Title: Dynamically Resilient Steel-Concrete Composite Super-Structure for Rapid Transportation (Dyna-Com)

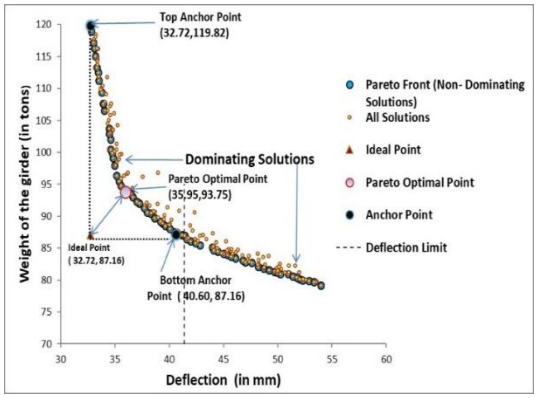
Duration: April 2024 to March 2026

Objectives:

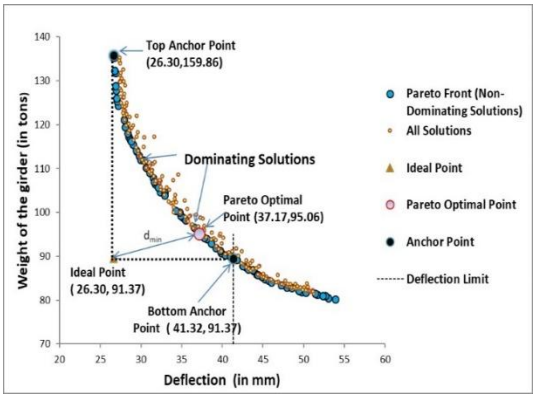
- Development of novel high performance concrete (nHPC) for rapid transportation
- Numerical simulations of steel-concrete composite bridges for rapid transportation
- Experimental investigations for evaluating the dynamic and fatigue performance of the developed steel-concrete composite structural systems

Progress Highlights:

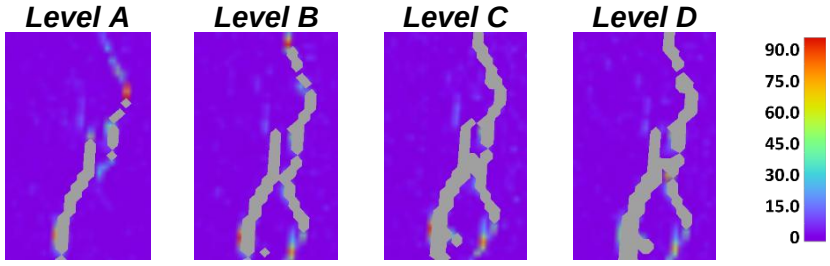
- ❖ Investigations on the tensile performance of strain hardened cementitious composites using specially designed and in-house fabricated test set-up
- ❖ Analyzing the post-peak behavior of the developed composite and correlating it with their strain/crack characteristics using image based correlation technique
- ❖ Design of steel-concrete composite girders for rapid transportation using high speed train models adhering to relevant codal provisions
- ❖ Optimization of composite girders using evolutionary algorithms for twin I-girder and trapezoidal box girder configurations and analysis of their Pareto fronts
- ❖ State-of-the-art review on wheel-rail interaction elements for carrying out vehicle bridge interaction studies



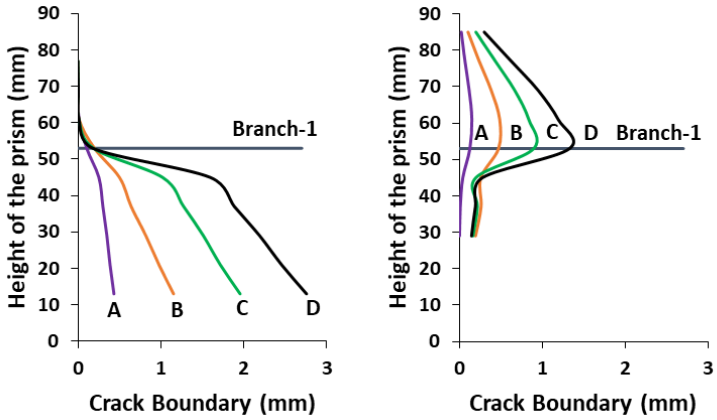
Pareto front of the twin i-girder bridge



Pareto front of the trapezoidal box girder bridge



a) Horizontal strain contours at different load levels



b) Left crack ***c) Right crack***

Phenomenon of crack branching of strain hardened cementitious composite, a) Horizontal strain profile (in micro-strain), Crack boundaries of b) Left crack and c) Right crack at different load levels

Future Programme:

- Investigations towards development of high-strength, strain-hardened cementitious composites
- Dynamic similitude analysis of steel-concrete composite girder towards laboratory investigations
- Evaluation of response of steel-concrete composite girder with wheel-rail interactions using different non-iterative numerical simulations

PI and Co-PI

Dr. B.S. Sindu (PI)
Mr. M. Kannusamy (Co-PI)

Team:

Dr. Ing. Saptarshi Sasmal
Mr. K. Saravana Kumar
Dr. A. Thirumalaiselvi
Mr. A.M. Sarath

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