

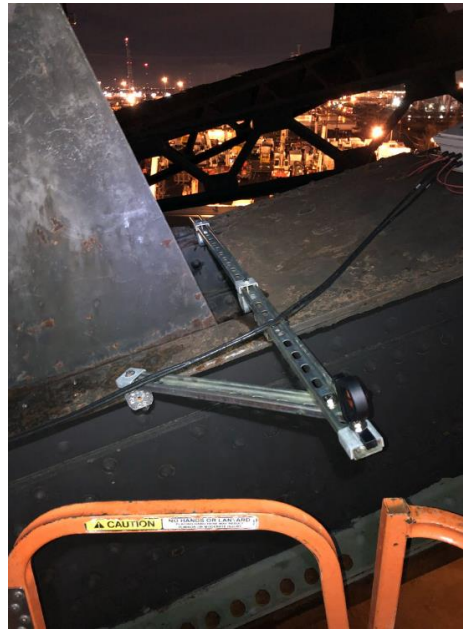
Structural Health Monitoring & Evaluation



There are around one million major highway and railway bridges in India. With the ever-growing traffic and demands, the need of the hour is to optimize the load carrying capacity of heavy trucks and loaded wagons in railways. Though the existing road and railway network might be able to cope up with additional load in terms of axle loads but load bearing capacity and the health of existing bridges is going to propose a major challenge. For example, there are around 160 thousand railway bridges, out of which eighty percent of them are more than eighty years old. Furthermore, there are no foundation drawings available for these old bridges.

Therefore, it is important to do a detailed health evaluation of these bridges periodically and map these unknown foundations. The periodic health evaluation comprises of *health monitoring* and *testing* of these bridges using advanced *Non-Destructive Technologies (NDT)*.

We provide an extensive array of integrated systems for structural health monitoring and evaluation. Our solutions cater to a diverse



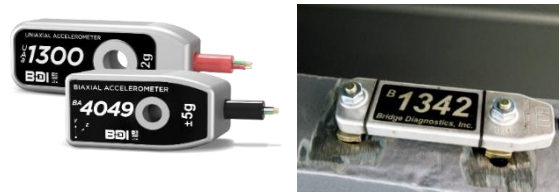
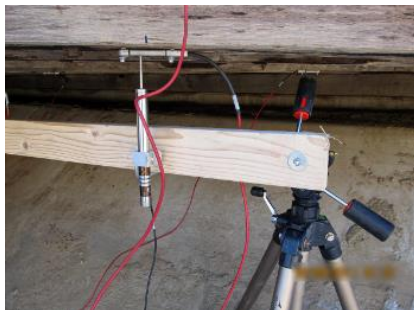
range of structures including foundations, bridges, dams, and buildings. Here discussed are these systems to ensure ongoing health and safety of the structures. Our smart data acquisition systems and user-friendly software streamline the process, empowering workers, scientists, and researchers to efficiently interpret data and attain the desired results. With our solutions, stakeholders can effectively assess the condition of structures, identify potential issues, and implement timely maintenance or remedial measures to uphold structural integrity and safety standards. We also offer



innovative IoT telemetry products and powerful data management software. These telemetry devices are designed with practicality and ease of use in mind to ensure fast setup and seamless data delivery from monitoring projects across the structural, geotechnical, and environmental fields. All the unique multi-comms IoT products can connect to any sensor, providing unlimited options for use.

Dynamic Load & Strain Monitoring

Dynamic load and strain monitoring plays a pivotal role in various applications where understanding the real-time behaviour of



structures is crucial for safety and performance optimization. *Accelerometers*, designed to excel in these scenarios, offer robustness that is invaluable for applications like earthquake monitoring, where rapid and accurate detection of seismic activity is paramount for early warning systems. Additionally, in vehicle dynamics analysis, these sensors provide crucial data for optimizing vehicle design and performance, ensuring both safety and efficiency on the road. Moreover, their versatility extends to *structure vibration testing*, aiding engineers in assessing the *structural integrity* of buildings, bridges, and other infrastructure under dynamic loads. In contrast, static load and strain monitoring is pivotal for evaluating long-term structural health and performance



under constant or slowly changing loads. *Strain transducers* and vibrating wire load cells find wide application in this realm. Their ability to measure strain and load on various materials, including steel, concrete, and timber, makes them indispensable for monitoring pre-stress/post-tension concrete structures, detecting fatigue in critical components, and ensuring structural stability over time. Furthermore, their robust construction and waterproof design enable reliable performance in harsh environments, making them suitable for live-load testing and monitoring in marine structures or outdoor installations. By providing insights into structural behaviour over time, these sensors facilitate proactive maintenance

strategies, ensuring the longevity and safety of vital infrastructure assets.

Displacement & Temperature Monitoring

Displacement and temperature monitoring are critical aspects of structural health assessment, ensuring the stability and durability of various constructions. Leveraging advanced technologies, such as



the *Linear Variable Differential Transformer (LVDT) displacement transducer*, engineers can accurately track movement in structural components affected by live loads and temperature fluctuations. *Thermistor Probes*,

housed within durable PVC enclosures, excel in capturing temperature variations in hostile environments. With a rapid response to temperature changes and immunity to chemical degradation, these probes are ideal for applications such as monitoring concrete curing temperatures and steel surface temperatures. Their versatility extends to measuring water temperatures in marine and industrial settings, highlighting their efficacy in ensuring optimal conditions for various structural materials and configurations.



Rotational/ Tilt Measurement of Structure

Rotation and tilt monitoring play pivotal roles in ensuring the stability and safety of structures, and *T500 tiltmeter* and the



Telemetry Tilt Meter provides rotation measurements of the structure, through electrolytic fluid-based tilt sensor. The rugged aluminum housing and simple range adjustment features make it suitable for various mounting configurations, including bridge slabs, retaining walls, and tainter gates. *Telemetry Tilt Meter* leverages cutting-edge wireless IoT technology to deliver precise triaxial tilt measurements with



unparalleled accuracy. Its autonomous data logging and transmission capabilities, coupled with 4GLTE or satellite connectivity, enable remote monitoring in the most remote areas without single-point failures. With a compact and rugged design, it facilitates plug-and-play setup and remote configuration changes, making it suitable for applications ranging from slope stability monitoring to rail and structural integrity assessments.



Remote Monitoring

Remote monitoring solutions like the *Vibrating Wire Telemetry* and *EWS Switch* are revolutionizing structural, geotechnical, and environmental monitoring applications. These can connect to standard sensors enabling



remote monitoring in complex integrated systems. The VWT, with its adaptable configurations, is particularly effective for tailings dam monitoring, ensuring reliable data transmission even in challenging environments. Its compatibility with various sensors makes it suitable for a range of applications, from monitoring structural integrity to assessing environmental conditions. The versatility caters to applications such as slope stability monitoring, enhancing resilience and adaptability in monitoring efforts. Both solutions offer reliable operation and scalability, addressing the evolving needs of remote monitoring projects across various industries.



Advanced and Convenient Data Acquisition

Advanced data acquisition systems are revolutionizing structural testing, offering tailored efficiency and precision to engineers. The *STS4* leads the charge with its rugged design and support for long-term monitoring applications, providing invaluable time-saving features that enhance productivity in the field.





Complementing this innovation are the *STS4-4 nodes*, boasting four-channel capabilities and compatibility with various sensors ensuring reliable performance for diagnostic testing applications. Moreover, we also offer wireless technology to monitor the longitudinal position of loading vehicles during tests by *Load position tracker*, providing engineers with invaluable insights into structural behaviour under varying loads. This nuanced understanding enhances the accuracy of analyses, particularly in assessing bridge responses to different stresses. Together, these systems represent a new era in structural testing, empowering engineers with unprecedented convenience

and precision to ensure the safety and longevity of critical infrastructure.

Support and Services

Support and software for structural monitoring have undergone remarkable advancements, delivering unparalleled convenience and efficiency. The *Solar-Mount Telemetry Logger*, a rugged, self-contained solution manufactured in Australia,



seamlessly integrates with various sensors, ensuring reliable data transmission even in remote areas. Its compact design, coupled with features like Bluetooth connectivity and automatic data upload, enhances user convenience. Paired with the *STS-LIVE application*, which leverages the latest STS4

data acquisition hardware, engineers benefit from intuitive setup and versatile functionality. Additionally, *STS-VIEW* provides a user-friendly graphing application tailored for viewing data from STS4 systems, offering quick insights for informed decision-making. Together, these solutions redefine structural monitoring, providing engineers with unprecedented ease of use, efficiency, and actionable insights.

Mobile Bridge Inspection Unit

Our array of Platform & Bucket Type Mobile Bridge Inspection Units (MBIUs) offers a





versatile and efficient solution for bridge and viaduct inspections. Mounted onto Indian Truck Chassis, these specialized vehicles eliminate the need for traditional scaffolding, providing a secure and cost-effective alternative. The MBIUs are highly mobile and can be swiftly deployed without extra hydraulic feet, making setup hassle-free.



With horizontal reaches ranging from 12 to 22 meters and customizable options, our units cater to various project requirements. The Platform-type MBIU, with platform lengths from 15 to 26 meters, offers a secure working area for inspectors and engineers, complete with power outlets and safety features. It ensures safe and efficient transportation of personnel and equipment, enhancing operational efficiency with quick 10-minute deployment times. The Bucket-type MBIU, with boom lengths from 16 to 22 meters, is designed for swift manoeuvrability and secure operation, making it ideal for light maintenance tasks and thorough inspections.

Its articulated boom design and bucket ensure safe transportation of personnel and equipment to various bridge locations, including under bridges and piers. Despite its extensive capabilities, the MBIU remains ensuring structural safety. Enhanced safety measures, such as safety/limit switches and stability actuators, guarantee reliable operation. Both types of MBIUs provide comprehensive coverage, ensuring efficient and safe bridge inspection and maintenance, ultimately contributing to the longevity and integrity of vital infrastructure.



Structural Health Evaluation

Structural health evaluation is crucial for the safety and durability of bridges, dams, and foundations. Our team specializes in non-destructive testing (NDT) methods, offering comprehensive assessments to detect construction defects, assess damage, and guide repair decisions. Using advanced techniques, we measure thickness, detect flaws, predict strength, and evaluate integrity, providing actionable insights for



informed maintenance and repair strategies.

This ensures the longevity and reliability of critical infrastructure, safeguarding them against potential failures. *Sonic Echo/Impulse Response (SE/IR)* and *Parallel Seismic (PS)* systems are key tools in our evaluation arsenal. The SE/IR system assesses the foundation length and structural integrity by capturing echoes from an impacted foundation, effective for piles, drilled shafts,



mat foundations, and abutment walls. It is particularly useful for concrete, wood, and steel structures. PS systems provide detailed insights into foundation length, compressional velocity, and underlying soil conditions, ideal for inaccessible sites. They offer fast, accurate measurements without excavation, enhancing efficiency and reliability in foundation assessments.



Advanced technologies like *Ground Penetrating Radar (GPR)* and *Impact Echo Scanning (IES)* further enhance our evaluation capabilities. The MALÅ ProEx Control Unit, a versatile GPR system, excels in void and subgrade support evaluation, reinforcement mapping, and utility detection. Its adaptability makes it indispensable for various non-destructive assessment needs. IES systems, on the other



hand, are tailored for investigating wide areas of structural concrete and pavements, locating voids, debonding, and cracks within overlays. These technologies, along with portable solutions like the *Construction Scan 2500* and *Ultraseismic methods*, ensure thorough and accurate evaluations of foundations, bridges, and parts of dams such as spillways and conduits.

In conclusion, our comprehensive approach to structural health evaluation combines advanced non-destructive testing methods



and cutting-edge technologies to ensure the integrity and safety of critical infrastructure like bridges, dams, and foundations. By employing tools such as Sonic Echo/Impulse Response, Parallel Seismic systems, Ground Penetrating Radar, and Impact Echo Scanning, we deliver precise and actionable insights that inform effective maintenance and repair strategies. Our expertise and innovative solutions not only enhance the durability and reliability of these structures but also help in preventing potential failures, ultimately safeguarding public safety, and extending the lifespan of essential infrastructure. Through meticulous evaluation and continuous monitoring, we are committed to maintaining the highest standards of structural health and integrity.



Complete Instrumentation Solutions Private Limited
Suite 512, Suncity Business Towers Golf Course Road, Sector-54, Gurgaon- 122002 Haryana 08
e-mail: info@instrumentation-solutions.com www.instrumentation-solutions.com