

IS.COM's Pavement Construction Technology

Our SPWS-CONCRETE SLAB FOUNDATION SYSTEM can be defined with four words:

Cheaper, Faster, Easier and Better

Cheaper once the total savings provided by this technology can get the final price to **30% less** than the traditional techniques for pavement construction would.

Faster mainly due to total replacement of the traditional base and sub base of pavements applying E.P.S.- High Density Expanded Polystyrene instead allows less ground movements works and for a team of three or four men to place the new base and sub base much faster, therefore reducing the total time of pavement construction **up to 40%**.

Easier due to less working operations required, once there are less materials to transport to the works site and less materials to apply.

Better because this technology provides pavements with a project life of 40 years minimum, has few maintenance and almost no repairs, is more ecological and at the end of its life all materials are fully recyclable – concrete is less pollutant, accumulates less heat and generates less global warming and vehicles have an inferior consumption of fuel.

The SPWS-CONCRETE SLAB FOUNDATION SYSTEM is based in four innovations:

E.P.S.- High Density Expanded Polystyrene - replacing totally the traditional base and sub base of pavements. EPS ensures a durable base throughout the lifespan of the pavement once it keeps all its features over time. The High Density Expanded Polystyrene should be produced at the site works with a portable machine to avoid transportation;

Plastic Film over the base allows concrete to retract freely without danger of any anchorage and therefore the risk of concrete cracking on retraction stage is minimized;

Joint Inductor ensures the exact location of opening of the joint without any mechanical operation, and also prevents all and any infiltration of liquids to and from the base, directing all liquids coming from the surface to the pavement's drainage system. The joints are watertight and very thin therefore sealing the joints becomes totally unnecessary.

Steel Load Transfer Plates replace the traditional load transfer bars allowing the transmission of loads and tensions between contiguous slabs in all directions, ensuring always the structural continuity of the pavement, once the slabs can slide over the EPS base either horizontally and perpendicularly to the joint without any stresses due to the loads and to the expansion or contraction of concrete. The rotation movement allowed by the steel plates also ensures the perfect continuity of the pavement when natural movements of the soil happens, either arising from ground settlements or any increase of volume, accepting soil movements more than 25 mm.

Our pavements are construed **continuously** with **two layers only** – EPS and the concrete poured immediately over it.

Traditional techniques for a pavement construction use a foundation, once soils are not inert material, on the contrary, being live material. It increases volume when it rains and decreases volume when it dries. The first action in any construction is to remove the topsoil, which is unfit for construction, in order to create a pavement box where the foundation is to be constructed. This latter is made with compressed selected soils – Crusher Run - topped with a layer of gravel, then a layer of sand, and irrigation with tar (to provide some consistency to these loose materials). Once this is done the two final layers are made (i) for flexible pavements two layers of asphalt (bitumen), or (ii) for concrete pavements a layer of lean concrete layer (poor concrete at 100kg of cement) and a layer of concrete. This latter after concrete retraction shall form the concrete slabs.

Our technology being a monolithic foundation system replaces the classical foundation, made with inert materials, for a layer of EPS (5 cm to 30 cm - also an inert material), allowing immediately the construction of the concrete pavement on top of it.

Construction steps: remove topsoil, open a box in natural ground, compact the soil and level it, then place the EPS, cover it with a plastic film, place the steel load transfer plates and the joint inductor, and finally pour the concrete over it, all in a continuous construction.

EPS placed directly over the soil substitutes quite efficiently the stabilization layers of inert, once EPS maintain a neutral and lasting action, without any relevant changes on of its mechanical action, being easy to handle and very fast to place.

High resilient concrete is used under IS.COM formulas, therefore our concrete is **unreinforced** and **fibbers free**, this also reflecting a significant economy.

Our SPWS technology also **removes the need for a lean concrete layer** and the steel load transfer bars (and the stresses that such bars cause to the concrete).

By placing under the concrete our steel load transfer plates it allows differential settlements of the ground up to more than 25 mm without damaging the concrete slabs and ensure effective transfer the loads to all contiguous slabs. The rotation movement allowed by the steel load transfer plates ensures always the perfect continuity of the pavement whenever natural movements of the soil happens, as well as the slab movements of expansion and contraction. The joints are very thin and they are **not sealed** once our **joint inductor is watertight**.

Summary of Advantages:

Reduction of ground movements;

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

Joint formation without mechanical intervention whatsoever;

Effective watertight joint, avoiding pumping phenomena;

Effective load transmission to all contiguous slabs;

No need to seal the joints;

Unreinforced concrete and fibber free;

No expansion joints required;

Allow slab construction with more than 7 m;

Ensures always the continuity of the pavement in case of natural movements of the soil;

Allows the use of light machinery for the pavement construction - crucial in remote areas;

Turn useless the need of piles over grounds with a low CBR or K;

Environment friendly: 30% less energy used when compared to asphalt solution;

Shortened construction deadlines up to 40%;

Reduced construction costs up to 30%.

Summary of Comparative Advantages & Savings

Savings on maintenance of the construction yard	Savings on equipments and on transportation	Savings on manpower
No selected soils transport	No spreading selected soils	No selected soils to compact
No transport of gravel	No spreading gravel	No compacting gravel
No transport of sand	No spreading of sand	No compacting sand
No tar irrigation	Sawing joints in fresh	No sealing of joints
No lean concrete layer	Concrete unreinforced	Concrete fibber free
Low maintenance	No repairs	

Efficiency: up to 45,000 m² / 8h shift / by Slip Form

up to 1200 m² / 8h shift / by Vibrating Straight Edge

E.P.S. base price: The price of the raw material is around Usd 500/Ton for what we expect that the base's price, including transportation expenses, custom fees and manufacturing, should be around or less than Usd 60.00/m³ that is equivalent to USD 6.00/m² (€5.00/m²) for each 10 cm thickness.

International Strategic Consultancy & Management

This is **not** an experimental technology. The steel plate load transfer was recognized by the State of France (Annales - Institut Technique du Batiment et des Travaux Publics, 1984) and State of Belgium (Centre de Recherches Routières, at Bruxelles, 1985) and latter on extraordinarily developed by us.

The SPWS-CONCRETE SLAB FOUNDATION SYSTEM is patented in several countries over the world and in Europe the European Patent is registered under the n° 2356287.



Steel Load Transfer Plates



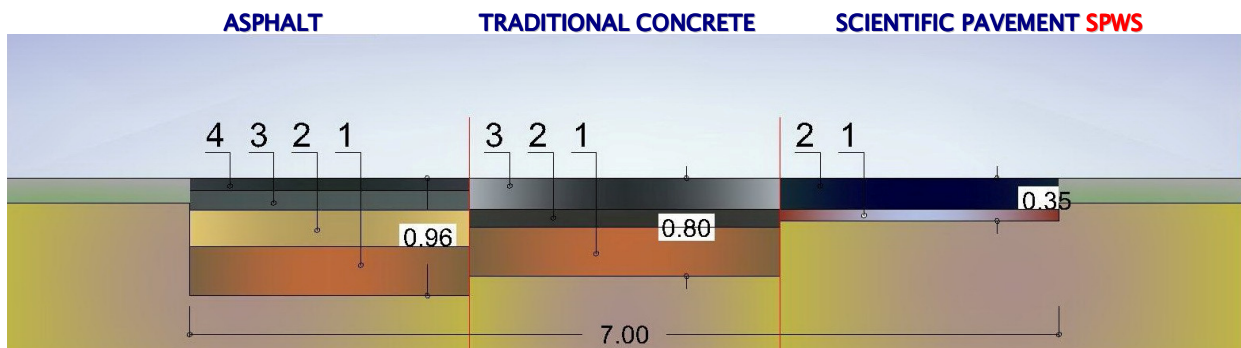
Steel Load Transfer Bars (DOWEL BARS)



EPS - High Density Expanded Polystyrene



Plastic film, Joint Inductor & Steel Load Transfer Plates



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

= 20ton

= 10 m³

= EPS machine on truck



GRAND TOTAL TRANSPORT ECONOMY EARTHMOVING, PAVEMENT BASE AND SUB BASE, MATERIALS & CONSTRUCTION			
TRUCKS CAPACITY CONSIDERED = 1 TRUCK = 35 M3			
ASPHALT LAYERS	CONVENTIONAL CONCRETE PAVEMENT LAYERS	CONCRETE SLAB WITH CONVENTIONAL BASE LAYERS	FOUNDATION LAYERS WITH HIGH DENSITY EXPANDED POLYSTYRENE - E.P.S.
		672.000 m3 735.000 m3 182.000 m3 1.589.000 m3 45.400 Trucks	560.000 m3 420.000 m3 280.000 m3 1.260.000 m3 36.000 Trucks
Base of Comparison	-21%	-61%	-74%
	Less: Laying machinery Compacting machinery Time of machinery Works Transportation	Less: Laying machinery Compacting machinery Time of machinery Works Transportation	Much Less: Laying machinery Compacting machinery Time of machinery Works Transportation

MOTORWAY - HIGHWAY - TORRES VEDRAS, POTUGAL (A8)



PORT, VITORIA, BRAZIL - PRYSMYAN (PIRELLI MARITIME CABLES - GENARAL CONTRACTOR HOCHTIEF (BR))

