

Unit-III

- Flexure and Shear in Prestressed Concrete

Course Outcomes

- Understand flexural behavior.
- Analyze stresses.
- Study shear design and IS provisions.

Introduction to Flexure

- Flexure in PSC is controlled by prestressing force and external bending moments. Prestress reduces tensile stress and cracking.

Stress Concepts

- Combined stresses due to prestress and bending are evaluated using stress equations and stress diagrams.

Straight Concentric Tendons

- Prestress acts through centroid producing uniform compression without bending.

Straight Eccentric Tendons

- Eccentricity produces additional moment that counteracts external loads.

Bent Tendons

- Cable profile changes near supports to improve shear and bending resistance.

Parabolic Tendons

- Most efficient profile for uniformly distributed loads; follows bending moment diagram.

Stress Diagrams

- Top and bottom fiber stresses at transfer and service stages with explanatory notes.

Flexural Analysis

- Calculate stresses using direct stress and bending stress equations.

Elastic Design Philosophy

- Concrete remains within permissible stresses under service loads.

Rectangular PSC Beam Design

- Procedure, assumptions and stress checks.

I-Section PSC Beam

- Advantages, stress distribution and applications.

PSC Slabs

- Elastic design concepts and typical applications.

Kern Line

- Definition, significance and location of kern for rectangular sections.

Cable Profile

- Selection based on bending moment variation and construction.

Cable Layout

- Spacing, cover, anchorage zones and practical considerations.

Introduction to Shear

- Shear behavior differs from RCC due to prestressing force.

Principal Tension & Compression

- Definition, Mohr's circle concept and crack formation.

Improving Shear Resistance

- Horizontal, vertical and inclined prestressing; effect of parabolic cables.

Shear Analysis of Rectangular Beams

- Critical sections, shear stress and design approach.

Shear Analysis of I Beams

- Web shear, flange contribution and design checks.

Design of Shear Reinforcement

- Stirrups, bent-up tendons and design procedure.

IS Code Provisions

- Permissible shear stress, design checks and reinforcement requirements as per IS 1343.

Summary

- Revision of flexure, cable profiles, shear resistance and design concepts.