

20-22 September 2023
New Delhi, India

**Engineering for
Sustainable Development**

One Day Workshop on “**Forensic Structural Engineering**”

**Reliable Forensic Investigations - Causes,
Investigation Methods and
Lessons Learned to Mitigate Failures**

Date: 19th September 2023
Venue: Hotel Vivanta Dwarka, New Delhi

Organised by



The Indian National Group of the IABSE



Instructors:

Laurent Rus^[1], Karel Terwel^[2,3], Dr. Harshavardhan Subbarao^[4,5], Mr. Alok Bhowmick^[6] & Mr. V.N. Heggade^[7]

^[1]Singular Structures Engineering, Madrid, Spain. ^[2]Delft University of Technology, Delft, The Netherlands. ^[3]IMd Raadgevende ingenieurs, Rotterdam, The Netherlands. ^[4]Chairman & Managing Director of Construma Consultancy Pvt. Ltd Mumbai, India, ^[5]Vice President IABSE. ^[6]Managing Director, B&S Engineering Consultants Pvt. Ltd. ^[7]Former Executive Director Gammon India Ltd (1985-2019) Former CEO, STUP Consultants Pvt. Ltd (2019-2021) Present Founder DECon Complete Solutions

Background to the Workshop:

Failures of structures occur in all parts of the world as the result of design errors, construction defects, abuse or misuse, lack of maintenance, ageing and deterioration, as well as environmental effects such as wind, flood, snow, earthquakes and, of course, human error. They can result in heavy financial losses to all involved, catastrophic human costs, expensive delays and repairs, as well as other repercussions, including to the responsible parties.

"Welcome" effects of these unfortunate events include a better understanding of the origins and causes of structural failures, lessons learned from them, and more effective mitigation of their occurrence through changes in codes, standards and practices.

In several countries, the investigation of the causes of failures, responsibilities and resolution of the consequent claims have created an active, demanding and rewarding field of professional practice - often referred to as Forensic Structural Engineering - with well - defined technical and legal procedures.

IABSE Working Group 8 (currently TG5.1) on Forensic Structural Engineering was formed in 2011. It aims to examine failures, improve the professional practice of forensic structural engineering, facilitate the dissemination of failure information, and ultimately to enhance the mitigation of failures by improved structural design and construction practices throughout the world. This course was designed and the lecturers were selected with those aims in mind.

Workshop Date

19th September , 2023

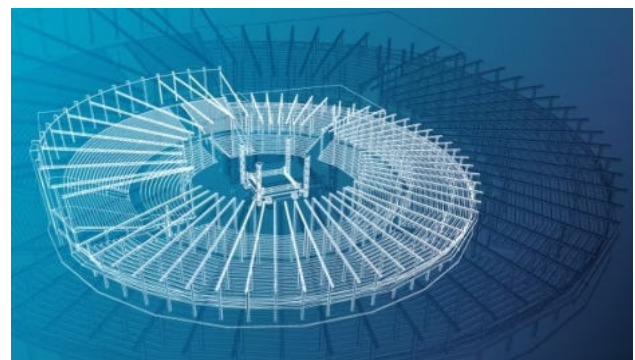
Venue

Hotel Vivanta Dwarka,
Service Road, Sector 21,
Dwarka, New Delhi.

Objectives:

The primary objective of this workshop is to provide an outline of a forensic investigation process and to provide starting points on how to improve the reliability of this investigation process.

The secondary objective of the workshop is to provide an understanding of the origins, causes and consequences of failures, the lessons learned from them, and thereby to improve design practices and elevate the standard-of-care - all to mitigate errors that may lead to failures and liabilities of engineers.



Target audience:

The workshop is aimed at a range of structural engineers: young, mid-career and experienced who want to acquire a better understanding of failures towards improving their design, inspection, construction, administration and other project-related practices to avoid pitfalls that may lead to failures. It is also informative to those wanting to acquire a working knowledge of, and embark on, the challenging and rewarding professional practice of forensic structural engineering.

The workshop will address:

- The understanding of structural failures, their origins, causes and consequences.
- The first steps after a failure, and the investigation process
- Cases, causes and lessons learned from failures in buildings, bridges, other permanent structures, and temporary structures in construction.
- Using the lessons learned for mitigating failures by meeting the standard-of-care, recognizing opportunities of catching design errors and construction defects, and affecting changes in codes & practices.

The workshop will start with some introductions, following a workshop where participants are asked to examine the causes of a failure from practice, and finally, a discussion to address lessons learned from failures.

Reference material:

Each attendee will receive an electronic format, of documents that will include PDFs of the slides of the speakers' presentations, and reprints of several journal articles for reference.

Speakers:

Dr. Harshavardhan Subbarao

Dr. Harshavardhan Subbarao, did his Masters from University of Michigan and holds a Ph.D. from Imperial College, London. He is Vice President of the International Association of Bridge and Structural Engineering (IABSE), Zurich. He has been involved with the Design and Supervision of a number of Landmark projects such as Signature Cable Stayed Bridge, Delhi; 4.6km Rail-cum-Road Bridge, Patna; Bridge No. 20 on JURL; metros, viaducts, elevated roads, arch and extra-dosed bridges, ROB's, underpasses etc. He has also been involved in the Repair, Rehabilitation & Retrofitting of more than 30 numbers of bridges including Balanced cantilever bridges. He is an Expert Committee Member of the National Highways Authority of India (NHAI) for Investigating Bridge Failures and has been involved in the Forensic Investigation of a number of failures.

He is an IABSE Fellow and a member of the Technical Committee of IABSE, Zurich, and past Chair of its Bulletin Edit Board, Chair of its Outstanding Paper and Ph.D Awards Committee, Member, TG:5.1 on Forensic Structural Engineering, served on Editorial Panel and as a reviewer for Proceedings of ICE (UK) – Forensic Engineering, Member of *fib* TG3.5 on Forensic Engineering, Editorial board of CROSFALL Reports of IAStructE, Editorial Board of Journal SED, ING-IABSE; Member of *fib*-Commission-8 on Durability and Service Life Design, Member Executive Committee of ING-IABSE & IIBE, Member, Governing Council of CEAI, Member Highway Research Board of India, and serves on several committees of IRC, BIS, and various International and National bodies, he has over 38 years of experience and a number of papers and bridge projects to his credit. He is a Chair of the Scientific Committee of IABSE Congress New Delhi Sept 22-24, 2023.



Laurent Rus

Laurent Rus earned his Civil Engineering Diploma from the Swiss Federal Institute of Technology in Lausanne (EPFL, Switzerland), followed by a Master of Science in Structural Engineering, Mechanics and Materials from the University of California, Berkeley (USA). He has participated in the design and construction of several singular structures across 5 continents, requiring long-term assignments, and therefore commitment to the project. These long-term journeys have mastered him in the different design techniques and available technology to the benefit of our structural civil engineering practice to society. He is an IABSE Fellow, a member of the Editorial Board of the Structural Engineering International Journal, and Vice-Chair of Task Group 5.1 on Forensic Structural Engineering, work that he encompasses simultaneously with his duties as Founder and CEO at Singular Structures Engineering.

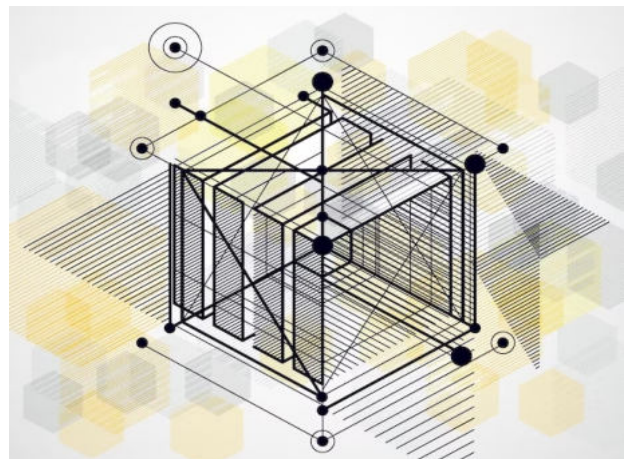
Karel Terwel

Karel Terwel MSc PhD RC received his PhD in 2014 for a study on the influence of human and organizational factors on structural safety. Currently, Terwel is an assistant professor at Delft University of Technology where he teaches courses on structural design and forensic structural engineering. Together with colleagues from various faculties, he developed a massive open online course on forensic engineering at EdX. With these colleagues, he wrote an award winning paper on reliable forensic investigations. Furthermore, Terwel is a consulting engineer at IMd in Rotterdam, where he is involved in structural design of complex buildings and in forensic investigations. Terwel has been active in IABSE's working group Forensic Structural Engineering since 2011; currently, he is the Chair of the Task Group.

Alok Bhowmick

Alok Bhowmick, Managing Director, B&S Engineering Consultants Pvt. Ltd., India, is a senior professional with more than 42 years of rich experience and with exceptional records and achievements. He has investigated several bridge failures in India on behalf of the Owner Client as well as on behalf of the Contractor. He is on the empanelled list of experts in NHAI for failure investigation.

He is a Fellow of National Academy of Engineering in India and a FIDIC Certified Consulting Practitioner. He is also an International Professional Engineer of The Institution of Engineers (India). He is the recipient of 24th S. B. Joshi Memorial Award for the Year 2018 for "Excellence in Bridge & Structural Engineering". He is known to actively participate in disseminating professional knowledge to young professionals in many forums. He is currently A Governing Council member of Consulting Engineers Association of India (CEAI), Vice Chairman of Indian National Group of the International Association for Bridge and Structural Engineering (ING-IABSE). He is also presently the Co-Chairman of the Editorial Board of the quarterly journal of ING-IABSE. He is the Past President of the Indian Association of Structural Engineers (IAStructE) and currently holds the post of Chairman, Publication Committee and Chairman, Professional Issues Committee of IAStructE.



V.N. Heggade

V.N. Heggade, the former Chief Executive Officer (CEO) of STUP & former Executive Director of Gammon India Ltd and presently is the founder of **DECon Complete Solutions**. He is a senior professional with a rich experience of nearly 4 decades in the Construction sector in the areas of Design Management, Technical Management, Site Management, Project Management & Contract Management of Highways, Bridges, Energy structures, Environmental, Marine and Hydraulic structures.

He is a recipient of around 17 National recognitions in addition to 2 International recognitions, **IABSE Prize-Zurich** and a fellowship from fib Lausanne. He has more than 190 publications including in conference proceedings to his credit and is a member of various IRC (Indian Roads Congress) and BIS (Bureau Of Indian Standards) & *fib* committees and Task Groups. Apart from being on Technical Board of ICI (Indian Concrete Institute) and Academic Board of SPCE (Sardar Patel College of Engineering) is also a Fellow of Indian National Academy of Engineering (FNAE). He is presently serving as a chief editor of ING-IABSE journal 'Bridge & Structural Engineer' and is on the Editorial Board of 'Structural Concrete Journal' of fib.

He has the rare distinction of carrying out structural failure investigations from both sides, i.e. from Builders/Consultants side (3 major investigations) and the owners side (5 major investigations) engaged as a part of the expert committee.

Acknowledgments: This is the sixth Forensic Structural Engineering Workshop that has been presented in conjunction with the annual IABSE Congress or Symposium. The previous workshops were presented in New York, Nantes, Vancouver, Stockholm, and Geneva. This workshop was envisioned and developed by Dr. Robert Ratay, the first chair of the IABSE Task Group 5.1, Forensic Structural Engineering (formerly Working Group 8). The ongoing activities of Task Group 5.1 are a testament to Dr. Ratay's vision and passion for teaching forensic structural engineering. We appreciate his ongoing contributions and support of this workshop.



Detailed Outline:

Time	Topic	Instructor	Description
08:30 - 09:30	Registration		
09:30 - 09:45	Welcome	HS	Opening words. Aim and contents of the workshop.
09:45 - 10:30	What is Forensic Structural Engineering?	HS	Describing structural failures and their origins, causes, consequences. Defining the field of Forensic Structural Engineering.
10:30 - 11:00	Coffee Break		
11:00 - 12:00	Reliable Forensic Investigation Process	KT	Engineers' first steps upon being informed of a structural failure. Outline of a reliable forensic investigation process.
12:00 - 12:30	Brief Break for Discussion		
12:30 - 13:15	Analysis Methodology	LR	Top-Down and Bottom-Up investigation process and applicable scenarios. Discussion
13:15 - 14:00	Lunch Break		
14:00 - 15:30	Cases, Causes & Lessons Learned	AB & VNH	<ul style="list-style-type: none"> Indian Failure Case Studies on Bridges following a structural failure (Preliminary assessment of the available data, missing data and layout of the preliminary path for investigations) and Failure Case Studies of other Structures
15:30 - 15:45	Coffee Break		
15:45 - 16:45	Working Session guided by the instructors	KT/LR	Analysis of existing case by attendees to generate a list of presumable technical, human and organizational causes.
16:45 - 17:30	Learning from failures	KT/LR	Debate how to learn from failures to avoid future failures
17:30	Closing	All	All instructors will be available for questions and open discussion.

*Draft schedule. All times and topics are subject to adjustments

Abbreviations:

KT = Karel Terwel; LR = Laurent Rus; HS = Harshavardhan Subbarao, AB : Alok Bhowmick, VNH: V.N. Heggade

Note: Certificate of attendance will be awarded. Attendees will get 25% discount on the purchase of the Book of SED "Case Studies on Failure Investigations in Structures and Geo-Technical Engineering."

Workshop Fees

*Plus 18% GST

Pre-Conference Workshop	Foreign Delegates*		BIMSTEC Delegates*	
	Young Engineers & Students	Other Delegates	Young Engineers & Students	Other Delegates
Forensic Structural Engineering	€ 140	€ 185	₹ 5,000	₹ 6,500

For Online Workshop Registration, Please click on below link

<https://regcon.in/sp/iabse-congress-2023-workshop-registration/>