

SP51A—Pillars, C And D



1. Description

This procedure describes the repair and complete or partial replacement of an aluminum **C-** or **D-pillar** assembly. Inspection and evaluation requirements are also included.



2. Purpose

The purpose of this procedure is to provide industry-accepted requirements for performing high-quality repair of aluminum C- or D-pillar assemblies. 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

- CP01A Corrosion Protection
- DO21 Door
- ME01 Three-Dimensional Measuring
- PS01 Personnel Safety
- RE01 Seat Belt
- RE31 Tensioners, Seat Belt
- RF41 Finish Application
- SG01 Adhesively Bonded
- SG02 Mechanically Fastened
- SG11 Gasket-Mounted
- ST01A Stress-Relieving Heat Limitations
- ST11 Structural Straightening
- ST21A Metal Repair
- ST31 Body Fillers
- WE01A GMA (MIG) Plug Weld
- WE11A GMA (MIG) Fillet Weld
- WE21A GMA (MIG) Butt Joint With Backing

3.2 Other Information

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



4. Equipment And Material Requirements

4.1 Welding Equipment

Use GMA (MIG) welding equipment as described in **WE01A**, **WE11A** or **WE21A**.

4.2 Welding Filler Wire

Welding filler wire must be compatible with the base metal alloy being joined. See **WE01A**, **WE11A** or **WE21A**.

4.3 Straightening And Measuring Equipment

Use straightening equipment as described in **ST11**.

Use measuring equipment as described in **ME01**.

4.4 Special Equipment

Use tools and materials, such as abrasives, that are designated for use only on aluminum, to avoid surface contamination.

A stainless steel wire brush, dedicated for use on aluminum, is recommended for cleaning aluminum before making a weld.

A power saw is recommended for cutting aluminum parts for partial replacement.



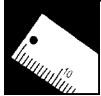
5. Damage Analysis

5.1 General Damage

Inspect an aluminum C- or D-pillar assembly for these types of damage:

- visible damage
- corrosion**
- dimensional misalignment
- misalignment with adjacent panels
- improper previous repairs
- cracked **seam sealers**

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5. Damage Analysis (cont'd)

Determine how much of the pillar can be straightened, and the portion that must be replaced. Verify the availability of replacement parts. Follow the vehicle maker's recommendations for joint locations.

Note: Some vehicle makers recommend against welding tears in aluminum alloys.



6. Personnel Safety

6.1 General Safety

General safety information is in **PS01**.

6.2 Pulling Safety

Pulling safety information is in **ST11**.

6.3 Welding Safety

Welding safety information is in **WE01A**, **WE11A** or **WE21A**.

6.4 Safety With Power Tools And Electrical Equipment

Power tool and electrical equipment safety information is in **ST21A**.

6.5 Safety With Restraint Systems

Restraint system safety information is in **RE21**, **RE22** and **RE31**.



7. Environmental Safety

Does not apply.



8. Vehicle Protection

8.1 Electronic Parts

To protect computers and other sensitive parts from damage:

- Follow the vehicle maker's recommendations for recording and resetting **electronic memories**.
- Ensure that the ignition switch is in the LOCK position, and the key is removed.
- Disconnect and isolate the negative battery cable, and disarm the **passive restraint system**. Follow the vehicle maker's recommendations.
- Carefully remove computer modules when welding or heating within 300 mm (12"), or a greater distance when recommended by the vehicle maker.
- Protect computer modules, connectors, and wiring from contamination such as dirt, heat, static electricity, and moisture.
- Loosen or remove any wiring harnesses or electrical parts that could be damaged during the repair process.
- Remove any electronic modules that may be subject to impact during the repair procedure.

Remove the battery if it is in an area to be welded or heated.

8.2 Adjacent Areas

Protect glass, upholstery, and other **cosmetic surfaces** from welding and cutting sparks. Remove glass, interior trim, and adjacent parts that cannot be protected.

Remove or relocate any wiring, roof drains, or antenna leads that may be attached to, or routed through, the C- or D-pillar.

8.3 Aluminum Surfaces

To prevent damaging aluminum surfaces:

- Use an orbital or dual-action sander. Do not use a disc grinder.
- Use 80-grit or finer, open-coat sanding discs.
- Use foam backing pads instead of stiff backing pads.
- Apply less pressure than when sanding steel.
- Do not sand continuously in the same area.
- Keep sanding discs and other abrasives separate from those used for steel repairs.
- Make sure the faces and edges of metal hammers and dollies are smooth and polished and have rounded edges.

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8. Vehicle Protection (cont'd)

- Make sure the points of picks are not sharp. File or grind the tips until they are rounded or flat. An option is to use a tip made of rubber or plastic, or cover the tip with tape.
- Use a dull file.
- Do not use shrinking hammers.

8.4 Galvanic Corrosion

Avoid galvanic corrosion of aluminum parts by following the procedures in **CP01A**.

To prevent galvanic corrosion when straightening aluminum parts:

- Ensure that all tools are cleaned before, or are dedicated for, use on aluminum.
- Thoroughly remove steel particles from power tools before use.
- Keep hand tools separate from those used for steel repairs.
- Keep sanding discs and other abrasives separate from those used for steel repairs.

8.5 Use Of Heat

The improper application of heat on aluminum alloys can greatly affect their strength. To prevent permanent softening, or increasing brittleness, of certain alloys, the temperature and heating time must be strictly controlled. Follow the vehicle maker's recommendations for applying heat to aluminum parts.

If vehicle maker recommendations are not available, keep the repair temperature between 200°C (400°F) and 300°C (570°F), while limiting the total heating time to no more than 15 minutes. Use temperature-measuring methods as described in **ST01A**.

Note: Some vehicle makers recommend against the use of heat on certain parts.

8.6 Sectioning Guidelines

Perform sectioning following the vehicle maker's recommendations. Do not section in or near these areas:

- holes larger than 3 mm (1/8")
- compound shapes**
- areas where proper welding cannot be performed
- mechanical or structural part-mounting locations

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8. Vehicle Protection (cont'd)

- areas where proper corrosion protection cannot be applied
- restraint system mounting locations

Note: Do not section reinforcements unless recommended by the vehicle maker.



9. Repair Procedure

9.1 Straightening

To straighten an aluminum C- or D-pillar assembly:

- 1. Reposition or remove the door, liftgate, quarter window, backlite, headliner, trim panels, and other parts required for access or to prevent damage.
- 2. Thoroughly clean the repair area to remove dirt, grease, sealers, anti-corrosion materials, etc.
- 3. Make sure the vehicle is properly anchored to the straightening system.
- 4. Make underbody and upperbody measurements using a three-dimensional measuring system to determine the location of the C- or D-pillar and surrounding structure.
- 5. Make door-opening diagonal measurements to determine the location of the C- or D-pillar.
- 6. Use **multiple pulls** and heat, if needed, to return the C- or D-pillar and surrounding structure to proper dimensions. Follow the repair and **tolerance** recommendations of the vehicle maker. If no recommendations are given, use a tolerance of ± 3 mm ($1/8$ "). Use a **three-dimensional measuring system** and adjacent panels to verify that the part is properly aligned. Check the fit and alignment of adjacent parts, such as the quarter and roof panels.

Note: If heat is used, follow the vehicle maker's temperature and time recommendations. Some vehicle makers recommend against the use of heat on certain parts. Refer to the vehicle maker's repair information to locate any **foam-fillers**, internal drain tubes, or wiring before applying heat.

- 7. Test-fit the rear door assembly.
- 8. Replace any areas that are **kinked**, have stress cracks, or develop cracks during straightening. Some vehicle makers recommend against welding tears in aluminum alloys. Use a dye penetrant to check the damaged area for cracks. If complete replacement is required, see **9.2** and **9.3**. For sectioning, see **9.4** and **9.5**.

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9. Repair Procedure (cont'd)

- 9. Apply body fillers, if required. The panel must be within 3 mm ($\frac{1}{8}$ ") of its original contour for most body filler applications. Follow the filler maker's recommendations. Ensure that the body filler used is compatible with aluminum. Some vehicle and product makers recommend the application of a two-part epoxy primer before applying body fillers to aluminum.
- 10. Apply corrosion-resistant **primer** to interior and exterior surfaces damaged by the collision, repairs, or anchoring.
- 11. Apply seam sealers, if required to seal the joints and restore the appearance. Reprime if required by the product maker.
- 12. Replace foam fillers, if required. Follow the vehicle maker's recommendations.
- 13. Apply **anti-corrosion compounds** to enclosed areas, if required.
- 14. Refinish areas damaged by the collision, repairs, or anchoring, if required to restore the appearance.
- 15. Continue vehicle reassembly.
- 16. Refinish cosmetic surfaces after all body repairs are complete.
- 17. Complete the final reassembly after refinishing is complete.
See **9.6**.

9.2 Complete Removal

Removal of the C- or D-pillar may also include removal of the quarter panel. To remove a complete pillar assembly:

- 1. Reposition or remove the, door, liftgate, quarter window, **backlite**, headliner, trim panels, wiring, drain tubes, and other parts required for access or to prevent damage.
- 2. Thoroughly clean the repair area to remove dirt, grease, sealers, sound deadeners, anti-corrosion materials, etc.
- 3. Perform measurements and adjacent panel alignment and straightening. See **9.1**.
- 4. Identify areas of overlapped panels to ensure that the replacement C- or D-pillar will be in the same relative position.
Note: It may be necessary to remove undamaged parts such as the quarter panel, rocker panel, or reinforcements to remove the C- or D-pillar.
- 5. Determine the cut location to separate the pillar from the quarter panel, if applicable.
- 6. Locate the roof-to-pillar seam, if equipped. Remove the paint and primers from this area.
- 7. Remove the filler material from the roof-to-pillar seam.
- 8. Install a holding device to support and align the roof panel.

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9. Repair Procedure (cont'd)

- ❑ 9. Cut the weld at the roof-to-pillar seam, using a saw. Do not damage the parts which are not to be replaced. Cut the panels slightly longer than the final cut locations.
- ❑ 10. Locate and mark all **spot weld** and rivet locations.
- ❑ 11. Drill out the spot welds and rivets. Do not damage the parts which are not to be replaced. Use the proper size and type of spot-weld cutter.
- ❑ 12. Remove the damaged pillar. Heat may be required to help separate adhesively bonded joints. Do not discard any labels until replacements are obtained.
- ❑ 13. Remove any burrs or spot weld **nuggets** from the mating surfaces and repair any damage.
- ❑ 14. Remove any foam fillers from the weld joint areas, if required. Follow the vehicle maker's recommendations.
- ❑ 15. Straighten the mating panel edges, if required to ensure a proper fit-up with the replacement pillar.

9.3 Complete Installation

To install a complete replacement aluminum C- or D-pillar assembly:

- ❑ 1. Verify that the proper parts are being installed by checking the part number and performing a trial fit. Ensure that all mating surfaces are properly aligned.
- ❑ 2. Clean the mating surfaces with the proper surface cleaner.
- ❑ 3. Refer to the vehicle maker's recommendation for the location, number, and size of **plug weld** holes. If no recommendations are available, punch or drill 10 mm ($\frac{3}{8}$ ") holes in the outer panel at the same locations used originally by the vehicle maker.
- ❑ 4. Use a stainless steel brush, designated for use on aluminum only, to remove aluminum oxide from the weld locations. Do not touch cleaned areas.
- ❑ 5. Follow the vehicle maker's recommendation for the types and locations of the welds required at the roof-to-pillar seam.
- ❑ 6. Test-fit the replacement pillar, and clamp or securely hold it in place. Ensure that all drain tubes and other parts are properly routed.
- ❑ 7. Use adjacent panels and a three-dimensional measuring system to verify that the pillar is properly aligned.
- ❑ 8. Mark the location of the C- or D-pillar assembly and remove it from the vehicle.
- ❑ 9. Apply adhesive when recommended by the vehicle maker. Avoid applying the adhesive in the weld areas.
- ❑ 10. Position the pillar on the vehicle and clamp or securely hold it in place.

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9. Repair Procedure (cont'd)

- 11. Verify that the pillar is properly aligned.
- 12. **Tack weld**, or securely hold, the pillar in position. Ensure that the proper electrode wire is being used for the type of alloy being welded.
- 13. Recheck the alignment.
- 14. Install any rivets, following the vehicle maker's recommendations.
- 15. Make test welds, before welding on the vehicle, using the same type and thickness metal being welded on the vehicle. Make the test welds in the same position as the welds on the vehicle. Visually inspect and **destructively test** the welds before welding on the vehicle.
- 16. Make the required welds. Make all welds as long as possible, without causing heat distortion, to avoid start and stop defects. Use a dye penetrant to check the repair area for cracks, only if recommended by the vehicle maker. Correct any defects.
- 17. Use the three-dimensional measuring system and adjacent panels to verify that the pillar assembly is still properly aligned.
- 18. **Dress the welds**, if required to restore the appearance.
- 19. Apply body fillers to the joint areas, if required to restore the appearance. The panel must be within 3 mm (1/8") of its original contour for most body filler applications. Follow the filler maker's recommendations. Ensure that the body filler used is compatible with aluminum. Some vehicle and product makers recommend the application of a two-part epoxy primer before applying body fillers to aluminum.
- 20. Apply corrosion-resistant primer to interior and exterior surfaces damaged by the collision, repairs, or anchoring.
- 21. Apply seam sealers, if required to seal the joints and restore the appearance. Reprime if required by the product maker.
- 22. Apply anti-corrosion compounds to all enclosed areas, if required.
- 23. Reinstall the rear door, liftgate, drain tubes and wiring, if required.
- 24. Replace foam fillers, if required. Follow the vehicle maker's recommendations.
- 25. Refinish areas damaged by the collision, repairs, or anchoring, if required to restore the appearance.
- 26. Continue vehicle reassembly.
- 27. Refinish cosmetic surfaces after all body repairs are complete.
- 28. Complete the final reassembly after refinishing is complete.
See **9.6**.

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9. Repair Procedure (cont'd)

9.4 Partial Removal

To remove the damaged portion of an aluminum C- or D-pillar for partial replacement:

- 1. Reposition or remove the, door, liftgate, quarter window, backlite, headliner, trim panels, wiring, drain tubes, and other parts required for access or to prevent damage.
- 2. Thoroughly clean the repair area to remove dirt, grease, sealers, sound deadeners, anti-corrosion materials, etc.
- 3. Perform measurements and adjacent panel alignment and straightening. See **9.1**.
- 4. Select the cut locations based on the vehicle maker's recommendations or other tested procedure and the sectioning location guidelines described in **8.6**.
- 5. Measure and mark the cut locations.
- 6. Install a holding device to support and align the roof panel.
- 7. Cut the undamaged portion of the pillar slightly longer than the final cut locations, using a saw.
- 8. Locate and mark the spot weld and rivet locations on the portion to be removed.
- 9. Drill out the spot welds and rivets. Do not damage any parts which are not to be replaced. Use the proper size and type of spot weld cutter.
- 10. Remove the damaged portion of the pillar from the vehicle. Heat may be required to help separate adhesive bonded joints. Do not discard any labels until replacements can be obtained.
- 11. Remove any foam fillers from the weld joint areas, if required. Follow the vehicle maker's recommendations.
- 12. Trim the remaining edges of the pillar to the exact cut locations.
- 13. Remove all burrs or spot weld nuggets from the mating surfaces, and repair all damage.
- 14. Straighten the panel edges, if needed to ensure a proper fit-up with the replacement portion.

9.5 Partial Installation

To install a partial aluminum C- or D-pillar section:

- 1. Compare the replacement part to the original part by part number, visual inspection and measuring. Measure across the area to be sectioned using three or more **reference points**, such as holes, notches, weld seams, or feature lines. If no reference points exist on the replacement part, make reference marks on both parts.

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9. Repair Procedure (cont'd)

- 2. Cut the replacement pillar to the proper length and shape for the type of joint recommended by the vehicle maker. The type of joint selected may require the use of an insert.
- 3. Clean the mating surfaces with the proper surface cleaner.
- 4. Refer to the vehicle maker's recommendation for the location, number, and size of plug weld holes. If no recommendations are available, punch or drill 10 mm ($\frac{3}{8}$ ") holes in the outer panel at the same locations used originally by the vehicle maker.
- 5. Use a stainless steel brush, designated for use on aluminum only, to remove aluminum oxide from the weld locations. Do not touch cleaned areas.
- 6. Test-fit the partial pillar, and clamp or securely hold it in place. Ensure that all drain tubes and other parts are properly routed.
- 7. Use adjacent panels, backlite, and a three-dimensional measuring system to verify that the pillar is properly aligned.
- 8. Mark the location of the pillar and remove it from the vehicle.
- 9. Apply adhesive when recommended by the vehicle maker. Avoid applying the adhesive in the weld areas.
- 10. Position the replacement part on the vehicle and clamp or securely hold it in place.
- 11. Verify that the pillar is properly aligned.
- 12. Tack weld, or securely hold, the pillar in position. Ensure that the proper electrode wire is being used for the type of alloy being welded.
- 13. Recheck the alignment.
- 14. Install any rivets, following the vehicle maker's recommendations.
- 15. Make test welds, before welding on the vehicle, using the same type and thickness metal that will be welded on the vehicle. Make the test welds in the same position as the welds on the vehicle. Visually inspect and destructively test the welds before welding on the vehicle.
- 16. Make the required welds. Make all welds as long as possible, without causing heat distortion, to avoid start and stop defects. Use a dye penetrant to check the repair area for cracks, only if recommended by the vehicle maker. Correct any defects.
- 17. Use the three-dimensional measuring system and adjacent panels to verify that the pillar is still properly aligned.
- 18. Dress the welds, if required to restore the appearance.
- 19. Apply body fillers to the joint areas, if required to restore the appearance. The panel must be within 3 mm ($\frac{1}{8}$ ") of its original contour for most body filler applications. Follow the filler maker's recommendations. Ensure that the body filler used is compatible with aluminum. Some vehicle and product makers recommend the application of a two-part epoxy primer before applying body fillers to aluminum.

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9. Repair Procedure (cont'd)

- 20. Apply corrosion-resistant primer to interior and exterior surfaces damaged by the collision, repairs, or anchoring.
- 21. Apply seam sealers, if required to seal the joints and restore the appearance. Reprime if required by the product maker.
- 22. Apply anti-corrosion compounds to all enclosed areas, if required.
- 23. Reinstall the door, quarter window, liftgate, drain tubes, wiring, and other required parts.
- 24. Replace foam fillers, if required. Follow the vehicle maker's recommendations.
- 25. Refinish areas damaged by the collision, repairs, or anchoring, if required to restore the appearance.
- 26. Continue vehicle reassembly.
- 27. Refinish cosmetic surfaces after all body repairs are complete.
- 28. Complete the final reassembly after refinishing is complete.
See **9.6**.

9.6 Final Reassembly

To complete the reassembly after refinishing is complete:

- 1. Install the backlite, labels, weatherstripping, etc.
- 2. Transfer or install replacement parts such as exterior trim, latch assemblies, etc. Include spacers, washers, isolators, etc. required to prevent contact between dissimilar metals.
- 3. Check the door and liftgate, for proper latching. Align the strikers and latch assemblies if required.
- 4. Lubricate the latch assemblies, if applicable, following the vehicle maker's recommendations.
- 5. Reroute any electrical wiring and antenna leads to their original locations.
- 6. Reconnect all electrical connectors.
- 7. Verify the proper operation of all door- and pillar-mounted lamps and electrical accessories.
- 8. Perform a water leak test to ensure proper sealing of the doors, quarter window and backlite. See **11.2**.
- 9. Install all removed interior trim.
- 10. Complete the steps in the final reassembly section of all appropriate procedures.



10. Use Of Recycled (Salvage) Parts

10.1 Inspection Of **Salvage Parts**

Do not install a salvage aluminum C- or D-pillar having any of these defects:

- unrepairable damage
- corrosion that has caused pitting
- improper previous repairs
- missing or damaged mounting locations

10.2 Preparation Of Salvage Parts

To prepare a salvage aluminum C- or D-pillar for installation:

- Make any required repairs.
- Trim the part to fit.
- Remove all **heat-affected zones**.
- Make sure the part is not deformed along the weld joints.
- Remove any corrosion.



11. Inspection And Testing

11.1 Inspection Of A Repaired Or Replaced Aluminum C- or D-Pillar

Inspect a repaired or replaced aluminum C- or D-pillar for these conditions:

- dimensional alignment
- weld quality
- proper application of corrosion protection
- proper finish appearance and film thickness
- proper installation of seam sealers
- proper installation of sound-deadening materials
- proper alignment with adjacent parts
- proper installation of all interior trim, labels, weatherstripping, and fasteners
- proper operation of all door- and pillar-mounted lamps and electrical accessories
- proper lubrication of latch assemblies
- correct routing of wiring harnesses and operating cables
- proper operation of the restraint system

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11. Inspection And Testing (cont'd)

- proper alignment, sealing, and operation of door mechanisms, hinges, latches, and locks
- proper installation of any spacers, washers, isolators, etc., required to prevent contact between dissimilar metals

Correct any defects.

11.2 Water-Leak Test

To test for water leaks:

1. Protect the vehicle interior.
2. Apply water at low pressure around the perimeter of the door, quarter window and backlite from the outside of the vehicle, starting at the bottom and working up.
3. Look for water leaks on the inside.

Correct any water leaks, and repeat the test.