



## 1. Description

This procedure describes methods for the repair and replacement of an exhaust system. 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 exhaust systems. 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

- EL21 Self-Diagnostics
- EM11 Charcoal Canister
- PS01 Personnel Safety
- WE11S GMA (MIG) Fillet Weld

### 3.2 Other Information

- Product-specific information
- Vehicle-specific repair information



## 4. Equipment And Material Requirements

### 4.1 Welding Equipment

Use GMA (MIG) welding equipment as described in **WE11S**.

### 4.2 Materials

The use of exhaust system sealer is included in this procedure.



## 5. Damage Analysis

### 5.1 General Damage

Inspect exhaust system parts for these conditions:

- visible damage
- misalignment
- internal noise when shaken or tapped lightly
- loose, missing, or damaged clamps, hangers, heat shield, etc.
- exhaust soot on underbody parts, indicating a possible leak location
- damaged or missing catalytic converter
- damaged or missing ground straps
- damaged or missing mounting locations
- corrosion that has caused pitting
- improper previous repairs

If the vehicle can be started, listen for excessive noises or rattling from the exhaust system parts. Also check for excessive back pressure, which may indicate a restriction. Listen for noise when the vehicle is shifted into and out of gear or when the clutch pedal is released. Further visual inspection and diagnosis may be required for proper analysis.

Damaged exhaust system parts must be replaced. Excessive corrosion at connection locations, or the system design, may require replacement of more than just the damaged exhaust parts. Verify the availability of replacement parts.

### 5.2 Catalytic Converter

The catalytic converter is part of the vehicle emission control system. The converter and heat shields must be restored to proper operation, as required by federal or regional regulations.



## 6. Personnel Safety

### 6.1 General Safety

General safety information is in **PS01**.

### 6.2 Exhaust Fumes

Avoid breathing exhaust fumes. Always vent the fumes outside of the repair facility. Carbon monoxide, contained in the exhaust stream, is a colorless, odorless, tasteless, but deadly gas.

### 6.3 Exhaust Heat

The normal operating temperature of exhaust system parts, especially the catalytic converter, is very high. Do not attempt to service any part of the system until the parts have cooled.

### 6.4 Welding Safety

Welding safety information is in **WE11S**.

If using an oxyacetylene torch to remove parts, do not allow the torch flame near brake lines or hoses, fuel lines or hoses, or the fuel tank.



## 7. Environmental Safety

Does not apply.



## 8. Vehicle Protection

### 8.1 Exhaust System Parts

To protect exhaust system parts:

- When lifting the vehicle, make sure that lifting pads do not come in contact with exhaust system parts.
- When pulling, make sure that exhaust system parts are not pulled or pinched out of position.
- When servicing or removing exhaust system parts, disconnect any sensor wiring.
- Do not attempt to straighten bent exhaust system parts.
- Replace one-time or damaged fasteners or sealers.
- Do not use fastener coatings unless recommended by the vehicle maker. The coatings may affect fastener torque and the joint clamping force.

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## 8. Vehicle Protection (cont'd)

- Use exhaust system sealer on slip joints.
- Do not apply undercoating, or other corrosion-resistant materials, to heat shields, sensors, and other exhaust system parts unless specified by the vehicle maker.

### 8.2 Adjacent Parts

To protect adjacent parts when working on the exhaust system:

- Protect cosmetic surfaces when removing or installing exhaust system parts.
- Allow proper clearance between exhaust system parts and pipes, hoses, etc. that are affected by excessive heat.
- Allow proper clearance between exhaust system parts and the floor pan.
- Do not allow a torch flame near brake lines or hoses, fuel lines or hoses, the fuel tank, or any other rubber or plastic parts.
- Protect adjacent objects from sparks and dust when using an abrasive cutoff wheel.



## 9. Repair Procedure

### 9.1 Removal Of Exhaust Parts

To remove exhaust system parts:

1. Properly lift and support the vehicle.
2. Remove all parts necessary to access the exhaust system parts that will be removed, and to prevent damage.
3. Disconnect or remove all exhaust sensors from parts that will be replaced.
4. Support the parts that will be removed before disconnecting the fasteners.
5. Remove the fasteners, or cut the pipes, and remove the required parts. When cutting welded parts, make the cuts directly adjacent to the weld. If using a cutting torch, avoid brake lines and hoses, fuel lines and hoses, and the fuel tank. Replace gaskets, broken ground straps, and one-time or damaged fasteners.

### 9.2 Installation Of Mechanically Fastened Exhaust Parts

To install mechanically fastened replacement exhaust system parts:

1. Clean the mating surfaces. Apply exhaust system sealer on slip joints.
2. If more than one part is being replaced, loosely assemble the parts before positioning the assembly on the vehicle.
3. Position the replacement part or assembly on the vehicle and loosely install the fasteners.

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## 9. Repair Procedure (cont'd)

Note: Sleeves or special seals may be required during reassembly to prevent leaks, especially near the catalytic converter. Follow the vehicle maker's recommendations.

- 4. Adjust the parts for proper alignment and clearance.
- 5. Reconnect or install replacement ground straps.
- 6. Torque the fasteners to the vehicle maker's recommendations, and in the proper sequence. Generally, work from the front to the rear of the vehicle.
- 7. Verify proper exhaust system alignment and clearance, and adjust if required.
- 8. Reinstall exhaust sensors, and other parts that were removed for access and protection.
- 9. Lower the vehicle.
- 10. Road-test the vehicle. See **11.2**.

### 9.3 Installation Of Welded Exhaust Parts

Note: Special welding materials, such as stainless steel filler metal, may be required. Follow the vehicle maker's recommendations.

To install exhaust system parts by welding:

- 1. Clean the mating surfaces.
- 2. Apply weld-through primer to the weld mating surfaces that do not have zinc coating, or where the zinc coating was removed. Follow the vehicle maker's recommendations.
- 3. Position the parts together and securely hold or tack weld them in place.
- 4. Make test welds before welding the exhaust system parts, using the same type and thickness metal that will be welded.
- 5. Make the required welds.
- 6. Loosely attach other parts that are part of the replacement assembly.  
Note: Sleeves or special seals may be required during reassembly to prevent leaks, especially near the catalytic converter. Follow the vehicle maker's recommendations.
- 7. Position the assembly on the vehicle and loosely install the clamps and hangers.
- 8. Adjust the parts for proper alignment and clearance.
- 9. Reconnect or install replacement ground straps, if applicable.
- 10. Torque the fasteners to the vehicle maker's recommendations, and in the proper sequence. Generally, work from the front to the rear of the vehicle.
- 11. Verify proper exhaust system alignment and clearance, and adjust if required.
- 12. Reinstall exhaust sensors, and other parts that were removed for access and protection.
- 13. Lower the vehicle.
- 14. Road-test the vehicle. See **11.2**.



## 10. Use Of Recycled (Salvage) Parts

### 10.1 Condition Of Salvage Parts

Do not install a salvage exhaust system having any of these defects:

- unrepairable damage
- internal flow restrictions
- damaged or missing mounting locations
- corrosion that has caused pitting

Do not install salvage gaskets or catalytic converters.



## 11. Inspection And Testing

### 11.1 Inspection Of A Repaired Exhaust System

After installation, inspect an exhaust system for these conditions:

- proper pipe routing and alignment
- muffler and catalytic converter installed in the proper direction
- proper coupling and clamping, with fasteners torqued to the vehicle maker's recommendations
- proper installation of hangers, heat shields, ground straps, etc.
- proper installation and connection of sensors and other emission-system parts
- no abnormal noises when shaken

Correct any defects.

### 11.2 Road-Test

Road-test the vehicle to check for these conditions:

- no exhaust system vibration
- proper noise level
- no exhaust odors inside the vehicle

Verify that no stored trouble codes indicate an exhaust or emission problem. See **EL21**.

Correct any defects.