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Resilient India - Disaster Free India



सत्यमेव जयते

BMTPC



75
आज़ादी का
अमृत महोत्सव

Web-Workshop (Online)
on

NIDM
WEBINAR SERIES - 26

HOW STRUCTURAL HEALTH MONITORING WORKS?

DATE : 13TH DECEMBER, 2023 (WEDNESDAY)

TIME: 07:00 PM - 09:00 PM (IST)

PATRONS



PROF. S.K. SINGH
VICE CHANCELLOR,
RAJASTHAN TECHNICAL UNIVERSITY, KOTA
CHAIRMAN, INSTITUTE OF ENGINEERS (INDIA)
DELHI STATE CENTRE



SHRI RAJENDRA RATNOO, IAS
EXECUTIVE DIRECTOR
NATIONAL INSTITUTE OF DISASTER
MANAGEMENT
MINISTRY OF HOME AFFAIRS,



DR. SHAILESH KR. AGRAWAL
EXECUTIVE DIRECTOR
BUILDING MATERIALS AND TECHNOLOGY
PROMOTION COUNCIL
MINISTRY OF HOUSING AND URBAN AFFAIRS,

GUEST SPEAKERS



PROF. DEEPAK KHAZANCHI
UNIVERSITY OF NEBRASKA,
OMAHA, U.S.



ER. PRADIT KULSHRESHTHA
CO-FOUNDER, LIVEHOOAH
PVT. LTD



PROF. SURESH BHALLA
DEPARTMENT OF CIVIL
ENGINEERING, IIT DELHI
PRESIDENT, ISHMS

SESSION CHAIR



PROF. CHANDAN GHOSH
HEAD
RESILIENT INFRASTRUCTURE DIVISION
NATIONAL INSTITUTE OF DISASTER
MANAGEMENT
MINISTRY OF HOME AFFAIRS, GOI

GUEST OF HONOUR

COORDINATOR & MODERATOR



MS. AVIPSHA MOHANTY
YOUNG PROFESSIONAL
RESILIENT INFRASTRUCTURE DIVISION
NATIONAL INSTITUTE OF DISASTER
MANAGEMENT
MINISTRY OF HOME AFFAIRS, GOVT. OF INDIA

Registration link:

<https://training.nidm.gov.in/>

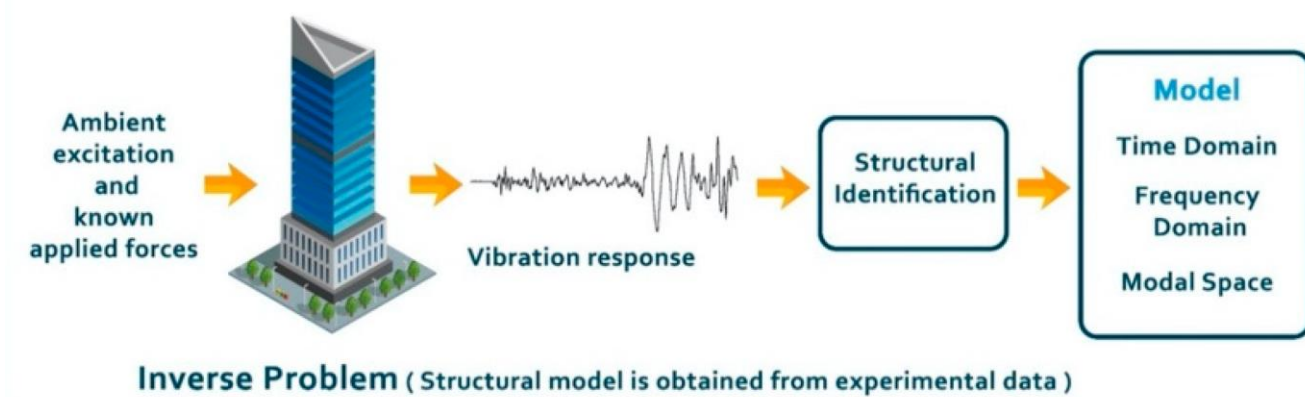
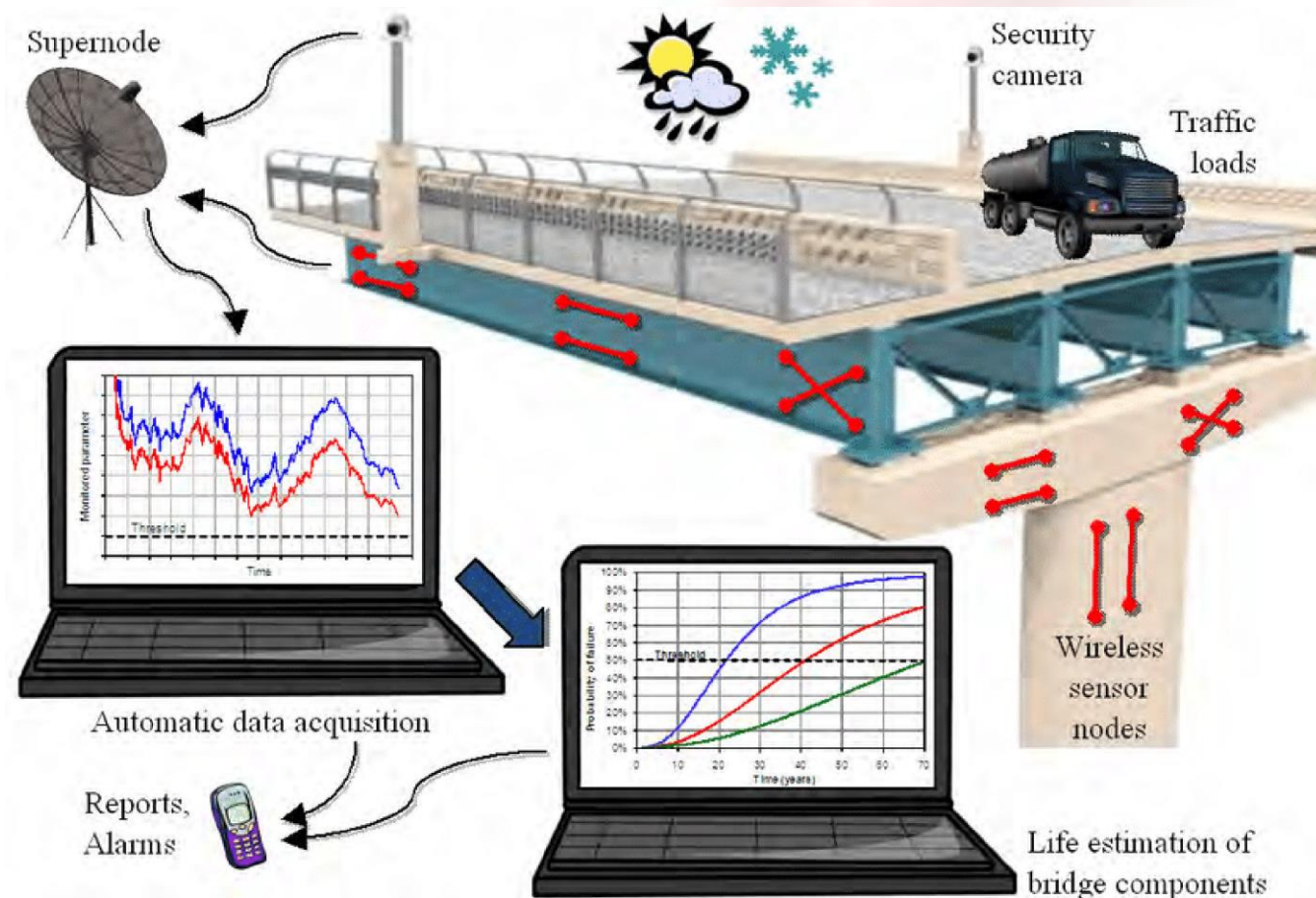
NIDM Training Portal

Register yourself, then enroll for the upcoming Programme

Get e-Certificate after successfully completion of the Programme

YouTube Link:

<https://youtube.com/live/9Zn24cYQcgg?feature=share>





How Structural Health Monitoring Works?

Concept Note

Date & Time: 13th December (Wednesday);
7:00 PM to 9:00 PM (IST)

National Institute of Disaster Management,
Ministry of Home Affairs, Govt. of India

CONCEPT NOTE

Topic: How Structural Health Monitoring Works?

National Institute of Disaster Management, Ministry of Home Affairs, Govt. of India

Date and Time: 13th December 2023, (Wednesday); 7:00 PM - 09:00 PM (IST)

Introduction

Structural Health Monitoring (SHM) is a technology-driven process that involves the continuous or periodic assessment of the structural condition of a building, bridge, dam, or any other infrastructure asset. The primary goal of SHM is to detect and assess damage, deterioration, or changes in the structural integrity of a system over time. The overview of how Structural Health Monitoring works are as mentioned below:

a. Sensor Deployment:

- **Selection of Sensors:** Different sensors are chosen based on the specific structure and the type of data required. Common sensors include accelerometers, strain gauges, displacement sensors, and temperature sensors.
- **Strategic Placement:** Sensors are strategically placed in critical locations on or within the structure to capture relevant data. The placement depends on the type of structure and the expected stress points.

b. Data Acquisition:

- **Continuous Monitoring:** Sensors continuously collect data related to structural responses such as vibrations, deformations, and temperatures. In some cases, monitoring may be periodic, depending on the monitoring objectives and the structure's criticality.
- **Wireless Communication:** In modern SHM systems, data is often transmitted wirelessly to a central monitoring system for real-time analysis.

c. Data Analysis and Processing:

- **Signal Processing:** Raw data from sensors undergo signal processing to filter out noise and extract meaningful information. This step involves techniques like Fourier analysis, wavelet transforms, and filtering.
- **Feature Extraction:** Relevant features are extracted from the processed data to identify patterns or anomalies indicative of structural issues.

d. Damage Identification:

- **Comparison with Baseline:** The processed data is compared with baseline or reference data obtained during the structure's healthy state. Deviations from the baseline can indicate potential damage or changes in structural behavior.
- **Pattern Recognition:** Advanced algorithms, including machine learning and artificial intelligence, may be employed to recognize patterns associated with specific types of damage.

e. Decision-Making:

- **Risk Assessment:** Based on the identified damage or anomalies, the system assesses the risk associated with the structural condition. This information is crucial for making informed decisions regarding maintenance, repairs, or operational changes.

f. Reporting and Visualization:

- **Alerts and Notifications:** In case significant structural issues are detected, the system generates alerts or notifications to relevant stakeholders.
- **Visualization Tools:** Data is often presented through graphical interfaces, allowing engineers and decision-makers to visualize the structural health in real time.

g. Maintenance and Intervention:

- **Timely Action:** With the insights gained from SHM, engineers can plan and execute timely maintenance or intervention measures to address identified issues and prevent further deterioration.
- **Lifecycle Management:** SHM contributes to the overall lifecycle management of structures, extending their service life through proactive maintenance.

Structural Health Monitoring is a proactive approach that enhances safety, reduces maintenance costs, and contributes to the overall resilience and sustainability of infrastructure. Advanced technologies continue to evolve, making SHM more effective, efficient, and widely applicable across various types of structures.

Key Words: Risk Assessment, Anomaly Detection, Structural Integrity, Infrastructure Resilience, etc.

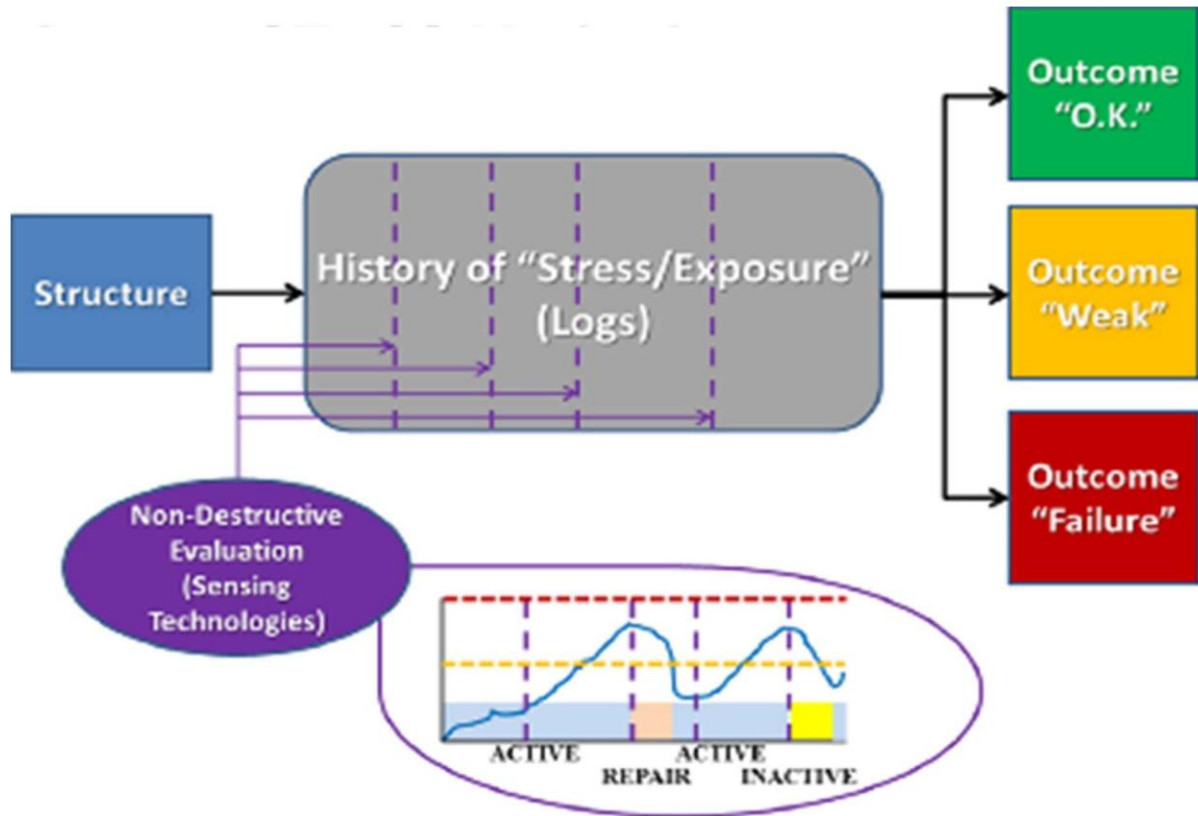


Figure: Block diagram illustrating the concept of Structural Health Monitoring

Purpose of the Webinar

The purpose of the webinar on "How Structural Health Monitoring Works?" is to educate participants about the principles, techniques, and technologies involved in monitoring and inspecting structures. The web-workshop aims to provide a comprehensive understanding of the process and its significance in maintaining the safety and integrity of structures. By attending this webinar, participants will gain a comprehensive understanding of structure monitoring and inspection methodologies, enabling them to make informed decisions regarding the maintenance, repair, and management of structures.

Objectives:

- To provide a concise introduction to the fundamental concepts of Structural Health Monitoring.
- To highlight the significance of SHM in ensuring the safety, reliability, and longevity of infrastructure.

- To discuss the evolution of SHM technologies and their applications across different types of structures.
- To illustrate how processed data is analyzed to identify anomalies and potential structural issues.
- To foster community engagement and social responsibility by involving local communities in the structural health monitoring domain.

About the Session Chair: Prof. Chandan Ghosh, Head Resilient Infrastructure Division, NIDM



Professor Ghosh is a multifaceted expert with knowledge in science and civil engineering. He served as a faculty of Civil Engineering Department at IIT-BHU (1990-2000), did postdoctoral research in Japan and was on Deputation to IIT Jammu from Sept 2019 to December 2020, where he served as Dean of Student Welfare. He has been a member of the National Institute of Disaster Management (NIDM) since July 2006, where he currently serves as the Professor and Head of the Resilient Infrastructure Division. Professor Ghosh has dedicated over three decades to

academia and research in various fields, including earthquake Geo-technology, Reinforced Earth, Seismic Microzonation, Ground improvement techniques, Structural health assessment of bridges, Geo-synthetics, and Bioengineering measures for sustainable developments. During this time, he indulged himself in training and capacity building in earthquake risk mitigation, landslides mitigation, bio-engineering by Vetiver grass for slope and erosion controls, cleaning lakes & sewerage by Natural methods, disruptive technologies in disasters. Also, he has developed teaching tools and training modules for engineers, architects, and town planners. As recognition to his seminal contributions, received Leonard prize for the best doctoral thesis in 1993, CIDC-Vishwakarma Awards-2013, IGS-Shri H.C. Verma Golden Jubilee Award-2013, Lifetime achievement award-2019 (Indian Geotechnical Society-Delhi Chapter).

For More Information Visit: <https://nidm.gov.in/faculty.asp>

For Work related Contribution: [https://www.linkedin.com/in/dr-chandan-ghosh-1967a912/? Original Subdomain=in](https://www.linkedin.com/in/dr-chandan-ghosh-1967a912/?OriginalSubdomain=in)

About Guest Speakers

PROF. DEEPAK KHAZANCHI, UNIVERSITY OF NEBRASKA AT OMAHA



Dr. Deepak Khazanchi currently holds the distinguished position of the Mutal of Omaha Chair of Information Science & Technology and is a Professor of Information Systems and Quantitative Analysis at the College of Information Science & Technology (IS&T) at the University of Nebraska at Omaha (UNO), USA. Over his 23-year tenure at UNO, Dr. Khazanchi has taken on various roles, including Department Chair for the Information Systems and Quantitative Analysis Department, Associate Dean for Academic Affairs and Community Engagement, and Internationalization Officer for the

College of IS&T. With over 30 years of experience in information systems and technology research, education, and consulting, Dr. Khazanchi will be sharing insights from his recent research and collaborative projects. These endeavors showcase the application of AI/ML and other intelligent technologies to address complex decision support and analytical challenges in managing the health of bridge infrastructure.

ER. PRADIT KULSHRESHTHA, CO-FOUNDER LIVEHOOAH PVT. LTD



Pradit Kulshreshtha, a distinguished alumnus of Pennsylvania State University, has made significant contributions in the field of Structural Health Monitoring using Machine Learning and IoT technology, earning him a patented innovation. Notably, he is the proud recipient of the prestigious Ardeth & Norman Frisbey Award, recognizing his outstanding efforts in advancing international understanding. Mr. Kulshreshtha has garnered acclaim for his seismic-resistant designs in Multi-Storey Buildings, showcasing his expertise in structural engineering. His achievements extend to holding practicing licenses in Structural Engineering, Green Building Design, and User Innovation Design in both the United States and India.

About Guest of Honor

PROF. SURESH BHALLA, DEPARTMENT OF CIVIL ENGINEERING, IIT DELHI & PRESIDENT OF ISHMS



Professor Suresh Bhalla, a distinguished member of the Civil Engineering Department at IIT Delhi, specializes in smart structures, structural health monitoring, EMI techniques, and the biomedical applications of smart materials. Currently serving as the President of the Indian Structural Health Monitoring Society (ISHMS), he brings extensive expertise to the field. Boasting an impressive academic record, Dr. Bhalla has authored over 80 papers in SCI indexed journals and penned two books. With an h-index of 27 in Web of Science, his notable contributions, such as a groundbreaking 2000 paper on RC structures, have garnered over 260 citations. Dr. Bhalla's excellence is evident through his recognition as a finalist for the SCOPUS Young Scientist Award and three prestigious Best Paper Awards. As the founder of the "Smart Structures and Dynamics Lab" at IIT Delhi and the current President of ISHMS, he spearheads global advancements in structural engineering. Recognized among the top 2% of world scientists since 2020, Prof. Bhalla's impact is underscored by standardized citation indications in Scopus Elsevier databases.

About the National Institute of Disaster Management (NIDM) (<https://nidm.gov.in/>)

The National Institute of Disaster Management (NIDM), Ministry of Home Affairs, and Government of India is a premium institute and a Statutory Body (under the Disaster Management Act 2005) for training, research, documentation, awareness, and human resources and capacity development in the field of disaster mitigation and management. The institute lays emphasis on a multi-stakeholder interdisciplinary cross-sectoral approach for an efficient proactive continuum of disaster risk management based on participatory, integrated, and multi-risk management concepts. The Institute's vision is to create a Disaster Resilient India at all levels.

About Building Materials and Technology Promotion Council (BMTPC)

(<https://bmtpc.org/topics.aspx?type=sub&mid=19>)

BMTPC is also one of the resource institution for the Ministry to provide S&T support in the area of innovative building materials & construction technologies and disaster mitigation & management. BMTPC is actively involved in disaster mitigation and management activities and working in close liaison with NDMA, NIDM and other Institutions. Apart from bringing out the first ever Vulnerability Atlas of India in 1997 and 2006, the Council brought out the third edition of its Vulnerability Atlas of India in 2019 which was released by Hon'ble Prime Minister of India. In order to educate and spread awareness about the Vulnerability Atlas of India and Disaster resistant design & construction practices, the Council organized workshops designed for engineers,

architects and other stakeholders dealing with housing and infrastructure. An E-Course on Vulnerability Atlas of India was also started in association with School of Planning & Architecture, New Delhi. Besides, the Council regularly publishes valuable guidelines/ manuals on disaster resistant construction. Towards earthquake preparedness and disseminate earthquake resistant construction practices and seismic retrofitting, the Council has undertaken retrofitting of few buildings including life line buildings and organized training programs for professionals.

About Institution of Engineers, Delhi State Centre

<https://www.ieidsc.in/#:~:text=About%20IEI%20Delhi%20State%20Centre,Dr%20K%20L%20Rao%2C%20Major%20Gen.>

The Institution of Engineers (India) stands as the largest professional body in the country, boasting a vast membership of nearly 9.50 lakh individuals. With 94 State and Local Centres across the nation and 8 overseas chapters, this institution plays a pivotal role in fostering professional development and collaboration within the engineering community. The Delhi State Centre holds a unique position within the organization, situated in the National Capital. Established in 1927, it has been a hub for engineering activities and advancements. Over the years, The Institution of Engineers (India) Delhi State Centre has been graced by the presence of distinguished engineering personalities who have served as Presidents, including notable figures such as Dr A N Khosla, Dr K L Rao, Major Gen. Harkirat Singh, Dr T Sen, Maj Gen S P Vohra, and Shri O P Goel. The Centre's significance is further underscored by the privilege of hosting esteemed Chief Guests at its Annual General Functions. Notably, personalities such as Shri Fakhruddin Ali Ahmed (President of India), Shri Morarji Desai (Prime Minister of India), Shri S S Barnala (Minister for Food & Agriculture), Late Shri P M Sayeed (Minister for Power), and Shri B L Joshi (Lt. Governor of Delhi) have graced these occasions.

As of now, the Delhi State Centre boasts a robust membership base, comprising over 9,252 corporate members representing 15 engineering disciplines. Additionally, it includes approximately 22,000 non-corporate members, consisting of Technicians, Senior Technicians, and Graduates. This diverse and extensive membership reflects the Centre's commitment to encompassing various facets of the engineering profession and fostering a rich collaborative environment for professionals at different stages of their careers.

About Indian Structural Health Monitoring Society (ISHMS)

<https://www.ishms.org.in/About.html>

The Indian Structural Health Monitoring Society was envisioned in the year 2021 by a group of Academician and Researchers, after successful culmination of the International conference on futuristic technologies (FT21). It was registered under the Societies Registration Act XXI of 1860 on 15th April 2023. ISHMS is a purely professional society, a non-profit making organization established with the objective to cater to the overall professional needs of structural engineers for structural health monitoring. The Association has become the source of expertise and information concerning all issues that involve structural health monitoring as well as structural engineering and public safety within the built environment and it has no commercial objective. ISHMS is purely a professional learned society with the prime objective of supporting and conceptualizing the profession of structural health monitoring (SHM) and structural engineering by upholding professional standards and acting as a mouthpiece for structural engineers in India. It endeavors to ensure that its members develop the necessary skill in SHM and work to the highest standards by maintaining a commitment to professional ethics and standards within Structural Health Monitoring (SHM). It strives for continued technical excellence; advancing safety and innovation across the built environment. It also strives to make

available to the Government, Public Sector and Private Sector - a credible source of well qualified and experienced Structural Engineers. A nationwide database of Structural Engineering has been compiled and is being constantly updated. The Association provides opportunity for all the members to develop skills in structural health monitoring (SHM) and helps members to be at the forefront of Structural Engineering practice. Towards achievement of its aims and objectives.

ISHMS is engaged in organizing the following:

ISHMS, act as catalyst for development and implementation of structural health monitoring (SHM) and related futuristic multi-disciplinary technologies.

- To form an ecosystem where industry, academia government bodies, students and all other stakeholders can coverage and collaborate.
- To conduct, promote and sponsor research in the field of SHM and related technologies in India.
- To undertake other lawful activities and acquire grants and assets as are incidental or conducive to the attainment of the above objectives or any of them and to and to dispose of them in any manner deemed fit.
- To promote awareness, capacity building, advancement of the knowledge and skills and real-life practice of SHM and related technologies in India.
- To promote dissemination n of the state-of-the art in the field of SHM by arranging seminars, conferences, continuing education courses and publication of books, journals, proceedings, newsletters etc.
- To represent SHM profession within India and abroad.

Webinar Series Conducted So Far:

The National Institute of Disaster Management has initiated the webinar series from the month of May, which takes place on every Friday from 2:30 pm to 4:30 pm. This time we are conducting our event from 7:00 pm to 9:00 pm (IST) this time, as our speakers are residing outside the country. Resilient Infrastructure division of NIDM has conducted ten webinar series and the current webinar is the 26th part of it. The details of the webinars conducted so far are as follows:

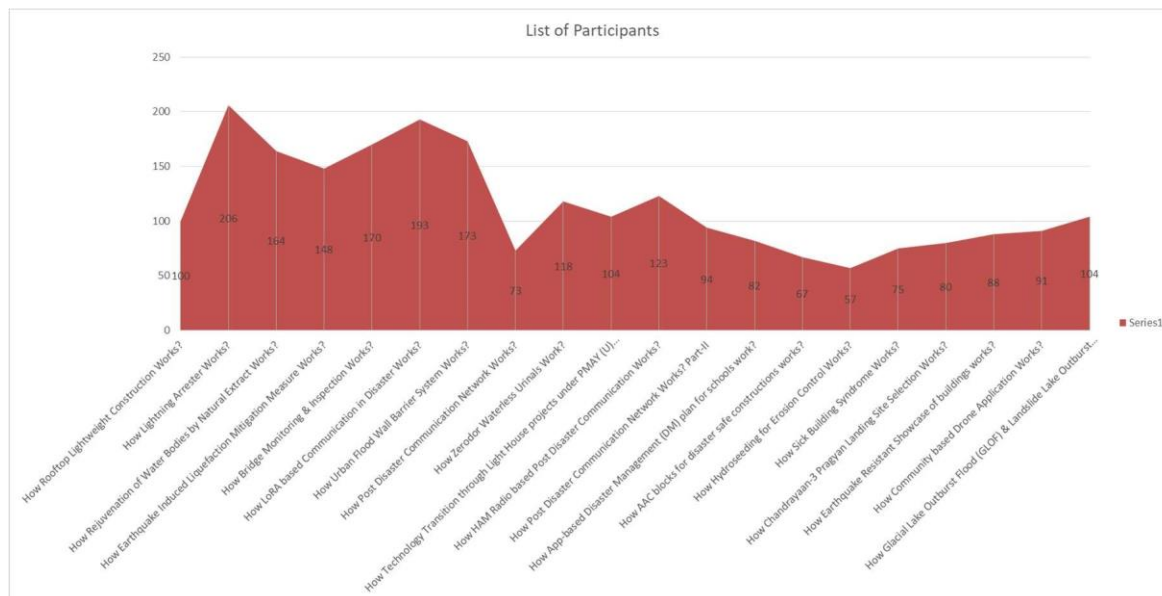
Webinar Series (W)	Title	Date	YouTube link
1	How Rooftop Lightweight Construction Works?	19th May 2023	https://www.youtube.com/watch?v=C SrgIgCBoME (114 views till date)
2	How Lightning Arrester Works?	26 th May 2023	https://youtube.com/live/scagqQJSkg?feature=share (351 views till date)
3	How Rejuvenation of Water Bodies by Natural Extract Works?	2 nd June 2023	https://www.youtube.com/watch?v=d GdVfmai1g (196 views till date)
4	How Earthquake Induced Liquefaction Mitigation Measure Works?	9 th June 2023	https://www.youtube.com/watch?v=r 1XQ6e 1p4g (82 views till date)
5	How Bridge Monitoring & Inspection Works?	16 th June 2023	https://youtube.com/live/Gi AUkT9LA U?feature=share (102 views till date)
6	How LoRA based Communication in Disaster Works?	23 rd June 2023	https://youtube.com/live/piErNKce7eo?feature=share (139 views till date)
7	How Urban Flood Wall Barrier System Works?	30 th June 2023	https://www.youtube.com/watch?v=N xcq7rwH (81 views till date)

8	How Post Disaster Communication Network Works?	7 th July 2023	https://www.youtube.com/watch?v=ik00gAL6IkU (178 views till date)
9	How Zerodor Waterless Urinals Work?	14 th July 2023	https://www.youtube.com/watch?v=H3OyDHgmX3A (168 views till date)
10	How Technology Transition through Light House projects under PMAY (U) Works?	21 st July 2023	https://www.youtube.com/watch?v=CTOjcfGpcBk (176 views till date)
11	How HAM Radio based Post Disaster Communication Works?	28 st July 2023	https://www.youtube.com/watch?v=OTq7-EAhcVM (206 views till date)
12	How Post Disaster Communication Network Works? Part-II	04 th August 2023	https://www.youtube.com/watch?v=hgvPv5qyCQ (59 views till date)
13	How App-based Disaster Management (DM) plan for schools work?	11 th August 2023	https://www.youtube.com/watch?v=OY4F2eTFn-o (114 views till date)
14	How AAC blocks for disaster safe constructions works?	18 th August 2023	https://www.youtube.com/watch?v=NGcLe72eVU8 (153 views till date)
15	How Hydroseeding for Erosion Control Works?	25 th August 2023	https://www.youtube.com/watch?v=RffR2Zvut-l (72 views till date)
16	How Sick Building Syndrome Works?	1 st September 2023	https://youtube.com/live/RffR2Zvut-l?feature=share (61 views till date)
17	How Chandrayaan-3 Pragyan Landing Site Selection Works?	15 th September 2023	https://www.youtube.com/watch?v=SrLgo1mBr_M&t=4812sm (93 views till date)
18	How Earthquake Resistant Showcase of buildings works?	6 th October 2023	https://www.youtube.com/watch?v=SrLgo1mBr_M&t=4812s (68 views till date)
19	How Community based Drone Application Works?	12 th October 2023	https://youtube.com/live/Czaj8gymlQY?feature=share (27 views till date)
20	How Glacial Lake Outburst Flood (GLOF) & Landslide Lake Outburst Surveillance System Works?	20 th October 2023	https://youtube.com/live/Oaoscwlcmsc?feature=share (77 views till date)
21	How Sustainable Roads & Transport Network System Works	27 th October 2023	https://youtube.com/live/Ntd-RBgoT4Y?feature=share (14 views till date)
22	How Post Earthquake Reconstruction Works?	3 rd November 2023	https://youtube.com/live/S3w4JEY3vG4?feature=share
23	How Air Pollution Control Measure Works?	10 th November 2023	https://youtube.com/live/eJUgg1X6Vx0?feature=share
24	How Green Building Rating System Works?	17 th November 2023	https://youtube.com/live/ESTulZR1ce0?feature=share
25	How Earthquake Early Warning & Precursors Work	1 st December 2023	https://youtube.com/live/tyveE30Ws-A?feature=share
Upcoming Webinar Details			
Webinar Series	Title	Date	YouTube link
26	How Structural Health Monitoring Works?	13 th December 2023	https://youtube.com/live/9Zn24cYQcg?feature=share

Also find the Resilient Infrastructure Division's YouTube Playlist link for your convenience:

https://www.youtube.com/watch?v=CSrglgCBoME&list=PLhLAQomSVWCs1TZXc_YjDdDSybOC08Cel

Webinars Participation



Registration:

Programs are going to be hosted on an open platform where anyone from all over India can join. Interested participants can register for the webinar on the National Institute of Disaster Management website (<https://training.nidm.gov.in/>). Registration is free and open to all.

Participation Certificate:

The participants would be entitled to receive an e-certificate after successfully completing the event (60% + Attendance) and submitting the feedback form on the portal.

Suggestive Readings:

1. Bridge Inspection Implementations and Maintenance Planning-A Comparative Analysis of a few distinctive countries. Retrieved from https://www.researchgate.net/publication/368697766_Bridge_inspection_implementations_and_maintenance_planningA_comparative_analysis_of_a_few_distinctive_countries/link/64451b2d2d8ff0036394bcc1/download
2. Structural Health Monitoring, History, Application and Future. Retrieved from https://www.researchgate.net/publication/266854280_Structural_Health_Monitoring_History_Applications_and_Future_A_Review_Book/link/5548b4770cf2e2031b38aed4/download

List of You Tube Videos on Green Building Rating System

1. Lessons learned from Data Fusion of Structural Health Monitoring (SHM), Digital Twin Simulation and Weigh-in-motion (WIM) SENSORS FOR Evaluation Concrete Bridges. Please visit <https://www.youtube.com/watch?v=0KYUqrMg-r8>
2. Structural Health Monitoring: In-depth Analysis. Please visit <https://www.youtube.com/watch?v=Zf-SirBg9iU>
3. Extradosed Bridge Structural Health Monitoring with Bridge Loading Test. Please Visit <https://www.youtube.com/watch?v=H0ks0wZUTeM&t=2s>



Thank You