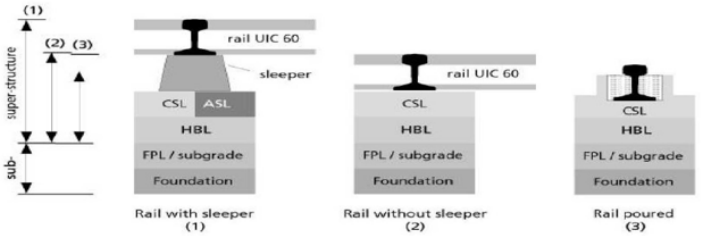
RAILWAYS

- **The railway line solutions are characterized as follows:**
  - **Ballasted line;**
  - **Mixed support line;**
  - **Not ballasted line**

The ballasted line is the oldest and is still today, a structural solution. Its composition appears to have evolved very little over two hundred years, however, from the last forty years has been discussed the efficiency of its use for several reasons.

RAILWAYS (2)

- Alternative solutions to the ballasted line have emerged with the aim to reduce the problems in this type of structure. The non-ballasted track has been implemented in various countries such as Germany and Japan. Currently, this solution contained a large variety of structural designs.
- In non-ballasted track, the ballast layer in the ballasted track is usually replaced by a layer of reinforced concrete slab or a layer of bituminous mixture (Figure 1.). The first group of solution which consists of rails, supported by sleepers laid or embedded in a concrete slab, being typically called line slab. For the second group, these solutions consist of sleepers made of reinforced concrete, supported directly on a bituminous layer, which replaces the ballast.



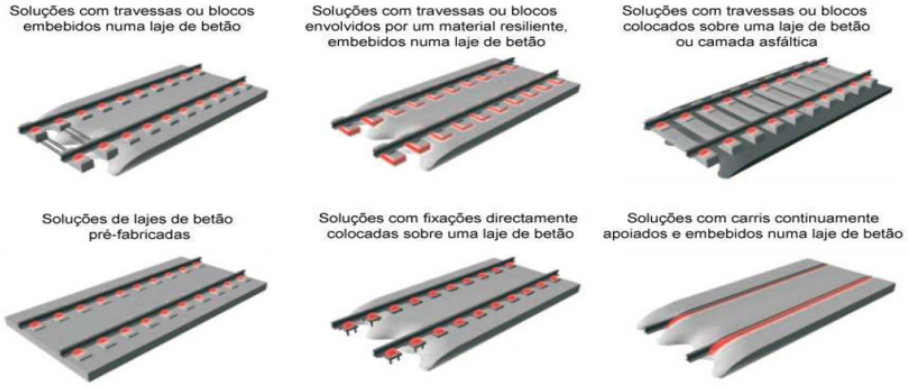
CSL - laje de betão (*Concrete Supportive Layer*); *ASL* – camada de mistura betuminosa (*Asphalt Supportive Layer*); *HBL* - agregados tratados com ligante hidráulico (*Hydraulically-Bonded Layer*); *FPL* - Camada de protecção contra o gelo (*Frost protection layer*); subgrade – leito de via.

RAILWAYS (3)

- **There are currently two types of concrete sleepers in particular the bi block sleepers (reinforced concrete) and monoblock sleepers (prestressed concrete) (Figure 2.).**

a) travessa bibloco b) travessa monobloco

- **The line slab solution, presents a wide range of structural designs. This variety results from different disposal possibilities and integration of the elements face the constraints imposed on the line. For example, in figure 3. are presented six different types of line design**



*Os elementos marcados a vermelho fornecem à via uma rigidez equivalente à conferida pelo balastro.

RAILWAYS (4)

- The use of non-ballasted line as a solution for new railway lines enables a reduction in maintenance costs and increased stability of the line, allowing greater safety regarding the movement of carriages with increasingly higher speeds.
- Regarding the foundation platform, it is necessary that this present deformations reduced to minimize the differential settlements throughout the project life.
    - **THE SOLUTION – THE SYSTEM SLAB-FOUNDATION SPWS**
- The base being formed by E.P.S. blocks (High density polystyrene at 30/kg / m3 at least) placed directly over the natural ground.
- Over it a plastic film of 0.02 cm, which function is only to allow the concrete to retract freely without anchoring and preventing it to crack while concrete retracts,
- High strength resilient concrete is immediately layed down supported by our unique steel load transfer plates.
- Our unique steel load transfer plates, which are anchored alternately on one side and the other of the concrete slabs, do allow transmission of the stresses caused by loads to all the adjacent slabs and accept differential settlements of the ground up to 25mm, but always ensuring the perfect continuity of the pavement.
    - The end of the rails should never coincide with the joints.
    - The price of the base in E.P.S. should be around € 5.00 /M2
    - TWO LAYERS ONLY. THE SLEEPERS MAY HAVE A FIXING SOLUTION

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SOME TECHNICAL ADVANTAGES

Load reduction on the natural ground from 1800 kg/m^3 to 30kg/m^3

- Building the concrete slabs **directly over the EPS** or compacted sand foundation **(Two layers only)**
- **Effective transmission of loads** to contiguous slabs (80% of the loads are transmitted to the next slabs)
- All components are **locally manufactured none to be imported**
- **Unreinforced concrete and fibbers free**
- **Seepage joints – no sealing of joints**
- **Cheaper works – savings up to 1/3 of total cost**
- **Faster works – up to 40% faster**

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WHAT WE DO

- PROJECT OF THE FORMULA FOR THE COMPOSITION OF HIGH RESILIENT CONCRETE
- ADVISE AND CALCULATE THE RIGHT BASE TO BE USED
- DIMENSIONING PROJECT OF THE PAVEMENT AND ALL MATHEMATICAL CALCULATIONS
- SPECIFICATIONS FOR THE STEEL LOAD TRANSFER PLATES, IT'S DIMENSIONS, SHAPES, SIZES AND ENDURANCE
- SUPERVISE THE MAKING OF THE STEEL LOAD TRANSFER PLATES
- SPECIFICATIONS FOR THE JOINT INDUCTORS IT'S DIMENSIONS, SHAPES, SIZES AND ENDURANCE
- SUPERVISE THE MAKING OF THE JOINT INDUCTORS
- GUIDE THE EXACT LOCATION OF THE STEEL LOAD TRANSFER PLATES AND THE JOINT INDUCTORS
- SUPERVISE THE PAVEMENT WORKS "*in situ*"

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SPWS

Scientific Pavement World Systems

CONCRETE SLAB FOUNDATION SYSTEM

- FASTER
- CHEAPER
- EASIER
- BETTER

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