Module 9: Rear Beam Suspension

Terms and Definitions

- A center bushing is a type of bushing that provides a pivot point for the beams and connects beams to the upper portion of the suspension.
- Cross tube is the suspension component that restricts side movement of the axles during cornering.
- Durometer is the instrument that measures the hardness (stiffness) of a material, such as rubber or urethane. The higher the number, the harder the material.

Note: Typical rubber or urethane suspension components have durometer readings of 40, 50, 60, 70 (natural rubber), and 90.

- An end bushing is the type of bushing that connects the beam ends to the axles.
- An equalizing (or walking) beam is a forged steel or aluminum suspension component mounted to the underside of the axles that distributes weight equally between both axles.

Note: As the forward rear axle goes over a 2-inch (5-cm) bump, the center of the equalizing, or walking, beam is raised about 1 inch (2.5 cm). This effect allows each axle to “step or walk” over bumps.

- Jounce is the upward movement of the axle as the wheels go over a bump.
- Rebound is the downward movement of the axle as the wheels return to the road.
- The torque rod is the suspension component that transfers braking and driving forces to the frame and maintains drive line angularity.

Purpose of Rear Beam Suspension

There are seven main purposes of rear beam suspension:
1. To support the weight of the vehicle and its load.
2. To cushion the frame and cab of the vehicle from road shocks.
3. To transfer braking forces and driving forces from the axle to the frame.
4. To allow axles some self-alignment during cornering.
5. To maintain axle alignment.
6. To maintain drive line angularity.
7. To allow a large amount of axle oscillation so that both axles can remain in contact with the ground on uneven terrain.

Basic Models of Rear Beam Suspension

- Leaf spring suspended beams.
  - RT2/RT2E.
    - Used for both on- or off-highway service.
    - Available in capacities from 34,000 to 52,000 lbs (15,422 to 23,587 kg).
  - U2/UE2.
    - Used for on-highway service.
    - Lightweight version of the RT series.
- Rubber-cushioned beams.
  - RS series.
    - Uses rubber load cushions to absorb shocks.
  - SR series.
    - Uses rubber shear springs to cushion the ride.
    - Available in capacities from 34,000 to 38,000 lbs (15,422 to 17,237 kg).
  - VR series.
    - Uses fluid-filled rubber modules to absorb road shocks.
    - Available in capacities from 34,000 to 38,000 lbs (15,422 to 17,237 kg).
Basic Beam Components of Rear Beam Suspensions

- Equalizing (or walking) beam.
- Center bushings.
- End bushings.
- Cross tube.
- Torque rods.

Basic Components of Rear Beam Suspensions and Their Functions

- RT2/RTe2 and u2/ue2 series.
  - Front hanger bracket (#1).
    - Attaches the front of the spring to the frame with a spring eye pin/bushing combination.
    - Draw keys or bolts secure the pin to the bracket.
  - Rear hanger bracket (#2).
    - Attaches the rear of the spring to the frame.
    - “Slipper” type allows the spring to slide as it flexes, and the spring is loosely retained by a roller and bolt.
  - Extended leaf bracket (#3).
    - Used on RTE or UE models only.
    - Cam-shaped; contacts the top four extended leaves.
  - Saddle
    - Forms the mounting surface for the spring, and the legs clamp around the center bushing of the equalizing beams.
  - Spring assembly.
    - Cushions the vehicle from road shocks.
    - Eye-and-slipper end designs.

Note: RT series springs are different from u2 series springs and are not interchangeable.

- SR series.
  - Shear springs include eight per suspension and are used to absorb road shocks.
  - The frame hanger attaches the suspension to the frame.
  - The saddle forms the lower mounting surface for the load cushions and overload cushions, and the legs clamp around the center bushing of the equalizing beams.

- V4 series.
  - Elastic module includes four per suspension. They are used to absorb road shocks and provide a shock absorber effect. Each unit (module) contains an internal jounce stop to prevent excessive compression of the module.
  - Rebound stop prevents excessive rebound travel, which would put a damaging tension load on the elastic modules.
  - The rebound stop hanger mounts the rebound stop to the frame.
  - The axle stop bracket prevents excessive oscillation of the equalizing beams, which could hit the underside of the module and damage it.

- RS series.
  - Rubber load cushions (four) are used to absorb road shocks, available in 40, 60, and 70 durometer for different applications (on- or off-highway).
  - Saddle bushings are used to provide a flexible connection between the saddle and the frame hangers.
  - The overload cushion contacts the overload frame hanger after the load cushions are partially compressed and provides for a variable spring rate.

- HN series.
  - The rubber bolster spring cushions the vehicle from road shocks and provides for a variable spring rate.
  - Diagonally mounted rubber pads are used to absorb road shocks.

- Available in capacities from 40,000 to 46,000 lbs (18,144 to 20,865 kg).
Operation of Rear Beam Suspension Models and Components

Ready for Review

■ Equalizing beam components (1).
  • Equalizing beams and torque rods work in a parallelogram-style linkage to maintain the pinion angle (drive line angularity) of the axles.

■ Equalizing beam components (2).
  • Center bushings and end bushings permit the axles some self-aligning capability during cornering.

■ Extended leaf spring models—RTe2 and UE2 unloaded.
  • When the vehicle is unloaded, the top four extended leaves contact the third spring hanger. This creates a gap between the spring and the #2 hanger, and the effect is a low spring rate that gives the vehicle a good ride.

■ Extended leaf spring models—RTe2 and UE2 loaded.
  • When the vehicle is loaded, the extended leaves flex until the spring contacts the #2 bracket, and the shorter effective length raises the spring rate so the suspension can carry a heavy load (UE2).

■ SR series.
  • Rubber shear springs provide a two-stage, variable-rate suspension.

■ V4 series.
  • Under no load, the inner (first-stage) rubber is in shear to provide a good ride.
  • As the vehicle is loaded, the flange of the frame hanger contacts a metal bushing inside the shear spring, and this increases the spring rate so the vehicle can carry a heavy load.
  • The bonded rubber portion of the load module assembly helps to carry some of the load.
  • The outer chamber contains a liquid that will be forced into the inner chamber as the vehicle is loaded. As more liquid enters the inner chamber, the air inside the bladder is compressed.
  • A dampener valve controls the flow of liquid to and from the outer chamber and the inner chamber.
    • The flow of liquid and compression of air cushion the load and provide for a varying spring rate.
    • The dampener valve also acts as a shock absorber, allowing the liquid to flow into the inner chamber more quickly than out.