USP - Under Sleeper Pad
On Ballasted Track
Under Sleeper Pad
Anti-vibration panel, from 9 to 15 mm thickness, produced using fibres and granules of SBR rubber (Styrene Butadiene Rubber) or EPDM rubber (Ethylene Propylene Diene Monomer) compacted using a polyurethane glue; density 800 e 1000 kg/m³ and more. A non-woven, non-stretch synthetic membrane is applied on both side of panel.

Installation process
The fixing to the sleepers does not interface with normal conditions of handling, transportation, stacking etc; the methods of fixing are:
- Inserting into wet/unset concrete during manufacturing of sleepers by using an interlocking layer, synthetic membrane
- Gluing to hardened concrete
Increase ballast Expected Life

The use of USP on the track increase the ballast life

The expected life of USP when fixed to sleeper is not less than normal life of concrete sleeper under normal operating and environmental conditions.

Ballast cushion reduction

Minimum ballast cushion thickness has been limited to 20 cm, as usually requested for the correct use of tamping machines.

The foreseen medium pressure $\sigma$ on ballast stones (i.e. the maximum stress on the beam “ballast”) is preserved, even with a reduced (from 35 cm to 20cm) ballast bed, should the sleeper be fitted with a layer of ISOLGOMMA USP.

As a consequence, upgrading the rail track with ISOLGOMMA USP ballast service life will be guaranteed, even if the ballast cushion thickness “$h$” is substantially reduced.
# USP - Under Sleeper Pad - On Ballasted Track

## STANDARD EN 16730

The Tests according to the EN 16730 Standard, on USP on concrete block with GBP plate according EN 16730

<table>
<thead>
<tr>
<th>Technical characteristics</th>
<th>Norm</th>
<th>Unit</th>
<th>USP-A</th>
<th>USP-B</th>
<th>USP-C</th>
<th>Tollerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Stiffness Cstat on concrete Block with GBP</td>
<td>EN 16730</td>
<td>N/mm²</td>
<td>0,36</td>
<td>0,23</td>
<td>0,14</td>
<td>± 10%</td>
</tr>
<tr>
<td>Dynamic Stiffness Cdyn on concrete block with GBP</td>
<td>EN 16730</td>
<td>N/mm²</td>
<td>0,57</td>
<td>0,28</td>
<td>0,16</td>
<td>± 10%</td>
</tr>
</tbody>
</table>

### Capability of stacked storage
- EN 16730

### Static Stiffness variation %
- ≤ 30%

### Dynamic Stiffness variation %
- ≤ 15%

### Fatigue test con concrete block and GBP
- EN 16730

### Static Stiffness variation %
- ≤ 25%

### Dynamic Stiffness variation %
- ≤ 15%

### Effect of severe environmental conditions
- EN 16730

### Dynamic Stiffness variation %
- ≤ 15%

### Pull - out
- sMin ≥ 0.40 N/mm²
Installation & Maintenance process

The USP does not adversely affect the normal track renewal and maintenance procedure.

Dimensions of USP are as per bottom profile of concrete sleepers of Indian Railways viz, with a recess of 15 mm from edges of sleeper to avoid damages to USP during handling and transportation.

Environmental effect

The USP does not include any additives hazardous to the environment, the USP isn’t an element of the track which pollutes the environment and it’s recyclable at the end of life. ages to USP during handling and transportation.

Other application of USP: Under Concrete Plate