



SR41

Knuckle And Spindle

**Uniform
Procedures For
Collision Repair
UPCR**

© Copyright 1998 Inter-Industry Conference On Auto Collision Repair

v.4.0



1. Description

This procedure describes replacement and inspection requirements for steering knuckles and wheel spindles.



2. Purpose

The purpose of this procedure is to provide industry-accepted requirements for performing high-quality repair of steering knuckles and wheel spindles. This procedure is intended for use by professionals who are qualified through training and experience.



3. Referenced Documents

The following documents are considered part of this procedure by reference.

3.1 Procedures

- BR11 Brakes
- PS01 Personnel Safety
- SR01 Steering, Gearbox
- SR11 Steering, Rack-And-Pinion
- SU01 Independent, Strut
- SU11 Independent, SLA
- SU21 Twin I-Beam
- SU31 Solid Axle, Coil Springs
- SU41 Solid Axle, Leaf Springs
- WA01 Wheel Alignment, Front
- WA11 Wheel Alignment, Rear

3.2 Other Information

- Equipment-specific information
- Vehicle-specific repair information
- Vehicle-specific dimension specifications



4. Equipment And Material Requirements

4.1 Equipment

The use of this equipment is included in this procedure:

- tie-rod end puller and wedge tools
- tie-rod sleeve-adjusting tools



5. Damage Analysis

5.1 General Damage

Inspect a steering knuckle and wheel spindle for these conditions:

- visible damage
- corrosion on sealing or wear surfaces
- wheels not pointing straight ahead with the steering wheel centered
- obvious wheel misalignment
- improper previous repairs
- flaking metal or corrosion that may indicate damage to a part
- modifications to the steering or suspension systems

5.2 Damage Indicators

Check for the following indicators of possible knuckle or spindle damage:

- axle and housing damage or misalignment
- damaged wheel
- worn or damaged tires
- different side-to-side measurements between the strut and tire and between the rotor and top of the steering knuckle, steering arm, or lower ball joint
- visible wheel misalignment
- flaking metal or corrosion that may indicate damage to a part
- incorrect included angle

Further checks may be required to determine the location and extent of damage. Follow the vehicle maker's recommendations. If there are no visible indications of damage, road-test the vehicle to confirm the diagnosis or verify proper operation of the steering system. See **11.2**.



6. Personnel Safety

6.1 General Safety

General safety information is in **PS01**.

6.2 Safety With Steering Systems

To prevent injury when working with steering systems:

- Properly lift and support the vehicle.
- Check fluid levels and add fluid only when the engine is not running.
- Use the proper equipment and procedures for compressing struts or springs.
- Use the proper tools, and follow the equipment and vehicle makers' recommendations.
- Do not disconnect the upper or lower ball joints without properly supporting and compressing the coil spring or torsion bar.



7. Environmental Safety

Does not apply.



8. Vehicle Protection

8.1 Steering System

To prevent damage to steering parts:

- Make sure the vehicle is properly supported during service.
- Do not weld or apply heat to any steering part.
- Use the proper tools, and follow the equipment maker's recommendations.
- Torque fasteners to the vehicle maker's recommendations.
- Replace any worn parts and one-time fasteners, as required.
- Make sure cotter pins are the proper size and properly locked. Do not reuse cotter pins.
- Make sure the steering linkage and wheels are in the straight-ahead position before reconnecting the tie rod to the knuckle assembly.



9. Repair Procedure

9.1 Parts Replacement

Note: Depending on the part design, the knuckle and spindle may be combined into one part, integrated with other steering parts, or separate parts. Refer to the vehicle maker's recommendations for part replacement.

To replace steering knuckles and spindles:

- 1. Ensure that the vehicle structure is aligned to the vehicle maker's dimension specifications, and all steering- and suspension-system mounting points are properly located.
- 2. Loosen the wheel lug nuts and spindle nut.
- 3. Properly lift and support the vehicle.
- 4. Remove the wheel assembly.
- 5. Disconnect the brake parts, if required. Properly support the brake caliper.
- 6. Disconnect the tie-rod end using the proper removal tool.
- 7. Compress the coil spring, if required to remove pressure from the knuckle assembly.
- 8. Separate the ball joints or remove the kingpins, using the proper tools.
- 9. Remove the damaged parts. Inspect the wheel bearings, seals, and races. Compare the replacement part to the original.
- 10. Install the replacement parts, duplicating the original mounting method.
- 11. Install the ball joints, or kingpins, and tie-rod ends. With the knuckle positioned in the straight-ahead position, torque ball joint and tie-rod ends to the vehicle maker's specifications. Replace one-time or damaged fasteners. Use replacement fasteners that are the same grade, size, and type as the original fasteners.
- 12. Install the brake parts, as required. Replace worn or damaged wheel bearings, seals, and races, following the vehicle maker's recommendations.
- 13. Torque all fasteners and bearings to the vehicle maker's recommendations.
- 14. Install the wheel and tire assembly. Torque the fasteners to the vehicle maker's recommendations.
- 15. Lower the vehicle and check the wheel alignment.
- 16. Continue vehicle reassembly.
- 17. Road-test the vehicle. See **11.2**.



10. Use Of Recycled (Salvage) Parts

10.1 Condition Of Salvage Parts

Use care in selecting and using salvage steering parts. Compare salvage parts to the original parts. Inspect salvage parts for any defects. Use magnaflux or a dye penetrant if necessary.

Do not install salvage steering parts with these defects:

- visible damage
- excessive wear
- evidence of having been heated, welded, damaged, or straightened
- flood or water damage
- flaking metal or corrosion that may indicate damage to a part

Replace all parts subject to wear. Do not install salvage bushings or fasteners.



11. Inspection And Testing

11.1 Knuckle And Spindle System Inspection

When repairs are completed, inspect the vehicle for these conditions:

- proper installation of all fasteners, brackets, clamps, retaining clips, and electrical connectors
- proper replacement and installation of cotter pins
- fasteners torqued to the vehicle maker's recommendations
- proper mounting of all parts
- proper lubrication of parts
- proper wheel alignment
- steering wheel centered
- proper routing of brake hoses or lines
- proper routing of wiring

Correct any defects.

11.2 Road-Test

Road-test the vehicle after repairs to inspect for these conditions:

- steering wheel free-play exceeding 6 mm ($\frac{1}{4}$ ")
- poor steering wheel return

(cont'd)



11. Inspection And Testing (cont'd)

- pulling to one side
- vehicle wander
- steering-wheel shimmy
- any binding or unusual noise during suspension travel or steering
- unusual bearing noise

Correct any defects.