalt = 100

Savings
253
174

Asphalt Concrete

31% Savings
153 69

ASPHALT
3 cm Asphalt + 12 cm hydraulic base

CONCRETE
10 cm Concrete over Existing Asphalt

You can integrate concrete easily in an existing asphalt road network. Next time a street is up for a major rehabilitation just choose a concrete overlay and enjoy significant long-term savings!

The Case of Mérida, MEXICO:
55% less maintenance at competitive first cost leads to savings of more than 30% over the full life cycle.
**CONCRETE VS ASPHALT ENVIRONMENTAL ADVANTAGES**

- Reduced Urban **HEAT ISLAND EFFECT**
- Reduced **FUEL CONSUMPTION**
- Lower Environmental Impacts over the **FULL LIFE CYCLE**
- **RECYCLING** to Save Natural Resources
HEAT ISLAND EFFECT

CONCRETE IS A REALLY COOL SOLUTION

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 reflects up to three times more sunlight than asphalt, reducing surface temperature on sunny days by 15°C or more.

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.

The effect of deflection has a noticeable impact on fuel efficiency during the use phase of a road.

Rigid VS Flexible Pavements

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.

A 3% improvement of US fuel consumption would save around 46.5 MMt of CO2 yearly, the equivalent of a country like Denmark.

**FUEL CONSUMPTION**

**CONCRETE PAVEMENTS SAVE ENERGY WHENEVER USED**

According to the Massachusetts Institute of Technology (MIT), concrete pavements can reduce fuel consumption by up to 3%.


Note: Deflection not to scale
Concrete offers significant advantages in a number of impact categories; even in global warming concrete performs better if the effect on the fuel consumption of vehicles is accounted for.

A Life-Cycle Assessment (LCA) analyzes the total environmental impact from cradle to grave, including different dimensions such as global warming, use of non-renewable energy or the Ecological Scarcity indicator.

LCA RESULTS
CONSTRUCTION, MAINTENANCE, DEMOLITION AND IMPACT ON FUEL EFFICIENCY OVER 80 YEARS

- **Global Warming**
  - Asphalt: 100
  - Concrete: 53

- **Non-Renewable Energy**
  - Asphalt: 108
  - Concrete: 32

- **Ecological Scarcity**
  - Asphalt: 69
  - Concrete: 23

Emissions from traffic on a road are up to 100 times larger than those from its construction.

Recycling
ADDITIONAL SAVINGS BEYOND MAINTENANCE

A well-designed concrete pavement can be used as the basis for the road for generations to come. In the case the pavement is demolished the concrete can be recycled and used as a valuable building material.

Some cement-based solutions can recycle worn-out asphalt pavements as part of a new, stabilized base, effectively solving the problem of removal and disposal of a potential waste with high content of hydrocarbons, and reducing other environmental impacts.

CONCRETE VS ASPHALT

SOCIAL ADVANTAGES

- **SAFETY**
- Reduction of **NOISE**
- **VERSATILITY**, a Solution for Every Need
- Variety of Finishes and Colors **[AESTHETICS]**
SAFETY

CONCRETE IS THE ONLY SOLUTION FOR TUNNELS

Fires in tunnels can ignite asphalt. The burning asphalt does not only contribute to the heat, but also to the formation of smoke, and even outside the actual combustion area melting asphalt will make firefighting and evacuation of victims more difficult.

A number of countries like Austria now mandate that all pavements in tunnels be made of concrete.

Concrete does not burn, nor emit toxic gases. This means a significant advantage over asphalt in case of fires, particularly in tunnels.

SAFETY

BETTER ROAD CONTACT IN ALL CONDITIONS

The higher skid resistance of concrete reduces braking distances by 12 - 15% in both dry and wet conditions, compared to new asphalt surfaces.

As concrete surfaces are very stable the advantage versus asphalt increases over time; in addition, as concrete pavements do not rut the risk of hydroplaning is effectively eliminated.

STOPPING DISTANCES CONCRETE VS ASPHALT SURFACES

The noise level of concrete roads can be significantly reduced without sacrificing durability or safety by choosing an adequate surface texture, e.g. broom finish, diamond-ground surface or exposed aggregates.

An Austrian study unveils that concrete pavements offer far better long-term behavior in terms of noise reduction.
ARCHITECTURE & DECOUPLING

VERSATILITY & AESTHETICS

CONCRETE, A MATERIAL FOR EVERY PAVEMENT PROJECT

AIRPORT RUNWAYS & APRONS
A typical application for concrete. Its durability and load-bearing capabilities ensure low life-cycle costs.

INDUSTRIAL FLOORS
Concrete is often the only viable solution for these heavy-duty applications.

Have a look at these examples to see for yourself how versatile concrete is as pavement material.

HIGHWAYS
A classical application for concrete that benefits from the material’s durability.

URBAN ROADS
Apart from the great savings over the full life cycle, concrete pavements offer additional benefits such as safety or a reduced urban heat island effect.

DEDICATED BUS LANES
An application with high loads where the durability of concrete ensures minimum interruption of operation.
VERSATILITY & AESTHETICS
FINISHES AND COLORS FOR A WIDE RANGE OF USES

PARKING LOTS & SIDEWALKS
Concrete is the maintenance-free solution that offers great options for distinctive aesthetics. Whether you want a particular color or a certain surface finish – concrete is the right material for it.

Our Concrete Pavement Solutions match all pavement applications.

RURAL ROADS
Can be built very economically with a number of cement-based solutions such as roller-compacted concrete or soil cement.

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

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

SHORT SLABS 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.
OUR TEAM DELIVERS THE MOST COMPLETE COMMERCIAL OFFER

- Evaluation of existing pavements
- Pavement designs with different technical solutions
- Develop final plan set
- Life-cycle cost analysis
- Life-cycle assessment of environmental impacts
- Materials (concrete, cement, additives, aggregates)
- Construction: Pavements, structure layers, curbs, sidewalks, others
- Maintenance & Rehabilitation
- Project supervision, technical training and support
- Identify public and private resources opportunities
- Develop financial scenarios
- Potential facilitator of financial schemes: public private partnership, public infrastructure financing, road concession
The project, which included not only the rehabilitation of the streets but also the recovery and adaptation of large areas of public space and infrastructure, was built by CEMEX as a Turn-Key project with a fixed and guaranteed price per m², effectively eliminating cost risks for the municipality.

The Metrobus Vallejo Bus Transit Line is expected to avoid 110'000 t of CO₂ emissions per year. CEMEX built the actual pavement and the 32 stations along this new line; confident in the durability of its solution CEMEX also provides maintenance over 10 years. In addition, CEMEX played a key role in structuring the financing of the project.

<table>
<thead>
<tr>
<th>PROJECT NAME</th>
<th>LOCATION</th>
<th>AREA</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metrobus Vallejo</td>
<td>Mexico City, MEXICO</td>
<td>400,000 square meters</td>
<td>Conventional Concrete</td>
</tr>
</tbody>
</table>

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<th>SOLUTION</th>
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</thead>
<tbody>
<tr>
<td>72W Street Longitudinal Park</td>
<td>Cali, COLOMBIA</td>
<td>9,800 square meters</td>
<td>Conventional Concrete, partly Colored</td>
</tr>
</tbody>
</table>
INTEGRAL PROJECTS

PAVEMENT REHABILITATION

This project consisted in the reconstruction of the city’s 160 km of primary urban arteries by placing a layer of concrete over the existing asphalt roads (whitetopping). Apart from the actual construction works CEMEX played also a crucial role in structuring and arranging the financing of this 150 mln USD project, which is one of the largest Public Infrastructure Financing projects in Mexico.

CEMEX’s Turn-Key offer comprises “Design + Materials + Construction”, representing a one-stop-shop solution for the customer. In this particular project it included an extended 5 year warranty which saved the client USD100,000 in annual maintenance.

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<th>SOLUTION</th>
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</thead>
<tbody>
<tr>
<td>Comprehensive Road Rehabilitation</td>
<td>Tijuana, MEXICO</td>
<td>1,900,000 square meters</td>
<td>Whitetopping</td>
</tr>
</tbody>
</table>

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<th>AREA</th>
<th>SOLUTION</th>
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<tbody>
<tr>
<td>Liverpool Distribution Center</td>
<td>Huehuetoca, MEXICO</td>
<td>46,700 square meters</td>
<td>Post-Tensioned Floor System</td>
</tr>
</tbody>
</table>
LET THESE SOLID ARGUMENTS DRIVE YOUR DECISION

CONCRETE PAVEMENTS

- Lower Cost Over the Full LIFE CYCLE of the Project
- Significantly Lower OPERATING COSTS
- Competitive INITIAL COSTS
- PREDICTABLE PRICES that Move in Line with Inflation
- Higher DURABILITY
- Less MAINTENANCE
- Less traffic interruption, nuisances & congestion
- Recycled Content
- Reduced Urban HEAT ISLAND EFFECT
- Reduced FUEL CONSUMPTION
- Chemically INERT MATERIAL
- Reduced light intensity
- Less fuel consumption
- Better Performance During FULL LIFE CYCLE
- 3% less fuel consumption
- Design for 50 years or more
- Low noise level throughout lifetime
- Safety
- Reduction of NOISE
- Higher visibility
- No aquaplaning
- Higher braking distances
- Variety of Finishes and Colors
- AESTHETICS
-กว่า 15 องศาเซลเซียส
- Incombustible
- Wide VERSATILITY

- Pavement can be cooler by 15°C or more
- Less traffic
- Reduced NOISE
- Less maintenance
- Shorter braking distances
- Higher visibility
- No aquaplaning
- Variety of Finishes and Colors
- AESTHETICS
- Incombustible
- Wide VERSATILITY