N. Saravanan

Carpet Reinforcement – An Innovative And Productive Solution For Slab Construction
Synopsis

- About NatSteel
- Carpet Reinforcement
- Carpet Characteristics
- Application
- Carpet Benefits
- Case Studies
- Overseas Carpet Adoption
- Conclusion
Synopsis

- About NatSteel
- Carpet Reinforcement
- Carpet Characteristics
- Application
- Carpet Benefits
- Case Studies
- Overseas Carpet Adoption
- Conclusion
NatSteel’s Asia Pacific Footprint

• Established in 1961 as the National Iron and Steel Mills to primarily serve the construction industry

• Member of Tata Steel, a top global steel company with significant presence in India, Asia Pacific and Europe

• NatSteel has a combined capacity of 3 MTPA

• Geographical Presence
  • Singapore
  • Malaysia
  • Thailand
  • Vietnam
  • Hong Kong
NatSteel Singapore is a fully integrated steel mill providing steel reinforcement solutions.

- Mesh Solutions
- Prefabricated Cage Solutions
- Carpet Reinforcement Solutions
- Cut & Bend and Coupler Products

Production Centre (Meltshop)
Being GREEN has always been high on our agenda

Production Centre (Rolling Mill)
Bench-marking against the world’s top performing steel mills.

Customers’ needs are met through our customized downstream fabrication services.
Synopsis

- About NatSteel

- **Carpet Reinforcement**

- Carpet Characteristics

- Application

- Carpet Benefits

- Case Studies

- Overseas Carpet Adoption

- Conclusion
Carpet Reinforcement

- Carpet Reinforcement can be defined as “Unidirectional reinforcement bars in roll form - Carpet”

- Carpets are formed by wire spinning for easy rolling & adjustment onsite

- Carpets can be rolled over at right angles to each other to form different layers of reinforcement

- Bar spacings maintained by wires
Carpet Reinforcement – Simple Laying Method

Carpet being hoisted onsite

Carpet positioning in progress

Carpet laid out

Carpet rolling out in progress
Carpet Reinforcement- Video
Synopsis

- About NatSteel
- Carpet Reinforcement
- **Carpet Characteristics**
- Application
- Carpet Benefits
- Case Studies
- Overseas Carpet Adoption
- Conclusion
Carpet Characteristics

The characteristics of the carpet reinforcement are defined by its bar size, spacing and shape, apart from others. The general characteristics and their ranges are as follows,

- Bar size: 16mm to 40mm
- Bar spacing: 50mm to 450mm
- Bar length: 3M to 12M
- Bar shape: straight bar – non bend
- Carpet weight: 2T to 4T / roll
- Two different bar sizes, alternatively – possible
Carpet Characteristics – Shape

- **Standard Carpet (12M long bars)**
- **Non Standard Carpet with Stagger**
- **Standard Carpet with Opening**
- **Non Standard Carpet with Taper**
Synopsis

- About NatSteel
- Carpet Reinforcement
- Carpet Characteristics

Application

- Carpet Benefits
- Case Studies
- Overseas Carpet Adoption
- Conclusion
Carpet Reinforcement Applications

Carpets can be used for **Slabs** and **Walls**, 

- Commercial / Industrial Projects
- Multi-storey Car Parks
- MRT Stations (UG / AG)
- Cut & Cover Tunnels
- Roads
- Canals / Large Drains
- Bridge Decks
- Raft foundations
- Large Pile Caps
- Retaining Walls
Synopsis

- About NatSteel
- Carpet Reinforcement
- Carpet Characteristics
- Application

- Carpet Benefits
- Case Studies
- Overseas Carpet Adoption
- Conclusion
Benefits of Carpet Reinforcement

- Reduction of rebar laying **Time** by up to 80% Vs Traditional loose bar laying
- Reduction of **Manpower** by up to 60% Vs Traditional loose bar laying
- Construction **Productivity** improved by up to 10 times
- Carpet Design & Installation **Drawings** done by trained engineers at factory
- **Simple** working method onsite – Rolling Vs Laying
- Higher construction **Quality** as spacing is maintained by wires
- **Cost Effective** – Overall cost effective than traditional loose bar laying
Synopsis

- About NatSteel
- Carpet Reinforcement
- Carpet Characteristics
- Application
- Carpet Benefits
- Case Studies
- Overseas Carpet Adoption
- Conclusion
Case Study-1: Subway
Construction Productivity – Carpet: Subway Base Slab

Plan View of Subway

Rolling Top Layer of Carpet

Rolling Bottom Layer of Carpet

Base Slab Casted
## Construction Productivity – Carpet: Subway Base Slab

<table>
<thead>
<tr>
<th>Item</th>
<th>Carpet Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base slab size</td>
<td>8.2M wide x 57M long, 1M thick</td>
</tr>
<tr>
<td>Reinforcement</td>
<td>T16/20/32-150 – T&amp;B</td>
</tr>
<tr>
<td>No. of Men</td>
<td>6</td>
</tr>
<tr>
<td>No. of Carpets</td>
<td>34</td>
</tr>
<tr>
<td>Total Carpet weight</td>
<td>28.3Tonne</td>
</tr>
<tr>
<td>Total Time – for Positioning &amp; Rolling out</td>
<td>3.13 Hours</td>
</tr>
<tr>
<td>Total Man hours</td>
<td>18.78 Man Hr</td>
</tr>
<tr>
<td>Productivity</td>
<td>1.51 T / Man Hr</td>
</tr>
</tbody>
</table>

**Traditional Method (loose bars):**
- Productivity = 0.17 T / Man Hr – 12 Men team*
- Total Man hours required = 28.3 / 0.17 = 166.5 Man Hr > 18.78 Man Hr

**Carpet Method is 8.9 Times More Productive with 50% Less Men!**

*Data from a similar project using Traditional Method*
Case Study-2: MRT Station
Construction Productivity – Carpet: MRT Station Roof Slab

Plan View – Roof Slab

1st Layer T40 Carpets Rolled Out – Staggered Lap

2nd Layer T40 Carpets Rolled Out

Roof Slab Being Prepared For Casting
### Construction Productivity – Carpet: MRT Station Roof Slab

<table>
<thead>
<tr>
<th>Item</th>
<th>Carpet Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base slab size</td>
<td>23M wide x 42.2M long, 1.2M thick</td>
</tr>
<tr>
<td>Reinforcement</td>
<td>T20/25/32/40-150 – T&amp;B</td>
</tr>
<tr>
<td>No. of Men</td>
<td>6</td>
</tr>
<tr>
<td>No. of Carpets</td>
<td>71</td>
</tr>
<tr>
<td>Total Carpet weight</td>
<td>81.5Tonne</td>
</tr>
<tr>
<td>Total Time – for Positioning &amp; Rolling out</td>
<td>8.93Hours</td>
</tr>
<tr>
<td>Total Man hours</td>
<td>53.6 Man Hr</td>
</tr>
<tr>
<td>Productivity</td>
<td>1.52 T / Man Hr</td>
</tr>
</tbody>
</table>

**Traditional Method (loose bars):**
- **Productivity** = 0.19 T / Man Hr – 12 Men team*
- **Total Man hours required** = 81.5 / 0.19 = 428.9 Man Hr > 53.6 Man Hr

---

**Carpet Method is 8 Times More Productive with 50% Less Men!**

*Data from a similar project using Traditional Method*
Synopsis

- About NatSteel
- Carpet Reinforcement
- Carpet Characteristics
- Application
- Carpet Benefits
- Case Studies

- Overseas Carpet Adoption
- Conclusion
Overseas Carpet Adoption

- Carpet reinforcement is extensively being used in Europe – UK, Germany, Denmark, Norway, Sweden etc – for over 10 years or so for various types of projects including Residential & Commercial Buildings, Industrial buildings, Tunnel and runway projects.

- Australia began using carpet reinforcement about 4 years ago or so mostly for road and building projects.

- Middle-East has reported to have used carpets extensively in the past 3 years or so.

- Carpet reinforcement was first introduced by NatSteel in Singapore last year. Since it’s introduction various projects like Industrial, MRT and Canal projects have started adopting it for it’s multiple benefits. Moreover, government funding support is available for projects adopting carpet reinforcement.
Synopsis

- About NatSteel
- Carpet Reinforcement
- Carpet Characteristics
- Application
- Carpet Benefits
- Case Studies
- Overseas Carpet Adoption

Conclusion
Conclusion

- Traditional method of fixing reinforcement – using loose pieces of rebars – is a time consuming and laborious process.
- Carpet method is faster – saves time up to 80%
- Carpet method saves manpower – up to 50%
- Productivity improvement of up to 8.9 times have been measured
- Many European countries have already adopted carpet – spreading to other parts of the world
- Ideal solution for countries facing productivity and manpower issues
Thank you