CSIR Structural Engineering Research Centre

Stakeholder Connect for the projects on

Innovative structural systems, integrity assessment and structural health monitoring of high speed railway bridges

and

Fiber Optic Based Wayside Railway Asset Monitoring System

30th August 2023

About Us

Structural Engineering Research Centre (SERC) is a pioneering research institute with focus on structural engineering under the umbrella of Council of Scientific and Industrial Research (CSIR). CSIR-SERC has carried out exhaustive R&D activities ranging from design and development of sustainable/multifunctional materials and structural systems, structural health monitoring and life enhancement of structures through multidisciplinary, advanced analytical / computational / experimental techniques. The institute has contributed greatly towards the welfare of our nation by providing timely engineering interventions and is equipped with state-of-the-art facilities for testing of structures & structural components and has been providing novel and cost-effective solutions to the challenging problems faced by the industry, society and strategic sectors. The services of CSIR SERC are being extensively used by the central and state governments and public and private sector undertakings. Scientists of CSIR SERC serve on many national and international committees and this centre has recognition nationally and internationally as a leading research institution in the field of structural engineering.

Tentative Program

Time	Event
10.00 - 10.05 am	Introduction
10.05 -10.15 am	Welcome address by Director, CSIR-SERC
10.15 -10.30 am	Brief presentation on the projects
10.30 -11.30 am	Perspectives of Stakeholders
11.30 -11.45 am	Break
11.45 -12.45 pm	Panel Discussion
12.45 -12.55 pm	Closing remarks by Director, CSIR-SERC
12.55 -1.00 pm	Vote of thanks

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Major focus:
- **Indigenous technology development**
- **Capacity building towards import substitution**

Title of Project	Innovative structural systems, Integrity assessment and structural health monitoring of High Speed Railway Bridges

The economic growth of a country greatly depends on its transportation system. Though the concept of high speed railways came into existent as early as 1970s, most of the countries started adopting it only very recently. So far around 20 countries have constructed HSR network with minimum operating speed of 250 kmph. Many other counties including India have started construction or are in planning stages. Most of the HSR lines are being planned in the elevated corridor considering the safety aspects. Hence development of bridges with materials and structural systems that account for dynamic effects due to trains running at high speed is very crucial for the successful implementation of HSR network. This project aims at providing innovative solution for development of high speed railway bridges with in-built structural health monitoring capabilities. Steel-concrete composite superstructure is being proposed in this project as it will overcome the problem associated with conventional steel and concrete bridges. The composite girders will be designed for static and dynamic strength and serviceability limits prescribed in the codal provisions for HSR structures. Experimental investigations will be carried on structural component level to assess its fatigue behavior and multi-metric strategies will be employed to get a wholistic picture of the damage progression. It is also aimed at developing methodologies for determining the real-time health of the HSR bridges to assess its stress state and continuous monitoring for early stage damage detection through artificial intelligence techniques.

Title of Project	Fiber optic based wayside Railway Asset Monitoring System

Indian Railways is now looking for on Board Condition Monitoring System of Rolling Stock which will enable predictive maintenance of coaches, wagons, locomotives and track. The current practice of inspection of Rolling stock over Indian Railways is largely based on manual inspection, which is either track side Rolling-in-Examination or pit examination of Rolling Stock in stationary or slow moving condition. The improvements in sensing technologies combined with latest machine learning algorithms are being explored for developing intelligent systems for real time online monitoring. Fiber optic based wayside railway asset monitoring system (FRAMS) for monitoring the condition of rolling stock to ensure safe operation of trains will be developed in this project. The main aim of this project is to develop an effective instrumentation methodology using indigenous fiber optic sensors to evaluate various wayside monitoring parameters like weigh in motion, wheel flat detection, uneven or over load detection, longitudinal stresses in rails and lateral load detection in rails to ensure safe operation of passenger and freight trains.

Outcomes Envisaged

➢ Novel high performance concrete with fatigue tolerant capabilities

➢ Robust techniques for sensing and Structural health monitoring (SHM) of high speed railway bridges

➢ Fiber optic based wayside railway asset monitoring system (FRAMS) for monitoring the condition of rolling stock ensuring safe operation of trains