

ING-IABSE Workshop on “Design, Construction and Maintenance of Steel Bridges” , Dehradun, 19th & 20th October, 2024



Dharmananda Sarangi

Director General (Road Development) & Special Secretary, MoRTH

Chairman, ING, IABSE

Ist Delegate of India to PIARC

Life Member and Honorary Treasurer of IRC

Fellow, Institute of Engineers, India

Vast experience in implementation of mega highway projects in all formats (Item Rate, EPC, BOT (Toll), HAM) from planning to design, construction, operation & maintenance

Spearheading applied research, formulation of guidelines of Ministry related to various aspects of highway projects and administration of IRC

Significant contribution to capacity building of highway engineers as Director of IAHE

Design Basis of Steel Bridges

- ❖ The structure shall be designed on the basis of the most critical limit state and shall be checked for other limit states
- ❖ Applicable Limit States:
 - Limit State of Strength:
 - Loss of equilibrium as a whole/parts
 - Loss of stability (overturning)
 - Excessive deformation, rupture
 - Brittle fracture
 - ❖ Limit State of Serviceability:
 - Deformation/deflection affecting use
 - Vibration
 - Corrosion
 - ❖ Limit State of Fatigue

Problems/Distresses observed in Steel Bridges

- ❖ Deviations from geometry
- ❖ Corrosion of various steel components
- ❖ Fatigue crack in elements/joints (particularly welded joints)
- ❖ Loosening and fracture of bolts
- ❖ Deformation such as buckling/bending (compression member in truss/web or flange in girders), crippling, warping, etc.
- ❖ Cracks at support of steel concrete composite bridges.
- ❖ Failure of temporary structures for erection

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Probable Reasons of Distress/Failure of Steel Bridges

- ❖ Deficiencies in the structural design and detailing of structural steel members (specifically gusset/splicing plates and connections)
- ❖ Inadequate stiffeners over bearings and at the location of concentrated loads
- ❖ Inadequate design and detailing of connections between structural steel and concrete members
- ❖ Impact created by moving vehicles specifically on through type bridges and bridges with degraded wearing coat
- ❖ Lack of adequate design and detailing of temporary structures required specifically during erection of steel structures

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Probable Reasons of Distress/Failure of Steel Bridges

- ❖ Material properties and testing not as per the specifications
- ❖ Lack of availability of detailed method statements for fabrication, transportation and erection of steel structures
- ❖ Poor fabrication and erection of steel structures
- ❖ Poor welding and lack of testing of welds
- ❖ Tightening of the bolts not done as per the specifications
- ❖ Lack of inspection and maintenance of steel structures

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How to ensure Quality of Design and Construction of Steel Bridges?

Panel Discussion on “Quality of Design and Construction of Steel Bridges”

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Thank You