Learning Objectives

1.1 Describe driveshaft design and balance.
1.2 Describe the function and operation of U-joints.
1.3 Describe how CV joints work.
1.4 Discuss the two types of CV joints.

Driveshafts

- What is the purpose and function of drive shafts?
- Driveshaft Design
  - One- or two-piece driveshaft
  - Aluminum driveshafts
This driveshaft was found to be dented during a visual inspection and has to be replaced.

A center support bearing is used on many vehicles with long two-part driveshafts.

Some driveshafts use rubber between an inner and outer housing to absorb vibrations and shocks to the driveline.
Driveshaft Balance

- Any driveshaft whose rotational speed is greater than 1000 RPM must be balanced.
- Driveshaft balance should be within 0.5% of the driveshaft weight.

U-Joint Design and Operation

- U-joints allow the wheels and the rear axle to move up and down, remain flexible, and still transfer torque to the drive wheels.
- Working angle of 1/2 to 3 degrees
  - If the angles differ by more than a 1/2 degree between the front and the rear joint, a vibration is usually produced that is torque sensitive.

Figure 9-9 The joint angle is the difference between the angles of the joint.
Double-Cardan Joints

- Regular U-joints are usually designed to work up to 12 degrees of angularity.
- If two Cardan-style U-joints are joined together, the angle at which this double-Carden joint can function is about 18 to 20 degrees.
Constant Velocity Joints (1 of 2)

- Designed to rotate without changing speed
- Regular U-joints are usually designed to work up to 12 degrees of angularity
- Double-Cardan U-joints were first used on large rear-wheel drive vehicles to help reduce drive line-induced vibrations

Figure 9–12 A constant velocity (CV) joint can operate at high angles without a change in velocity (speed) because the joint design results in equal angles between input and output.

Constant Velocity Joints (2 of 2)

- Outer CV Joints
  - Rzeppa Joints: Most commonly used joint as an outer joint.
  - Transfers torque through six round balls that are held in position midway between the two shafts.
- Inner CV Joints
  - Attach the output of the transaxle to the drive axle shaft.
The Rzeppa-type CV joint is most commonly used at the wheel side of the drive axle shaft. This joint can operate at high angles to compensate for suspension and steering angle changes.

Some joints cannot be replaced individually if worn. The outer joint must do the protective outer flexible boot.

Be able to transmit engine torque to drive the front wheels.

Allow up to 40 degrees or more of movement to allow the front wheels to turn.

While commonly used today in all front-wheel-drive vehicles, the first front-wheel-drive car to use a CV-type drive axle joint was the 1929 Cord. Built in Auburn, Indiana, the Cord was the first of its kind. It can also function as an outer joint on most front-wheel-drive vehicles.

Years later, the Rzeppa joint gained its name of an original equipment manufacturer. This type of CV joint is found once this CV joint has been split open, the special high-quality grease is replaced with an entire drive axle shaft assembly.

Figure 9–13 A Rzeppa fixed joint.

Figure 9–14 The protective CV joint boot has been torn away on this vehicle and all of the grease has been thrown outward onto the brake and suspension parts.

The protective CV joint boot has been torn away on this vehicle and all of the grease has been thrown outward onto the brake and suspension parts.

Figure 9–15 A tripod fixed joint.
Figure 9–16 The fixed outer joint is required to move in all directions because the wheels must turn for steering as well as move up and down during suspension movement.

Summary (1 of 2)

- The driveshaft of a rear-wheel-drive vehicle transmits engine torque from the transmission to the differential.
- U-joints allow the driveshaft to transmit engine torque while the suspension and the rear axle assembly are moving up and down during normal driving conditions.

Summary (2 of 2)

- CV joints provide a smooth transmission of torque to the drive wheels regardless of angularity of the wheel or joint.
- Outer or fixed CV joints commonly use a Rzeppa design, while inner CV joints are the plunging or tripod type.