

CHAPTER REVIEW

Trusses are composed of slender members joined together at their end points to form a series of triangles.

For analysis we assume the members are pin connected, and the loads are applied at the joints. Thus, the members will either be in tension or compression.

Trusses can be classified in three ways:

Simple trusses are formed by starting with an initial triangular element and connecting to it two other members and a joint to form a second triangle, etc.

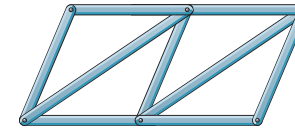
Compound trusses are formed by connecting together two or more simple trusses using a common joint and/or additional member.

Complex trusses are those that cannot be classified as either simple or compound.

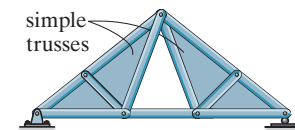
If the number of bars or members of a planar truss is b , and there are r reactions and j joints, then if

$b + r = 2j$ the truss will be statically determinate

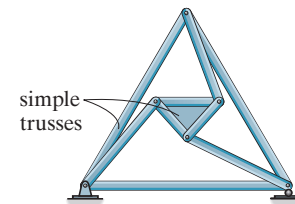
$b + r > 2j$ the truss will be statically indeterminate



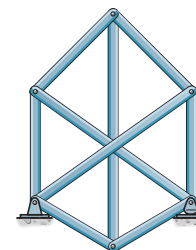
simple truss



compound truss



compound truss

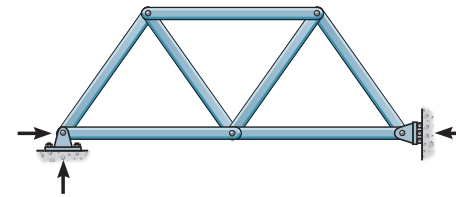


complex truss

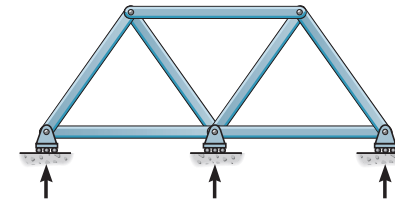
The truss will be externally unstable if the reactions are concurrent or parallel.

If the number of bars is b , reactions r , and joints j , then if $b + r < 2j$ the truss is unstable.

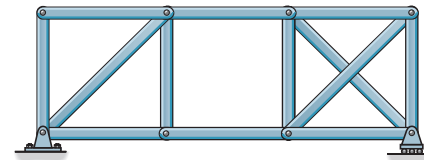
If $b + r \geq 2j$ it may still be unstable, so it becomes necessary to inspect the truss and look for bar arrangements that form a parallel mechanism, without forming a triangular element.



unstable concurrent reactions



unstable parallel reactions



unstable internally

Planar trusses can be analyzed by the *method of joints*. This is done by selecting each joint in sequence, having at least one known force and at most two unknowns. The free-body diagram of each joint is constructed and two force equations of equilibrium, $\Sigma F_x = 0$, $\Sigma F_y = 0$, are written and solved for the unknown member forces.

The method of sections requires passing a section through the truss and then drawing a free-body diagram of one of its sectioned parts. The member forces cut by the section are then found from the three equations of equilibrium. Normally a single unknown can be found if one sums moments about a point that eliminates the two other forces.

Compound and complex trusses can also be analyzed by the method of joints and the method of sections. The “method of substitute members” can be used to obtain the forces in the members of a complex truss.