STRUCTURAL ENGINEERING BASICS

STRUCTURAL ENGINEERING BASICS

Load Transfer and Structural Analysis/Design

STRUCTURAL ENGINEERING BASICS

TYPES OF LOADING ON STRUCTURES

- Point Loads (lb or kN)
- Uniformly Distributed Loads (lb/ft or kN/m)
- Area Loads (lb/ft^2 or kN/m^2)
- Triangular Distributed Loads (lb/ft or kN/m)

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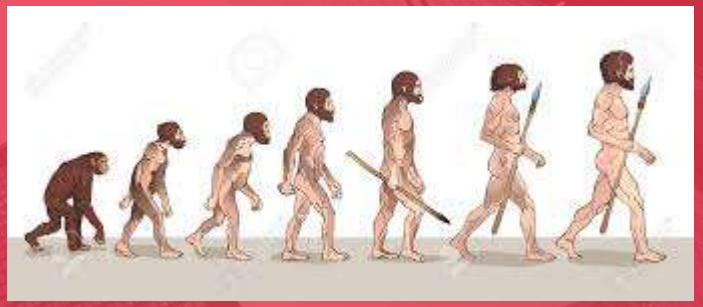
TYPES OF LOADING ON STRUCTURES



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BASICS

TYPES OF LOADING ON STRUCTURES

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Load Transfer

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Load Transfer

- Tributary Area
- Tributary Width
- Load wants to go to the closest support →shortest path
- Load is attracted to stiffness
- Load Takedown – Live Load Reductions

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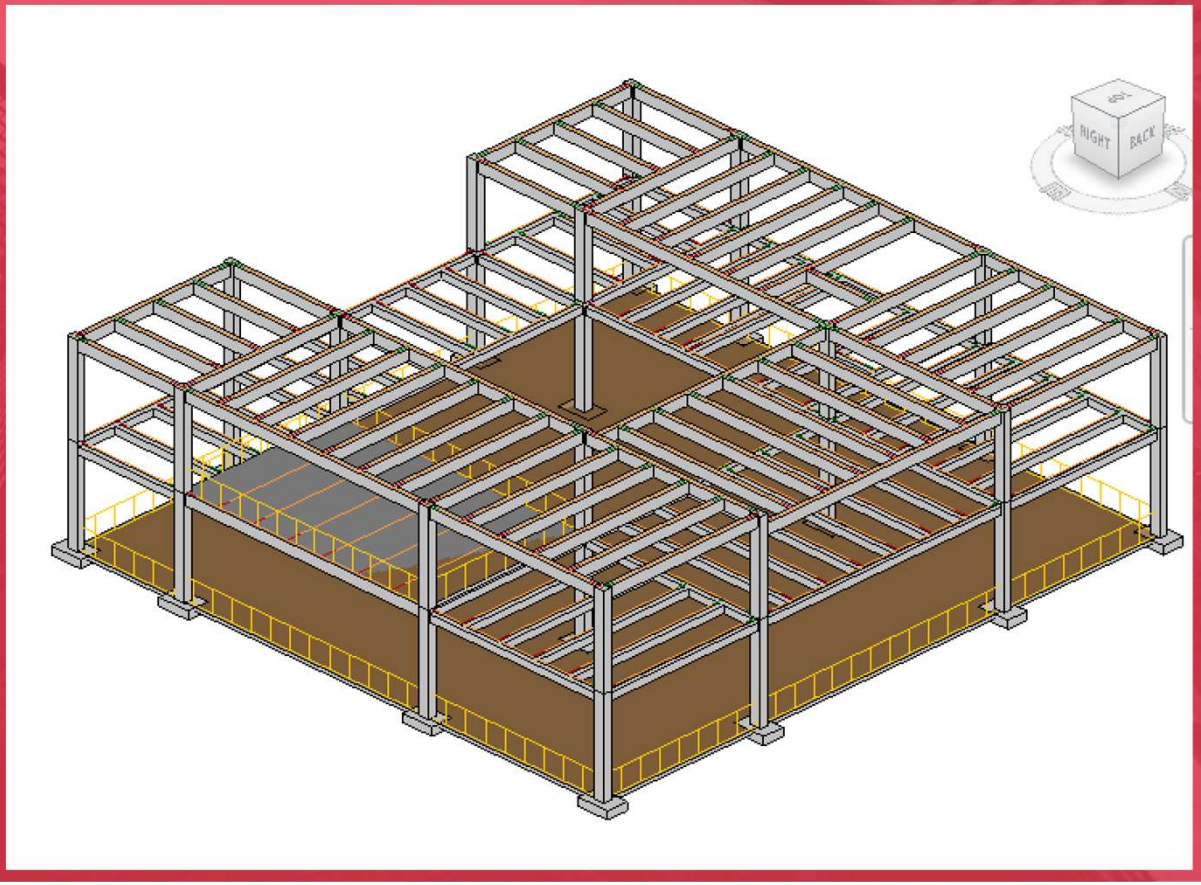
Load Transfer



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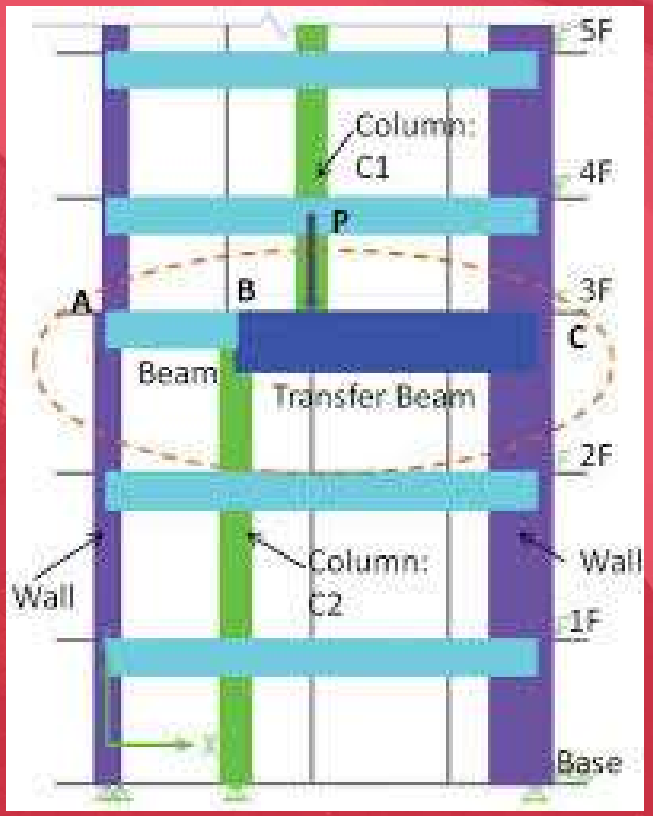
-Cantilevers

Load Transfer



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Analysis & Design

- Structural elements are designed to resist stresses

- Tension
- Compression
- Bending
- Shear
- Torsion
- Bearing

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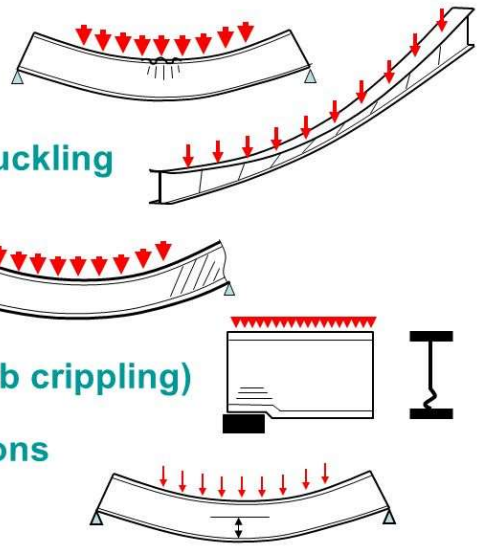
BASICS

Modes of Failures that are designed for in structures:

What can go wrong ?

STEEL BEAMS:

- Bending failure
- Lateral torsional buckling
- Shear failure
- Bearing failure (web crippling)
- Excessive deflections



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Modes of Failures that are designed for in structures:

- Buckling of Beams and Columns → Dependant on unsupported length and stiffness

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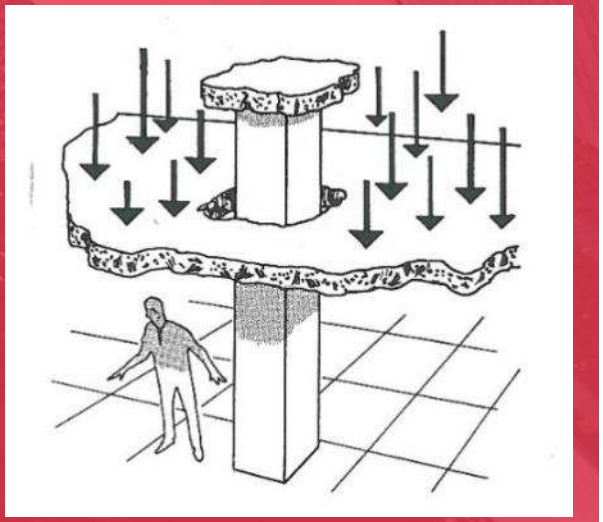
Modes of Failures that are designed for in structures:

- Shear Failure→



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Modes of Failures that are designed for in structures:

- Bending Failure→

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Modes of Failures that are designed for in structures:

- Compression Failure→

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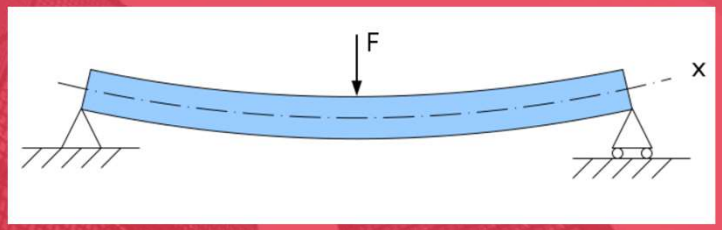
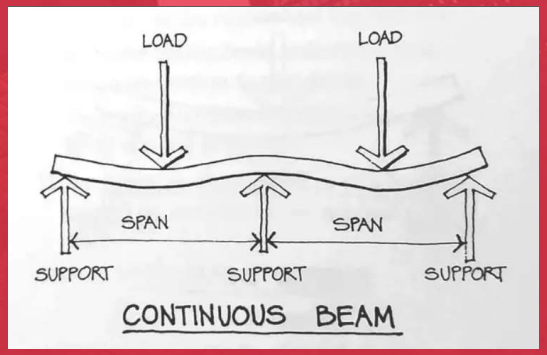
Analysis & Design

Moment & Shear:

- Simple Span Beams



- Continuous Beams



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Analysis & Design

Material Properties:

- Compression Strength
- Yield Strength

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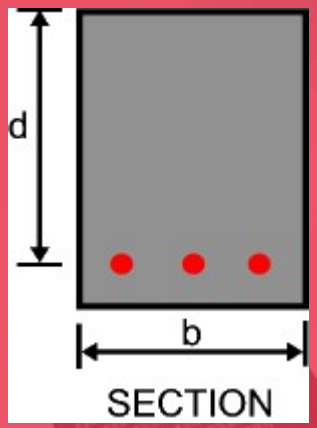
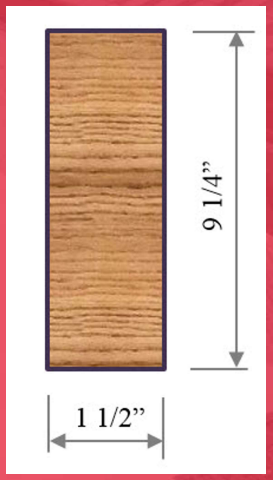
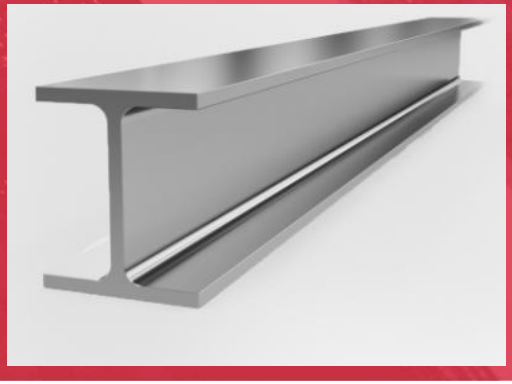
Analysis & Design

- Span vs. Depth







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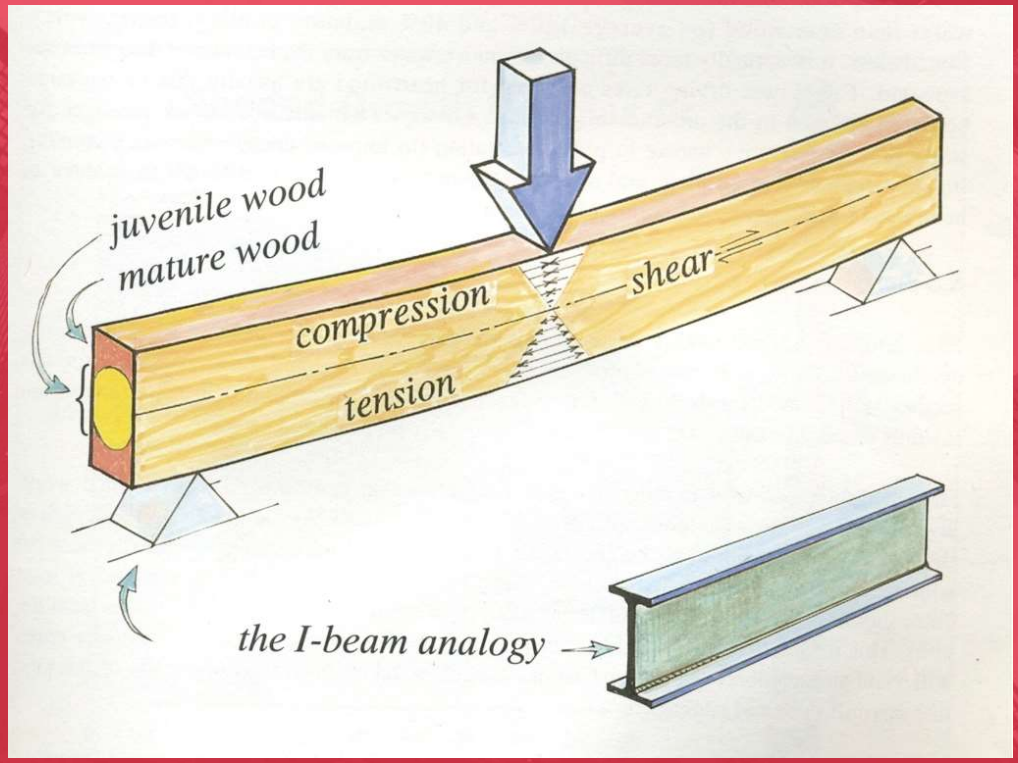
Analysis & Design



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Analysis & Design

- Deeper the section, higher resistance to bending and deflection
- Deflection resistance vs. bending resistance
→ Bending Moment = span ^{2}
→ Deflection = span ^{3}

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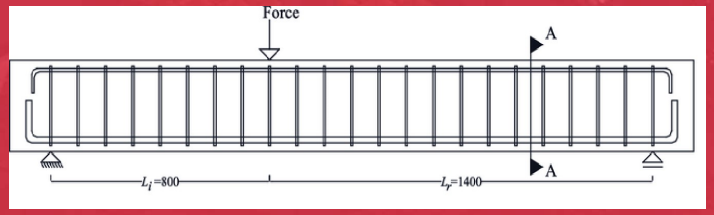
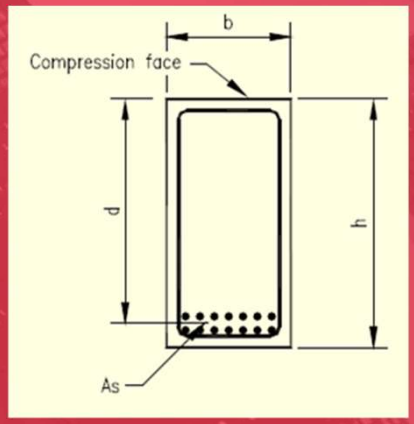
Analysis & Design

Reinforced Concrete:

- Concrete is strong in compression, weak in Tension
- Steel reinforcing used to resist tension loads
- Same design method applies to slabs





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Analysis & Design

Splices/Development Length

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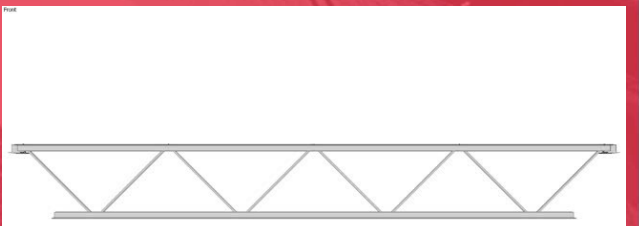
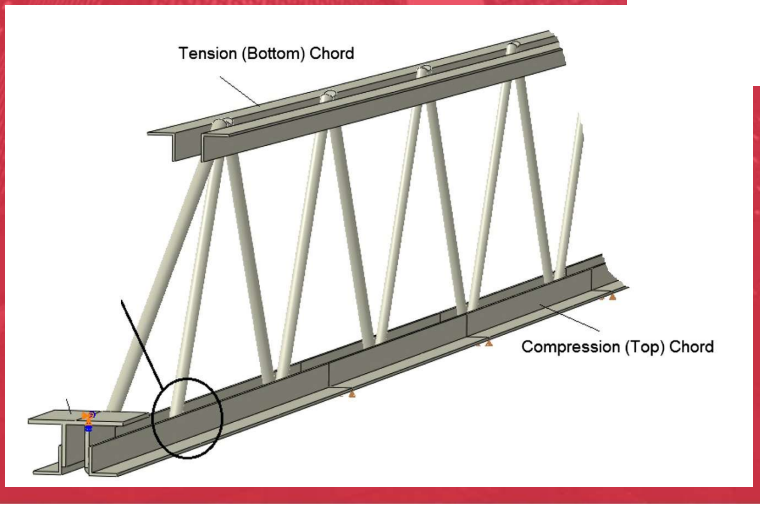
Analysis & Design

Joists/Trusses





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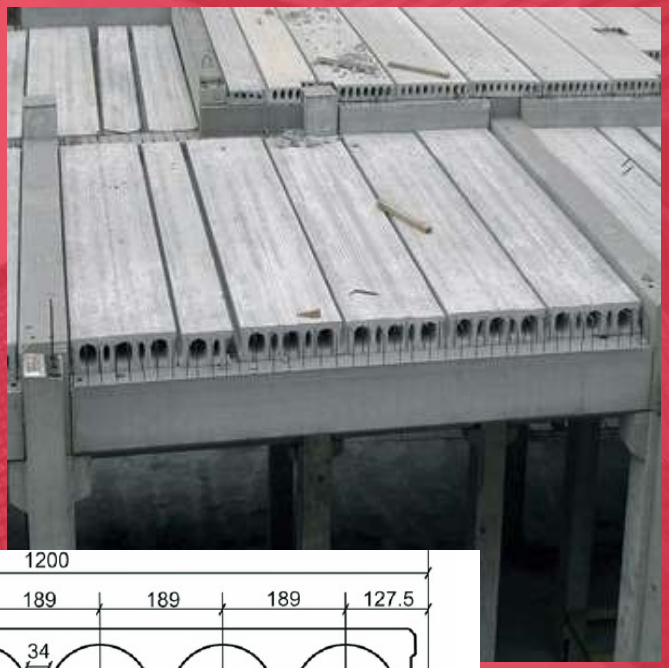
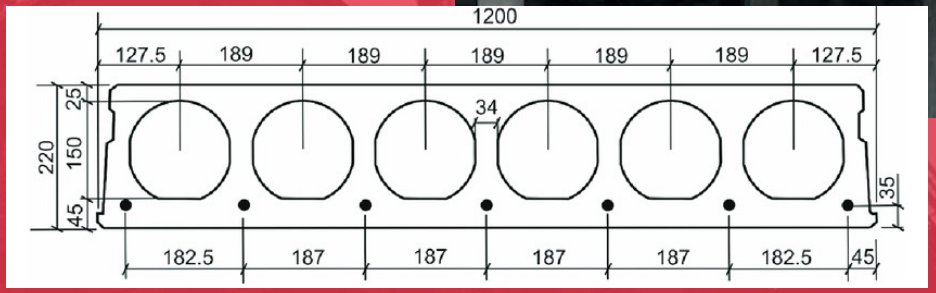
Analysis & Design

Hollowcore Slabs





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Analysis & Design

Columns

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Analysis & Design

Exterior Walls