ENGINEERED CEMENT-BASED COMPOSITE SYSTEMS FOR EXPANSION JOINT-FREE BRIDGES (Jt-Free)

Alternative to conventional expansion joints for maintenance-free bridges with long service life

The durability and life of most of the bridges are affected by expansion joints. More often, the debris accumulation leads to improper functioning of the joints and causes stress accumulation in the superstructure; leakage of drainage water through these joints damages vital parts of the bridge sub-structure. Expansion joints also make construction expensive and require huge maintenance. In order to overcome these issues, an engineered concrete based technology (Jt-Free) has been developed which can serve as a replacement to conventional expansion joints. The proposed technology maintains the simple supported functionality of the individual spans while eliminating the need for deck joints. This technology also reduces the construction and maintenance costs, avoids the potentially damaging overloads by distributing loads along the continuous deck, offers better riding comfort and increases the life expectancy of the bridges.

Features / Highlights

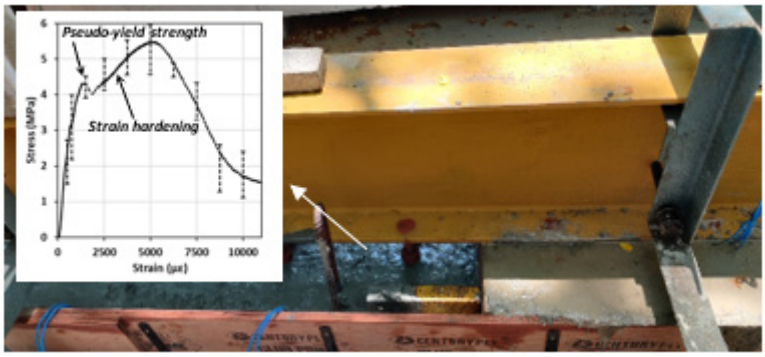
- Technology to overcome the perennial problems of conventional expansion joint related problems in bridges
- Developed composite system will:
  1. Significantly increase the service life of bridges
  2. Offer riding comfort as it can make the bridges joint-free
  3. Improve the fuel efficiency of vehicles
- Reduce the maintenance demand of bridges
- Due to the less reinforcement demand, implementation will be easy
- Can be implemented in new as well as existing bridges
- Life-cycle cost of the technology is very low compared to conventional expansion joints
- Indigenous technology with high market potential

Technical Details

- Technology to resist thermal expansion of bridges
- Capable of withstanding the vehicular fatigue loads
- Engineered cement-based composite system
- Minimum reinforcement
- Length ≈ 5% of span length of two spans

Applications

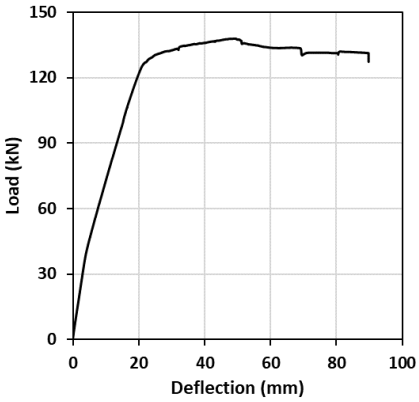
- Engineered cement-based composite systems for expansion joint-free bridges (Jt-Free) can be used as a replacement to conventional expansion joints and aid in development of expansion-joint free bridge deck systems
- Applicable to any environmental exposure condition and high temperature variation
- Effective for easy and fast replacement of the existing metallic or polymeric expansion joint and completely maintenance-free
- Due to the efficient design, low cost to performance ratio and high durability, this novel Jt-Free will be a game changer in bridge industry with huge socio economic impact



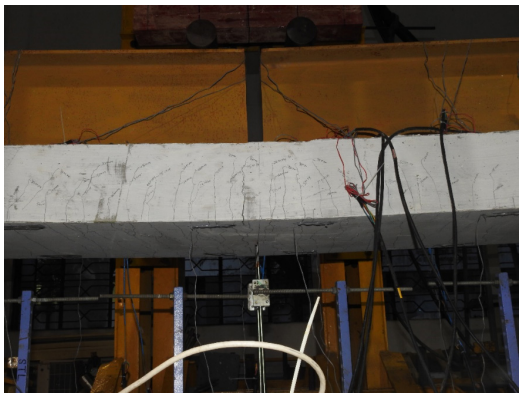
Fabrication of the technology

Experimental investigations on the proposed technology

Experimental test set-up for investigations (inverted position)



Performance under static load



Deck showing multiple micro-cracks formation

Status of Technology

- Design of the technology for in-situ applications
- Fabrication of the technology for assessing its performance
- System level validation in laboratory environment

Future Plan

- Design of technology for in-situ applications and as a prefabricated product
- Investigations on the developed technology to evaluate its efficacy under static, cyclic and fatigue loading scenarios
- Full scale demonstration of the performance of the technology
- Industry connect for upscaling of technology, field demonstration and for technology transfer

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