Structural Analysis – Trusses

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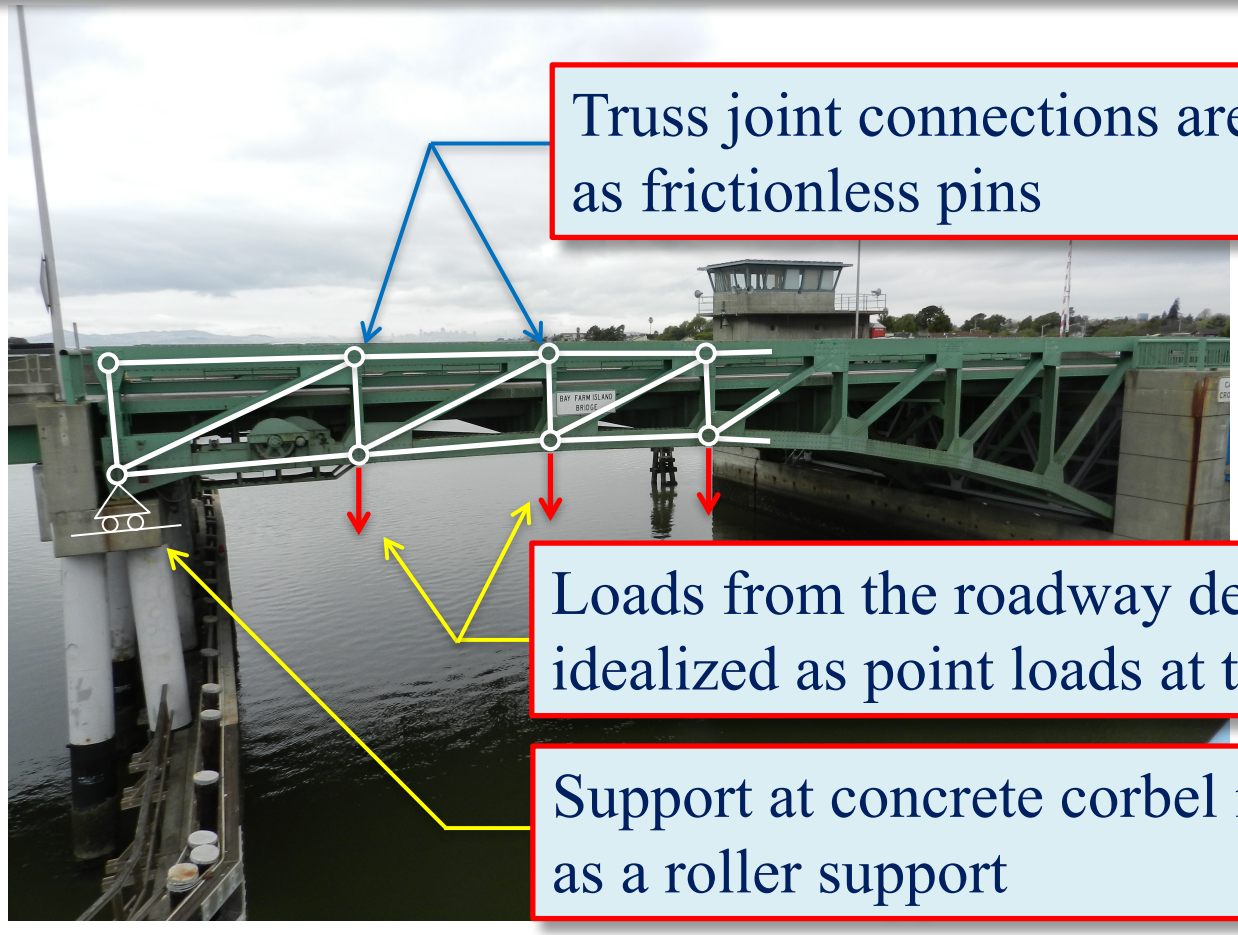
Truss Structure – Drawbridge Supporting a Roadway

A truss is a structure comprised of slender members connected at their ends

For Analysis – We Use an Idealized Model of the Truss Members, Connections, and Loads

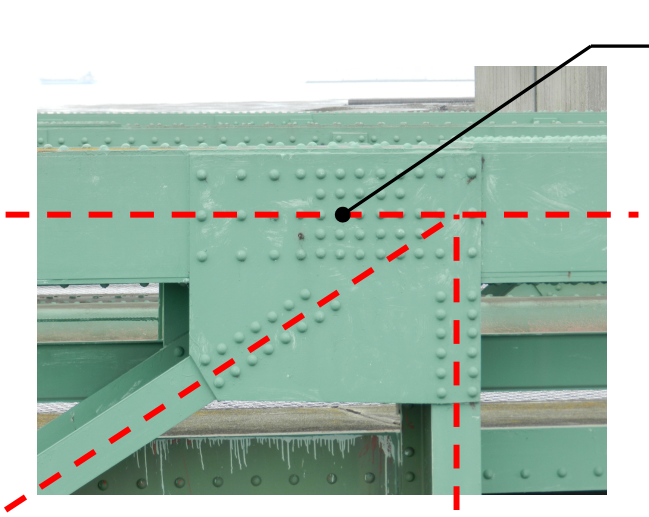


Truss joint connections are modeled as frictionless pins

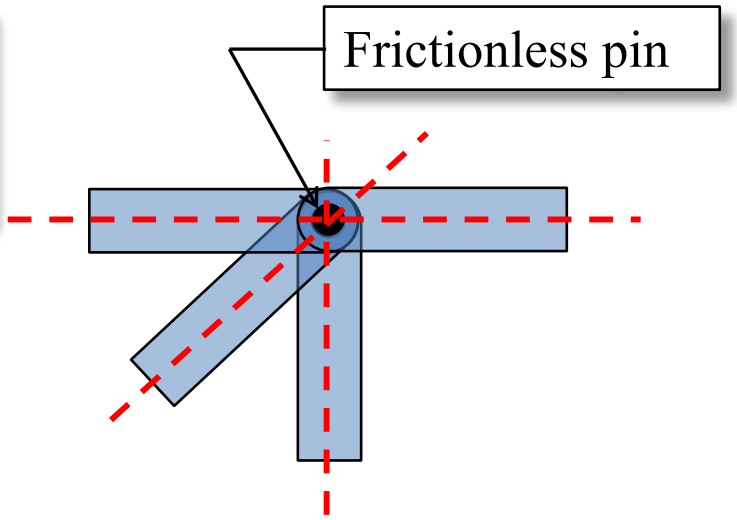
Loads from the roadway deck are idealized as point loads at truss joints

Support at concrete corbel is idealized as a roller support

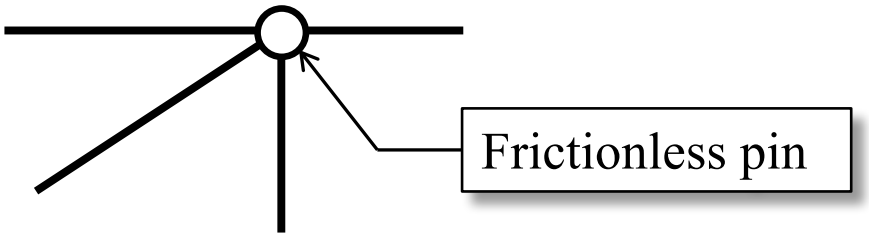
Idealized Truss Joint



Actual Truss Joint



Idealized Truss Joint



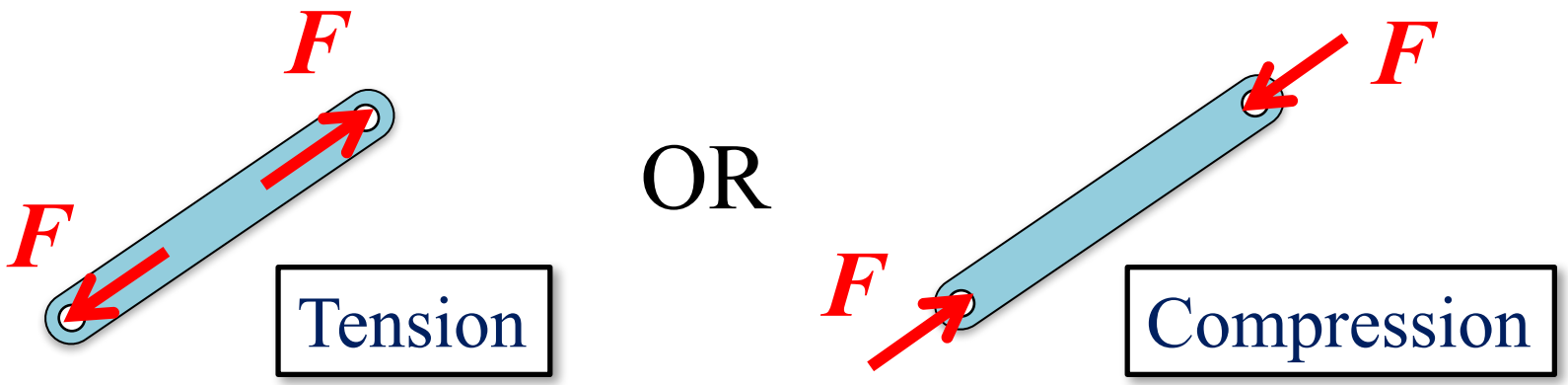
Common notation for calculations
and free-body diagrams

Common Assumptions for Simple Truss Analysis

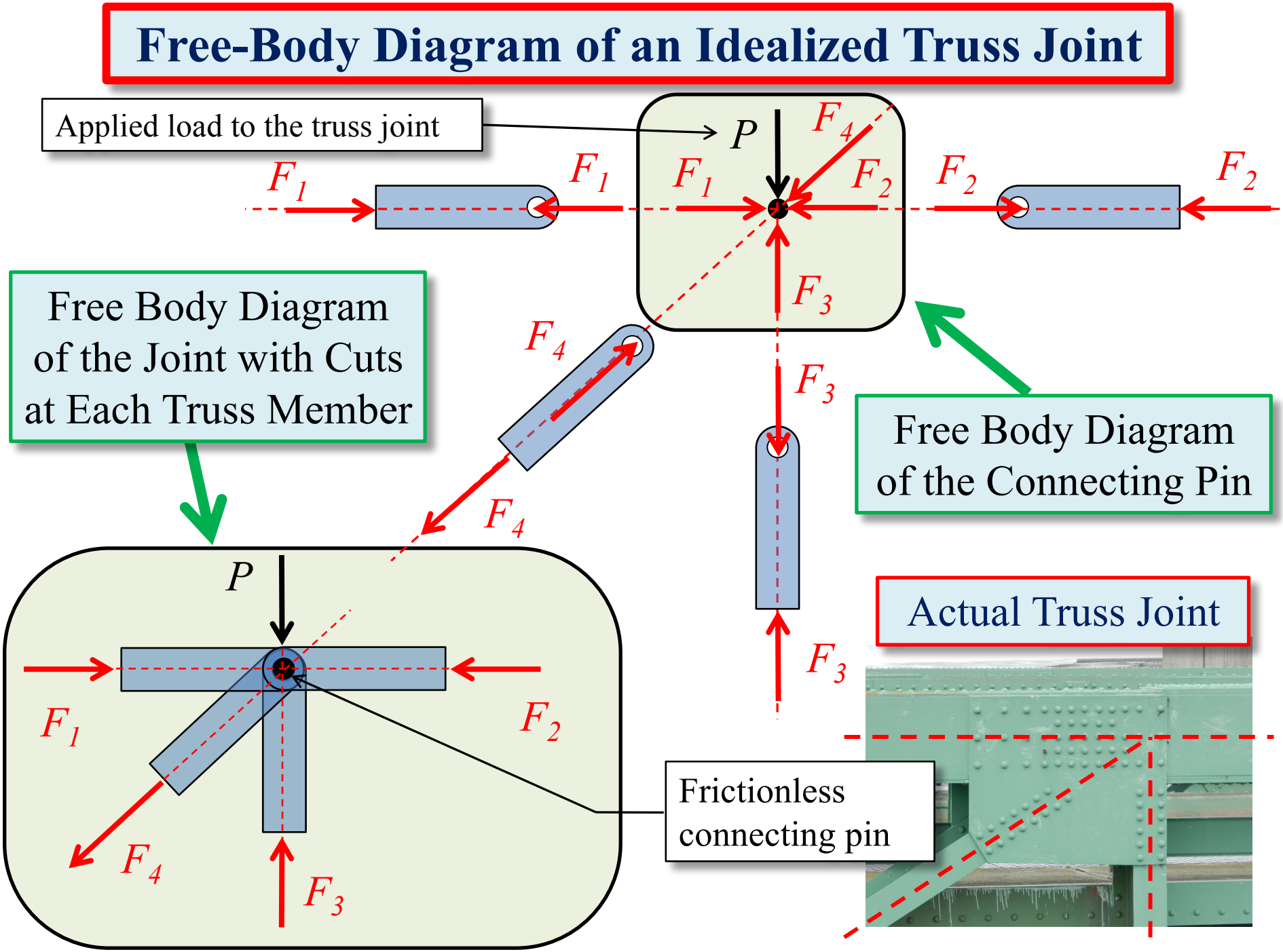
1. All truss connections are idealized as frictionless pins;
2. All loads to the truss are point loads applied at the truss joints;
3. Weight of the truss members is small compared to joint loads and internal axial force that can be carried by the member.

Due to the above assumptions, each truss member is loaded only at its ends and so each truss member is a Two Force Member.

Two possible conditions for equilibrium of each truss member



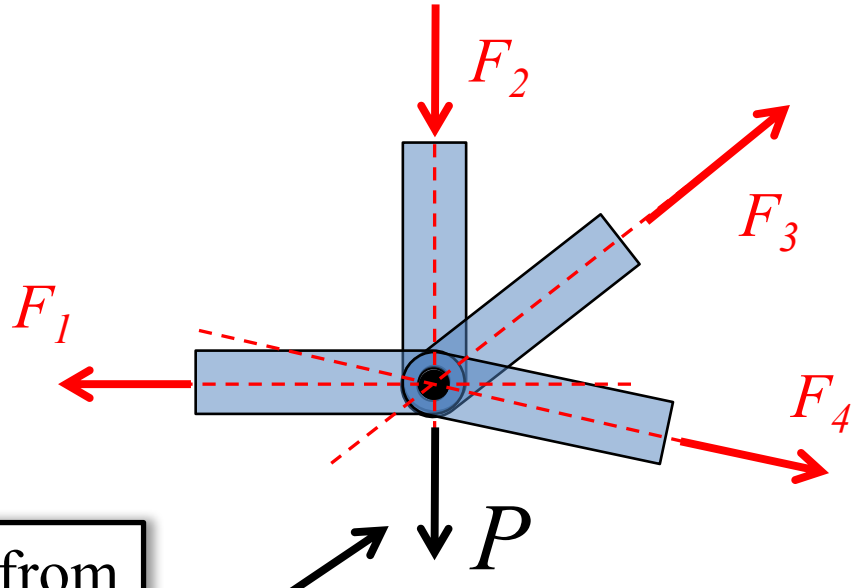
Free-Body Diagram of an Idealized Truss Joint



Loads to the Truss Joints Usually Come From Structure that the Truss is Supporting

Beam supporting the roadway deck

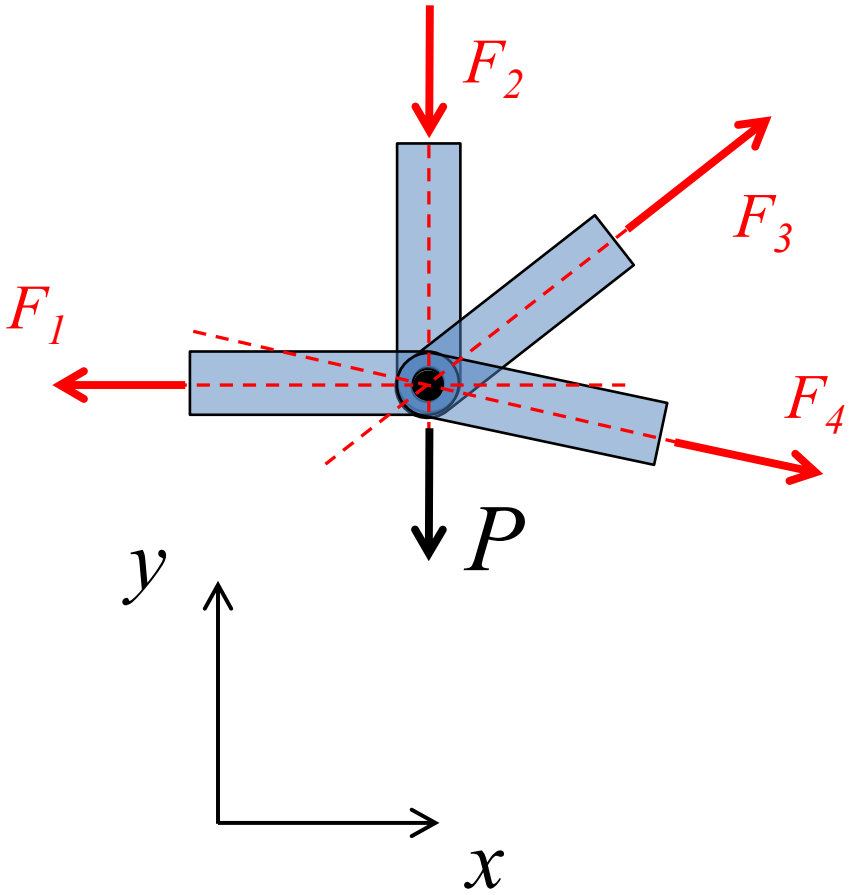
Free-Body Diagram of Idealized Truss Joint



Load to truss joint from the roadway deck

Note that the Free-Body Diagram of Each Truss Joint is a Concurrent Force System

Free-Body Diagram of Idealized Truss Joint



Two equations of equilibrium are available to find unknown truss member forces

$$\sum F_x = 0$$

$$\sum F_y = 0$$

Another Example of a Truss Structure

New Recreation Center at SJSU