
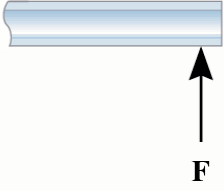

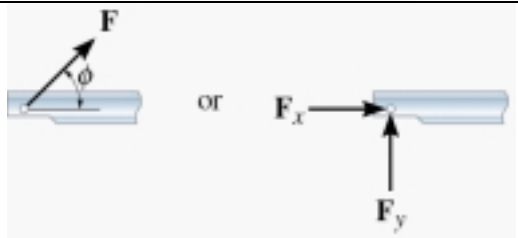
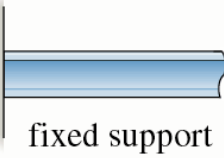
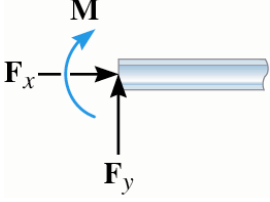


Support reactions:

If a support prevents translation of a body in a given direction, a force is developed on the body in that direction.

Constraints	Type and direction of forces produced
 <p>roller</p> <p>The connection point on the bar can not move downward.</p>	 <p>F</p>
 <p>pin</p> <p>The joint can not move in vertical and horizontal directions.</p>	 <p>or F_x F_y</p>
 <p>fixed support</p> <p>The support prevents translation in vertical and horizontal directions and also rotation, Hence a couple moment is developed on the body in that direction as well.</p>	 <p>M F_x F_y</p>

Free body diagrams considering supports:

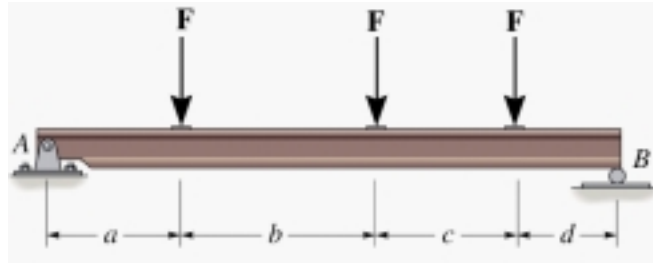
Example:

Draw the FBD for the following beam (the trusses are imposing the same forces on the beam):



Solution:

- A pin can be considered for left support (A); no motion in 2 directions,
- A roller can be considered for right support (B); no vertical motion,
- Weight of the beam is generally neglected (when not mentioned and) when it is small compared to the load the beam supports.
- Replace each truss with force F :



- FBD:

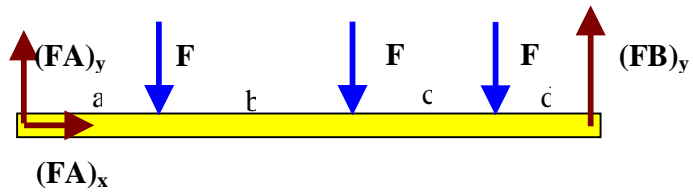


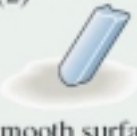



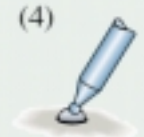
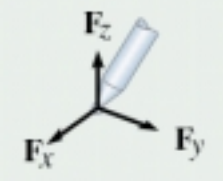

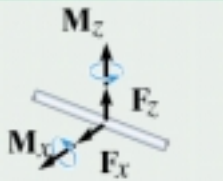

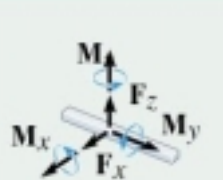



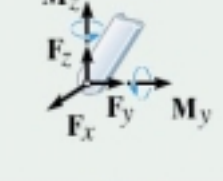

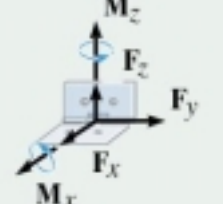
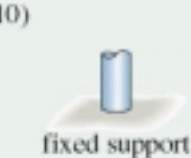



Table 5-2 Supports for Rigid Bodies Subjected to Three-Dimensional Force Systems

Types of Connection	Reaction	Number of Unknowns
(1)  cable		One unknown. The reaction is a force which acts away from the member in
(2)  smooth surface support		One unknown. The reaction is a force which acts perpendicular to the surface
(3)  roller		One unknown. The reaction is a force which acts perpendicular to the surface

<p>(4)</p>  <p>ball and socket</p>		<p>Three unknowns. The reactions are three rectangular force components.</p>
<p>(5)</p>  <p>single journal bearing</p>		<p>Four unknowns. The reactions are two force and two couple-moment</p>
<p>(6)</p>  <p>single journal bearing with square shaft</p>		<p>Five unknowns. The reactions are two force and three couple-moment components.</p>
<p>(7)</p>  <p>single thrust bearing</p>		<p>Five unknowns. The reactions are three force and two couple-moment components.</p>
<p>(8)</p>  <p>single smooth pin</p>		<p>Five unknowns. The reactions are three force and two couple-moment components.</p>
<p>(9)</p>  <p>single hinge</p>		<p>Five unknowns. The reactions are three force and two couple-moment components.</p>
<p>(10)</p>  <p>fixed support</p>		<p>Six unknowns. The reactions are three force and three couple-moment components.</p>