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**PRODUCT ENHANCEMENT SERIES**

# Cab Maintenance Guide for Sound

Maintenance and Repair      Application      Component Life Management      Component Renewal (CRC)      MARC Management      Product Enhancement Series

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**September 11**  
**1011-6.00-1215**

## 1.0 Introduction

Maintaining low operator noise over the life of the machine helps ensure operator comfort, operator productivity, clear communications, and minimum noise exposure. Operator noise can increase over time from normal wear or physical damage.

This document provides background information, guidelines for inspection and corrective action to maintain low operator noise. These practices apply to a broad range of cabs and machines, not a single machine model or cab.

## 2.0 Product Enhancement Description

### A. Useful definitions

**Sound** is waves traveling in the air which can be perceived by human hearing. Sound can be useful – for communication, safety warning, or information about the machine condition or how it is operating. Excess or unwanted sound is noise. The amount of sound is the ‘sound pressure level’, which is typically measured in logarithmic units called decibels (dB).

**Operator Noise** is the amount of sound at the ‘operator’s ear location’. Operator noise can be caused by the machine and its noise sources (diesel engine, fan, exhaust stack, transmission gears, hydraulic pumps, etc.) or from other noise at the worksite. The amount of operator noise can be measured in terms of sound pressure level in decibels.

**Operator Noise Exposure** is the amount of noise over a long period of time, such as an 8 or 12 hour period.

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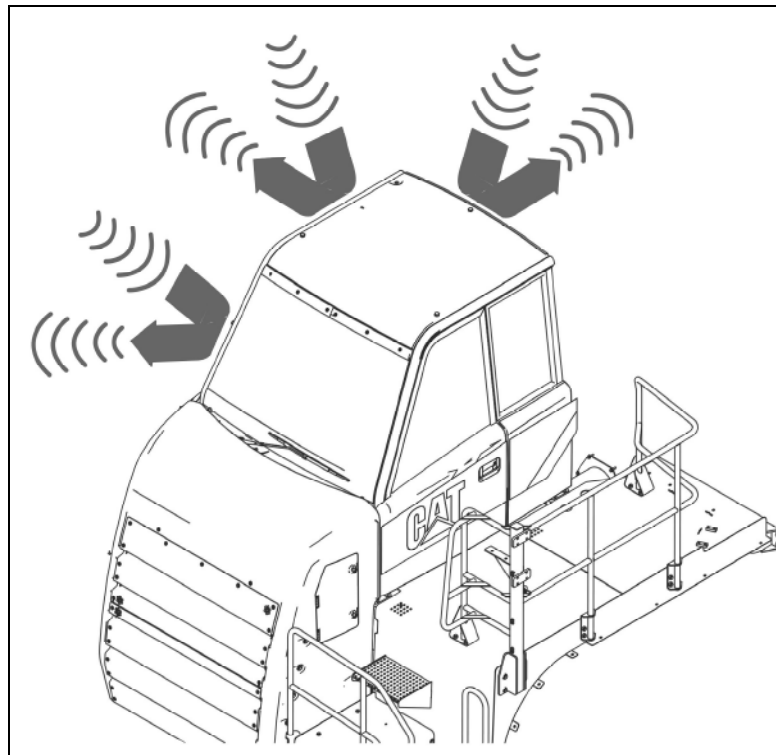
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**B. Noise Control Principles**

One purpose of the operator station or cab is to reduce noise reaching the operator. Caterpillar cabs are designed to block sound from entering the cab, absorb sound once it is inside the cab, and reduce vibrations that can result in sound.

**Cabs block sound**

Cabs provide a barrier to noise from the machine and worksite. Sound barriers, such as cab panels, glass, flooring, floor mats, various covers and seals are often chosen to block sound from entering the cab.



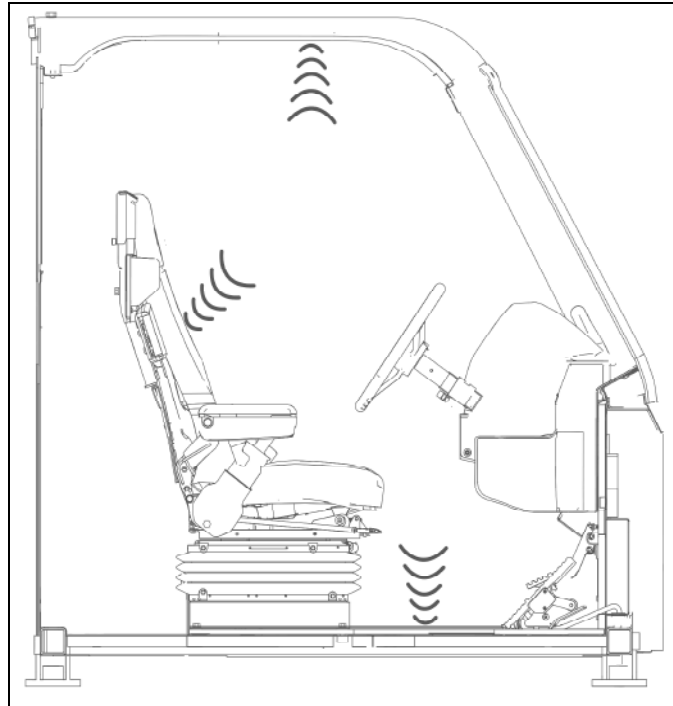
**Illustration 1. Cabs block sound.**

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**Cabs absorb sound**

Cab interior components are added or chosen to absorb sound. These can include headliners, seats, floor mats, and sound absorbing trim applied to panels, covers, posts, etc.



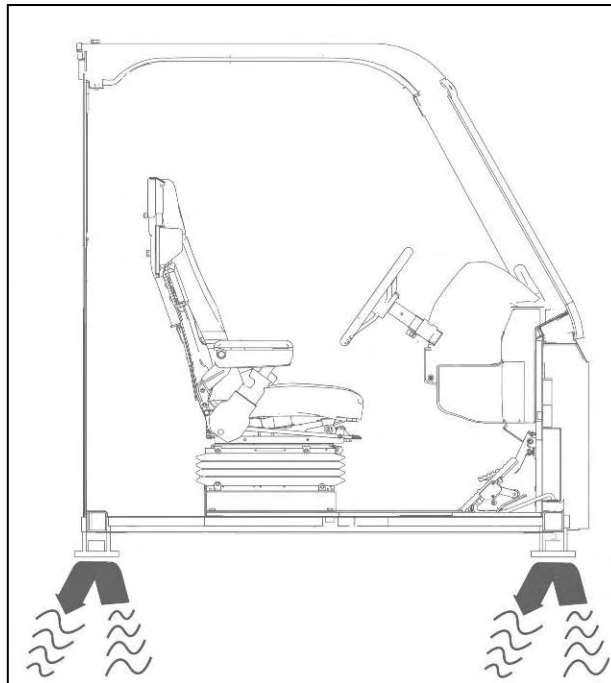
**Illustration 2. Cabs absorb sound.**

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**Cabs block vibration**

Cab structures and installations are designed to reduce vibrations that cause sound inside the cab. This can include use of materials (panels, glass, etc.) that damp vibrations or use of isolators that prevent transmission of vibrations. For example, cabs are mounted on carefully selected rubber mounts to block vibrations from travelling from the machine to the cab.



**Illustration 3. Cabs block vibration.**

**C. Cab Sound Inspection Checklist**

The performance of sound-related components can degrade with aging, wear, exposure to extreme conditions, physical damage, etc. Regular inspection of the cab and machine can be used to identify degradation of sound-related components that can contribute to increased operator noise. These parts can then be reconditioned or replaced as needed.

This section contains a general inspection checklist. Further details on inspection and related corrective actions are in the following section.

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**Inspection Checklist**

**Cab Structure Inspection:**

- Exterior access panels are in-place, tightly secured, and properly sealed
- Exterior fixed panels are sealed/ caulked with no damage (holes, cracks, missing pieces)
- Hole/ penetration seals remain complete (caulked, grommets, rubber boots, etc.)
- Fixed window seals are in-place with no gaps, including bonding
- Sliding windows are properly aligned with no channel obstructions; latches secure window
- Hinged window seals are complete, compliant, and seal with no leaks
- Hinged window latch adjustment and wear enable tight, rattle-free closure
- Door seals are compliant and have no gaps, misalignments, or leaks
- Door latch adjustment and wear provide tight, rattle-free, leak free sealing (inspect both interior and exterior)

**Cab Interior Inspection:**

- Floor mat coverage is complete (not torn, missing pieces) and remains compliant
- Headliners are complete, properly aligned/ secured, sufficiently clean
- Cab interior trim is complete, securely attached, sufficiently clean
- Cab interior sound materials (hidden) are in place, complete, and sufficiently clean
- Cab interior trim and attachments are securely fastened and rattle-free
- HVAC filters, insulation, and baffles should be in-place, complete, and sufficiently clean
- HVAC system and components ( fans, duct work, filters) are properly functioning
- Panels and Partitions are free of holes, cracks, and sealed

**Machine Inspection:**

- Mounts should not be distorted, damaged, or cracked
- Hoses, cables, or other machine elements should not be attached or contact cab surfaces
- Engine enclosure insulation should be in-place, complete, and sufficiently clean

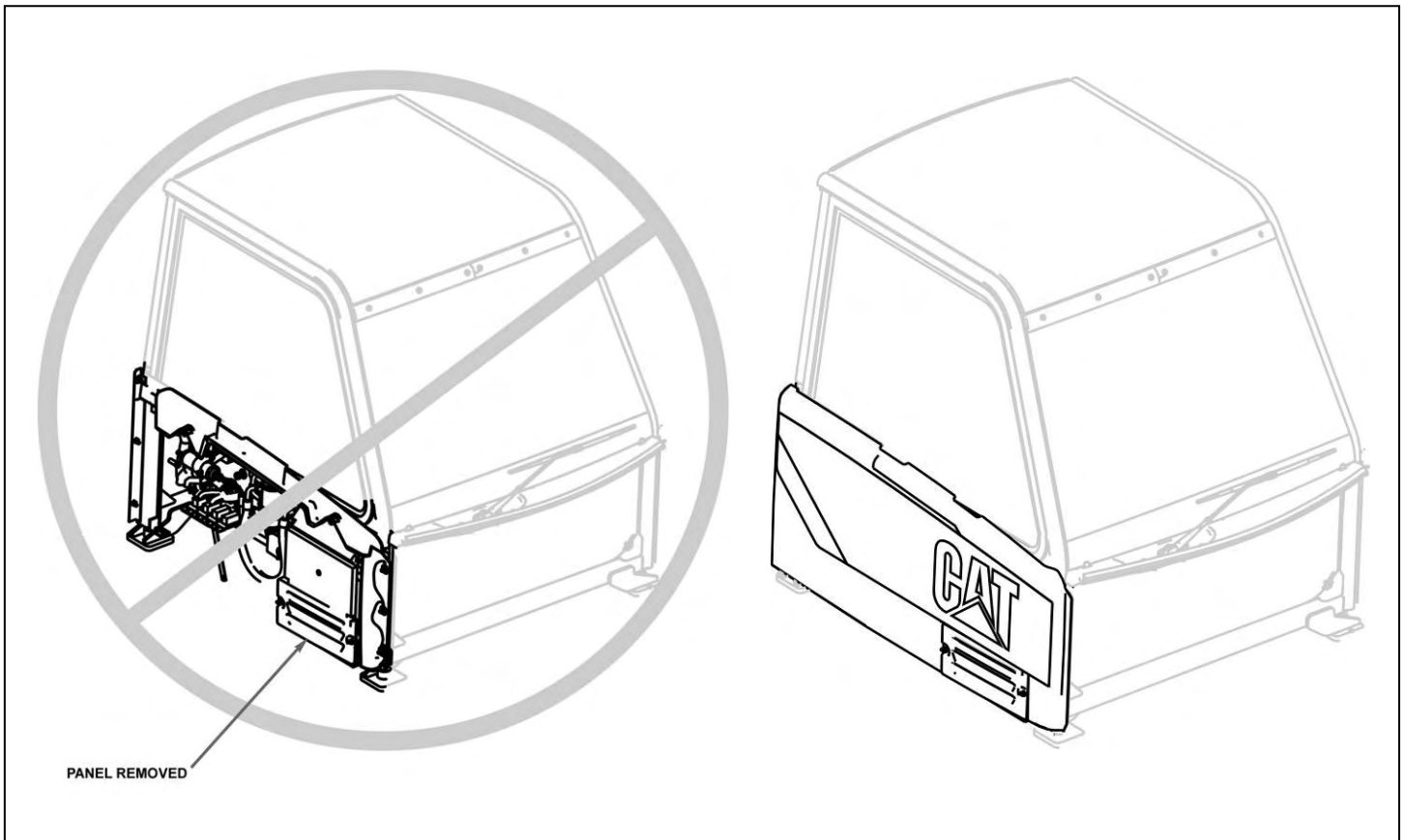
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**D. Cab Component Inspection & Maintenance Details**

This section describes specific inspections and corrective actions. Note that cabs differ in their design and noise controlling features. Some features listed below may not exist on some cabs

**Exterior panels / access panels**

Access panels may be found on the sides and floor of the cab. These panels should be securely in place. Some panels may have weather stripping or a seal around part of the entire perimeter. If so, check that the seal is in good condition and has not been displaced or worn.



**Illustration 4 – Properly Reinstall Cab Components & Repair Damage**

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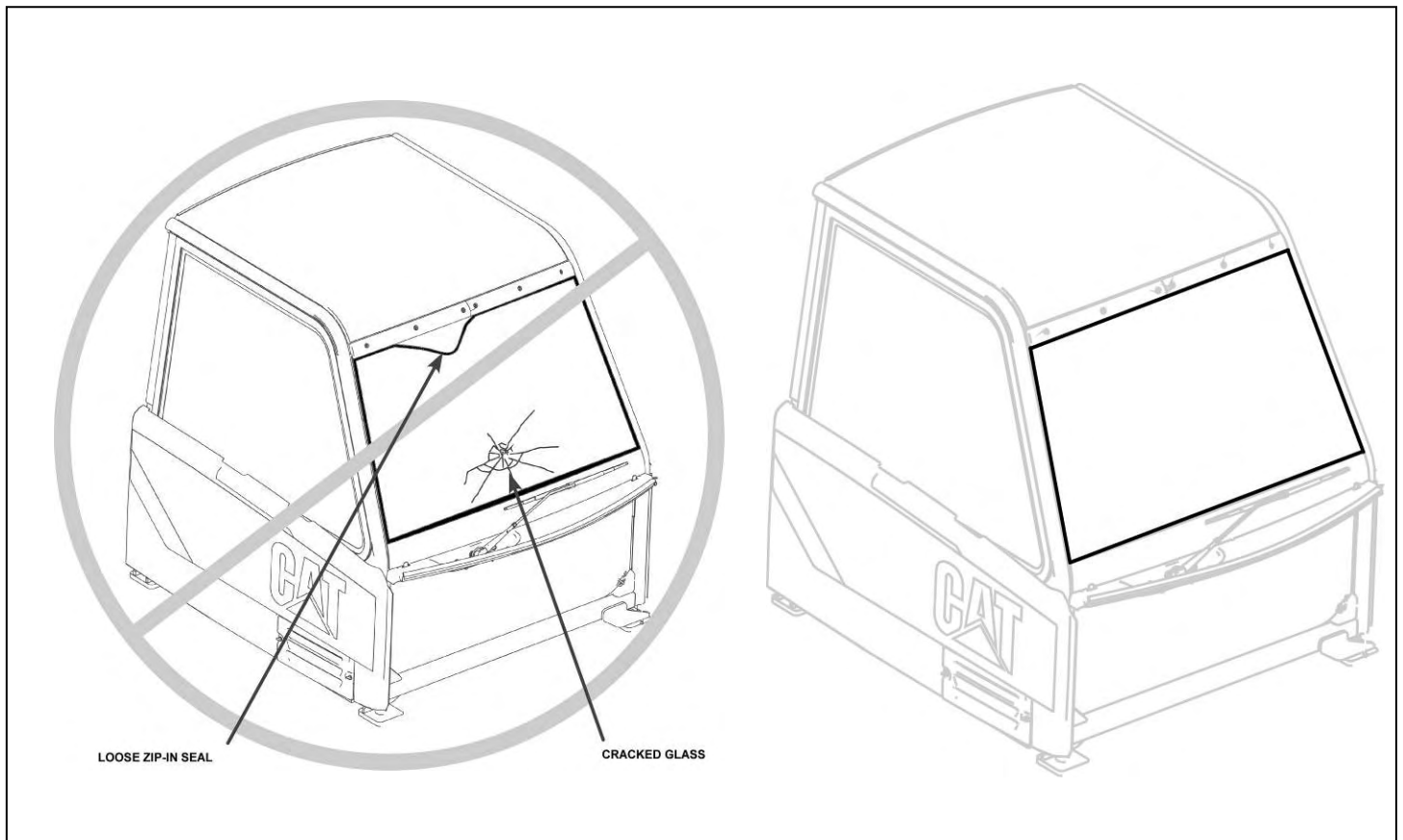
**Windows**

A window is a barrier to sound. Some windows are fixed in place, such as the windshield. Other windows are designed to move for ventilation. Windows should be free of cracks and holes and should seal well around the perimeter. Repair or replace any windows with holes or cracks.

**Fixed-place windows**

Check that zip-in seals are in good condition and properly set. Repair or replace as necessary.

If replacing a bonded window, ensure that the bond covers the entire perimeter of the window. The bond should be allowed to cure properly before placing into service. Improper cure could result in changes to the window sound barrier properties.



**Illustration 5 – Properly Repaired Windshield**

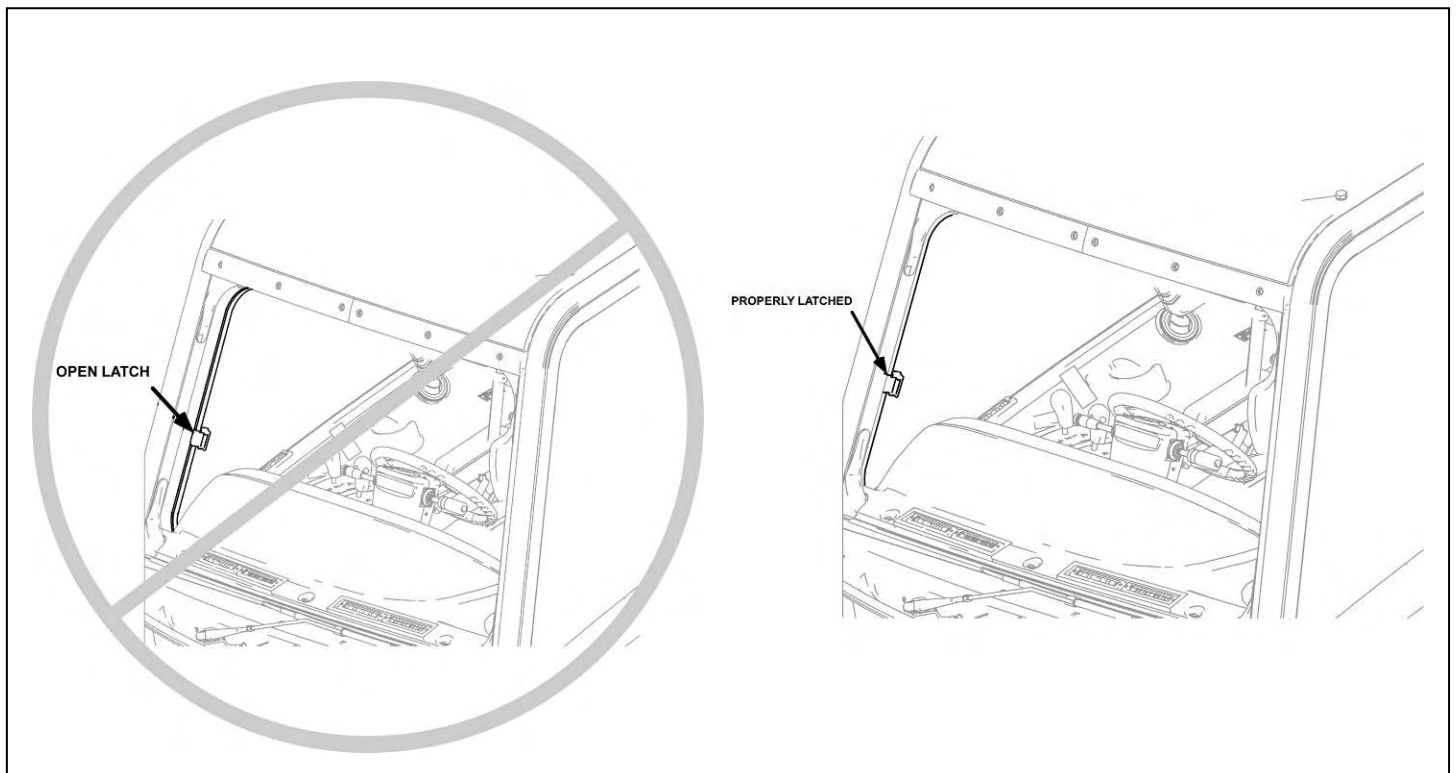
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**Movable windows**

For a sliding window, the channel should be clear of dirt and debris that may cause window misalignment. Ensure that the latch can hold the window securely in place. Clean the channel and adjust or repair the latch if necessary.

For hinged windows, inspect the condition of the perimeter seal. When shut, there should be no gaps between the window, the seal, and the window frame. If displaced or worn, repair or replace as necessary. Ensure that the latch can hold the window securely in place and that it can be easily operated. Adjust or repair the latch if necessary.



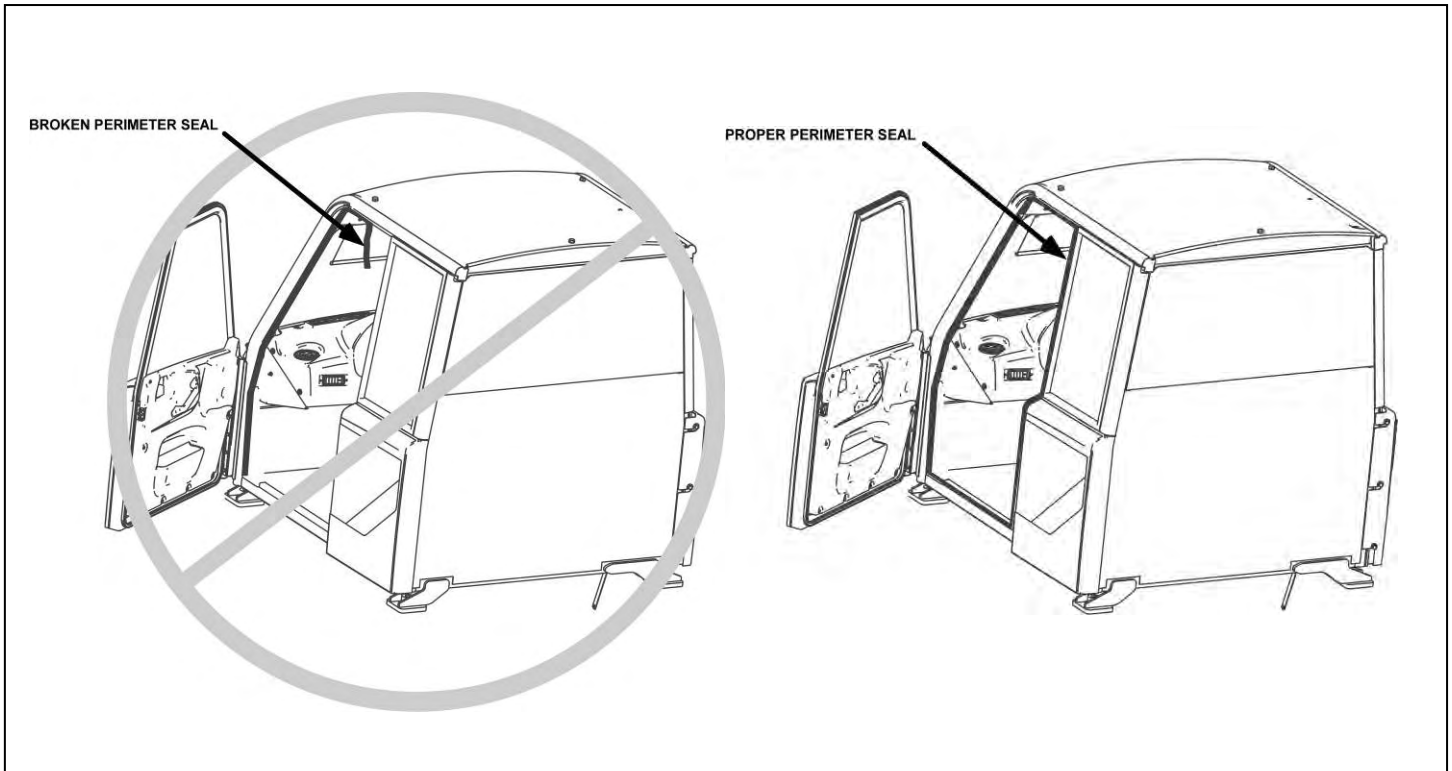
**Illustration 6 – Properly Latched Sliding Window**

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**Doors**

A door blocks sound when it is closed. Perimeter seals are used on doors for weather stripping and noise control. On many cabs the seal extends around the entire perimeter. Inspect the seal for excessive wear, misalignment or damage. Repair or replace as necessary.

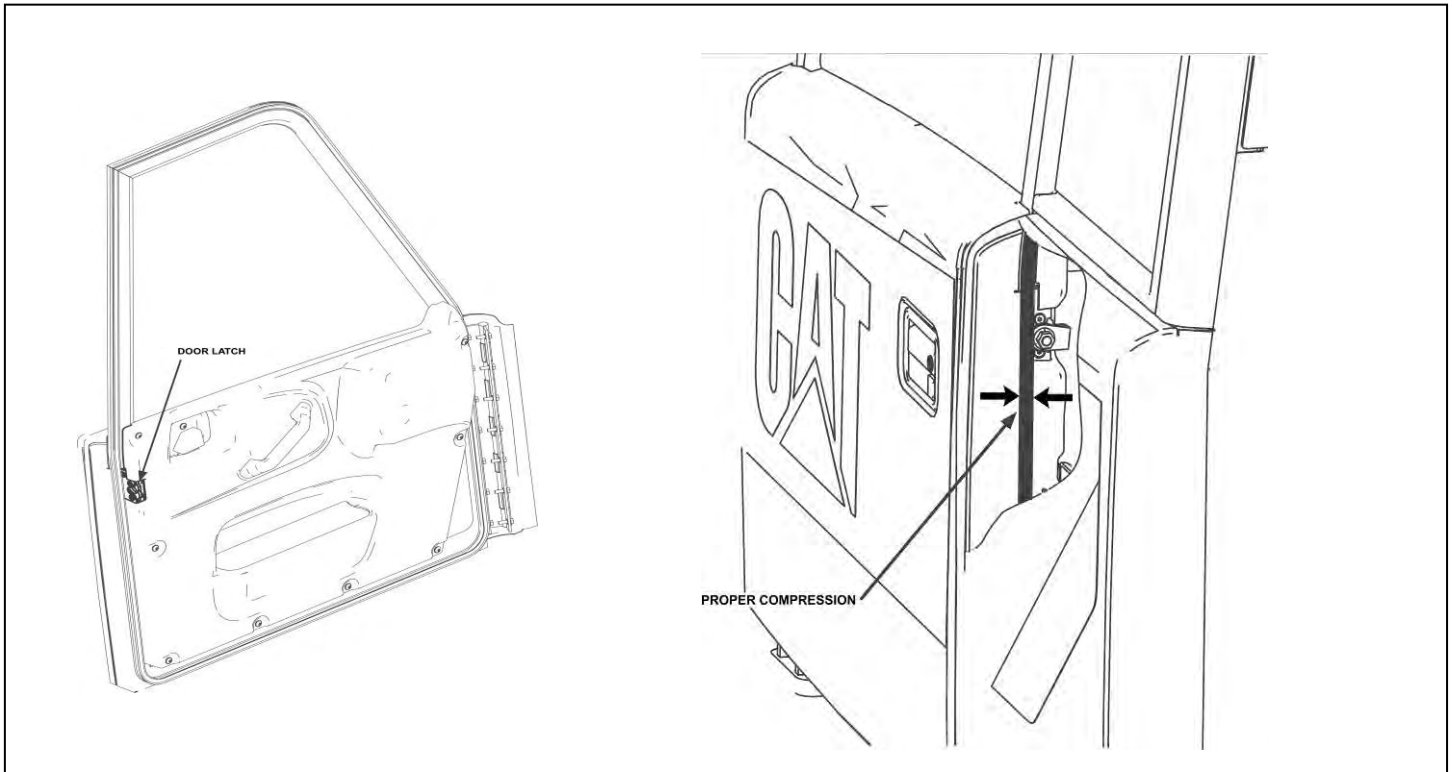


**Illustration 7 – Properly Aligned Door Seal**

The latch system is critical to ensure proper compression when the door is closed. Inspect the door in the latched position. It is best to inspect the door from both outside and inside the cab. The door should compress against the seal uniformly around its perimeter. If compression is too loose, adjust or replace the latch and/or striker to improve compression.

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**Illustration 8 – Properly Compressed Door Latch**

**Two-stage latches**

Note that some doors have a two-stage latch. With moderate closing force the latch engages its first stage. Stronger force is required for the door to engage the second stage. The cab's sound performance is based on compression at the second stage.

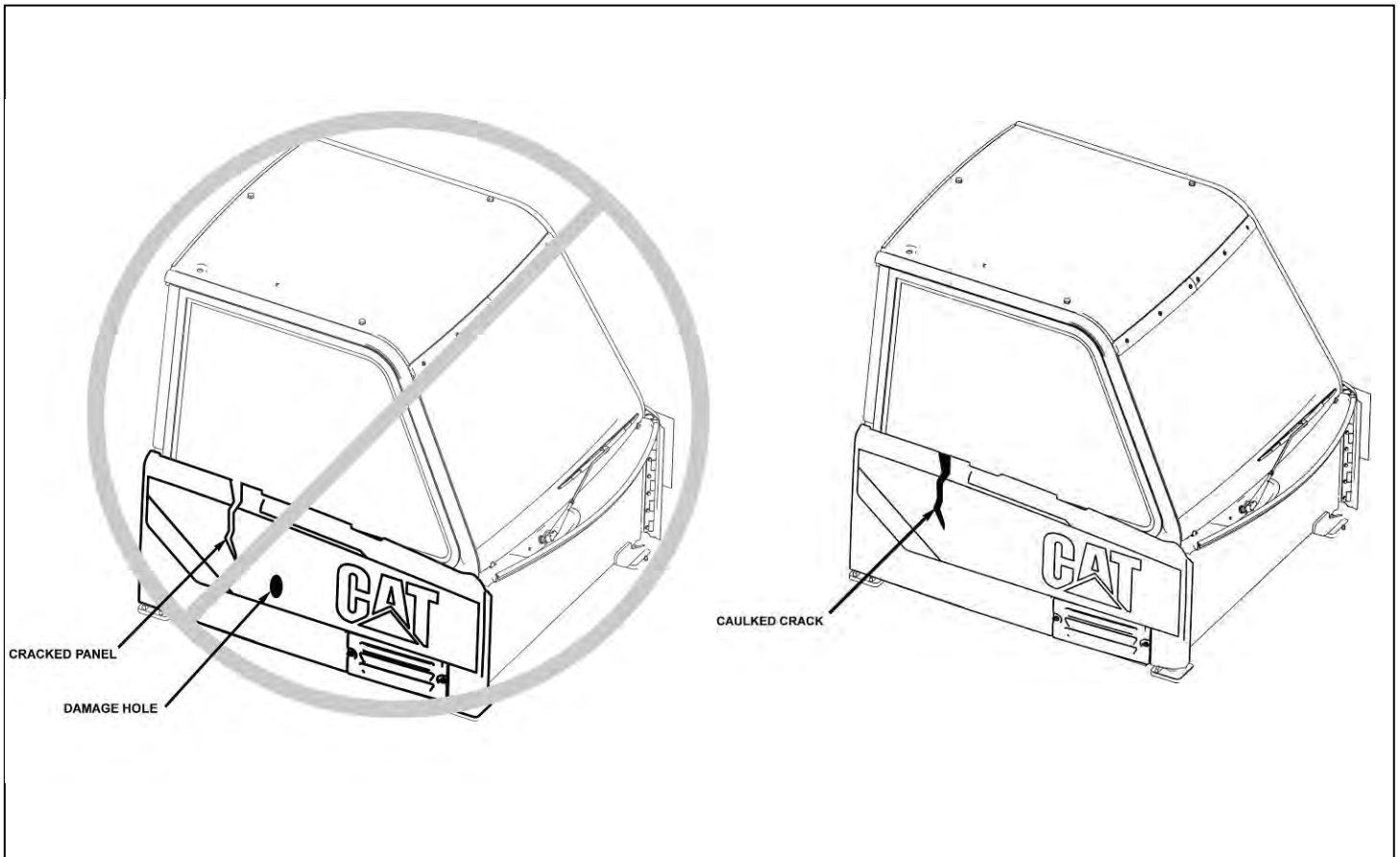
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**Panels**

Inspect cab panels for holes or cracks. Repair or replace as necessary.

Some cab panels have caulking along joints. Inspect the caulking and repair if necessary.



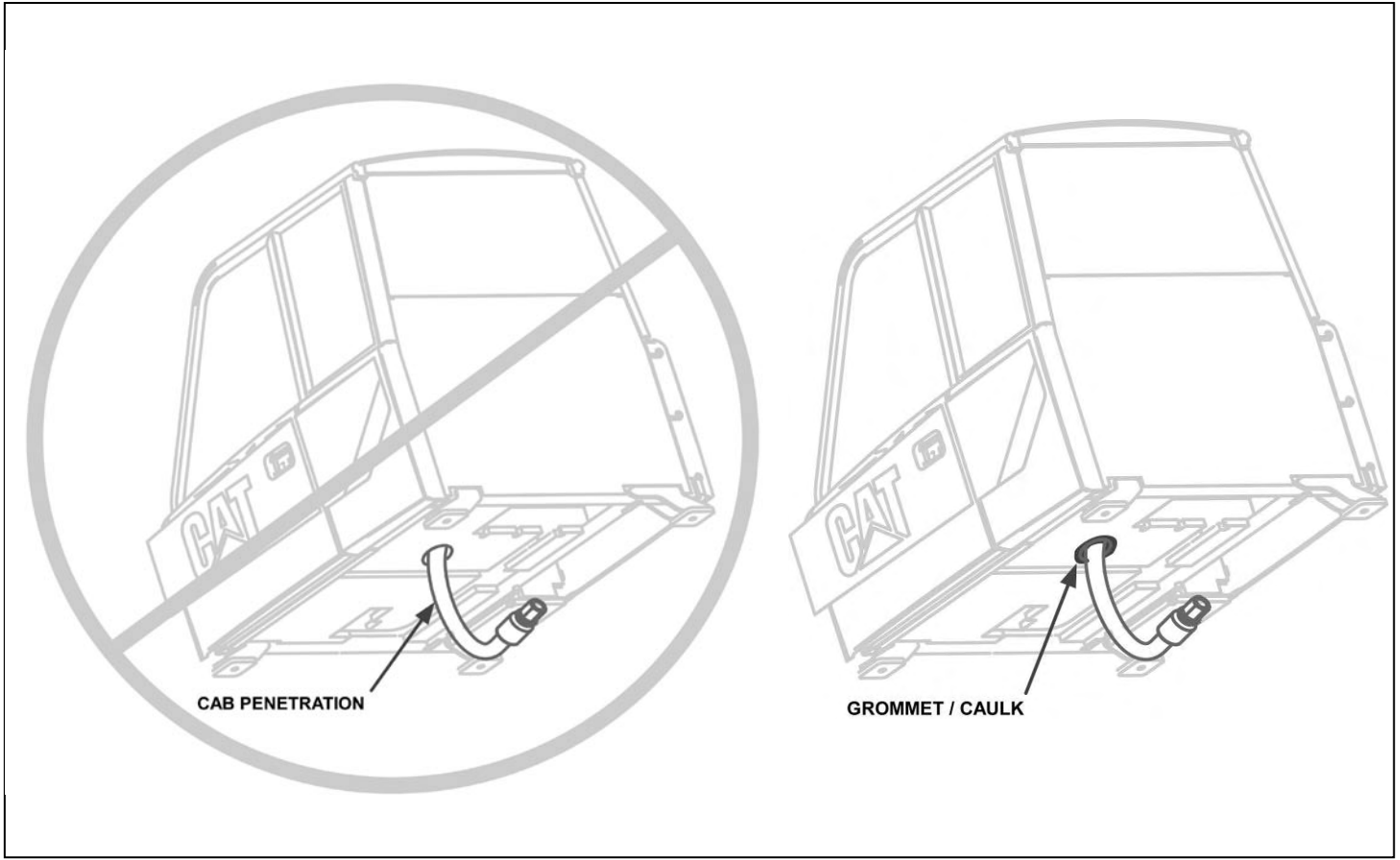
**Illustration 9 – Properly Repaired Cab Panels**

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**Penetrations**

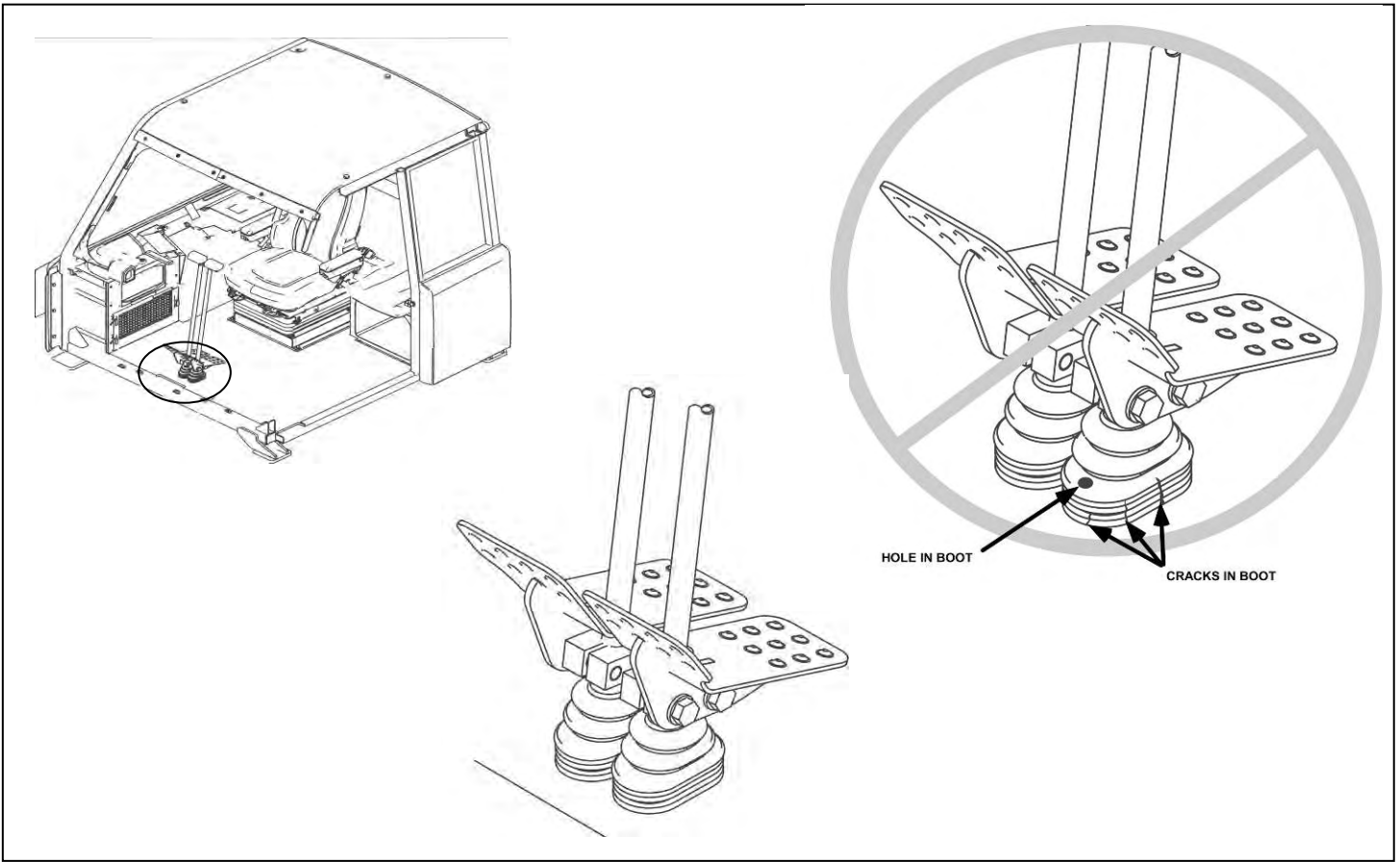
Some cabs have penetration holes for wiring harnesses, lines, etc. along with various means to seal the holes (caulk, grommets, etc.). These penetration holes may be located on the floor or side panels. Inspect these areas and repair / replace the seals as necessary.



**Illustration 10 – Plug Holes With Grommets**

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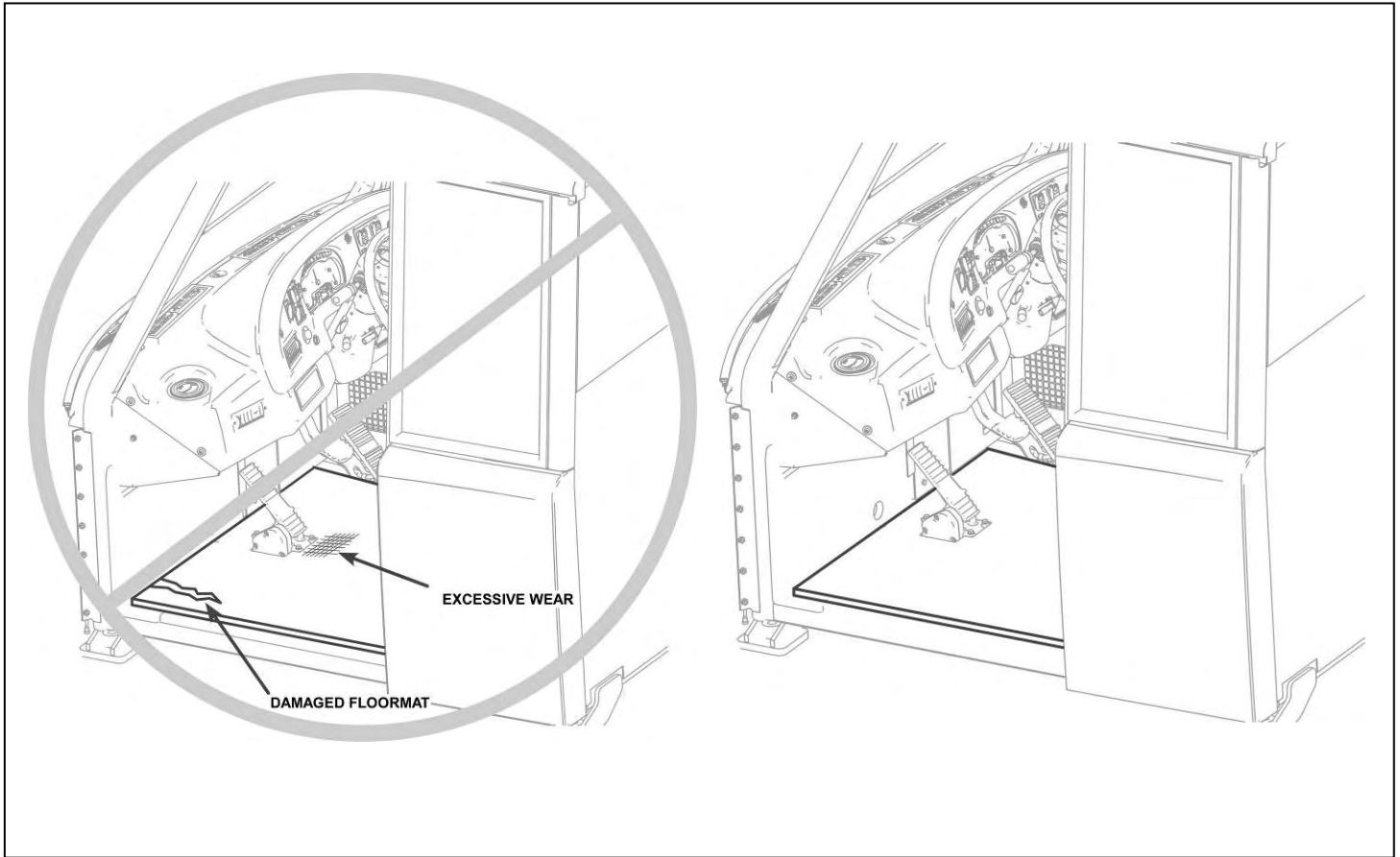
**Illustration 11 – Inspect Rubber Boots**

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**Floor mat**

The floor mat serves as a supplemental sound barrier as it sits atop the floor. Inspect the floor mat for excessive wear, proper placement or physical damage. Repair or replace as necessary.



**Illustration 12 – Replaces Damaged Floor mat**

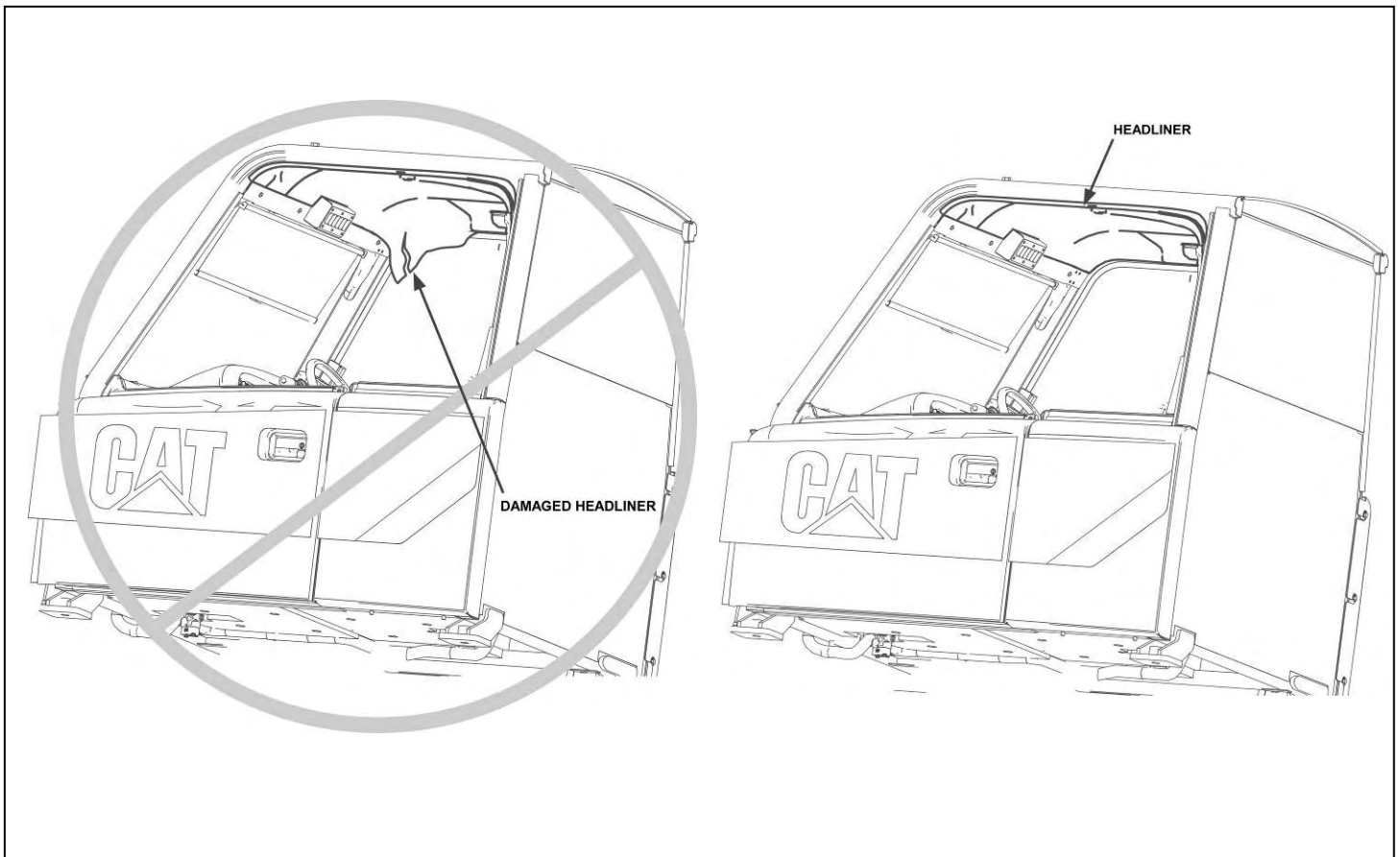
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**Headliner**

For most cabs, the headliner plays an important role in noise control as the primary absorber of sound. To serve that purpose, the headliner must be in good condition and mounted properly.

Inspect the headliner for fit and condition. Clean its surface if it is excessively dirty. Remount if not properly set in place. Repair or replace if damaged. Ensure all materials and fasteners (grommets, bolts, clips etc.) are in place.



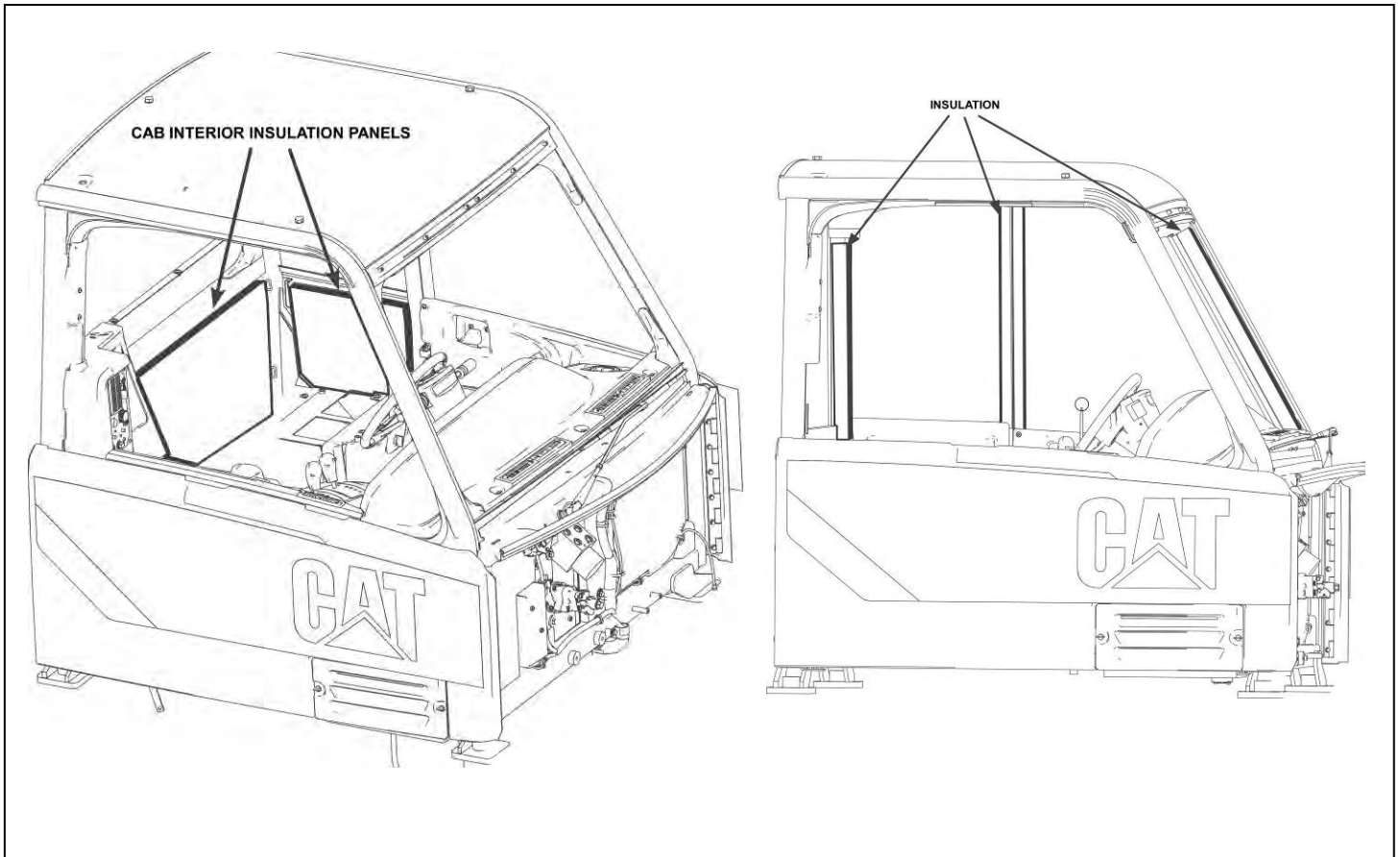
**Illustration 13 – Replace Damaged Headliner**

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**Trim and Sound Insulation parts**

Some trims parts perform sound-related functions. Some help to block sound while others help to absorb sound. Generally, those that primarily absorb sound will be identified as “insulation” in the parts system.



**Illustration 14 – Properly Reinstall Cab Insulation Panels**

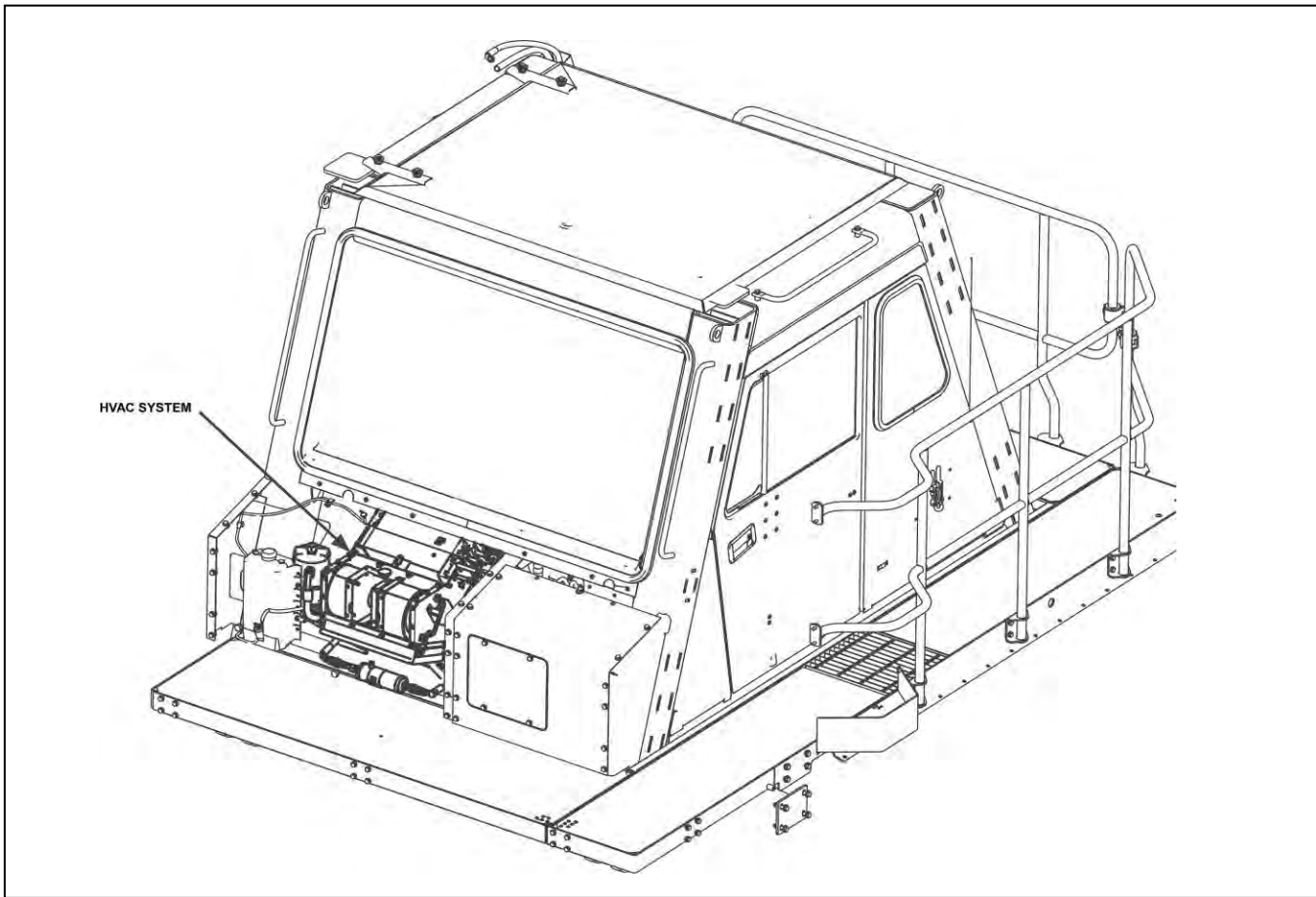
Inspect the insulation parts. Clean surfaces if excessively dirty. Remount if not properly set in place. Repair or replace if damaged. Note that some sound insulation parts may not be immediately visible and may be inside some of the cab’s compartments, requiring removal of parts for inspection.

Inspect the other trim parts and repair or replace if damaged. It may be necessary to remove trim parts to maintaining other parts of the cab. During removal, take care not to damage the part. During re-installation take care to achieve proper placement and fit. Plastic trim parts that are not replaced well may result in excessive rattle noises.

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**HVAC**

Noise generated by the HVAC system is generally related to the blower and motor. Filters can also affect HVAC noise. Some cabs have a shield near the recirculation inlet that helps direct noise away from the operator. Inspect the HVAC filters and replace as necessary per normal filter replacement guidelines. If the recirculation inlet has a shield, inspect it for damage and repair or replace as necessary. Unusual noises from the blower or motor may indicate a component problem and should be inspected.



**Illustration 15 – Inspect HVAC**

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**HVAC Operation**

Proper HVAC operation provides good operator comfort, allowing continual operation with the cab doors and windows closed and the cab properly pressurized. A closed cab minimizes entrance of excess dust, dirt, and grit that can wear and degrade cab materials and their intended function. Potential degradation includes sound materials such as rubber seals, headliners, cab trim, floor mats etc. or mechanical latches designed to securely seal doors and windows as barrier to sound. Excess dust and dirt can also degrade the HVAC air system and function, which in turn can further contribute to the problem.

Ensure that HVAC fans, ducts, louvers, heat exchangers, and filters are clean, operating properly, and providing intended performance. HVAC fans should operate with minimal noise and vibration at their designed speeds. Dust-filled filters should be replaced. Airflow volumes and velocities should be sufficient for heating, cooling, defrosting, etc.

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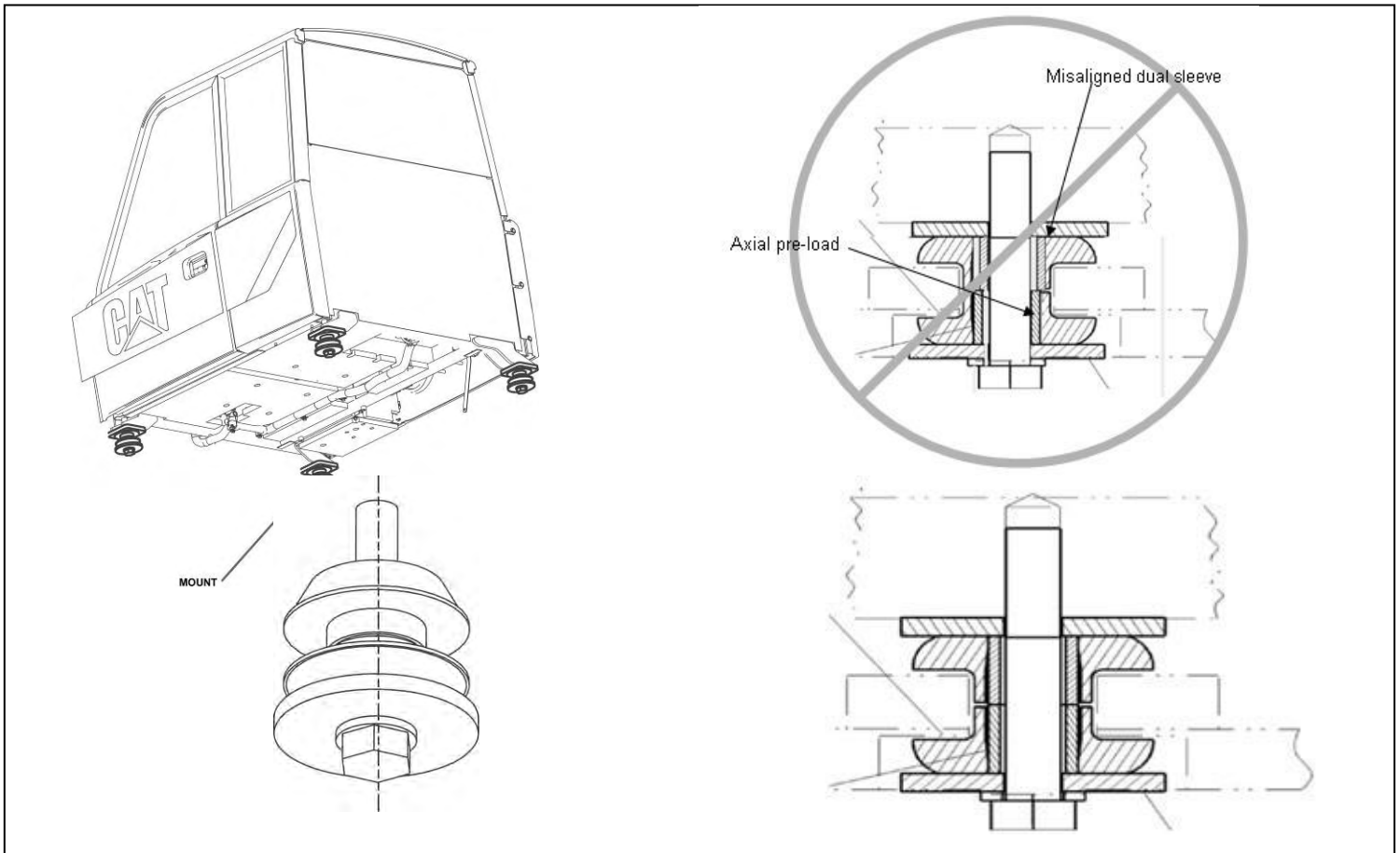
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**Mounts**

Most cabs are isolated from machine vibrations by four isolation mounts. A typical mount includes upper and lower parts made from elastomeric materials (rubber, etc.), a sleeve and a bolt. The mount's isolation performance depends on its design and installation.

There may be times when a cab is removed from its machine. When re-installing the cab, care must be taken when reseating the cab and its mounts. Using recommended tools, follow established torque guidelines and recommended torque order instructions. A custom jig may be useful to ensure proper relative placement of the mounts as the cab is lowered and aligned.

Inspect mounts and look for signs of cracking, discoloration, severe shape distortions or physical damage. Replace as necessary.

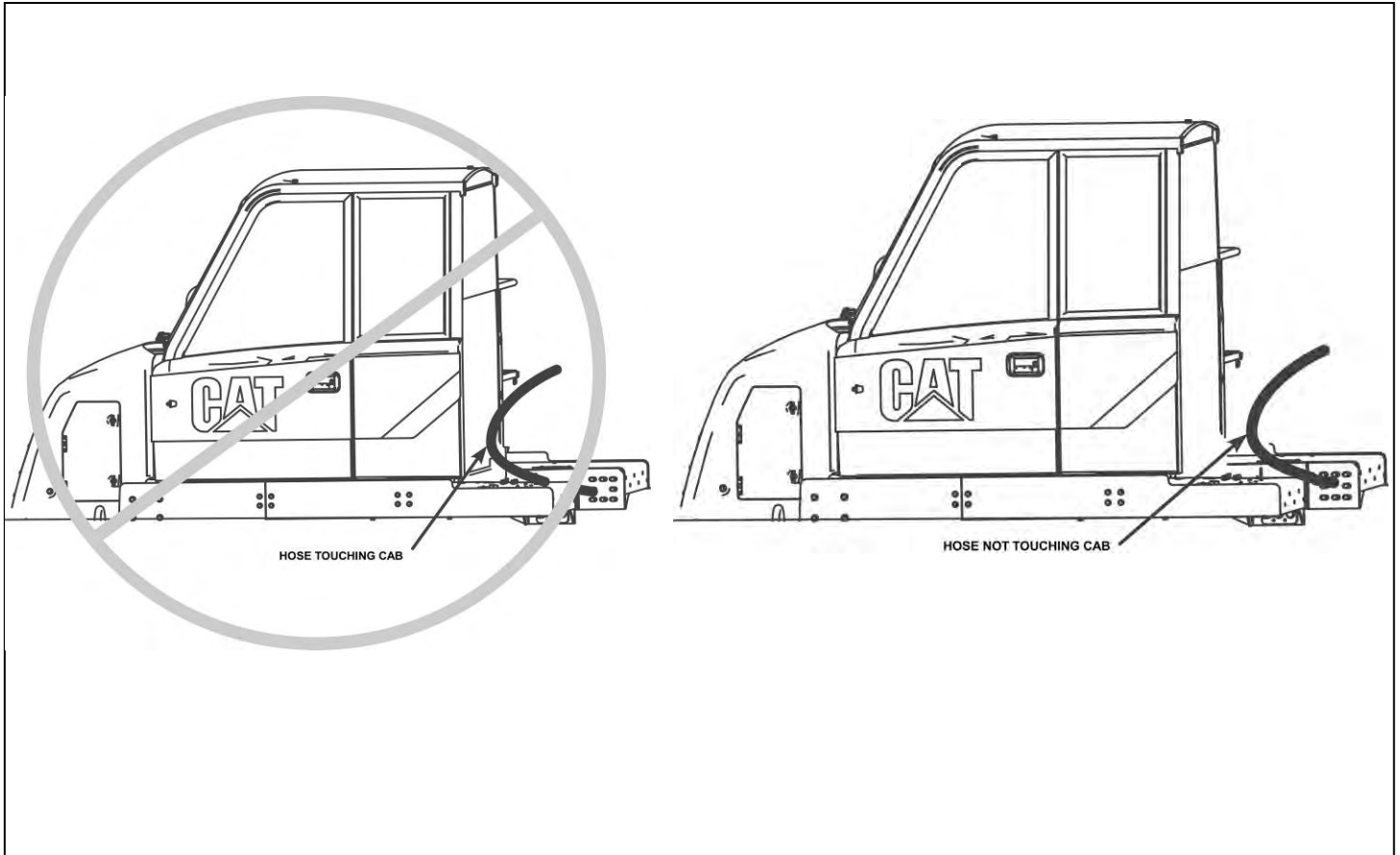


**Illustration 16 – Inspect Mount Alignment**

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**Cab perimeter**

After a cab has been re-installed, be sure nothing is touching it other than that which is designed to touch it. Take care that no extraneous hoses, lines, or other machine components touch the cab. In particular, closely inspect underneath the cab for things that may touch the underside of the floor. Make any necessary adjustments to prevent extraneous machine components from touching the cab.



**Illustration 17 – Inspect Hoses not touching Cab**

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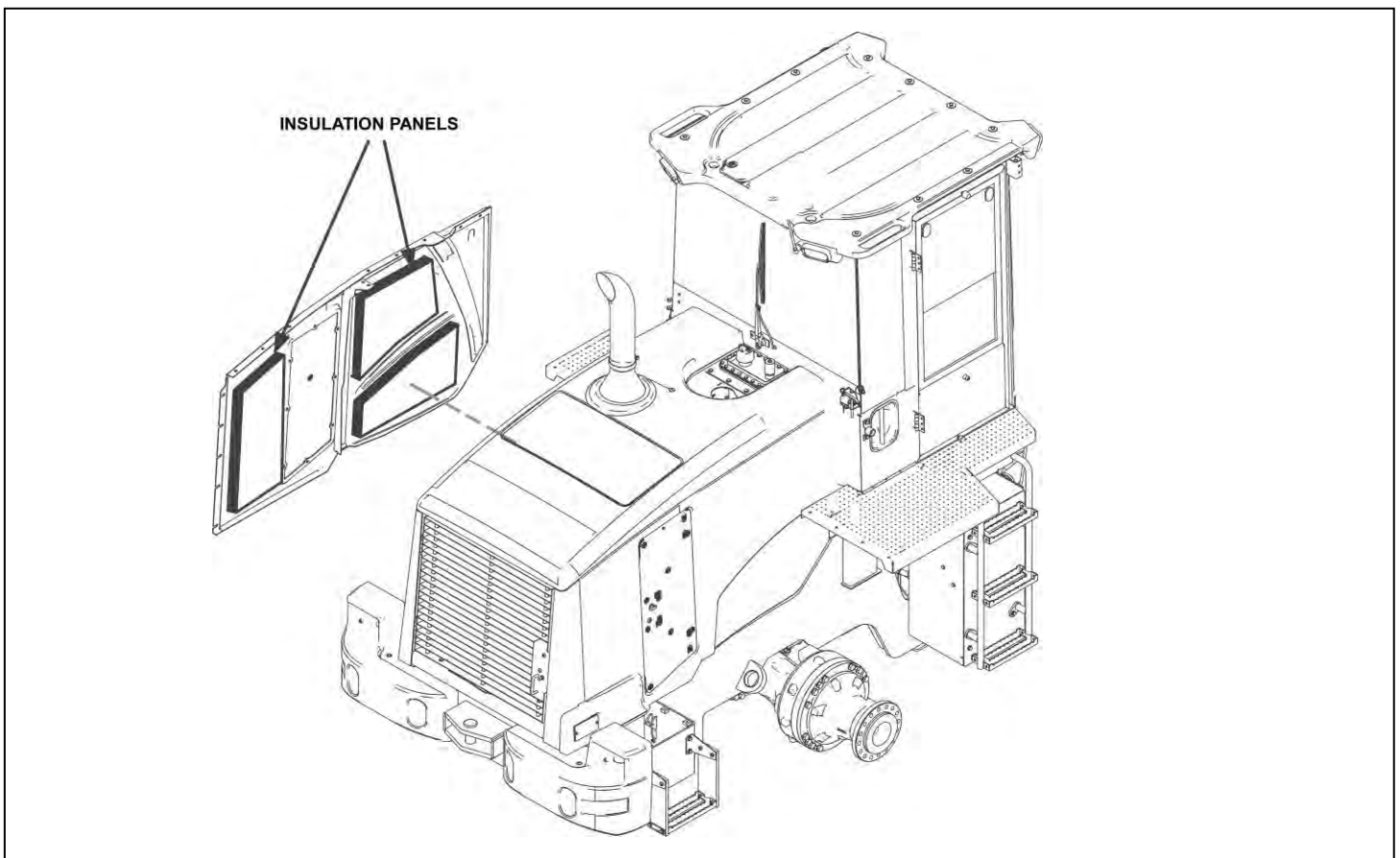
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**Machine**

With the exception of the HVAC, the sounds heard inside a cab come from outside the cab. Thus, changes to the machine sound affect the sound inside the cab.

When inspecting a cab for sound performance, it is recommended that the machine be inspected as well. In particular,

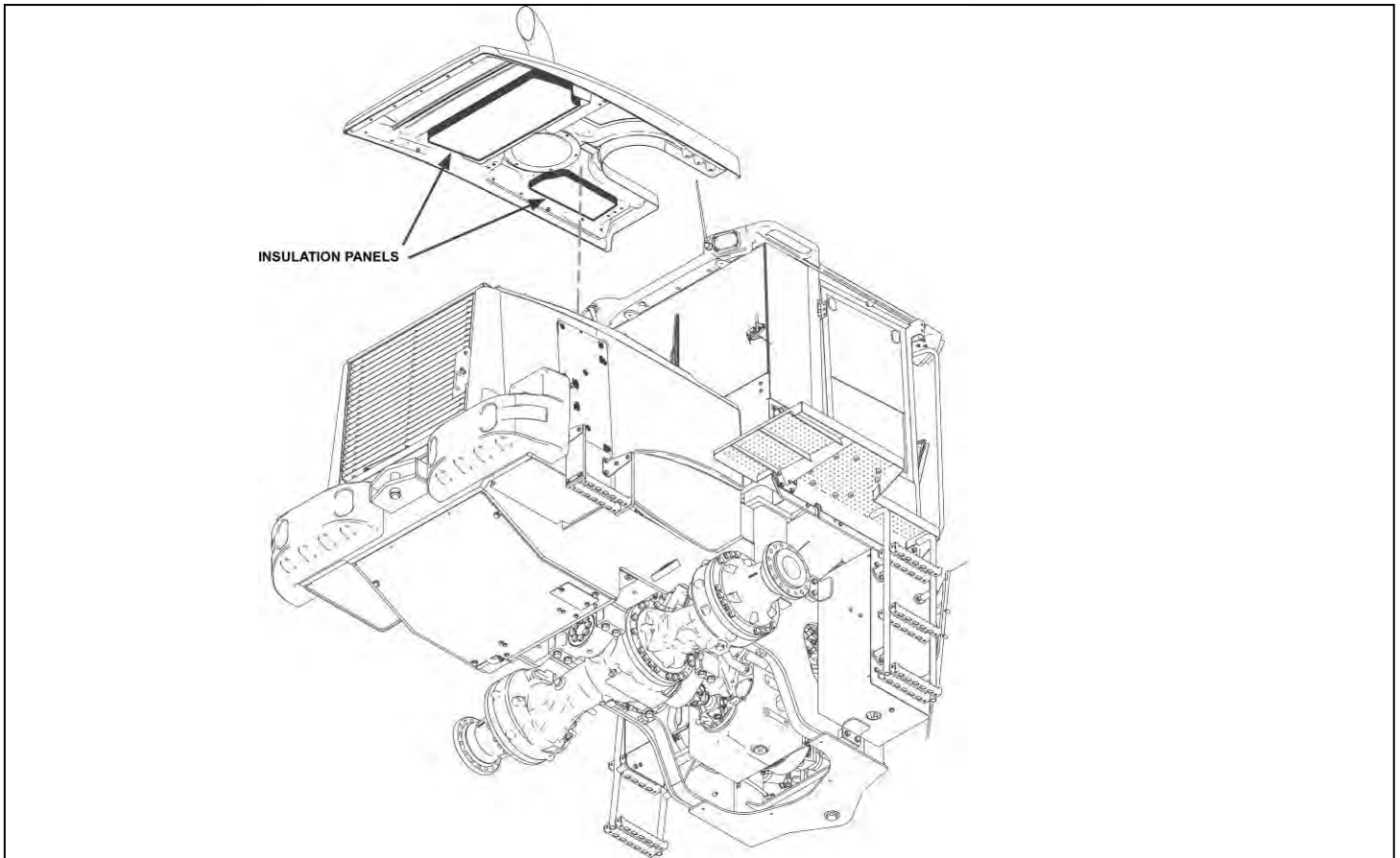
- Check access panels and hood components for proper installation and sealing.
- Check the condition of sound insulation parts inside the enclosure.
- Clean dirty sound insulation parts.
- Replace damaged sound insulation parts.



**Illustration 18 – Inspect Machine Insulation Panels**

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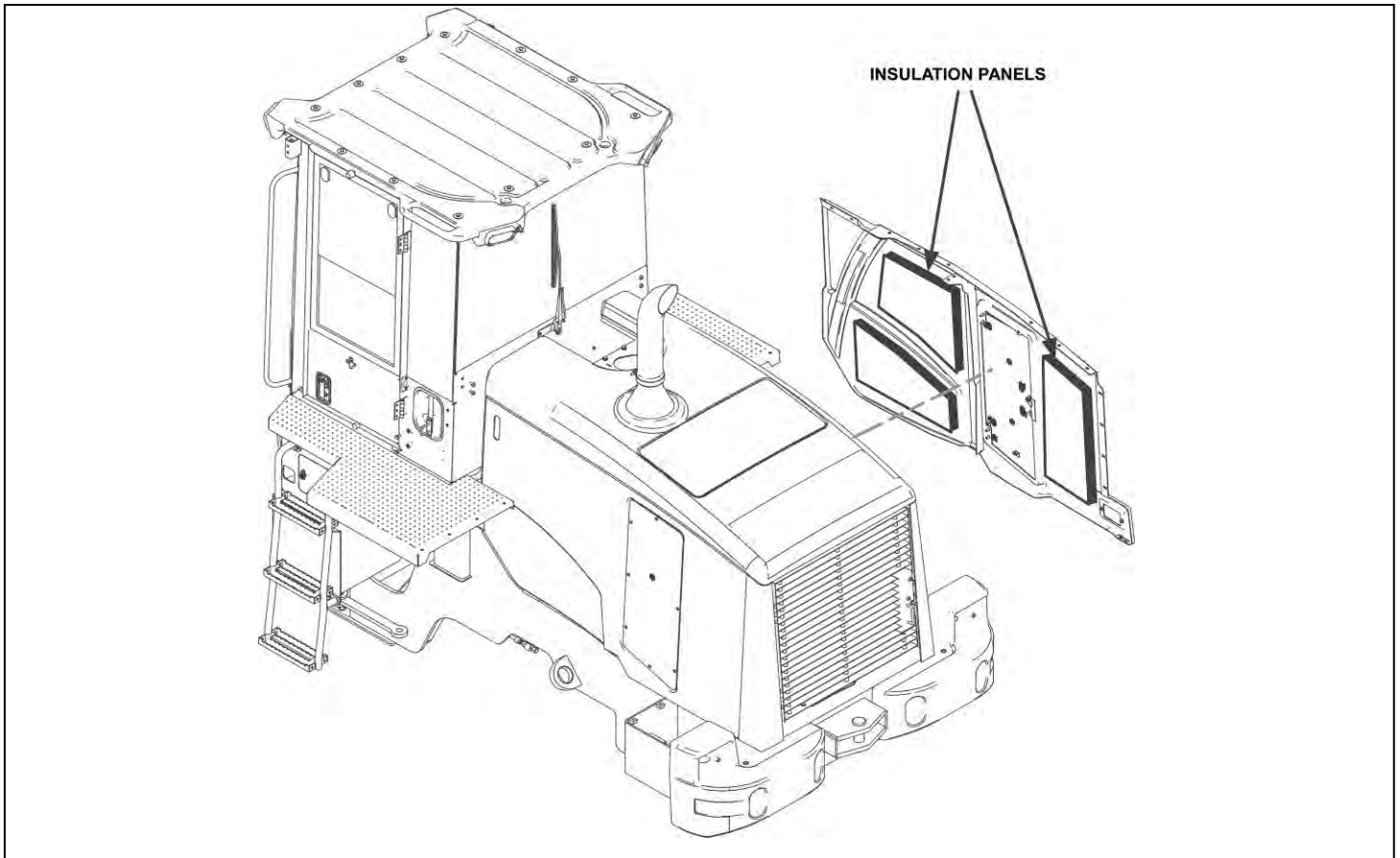
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**Illustration 19 – Inspect Machine Insulation Panels**

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**Illustration 20 – Inspect Machine Insulation Panels**

The condition of machine components may affect machine sound. For example, the muffler, cooling fan, engine, hydraulic pumps and lines, etc. can each impact sound inside the cab. When maintaining or replacing these components, use recommended replacement procedures and parts.

**3.0 Implementation Steps**

Establish a regular inspection schedule.

Inspect cab and machine as described in section 2.0.

Make adjustments, repairs or replace parts as necessary per guidance in section 2.0.

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**4.0 Benefits**

Minimizing operator sound levels to reduce operator noise exposure, improve productivity and reduce fatigue due to high noise levels, improve operator communications, generally minimize Health, Safety Environment and Community (HSEC) risks.

**5.0 Resources Required**

These practices apply to a broad range of cabs and machines, not a single machine model or cab.

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