Textbook

# Inspecting Repairs For Quality Control (QUA01)

I-CAR®

Version: 12.3

QUA01-STMAN1-E

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# Contents

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# *Introduction*

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## Obligations To The Customer And Liability

The collision repair industry has an obligation to correctly repair the customer's vehicle. Collision repairs must be performed using:

- recommended or tested procedures from vehicle makers, I-CAR, and other research and testing organizations.
- quality replacement parts and materials.
- repair processes and parts as written and agreed upon in the repair order. If items on the repair agreement are not consistent with the repair order, it can be considered fraud.

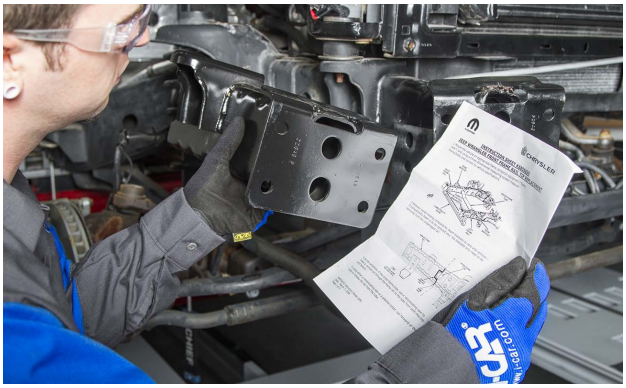
Performing proper collision repairs requires using parts and procedures that keep remaining warranties intact.

Collision repairs must restore:

- safety.
- structural integrity.
- durability.
- performance.
- fit.
- finish.

Throughout the damage analysis and repair process the repairer and insurer must:

- communicate with each other.
- maintain constant communication with the customer.
- be in agreement with each other and the customer on how repairs will be performed.
- inform the customer of any changes in the repair plan from the original repair agreement, and explain the changes and why they have to be made.



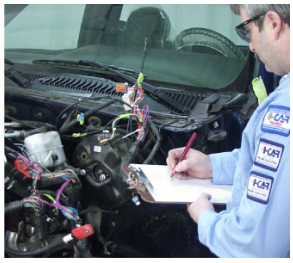
To reduce liability:

- make sure that all repairs are performed thoroughly, correctly and as listed in the damage report.
- follow proper procedures.
- have documentation of required repairs with detailed record keeping available for customers.

Technicians are considered the experts and are expected to be knowledgeable on how to perform a quality repair.

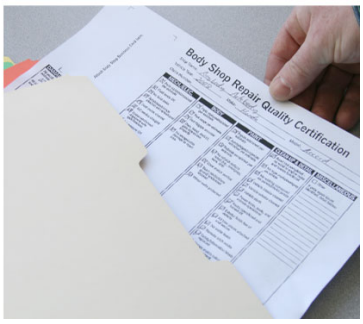
Liability insurance that covers the repair facility may not always cover all damages. For example:

- the policy may not cover faulty repairs, leaving liability responsibility completely on the facility.
- a shop owner may find that repair facility liability coverage may not cover the full amount awarded in a lawsuit. The shop owner would have to pay the difference.



It is difficult to reduce the risk of liability exposure. The part that the repairer can control is the chance of being found at fault. Chances can be minimized by:

- using recommended or tested procedures from the vehicle makers, I-CAR, or other research and testing organizations.
- using quality replacement parts and materials that restore fit, finish, durability, and perform at least as well as the original.
- keeping thorough records.




Keeping thorough records includes more than recording the date, mileage, and pre-existing damage. Record keeping also includes:

- making sure all notes are legible.
- verifying the repairs that were made or not made.
- having the customer sign a waiver for repairs that they do not want performed. Repairers must determine their liability on not repairing safety systems such as restraint and anti-lock brake systems.
- keeping computer printouts or worksheets on file showing wheel alignment readings or vehicle dimensions before and after repairs.
- keeping scan tool printouts and records of computer codes for airbag, anti-lock brake, emission, and powertrain control module (PCM) systems.

- attaching the OEM or other tested procedure printout to the vehicle repair order.
- keeping receipts for all sublet work performed.

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# *Module 1 - Importance For Quality Control And Inspecting Structural Repairs*

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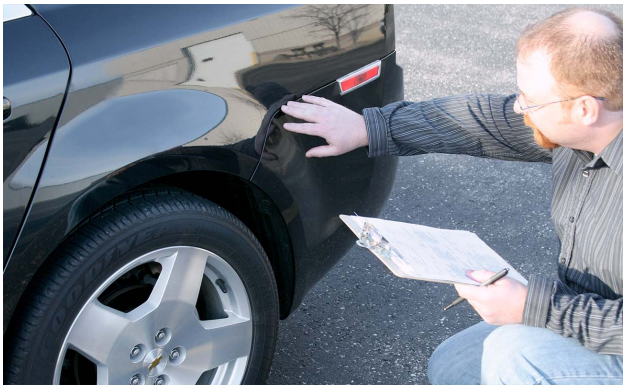
## Establishing A Quality Control System

Learning objectives for this module include:

- explaining the importance for conducting post-repair inspections for quality control.
- identifying various opportunities during the repair process where inspections may be conducted.
- identifying repairs that should be inspected before coatings are applied.
- identifying incomplete or poor quality repairs.
- describing how to use various inspection tools to access hard-to-see repair areas.



*Verifying complete and safe repairs includes checking panels for proper fit-up.*

The purpose of this course is to teach students how to identify complete and safe repairs. This course is not intended to cover what may have caused an improper / poor quality repair or how to correct the issues. Simply put, quality issues identified during a post-repair inspection must be corrected by a properly trained technician.

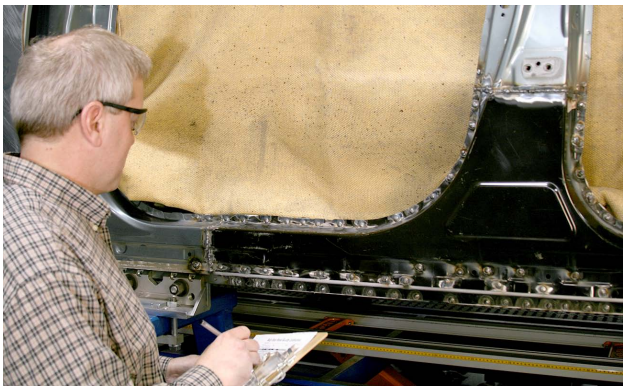
**2010 Cadillac SRX**

*Post-repair inspections can be done at various stages of the repair process and after all repairs are completed on the vehicle.*

Quality control may be defined as an inspection process done:

- to verify complete and safe repairs.
- throughout the entire repair process. Inspections may be done at various stages of the repair process to prevent compounding rework.
- after all repairs are completed on the vehicle. This includes inspections before delivery while the vehicle is still located at the repair facility, or somewhere offsite after the vehicle has been delivered to the customer.
- by communicating to everyone in the repair process their role in ensuring only high-quality repairs.

**2009 Toyota Venza**



*Inspecting repairs will reduce the chance for rework or comebacks.*

It may be important to establish a quality control process to:

- ensure complete and safe repairs. The vehicle must be properly repaired to ensure the safety of the passengers.
- ensure customer satisfaction. Poor quality repairs may discourage current customers from returning to the repair facility in the future, as well as any potential customers the customer may talk to. Customer expectations will vary from one customer to the next. Achieving customer satisfaction may include high-quality repairs, high level of customer service, and a timely repair.
- verify the work matches the repair order. The repairs listed on the repair order must match the repairs that were made on the vehicle.
- prevent rework or comebacks. A comeback is when the vehicle is returned to the repair facility after the vehicle has been delivered to the vehicle owner due to incomplete or inferior repairs. Comebacks will interfere with cycle time and shop efficiency.
- maintain a good reputation. A poor reputation may develop if too many quality issues are not caught before the vehicle is delivered to the customer. There is also the potential for another repair facility to recognize and point out defects to the customer during a subsequent repair. This also has the potential to adversely affect the name of an entire franchise.
- limit liability issues.
- guarantee the repairs last as long as the customer owns the vehicle.

*Comebacks affect the time of both the customer and the repair facility.*

Comebacks decrease production at the repair facility and inconvenience the customer. Comebacks:

- affect the time of each person involved. At the very least, it will affect the time of the person handling the situation with the customer, on the phone or in

person. Comebacks also involve the customer's time.
- may disrupt current jobs in production. In addition to the technician's time taken off the current job, this also increases the risk of technician error when returning to the current task. It may be difficult to determine exactly where in the repair process the technician was. These errors increase the risk for rework or comebacks.
- may require a rental vehicle for the customer while the problem is being corrected.
- may result in lower customer satisfaction index (CSI) scores. Comebacks may also affect the reputation of the repairer and / or insurer. Stories of bad experiences are more likely to be communicated to friends and relatives than good experiences.
- may adversely affect a relationship with a direct repair program (DRP).

There is also the issue of liability if there was no comeback, but passenger safety was compromised due to substandard repairs on the vehicle.

More information on improving cycle time and shop efficiency can be found in the I–CAR live "Overview of Cycle Time Improvement for The Collision Repair Process (CYC01)" training course.

*It is important to recognize quality issues and have them corrected before the vehicle is delivered to the customer.*

Everyone involved in the repair process is responsible for quality control. This includes:

- technicians. Proper training is an essential tool for repairing vehicles properly. It is also beneficial for the technician to be able to recognize quality issues from other departments of the repair facility. This may help catch mistakes earlier in the repair process and reduce compounding rework.
- managers. Managers need to know how to recognize quality issues and conduct regular inspections of each technician's work. The role of quality control inspector may be anyone qualified within the repair facility; however, it is the responsibility of the managers that all repairs meet quality standards.
- insurance appraisers / inspectors. Quality control inspections may be done after all of the repairs are completed on the vehicle or during the repair process. It is important to establish a working relationship with the

repair facility if inspections are done on-site. There should be a mutual understanding between the repair facility and the insurance appraiser / inspector.

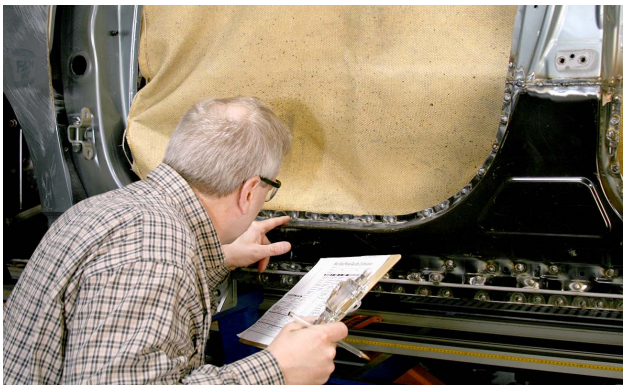
Regular inspections may help management determine if additional training is required or if a technician is consistently careless.

**2010 Ford Taurus**

*The level of quality repairs should be discussed with the customer before repairs are started on the vehicle.*

It is important to conduct quality control inspections to verify proper fit, function, and appearance of the repaired vehicle. The structural integrity of the vehicle must not be compromised. This includes ensuring OEM repair procedures were followed properly, proper welding techniques were used, and corrosion-resistant coatings were applied to ensure lasting repairs.

Communication with the customer should start before repairs are started to discuss the customer's expectation of the repair and what level of quality may be expected after the repairs are completed. It is also important to maintain communication, especially if the repair plan changes.



*Quality issues should be marked on the inspection checklist and followed up to make sure the issue was corrected.*

An effective quality control process:

- is done throughout the entire repair process. This does not necessarily mean stopping production at certain stages of the repair. It does mean routine checks should be done to monitor the quality of the work that is being done. This will require the ability to recognize certain stages of the repair and what can be thoroughly inspected at that time.
- requires regular monitoring. If it is unreasonable to conduct post-repair inspections at every stage of the repair process on every vehicle, commit to a specific number. For example, do seven inspections on seven vehicles per week.
- may include conducting post-repair inspections as a standard operating procedure (SOP).

- may include inspection checklists. Inspection checklists will help ensure nothing is missed.

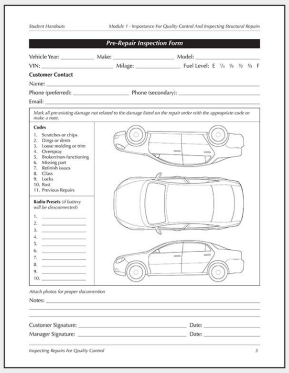
This training course provides many considerations for improving quality control throughout the collision repair process. Every repair facility is different and likely has, or will adopt, a quality control process that is right for each facility. For example, one collision repair facility may require every vehicle to be inspected by a manager or assigned quality control technician, while another facility may only conduct random inspections.


*A pre-repair inspection form may be used to record memory settings for the radio.*

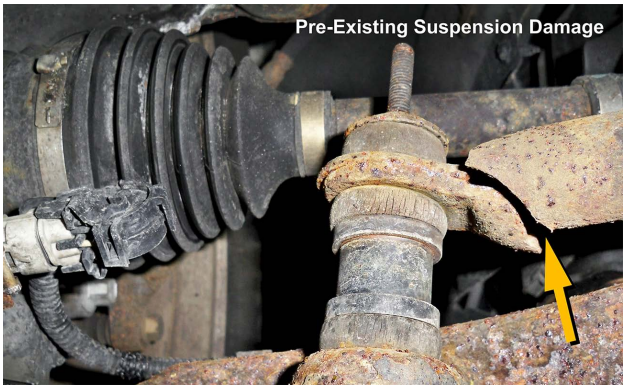
A pre-repair inspection may be done before starting repairs. A pre-repair inspection should:

- identify all unrelated damage, including any missing parts that were not related to the damage. This is also an opportunity to up-sell repairs to pre-existing damage or inoperative systems.
- identify previous repairs. Note all detectable previous repairs so there is no confusion on what repairs were made by the repair facility and what was done during a previous repair. It is especially important to note improper previous repairs and determine if and how these will be corrected.
- include recording memory settings for the radio, seats, etc. Also, identify vehicle mileage and fuel levels before and after repairs.
- be communicated with the customer to avoid any issues after all repairs are completed.

It is also important to address interior concerns and communicate them to the customer before repairs are started to avoid any confusion after all of the repairs are complete. This includes checking the interior for missing parts and fasteners, and verifying proper operation of systems and lamps.


Pre-Repair Inspection Form

Refer to "Activity: Pre-Repair Inspection Form" in the presentation for an explanation of how the illustration can be used to identify pre-existing damage.

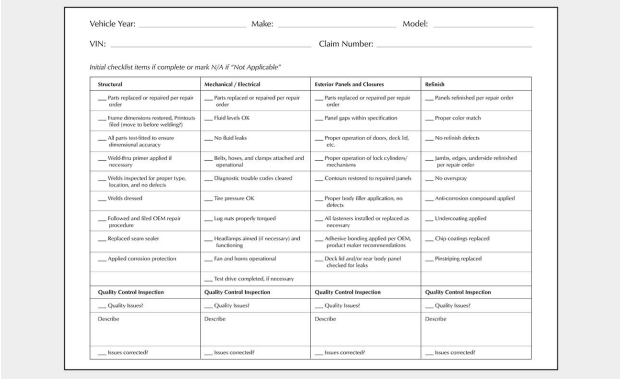



*Signs of rust on broken parts may indicate pre-existing safety-related damage.*

During the pre-delivery inspection, safety issues that are unrelated to the collision or pre-existing may be identified. This may include missing or damaged passive restraint system equipment or worn tires.

Be sure to document and communicate all safety concerns to the customer.

- may be designed to be filled out by the repair technician, then signed or initialed.
- may be designed to be filled out or reviewed by a designated quality control inspector.
- may be required to be reviewed before moving the vehicle to the next department. The next department can accept or reject the vehicle based on the results of the inspection checklist.
- should be monitored regularly to verify they are being used. The checklists should follow the vehicle through the repair process.
- are only as reliable as the people who use them. It is a good management practice to conduct random visual inspections to verify they are being used properly.



Vehicle Year: _____ Make: _____ Model: _____

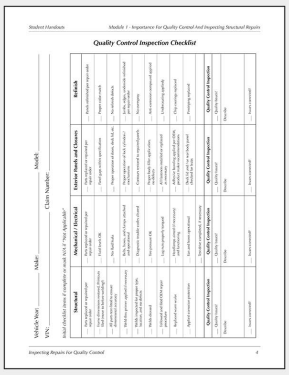
VIN: _____ Claim Number: _____

*Initial checklist items if complete or mark N/A if "Not Applicable"*

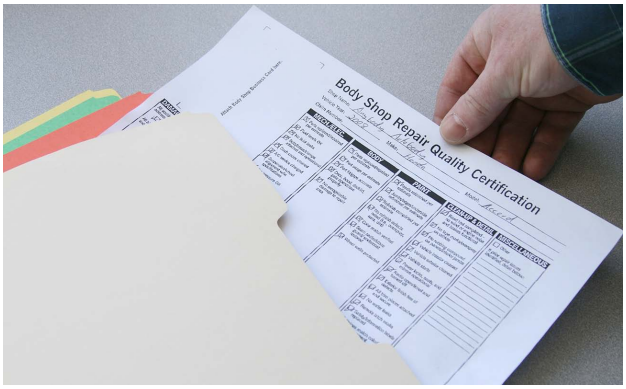
| Structural | Mechanical / Electrical | Exterior Panels and Closures | Refinish |
|---|---|---|---|
| ___ Parts replaced or repaired per repair order | ___ Parts replaced or repaired per repair order | ___ Parts replaced or repaired per repair order | ___ Panels refinished per repair order |
| ___ Frame dimensions restored, Printouts filed (measure before weldings!) | ___ Fluid levels OK | ___ Panel gaps within specification | ___ Proper color match |
| ___ All parts test-fitted to ensure dimensional accuracy | ___ No fluid leaks | ___ Proper operation of doors, deck lid, etc. | ___ No refinish defects |
| ___ Weld-thru primer applied if necessary | ___ Belts, hoses, and clamps attached and operational | ___ Proper operation of lock cylinders/ mechanisms | ___ Jambs, edges, underside refinished per repair order |
| ___ Welds inspected for proper type, location, and no defects | ___ Diagnostic trouble codes cleared | ___ Contours restored to repaired panels | ___ No overspray |
| ___ Welds dressed | ___ Tire pressure OK | ___ Proper body filler application, no defects | ___ Anti-corrosion compound applied |
| ___ Followed and filed OEM repair procedure | ___ Lug nuts properly torqued | ___ All fasteners installed or replaced as necessary | ___ Undercoating applied |
| ___ Replaced seam sealer | ___ Headlamps aimed (if necessary) and functioning | ___ Adhesive bonding applied per OEM, product maker recommendations | ___ Chip coatings replaced |
| ___ Applied corrosion protection | ___ Fan and horns operational | ___ Dock lid and/or rear body panel checked for leaks | ___ Pinstriping replaced |
| | ___ Test drive completed, if necessary | | |
| **Quality Control Inspection** | **Quality Control Inspection** | **Quality Control Inspection** | **Quality Control Inspection** |
| ___ Quality Issues? | ___ Quality Issues? | ___ Quality Issues? | ___ Quality Issues? |
| Describe | Describe | Describe | Describe |
| ___ Issues corrected? | ___ Issues corrected? | ___ Issues corrected? | ___ Issues corrected? |

*A quality control inspection checklist may be designed to be used by various departments in a repair facility.*

Inspection checklists may include a comprehensive list of all possible inspection items for a given stage of repair. Inspection checklists:



Refer to "Activity: Quality Control Inspection Checklist" in the presentation for a brief explanation how to use the Quality Control Inspection Checklist.




*Inspection checklists may be filed and reviewed to monitor technician performance.*

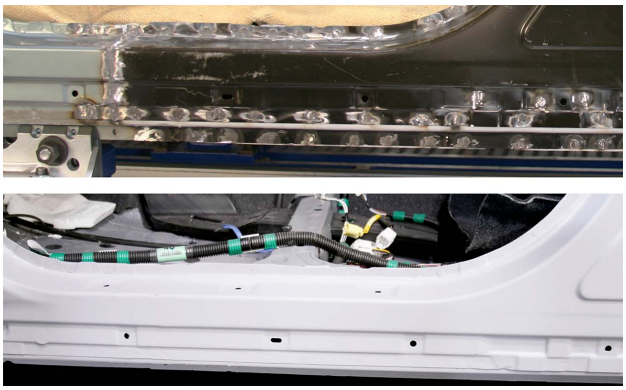
In order to maintain inspection data, it may be a good practice to log data from inspection checklists and look for patterns in technician performance.

The data should be periodically reviewed to identify strengths and weaknesses and to determine areas that may require more training and where technician skills are best used. This is an ongoing process that will result in continual improvement in quality and efficiency.

| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | **Jim** | **Bob** | **Sarah** | **Nate** |
| 4 | **Structural** | | | | |
| 5 | Parts replaced or repaired per repair order | | | | |
| 6 | Weld-through primer applied | | | | |
| 7 | Welds dress | | | | |
| 8 | Followed and filed OEM repair procedure | | | | |
| 9 | Replaced seam sealer | | | | |
| 10 | Applied corrosion protection | | | | |
| 11 | Frame dimensions restored, printouts filed | 1 | | | |
| 12 | All parts test-fitted to ensure dimensional accuracy | | | | |
| 13 | | | | | |
| 14 | **Mechanical/Electrical** | | | | |
| 15 | Parts replaced or repaired per repair order | | | | |
| 16 | Fluid levels OK | | | | |
| 17 | No fluid leaks | | | | 1 |
| 18 | Belts, hoses, and clamps attached and operational | | | | |
| 19 | Tire pressure OK | | | | |
| 20 | Lug nuts tightened | | | | |
| 21 | Headlights aimed and all lights work | | | | |
| 22 | Fan and horn work | | | | 1 |
| 23 | Test drive | | | | |
| 24 | | | | | |
| 25 | **Exterior Panels and Closures** | | | | |
| 26 | Parts replaced or repaired per repair order | | 1 | | |
| 27 | Panel gaps within specification | | | | |

Refer to "Activity: Monitoring Technician Performance" to see an Excel spreadsheet and how it can be used in conjunction with inspection checklists to monitor technician performance.

**2009 Toyota Venza**



*It may be a good practice to take photos of the repairs both before and after coatings are applied.*

Taking photos of the repair areas:

- may be done to provide documentation that the repairs were done properly.
- may be done before and after coatings are applied. A “before coatings” photo will show improper repairs were not covered up.
- may require some training for taking quality photos.
- may be done to allow the customer to “follow” the vehicle through the repair process. Some collision repair facilities will email photos to the customer on a daily basis. Some insurance companies such as Nationwide and Esurance use a third-party service called AutoWatch to provide the customer with updated photos of the vehicle repairs. One consideration would be to include this as an SOP for entry-level technicians to monitor their performance.

**Inspection Tools**

*Flashlights can be used to illuminate dark repair areas.*

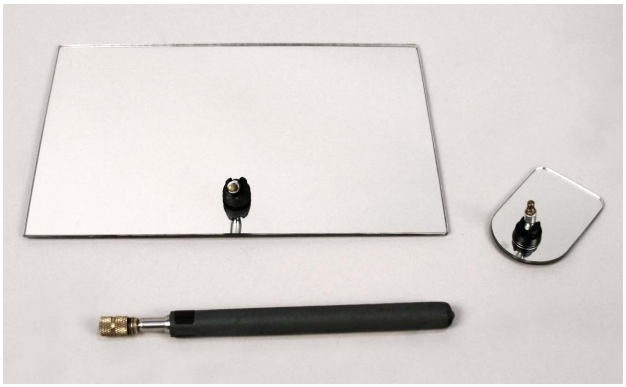
A bright flashlight is a valuable tool to have when conducting post-repair inspections. This is because eyes are normally adjusted to ambient light and need time to adjust to darker areas such as under the vehicle or behind panels. A bright flashlight will illuminate these dark areas and provide enough light to effectively see defects or other repair issues. The brighter the flashlight is, the better.

Also consider flashlights that can be maneuvered around corners to reach tight areas. Flashlights like these may be called snake lights.

Not only is a flashlight valuable to have during an inspection process, but also at each workstation. The more a technician uses a flashlight to inspect their work, the less chance for rework or comebacks.

A flashlight may also help to expose thin coatings. New light-emitting diode (LED) technology provides bright illumination and longer battery life in a smaller flashlight compared to incandescent bulbs that require larger batteries. Examples of LED flashlights that provide illumination of 100 lumens or more include the:

- Pelican 2360
- Snap-on 4.8 watt LED (ECF965B)
- Blue-Point 3 watt LED (Blue – ECFB200BL) (Silver – ECFB200S)



*Various sized mirrors will help with accessing different repair areas.*

Mirrors may be used during post-repair inspections to access areas that are difficult see such as panel backsides, underbody areas, and cracks and crevices. Inspection mirrors are available in kits that contain various sized mirrors and have adjustable pivot angles.

*Shining the flashlight into a mirror will reflect the light onto the repair area.*

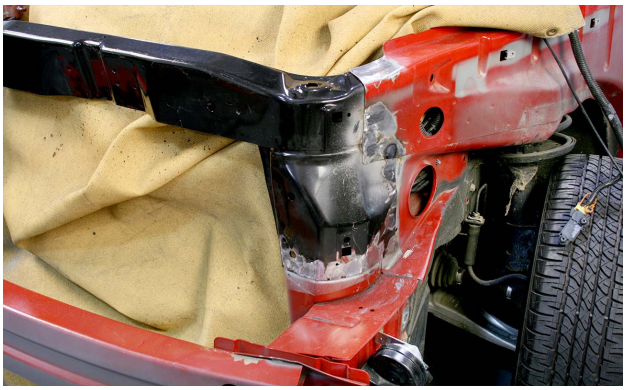
Flashlights and mirrors can be used together to inspect areas that are difficult to access and to provide adequate light. When using a flashlight and a mirror during a post-repair inspection:

- shine the flashlight onto the mirror to illuminate the inspection area.
- the light will reflect from the mirror onto the inspection area.

Some mirrors may be designed with built-in illumination. For example, Snap-on has a Lighted Inspection Mirror (UIM2LT) available.

## Inspecting Structural Repairs

### Chevrolet HHR



*Structural repairs such as welded joints are best inspected before coatings are applied.*

Structural repairs are made during the earliest stage of the repair process. It may be more difficult to identify defects after coatings are applied and adjacent parts are replaced / reinstalled. If not identified early in the repair process, defects may cause compounding rework. For example, coatings may have to be removed and replaced if a poor quality weld is not identified and corrected before the coatings are applied.

It is more difficult to identify structural repair issues after coatings are applied. The structural integrity of the vehicle may be compromised if poor quality repairs are not identified and corrected.

Refer to "Video: In-Process Inspections" in the presentation. This video introduces a damaged Toyota Venza, provides an overview of the repairs that will be made, and explains the importance for conducting in-process inspections.

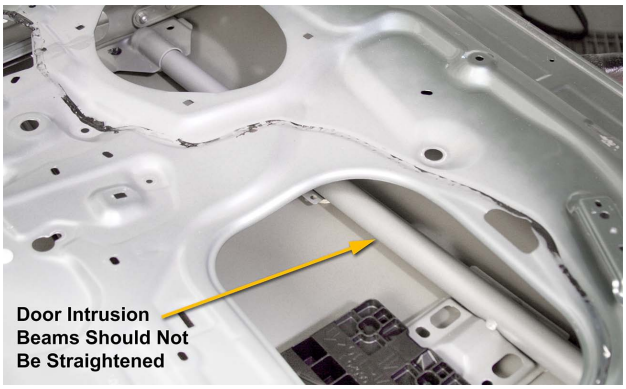

*Both the I-CAR and OEM1STOP websites provide links to various vehicle maker service information websites.*

Because of the wide use of high-strength steels, it is important to:

- identify the type of metal the damaged part is made from.
- verify the vehicle maker allows straightening of the part.
- determine if heat is allowed, if straightening is acceptable.
- refer to OEM service information. This information is typically provided by vehicle maker service information accessed from the Internet. Access is typically fee-based, but some vehicle makers provide the information for free. Examples of free service information websites include genuinegmparts.com for General Motors vehicles and moparrepairconnection.com for Chrysler vehicles. Links to all vehicle maker service information websites are available at oem1stop.com or i-car.com/RTS.

More information on high-strength steel and straightening considerations can be found in the I-CAR live “Structural Straightening Steel (SSS01)” training course.

**2009 Toyota Venza**




*Door intrusion beams should NOT be straightened.*

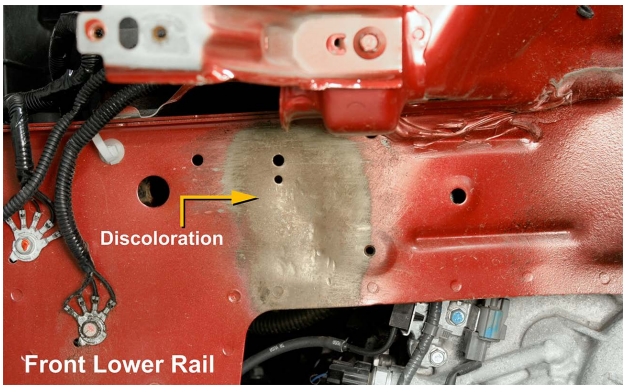
Even if the vehicle maker allows straightening of a structural part, kinked structural parts should not be straightened. Signs of a straightened kinked part include:

- deformation.
- cracks.

- shiny, silvery splinters in stressed areas.

Ultra-high-strength steel (UHSS) parts such as bumper reinforcements, door intrusion beams, and other reinforcements should not be straightened unless recommended by the vehicle maker.

**Honda Accord**




*Discoloration may be an indication that heat was applied to a part.*

Some parts may only be straightened cold. Signs of heating may:

- only be visible before coatings are applied.
- include blistered coatings.
- include a warped surface.
- include discoloration.
- include cracks.
- be hidden with body filler or extensive sandscratches. Further inspection may be required if it is suspected that heat was applied during straightening where the vehicle maker does not recommend.

**Audi A8**

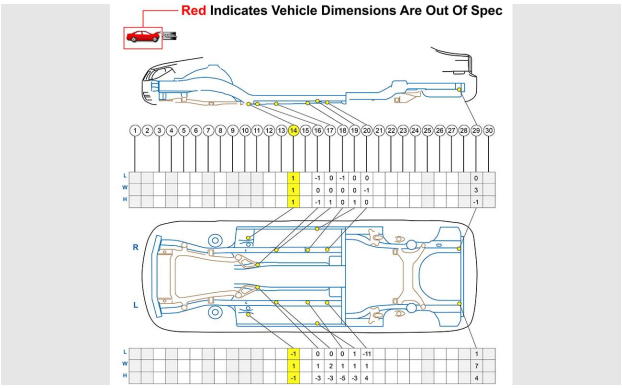

*Cast aluminum parts should never be straightened.*

When inspecting vehicles with aluminum parts, it is important to know that aluminum:

- has less memory than mild steel. Mild steel parts have memory, which allows it to return to its original shape. Aluminum parts do not have this characteristic and are not as easy to straighten.
- sheet metal parts may not always be straightened. Depending on the severity of damage, straightening an aluminum panel may not be an option.
- extrusion parts may have limited repairability based on the design and application. Some vehicle makers do not allow the repair of extrusions, while some may allow limited repair. Refer to the vehicle-specific service information to verify that an extruded aluminum part may be straightened. If allowed, inspect the straightened area for signs of deformation and cracks.

- casted parts should never be straightened. may crack when straightened.
- may not be able to be returned to its original shape when straightened. If signs of deformation cannot be corrected, the part must be replaced.

Consider this information when inspecting repairs to aluminum parts or aluminum-intensive vehicles. Inspect straightened aluminum parts for cracks or deformation. Straightening structural aluminum parts in unibody structures may also lead to collateral damage that lowers the strength of attached metal parts.




*The red-colored vehicle on the upper left portion of this measurement system printout shows that the dimensions on this vehicle are out of specification.*

Verify vehicle dimensions have been restored following straightening. To verify that vehicle dimensions have been restored:

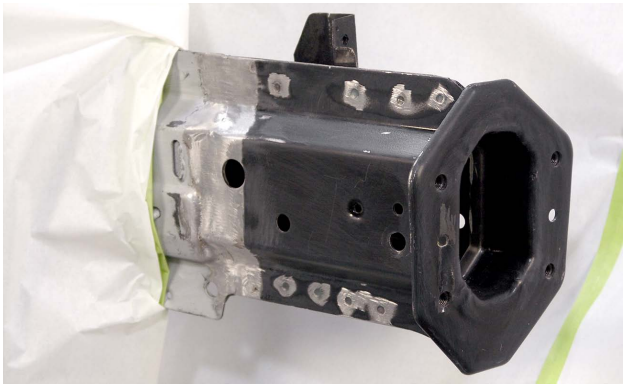
- verify measurement data is within specification. Measurement data from a measuring system will provide the most accurate results to show that vehicle dimensions have been properly restored.
- a quick check of wheelbase and ride height may be done to help determine proper vehicle dimensions.
- confirm with the technician that the exterior panels were test fitted.

- confirm the technician is using the equipment properly. Improper use of measuring equipment may lead to inaccurate measurements. Consider conducting periodic inspections during the measuring process to verify that correct measurement points are being referenced and that the tool end is positioned correctly on the vehicle.

Accurate analysis of measuring system dimension sheets requires an in-depth understanding of vehicle dimension tolerances. Inspecting dimension sheets to verify vehicle dimensions were properly restored should only be done by a qualified technician.

More information on how to read and understand vehicle measuring equipment data can be found in the I-CAR live “Measuring (MEA01)” training course.

**Chrysler 300**



*Before coatings are applied, verify welds are made with no defects and done according to vehicle maker recommendations.*

All welds should be inspected. Missing, incomplete, or defective welds may adversely affect the structural integrity of the vehicle or become a corrosive hot spot. Inspect welds:

- before coatings are applied.
- to verify all welds are replaced.
- to verify they are the same type, number, and location as indicated in the OEM procedure.
- meticulously. Every weld must be inspected to ensure the structural integrity of the vehicle is maintained. This includes inspecting both the front and backsides of the welds.

**Ford Mustang**

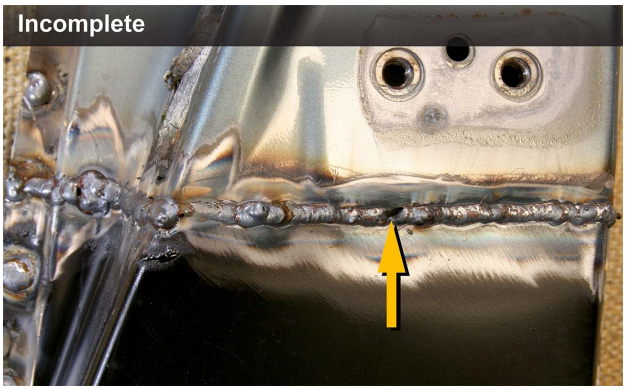

*The plug welds on this trunk floor should be inspected to verify they were properly made.*

When inspecting steel GMA (MIG) welds, verify:

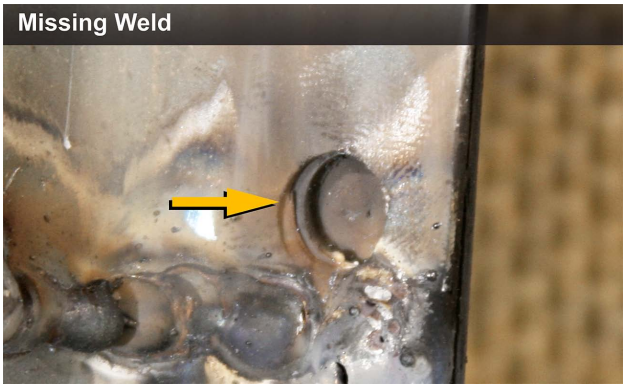
- proper location. Verify the weld is replaced where the original was located or where specified in the OEM repair procedure. Verify the procedure applies to the year, make, and model of the vehicle being inspected.
- proper weld nugget size. The vehicle maker may specify plug weld hole size in the service information.
- the weld bead or nugget is completely filled in.
- proper penetration. Check the backside of the welds whenever possible to ensure proper penetration.
- the weld bead is properly dressed. Not only does this apply to grinding the weld bead, but also cleaning the heat-affected area around the weld to ensure good adhesion of corrosion protection. The only exception would be if the OEM repair procedure specifies not dressing certain welds. For

example, the sectioning procedure for the front outer rail on a 2008 Mercedes-Benz CLK350 specifies NOT to grind the GMA (MIG) seam weld at the cut location.

Each weld should look similar to the factory weld after they are completely dressed.




*Incomplete welds are indications of a weak weld joint.*



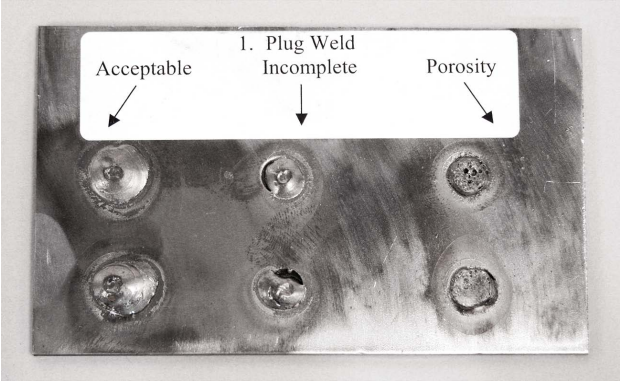

*Missing welds are indications of a weak weld joint.*


*Welds with porosity are indications of a weak weld joint.*

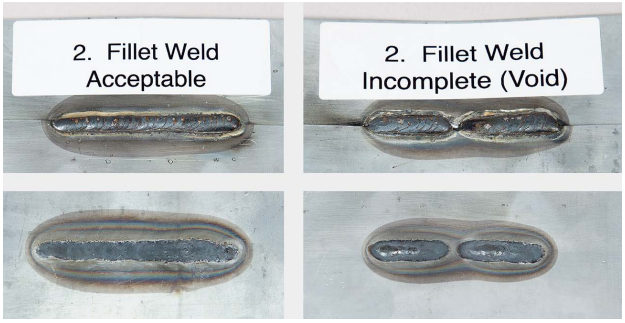
The concerns listed below are indications of weak GMA (MIG) weld joints and may adversely affect the structural integrity of the vehicle. Inspect welded areas for:

- missing welds. An open hole or seam may indicate a missing weld.
- an incomplete weld bead. Look for voids and gaps in each weld bead.
- porosity. Porosity will appear to have several holes or pores, caused by internal gassing. Not only does this weaken the weld, but may also become a corrosive hot spot.
- cracks.

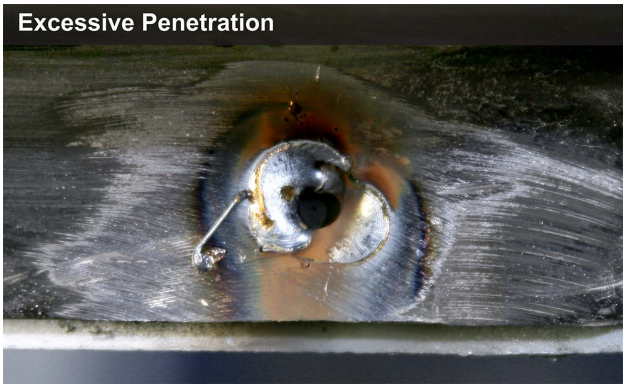
Dye penetrant may be applied to welds to help expose cracks, skips, or porosity.



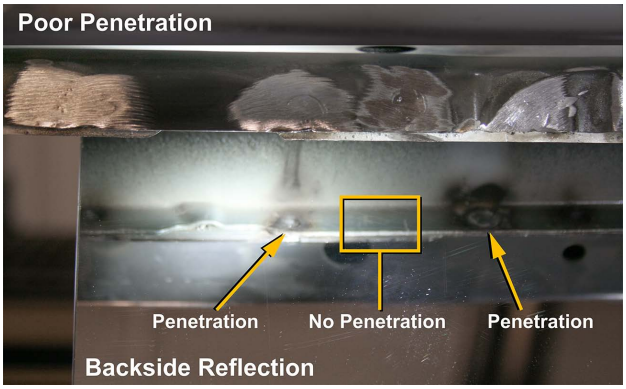

Refer to "Demonstration: Plug Weld Quality Issues" for examples of plug weld quality issues.



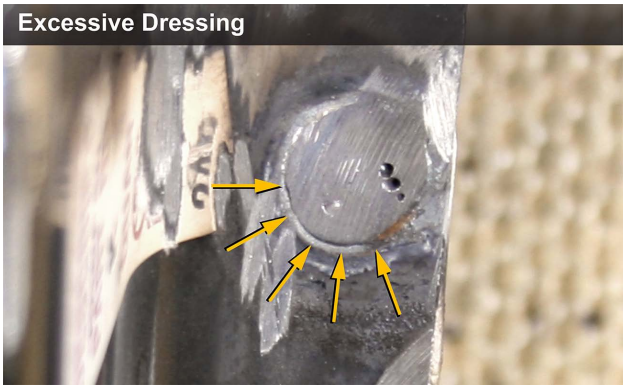

Refer to "Demonstration: Fillet Weld Quality Issues" for examples of fillet weld quality issues.




*Excessive penetration may also create weak weld joints.*




*Poor penetration may also create weak weld joints.*

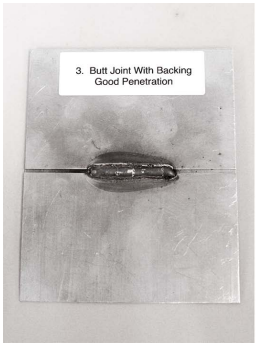



*Excessive dressing may also create weak weld joints.*

Other indications of a weak GMA (MIG) weld joint include:

- poor joint fit-up. For example, a narrow root gap on a butt joint with backing may result in insufficient weld penetration.
- excessive penetration. Excessive penetration is seen as a large bead or ripple on the backside, or if a hole is completely burned through the weld.
- poor penetration. This may be indicated by minimal or no sign of penetration on the backside of the weld.
- undercut. Undercut is when a groove is cut into the base metal on one or both sides of a weld.

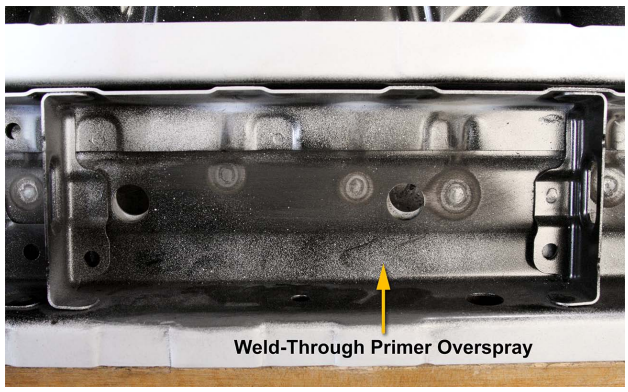
- excessive dressing. This is when the weld bead is ground below the edge of the metal.





Refer to "Demonstration: Butt Joint With Backing" to see two examples of a butt joint with backing.

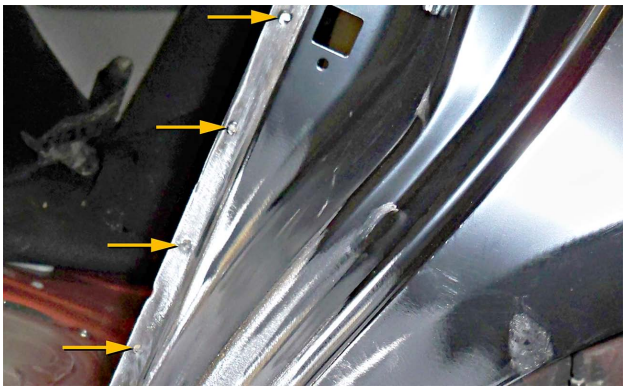
**2009 Toyota Venza**




*Weld-through primer can be seen on the mating flanges of this rocker panel reinforcement.*

Many vehicle makers require weld-through primer be applied to the mating surfaces before welding. If required, verify weld-through primer was applied to the mating surfaces by:

- including the use of weld-through primer as an SOP. This can be added to the quality control inspection checklist and checked off by the technician.
- inspecting the mating flanges before the parts are installed.
- looking for signs of overspray. Weld-through primer overspray may be seen along the edge of a pinchweld flange.



*Replacement spot welds look identical to the ones installed at the factory.*

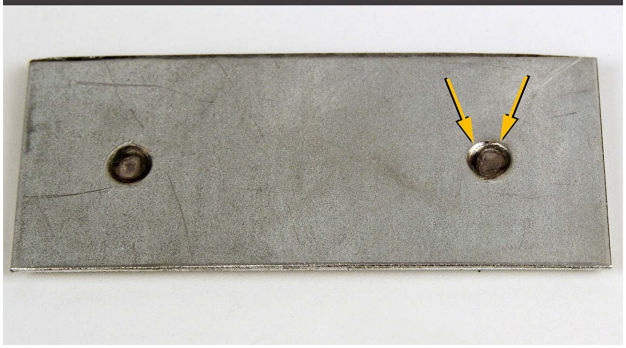
When inspecting spot welds:

- verify they are located adjacent to the original welds. The replacement welds should be located next to, but not on top of, the original welds. There are exceptions to that rule in instructions by some vehicle makers, such as BMW, Mercedes-Benz, and Porsche. The exception is with weld-bonded joints. This is because there is an electrical path already established at those points, and it is difficult to establish an electrical connection through the cured adhesive anywhere else on the joint.

- verify the weld nugget is completely round. It should not be oblong.
- verify only a slight indent of the weld nugget.
- check both sides of the panel flange for drilled holes. There should be no drilled holes on either of the parts when spot welding is used to join panels. Drilled holes might be made by accidentally drilling through both panels during part removal or making plug weld holes by mistake.

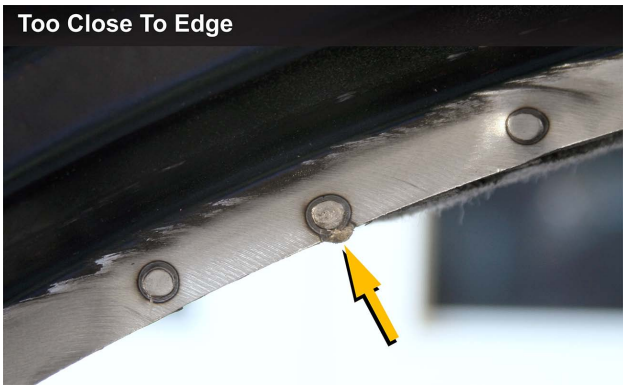
**Oblong Shape**

**Excessive Indentation**



**Excessive Metal Throwout**

**Too Close To Edge**



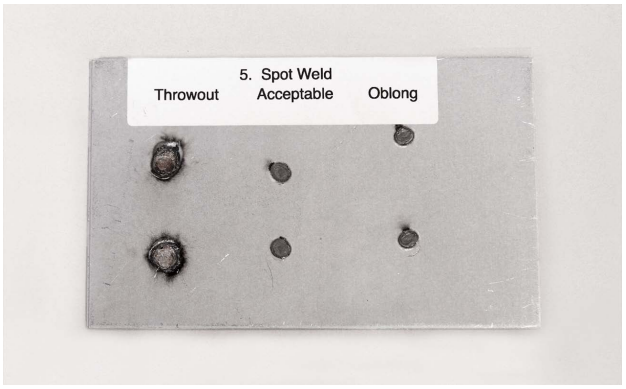
**Pinholes**

**Blowout**

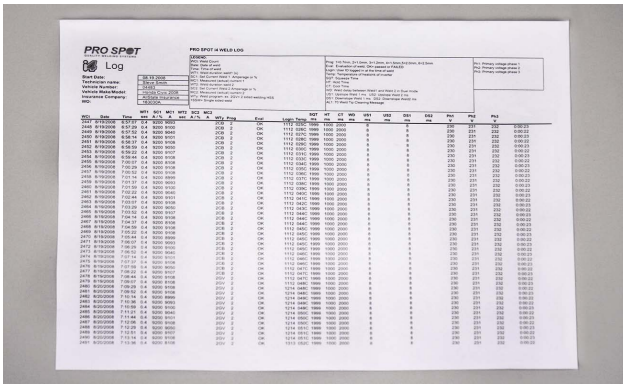
The concerns listed below are indications of weak spot weld joints. Inspect spot welds for:

- improper placement, for example being located too close to the flange edge.
- excessive metal throwout. Excessive metal throwout is when some of the weld nugget is spattered around the weld.
- pinholes or cracks.
- excessive indentation. The spot weld should be only slightly concaved. Excessive indentation may be on one or both sides of the weld.
- blowout. This is when a hole is blown completely through both panels and is fairly easy to recognize.
- an oblong shape. The spot weld should be completely round in shape.

Weak weld joints must be corrected by a properly trained technician. More information on spot welding can be found in the I-CAR live “Squeeze-Type Resistance Spot Welding (WCS04)” training course.




Refer to "Demonstration: Spot Weld Quality Issues" to see examples of spot weld quality issues.

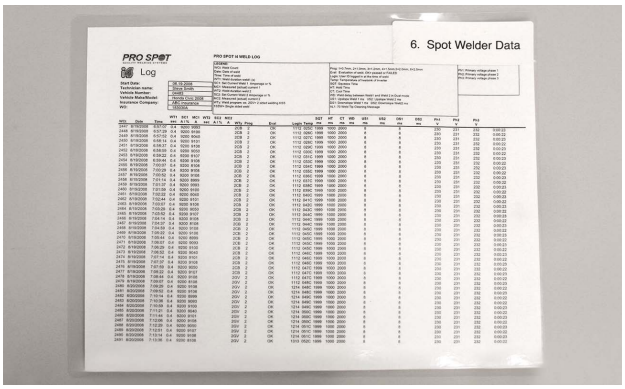



*This data sheet shows that all spot welds were completed properly.*

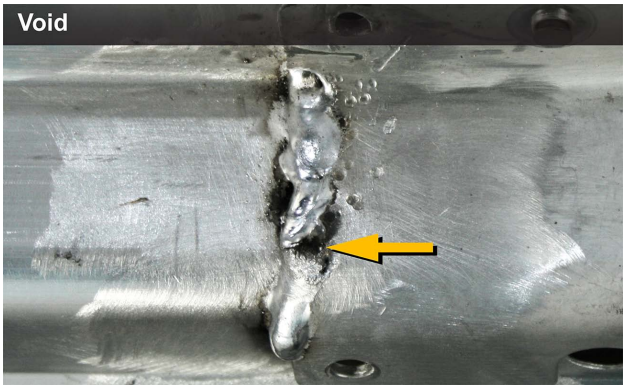
Some spot welding equipment is capable of recording and storing data. Data may include the technician, vehicle, weld pass / fail, temperature, squeeze time, hold time, cool time, and other information. Spot welder data may be:

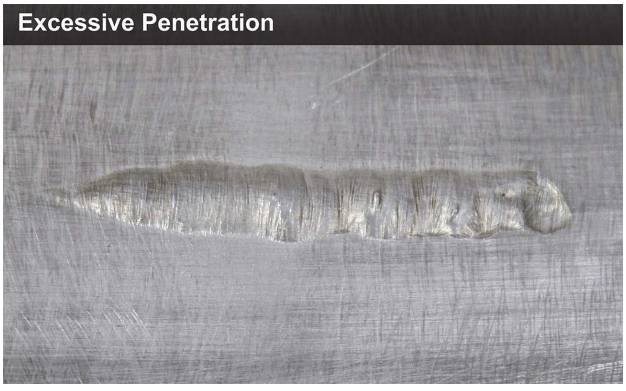
- referenced to verify welds were completed at the proper settings.
- saved on a memory card, which can be transferred to a computer.
- printed for documentation.
- logged into the technician’s file to monitor performance.

Some spot welding equipment does not allow bad welds to be made.




Refer to "Demonstration: Spot Welder Data" for an example of a spot weld data printout.





Similar to steel GMA (MIG) welds, aluminum GMA (MIG) welds must be inspected to ensure the structural integrity of the vehicle. The concerns listed below are indications of weak aluminum GMA (MIG) weld joints. Inspect aluminum welds for:

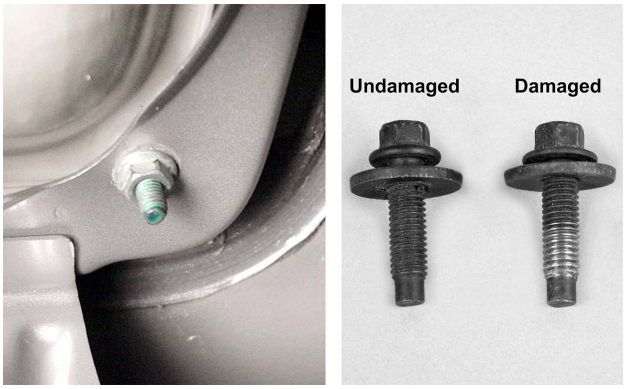
- lack of penetration. This is when there is no ripple on the backside of the weld joint and the weld bead sits on top of the workpiece. This is common at the start of an aluminum weld bead.
- an incomplete weld bead. Look for voids and gaps in each weld bead.
- crater or undercut. A crater is seen as a sunken area in the weld. Craters are commonly located at the end of a weld. Undercut will look as if the entire weld bead is lower than the edge of the workpiece.
- excessive penetration.
- suck-back. Suck-back is when the weld bead shrinks back during cooling to form a crater on the backside of the weld, when welded in the overhead position.
- cracks.

- porosity. Porosity will appear to have several holes or pores, caused by internal gassing. Porosity in aluminum welds may not be evident on the outside surface of the weld.

Dye penetrant may be applied to the aluminum welds to help expose cracks, skips, or porosity.


Refer to "Demonstration: Acceptable Weld" for an example of an acceptable aluminum GMA (MIG) weld.

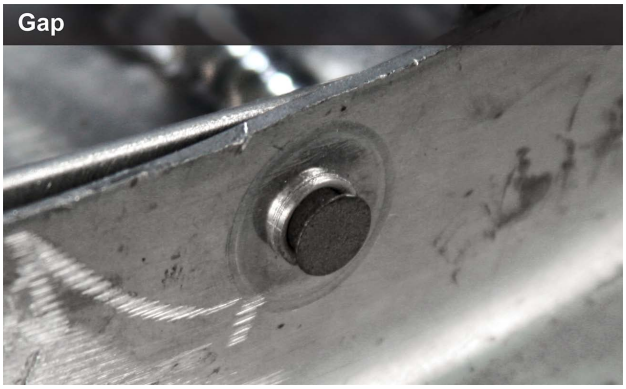

Refer to "Demonstration: Excessive Heat and Cold" for examples of unacceptable GMA (MIG) welds.



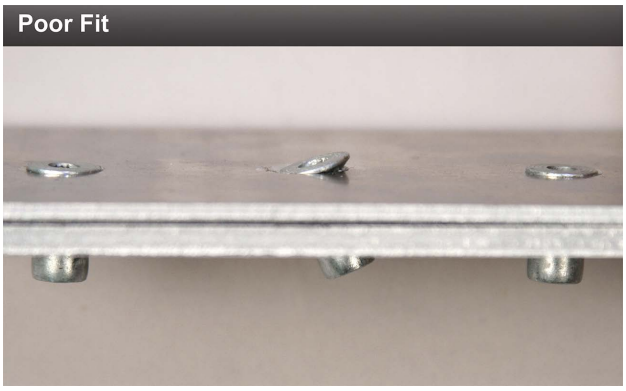

*Some fasteners have a noticeable coating applied.*

Coated fasteners may be used to attach aluminum body panels. Verify all one-time-use fasteners are replaced:

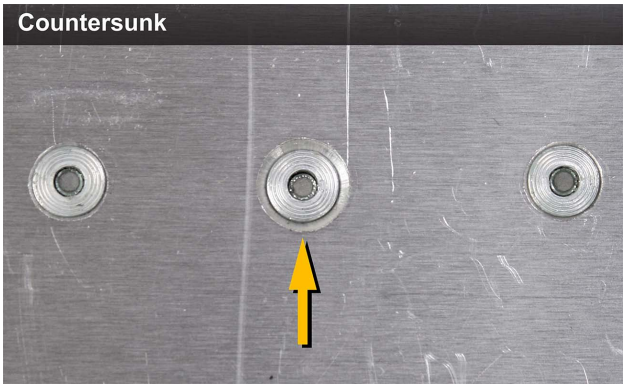
- because they may have a special coating on the head and / or threads, which prevents contact between the steel fastener and the aluminum part. This coating reduces the chance of galvanic corrosion developing.
- by inspecting the fasteners for a damaged coating. Any fastener with a damaged coating should be replaced.
- by referring to the service information to determine fasteners that are specified as one-time use.
- by including proper fastener replacement as an SOP. Replacement of one-time-use fasteners may be checked off by the technician on the quality control inspection checklist.




*Check both sides of riveted panels for indications that they were not properly installed.*



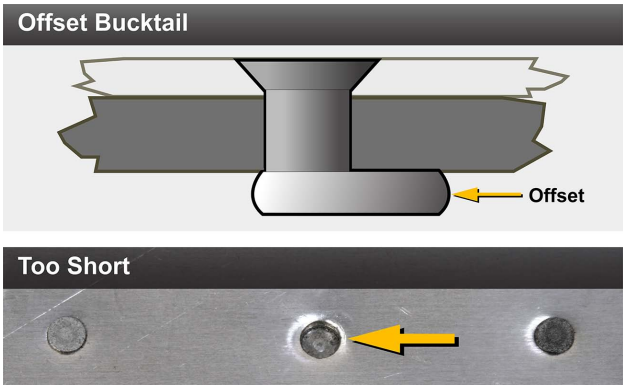

*Check both sides of riveted panels for indications that they were not properly installed.*




*Check both sides of riveted panels for indications that they were not properly installed.*

Rivets are commonly used to attach aluminum body panels. When inspecting body panels that are attached with rivets, check:

- both sides of the panel for open holes. There should be no open holes on either side of the panel.
- for oversized holes. A countersunk rivet may be caused by an oversized hole.
- for gaps between the rivet head and the panel. Gaps may also be present if the rivet is not properly fitted in the hole.

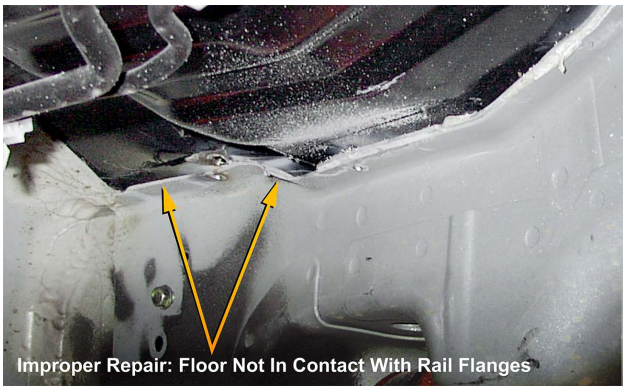



*A rivet that is too short may excessively sink into the panel.*

When inspecting body panels that are attached with rivets, also check:

- for cracked rivets.
- for an offset bucktail. This is when the bucktail of a solid rivet is not centered properly.
- for the use of improperly sized rivets, such as rivets that are too short or too long.

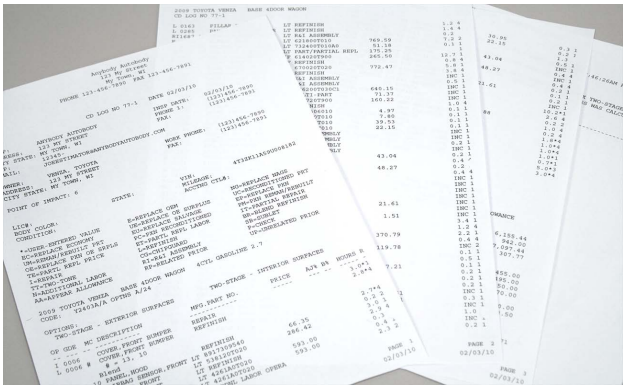
**Honda Civic Hybrid**




*Inspect parts closely to make sure all attachment points are done using acceptable repair methods.*

Improperly fitting parts may be an indication the vehicle dimensions have not been properly restored. When inspecting structural repairs, check the attachment points for gaps or signs that a part was modified to make it appear as though it is properly fit.

It is typically unacceptable to use a weld bead to achieve proper panel alignment; however, there are some exceptions when repairing extensively handbuilt aluminum vehicles. For example, the 2004 Ferrari 360 Spyder requires a built-up weld bead for proper fit-up of a replacement quarter panel.



*When conducting post-repair inspections, verify there are no inconsistencies between the line items on the repair order and the repairs made on the vehicle.*

The repair plan may change course during the repair process. When conducting in-process inspections, it is important to verify the repairs being done match what is written on the repair order. When conducting visual inspections, refer to the repair order:

- to ensure the repair or replacement procedures have been properly identified.
- to ensure the replacement parts have been properly identified.
- and identify any inconsistencies immediately.

The technician should be noting any changes made during the repair process and communicating this with management as soon as reasonably possible. Inaccuracies in the repair order can affect the reputation of the collision repair facility.

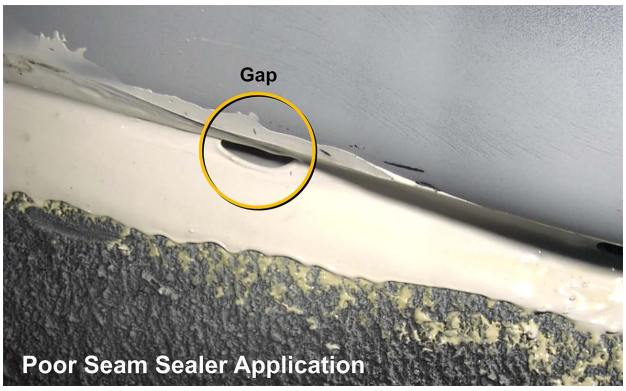
Refer to "Video: Inspecting Structural Repairs" in the presentation. This video discusses inspection of the structural repairs, including weld quality and verifying OEM procedures were followed. The video also demonstrates how to use inspection tools to access hard-to-see areas.

**Ford Mustang**

*Seam sealer should be applied smoothly and completely along the entire seam.*

Proper seam sealer application is important to ensure corrosion protection, reduce noise, vibration, and harshness (NVH), and to prevent toxic gases from entering the passenger compartment. It is also important to ensure uniform appearance to reduce the amount of identifiable repairs. When inspecting seam sealers verify:

- they are replaced where applicable.
- the appearance resembles the factory application. The seam sealer bead width, height, and texture should match the original factory application. Do this by comparing to the undamaged side of the vehicle or to the original assembly or part. Duplicating the visual appearance of the seam sealer may not be as important if the area will be covered by adjacent parts or cladding, as long as the correct materials were used and applied properly.
- the appearance is consistent along the entire length of the bead.

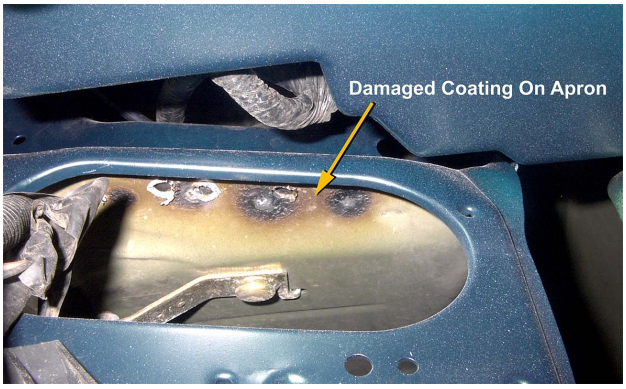



*Make note of any gaps when inspecting seam sealer.*

Issues concerning seam sealer application include:

- missing seam sealer. All seam sealer should be replaced where it was originally applied.
- gaps in the seam sealer bead.
- cracked seam sealer.

**Ford Ranger**




*The coatings on the backside of this apron are damaged and must be replaced.*

Inspect panel backsides:

- for damaged coatings caused by straightening or welding.
- including enclosed areas such as rails or rocker panels. Panel backsides on these parts have limited visual access. A special inspection tool, such as a borescope, can be used to inspect enclosed areas.


*A small camera is attached to the end of the borescope wand.*

A borescope is a small camera inspection device that:

- can be inserted into small crevices or holes.
- is able to show images from around corners and inside interior areas.
- may be equipped with a light to illuminate interior areas.
- displays images through an eye lens or video screen.

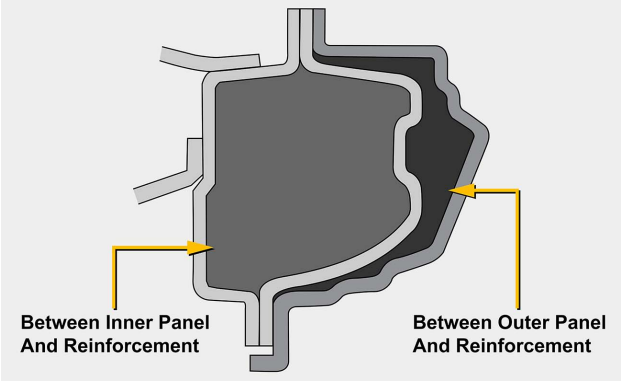
Borescopes are available with various features and in different price ranges.


*A borescope is able to display the backside of this seam weld in an enclosed area of the B-pillar.*

A borescope is useful for inspecting:

- panel backsides of door skins, fenders, and quarter panels.
- enclosed parts such as pillars, rocker panels, and rails.
- for proper placement of corrosion-resistant coatings. Inspecting enclosed areas for application of anti-corrosion compounds is typically done after the refinish process. This is because anti-corrosion compounds are typically

applied after refinishing to prevent contamination of the refinish.
- for proper replacement of foam. More information on foams can be found in the I-CAR live "Automotive Foams (FOM01)" training course.
- the backsides of welds and sectioning joints.




*This illustration shows two different cavities in the rocker panel assembly.*

Inspecting enclosed areas may require inspecting multiple layers of a part or assembly. For example, it may be necessary to locate an access hole from inside the vehicle to inspect between the inner rocker panel and rocker panel reinforcement. To inspect between the outer rocker panel and rocker panel reinforcement, an access hole would need to be accessed from the outer panel.

Refer to "Video: Using A Borescope" to watch a video on how to use a borescope to inspect the backsides of welds in enclosed areas.

**Module Wrap-Up**

Topics discussed in this module included:

- explaining the importance for conducting post-repair inspections for quality control.
- identifying various opportunities during the repair process where inspections may be conducted.
- identifying repairs that should be inspected before coatings are applied.
- identifying incomplete or poor quality repairs.
- describing how to use various inspection tools to access hard-to-see repair areas.

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# *Module 2 - Inspecting Exterior Panels And Refinish*

I-CAR®

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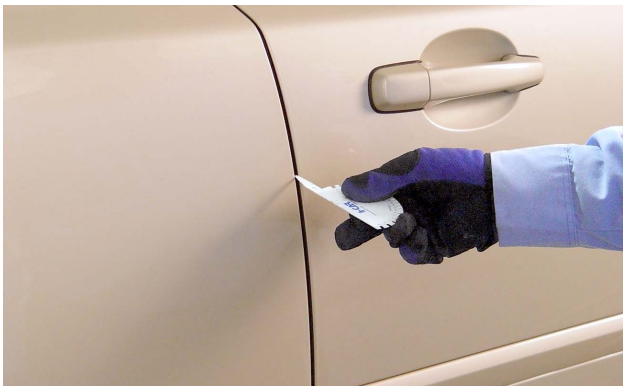
## Inspecting Exterior Panels

Learning objectives for this module include:

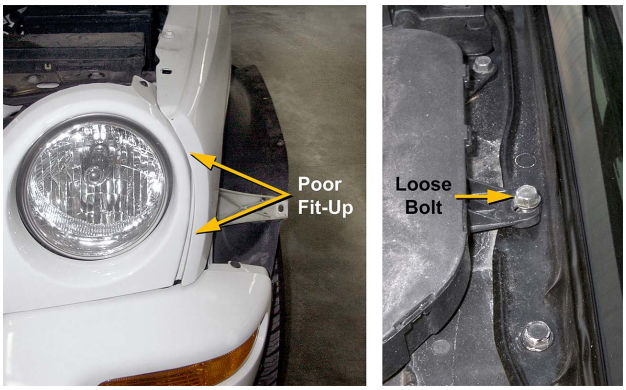
- identifying repair or replacement quality issues related to exterior panels.
- describing how to verify quality sublet work.
- identifying refinish defects.
- explaining how to verify corrosion protection has been properly applied.



*A gap gauge is being used to verify this door gap is consistent.*

When inspecting exterior panels:

- verify proper fit of any panels that were replaced, or removed and reinstalled.
- verify the correct attachment methods were used. Similar to inspecting structural repairs, this includes inspecting for proper placement and quality of the welds. Refer to the OEM service procedure to determine the proper attachment methods and placement.
- straightening repairs should be inspected to verify the original shape and contours of panels have been restored. It is also important to verify that contours align to adjacent parts.




*Fenders should be inspected for proper fit-up and that all the bolts are properly tightened.*

When inspecting exterior panels, look for:

- inconsistent gaps between adjacent panels. This may be seen as an uneven gap along the length of the gap or a substantially smaller or larger gap compared to the original part on the other side of the vehicle.
- bulges in the panel. Bulges may be due to unknowingly causing foam to expand when heating during straightening repairs.
- missing or loose fasteners.

More information on proper panel alignment can be found in the I-CAR live

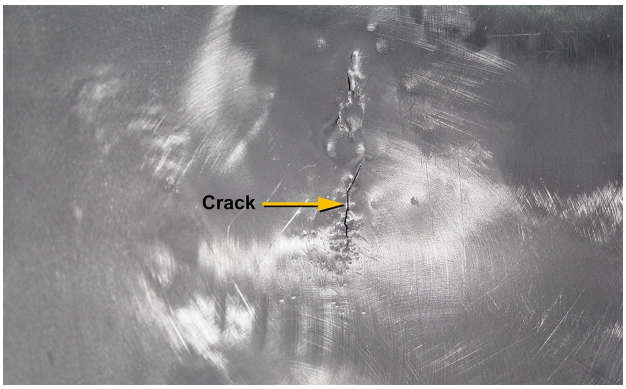
"Bolted-On Part Replacement (EXT01)" training course.


*The distorted mating flanges of this quarter panel and wheelhouse may lead to corrosion.*

Other quality issues related to exterior panel repairs include:

- signs of part modification such as using shims where not recommended to force the part to fit correctly. Shims are not typically recommended for proper fit-up of welded panels. A part that does not fit correctly may be an indication the vehicle dimensions were not properly restored.
- distorted flanges. Inspect mating flanges to verify the mating flanges are properly straightened. There should be minimal to no distortion of the flange areas to ensure proper corrosion protection and reduce the visibility of the repair.
- water or noise leaks. The technician should inspect replaced or reinstalled closure panels for leaks and mark the inspection as complete on the quality control inspection checklist. A road test may be done to inspect for noise, vibration, and harshness.

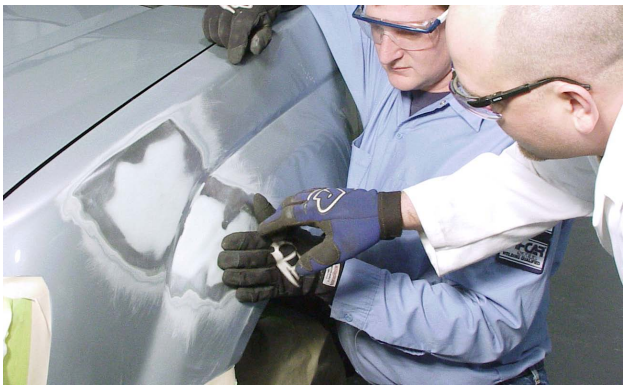
More information on testing for wind noise and water leaks can be found in the I-CAR live "Wind Noise and Water Leaks (WNW01)" training course.




*The crack in this aluminum exterior body panel was caused by straightening a dent.*

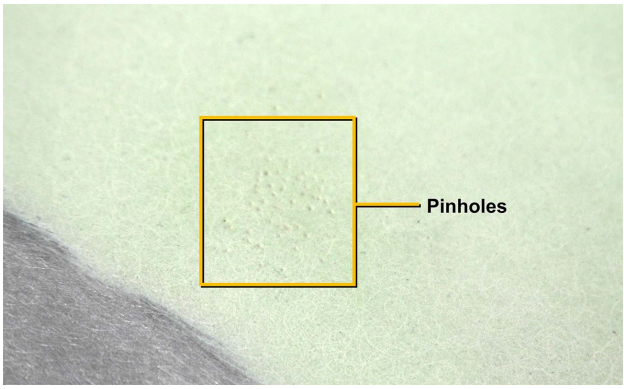
When inspecting straightened exterior panels:

- verify the majority of the damage is removed. The less body filler that is required, the less chance for potential problems down the road such as the body filler falling off or cracking.
- verify the contours are restored properly. This can be done by a comparison to the undamaged side of the vehicle.
- inspect for oil canning. Oil canning is when stretched metal moves with little applied pressure.
- look for cracks or holes in the metal. Cracks are more likely in highly formed areas or on sensitive metal such as aluminum or UHSS that has been straightened.
- verify the surface is properly prepared for body filler.



When inspecting application of body filler on exterior panels, verify the:

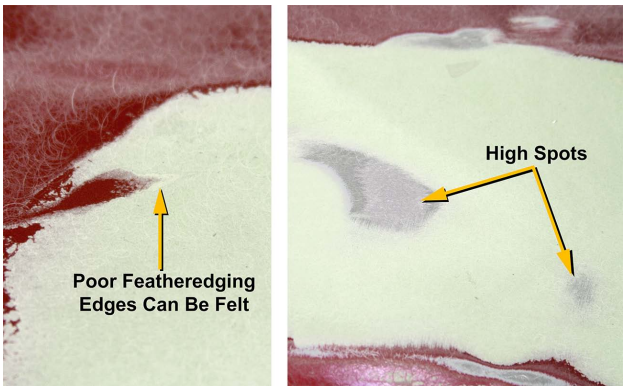
- thickness of the body filler application does not exceed the maximum thickness specified by the product maker. Body filler should only be used for minor surface imperfections. It should not be used in place of straightening.
- surface is smooth. Verify the surface of the body filler is sanded to the proper grit following the paint maker's recommendations, and is properly featheredged.
- repair area matches the panel contours. This may be done with both a visual inspection and by touch. When inspecting by touch, used a gloved hand or clean cloth. The hand should be kept flat and moved across the area in several directions.




*Inspect body filler applications for pinholes.*

When inspecting application of body filler, look for defects such as:

- peeling.
- pinholes.
- sandscratch swelling.
- cracks.



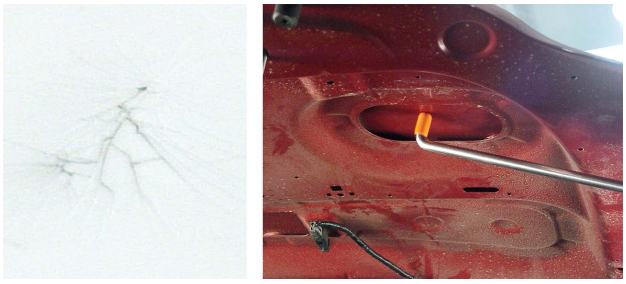

*Poor featheredging of body filler must be corrected before the vehicle is refinished. Exposed metal is an indication of a high spot.*

Other indications of improper application or finishing of body filler include:

- high or low spots. Inspect for high or low spots with a gloved hand or

a straightedge. Exposed metal is an indication of a high spot.
- poor featheredging. Poor featheredging may be identified with a visual inspection or felt by a gloved hand. The hand should be kept flat and moved across the area in several directions. The area should feel completely smooth. An unintended edge or lump may indicate a poor repair that will require correcting.

More information on proper body filler application can be found in the I-CAR live "Cosmetic Straightening Steel (STS01)" training course.

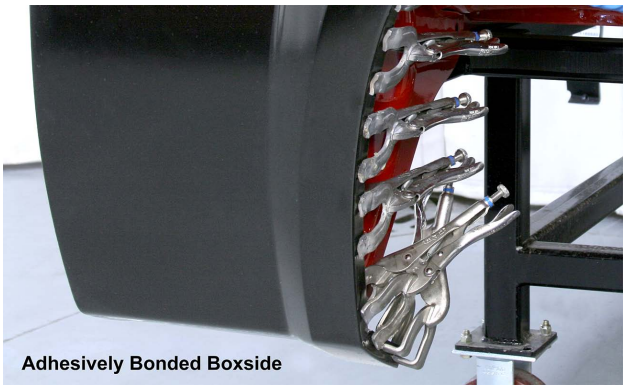


*Inspect paintless dent repairs for small cracks in the finish. This paintless dent repair tool has a plastic tip to prevent damaging the backside of the panel.*

Signs of poor quality paintless dent repair (PDR) include:

- tool damage to the backside of panels or adjacent panels. Scratches or nicks to corrosionresistant coatings must be replaced.
- drilled holes to access repair areas. Access holes should not be made for PDR. Indications that a hole was not part of the original design include burrs and/or missing finish around a hole.
- cracked finish. A lighted magnifier may be used to inspect the finish for cracks. A lighted magnifier will allow you to see how deep a crack is and determine what may be required to correct the problem.

**2007 GMC Sierra**



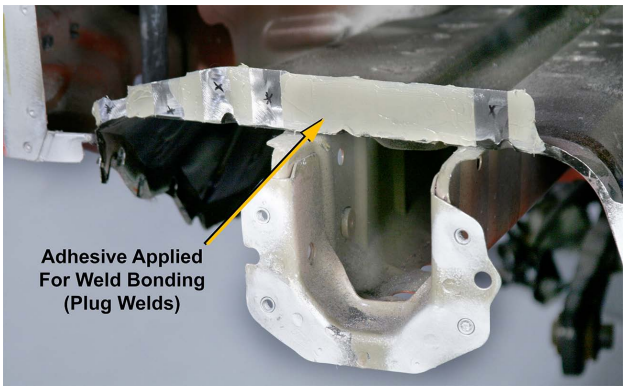

*Clamps are used to hold this adhesively bonded boxside in place while the adhesive cures.*

When inspecting panels that were adhesively bonded, check for:

- documented procedures and materials. These may be referenced to determine that adhesive bonding is allowed and the proper materials were used. Verify adhesive is only applied in areas specified by the vehicle maker.
- proper fit-up. Check the mating flanges of adhesively bonded panels to make sure all mating surfaces are properly aligned according to the OEM procedure and adhesive maker instructions.

- excess material oozing out of the flange edges.
- signs of failure such as peeling.

More information on proper panel bonding methods can be found in the I-CAR live "Adhesive Bonding (ADH01)" training course.




*Masking tape was used to prevent adhesive from being applied where GMA (MIG) plug welds will be made.*

When inspecting panels that were adhesively bonded, also look along the entire flange to verify complete coverage. This is because the adhesive may also be designed to protect the metal from corrosion.

Adhesive is sometimes used with other attachment methods such as welds or rivets. In these situations, ensure the flanges are properly prepared according to the OEM procedure. For example, Ford recommends applying 25 mm (1") pieces of tape to the plug weld locations to prevent adhesive from being applied too close to the weld zone when adhesive is used in combination with GMA (MIG) plug welds.

**Before Refinish**

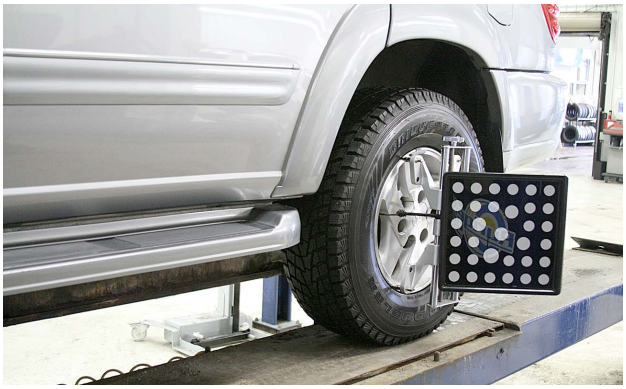
*Common sublet work includes stationary glass installation and wheel alignments.*

It is the responsibility of the collision repair facility to ensure sublet work was completed properly. For this reason, it is important to verify sublet repairs were done properly before the vehicle leaves the collision repair facility.

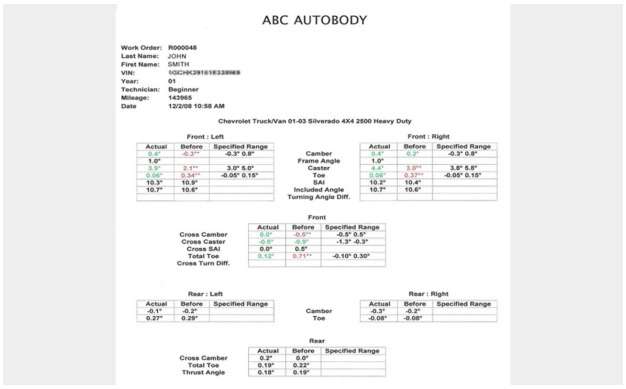
Billing, documented procedures, and specification sheets may help when determining whether or not repairs were done properly. Training may be required to know how to read and understand equipment specification sheets.

Inspection sheets should be kept on file for each vehicle.

Examples of common sublet repairs include, but are not limited to glass installation, refinishing, and wheel alignments.



*Wheel alignments require special equipment.*




*Wheel alignment printouts for collision-damaged vehicles should include all alignment angles.*

It is important to know how to determine if the wheel alignment has been properly restored. Whether done in-house, sublet, or by the service department, proper wheel alignment must be verified. This may be done:

- by reviewing the before and after specifications on the wheel alignment system printout.
- by referencing the wheel alignment specifications provided by the vehicle maker.
- with a visual inspection. Some manual measurement inspections that can be done to identify wheel alignment problems include wheelbase, ride height, and wheel tracking quick checks.
- with a test drive to ensure there are no handling or driveability issues. This includes making sure the vehicle drives straight and does not pull to either side. Also verify there are no suspicious vibrations and there are no differences in torque steer when braking or accelerating.

The wheel alignment specifications printout should include:

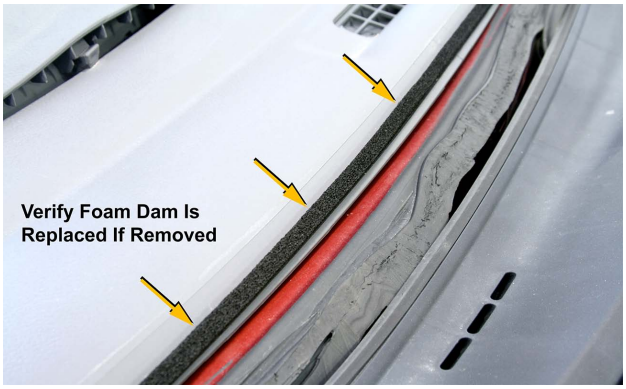
- the year, make, and model of the vehicle. It may also be necessary to include the option package. For example, whether or not a vehicle is equipped with air suspension.
- the vehicle identification number (VIN).
- the mileage.
- the date and time the alignments were recorded/adjusted.
- both before and after specifications.
- all alignment angles. There should be no blank cells. This is especially important with collision damaged vehicles.

Tire pressure, and whether the vehicle was loaded or unloaded, may be included on the wheel alignment printout.

Accurate analysis of wheel alignment specification sheets requires understanding complex alignment angles. Inspecting wheel alignment

specification sheets to verify the vehicle is properly aligned should only be done be a qualified technician.

More information on wheel alignment angles can be found in the I-CAR live "Steering and Suspension Damage Analysis (DAM06)" and "Wheel Alignment and Diagnostic Angles (STE04)" training courses.



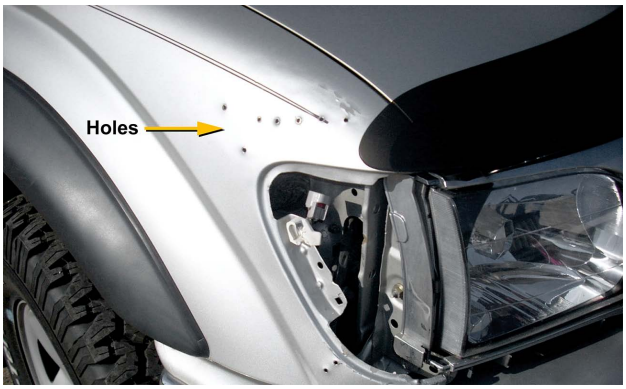

*A foam dam is located on the edge of this dash panel, near the trimmed windshield urethane adhesive.*

Stationary glass is another repair that may be sublet. Inspections specific to stationary glass include checking for:

- uneven or inconsistent fit. Check replaced or reinstalled stationary glass for proper height and inconsistent gaps along the edges of the glass. Inconsistent gaps may indicate the vehicle dimensions have not been properly restored.
- documentation of the procedure, materials, and cure time. Be sure documentation is obtained if the glass installation was sublet.
- excess urethane. Inspect for excessive urethane from both outside and inside the vehicle.

Verify that foam dams were replaced if originally installed. An example of a vehicle that uses a foam dam is the 2008 Toyota Corolla.

More information on proper stationary glass installation can be found in the I-CAR live "Stationary Glass (GLA02)" training course.




*The holes in this fender were caused by straightening the panel.*

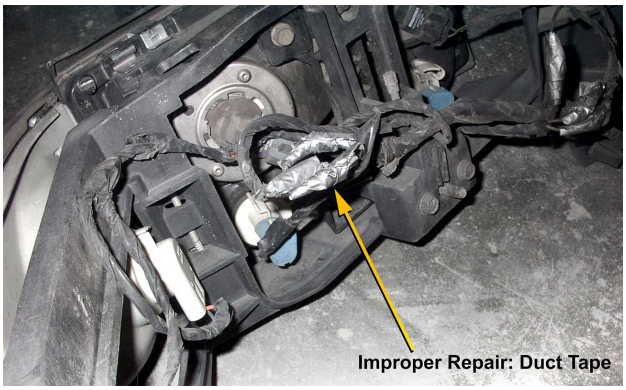
During a pre-delivery inspection, it is also important to check for incomplete work before the refinish process is started. Examples of incomplete work include:

- weld-on studs not removed or the holes not repaired after straightening.
- related damage not repaired.
- parts not replaced.
- missing body filler.
- missing welds.

*Clamp marks from vehicle straightening equipment can be seen on this pinchweld flange.*

Inspect vehicles for damage caused by repairs. Examples include:

- clamp marks on the pinchweld flange.
- burn holes caused by welding or grinding sparks.
- tears or rips.
- scratches.
- stains.
- heat damage to plastics or adhesives.




*Duct tape should not be used in place of wiring harness casing.*

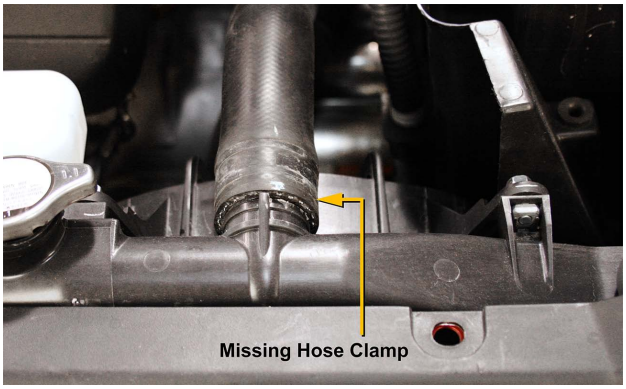
Wiring located near repair areas should be inspected to verify:

- proper placement.
- quality splice methods were used on repaired wires. Heat-shrink tubes are typically recommended for splicing wires. Twisted wire ends wrapped with electrical tape is not an acceptable wiring repair method.
- the harness casing is replaced. Using tape in place of the properly sized wiring harness casing is not an acceptable repair method.
- allowable passive restraint system wiring. Refer to vehicle-specific service information to determine if wiring repairs are allowed on passive restraint system wiring and that they were done as specified by the vehicle maker.

A lit malfunction indicator lamp (MIL) or diagnostic trouble code (DTC) may indicate an electrical problem that requires wiring repair.

High-voltage wiring is contained in an orange sheathing and is not repairable.

More information on proper wiring repair methods can be found in the I-CAR live "Electrical Circuits and DVOM Usage (ELE01)" training course.




*A clamp is missing from this radiator hose.*

Mechanical systems may include, but are not limited to, air conditioning, cooling, and brake systems. Mechanical systems should be inspected to verify:

- all of the parts are installed correctly. For example, make sure the correct hoses or bolts are installed or reinstalled in the proper locations.
- all bolts are replaced and properly torqued. Verifying proper torque may be included on an inspection checklist. Ensure one-time-use fasteners are replaced accordingly.
- all hoses and hose clamps are properly installed.
- the system is operating as designed.

Again, a lit MIL or DTC may indicate a problem with a mechanical system.


*The service part label should be removed from this replacement apron.*

To help ensure a quality refinish job:

- verify trim and handles are removed when required. This may be necessary to prevent hard tape lines.
- verify a clean surface and that grease pencil markings have been removed.
- verify service part labels are removed.
- inspect sprayout panels to ensure proper color match and no defects. These may be filed for documentation.

Refer to " Video: Inspecting Exterior Panel Repairs" for a video on inspection of exterior panel repairs including checking panel gaps, closure panel fit and function, and inspecting the workmanship of body filler repairs.

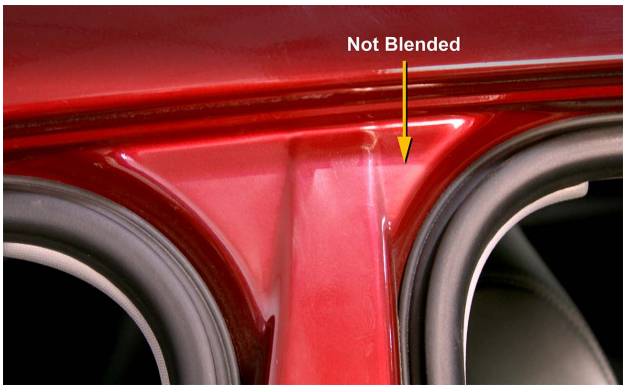
**Refinish Inspection**

*Inspecting for proper color match should be done outdoors or using a color-corrected light source such as this sun lamp.*

When inspecting refinish work for proper color match:

- examine the refinish work under sunlight or using a color-corrective light source. Refinish color should only be matched to one type of light source and the standard is to match to natural sunlight. A color-corrective light source such as a “sungun” is designed to mimic natural sunlight.
- do NOT wear tinted glasses.
- be confident you do not have a color vision deficiency.

The technician should be primarily responsible for verifying proper color match and inspecting their own work for refinish defects. Routine inspections may be conducted by a quality control inspector to verify quality refinish work is being done.




*The refinish on this door ring area is unacceptable.*

When inspecting refinish work for proper color match:

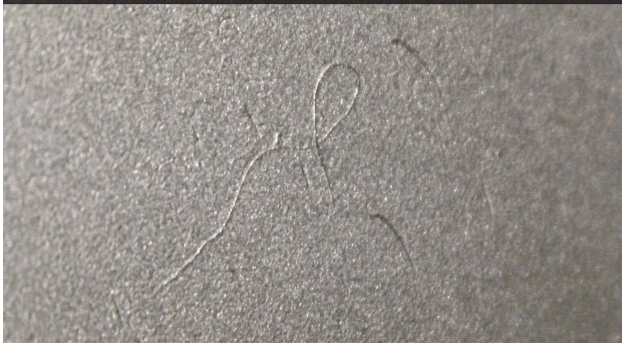
- verify the color is blended properly into adjacent panels so any slight variation in color is not noticeable. Verify the refinish does not stop at the edge of the panel. There will likely be a visible difference in color between panels if blending is not done.
- view the refinish area from various angles. Metallic and pearl finish colors appear different when viewed from different angles. This difference is called color flop. Inspect the refinish by looking at it both straight on and from a sharp angle to verify there is no noticeable color variation from either angle.
- consider that some parts may have not originally matched adjacent panels. For example, some bumper covers do not exactly match the rest of the vehicle from the factory. This is because both parts were painted

at different locations. The refinish should match, which may result in the undamaged bumper cover not matching the refinished one. If necessary, communicate this to the customer before the repairs are started on the vehicle.

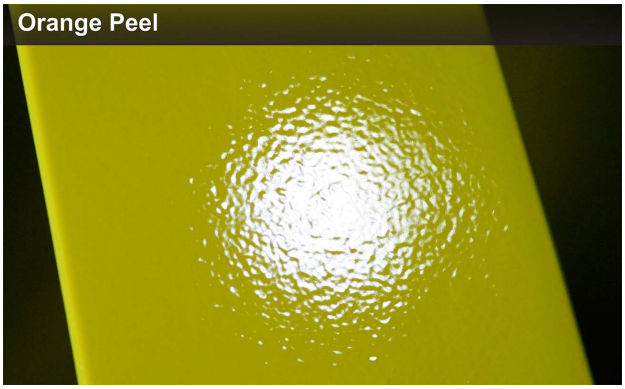
- door rings, doorjambs, and underhood parts should also be inspected. While inspecting doorjambs for proper color match, also verify doorjamb areas are clearcoated if they were originally. The texture of the finish should match the original factory application.

Runs

Debris



Orange Peel



Sandscratch Swelling

Wrinkling

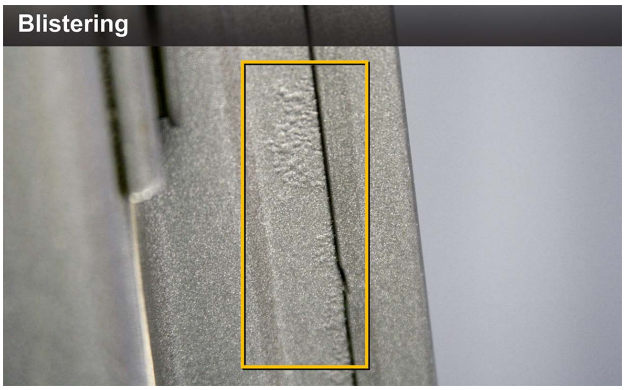
Solvent Popping

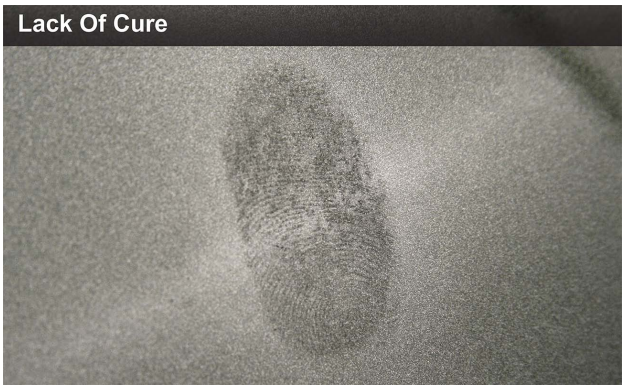
Inspect refinish work for:

- runs or sags. Runs or sags are heavy deposits of refinish that slide on the surface. They may look similar to solid drips. They typically occur on vertical panels, but may occasionally occur on a horizontal surface as well.
- debris. Debris may include dust, dirt, and insects stuck in the refinish.
- excessive or inconsistent orange peel. Orange peel looks similar to the textured surface of an orange skin. The texture of the refinish should match the factory application.
- sandscratch swelling. Sandscratch swelling appears as a scratch or scratches under the refinish.
- wrinkling or lifting. Wrinkling or lifting appears as a distortion of the surface.
- solvent popping. Solvent popping appears as tiny pinholes in the refinish.


Mottling


Dry Spray


Blistering

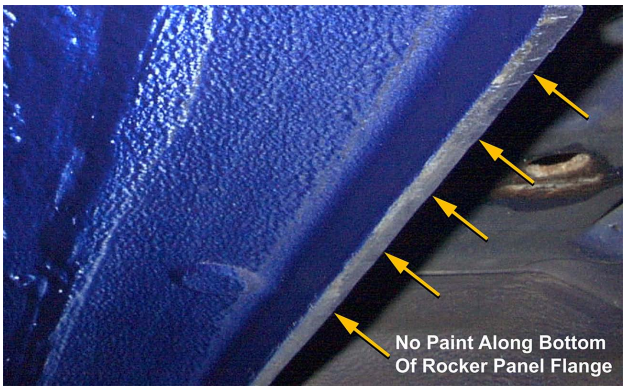

Lack Of Cure

Other examples of refinish defects include:

- mottling. Mottling appears as dark spots or blotches in the color and may give the panel a striped appearance in extreme situations.

- a dull gloss. The glossiness of the refinish should match the original factory application.
- dry spray, which is a grainy texture, usually with no gloss.
- blistering. This appears as the refinish lifting off the surface.
- lack of cure. The refinish should be completely cured following the paint maker's recommended cure process. A refinish that is not completely cured may be soft enough to leave a fingerprint impression when touched.
- two-tone paint lines misaligned. Verify two-tone refinish jobs are aligned properly between panels.

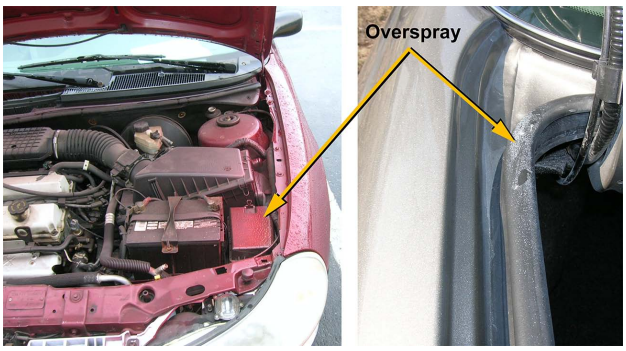
More information on what causes refinish defects can be found in the I-CAR live "Understanding and Preventing Refinish Defects (REF10)" training course.




*The refinish does not extend to the bottom side of this rocker panel.*

When inspecting for sufficient refinish coverage:

- check the lower areas and parts of the vehicle, including the underside. These areas are most likely to be overlooked during the refinish process.
- verify the clearcoat extends to jambs, if required. Some vehicles have clearcoated jamb and underhood areas. Ensure the texture and appearance of the refinish matches the factory application for that area of the vehicle. A partially clearcoated surface will have a rough feel to it.
- a flashlight may help illuminate underside areas and jambs.




*Severe overspray can be seen in this engine compartment.*

Inspect refinish areas for overspray on:

- weatherstripping.
- glass.
- parts in the engine compartment.
- adjacent parts.
- trim.

Overspray can be seen visually and felt as a rough surface.

More information on refinish defect removal and final detailing can be found

in the I-CAR live "Detailing (REF04)" training course.


*The pinstriping is missing on this replaced quarter panel.*

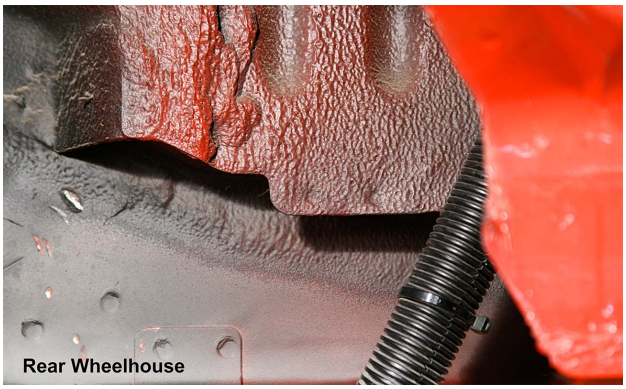
Pinstriping must be replaced where originally applied with the same appearance as the undamaged side. Also verify consistency between adjacent panels. When inspecting pinstriping, verify:

- all pinstriping has been replaced. Pinstriping may be applied to the vehicle with a decal or painted on. Replaced pinstriping should look the same as the original.
- proper alignment between panels.
- the same thickness between panels.
- the color match.
- the same design.


*A film thickness gauge may help determine if chip-resistant coatings were replaced properly. The OEM service information may specify locations and thicknesses for replacement chip-resistant coatings.*

Verify all chip-resistant coatings have been replaced where required. Refer to the service information or the undamaged side of the vehicle to determine the locations where chip-resistant coatings should be applied on the vehicle. The vehicle-specific service information may specify the thickness the coatings should be applied.

A film thickness gauge can be used to identify locations where anti-chip coatings were applied and to measure the thickness.




*Wheelhouse areas are common locations where undercoating is applied.*

Inspect underside areas to verify undercoating has been replaced, where

required. When inspecting underside areas for undercoating, verify:

- the undercoating matches the original factory appearance. Undercoating should be replaced in the areas where it was removed. The vehicle-specific service information may provide an illustrated diagram where undercoating should be replaced. The replacement undercoating texture and color should match the original factory application. The vehicle maker may recommend using a specific product.
- complete coverage in the areas for replacement.
- proper thickness.

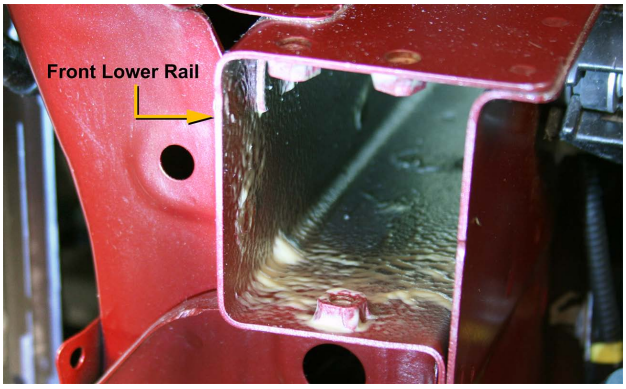
**Toyota Camry**


*The cracked undercoating under this rear floor pan should have been replaced.*

When inspecting undercoating, check for:

- damaged coatings that were not replaced.
- overspray. Undercoating should not be applied to electrical, mechanical, or exhaust system parts.
- areas that should not be undercoated. Undercoating that is applied where it was not originally may indicate an attempt to hide improper repairs.

**2007 Honda Accord**




*Anti-corrosion compound can be seen on the inner area of this replaced front rail.*

When inspecting areas for application of anticorrosion compounds:

- refer to the vehicle-specific service information. The vehicle maker may specify locations where anti-corrosion coatings should be replaced. This may include locations such as around hinges and door skin hem flanges. When inspecting door skins for anti-corrosion compounds, verify weep holes that are designed to let water out are not blocked.
- inspect the backside of weld areas in enclosed areas. This may require the use of inspection tools

such as a mirror and flashlight or a borescope.
- inspect areas as much as possible to ensure complete coverage. Anti-corrosion compounds are designed to creep into hard-to-reach areas such as flanges and under inserts.

Verifying the technician marked the application of anti-corrosion compounds as complete on the quality control inspection checklist may be another way to check that this was done.

Refer to "Video: Using A Borescope To Inspect Corrosion-Resistant Coatings" to see how to use a borescope to inspect the application of corrosion-resistant coatings in enclosed areas.

**Module Wrap-Up**

Topics discussed in this module included:

- identifying repair or replacement quality issues related to exterior panels.
- describing how to verify quality sublet work.
- identifying refinish defects.
- explaining how to verify corrosion protection has been properly applied.

# *Module 3 - Pre-Delivery And Post-Delivery Inspections*

I-CAR®

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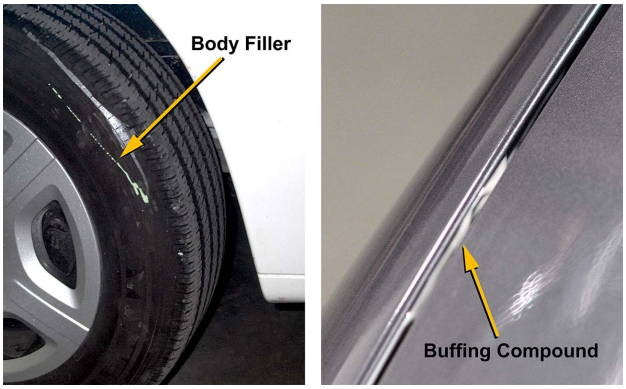
## Pre-Delivery Inspections

Learning objectives for this module include:

- describing the importance for conducting pre-delivery inspections.
- describing considerations for pre-delivery inspections.
- identifying inspections that should be done before and after doing a test drive.
- describing considerations for post-delivery inspections.
- explaining the importance of open communication.

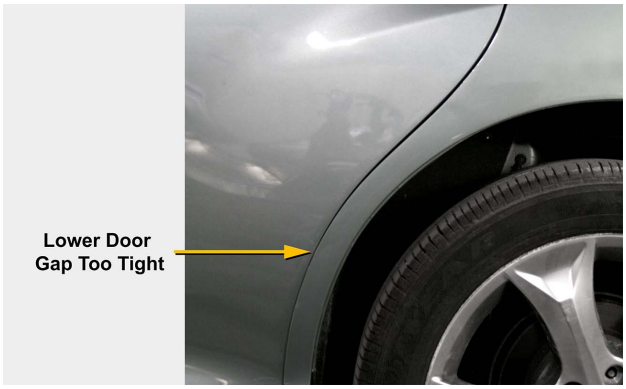



*The spilled body filler on the tire and buffing compound in the gap should be cleaned up before this vehicle is delivered to the customer.*

When inspecting the exterior during a pre-delivery inspection:

- verify proper fit and finish of the repaired or replaced panels.
- look for smudges or stains from repair materials. This may include buffing compound, body filler, repair dust, or other types of markings.
- keep in mind that every detail is important. Any small issue may result in a comeback.

Pre-delivery inspections may be done by the technician using an inspection checklist. This checklist should be reviewed and signed by the manager. The manager or the assigned quality control technician should conduct random visual inspections.

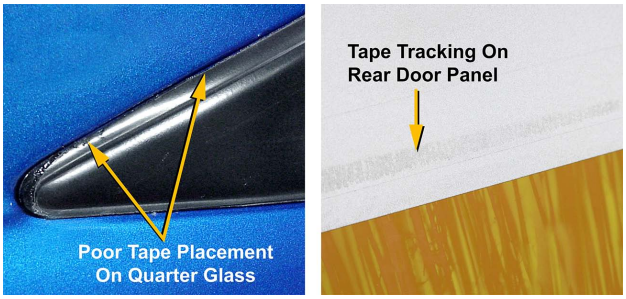



*The gap on the lower portion of this rear door is too tight.*

When conducting a pre-delivery inspection, inspect closure panels for:

- uneven or inconsistent gaps.
- missing parts such as lamps, handles, lock cylinders, and fasteners.
- improper function. Open and close the closure panels to verify they operate properly. This also includes verifying the lock cylinders operate properly.
- signs of part modification, such as using shims where not

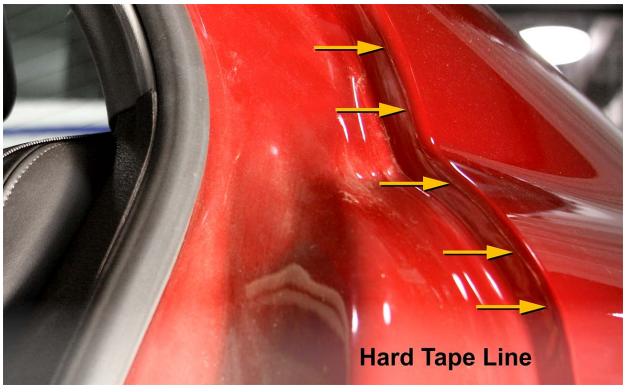
recommended to force the part to fit correctly.




*Improper masking resulted in some overspray on this quarter glass. In the lower photo, an imprint of the masking tape can be seen on the custom painted panel.*

When conducting a pre-delivery inspection, check for signs of improper masking. Examples of improper masking include:

- poor tape placement. Poor tape placement may include the tape being improperly applied over the area that was supposed to be completely refinished. It may also include the tape not reaching the edge of the panel or area that was supposed to be completely masked.
- no masking, which is seen as complete overspray on adjacent panels or parts.
- tape tracking. Tape tracking occurs when tape has been applied to an uncured refinish and is seen as an imprint. This may be a concern with two-tone or custom refinish work.

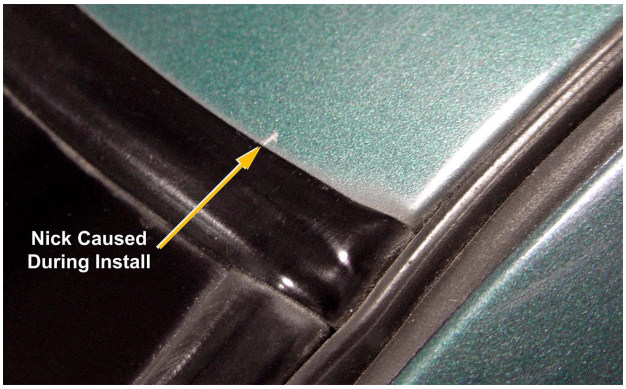



*A hard tape line can be seen on the edge of this door ring.*

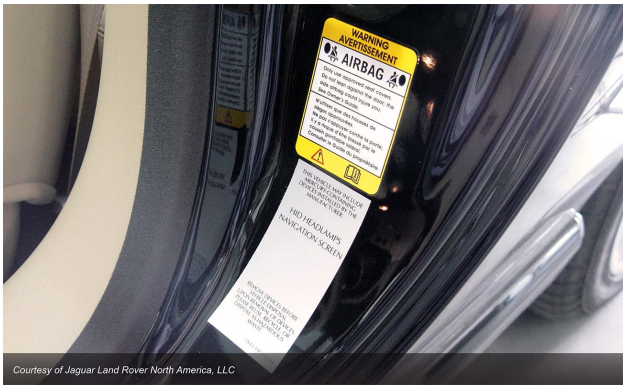
When conducting a pre-delivery inspection, check for signs of masking. Signs of masking include:

- a hard tape line. This is when you can see or feel a line at the edge of the refinished area. The line should have been smoothed out to reduce the visibility of the repair and prevent chipping.
- tape residue.
- whole or portions of masking left on the vehicle.

Do not forget to check door rings, jambs, and other hidden areas for signs of masking.




*A nick caused during windshield installation can be seen near this molding.*




*Be sure to replace any labels that are removed during repairs.*

When inspecting both stationary and movable glass installation, check for:

- damaged molding or trim.
- looseness. Push on the glass to check for looseness.
- replaced window tint.
- water or noise leaks. The technician should inspect replaced or reinstalled glass for leaks, and mark the inspection as complete on the quality control inspection checklist.
- proper function of movable glass. Check for smooth operation. Movable glass should not bind. Check the full-up and full-down function for power windows.

More information on movable glass installation can be found in the I-CAR live "Movable Glass (GLA01)" training course.

When inspecting labels during a pre-delivery inspection:

- verify any removed labels were replaced. Common locations for labels include underhood, door frame, and in door ring areas.
- verify vehicle identification number (VIN) labels were not removed.
- verify any vehicle pass labels are transferred or replaced appropriately. Examples of these include parking pass, toll pass, and carpool lane exemption stickers for hybrid vehicles.
- verify chip-guard labels are replaced. These may be located on dogleg areas and behind wheels.
- it may be necessary to check original parts that were removed to determine what labels should be installed.

Some labels may not be available from the vehicle maker, but may be provided by aftermarket companies.


*The tire size is located on the sidewall.*

When conducting a pre-delivery inspection, check tires and wheels for correct:

- size.
- wheel nut torque.
- tire pressure.

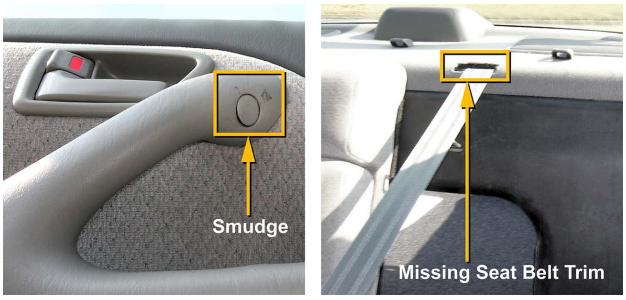
A lit MIL or DTC may indicate a problem with the anti-lock brake system (ABS) or tire pressure monitoring system (TPMS).

*The operation of these exterior lamps are being inspected.*

When conducting a pre-delivery inspection, verify all exterior lamps are functioning properly. These include, but are not limited to:

- headlamps.
- turn signals.
- brake lamps.
- tail lamps.
- parking lamps.
- side marker lamps.

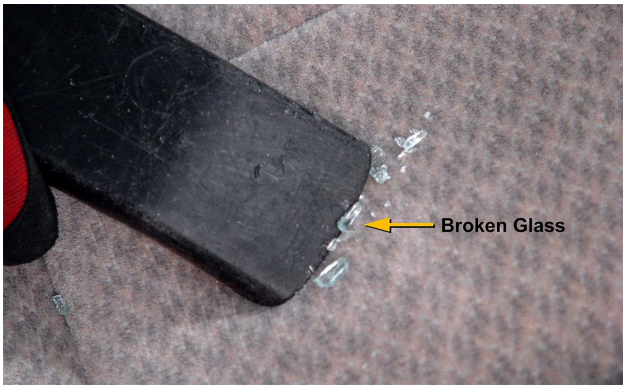
Other lamps that should be inspected for proper operation include fog lamps, license plate lamps, reverse lamps. Also check for proper operation of the emergency flashers.




*A smudge can be seen on this interior door handle. In the lower photo, the trim for the seat belt opening is missing.*

When conducting a pre-delivery inspection, inspect the vehicle interior:

- for smudges or stains that resulted from the repair process.
- for damage that occurred during the repair process.
- to verify all trim panels were replaced properly.
- to verify all fasteners and clips have been properly replaced and are not damaged.
- to verify all interior lamps are functioning.

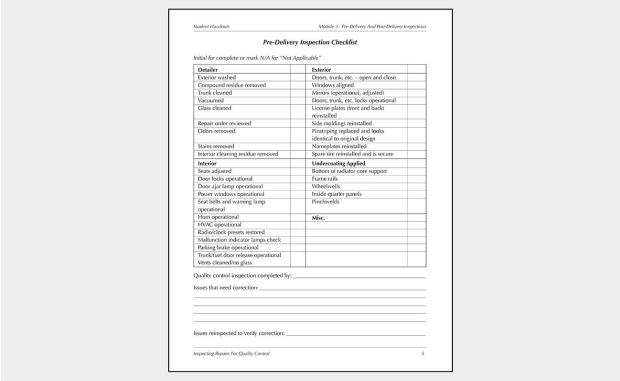



*All broken glass should be removed before the vehicle is delivered to the customer.*

When conducting a pre-delivery inspection, also inspect the vehicle interior:

- to verify all accessories are working properly. This includes running the vehicle and checking to make sure the heater and air conditioning systems are working properly. Also verify radio presets and other memory functions have been restored per the pre-repair inspection form.
- to verify the seats are not damaged or improperly installed.
- for broken glass. Inspect weatherstripping, the carpet, and seat cushions for broken glass. Also turn on the vents to make sure they are free of glass fragments.
- for abnormal odors.

**Personal Safety**
Be sure to wear safety glasses when turning on the vents to inspect for glass fragments.



Pre-Delivery Inspection Checklist

Initial for complete or mark N/A for "Not Applicable"

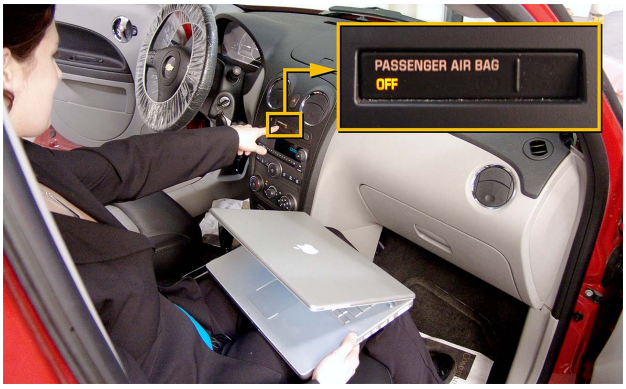
| Detailer | | Exterior | |
|---|---|---|---|
| Exterior washed | | Doors, trunk, etc. – open and close | |
| Compound residue removed | | Windows aligned | |
| Trunk cleaned | | Mirrors (operational, adjusted) | |
| Vacuumed | | Doors, trunk, etc. locks operational | |
| Glass cleaned | | License plates (front and back) reinstalled | |
| Repair order reviewed | | Side moldings reinstalled | |
| Odors removed | | Pinstriping replaced and looks identical to original design | |
| Stains removed | | Nameplates reinstalled | |
| Interior cleaning residue removed | | Spare tire reinstalled and is secure | |
| **Interior** | | **Undercoating Applied** | |
| Seats adjusted | | Bottom of radiator core support | |
| Door locks operational | | Frame rails | |
| Door ajar lamp operational | | Wheelwells | |
| Power windows operational | | Inside quarter panels | |
| Seat belts and warning lamp operational | | Pinchwelds | |
| Horn operational | | **Misc.** | |
| HVAC operational | | | |
| Radio/clock presets restored | | | |
| Malfunction indicator lamps check | | | |
| Parking brake operational | | | |
| Trunk/fuel door release operational | | | |
| Vents cleaned/no glass | | | |

Quality control inspection completed by: _____

Issues that need correction: _____

Issues reinspected to verify correction: _____

Refer to "Activity: Pre-Delivery Inspection Checklist" for an activity using the Pre-Delivery Inspection Checklist.




*The operation of the occupant classification system is being verified.*

When conducting a pre-delivery inspection, verify parts of the passive restraint system have been properly replaced and the system is functioning properly. Some inspections for the passive restraint system include checking the:

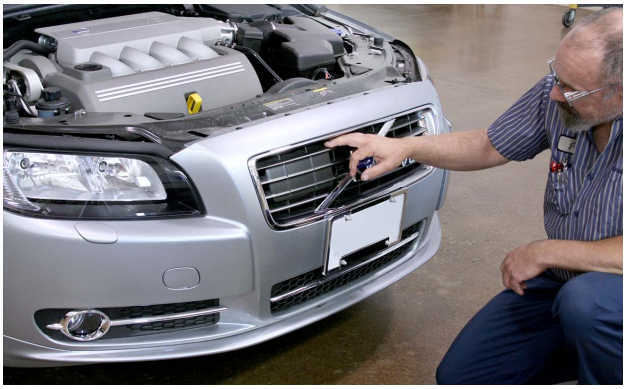
- damage report or repair order to determine which parts of the system were replaced. A damage report may also be called an estimate.
- airbag MIL on the instrument panel. The airbag lamp should illuminate briefly and then turn off

when the vehicle is started. A scan tool may also be used to check for diagnostic trouble codes for the passive restraint system.

- operation of the occupant classification system (OCS). This can be done with a quick check by sitting in the passenger seat while the vehicle is running and verifying the operation of the passenger airbag disable lamp. Additional weight may be required if the person conducting the inspection weighs less than 45 kg (100 lb). A scan tool may also be used to check for diagnostic trouble codes for the OCS. When inspecting the passive restraint system it is also important to check the operation of the seat belts.

When inspecting seat belt operation, verify the retractor locks when pulled quickly. Also check the cinch mechanism by pulling the seat belt all the way out and listening for a clicking noise. Inspect seat belt webbing for tears, cuts, bowing, or broken threads.

More information on inspecting supplemental passive restraint systems can be found in the I-CAR "Restraint Systems Damage Analysis (DAM11)" training course.



*A radar sensor for a collision warning system is being inspected for proper installation.*

When conducting a pre-delivery inspection, check all vehicle options:

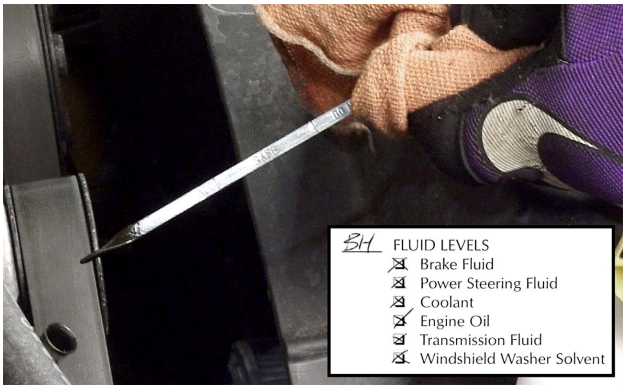
- to ensure they are functioning properly.
- including exterior parts such as cameras and sensors. Check exterior cameras and sensors to ensure they are installed properly and all the bolts are tightened.

Ongoing training may be required to be able to identify electronic vehicle options and know how they are designed to operate. More information on these systems can be found in the I-CAR live "Damage Analysis of Advanced Automotive Systems (DAM07)" training course.

*A vehicle lift provides the best access for inspecting underbody repairs.*

Raising the vehicle on a lift will provide the best option for inspecting parts located on the underside of the vehicle. Raising the vehicle on a lift can be done to access:

- critical areas that may otherwise be ignored. It is important to have the underside adequately lighted or use a high-quality flashlight when inspecting parts located under the vehicle.
- structural parts such as the front lower tie-bar, front and rear rails, and the underside and inside portions of the rocker panels.
- suspension and other mechanical system parts. When inspecting the underside of the vehicle, verify there are no missing mechanical parts.
- areas where undercoating has been applied.




*The dipstick shows that the oil level is too low.*

Depending on the nature of the repair, a pre-delivery inspection may include checking underhood to verify:

- fluid levels, especially before starting the engine. Ensure all fluids are topped off properly. If necessary, consult the vehicle owner to determine which type of oil to use to top off or replace. It may also be necessary to verify recommended fluids are used to maintain OEM warranties. Hybrid-electric and other alternative fuel vehicles may require special types of fluids that are not used on conventional vehicles. For example, the 2011 Ford Super Duty diesel uses a special diesel exhaust fluid to reduce emissions.
- all hoses are properly connected.
- all belts are installed and correctly routed.
- electrical connections are properly connected. This includes verifying the battery cables are reconnected to clean terminals.

It is especially important to conduct these inspections before starting the

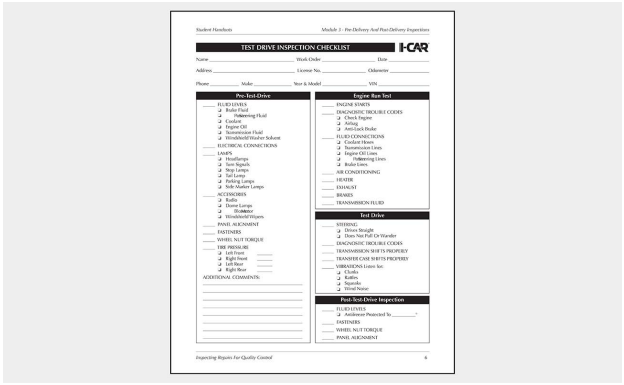
engine or taking the vehicle out for a test drive. The technician should initial the checklist to show that the inspections were completed.

*This vehicle is being test driven before it is delivered to the customer.*

A test drive may also be part of a pre-delivery inspection. However, simple or light repairs may not require test-driving the vehicle. When performing a test drive:

- check the steering. Verify the vehicle drives straight and does not pull or wander.
- verify no malfunction indicator lamps (MILs) turn on and there are no diagnostic trouble codes (DTCs).
- ensure the transmission shifts smoothly.
- listen for noises such as clunks, rattles, squeaks, or wind noise. Also feel for vibrations.

Recheck fluids, wheel nut torque, and check for proper panel alignment following the test drive.

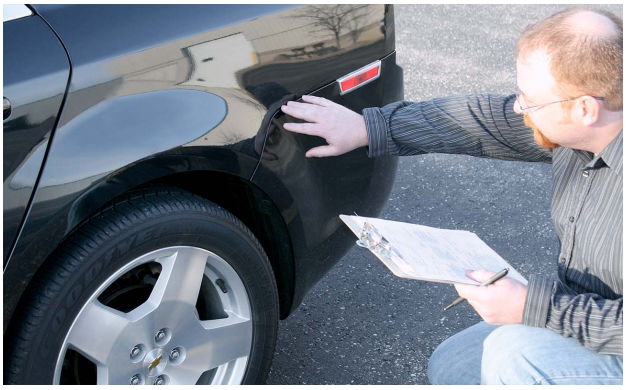

TEST DRIVE INSPECTION CHECKLIST

I-CAR

Refer to "Activity: Test Drive Inspection Checklist" for an explanation of the Test Drive Inspection Checklist.

Refer to "Video: Pre-Delivery Inspection" to watch a video that discusses some considerations for conducting a pre-delivery inspection and how to verify the inspection is being done properly.

## Post-Delivery Inspections



*The gap between this bumper and quarter panel is being inspected.*

Post-delivery inspections:

- are typically done after all repairs are completed and the vehicle is returned to the owner.
- are done to verify the repairs on the vehicle match the damage report or final bill.
- are done to ensure customer satisfaction.
- may be done at the repair facility or offsite. The vehicle may be returned to the repair facility for a follow-up inspection or done offsite as an insurance audit or field inspection. These are commonly done at the owner's home or place of employment. The vehicle may also be inspected by a third-party inspection service or another repair facility.

*This vehicle was returned to the repair facility for a post-delivery inspection.*

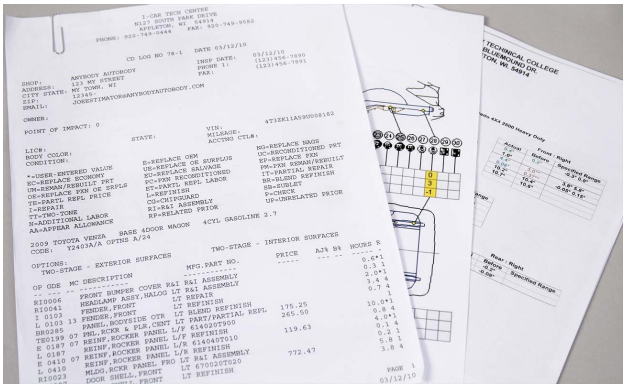
The need for post-delivery inspections and the level of the inspection may be determined:

- by the performance history of the repair facility.
- to be done randomly. An insurance company or repair facility may conduct random post-delivery inspections to ensure customer satisfaction is being maintained.
- by a request from the customer.
- to be necessary on all repaired vehicles.
- by the severity of damage.

1. **Contact Customer**
2. **Conduct Customer Satisfaction Survey Over The Phone.**
3. **Communicate With The Owner A Time And Place For Post-Delivery Inspection.**
4. **Invite Owner To Be Present (Optional).**
5. **Print Damage Report And Damage Photos To Bring On-Site**
6. **Verify The Correct Vehicle By Checking The VIN.**
7. **Inspect Vehicle And Note Any Quality Issues.**
8. **Communicate Any Quality Issues With Owner And Repair Facility.**
9. **Arrange The Vehicle To Be Returned To The Repair Facility To Correct Concerns**

Establishing SOPs should be done to ensure postdelivery inspections are done:

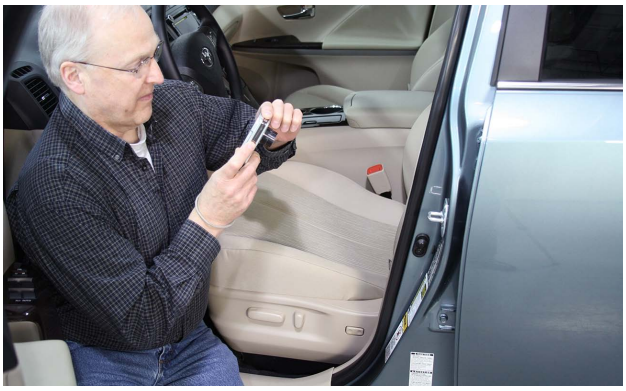
- the same for each vehicle.
- efficiently.
- consistently between two different inspectors.



*The repair order, vehicle dimension, and wheel alignment printouts can be referenced during a post-delivery inspection.*

Documentation that may help determine if the vehicle was repaired properly includes:

- the damage report or final bill.
- supplements.
- parts and sublet invoices.
- OEM procedures. Verify the procedure applies to the year, make, and model of the vehicle being inspected.
- printouts from a vehicle measuring system or wheel alignment equipment. Spot weld data printouts and paint mix formulas are two more examples of documentation that may help determine if the vehicle was properly repaired.



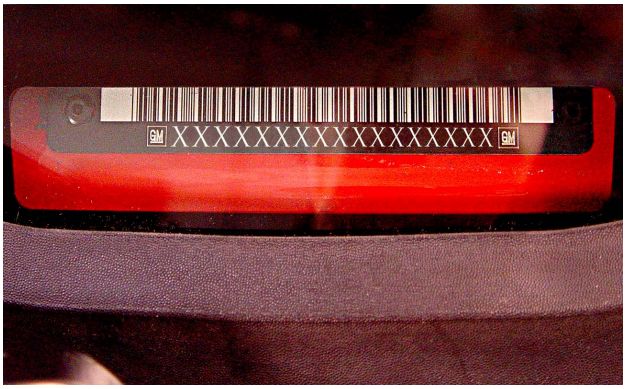
*A photo of the repair area is being taken.*

Repair photos may show repair areas before coatings were applied and can be retained as documentation. If available, repair photos can be examined as part of a post-delivery inspection.

Original damage photos may be referenced to ensure parts were replaced properly. For example, photos may help verify the grille was replaced with the same color and style.

Taking photos during a post-delivery inspection may be considered to document that all repairs were inspected. Photos may also be taken to document any repair issues.

To effectively communicate the location of a repair area, take a wide shot of the repair area in addition to a close-up shot. This will help the viewer identify the exact location of the close-up shot.




*The VIN on the vehicle should match the one recorded on the repair order.*

Before starting a post-delivery inspection, be sure you are looking at the correct vehicle. To identify the vehicle, check the:

- VIN. Verify all of the characters of the VIN match what is recorded on the damage report. Do not just rely on the last six digits.
- license plate number.
- mileage. A mileage number that is substantially greater or less than what was documented may be an indication it is the wrong vehicle.

*Each line on the repair order should be inspected.*

To ensure a thorough post-delivery inspection, go through the damage report line-by-line. Do not skip any item on the damage report. Start with the outer body panels and parts and work inward.

It may be beneficial to do a general walk-around inspection of the entire vehicle before inspecting each item on the damage report. This may help avoid making premature assumptions on what does or does not require inspecting.

*This rear door is being checked for proper operation.*

Begin the post-delivery inspection by taking a look at the overall condition of the vehicle and noting any obvious issues. Inspect the outer body:

- for proper color match and refinish quality. Also look for obvious signs of masking or unfinished detailing work.
- panels for proper fit. Look for inconsistent panel gaps. Verify panel gaps are within specification.
- closure panels for proper fit and operation.
- wheels for proper size.

- for proper fit and function of other parts such as lamps, trim, emblems, nameplates, and mirrors.


*This undressed plug weld has been refinished.*

After inspecting the outer body panels and parts, work inward and inspect the attachment points of the outer body panels. Then work further inward and inspect the attachment points of the structural parts that were repaired or replaced. When inspecting attachment points:

- check both removed and replaced parts. Some parts may have been removed and reinstalled during repairs. Do not disregard to inspect the attachment points of removed parts to verify they were installed properly.
- check the welds. Look for signs of missing welds or weld defects.
- verify adhesively bonded panels are properly aligned and there are no signs of failure.
- verify all mechanical fasteners have been reinstalled or replaced as necessary.

*Access to the repair areas are limited after all repairs are completed*

Post-delivery inspections may pose some challenges because all:

- parts have been attached, which may limit access to repair areas.
- coatings have been applied, which may cover up repair areas and attachment points.

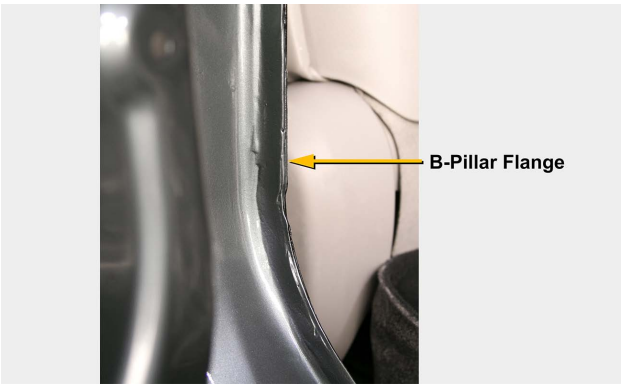
*This weatherstripping is being removed to inspect the repair area.*

Do not remove any trim panels or other parts that could damage clips or other types of fasteners. Only parts that are designed to be removed by the vehicle owner should be removed during a post-delivery inspection. For example, access panels with designed latches to open and

close. The only exception would be if the vehicle is being inspected at a collision repair facility and the replacement parts are on hand.

It may be safe to remove weatherstripping to access pinchweld flanges, as long as no other parts or trim panels have to be removed to do this. Do not force the weatherstripping off, as it may be bonded to the pinchweld flange. A good rule of thumb is to temporarily remove it only if it comes off relatively easy.

Also, it is typically acceptable to remove carpeting located in the trunk to inspect repair areas.




*Inspect pinchweld flanges closely to make sure there is no exposed bare metal.*

When inspecting mating flanges, verify the flange is properly sealed from exposure to the elements. There should be no visible bare steel. Inspecting the edge of a mating flange may require the use of a bright flashlight for good visibility.


*A mirror is being used to inspect the mating flange of this quarter panel and wheelhouse.*

When inspecting the underbody during a post-delivery inspection:

- verify all of the welds were replaced completely and there are no defects.
- verify all the necessary corrosion-resistant coatings were replaced. Inspect wheelwell areas and other parts of the underbody to ensure all undercoating was replaced. The OEM procedure may provide an illustrated chart showing all underbody areas that require undercoating.
- an inspection mirror may be required for visual access. Post-delivery inspections may be done at the owner's home or place of employment.
- the vehicle may have to be returned to the repair facility for closer inspection and put on a lift. This may be a consideration if suspension issues are suspected, or if a mirror does not provide adequate access for a complete inspection.

*An inspection kit like this one can be used for post-delivery inspections.*

It may be beneficial to put together a kit with various tools used for post-delivery inspections. Items in an inspection kit may include:

- a flashlight.
- various sized mirrors. There are kits available which include various sized mirrors, magnets, magnifying glass, which attach to an adjustable or telescoping handle.
- a camera.
- knee pads or a floor mat.
- borescope.
- a film thickness gauge.
- a magnet or specific tool to measure body filler thickness.
- a tape measure.

Other items that may be considered for an inspection kit include tools and products that can be used to fix minor imperfections on the spot. Items include polishing compound, towels, plastic razor blades for refinish overspray, and some common size clips and bolts.

Refer to "Video: Post-Delivery Inspection" to watch a video that discusses why and how post-delivery inspections are done.

*The damage appraiser is discussing the repair order with the manager of this repair facility.*

Both the repair facility and the insurer have an interest in conducting post-delivery inspections for the benefit of the consumer. Open communication must be maintained to ensure a timely and thorough inspection process.

It is important to develop a working relationship and establish a system if the insurer would like to conduct post-repair inspections at the repair facility. For example, a repair facility may expect to be notified in advance if the insurer wants to conduct a post-repair inspection at the repair facility.

Communication should always be professional. Feedback should not be limited to repair issues. Providing positive feedback will help ensure everyone involved knows what is expected from each other regarding the quality of repairs and / or service.

*The customer is present during this post-delivery inspection.*

The customer may be involved with the post-delivery inspection process. If the customer is present during the inspection process:

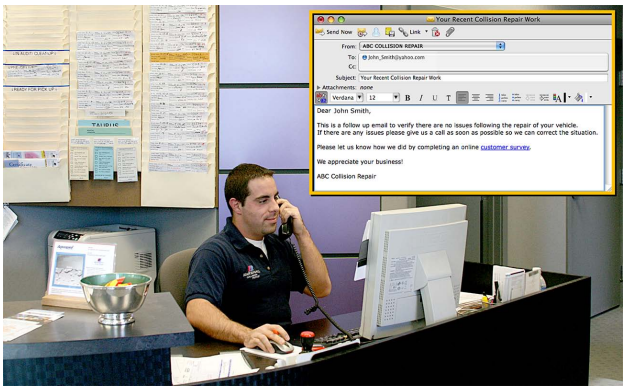
- maintain open communication during the inspection. Describing the inspection process to the customer may help the customer feel more comfortable. It is good customer service. The customer should feel good about the entire repair process.
- avoid upsetting the customer with emotional response to issues. “Oh my!” verbal or facial expressions may upset the customer.
- openly communicate any quality issues. It is important to communicate to the customer any concerns about a repair. Even if you think the customer would never know, friends and family will likely see the repair and may notice the issue. This is one reason proper expectations and prior damage should be communicated with the customers before repairs are started.

*Open communication with the customer will help achieve good customer satisfaction.*

Other considerations when conducting a post-delivery inspection with the customer present include:

- determining whether or not to point out minor imperfections. However, any major repair issues should be communicated and returned to the repair facility to be corrected.
- letting the repair facility explain to the customer the procedures that will be done to correct a quality issue. This is because the inspector would only be speculating on what “could” be done to correct the issue. The repair facility will know exactly what will be done and how to describe it to

the customer using the correct verbiage.




*A customer follow-up may be done over the phone or done electronically via email.*

The final inspection following the vehicle repair process is verifying customer satisfaction. Follow up with the customer a week or so after vehicle delivery to verify there are no issues with the repair and ask if they have any questions. A customer follow-up may be done:

- to monitor customer issues with repairs and / or service and can be referenced for continuous improvement.
- with a phone call.
- by sending a printed survey with a pre-paid envelope via traditional mail.
- by email or using text messages. A hyperlink to an online survey may be sent to the customer electronically.

Monitoring customer feedback is vital to see improvement in customer satisfaction index (CSI) scores.

**Module Wrap-Up**

Topics discussed in this module included:

- describing the importance for conducting pre-delivery inspections.
- describing considerations for pre-delivery inspections.
- identifying inspections that should be done before and after doing a test drive.
- describing considerations for post-delivery inspections.
- explaining the importance of open communication.