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PRESENTS

A NEW TECHNOLOGIES FOR CONCRETE PAVEMENTS

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SPWS is managed world wide by **IS.COM**

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SCIENTIFIC PAVEMENT

SEMI CONTINUOUS CONCRETE AND CONCRETE SLAB FOUNDATION SYSTEM

- FASTER
- CHEAPER
- BETTER
- EASIER

SPWS
Scientific Pavement
World Systems

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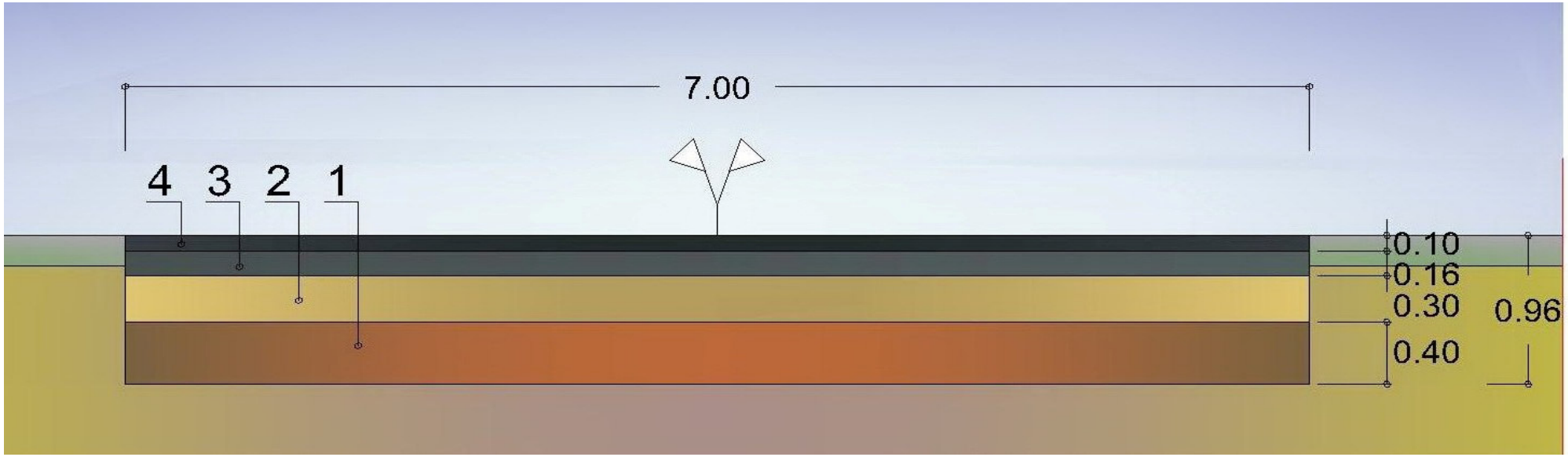
ASPHALT

(as per European Standards)

LAYERS



1 – 40 CM CRUSHER RUN (TOUT VENANT) BASE LAYER
2 – 30 CM GRAVEL AND SAND SUB BASE LAYER
3 – 16 CM BITUMEN LAYER
4 – 10 CM ASPHALT LAYER

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REQUIREMENTS FOR ASPHALT PAVEMENT

- OPEN A BOX OF 96 CM
- TRANSPORT, SPREADING AND COMPACTING OF CRUSHED RUN FOR A 40 CM LAYER
- TRANSPORT, SPREADING AND COMPACTING GRAVEL AND SAND FOR A 30 CM LAYER
- TRANSPORT, SPREDAING AND COMPACTING A 16CM BITUMEN LAYER
- TRANSPORT, SPREADING AND COMPACTING A 10CM ASPHALT LAYER

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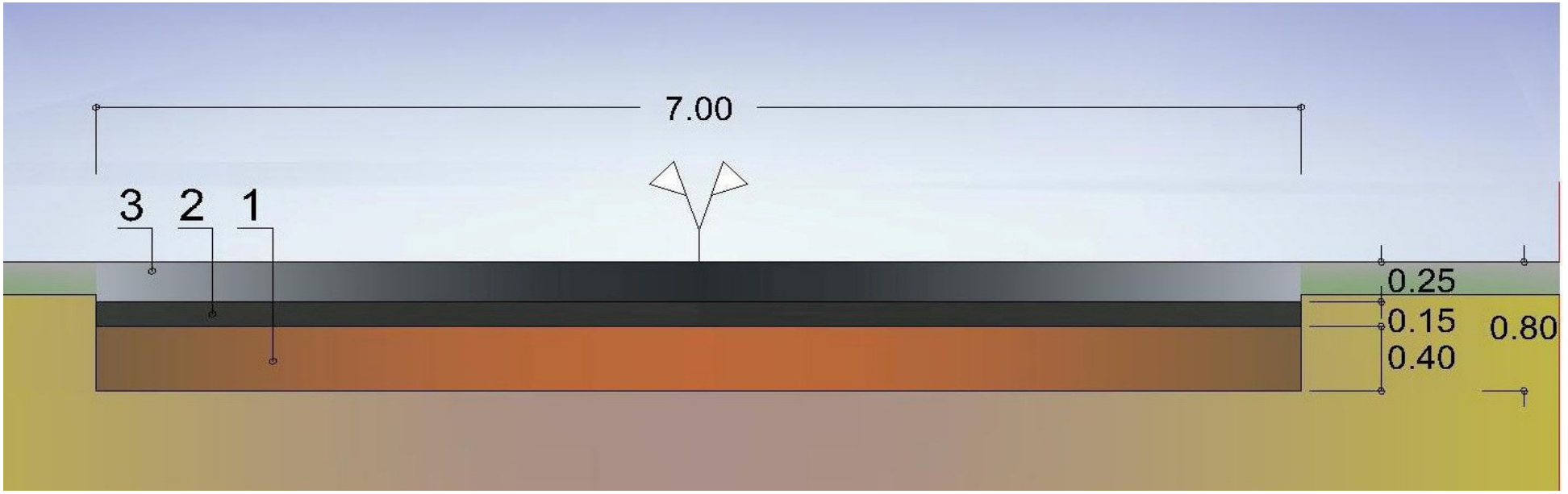
CONVENTIONAL CONCRETE PAVEMENT

LAYERS

(as per European Standards)



1 – 40 CM OF CRUSHER RUN (TOUT VENANT) BASE LAYER
2 – 15 CM LAYER OF LEAN CONCRET OF 100Kg/M3 CEMENT
3 – 25 CM OF 4,5 Mpa RESILIANT CONCRETE SLAB

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REQUIREMENTS FOR CONVENTIONAL CONCRETE PAVEMENT

- OPEN A BOX OF 80 CM
- TRANSPORT, SPREADING AND COMPACTING OF CRUSHED RUN FOR A 40 CM LAYER
- A 15 CM LEAN CONCRETE LAYER (100Kg/M3 OF CEMENT)
- A 25 CM OF CONCRETE LAYER

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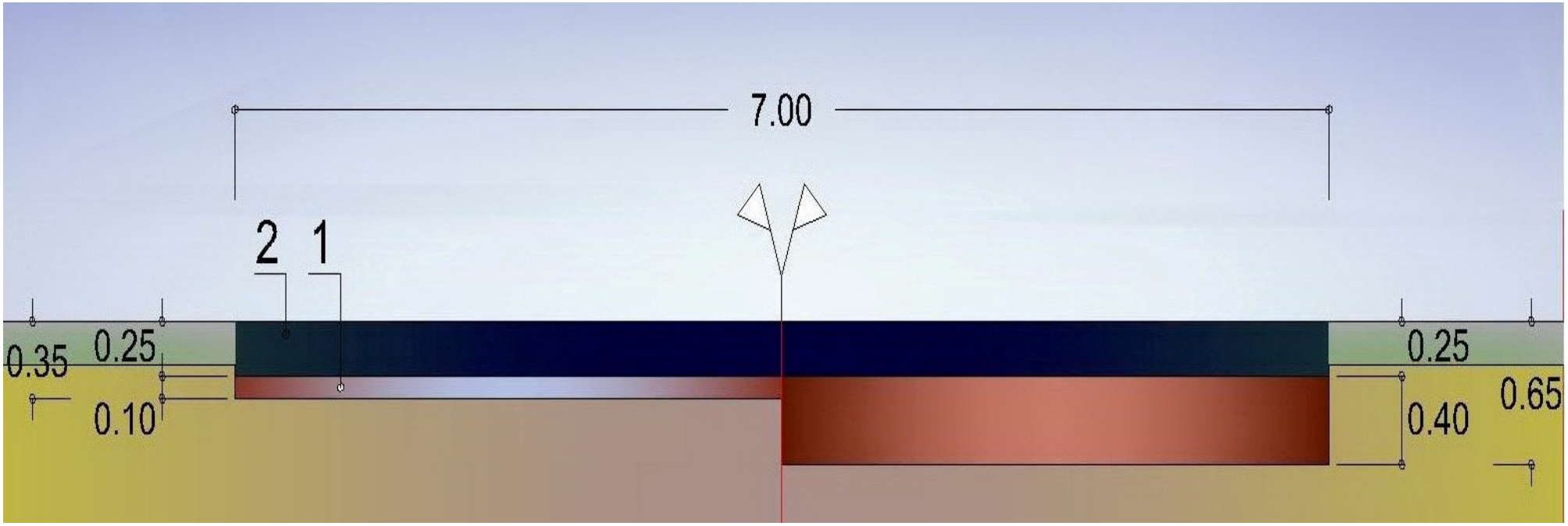
THE ULTIMATE SOLUTION

SCIENTIFIC PAVEMENT

CONCRETE SLAB FOUNDATION SYSTEM LAYERS



1 – 10 CM OF EPS *OR* 40 CM OF COMPACTED SAND LAYER

2 – 25 CM OF 4,5 Mpa RESILIANT CONCRETE SLAB

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REQUIREMENTS FOR SCIENTIFIC PAVEMENT

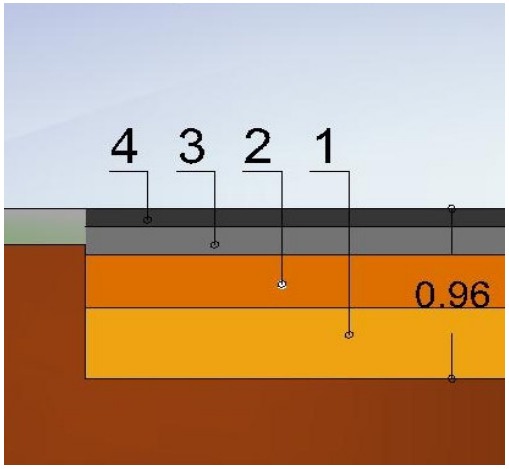
- OPEN A BOX OS 35 CM TO 65 CM
- A LAYER BASE OF A 10 CM EPS

OR

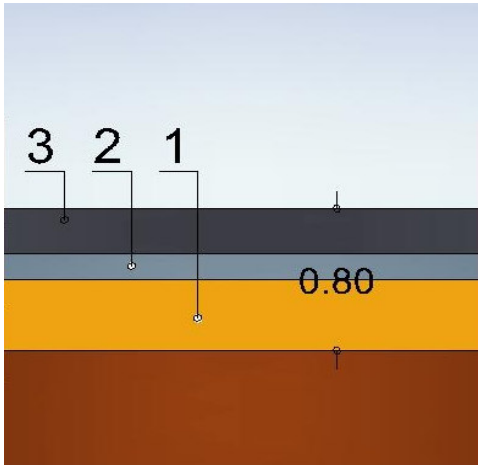
- A LAYER BASE OF 40 CM COMPACTED SAND

- A 25 CM OF CONCRETE LAYER (FOR HIGH WAYS)

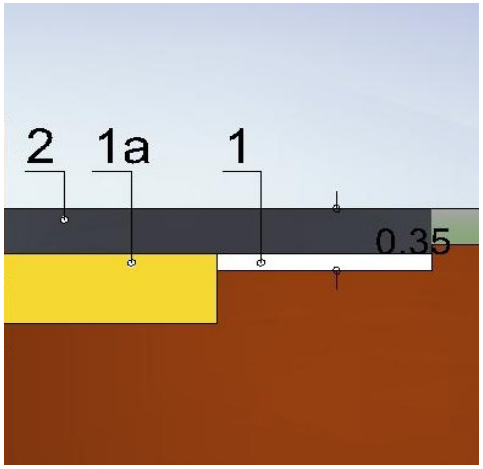
Asphalt



Concrete



SPWS



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Less earthmoving

Less manpower required

Less construction time

Less expensive works

Less time required for maintenance of construction yard and equipments at the site

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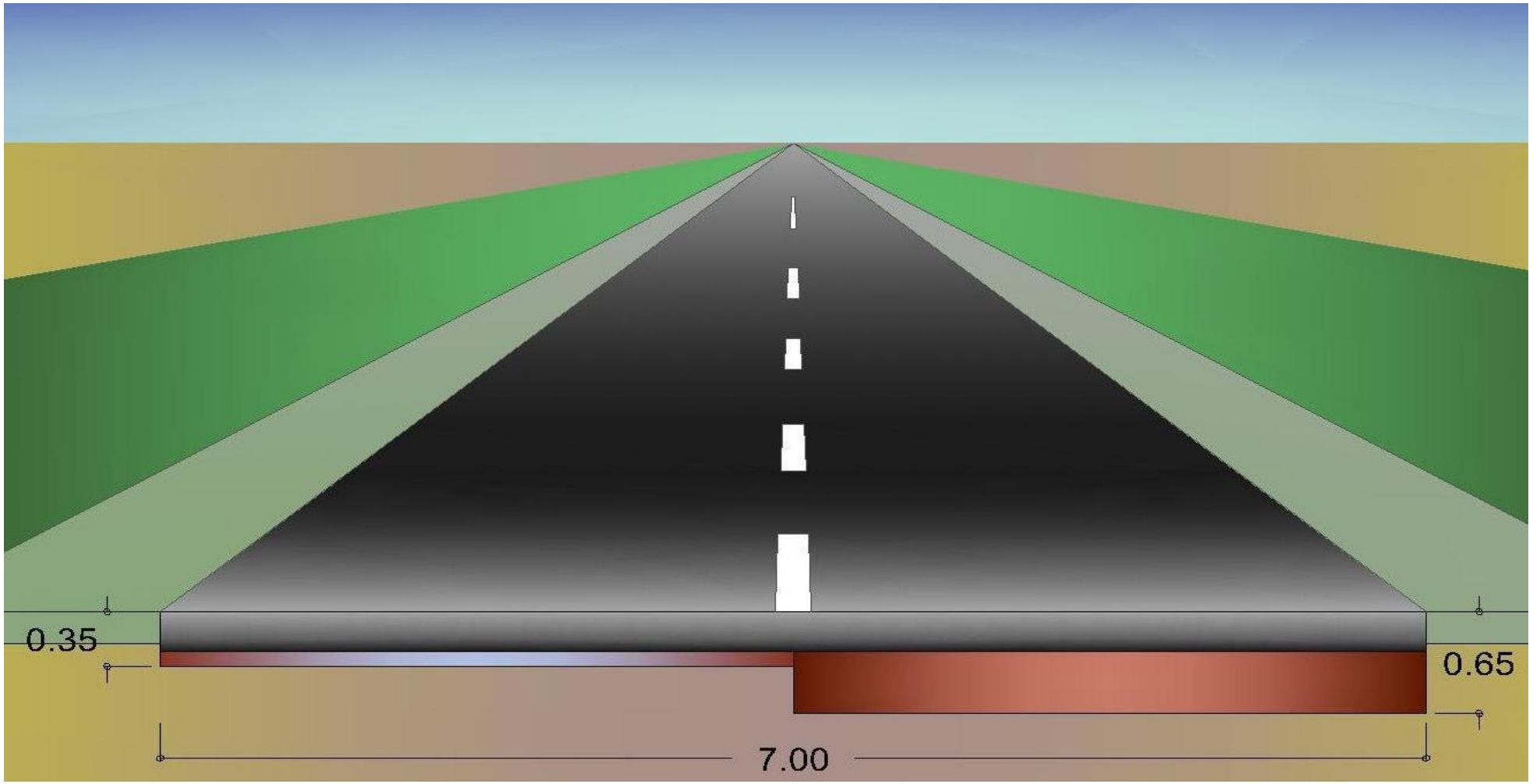
A BASE OF 10 CM EPS OR A COMPACTED SAND BASE OF 40 CM AND A SCIENTIFIC CONCRETE SLAB ON TOP OF IT

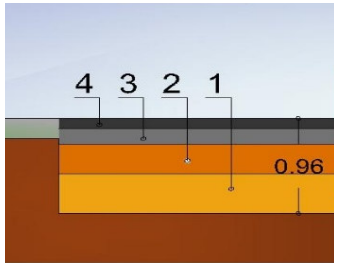


TRANSPORTATION AND MATERIALS - for 1 km of pavement, 7m wide

(as per European Standards)

= 20ton = 10 m³ = EPS machine on truck

Asphalt

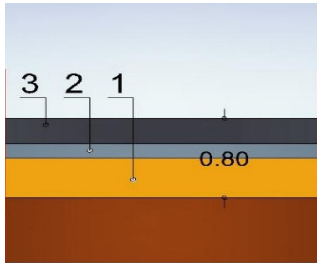


225
180
135
90

630 Total

100%

Concrete



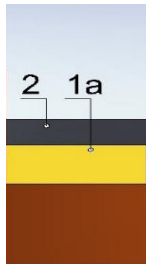
225
105
175

505 Total

- 20%

SPWS

Sand



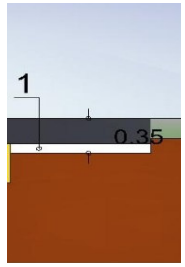
225
175

400 Total

- 37%

or

EPS



1
175

176 Total

- 72%

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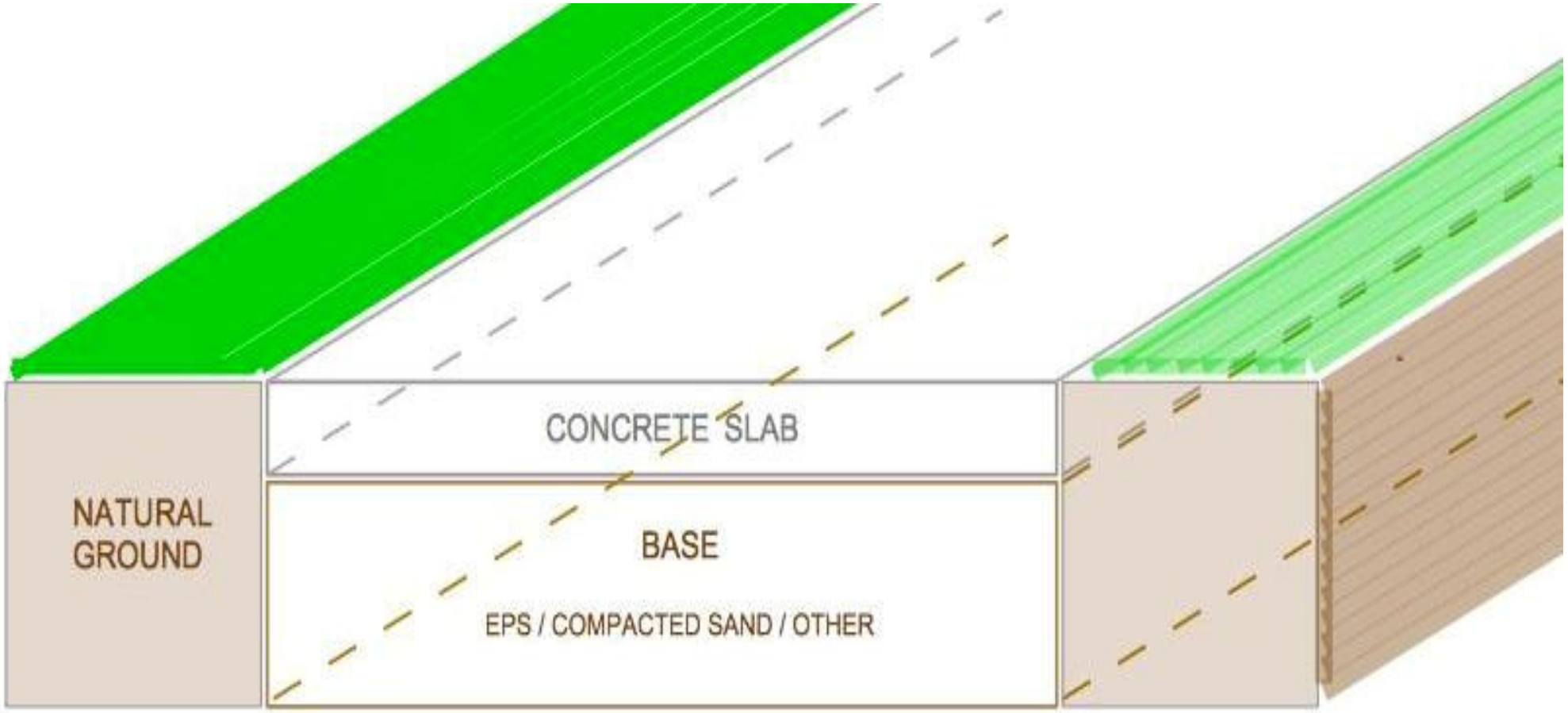
TWO LAYERS ONLY



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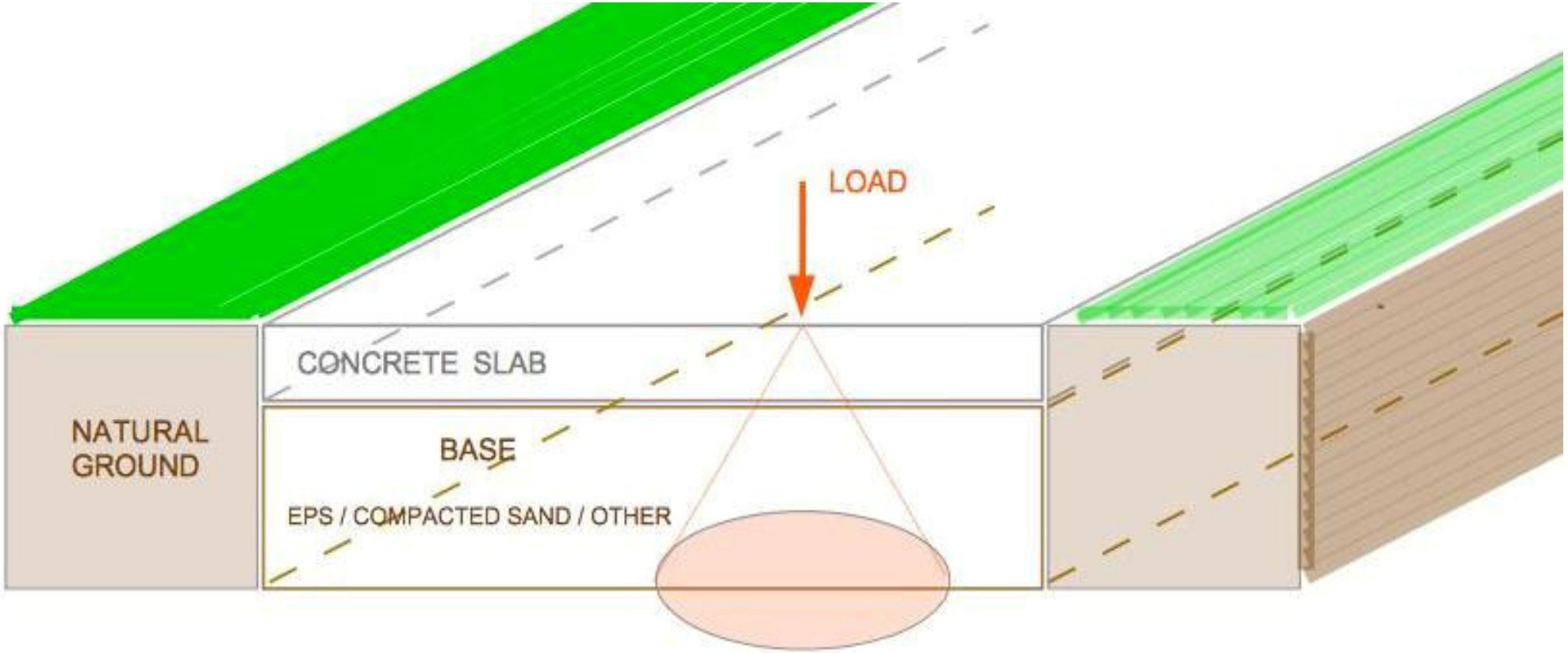
SCIENTIFIC MATHEMATICAL CALCULATIONS

LOADS ARRIVING AT THE SOIL FOR AN INFERIOR VALUE THAN IT'S CBR



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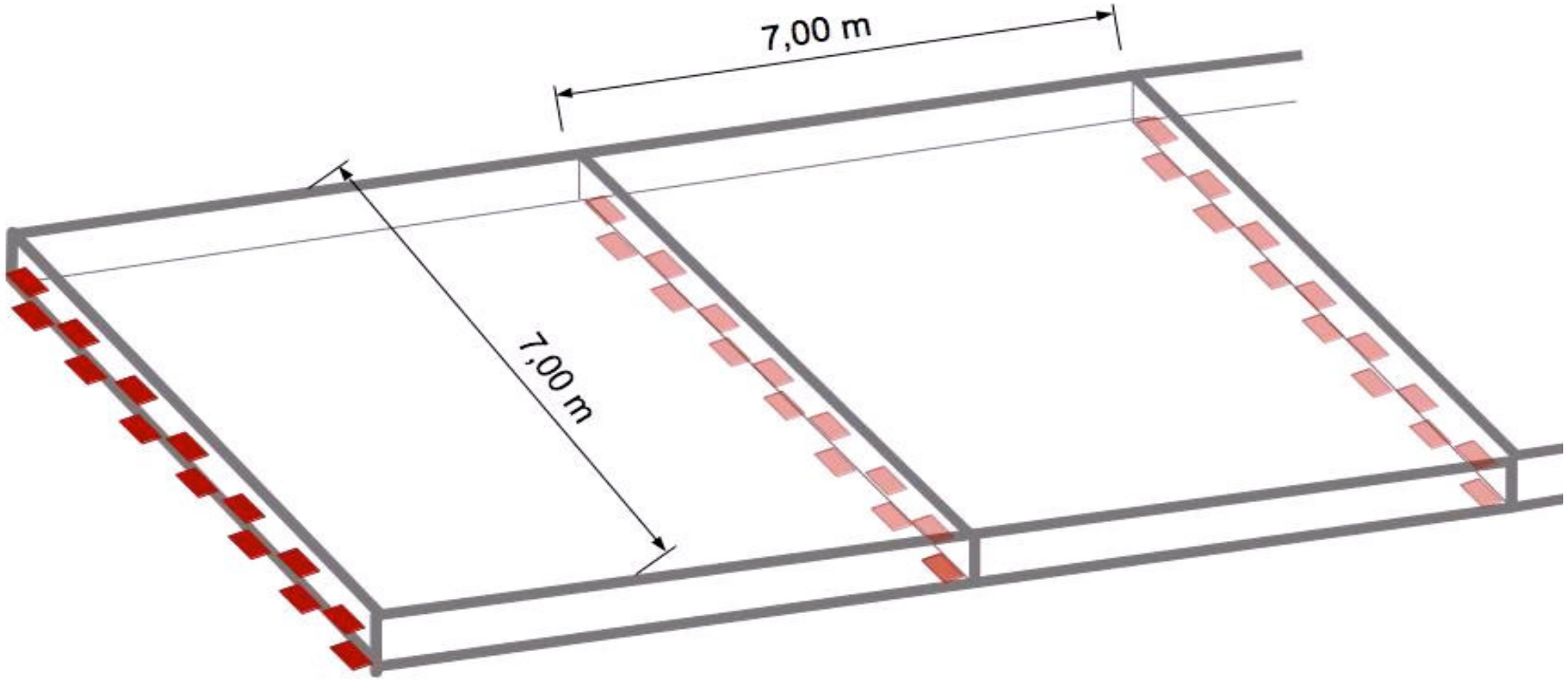
OUR UNIQUE LOAD TRANSFER STEEL PLATES ENSURES VERTICAL AND HORIZONTAL ROTATION OF THE SLABS



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IS.COM grants the pavement sizing projects, licences and follows its construction worldwide.

IS.COM shall at the site help to coordinate the construction works and provides to it's supervision.

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INDEX

1. Concrete Slab Foundation System – Method description

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METHOD DESCRIPTION

The Concrete Slab Foundation System is a **constructive method of pavements on semi-continuous concrete slabs**.

Focusing on this construction method, we will describe it step by step.

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Concrete Slab Foundation System

Is a monolithic foundation system with homopolymer/resistant aggregate pavement with a semi-continuous configuration, which uses a pavement with load transfer elements for the induction of joints, comprising a foundation having high-density expanded polystyrene blocks, which supports a semi-continuous concrete pavement, the pavement formwork being formed by the polystyrene blocks of the foundation

This invention relates to a monolithic foundation system with homopolymer/resistant aggregate pavement with a semi-continuous configuration, more specifically to a semi-continuous cement concrete pavement having joints formed by load transfer plates, with a structural strength which, by itself, absorbs, degrades and transmit loads, while withstanding the forces exerted thereon as well as the abrasion caused thereby, without differential settlements on the joint axis, also serving as a wearing course, the said pavement being laid on a foundation which is independent of the natural soil and acting as both a base and a sub-base.

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1st The base is constructed with **EPS blocks**, placed directly on the ground, overlaid by a high strength concrete slab.

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2nd Before concreting, **load transmission steel plates**, which are anchored alternately on either sides of the future joint, are placed over a **plastic film**.

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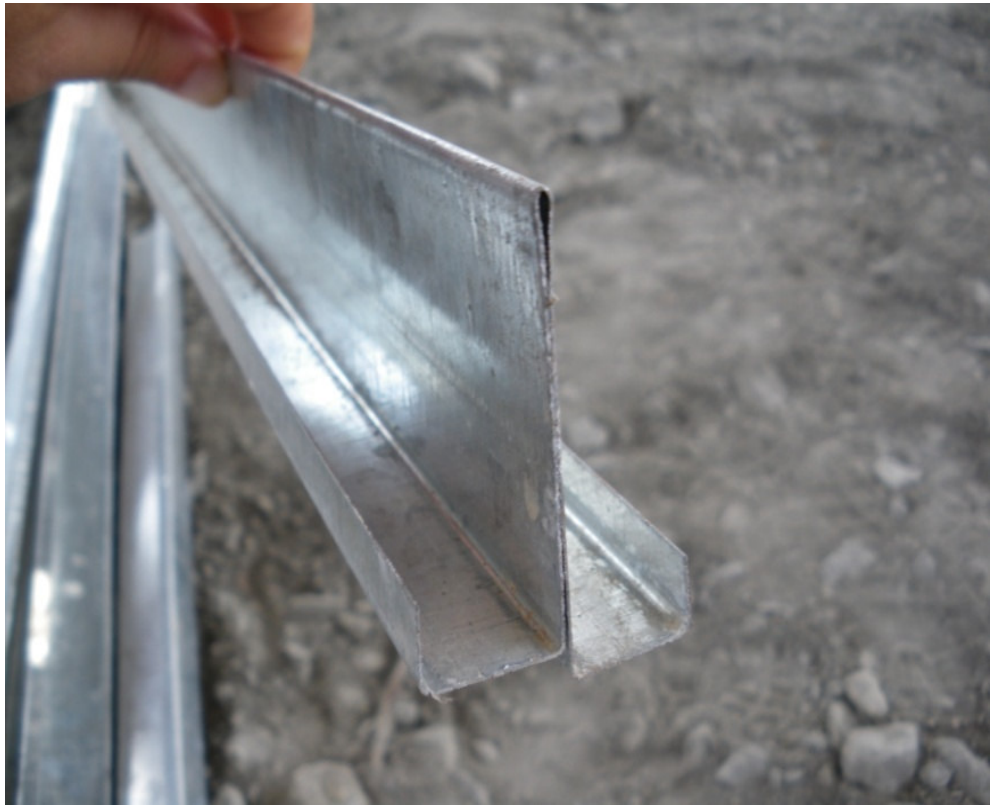
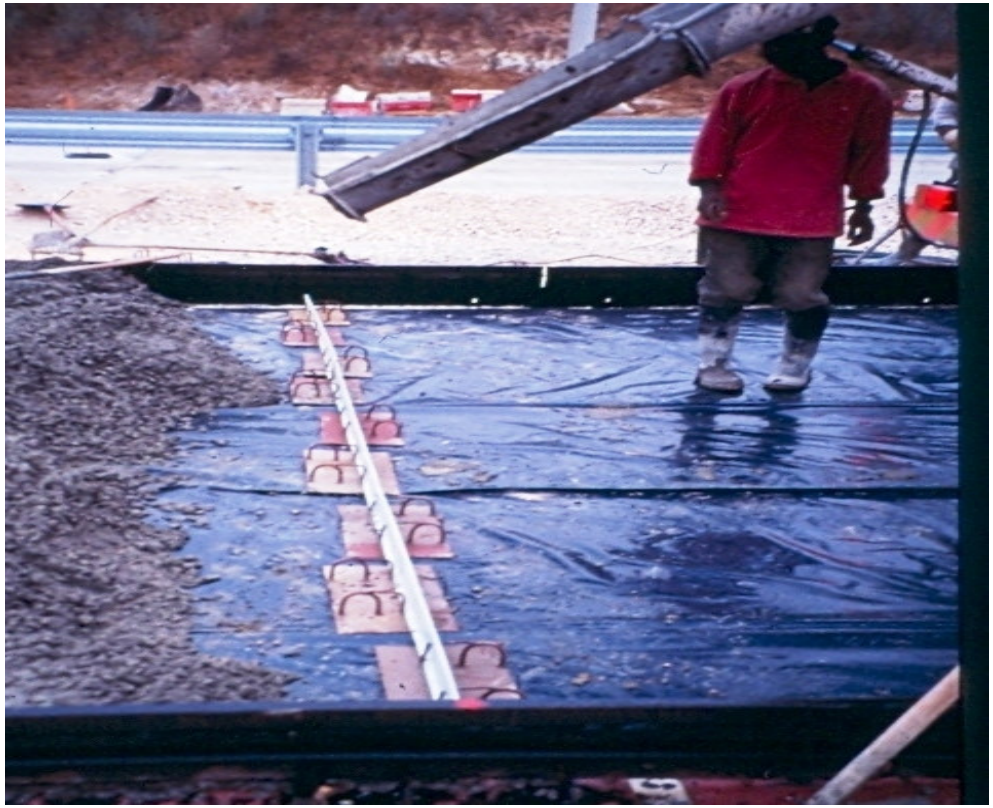
3rd A watertight **joint inductor** is placed on the steel plates to ensure the joint's opening on its exact location.





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4th High strength concrete, designed by IS.COM's technicians, is poured and finished with lightweight equipment, **or in case of road** construction is made with slip form paving machines.

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2. Concrete Slab Foundation System

THE ULTIMATE SOLUTION

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THE CONCRETE SLAB FOUNDATION SYSTEM´S INOVATIONS

- EPS base
- Plastic film
- Load transmission steel plates
- Joint inductor

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a) The **EPS base** replaces the embankment and the usual compressed base (**5cm/10cm** are usually enough).

By keeping all its features over time, EPS ensures a **durable base throughout all the pavements lifespan**.

Compacted sand may also be used as a base.

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The EPS base

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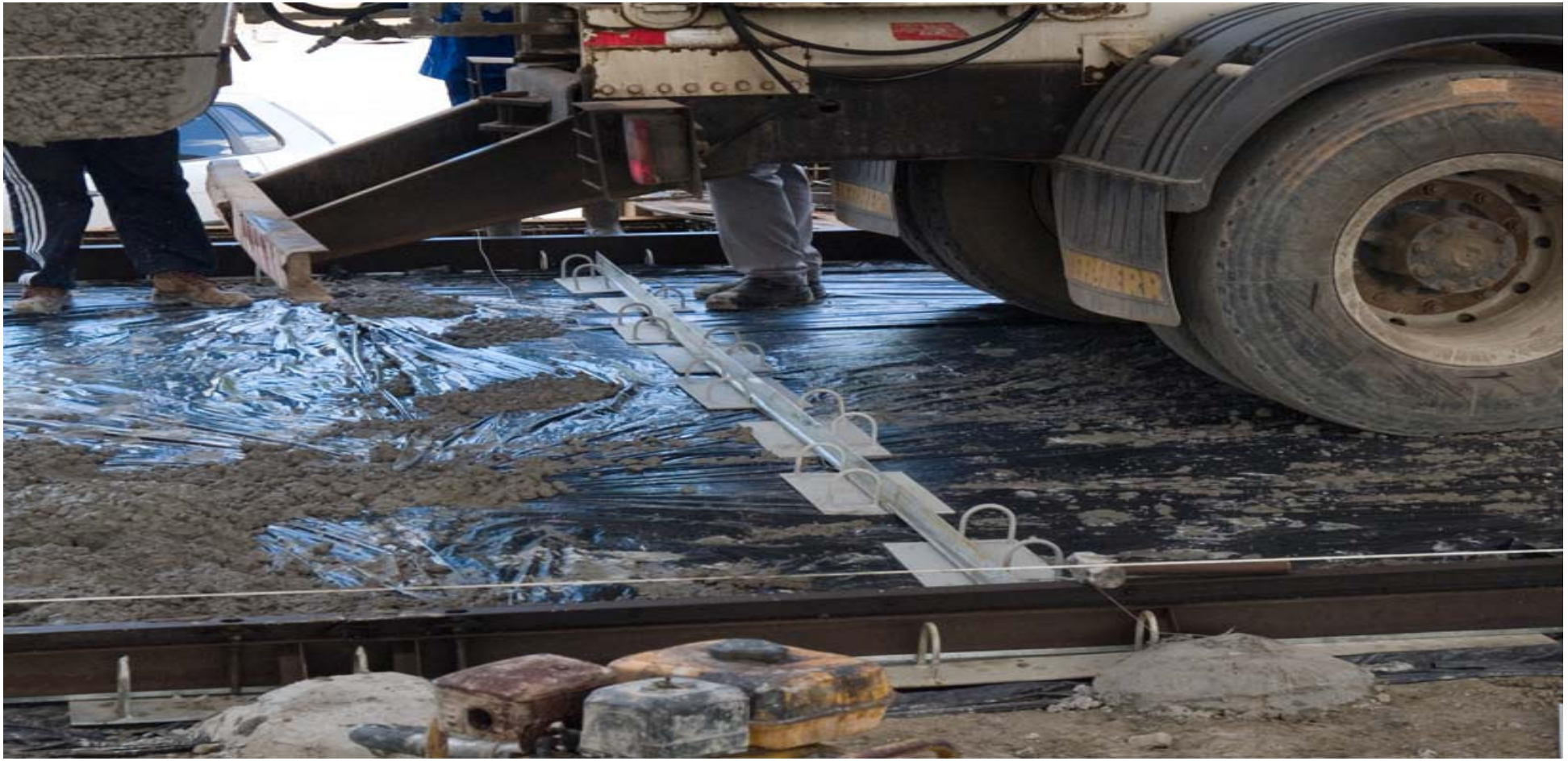
b) The **plastic film (0.2mm)** under the slabs reduces the friction over the base during the concrete shrinkage.



c) The replacement of load transfer bars in the middle of the concrete slabs, for **load transmission steel plates** (i.e. steel plates that are alternately anchored **to the base** of the concrete slabs on alternate sides of the joints) ensures that all movements due to expansion and contraction do not create any undesirable stresses in the slab.

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Example of load transmission steel plates over plastic film

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These steel plates **transmit effectively the tensions between contiguous slabs**, allowing the slabs to slide on the EPS base perpendicularly to the joint, **without any stresses due to expansion and / or contraction**.

The rotation movement allowed by the steel plates ensures **structural continuity of the pavement** in case of natural movements of the soil.

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d) The **joint inductor**, made from galvanized steel sheet (or plastic, the cheaper the best), is placed on the steel plates to ensure the exact location of the joint opening, and simultaneously to prevent any infiltration of liquids **to and from** the base, directing all liquids coming from the surface to the pavement's drainage system.

The pumping phenomenon is thus eliminated, and **the EPS base is protected against the infiltration of contaminants**.

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The Joint Inductor

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THE ULTIMATE SOLUTION

1) Due to our technique, it is now possible to build concrete slabs with **ability to resist to the differential settlements on the ground**.

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THE NEW SOLUTION (2)

2) Guarantees the stable homogeneous foundation which allows the concrete pavement to be **sustainable and durable at least for all the lifetime of its project**.

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Biancogres Factory

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Final Aspect

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THE NEW SOLUTION (3)

3) The Concrete Slab Foundation System has **solved all the issues and difficulties related with the instability of natural soils, as well as slab cracking**, either due to shrinkage or to natural foundation movements.

3. Technical advantages

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TECHNICAL ADVANTAGES

1) Load reduction on the natural ground from 1800 kg/m3 to 30 kg/m3, by **replacing and avoiding embankment material**.

2) Previewing the foundation's behaviour on a **long term basis** and sizing the concrete slabs.

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TECHNICAL ADVANTAGES (2)

3) Building the concrete slabs **directly over the EPS foundation**.

4) Effective transmission of loads to contiguous slabs (80% of the loads are transmitted to the next slabs)

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TECHNICAL ADVANTAGES (3)

5) Reduction of ground movements – organic soil stripping is the only necessary step to establish the construction base.

6) Joint formation **without mechanical intervention** whatsoever. Sealing the joints is unnecessary.

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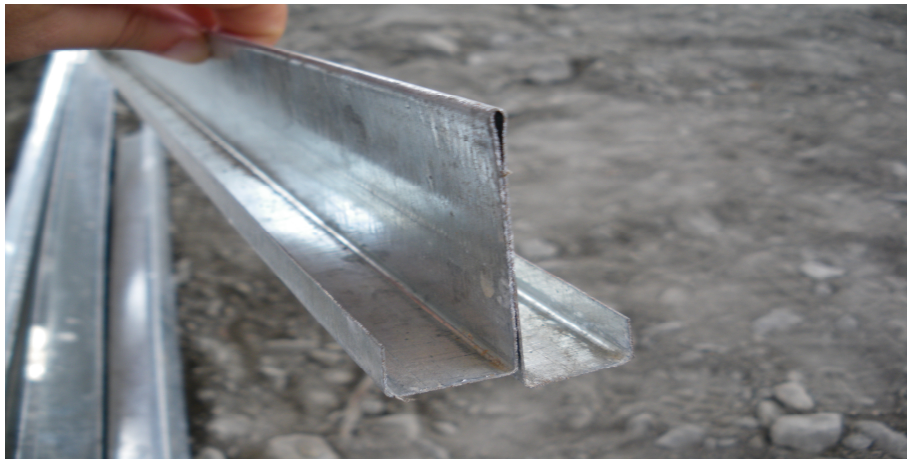
TECHNICAL ADVANTAGES (4)

7) Effective watertight joints, **avoiding pumping phenomenon**.



8) Excellent work rates during the execution of the pavements, compared against the traditional systems of construction (steel rebar's or load transfer bars, etc.).

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TECHNICAL ADVANTAGES (5)

9) Allows the **use of light machinery for the pavement construction** - crucial in remote areas.

10) No need for reinforced concrete and NO lean concrete

11) Concrete with **no use for any fibres** whatsoever.

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12) No need to seal the joints. Joints may be saw in fresh

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TECHNICAL ADVANTAGES (6)

13) Shortened construction deadlines – reduced ground movements and no need for a compacted base, speeding the works.

14) Great reduction of costs, regarding both the construction **and maintenance phases**, compared with the traditional building systems of either concrete and asphalt pavements.

4. Comparative advantages

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COMPARATIVE ADVANTAGES

1) Savings during the maintenance phase

a) **Concrete Slab Foundation System** compared with flexible pavements: **300% in 40 years**.

b) **Concrete Slab Foundation System** compared with conventional rigid pavements: **100% in 40 years**.

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COMPARATIVE ADVANTAGES (2)

2) Guarantee (available in Europe)

Considering the excellent levels of resistance and the neutral behaviour of the Concrete Slab Foundation System, our concrete slab pavements **benefit from a 10 year guarantee**, provided by an insurance company and reinsurance companies, on the total cost (100%) of the pavement. (**Average Applicable Rate for Insurance 3,500%**) **(the only concrete technique acceptable for insurance)**

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COMPARATIVE ADVANTAGES (3)

3) Environmentally sustainable technology

The Concrete Slab Foundation System uses **30% less energy** during its construction than the asphalt solution.

The concrete slabs also **accumulate less warm than the asphalt**, minimizing the global warming and reducing the carbon footprint.

Trucks and cars **consume less gasoline** driving above concrete pavements

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COMPARATIVE ADVANTAGES (4)

4) Recycling

At the end of the concrete slabs lifespan, **all of its material composition is recyclable**.

5) Faster, cheaper and better construction

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COMPARATIVE ADVANTAGES (5)

IT IS NOT AN EXPERIMENTAL TECHNOLOGY

The load transmission steel plates where accepted by the **States of France and Belgium** and they where inserted at the "*Annales*" of *Institut du Batiment et Travaux Publique* (**France, since 1984**) and at *Centre de Recherches Routiéres* (**Belgium, since 1985**).

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LESS

- Earthworks
- Materials acquisition
- Manpower
- Days of construction
- Maintenance of construction yards
- Equipment on the site
- Expensive works

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MORE

Profit

Efficiency

Building Capacity

Construction of m2 with the same budget

5. Applicability

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SPWS
GLOBAL APPLICABILITY

- **Roads** and **Highways**
- **Ports, Airports** and **Railways**
- **Streets** and **Parking facilities**
- **Industrial Factories** and **Commercial Areas**
- **Warehouses**
- **Refrigerated Warehouses** and **Food Warehouses**

6. Construction works

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SOME CONSTRUCTION WORKS

1) WAREHOUSE FOR JOHNSON & JOHNSON, AT LISBON, QUELUZ, PORTUGAL

PUNCTUAL LOADS OF 8.000 KG / M2

SLABS OF 12 X 12 M COM 12 CM THICKNESS

2) PARKING FOR MATERIALS AND WAREHOUSES OF NATO'S (OTAN) AIRPORT, AT MONTE REAL, PORTUGAL

PUNCTUAL LOADS OF 20.000 KG / M2

SLABS OF 8 X 8 M WITH 20 CM THICKNESS

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SOME CONSTRUCTION WORKS (2)

3) ROAD AT VALENÇA, PORTUGAL (without any base over topsoil)

FOR TRUCKS WITH 13.000 KG PER AXLE

SLABS OF 8 X 4 M WITH 16 CM THICKNESS

4) ROADS AT VILA NOVA DE CERVEIRA, PORTUGAL

FOR TRUCKS WITH 13.000 KG PER AXLE

SLABS OF 8 X 4 M WITH 16 CM THICKNESS

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SOME CONSTRUCTION WORKS (3)

5) WAREHOUSE OF NESTLÉ, AT AVANCA, PORTUGAL

PUNCTUAL LOADS OF 4.000 KG

SLABS OF 12 X 12 M WITH 12 CM THICKNESS

6) TREATMENT OF SOLID RESIDUALS (TRASH) AT VALE DO AVE, PORTUGAL

FOR TRUCKS WITH 13.000 KG PER AXLE

SLABS OF 8 X 4 M WITH 16 CM THICKNESS

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SOME CONSTRUCTION WORKS (4)

7) INSTITUTE FOR DEVELOPMENT AND TECHNOLOGICAL INNOVATION (IDIT) AT SANTA MARIA DA FEIRA, PORTUGAL

SLABS OF 8 X 8 M WITH 13 CM THICKNESS

8) EXPONOR FAIR (PAVILHÃO TOPO NORTE) AT OPORTO, PORTUGAL

PUNCTUAL LOADS OF 13.000 KG / M2

SLABS OF 8 X 8 M WITH 16 CM THICKNESS

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SOME CONSTRUCTION WORKS (5)

9) ACCESS ROAD TO THE CIMPOR CEMENT FACTORY AT SÃO MIGUEL, AZORES

FOR TRUCKS WITH 13.000 KG PER AXLE

SLABS OF 8 X 4 M WITH 16 CM THICKNESS

10) MOTORWAY A8 – REPAIR – PAVEMENT REPLACEMENT AT TORRES VEDRAS TOLL

FOR TRUCKS WITH 13.000 KG PER AXLE

SLABS OF 5 X 6 M WITH 20 CM THICKNESS

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SOME CONSTRUCTION WORKS (6)

11) MARITIME PORT AT VITÓRIA, ESPÍRITO SANTO STATE, BRAZIL, FOR PRYSMIAN (PIRELLI MARITIME CABLES), JUNE 2011

12) BIANCOGRES FACTORY & SEVERAL WAREHOUSES AT ESPIRITO SANTO STATE, BRAZIL 2011-2013

13) JURONG PORT AT ARACRUZ, ESPÍRTO SANTO STATE, BRAZIL 2015

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CONSTRUCTION WORKS (7)

MARITIME PORT AT VITÓRIA, PAVEMENT ORDERED FOR 25 TONS IN WHICH LOADS OF 300 TONS WERE PLACED

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CONSTRUCTION WORKS (8)

MARITIME PORT AT VITÓRIA, PAVEMENT ORDERED FOR 25 TONS IN WHICH LOADS OF 300 TONS WERE PLACED

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CONSTRUCTION WORKS (9)

MARITIME PORT AT VITÓRIA, PAVEMENT ORDERED FOR 25 TONS IN WHICH LOADS OF 300 TONS WERE PLACED

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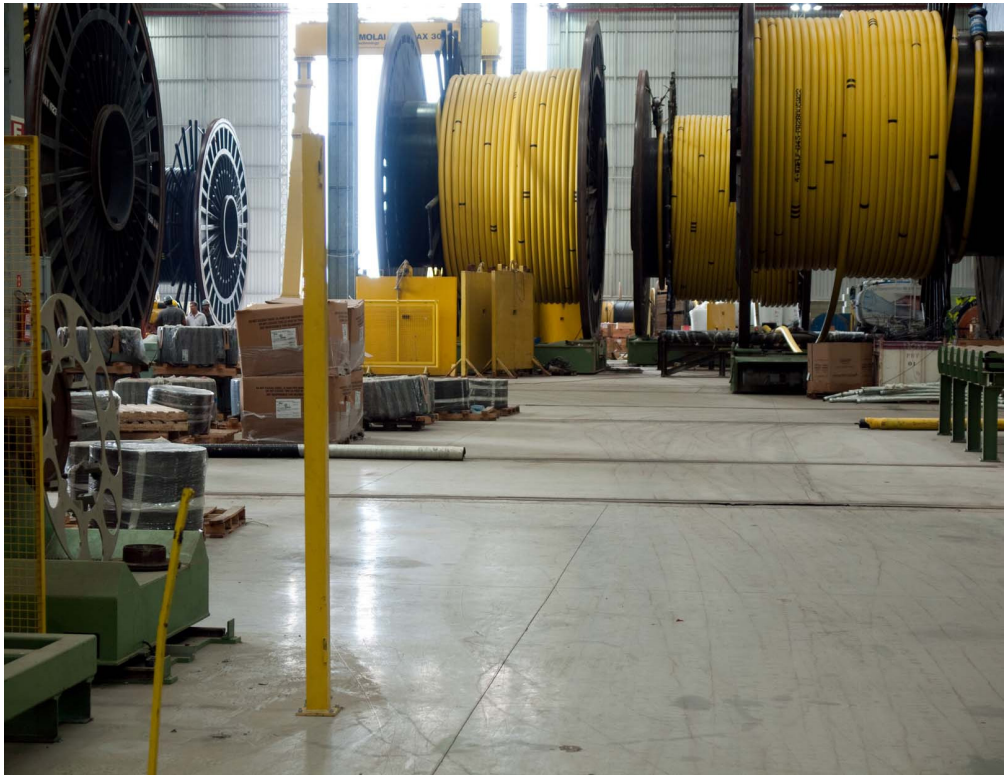
CONSTRUCTION WORKS (10)

MARITIME PORT AT VITÓRIA, PAVEMENT ORDERED FOR 25 TONS IN WHICH LOADS OF 300 TONS WERE PLACED



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CONSTRUCTION WORKS (11)

MARITIME PORT AT VITÓRIA, PAVEMENT ORDERED FOR 25 TONS IN WHICH LOADS OF 300 TONS WERE PLACED

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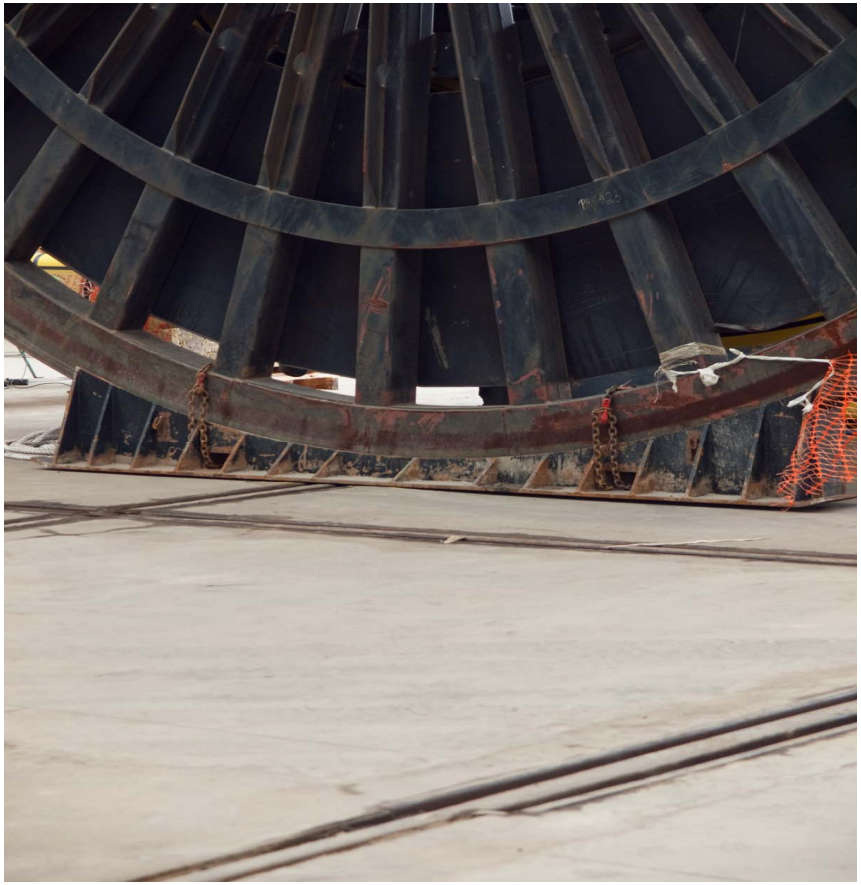
CONSTRUCTION WORKS (12)

MARITIME PORT AT VITÓRIA, PAVEMENT ORDERED FOR 25 TONS IN WHICH LOADS OF 300 TONS WERE PLACED



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CONSTRUCTION WORKS (13)

MARITIME PORT AT VITÓRIA, PAVEMENT ORDERED FOR 25 TONS IN WHICH LOADS OF 300 TONS WERE PLACED

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CONSTRUCTION WORKS (14)

MARITIME PORT AT VITÓRIA, PAVEMENT ORDERED FOR 25 TONS IN WHICH LOADS OF 300 TONS WERE PLACED

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CONSTRUCTION WORKS (15)

MARITIME PORT AT VITÓRIA, PAVEMENT ORDERED FOR 25 TONS IN WHICH LOADS OF 300 TONS WERE PLACED

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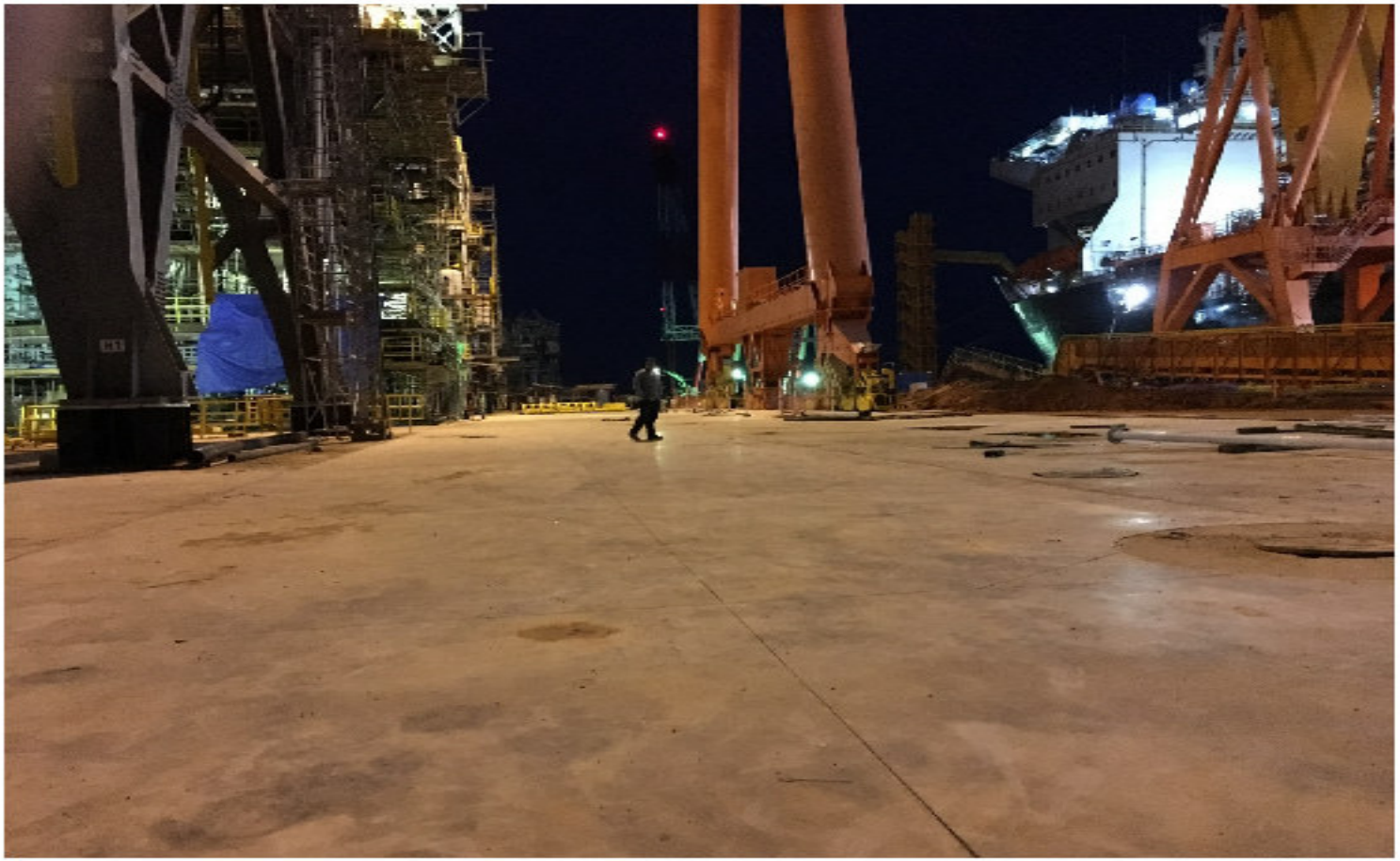
CONSTRUCTION WORKS (16)

JURONG PORT IN BRAZIL - 830,000 M2



7. Contacts

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