2.4 Concurrent Force Systems - Video Transcript

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Hello. For today's video lecture, we're going to be talking about concurrent force systems.

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A set of forces is concurrent if the lines of action of all the forces come together at one point. The line of action of a force is simply the line along which the force vector acts. If we have a force vector, its line of action is the continuation of that vector in either direction.

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In concurrent force systems, all forces meet at a single point. Here, we have a traffic light held up by two cables. Each cable carries a force along the direction of the cable, and gravity acts straight down through the center of the traffic light. If we draw all the lines of action, we see that they intersect at one point in the middle.

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Contrast this with a non-concurrent force system. Here, we have a gravity force acting downward and two normal forces acting upward. These lines of action do not come together at any point. This is the opposite of a concurrent force system because there is no single intersection point.

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Why do we care if forces are concurrent? If all forces come together at a single location, then no force will exert a moment about that point. Returning to the traffic light example, if we analyze the body at that intersection point, tension one, tension two, and the gravity force do not exert any moment about that point.

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Because there are no moments to consider, we can simplify the system analysis by treating the body as if it were a particle located at that point. Although the traffic light is a rigid body with mass and volume, for analysis we can treat it as a single particle at the intersection point.

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In particle analysis, we only need to balance the forces. We do not need to balance moments because there are no moments about that point. This simplifies the problem significantly.

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That's all for today's video lecture. Thank you for watching, and I hope to see you again.