STRUCTURAL CONSIDERATIONS FOR BRIDGES

0

Introduction

- Bridge members must be able to carry loads applied to them.
- Forces resisted by bridge members:
  - Axial forces
  - Bending forces
  - Shear forces
  - Torsional forces
- This presentation considers:
  - How bridge members are stressed by loads
  - How bridge materials resist stress
  - How bridges accommodate thermal movements

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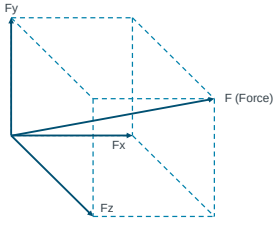
Force



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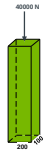
Stress

- What is a stress?
  - Loads cause stresses
  - Stresses are the internal force effects
- How to calculate stress?

Stress = Force/Area
= 40000/200x100
= 2MPa



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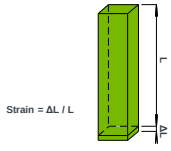
Strain

- It is described as the amount of deformation.
- It denotes the ratio of materials deformed dimension to its original dimension.



Deformation & Modulus of Elasticity

- Elastic Deformation – reversible distortion of a material.
- Plastic Deformation – the irreversible distortion of a material.
- Modulus of Elasticity (E) = Stress/Strain

Response to Loading

- Forces resisted by bridge members:
  - Axial forces
  - Bending forces
  - Shear forces
  - Torsional forces

Response Loading

Rigid Body

- A rigid body does not deform under load.

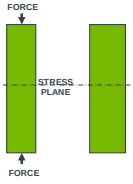
Equilibrium

- When a particle is at rest or moves with constant velocity.
  ∑V = 0
  ∑H = 0
  ∑M = 0

Types of Applied Stresses

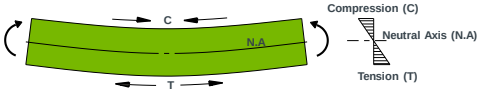
Tensile Stress

Types of Applies Stress



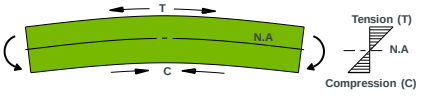
Compressive Stress

Types of Applied Stresses



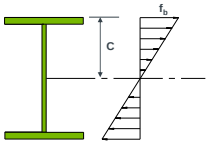
Positive Moment

Types of Applied Stresses



Negative Moment

Bending Stress



Bending Stress
$f_b = Mc/I$

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Types of Applied Stress

Shear Stress

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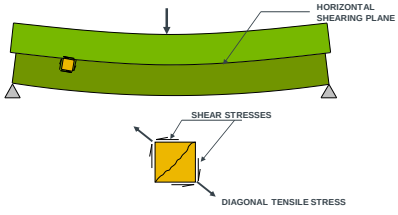
Beams – Horizontal Shear Stress



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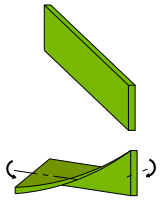
Torsional Forces



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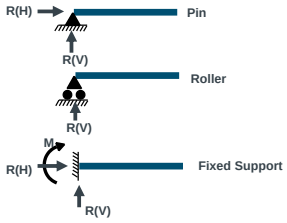
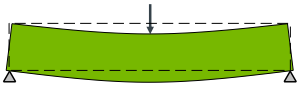
Types of Supports

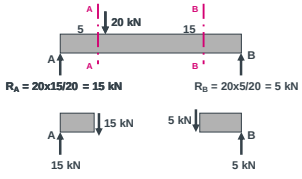


Span Classification

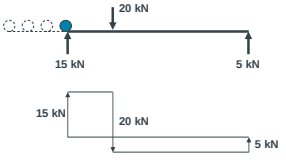


Simple Span

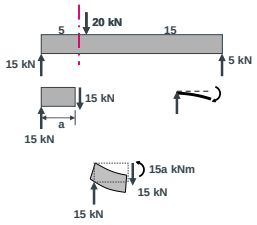
Shear



Shear Diagram



Bending Moment



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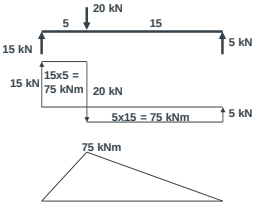
Bending Moment Design



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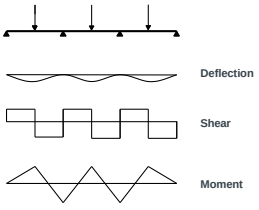
Span Classification



Continuous Span

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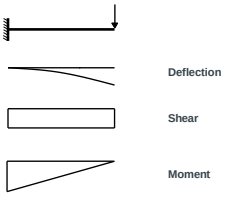
Span Classification



Cantilever

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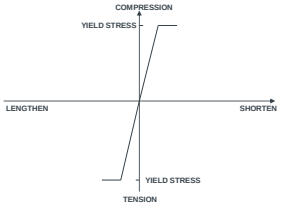
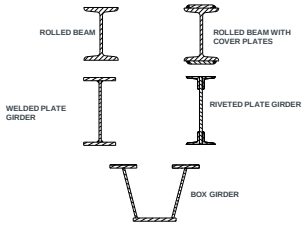
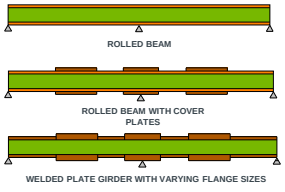
Stress in Steel



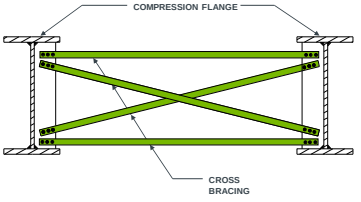
Steel Bridge Members



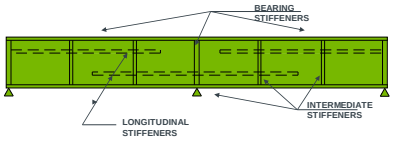
Steel Beams – Bending Stress



Steel Beams – Compression Stress



Steel Beams – Shear Stress



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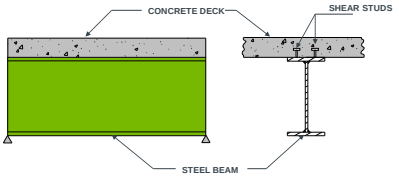
Composite Beam



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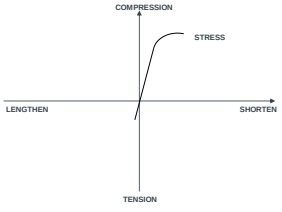
Stress in Concrete



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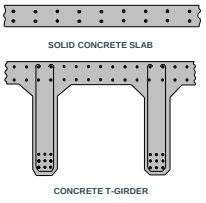
Concrete Bridge Members



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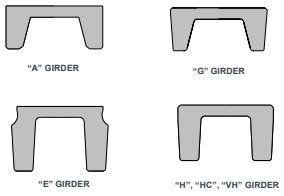
Concrete Bridge Members



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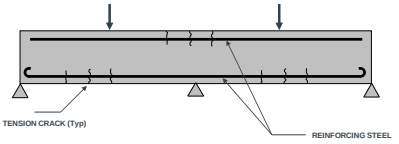
Concrete Beams – Bending Stress



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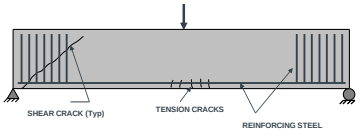
Concrete Beams – Shear Stress



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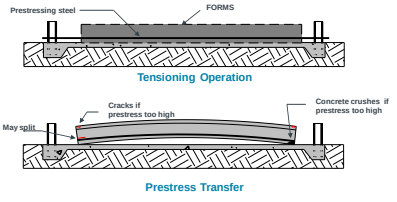
Prestressed Concrete



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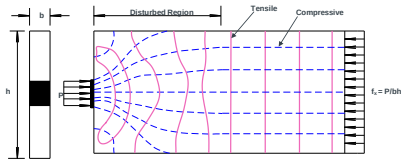
Anchorage Stress



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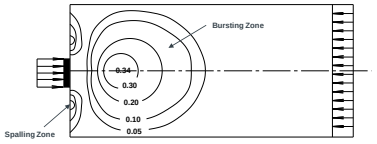
Anchorage Stress



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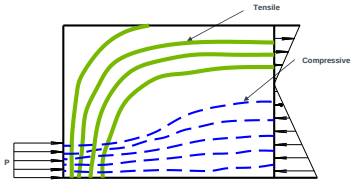
Anchorage Stress



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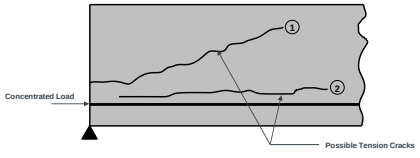
Anchorage Stress



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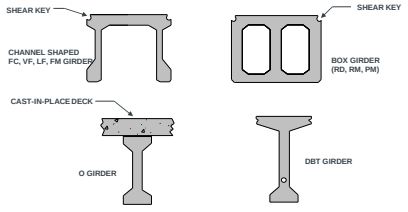
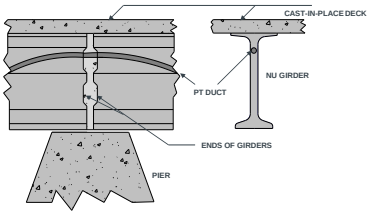
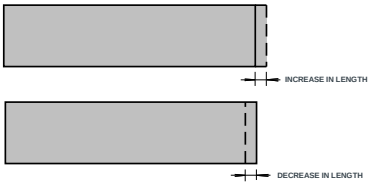
Prestressed Concrete Bridge Members



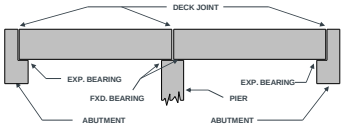
Prestressed Concrete Bridge Members



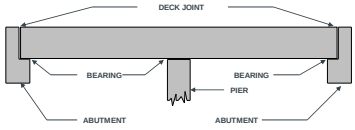
Thermal Stress



Thermal Stress



Thermal Stress



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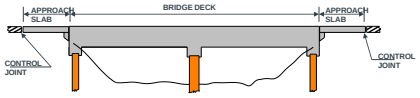
Stress in Concrete



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Questions?

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