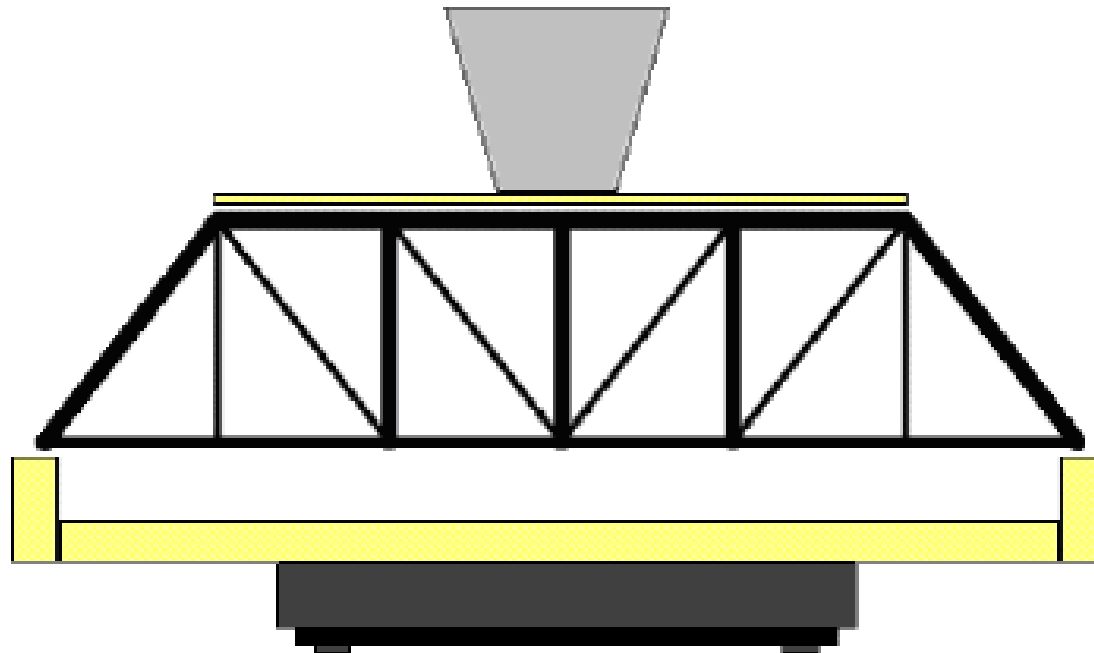


Simple Structures – Truss Bridge

Ms. Sparnell



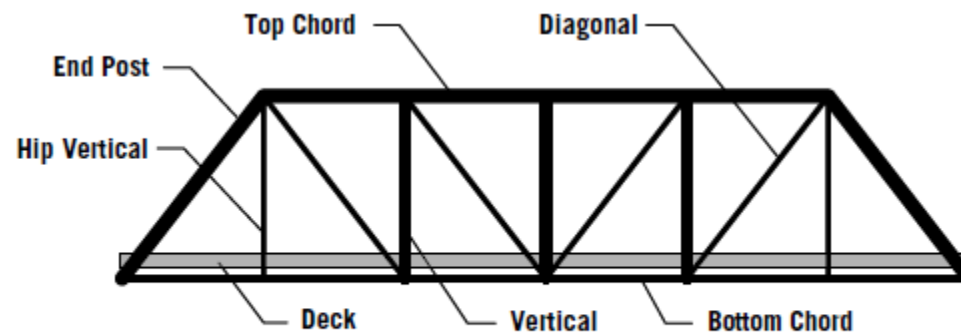
Learning Objectives

- Identify the major components of a truss bridge
- Explain fundamental structural engineering concepts
- Identify types of truss bridges
- Apply the engineering design process to build a truss bridge

Components of a Truss Bridge

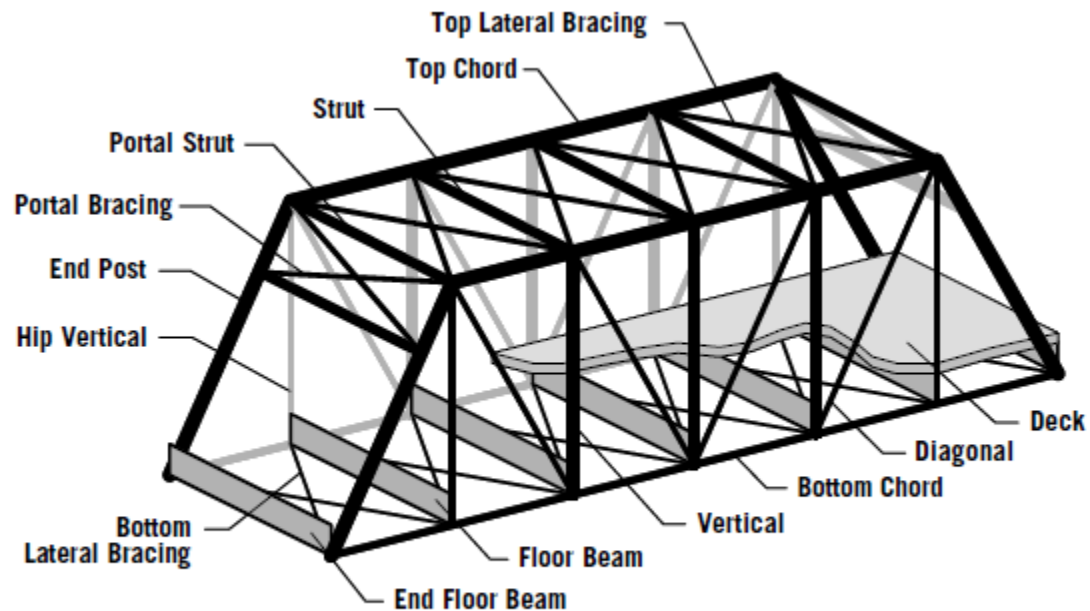
- A **truss** is a structure composed of members connected together to form a rigid framework
 - Trusses have a very high strength-to-weight ratio, which allows them to span long distances.
- **Members** are the load-carrying components of a structure. In most trusses, members are arranged in interconnected triangles. Because of this configuration, truss members carry load primarily in tension and compression
- **Deck**
 - The flat surface between the two main trusses

Elevation View



Component parts of a typical truss bridge - Elevation View

Isometric View



Component parts of a typical truss bridge - Isometric View ¹

Types of Bridges

- One of the most common truss configurations is the **Warren truss**, known for its simplicity because no vertical members are used
- Pratt Truss
 - All inner diagonal members slant down toward the center
- Howe Truss
 - All inner diagonal members slant toward the outside

Types of Truss Bridges



Pratt



Parker



K-Truss



Howe



Camelback



Warren



Fink



Double Intersection Pratt



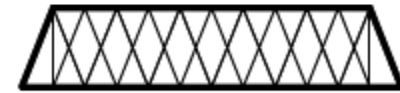
Warren (with Verticals)



Bowstring



Baltimore



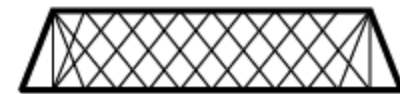
Double Intersection Warren



Waddell "A" Truss



Pennsylvania

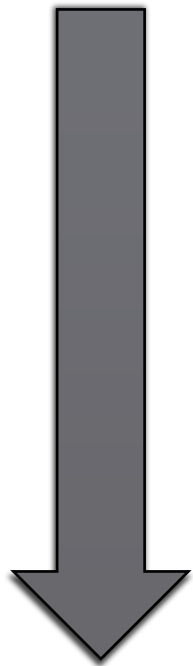


Lattice

How a Structure Carries a Load

- Much of structural engineering deals, in some way, with the concept of force
- A **force** is simply a push or a pull applied to an object. A force always has both magnitude and direction
- Tension
 - Members in tension are being pulled or stretched
- Compression
 - Members in compression are being pushed or shortened

Loads




10 NEWTONS

- A **load** is an external force applied to a structure
 - Weight of the vehicles and pedestrians crossing the bridge
 - Weight of the bridge itself
- **Reactions** are the support forces supplied by the abutments or piers
- **Internal forces** are the tension and compression forces developed along structural members when a load is applied

Safety Factor

➤ Safety Factor

- A measure of the load a structure can withstand beyond the load for which it was designed
- Most truss bridges are designed for a safety factor greater than **1.6**
- $SF = \frac{S}{F}$
- S = maximum strength a structural member can withstand before failing (N)
- F = maximum internal force calculated when a load of 50 N is applied to your bridge (N)



BUILD!