



# SP01A

## Rail, Front Upper

**Uniform  
Procedures For  
Collision Repair  
UPCR**

© Copyright 1999 Inter-Industry Conference On Auto Collision Repair

v.4.0



### 1. Description

This procedure describes the repair and complete or partial replacement of an aluminum front upper rail. 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 front upper rails. 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
- CS01A Radiator Core Support, Welded-On
- ME01 Three-Dimensional Measuring
- PS01 Personnel Safety
- RF41 Finish Application
- ST01A Stress-Relieving Heat Limitations
- ST11 Structural Straightening
- ST21A Metal Repair
- WA01 Wheel Alignment, Front
- 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**.

**(cont'd)**



## 4. Equipment And Material Requirements (cont'd)

### 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 front upper rail for these types of damage:

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

### 5.2 Mounting Locations

Inspect an aluminum front upper rail for damage at mounting locations such as these:

- radiator core support
- engine
- suspension

Determine how much of the front upper rail 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.

If a replacement rail extension will be used, follow the vehicle maker's replacement procedure.

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

Note: A wheel alignment may be required after repair or replacement of the upper rail.



## 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**.



## 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.

**(cont'd)**



## 8. Vehicle Protection (cont'd)

### 8.2 Adjacent Areas

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

Remove or relocate any wiring or other parts that may be attached to, or routed through, the upper rail.

### 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.
- 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.

**(cont'd)**



## 8. Vehicle Protection (cont'd)

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.



## 9. Repair Procedure

### 9.1 Straightening

To straighten an aluminum front upper rail:

- 1. Reposition or remove the hood, fender, battery tray, coolant bottle, wiring harnesses 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 upper rail and surrounding structure.
- 5. Use multiple pulls and heat, if needed, to return the upper rail and the surrounding structure to proper dimensions. Follow the repair and tolerance recommendations of the vehicle maker. If no recommendations are given, use a tolerance of  $\pm 3$  mm ( $\frac{1}{8}$ " ). Use a three-dimensional measuring system and adjacent panels to verify that the rail is properly aligned. Check the fit and alignment of adjacent parts, such as the hood and fenders.

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 or wiring, before applying heat.

- 6. 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**.
- 7. Apply corrosion-resistant primer to interior and exterior surfaces and other areas damaged by the collision, repairs, or anchoring.
- 8. Apply seam sealers, if required to seal the joints and restore the appearance. Reprime if required by the product maker.
- 9. Apply anti-corrosion compounds to enclosed areas, if required.
- 10. Replace foam fillers, if required. Follow the vehicle maker's recommendations.
- 11. Refinish areas damaged by the collision, repairs, or anchoring, if required to restore the appearance.

**(cont'd)**



## 9. Repair Procedure (cont'd)

- 12. Transfer or install replacement parts such as the battery tray, coolant bottle, wiring harnesses, etc. Include spacers, washers, isolators, etc. required to prevent contact between dissimilar metals.
- 13. Install any labels previously removed.
- 14. Continue vehicle reassembly.

### 9.2 Complete Removal

To remove a complete aluminum front upper rail:

- 1. Reposition or remove the hood, fender, battery tray, coolant bottle, wiring harnesses, 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. Perform measurements and adjacent panel alignment and straightening. See 9.1.
- 4. Identify areas of overlapped panels to ensure that the replacement upper rail will be in the same relative position.

Note: It may be necessary to remove undamaged parts, such as the radiator core support or a reinforcement, to remove the upper rail.

- 5. Locate and mark all spot weld and rivet locations.
- 6. 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.
- 7. Remove the damaged rail. Heat may be required to help separate adhesively bonded joints. Do not discard any labels until replacements are obtained.
- 8. Remove any burrs or spot weld nuggets from the mating surfaces, and repair any damage.
- 9. Remove any foam fillers from the weld-joint areas, if required. Follow the vehicle maker's recommendations.
- 10. Straighten the mating panel edges, if required to ensure a proper fit-up with the replacement upper rail.

### 9.3 Complete Installation

To install a complete aluminum front upper rail:

- 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. Test-fit the replacement rail, and clamp or securely hold it in place.

**(cont'd)**



## 9. Repair Procedure (cont'd)

- 6. Use adjacent panels, the hood and fender, and a three-dimensional measuring system to verify that the upper rail is properly aligned.
- 7. Mark the location of the upper rail and remove it from the vehicle.
- 8. Apply adhesive when recommended by the vehicle maker. Avoid applying the adhesive in the weld areas.
- 9. Position the rail on the vehicle and clamp or securely hold it in place.
- 10. Verify that the rail is properly aligned.
- 11. Tack weld, or securely hold, the rail in position. Ensure that the proper electrode wire is being used for the type of alloy being welded.
- 12. Recheck the alignment.
- 13. Install any rivets, following the vehicle maker's recommendations.
- 14. 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.
- 15. 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 welds for cracks, only if recommended by the vehicle maker. Correct any defects.
- 16. Use the three-dimensional measuring system and adjacent panels to verify that the rail is still properly aligned.
- 17. Dress the welds, if required to restore the appearance.
- 18. Apply corrosion-resistant primer to interior and exterior surfaces damaged by the collision, repairs, or anchoring.
- 19. Apply seam sealers, if required to seal the joints and restore the appearance. Reprime if required by the product maker.
- 20. Apply anti-corrosion compounds to enclosed areas, if required.
- 21. Replace foam fillers, if required. Follow the vehicle maker's recommendations.
- 22. Refinish areas damaged by the collision, repairs, or anchoring, if required to restore the appearance.
- 23. Transfer or install replacement parts such as the battery tray, coolant bottle, wiring harnesses, etc. Include spacers, washers, isolators, etc. required to prevent contact between dissimilar metals.
- 24. Install any labels previously removed.
- 25. Continue vehicle reassembly.

### 9.4 Partial Removal

To remove the damaged portion of an aluminum front upper rail for partial replacement:

- 1. Reposition or remove the hood, fender, battery tray, coolant bottle, wiring harnesses, 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.

**(cont'd)**





## 9. Repair Procedure (cont'd)

- 3. Perform measurements and adjacent panel alignment and straightening. See 9.1.
- 4. Select the cut location based on the repair procedure.
- 5. Measure and mark the cut location.
- 6. Cut the undamaged portion of the rail slightly longer than the final cut location, using a saw.
- 7. Locate and mark the spot weld and rivet locations of the portion to be removed.
- 8. Drill out the spot welds and rivets. Do not damage any parts that are not to be replaced. Use the proper size and type of spot weld cutter.
- 9. Remove the damaged portion of the rail from the vehicle. Heat may be required to help separate adhesively bonded joints.
- 10. Remove any foam fillers from the weld joint areas, if required. Follow the vehicle maker's recommendations.
- 11. Trim the remaining edges of the rail to the exact cut location.
- 12. Remove any burrs or spot weld nuggets from the mating surfaces, and repair any damage.
- 13. Straighten the panel edges, if needed to ensure a proper fit-up with the replacement portion.

### 9.5 Partial Installation

To install an aluminum front upper rail 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.
- 2. Cut the replacement upper rail 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 rail, and clamp or securely hold it in place.
- 7. Use adjacent panels and a three-dimensional measuring system to verify that the upper rail is properly aligned.
- 8. Mark the location of the upper rail and remove it from the vehicle.
- 9. Apply adhesive when recommended by the vehicle maker. Avoid applying the adhesive in weld areas.
- 10. Position the partial rail on the vehicle and clamp or securely hold it in place.
- 11. Verify that the rail is properly aligned.

**(cont'd)**



## 9. Repair Procedure (cont'd)

- 12. Tack weld, or securely hold, the partial rail 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 welds 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 rail is still properly aligned.
- 18. Dress the welds, if required to restore the appearance.
- 19. Apply corrosion-resistant primer to interior and exterior surfaces damaged by the collision, repairs, or anchoring.
- 20. Apply seam sealers, if required to seal the joints and restore the appearance. Reprime if required by the product maker.
- 21. Apply anti-corrosion compounds to enclosed areas, if required.
- 22. Replace foam fillers, if required. Follow the vehicle maker's recommendations.
- 23. Refinish areas damaged by the collision, repairs, or anchoring, if required to restore the appearance.
- 24. Transfer or install replacement parts such as the battery tray, coolant bottle, wiring harnesses, etc. Include spacers, washers, isolators, etc. required to prevent contact between dissimilar metals.
- 25. Install any labels previously removed.
- 26. Continue vehicle reassembly.



## 10. Use Of Recycled (Salvage) Parts

### 10.1 Inspection Of Salvage Parts

Do not install a salvage aluminum front upper rail having any of these defects:

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

**(cont'd)**



## 10. Use Of Recycled (Salvage) Parts (cont'd)

### 10.2 Preparation Of Salvage Parts

To prepare a salvage aluminum front upper rail 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 Front Upper Rail

Inspect a repaired or replaced aluminum front upper rail for these conditions:

- dimensional alignment
- weld quality
- proper application of corrosion protection
- proper finish appearance and film thickness
- proper alignment with adjacent parts
- proper installation of all labels
- proper installation of seam sealers
- proper installation of sound-deadening materials
- proper installation and operation of all attached mechanical and electrical parts
- proper operation of all underhood and fender-mounted lamps and electrical accessories
- proper installation of any spacers, washers, isolators, etc., required to prevent contact between dissimilar metals

Correct any defects.

The front wheel alignment should be checked, after repairing or replacing a front upper rail, to determine if re-alignment is required.