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COIMBATORE

DEPARTMENT OF CIVIL ENGINEERING

19CET304-DESIGN OF STEEL STRUCTURES

III YEAR / VI SEMESTER

Unit 5 :Plate Girder

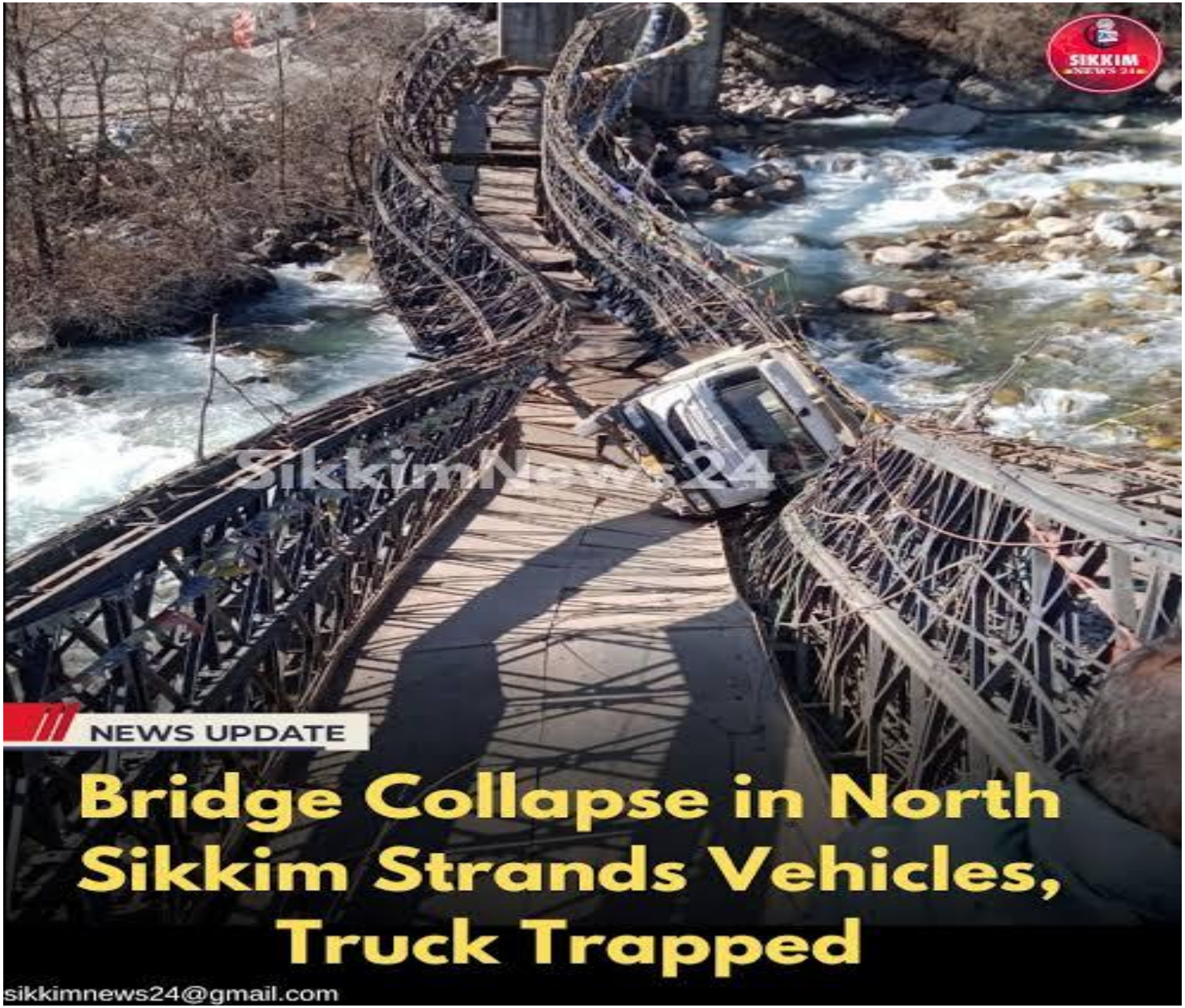
Case Study: Plate Girder Bridge

Introduction

What is a Plate Girder Bridge?

- A type of bridge built using steel girders composed of flanges and a web plate.
- Commonly used for medium to long spans in road and rail infrastructure.

Bridge over Lachung River, North Sikkim


SIKKIM
NEWS UPDATE
Bridge Collapse in North Sikkim Strands Vehicles, Truck Trapped
sikkimnews24@gmail.com

Case Incident: Bridge Collapse

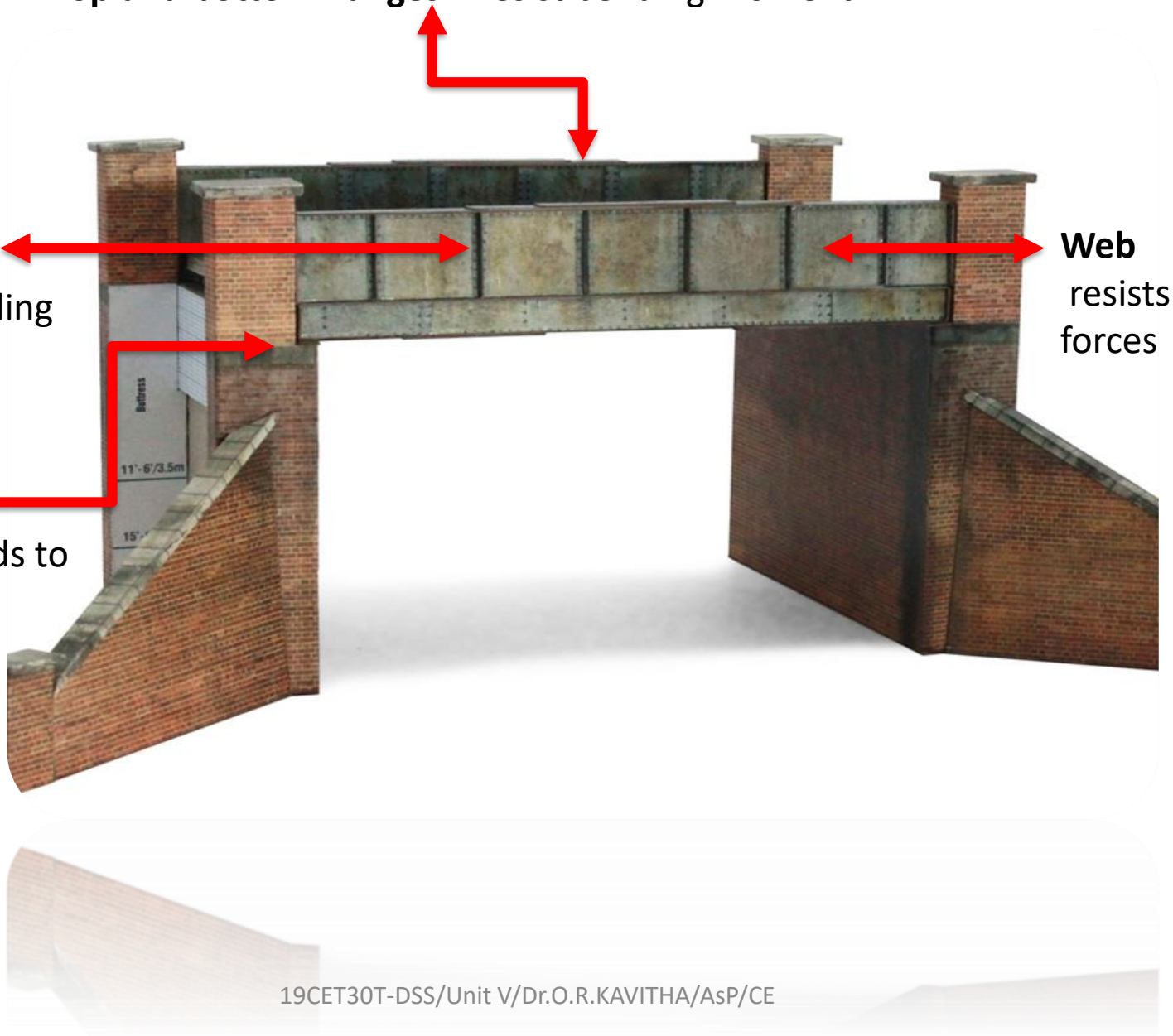
- A 25-year-old Bailey bridge over the Lachung Chu River on the Lachung-Katao Road in North Sikkim collapsed on January 4, 2025

Bridge Overview

- Location: Example - Lachung, North Sikkim (hypothetical data)
- Type: Steel Plate Girder Bridge
- Span: Approx. 25 meters
- Used for: Vehicular transport over river

Structural Components

Top and bottom flanges – resist bending moment



Stiffeners
prevent buckling of web

Web
resists shear forces

Bearings
transfer loads to supports

Design Considerations

- Load types: Dead load, live load, wind, seismic
- Material: High strength structural steel
- Codes followed: IRC, AASHTO, IS 800

Construction Process

- Fabrication of girders in workshop
- Transportation and erection on site
- Deck slab casting
- Installation of bearings and joints

Reasons for failures

1. Overloading Beyond Design Limits

Plate girder bridges are designed for specific load capacities. Repeated or excessive loading—like overloaded trucks—can exceed the moment and shear capacity of the girder.

2. Inadequate Maintenance and Corrosion

Steel is susceptible to corrosion, especially in moist or marine environments. Without regular painting or inspections, sections may corrode.

3. Fatigue Failure

Repeated traffic loads cause cyclic stresses in the steel. Over time, microscopic cracks can initiate and grow.

Reasons for failures

4. Web Buckling or Local Buckling

Thin webs or improperly stiffened plates may buckle locally under high shear or compressive stress.

5.Improper Detailing or Fabrication

Welding defects, poor flange-web connections, or misaligned components introduce stress concentrations.

6.Inadequate Stiffeners or Bracing

Stiffeners prevent web buckling and bracing provides lateral stability to flanges.

7.Foundation or Bearing Failure

Differential settlement, scouring, or damaged bearings can lead to misalignment or increased stresses.

Lessons Learned

- Enforce weight regulations on bridges
- Schedule regular maintenance and inspections
- Update aging infrastructure

Rehabilitation Techniques

- Use of additional stiffeners or support
- Retrofit with FRP or steel plates
- Partial or complete replacement

Conclusion

- Plate girder bridges are vital for infrastructure
- Regular inspection and responsible loading are key to longevity
- Lessons from failures guide future designs

Thank you