Truss

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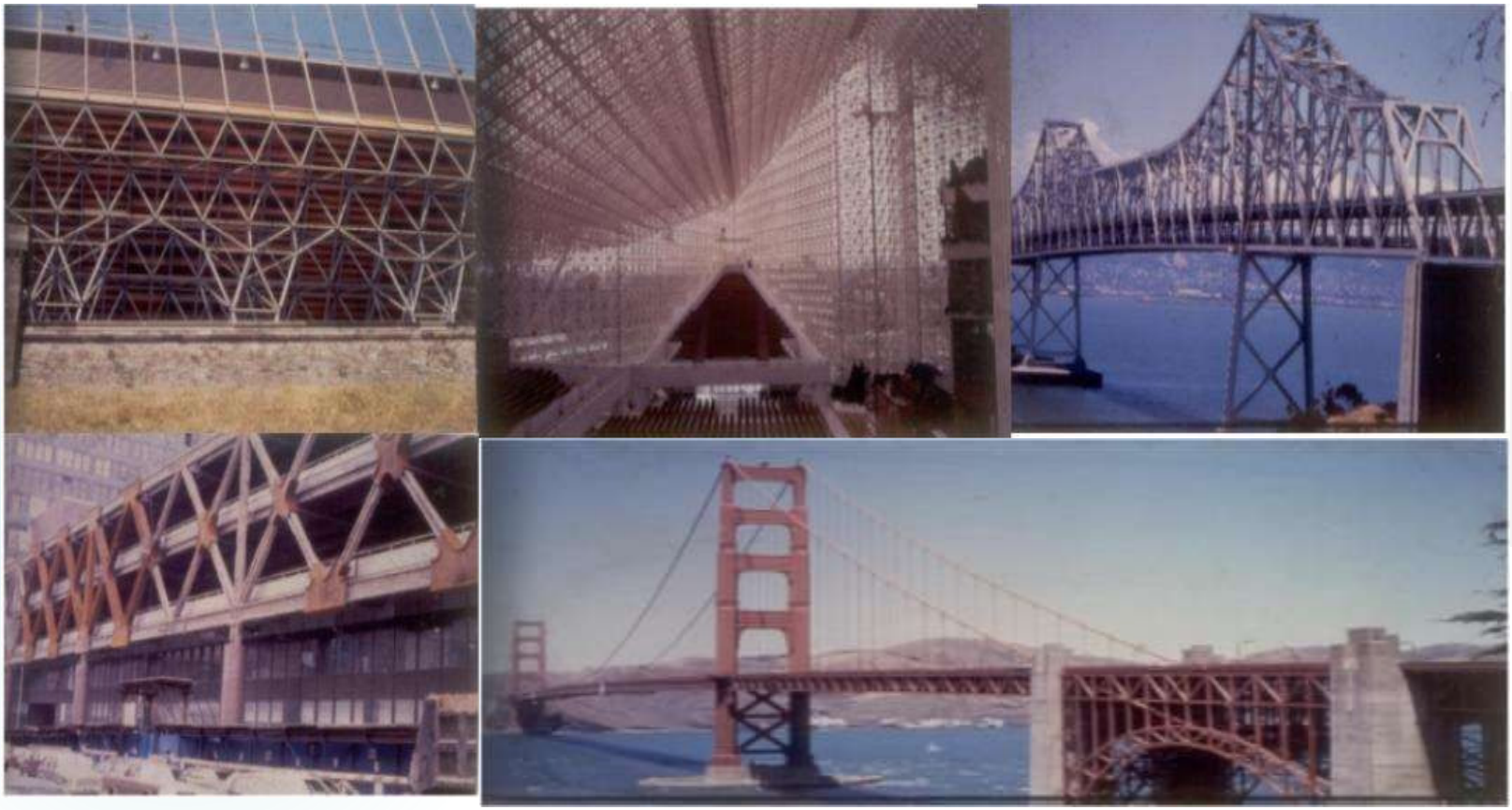

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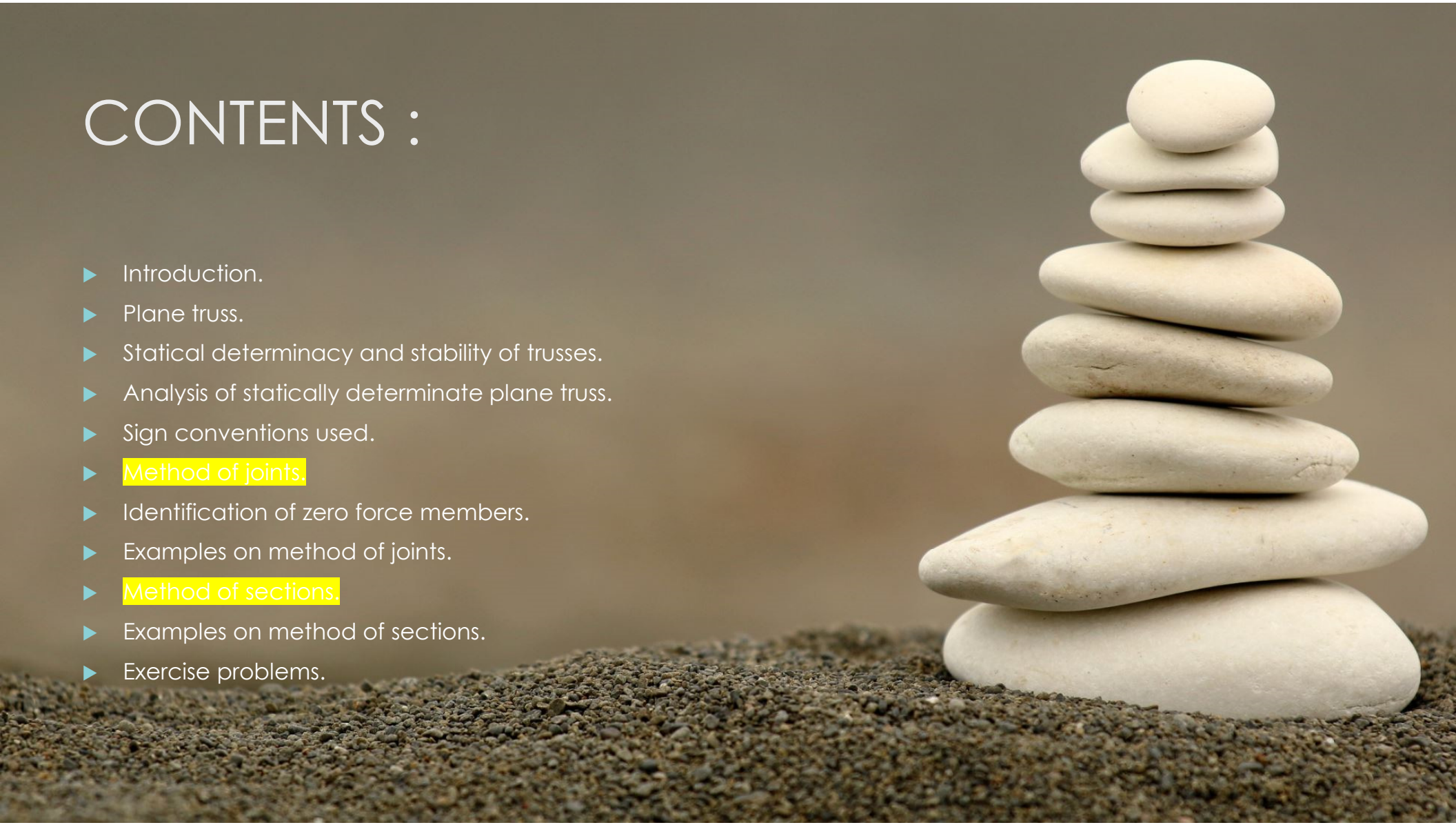

- Introduction.
- Plane truss.
- Statical determinacy and stability of trusses.
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- Examples on method of sections.
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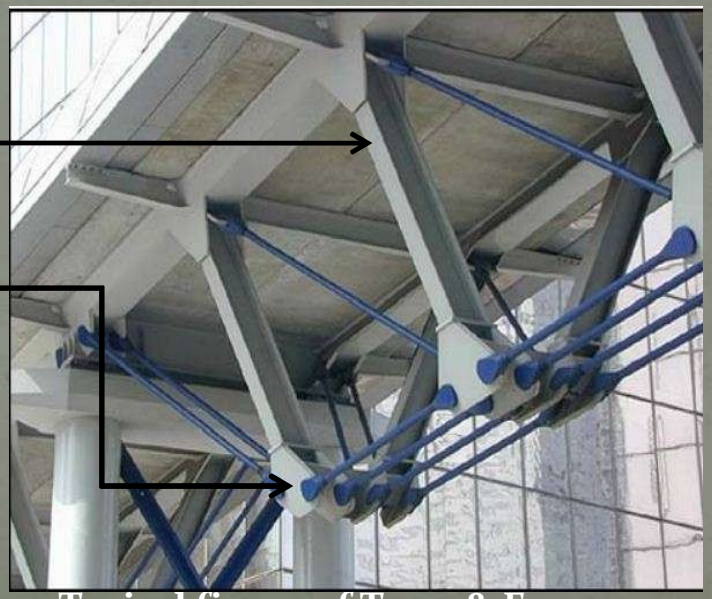
Truss

- **A truss is a structure composed of slender members joined together at their end points. Planar trusses lie in a single plane. Typically a truss is a joint framed structure which is designed to sustain inclined, vertical or horizontal loads occurring at or between its points of supports and has the following characteristics:**

- Straight Members

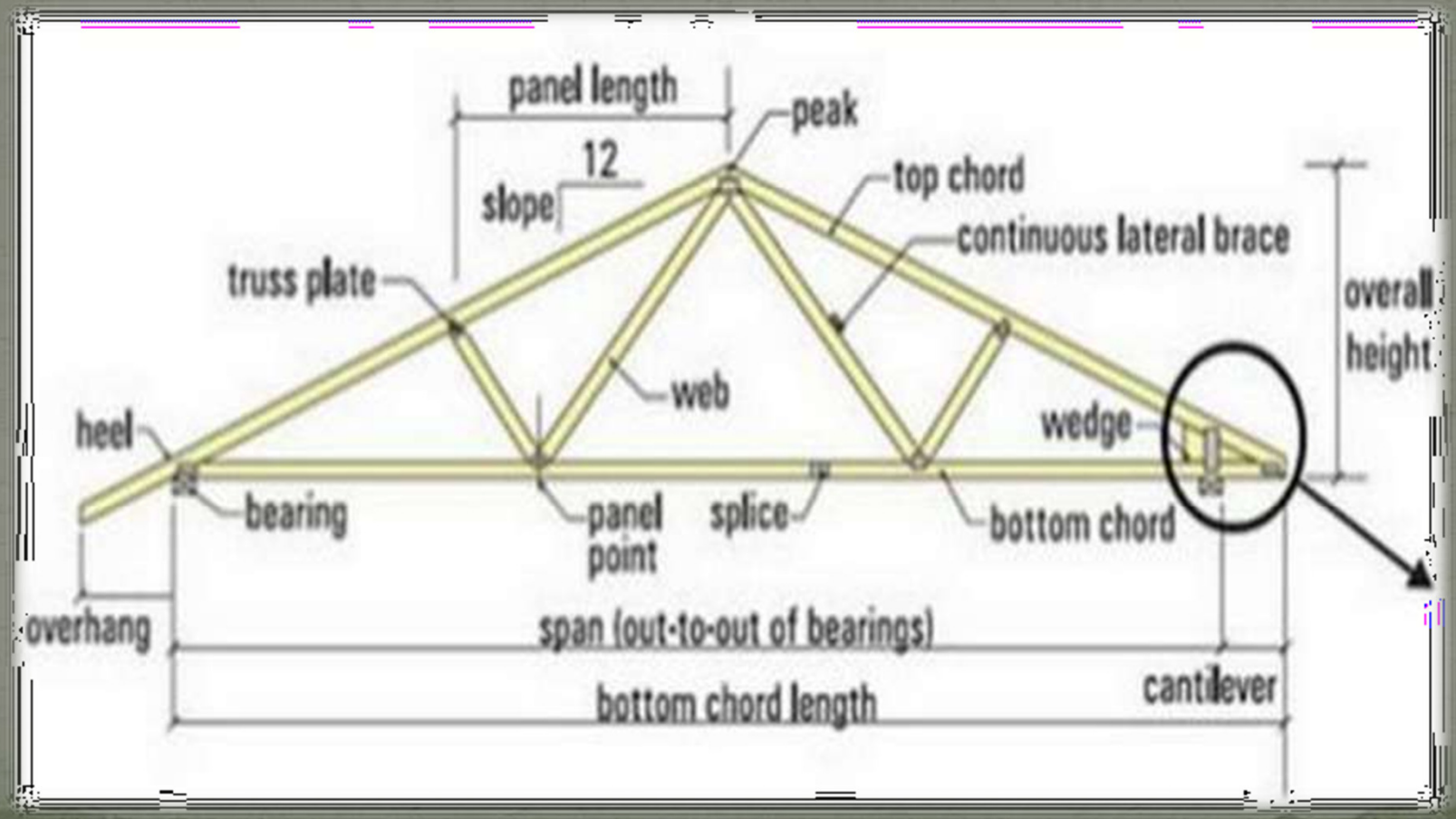
- Members connected at their intersections by means of frictionless pins or hinges

- Members so arranged that the truss is loaded only at the joints



Typical figure of Truss & Frames

Components of Truss

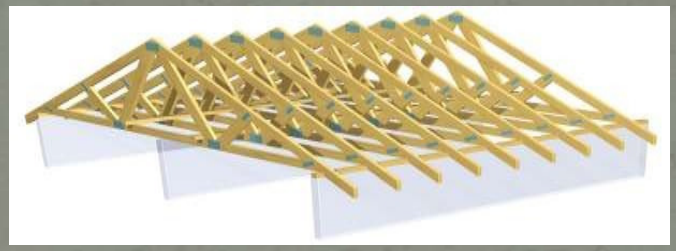


Plane truss: A truss consisting of members which lie in a plane and are loaded in the same plane is called a plane truss. Ex: Roof truss, bridge truss, etc.

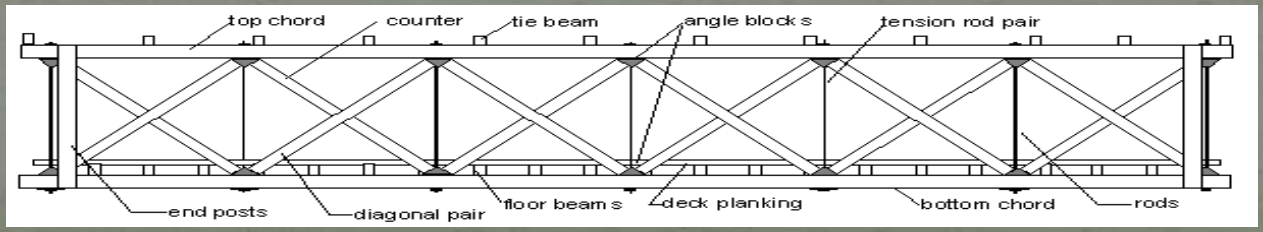
Space truss: A truss made up of members not lying in the same plane is referred to as space truss. Ex: Electric power transmission tower, microwave tower, etc.

Basic Types of Truss

- Pitched Truss- Characterized by its triangular shape. It is most often used for roof construction.



- Parallel Chord Truss- Its named from its parallel top and bottom chords. It is often used for roof construction.



Various Types of Truss

Flat Truss

Queen Post Truss

Bowstring Truss

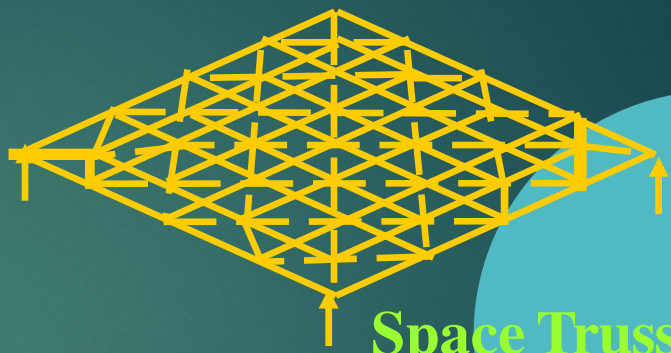
King Post Truss

Lenticular Truss

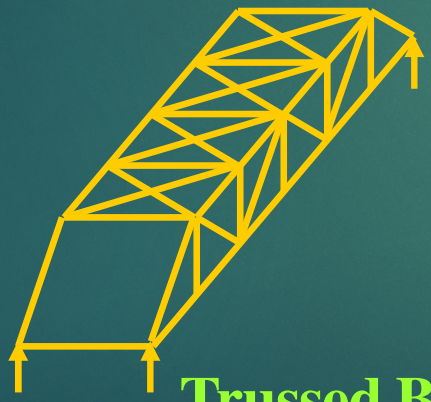
Lattice Truss

APPLICATIONS

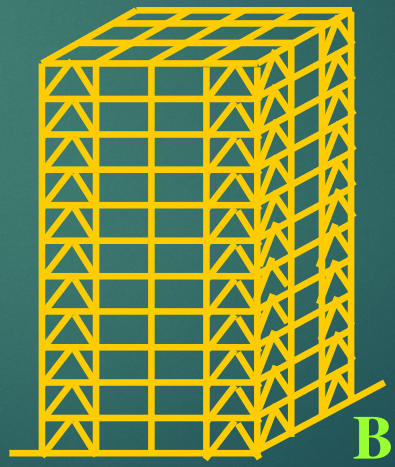
Plane Truss



Space Truss



Trussed Bridge



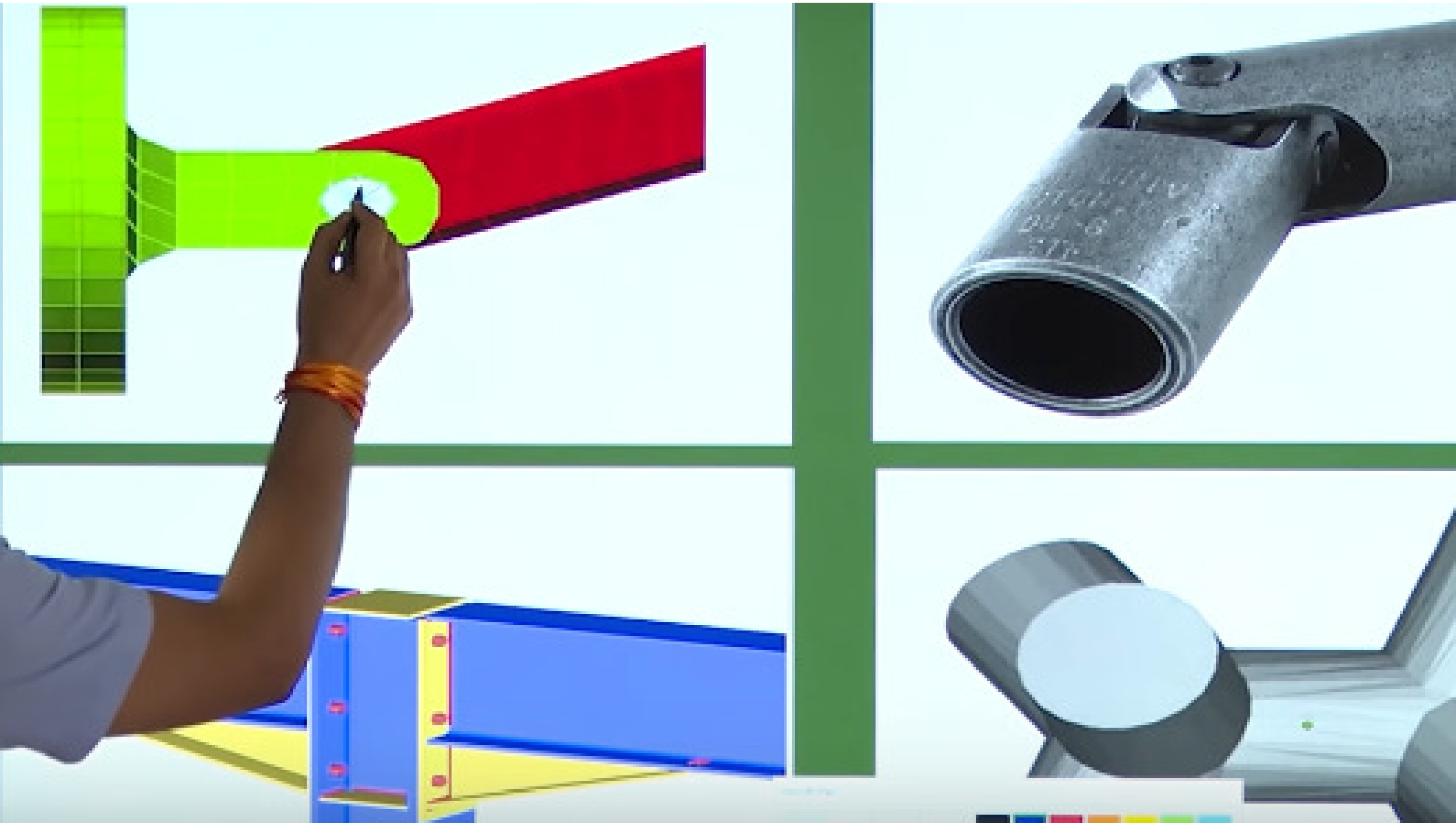
Braced Frame

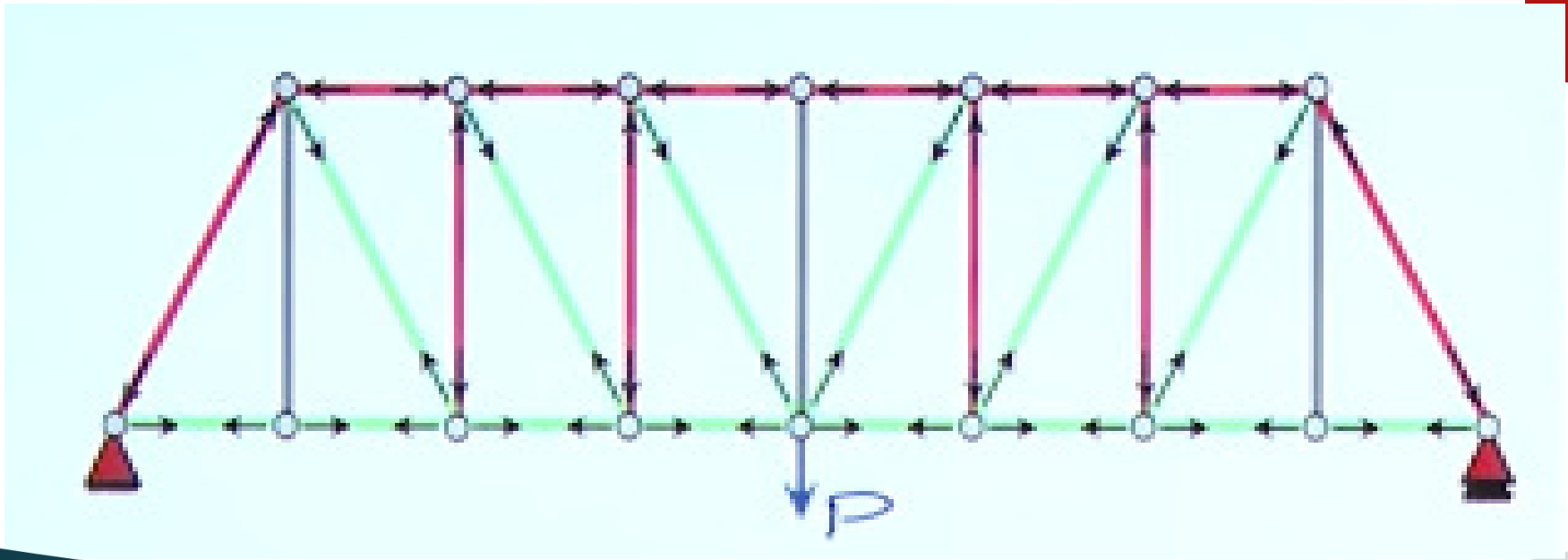
Truss

- In a truss, the joints are of pin type, where end of the members can rotate freely. Moreover, individual truss members should not directly loaded transversely; loads should be applied at the joints of members so that no bending or shear forces will be generated on truss members. Self-weight of the members should be dumped both end for the same reason.
- In truss, joints are of pin joint type and can freely rotate about the pin. So, they cannot transfer moments.
- In practical, truss have no flexibility in joints.

Frame

- Unlike truss, the members of frames are connected rigidly at joints and individual members can carry transverse load, which may generate bending moment, shear forces along with axial forces.
- In frame, joints are joined by welding and bolting so they are rigid and cannot rotate freely. They can transfer moments as well as axial loads.
- Frames are of 2types. Rigid non collapsible and non rigid collapsible.

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- The free body diagram of a member shows that it is acted upon by two equal and opposite forces.
- The hinged joint permits members to rotate with respect to each other and hence the members are subjected to purely axial forces.

Tension Member

Compression Member

The convention for internal forces, i.e., the action of forces in the members on the joints is shown.

TENSION COMPRESSION

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ANALYSIS OF STATICALLY DETERMINATE PLANE TRUSS :

The assumptions made in the analysis are as follows:

- The members of the truss are connected at the ends by frictionless hinges.
- The axes of all members lie in a single plane called 'middle plane of the truss'.
- All the external forces acting on the truss are applied at the joints only.
- All the loads are applied in the plane of the truss.

The following methods of analysis will be adopted :

A.) Method of joints. B.) Method of sections. SIGN

CONVENTIONS USED :

Positive sign is used for tension. Negative sign is used for compression.

Clockwise moment ()is taken positive and anti-clockwise moment () is taken as negative.

METHOD OF JOINTS :

A member in a pin - jointed truss has only one internal force resultant i.e., the axial force. Hence the F.B.D of any joint is a concurrent system in equilibrium.

METHOD OF JOINTS : (contd..)

The procedure for method of joints is as follows :

- The support reactions of the truss are first obtained considering the three conditions of equilibrium, applied to the truss as a whole ($\Sigma H=0$, $\Sigma V=0$ and $\Sigma M=0$).
- Taking the F.B.D of a joint which has not more than two unknowns (preferably), and applying the equations of equilibrium for a coplanar concurrent force system ($\Sigma H=0$ and $\Sigma V=0$), the unknowns are evaluated.
- The analysis is continued with the next joint with two unknowns (preferably), until the forces in all the members are obtained.