

# Hail, Theft, Vandalism Damage Analysis

Textbook



Version: 13.2

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DAM09-STMAN1-E

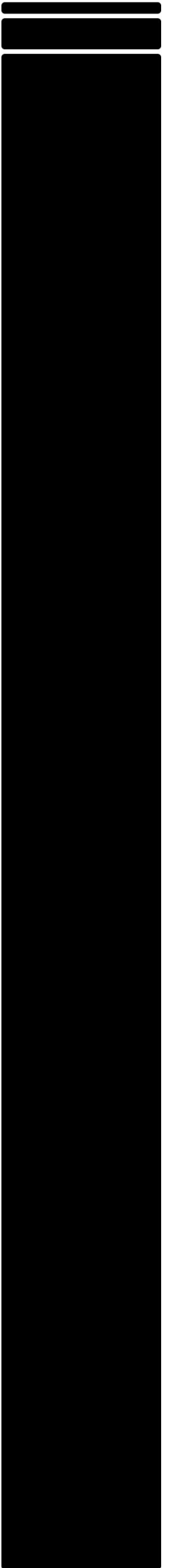
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# *Introduction*



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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.

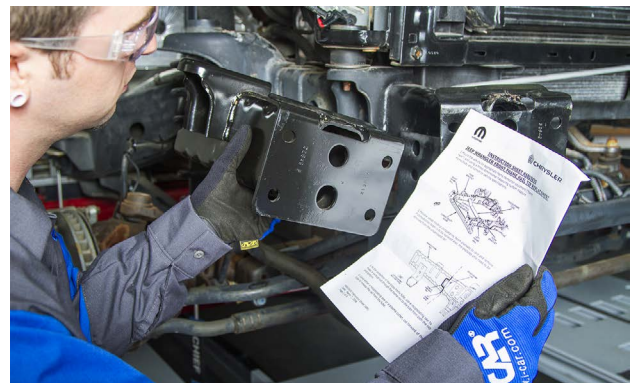
Performing proper collision repairs requires using parts and procedures that keep remaining warranties intact. Collision repairs must restore:

- 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 damage report.
- follow proper procedures.
- use quality replacement parts and materials.
- 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.

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.

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.



# *Module 1 - Analyzing Vandalism*

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## Fuel Contamination

Learning objectives for this module include:

- providing an overview of different types of vandalism.
- identifying vehicle fluid contamination and listing repair options.
- identifying vandalism damage to a finish.
- identifying vandalism damage to the vehicle interior and repair considerations.
- identifying slashed tires and determining repair or replace options.



*This course will address various types of damage that can occur from theft and vandalism, such as broken windows.*

This course provides information on how to analyze damage that occurs from a variety of circumstances that are not commonly associated with a typical collision. These include:

- vandalism.
- common theft damage.

- weather-related damage, such as hail, wind, and lightning.

The course will look into inspection methods used to analyze these types of damage, and provide possible repair options.



*This windshield was broken from a random act of violence.*

Vandalism commonly occurs in two ways. The first is when someone is intent on damaging the vehicle, either targeting a specific owner and vehicle through an act of vengeance, or through random vandalism.

The second type of vandalism occurs from someone who damages the exterior when looking to gain access to the interior for the purpose of theft. This type of damage generally includes broken glass and damaged door lock assemblies. This type of damage can also include damage to the interior of the vehicle after access has been made.



*Sugar does not dissolve in gasoline and will sink to the bottom of the fuel tank.*

Contaminating the fuel tank has been a popular form of vandalism for some time. Contaminants that have been used by vandals include:

- sand.
- sugar.
- dirt.
- water.
- fire extinguisher residue.
- soda water.
- varnish and paint.

Most solid contaminants:

- do not dissolve in gasoline or diesel fuel.
- will clog the fuel filter and fuel injectors. Some may even damage the fuel pump. However, rarely do larger, granular-type contaminants make it to the engine. However, some contaminants, such as soda water, can make it to the engine and disable it.

### Honda Pilot



*On this 2007 Honda Pilot, the fuel sample is collected from the engine compartment area.*

To determine if there is fuel contamination, take a fuel sample from a fuel line leading out of the fuel tank into the engine. Because most contaminants sink in gasoline, including water, the bottom of the tank is the best source for a fuel sample, which is where fuel pumps pull from. When extracting the sample:

- fill a clean glass container with fuel.
- use the fuel from the supply line to the engine.
- operate the fuel pump to gather 0.5 L (one pint) of fluid.
- allow the sediment to gather, if it exists.

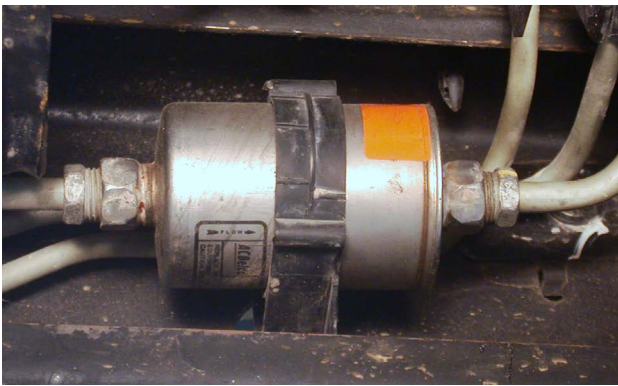
### Personal Safety

When servicing fuel systems, if any fuel spills on skin, immediately wash the affected area with soap and water. If clothing becomes saturated with fuel, remove the clothing immediately.

When servicing fuel systems, always wear safety glasses and ventilate the area to control fuel vapor buildup. Plug or cap all fuel system openings when removing or disconnecting fuel system parts.

It is also recommended to clean up spilled fuel immediately, avoid sparks and other sources of ignition, and notify others in the work area that fuel system work is in process.

### Ford F-150



The fuel filter on this Ford F-150 will have to be inspected and likely replaced if fuel contamination is found.

When determining fuel contamination:

- check the fuel filter for large amounts of solid contaminants. Gasoline is a preservative and items like sugar will not dissolve.
- it may be necessary to have the fuel analyzed by an independent laboratory. There are generally three levels of testing available. More basic, or level one tests, simply determine that the fuel is contaminated. More extensive testing, or a level three test, will indicate the type of contaminant.

The extent of testing varies depending on the desired results.

If doing outside testing, it is recommended to use the container provided by the testing facility to ensure the container is free of contaminants that may taint the results.

### Hazardous Materials

When shipping fuel samples to a testing laboratory, technicians must follow the proper shipping regulations regarding transportation of hazardous fluids.



Refer to Module 1, "Video: Determining Fuel Contamination" for a video on how to determine if a vehicle fuel system has been contaminated.



Ethanol test kits are available to determine if a fuel system is contaminated with E85 fuel.

In some instances, fuel contamination is not deliberate. People may inadvertently mix the wrong fuels at a gas station. For example, some may mix:

- E85 and E10. Unless the vehicle is specifically equipped for E85 fuel, using E85 can cause drivability conditions and deterioration of some fuel system parts.
- gasoline and diesel.
- water and gasoline. While the vehicle owner generally does not add water to the gas tank, some service stations can have leaky storage tanks that allow water to flow into the supply.

Some vehicle makers may have specific:

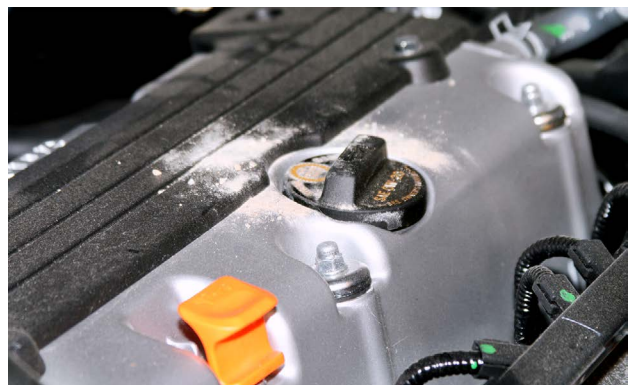
- test kits that allow technicians to check for the presence of excess alcohol or water in the fuel system.
- recommendations and tools for purging the fuel system of E85 and other contaminants.



*Dropping and cleaning the fuel tank is required for removing contaminants from the fuel system.*

To clean a contaminated system, the:

- tank must be drained and cleaned.
- fuel lines and filters must be clear.
- plugged filters are replaced.
- fuel lines may need to be replaced.
- fuel injectors must be cleaned. Depending on the extent of damage, some injectors may need to be replaced. Moisture can corrode and pit newer fuel injectors.



*Engine oil contamination may be indicated by dirt or sand around the oil filler cap.*

Another type of vandalism that may occur is adding contaminants directly into the crankcase to lock up the engine. This requires access to the engine compartment, so this type of damage is less common.

Common contaminants added to the crankcase are sand or dirt. Some indications that there may have been foul play may be residual sand or dirt around the oil cap. To verify whether contamination actually occurred, engine oil may be analyzed for contaminants, similar to how the fuel is analyzed.

If water is in the crankcase, it should be verified that it was intentional. This can be done by checking for a cracked block, damaged head gasket, or other areas that would allow moisture into the engine.

As with fuel, not all contamination is deliberate. Some cases are accidental, for example, adding the wrong fluid to a reservoir (power steering fluid to brake fluid reservoir, windshield wiper fluid to power steering fluid reservoir). Improper fluid can cause damage. For example, the wrong brake fluid can disintegrate seals on some systems.



*A loosened transmission fluid plug will slowly drain the fluid and lock up the transmission.*

Other types of vandalism include fluid level tampering. This includes vandals:

- disconnecting or loosening the oil filter. As the oil drains out, the engine locks up from overheating.
- removing the transmission fluid plug. This will cause the transmission to lock up.
- removing the coolant drain plug. This will cause the engine to overheat.

Sometimes, vandals will plug the fuel filler neck, requiring disconnecting the fuel filler neck, cleaning out the debris, and reassembling the parts.

## Finish Damage



*Raw eggs can etch the clearcoat if left to dry.*

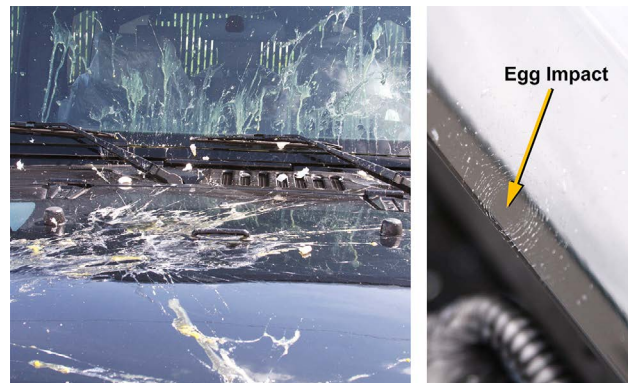
One of the more common types of vandalism damage is to the vehicle finish. Depending on what was used, damage may be:

- just to the clearcoat. In this instance, detailing or refinishing may be required depending on the depth of damage.
- through either the topcoats or all the finish layers, which will always require the panel to be refinished.



Refer to Module 1, "Video: Raw Egg Damage And Repair" for a video on how raw eggs and egg shells can damage a

vehicle finish and repair options for this type of damage.



*Egg shells can crack a vehicle finish if thrown with enough velocity.*

Eggs are commonly used to vandalize vehicles. While eggs seem fairly harmless:

- they can etch clearcoat if left on the panel for an extended period of time or simply allowed to dry onto the finish. Eggs are slightly alkaline, with a 7.6 – 7.8 on the pH scale, so even this small amount of alkalinity will damage the clearcoat.
- the impact of egg shells may chip or crack the finish depending on how hard they are thrown at the vehicle.
- damage not related to the impact can generally be avoided with immediate removal of the egg yokes and egg whites.





Refer to Module 1, "Video: Key Scratch Repair" for a video on how to determine if key scratches in a vehicle finish can be repaired.



*Deep key scratches require refinishing a panel.*

Key scratches are generally deep scratches into the vehicle finish. When analyzing repair options for key scratches:

- the depth of the scratch determines repair options.
- if only the upper layer of the clearcoat is scratched, and a fingernail does not catch on the scratch, buffing may be a repair option.
- deeper scratches, where a fingernail catches on the scratch, require refinishing. This is

generally the more common type of key scratch.

- note that vehicle makers may provide a recommendation regarding the amount of clearcoat that can be removed from a panel. Limits are put in place to prevent excessive amounts of clearcoat from being removed. If too much clearcoat is removed, paint failure may occur. Most vehicle makers recommend not removing more than 0.5 mil of clearcoat. This will require monitoring the finish thickness during the buffing process.



*Spray paint removal products are available to remove graffiti from a finish.*

Spray paint, or graffiti, on a vehicle surface may require a variety of repair techniques based on the spray paint chemistry. Common types of spray paint are made from:

- acrylic.
- epoxy.
- latex.

In addition to vandalism, other types of damage may include house paint or road paint or other types of industrial overspray.

Graffiti removal may require using:

- special cleaners, solvent or water-based.
- detailing clay.

Detailing clay used with a water-based lubricant can be used to remove some forms of overspray and paint on non-porous (smooth) surfaces such as glass and metal. In some instances, a pressure washer may be used to remove latex-based paint.

Another option for removing graffiti spray paint, permanent marker, or other staining products includes specially designed products such as graffiti remover. These are either petroleum-based or water-based. It is important to note that before using this type of product, it should be verified that it is compatible with automotive finishes. When using chemical cleaners, always test the effects of cleaner on an inconspicuous area to determine that the surface will not become damaged from the cleaner.

If all other methods fail, sanding and refinishing may be the only repair option.



*Battery acid, solvent, and brake fluid can damage a vehicle finish.*

Other types of fluid that may be used to vandalize a vehicle include:

- brake fluid.
- paint thinner.
- battery acid.

These should be removed as soon as possible to prevent etching the clearcoat or even deeper into the finish. Generally, materials such as this will require neutralizing the fluid, followed by refinishing the panel.



*Damage to a custom finish, such as this, requires access to paint records on how the finish was created. This helps determine if the finish is repairable.*

If the clearcoat scratches cannot be repaired with buffing, repair to custom finishes may require:

- determining the refinishing process.
- finding documentation about the finish from the company that painted the vehicle.
- stripping an entire panel. Unlike a traditional finish, custom finishes are difficult to blend.

### Interior And Underhood Damage



*Slashed airbags require replacement. Repairs should never be made to airbag covers.*

Vandals that gain access to the vehicle interior can do considerable damage. Common types of damage include:

- slashed seats / upholstery.
- slashed airbag covers. There are no repair options for this type of damage. The slashed airbag covers require replacement of the airbag module.
- stains on seats.
- intentional water damage. This may require replacement of

carpeting as often times it is difficult to completely dry the matting that is attached to the carpeting. This can result in mold problems. Also, the floor of many vehicles now contains control modules and wiring harnesses that can be damaged from excessive moisture.

- stained or cut carpeting.
- contamination from various materials.



*Slashed seat fabric may require replacement of the seat cover if not the entire seat, while mud stains on seats require proper cleaning.*

Seats that are slashed may require replacement of the:

- fabric, if it is sold separately from the seat.
- seat cushion.
- seat cushion and fabric, if sold together.
- seat cushion heaters.
- side impact airbag module, if integrated into the seat back.

Many passenger seats are equipped with an occupant detection system that includes a bladder that can be

damaged if punctured. This would require replacement of the occupant detection parts and recalibration of the system. Which parts are replaced is dependent on the vehicle maker. Reference the vehicle service information for a specific list. Even if the detection system is not damaged, some vehicle makers, such as GM, recommend replacing the sensor if replacing the cushion.

When replacing the fabric or seat cushion, some vehicle makers recommend disabling the passive restraint system if the side airbag is integrated in with the seat.

Stains may also require removal. The method used depends on the material that caused the stain. More information on this type of repair can be found in the I-CAR live "Detailing (REF04)" training course.



*A cut radiator hose requires replacement.*

Common items that may be damaged underhood include:

- wire harnesses, which can be cut.
- radiator hoses, which can be cut.

It is rare to find underhood items are vandalized in this manner, as more vehicle designs enclose the engine compartment. This generally requires access to the vehicle interior so the hood latch can be disengaged.

With any vandalism damage, it is important to perform a complete inspection inside the vehicle, outside the vehicle, underhood, and underbody. Covering all areas ensures that any hidden damage is found and analyzed.



*A slashed convertible top may require replacement of the fabric if the slash is not along a seam.*

Damage to a fabric convertible top may include:

- cuts to the top.
- stains to the fabric.

Damage to a fabric convertible top has few repair recommendations. For example, a:

- cut or slashed top generally requires fabric replacement. Sewing the fabric may not be

- practical as it would leave a visible mark.
- stained top can be cleaned with soap and water if it is a fairly mild stain. For more aggressive stains, one vehicle maker, GM, recommends Armor All OxiMagic Carpet and Upholstery Cleaner. However, some stains, such as paint, may not be cleaned, requiring replacement of the fabric.

### Slashed Tires



*Tires that are punctured on the sidewall are not repairable.*

Slashed tires are tires that have been intentionally punctured through various methods such as:

- knives and ice picks.
- cut valve stems.

Whether or not the tire can be repaired depends on the cut location. For example:

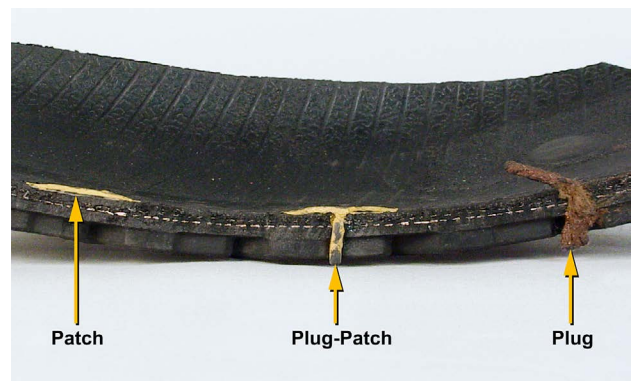
- sidewalls are not repairable due to safety concerns.

- the tread area may be repairable depending on the size of the puncture.

All four tires should be checked. If one is damaged, there may be damage to others.

Also, for vehicles equipped with tire pressure monitoring systems, the system sensor on the wheel should be checked to make sure it was not damaged. Sensors can be damaged if the valve stem is cut, or damaged from the flat if the sensor is crushed by the weight of the vehicle.

To verify that the tire pressure monitoring system is still functioning, turn the vehicle on and make sure the tire pressure monitoring system warning light is off. Tire pressure warning systems were mandated on vehicles sold in North America as of model year 2009.



*Do not use a tire plug when repairing tires.*

Tire repairs are limited to:

- a two-piece plug and repair method or a one-piece / plug

combination repair method. Tire plugs should not be used alone because they do not seal the inner liner and will void the tire warranty. Also, do not use a patch only to repair a puncture.

- punctures that are 1/4" or smaller.

When repairing punctured tires, always remove the tire and inspect the inner tire liner. Never use an inner tube for a tire repair.

Plug-patches:

- keep the inner tire liner sealed. If the inner liner does not stay sealed, the tire can separate from the inside.
- maintain the speed rating of a tire. This can be done using a special speed rated plug-patch.

All four tires that have been slashed with very little tread on them may raise a red flag for potential fraud.

### **Module Wrap-Up**

Topics discussed in this module included:

- an overview of different types of vandalism.
- vehicle fluid contamination and repair options.
- finish issues as a result of vandalism.
- vandalism damage to the vehicle interior and repair considerations.

# *Module 2 - Theft Analysis*

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## Automotive Theft

Learning objectives for this module include:

- identify commonly stolen vehicles and parts
- determining the difference between theft and prior damage.
- identifying potential fraud indicators.
- identifying items typically damaged on stolen vehicles.
- identifying damage to electronics, both factory installed and aftermarket.

Top 10 US Insurance Theft Losses For 2007 – 2009	U.S. Cities With Most Stolen Vehicles Per Capita
1. Cadillac Escalade	1. Laredo, TX
2. Ford F-250 Crew 4WD (08 / 09)	2. Modesto, CA
3. Infiniti G37 2-door (08 / 09)	3. Bakersfield, CA
4. Dodge Charger HEMI	4. Stockton, CA
5. Chevrolet Corvette Z06	5. Fresno, CA
6. Hummer H2 4WD	6. Yakima, WA
7. Nissan Pathfinder Armada	7. San Francisco / Oakland, CA
8. Chevrolet Avalanche 1500	8. Visalia / Porterville, CA
9. Chevrolet Silverado 1500 Crew	9. Las Vegas, NV
10. GMC Yukon	10. Albuquerque, NM

*Shows the top 10 insurance theft losses for 2007-2009 and the U.S. cities with the most stolen vehicles per capita.*

The top 10 US insurance theft losses for 2007 – 2009 include the following vehicles:

1. Cadillac Escalade
2. Ford F-250 Crew 4WD (08/09)
3. Infiniti G37 2-door (08/09)
4. Dodge Charger HEMI
5. Chevrolet Corvette Z06
6. Hummer H2 4WD

7. Nissan Pathfinder Armada
8. Chevrolet Avalanche 1500
9. Chevrolet Silverado 1500 Crew
10. GMC Yukon

This list is provided by the Insurance Institute for Highway Safety.

It is important to note that these vehicles are not the most common vehicles stolen. This figure is in relation to claims filed, and what the industry is most likely to see repaired in the even of a theft recovery. The most popular vehicles stolen in the US include the following:

1. 1994 Honda Accord
2. 1995 Toyota Camry
3. 1989 Toyota Camry
4. 1997 Ford F-150 Pickup
5. 2004 Dodge Ram Pickup

U.S. cities with the most stolen vehicles per capita include:

1. Laredo, TX
2. Modesto, CA
3. Bakersfield, CA
4. Stockton, CA
5. Fresno, CA
6. Yakima, WA
7. San Francisco/Oakland, CA
8. Visalia/Porterville, CA
9. Las Vegas, NV
10. Albuquerque, NM



*Catalytic converters are often stolen for their high scrap value.*

Common stolen vehicle items include:

- catalytic converters, which are often sold to scrap yards for the precious metals. High-ride vehicles, such as trucks and SUVs, are often targeted, as it is easy to get underneath the vehicle for removal.
- airbags. There are over 75,000 airbags stolen every year, which cost the industry approximately \$50 million. Several initiatives are currently underway to curtail the installation of stolen airbags for collision repairs.
- vehicle maker emblems.
- wheels. Even wheels with locking lugs can be stolen. Tools are easily available to those with the knowledge of how to remove them and the proper contacts for accessing the tools.
- hubcaps.
- high-intensity discharge headlamps.

Thieves can be aware of market demands. For this reason, some vehicles may

be stolen for specific parts, taken to a location where the parts are removed, and then towed or driven to a remote area where the vehicle is abandoned.



*Thieves often break the side glass when looking to gain access to the vehicle interior.*

One of the more common types of theft is the smash and grab, where windows are broken to quickly retrieve items inside, such as:

- iPods / MP3 players.
- computers.
- portable navigation systems.
- DVD players.
- phones.
- purses.
- radar detectors.

Generally, items that are stolen are easy to remove and / or have a high dollar value.



Factory stereos are often integrated with other controls and coded so that contact with the vehicle maker must be done to re-activate the stereo.

In-dash items, such as factory-made stereos, are not as popular to steal as they once were and are rarely stolen. Factory-made stereos:

- often require specific codes from the vehicle maker to re-activate once removed.
- are difficult to remove from the dash.



Aftermarket stereos are stolen more often since they do not require a factory code to enable them.

Aftermarket stereos are much easier to steal compared to factory parts and do not always require special codes to

reactivate. They are also easier to remove from the dash, as they are not secured as well as factory equipment. Most can be removed by releasing clips inside the dash housing.

Other aftermarket electronics commonly stolen include:

- speakers.
- custom TVs.

During damage analysis, to verify that the vehicle was indeed equipped with certain electronics, there are steps that can be taken for validation. This includes:

- checking for a wiring harness that would match the description of part that was stolen.
- asking the vehicle owner for receipts, an owner's manual, or original packaging for proof of ownership.
- if it is dealer-installed equipment, verifying with the dealership records.

A common indication that a navigation system was in the vehicle is the presence of a suction cup ring on the windshield. The downside of this marking is that it also is a clue for thieves looking to determine if there is a navigation system inside the vehicle.



Wiring may provide an indication that a vehicle is equipped with an aftermarket stereo.

Other items that can be used to verify that a vehicle was equipped with specific electronics include checking for permanent installation items such as:

- an inline fusible link.
- a permanent fixture that holds the stereo.
- wiring to an amplifier.
- larger gauge speaker wire.
- part specific mounting brackets, such as those used for a subwoofer.
- aftermarket brackets attached to the interior of the car or holes left from self-tapping screws.
- evidence of an adapter plate in the radio opening. It is also recommended to check the vehicle build sheet, if it is available, to see what options were included from the factory.

It is also recommended to check the vehicle build sheet, if it is available, to see what options were included from the factory.



Refer to Module 2, "Video: Break-In Theft Damage Analysis" in the presentation. This video on analyzing vehicle damage, missing parts, and personal property following a break-in.

This I-CAR training course has been design to identify potential indicators of fraud and the issues related to damage analysis that may warrant additional investigation. I-CAR is not in the position to recommend how situations that might involve an element of fraud should be handled. The investigation and handling of these situations is a highly sensitive matter, and one which must respect the relationship, rights, and obligations that exist between an insurer and its customers. All situations that involve potential indicators of fraud and related damages should be handled according to the policies, practices, and procedures of the insurance company involved.



Vehicles can be vandalized by the owner to total the vehicle.

Fraud is an unfortunate reality of the claims industry. There is a small percentage of vehicle owners that intentionally vandalize their vehicle in order to receive insurance compensation. Industry statistics show that 10% of all insurance industry losses are related to fraud.

Common reasons fraud may occur include the customer is looking to:

- total the vehicle.
- increase repair amounts.
- receive cash to cover deductibles.

While it is not recommended to go into every claim suspecting fraud, it is important to be able to identify the common signs of fraud. Some of these signs include:

- vague or inconsistent details regarding the claim.
- physical indications not consistent with the claim.



Electronic items that are unplugged may be an indication of fraud.

Inspection items that may raise red flags with regard to fraud include:

- a clean vehicle. Thieves are typically not worried about cleanliness.
- items that are unscrewed from their mounting with the screws or bolts on the floor. Most theft items are torn out with little regard for appropriate removal methods or making sure there is no damage to adjacent parts.
- wires that are unplugged. In most situations, a thief will cut the wires as it takes considerably less time.

It is important to note that these are simply items to consider. Fraud is a delicate issue that must be handled following specific company policy.

## Total Vehicle Theft



*This vehicle was brought to an area where it was disassembled for parts, then dragged to a remote spot and abandoned.*

Instead of breaking in and stealing parts of the vehicle, some vehicles are stolen and:

- driven somewhere and disassembled for parts.
- taken for joy rides, where thieves take the vehicle for short periods of time and then abandon it. These types of theft are typically recovered within 30 days.
- often driven very hard, which can cause damage to the brakes, motor, or transmission.
- stolen for personal use.



*Initial inspection requires looking over the entire vehicle, not just obvious areas of damage.*

When doing an initial inspection following a theft recovery, it is important to:

- look for vehicle damage beyond the obvious areas of damage.
- determine how the vehicle was entered and started. If equipped with an alarm system, determine how the system was bypassed. Check for cut battery cables, as this could be an indication of how the alarm was bypassed. This is also recommended for break-in thefts.
- look for missing items from the interior.
- verify that the license plates are still on the vehicle. License plates can be stolen and reattached to another vehicle for the purpose of committing crimes.
- make sure the vehicle registration stickers are still on the license plates. These can be taken off and reattached to another plate.



*Fluid levels should be checked during damage analysis to ensure proper levels or that the fluid color looks normal.*

The entire vehicle should be inspected for damage including checking the:

- fluid levels such as coolant, brake fluid, power steering fluid, etc.
- underbody, looking for damage that may have occurred from riding over rough terrain, potholes, curbs, etc.
- exhaust, making sure there is no damage to the muffler, catalytic converter, or exhaust pipes.
- suspension, which can be damaged from hard driving or driving on rough road surfaces at high speeds.



*Damaged door handles or ignition cylinders are indications that the vehicle was forcefully accessed and driven.*

Gaining vehicle access is one of the first steps in stealing a vehicle. The common methods include accessing lock cylinder on doors, or working windows down or pushing them to the side to access the vehicle lock mechanism. Therefore, items commonly damaged during vehicle access include:

- door handles and areas around the door handles that can become scratched from pry tools such as ice picks and screwdrivers.
- door lock cylinders.
- broken ignition cylinders.
- weatherstripping and belt moldings.
- door frames, which can be bent from being pulled out to access the door locks.
- broken window regulator. Sometimes thieves will push the window down hard and snap the retainer clips to the glass.

In some instances, the vehicle may be stolen by towing the vehicle away. In this instance, it's necessary to check for damage at jack points or towing points. Thieves rarely take the time to ensure the vehicle is properly attached before hauling it away.

When stealing vehicles, generally, the thieves prefer to keep the window intact so they do not have to sit on the glass while driving. Some may punch out the vent window, as that would tend to fall on the floor, however, this missing piece of glass may be an indication to police that the vehicle was stolen.



*During joy rides, thieves will often leave a lot of trash in the interior, which can damage the upholstery and carpeting.*

When analyzing a theft recovery, common interior damage includes:

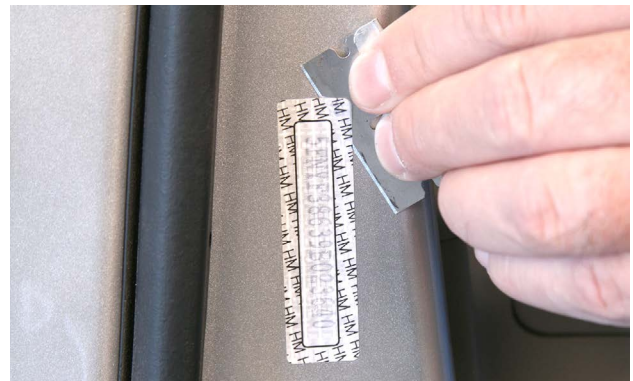
- cigarette damage such as burns in the seat or carpeting, and cigarette smoke damage.
- cut up interior parts such as seats, trim, and the headliner.
- human waste.
- garbage.
- stains.
- broken arm rests.



*Rust always provides the best indication of previous damage.*

As with traditional collision damage, it is important to differentiate between pre-existing damage and damage related to the claim. This requires looking for clues to previous damage, such as:

- signs of age (corrosion).
- consistency to the damage. For example, minor damage to a panel that is not adjacent to where the majority of damage, it is possible that it is not related to the claim. However, it is difficult in most cases to say for sure. Asking the claimant is generally the only way to verify.
- checking for prior claims.



*Thieves may remove VIN labels and re-attach them to stolen parts or simply remove them so the part is not traceable.*

For recovered theft, it is important to check the VIN plates to make sure that they were not:

- altered.
- removed.



To verify the vehicle has the proper VIN:

- check the multiple VIN locations on the vehicle, such as the door jamb or trunk floor.
- make sure all VIN labels have the same number.

To help with VIN tracking, the government developed the Motor Vehicle Theft Law Enforcement Act. This act:

- requires manufacturers of designated high-theft passenger vehicle lines to put the VIN on the engine, the transmission, and 12 major body parts such as fenders, doors, hoods, etc.
- has a national database created to trace parts.

The National Insurance Crime Bureau (NICB) is a source that can be used to verify VIN number authenticity.



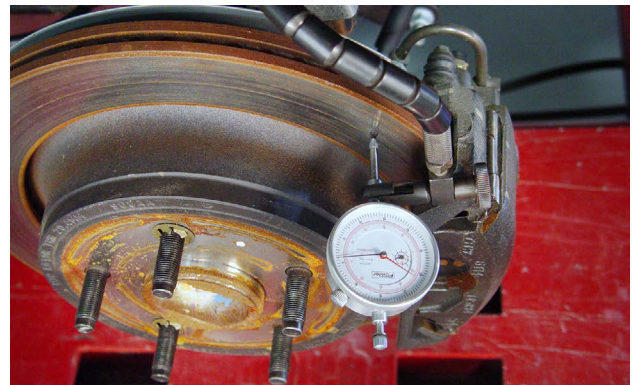
When writing an estimate, check the dash lamps that may indicate problems with the vehicle, such as this oil pressure lamp.

When analyzing the drivetrain following a theft recovery, check for signs of an abused engine (overheating). This may include:

- a low engine oil level.
- having an engine oil analysis performed to make sure there are no metals or additives present in the oil. Harsh metals can lead to engine wear problems.
- engine knock.

The clutch or transmission should be checked for damage that can occur from dropping the vehicle into reverse at higher speeds.

For a thorough damage analysis, the underside of the vehicle should be checked for damage. If damage is suspected, a lift may be required for a closer inspection.



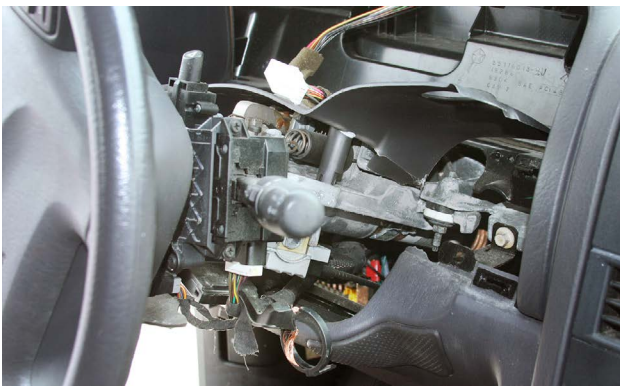
If brake problems are suspected, brake rotors may be checked by a technician for possible warpage.

Brake abuse is also very common with theft recovery. Hard driving, brake stands, fast starts and quick stops can lead to:

- worn pads and warped rotors not consistent with normal use.
- pads that are worn to the rivets.

It is also important to look for signs of excessive heat on the pads and rotors. This may be indicated by discoloration and / or warping of the rotor.

Driving with the parking brake partially on will cause rear brake overheating, but no indicators of damage to the front brakes. For this reason, be sure to inspect both front and rear brake systems.



*Starting the vehicle without a key often requires breaking the ignition housing.*

Steering column damage occurs from thieves trying to remove the lock cylinder. Lock cylinders are removed from the housing by:

- chiseling out the cylinder.
- using a special tool to pull out the lock cylinder.

A screwdriver, pliers, or other custom tool can then be used to turn the ignition over and start the vehicle. This damages the

ignition and requires the steering column to be replaced or rebuilt.



*Instrument panels may be stolen on vehicles that were stripped for parts.*

When analyzing theft recovery, check for damage to the instrument panel. This includes:

- damage from aftermarket radio removal.
- damage from vandalism, such as cuts, tears, stains, etc.
- broken plastic on the instrument cluster.
- fingerprint powder residue, which will need to be removed. This may be located throughout the vehicle.



Check the wheels for signs of damage. This type of damage is often consistent with hard driving.

When analyzing theft recovery, check the tires and wheels for:

- excessive tire wear.
- tire wear spots.
- gouges or wear in the tire sidewall.
- scuffed, dented, or gouged wheels.
- damaged or missing hubcaps.

Also, check the spare tire to make sure it is still in place.

### Theft And Fraud



It may be helpful to check previous claims on a vehicle when estimating damage.

Indications of possible fraud regarding vehicle theft include:

- multiple accidents with no repair, or the owner has multiple deductibles.
- signs of previous damage.

One method that may be used to determine possible fraud is to look at digital images captured from a previous estimate and compare those images with the current claim.



This vehicle had the door lock punched out. This is a sign that the vehicle was broken into.

Other indications of possible fraud regarding vehicle theft include no signs of forced entry. Typically there is a broken ignition, broken lock cylinder, and damaged door handle, door frame, or door glass.

However, vehicle jacking always remains a possibility, and with that type of crime, there are no signs of forced entry. For this reason, it is important to verify the vehicle condition with the claimant testimony and police report.

### Module Wrap-Up

Topics discussed in this module included:

- commonly stolen vehicles and parts.
- the difference between theft and prior damage.
- potential fraud indicators.
- items typically damaged on stolen vehicles.
- identifying damage to electronics, both factory installed and aftermarket.

*Module 3 - Analyzing  
Damage From  
Natural Causes*

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## Hail Damage

Learning objectives for this module include:

- identifying hail damage.
- determining repair options for hail damage.
- identifying wind damage.
- determining lightning damage indicators and repair issues.
- identifying infestation and analyzing potential damage.



*Weather-related damage that can damage vehicles include lightning, hail, and wind-blown objects.*

Types of weather-related vehicle damage include:

- hail.
- wind.
- lightning.

Floods are also a very common type of weather related damage. However, flood damage is covered in a separate I-CAR course.



*Hail often damages horizontal panels the most.*

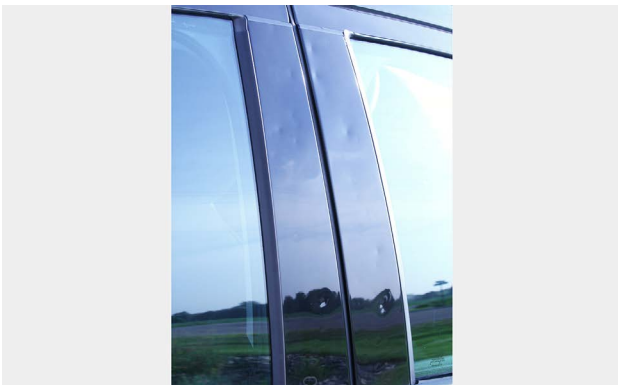
When identifying hail damage compared to other types of damage:

- hail damage looks similar to door dings, but is more often found higher on the panel.
- hail dents generally do not damage below the crown of the panel. However, this is not a hard rule. Extreme wind can drive hail into all areas of a panel. If this is the case, the hail damage is generally only on one side of the vehicle. Also, damage may be on both sides of the vehicle if the driver makes turns into the wind or away from the wind.
- hail generally does not chip paint. It will be a smooth dent with no breaks in the finish.
- if hail falls on the panel edges, such as the front of the roof that meets the windshield, the paint film may crack.

If panels have been refinished, it is possible that the refinish will not handle the hail as well as the original finish. This depends on the thickness of the coatings. A high film thickness may result

in possible chipping of the paint in a hail storm. For this reason, it may be necessary to measure the film thickness with a film thickness gauge to determine if the panel was previously repainted.

When analyzing hail damage, note that panels may delay the appearance of hail damage until they are heated by the sun. As the metal expands, hail damage may become more pronounced.



*Some hail-damaged parts, such as this door cladding, are often replaced rather than repaired.*

The determination to repair or replace a hail-damaged panel is based on:

- the percentage of damage to panel. If a panel has hundreds of hail dents, panel repair may simply not be feasible as the damage is too extensive. There may also be a concern about the durability of the repair.
- cost of repair versus replacing the panel. Depending on the vehicle make and model, even a panel with considerable damage may be more cost effective to repair rather than replace.

- ease of obtaining the part. If a panel is back ordered or rare, repair may be the better option. Since parts are ordered following the estimate, this may not be immediately evident, requiring a change to be made to the estimate.
- repairability of the part. Some parts, such as trim pieces, are difficult to repair, or repair cost effectively.
- ease of panel replacement. For example, replacing a hood or deck lid, which are bolt-on parts, is much easier than replacing a welded or bonded roof panel. Replacing a roof generally requires replacing and installing the windshield and backglass. Depending on the flange configuration, it may also require drilling out the top portion of the B-pillar or sail panel. It is recommended to be least invasive as possible during the repair process.



*Glass that is damaged from very large hail may be replaced before body repair to prevent interior damage from moisture.*



In some cases, especially where there was a large hailstorm that damaged many vehicles, repair time may be at a premium, requiring the customer to wait several weeks before their vehicle can be repaired. In these cases, temporary repairs may be made to make the vehicle driveable while waiting for scheduled repairs.

Types of repairs may include replacing:

- damaged headlamps or tail lamps for driveability.
- the windshield or backglass to protect the interior from further water damage.

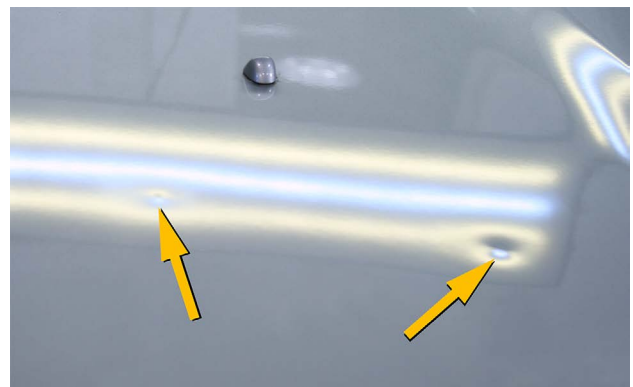


*A hammer and dolly are common tools used to make conventional repairs to damaged metal.*

Hail dents can be removed through conventional dent removal techniques using:

- a hammer and dolly. Technicians should be careful to avoid stretching the metal when using a hammer and dolly.

- heat shrinking, which requires heating the panel and quick cooling to contract the metal and reduce the size of the dent.
- stud welding, which requires welding small pins, or studs, to the panel and gently pulling on the pins systematically to remove the dent.
- body filler following initial straightening. Technicians should limit the use of filler as it may show through the finish following various heating and cooling periods.



*There should be no damage to the vehicle finish for dents to be a candidate for PDR.*

Another method of panel repair for hail damage is a process called paintless dent repair or PDR. PDR, as the name implies, does not require panel refinishing following the repair. This process removes the dent leaving the finish completely intact.

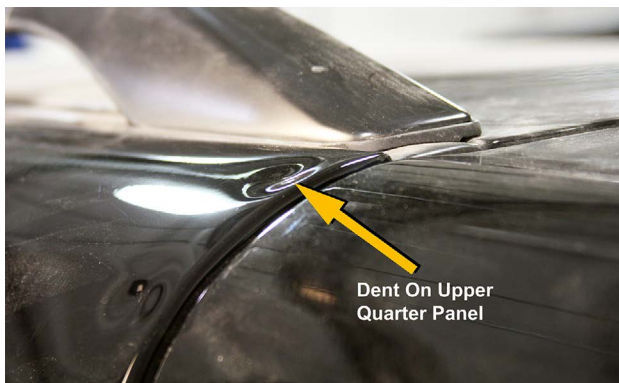
Not all hail damage is a good candidate for PDR. Hail on panel edges that cracked the finish will require refinishing. Door dings or other types of damage that have

resulted in a chipped finish also may not qualify. Additionally, some dents might have microcracking in the finish. This condition may happen on finishes that have:

- a thick finish. This is generally common on custom finishes or previous refinishes.
- been exposed to exceedingly large hail.
- an aged finish.

To check for microcracks, dye penetrant may be used. Dye penetrant is designed to seep into small cracks to highlight the crack. Magnification may be required to better see any cracks in the finish.

Even if a dent has marks, PDR techniques still may be used to remove the dent, even though refinishing is required. Using PDR in combination with conventional repairs may allow for a faster and less invasive repair to the vehicle in addition to using less filler and less primer.

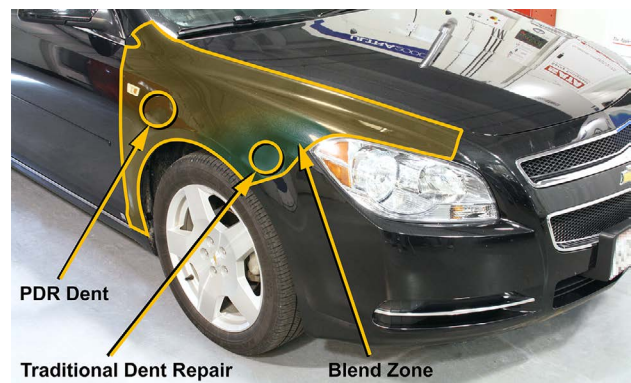


The upper quarter panel on this SUV has a dent that may not be a good candidate for PDR since it is too close to the panel edge.

When determining whether or not a dent may be repaired using PDR, it is important to consider the:

- location of the dent. If the dent is at or near a panel edge, it may not be repairable due to access.
- shape and / or size of the dent. Larger dents may be impractical. Some PDR specialists state that repairing anything larger than a credit card is not practical.
- access to the panel backside. This is required for the paintless dent repair process.
- reinforcements. Reinforcements can block access to the backside of exterior body panels, making PDR impractical.

Some dent removal companies publish charts that show where PDR can and cannot be performed.



This is an example of a combination repair option that uses both PDR and conventional repair. This type of repair allows blending to stay within the panel.

Some types of damage may allow a combination repair, which is where PDR

is used along with conventional repair methods. For example, on one panel:

- bigger dents may be repaired conventionally.
- smaller dents may be repaired with PDR.

This type of repair may allow blending to stay within a panel depending on the blend location.



*The scratching in the center of this dent makes it not a good candidate for PDR.*

Pre-existing panel condition is also taken into consideration when determining possible PDR options. These include:

- a finish that is scratched, chalked, or dull. PDR is not really an advantage when the finish is in poor condition. However, it may be useful in that some finishes may be difficult to color match. PDR would eliminate that problem.
- previous repairs. If there is body filler beneath the finish, the part cannot be repaired using PDR. Body filler will crack from the

PDR process. Check the film thickness to determine previous repair or additional paint coatings. Aside from thicker coatings from a repair, additional coatings may be added for custom finishes. These coatings may be more brittle and tend to crack from the PDR process.

- a refinish that is poor quality. For example, if the vehicle was restored and older materials were used, it is possible the finish will crack during the dent removal process. Also, if there are factory defects in the finish, such as poor application, PDR would not restore an acceptable appearance to the hail-damaged panel.



*Tools may be used to help gauge the size of dents when writing estimates.*

When viewing hail damage during the damage analysis inspection:

- indoor inspection provides better light for identifying dents. Direct sunlight can often hide smaller dents, so shade is necessary to get an accurate dent count.

- dark colors show dents better than light colors. This emphasizes the importance of using the proper lighting during the analysis process.
- a clean vehicle is helpful in seeing all the dents. A light layer of dust and dirt can hide smaller dents, and cause an inaccurate count.
- look for the smallest dents first, do not let the obvious size dents direct your perception. This may lead to missing a large percentage of damage.



*A water-soluble marker may be used to help identify the quantity and location of hail dents.*

When hail damage is being inspected:

- follow a systematic order to ensure all panels are inspected and an accurate dent count has been made.
- use water-soluble markers to highlight hail dents on the vehicle. Do not use grease pencils, as they may not be washed off adequately. It is also possible that grease pencils may bake onto the finish, damaging the clearcoat.

- it is helpful to view each panel from multiple directions. Different viewing angles provide different lighting that may better identify hail damage.
- using a squeegee over a wetted panel can help identify depressions in the panel, as they will remain filled with water.

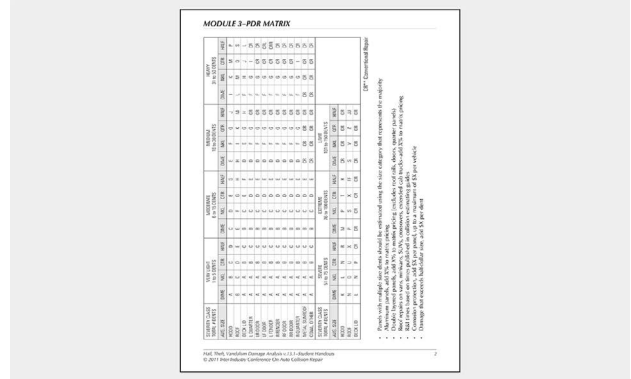


*A flashlight held parallel and close to the panel can help identify hail dent locations.*

When hail damage is being inspected:

- reflection is key, especially for taking digital images. Using a striped or checked board can help highlight depressions in the panel surface. This only works on a gloss finish.
- lighting can help highlight dents. Lighting angles can cast shadows into panel depressions. Some technicians carry a small LED light to assist during inspection, using various angles to see the dents.
- reference tools may be used to identify dent size.

A reference tool may be used that is specially designed to determine hail dent size for damage analysis purposes. This tool includes various sized discs that are designed to cover the entire area of damage. The disc size may be used to determine repair costs when compared to a specific reference chart or cost matrix. These discs are commonly the size of a dime, nickel, quarter, and half dollar. While not used every time to estimate damage, these discs may be used when starting out to identify damage size.



Refer to "Demonstration: PDR Matrix" for an example of a PDR matrix that is commonly used in the field to estimate hail damage.

SEVERITY CLASS TOTAL # DENTS	VERY LIGHT 1 to 5 DENTS				MODERATE 6 to 15 DENTS				MEDIUM 16 to 30 DENTS				HEAVY 31 to 50 DENTS				
	AVG. SIZE	DIME	NICKEL	QUARTER	HALF	DIME	NICKEL	QUARTER	HALF	DIME	NICKEL	QUARTER	HALF	DIME	NICKEL	QUARTER	HALF
HOOD	A	B	C	D	C	D	E	G	E	F	G	J	I	K	M	P	
ROOF	B	C	D	E	E	F	H	H	I	K	M	L	M	U	S		
DECK LID	A	A	B	C	B	C	E	F	D	E	G	H	H	J	L		
L QUARTER	A	A	B	C	B	C	D	E	D	F	G	CR	F	G	I	CR	
LR DOOR	A	A	B	C	B	C	D	E	D	F	G	CR	F	G	CR	CR	
LF DOOR	A	A	B	C	B	C	D	E	D	F	G	CR	F	G	CR	CR	
L FENDER	A	A	B	C	B	C	D	E	D	F	G	CR	F	G	CR	CR	
R FENDER	A	A	B	C	B	C	D	E	D	F	G	CR	F	G	CR	CR	
RF DOOR	A	A	B	C	B	C	D	E	D	F	G	CR	F	G	CR	CR	
RR DOOR	A	A	B	C	B	C	D	E	D	F	G	CR	F	G	CR	CR	
R QUARTER	A	A	B	C	B	C	D	E	D	F	G	CR	F	G	CR	CR	
REAR BUMPER	A	A	B	C	B	C	D	E	D	F	G	CR	F	G	CR	CR	
CDVAL OTHER	A	A	B	C	B	C	D	E	D	F	G	CR	F	G	CR	CR	

SEVERITY CLASS TOTAL # DENTS	SEVERE 51 to 75 DENTS				EXTREME 76 to 100 DENTS				LIMIT 101 to 150 DENTS				
	AVG. SIZE	DIME	NICKEL	QUARTER	HALF	DIME	NICKEL	QUARTER	HALF	DIME	NICKEL	QUARTER	HALF
HOOD	K	L	R	M	P	T	X	CR	CR	CR	CR	CR	CR
ROOF	N	Q	U	X	P	S	X	FF	S	V	Z	JJ	
DECK LID	L	N	P	CR	CR	CR	CR	CR	CR	CR	CR	CR	CR

CR\*\* Conventional Repair

- Panels with multiple size dents should be estimated using the size category that represents the majority
- Aluminum panels, add 3% to matrix pricing
- Double layered panels, add 3% to matrix pricing (excludes roof rails, doors, quarter panels)
- Roof repairs on vans, minivans, SUVs, crossovers, extended cab trucks-add 3% to matrix pricing
- R&I times based on times published in collision estimating guides
- Corrosion protection, add \$X per panel, up to a maximum of \$X per vehicle
- Damage that exceeds half-dollar size, add \$8 per dent

A PDR matrix is used to help write estimates for paintless dent repairs.



If a hood is being repaired, hood insulation removal may be added to a PDR estimate.

A chart has been created by several insurance companies and PDR professionals to help assist in determining the cost of PDR relative to:

- damage location.
- dent quantity.
- dent size.

The chart is broken into seven different categories, from "very light" to the "limit" which is the maximum amount of dents that are addressed. The chart is also categorized by damage location.

Items that may be added to the PDR estimate include:

- part removal. To access the backside of the dents, parts may require removal.
- airbag deactivation. Some side airbags are located along the roof rail, which may limit access to the roof panel or roof rail.
- sheet metal design. Some designs make it more difficult to access the backside of hail dents and

can increase the amount of time required for the repair.

- corrosion protection for the panel backside.
- damage that exceeds the half dollar size.
- roof repairs for certain vehicles, such as minivans, SUVs, and extended cab pickup trucks.



*The tail lamp mounting area is a common location used to access the backside of the quarter panel.*

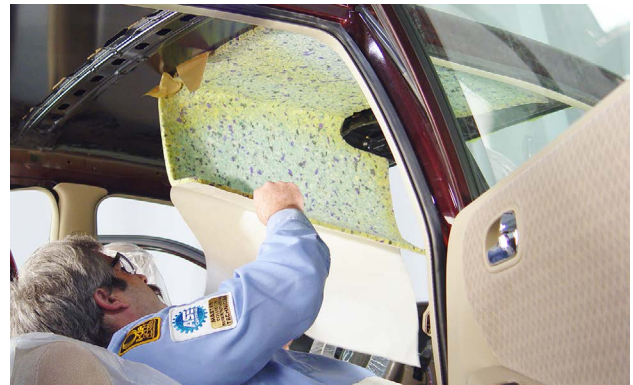
To access the backside of panels, there are a number of access holes in the vehicle structure that can be used. Some of these include:

- headlamp (fender) and tail lamp (quarter panel) assembly mounting areas.
- A-pillar, at the leading edge of the front door (fender area).
- under the hood with the insulation removed.
- factory plug holes.

Other parts that may require removal include:

- interior trim.
- window regulators.

Note that there are airbag sensors contained in some doors. This may require airbag deactivation before performing PDR work.



*Headliner sound insulation may require removal if the roof is being repaired using PDR.*

The roof panel also requires adjacent parts to be removed to access the panel backside. This may require removal of the:

- hatch, luggage rack, and sunroof.
- headliner.

#### **Personal Safety**

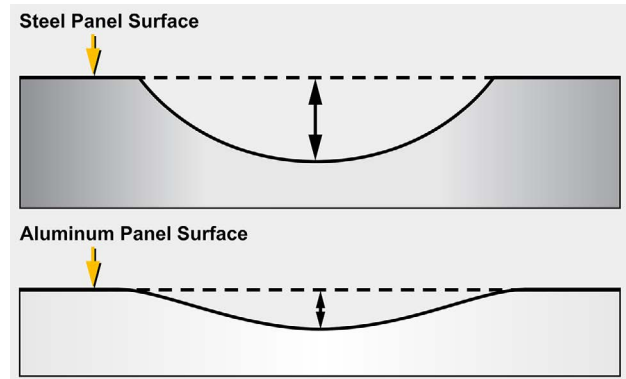
If doing PDR on a roof rail, note that some vehicle designs have side curtain airbags in this area. For this reason, some vehicle makers may require disabling the airbag system before removing the headliner assembly.



Access holes should NOT be drilled for PDR.

Some limitations or considerations for PDR repair include:

- do not drill access holes. If holes must be cut to access the panel backside, PDR is not an acceptable option. Adding holes to a structural part can alter the structural integrity of the vehicle, creating collapse zones where none were intended.
- no foams should be removed. It would be difficult to reinstall foams in many situations.
- other parts should not be damaged during the dent removal process. An example of this may include elongating an access hole by placing pressure on it during the dent removal process.
- the finish may be damaged during dent removal.



Aluminum hail dents are generally shallower than the same dents in steel.

Aluminum PDR is slightly different when compared to steel. Some notable differences include aluminum:

- dents are shallower than steel dents, as they resist impacts better than steel.
- panels may have less damage compared to steel because of the higher impact resistance. So it is possible that on the same vehicle, an aluminum hood will have less damage compared to the steel roof.
- has less metal memory than steel.



Heat may be used to soften aluminum panels before PDR is performed.

When working with aluminum panels:

- PDR requires different repair techniques.
- some PDR technicians may heat the panel to make metal more malleable. The common temperature range includes 66 - 93°C (150 - 200°F). Heating equipment includes an ultraviolet light or propane torch. If heating a panel, consider what is behind the panel so as not to damage any adhesive or foam. Overheating can damage paint, eliminating the benefit of PDR and requiring a more conventional repair.
- aluminum work hardens quicker than steel. This can cause problems during the removal process. The more a dent is worked with the dent removal tools, the less likely the dent will be completely removed.
- more time may be required to PDR aluminum if the spot becomes work hardened.



Anti-corrosion compound is applied to the PDR location to repair any scratches that may have been created.

During the PDR process, it is possible that the corrosion protection materials on the backside of the panel may be removed from the repeated scratching of the dent tool tips, even though the tips may be protected with plastic. Therefore, corrosion protection must be restored to ensure the durability of the repair.

This is recommended for most PDR repairs, as it is difficult to see if the corrosion protection was removed. It is safer to assume that the finish has been scratched and apply corrosion protection to the panel backside.

Corrosion protection to the backside is typically done by applying anti-corrosion compound.

Following PDR repairs, it may be necessary to check for microcracking after the dent removal. Any damage to the coating will require the area to be refinished.

**Service Information** Document ID: 3277979

**#99-08-51-001C: Paint-less Dent Repair Process - (Feb 25, 2013)**

**Subject:** Paint-less Dent Repair Process

**Models:** 2014 and Prior GM Passenger Cars and Light Duty Trucks with Steel Outer Body Panels

**This bulletin is being revised to add the 2013 and 2014 model years. Please discard Corporate Bulletin Number 99-08-51-001B (Section 08 - Body and Accessories).**

The process of removing dents from vehicles without painting has been around for many years. General Motors has evaluated many versions of this process. A process using special tools that allow shallow dents to be removed without drilling holes in the body, by removing components like hood insulators, tail lamps, and headlamps is recommended. This process is appropriate for the majority of panels with reasonable access to the back side of the damaged area. The special tools and procedures used with paint-less dent repair that have been developed will remove the dents while eliminating the need to fill, paint, or replace the panel.

New developments in this technology have also made dent removal possible in areas where there is minimal or zero access to the back side of the panel by use of "glue stick" dent removal. From the outside of the panel, adhesive material is placed over the dent, allowed to cool and the dent can be pulled back to its original contour without paint damage. Common areas for "Glue Stick" dent removal are roof rails, pickup box bed rails, roof skin near stationary glass, etc. This process requires no drilling of holes or removal of vehicle components for access. These types of repairs will eliminate concerns about paint and factory corrosion durability and significantly reduce repair and disclosure amounts. This type of procedure has been thoroughly evaluated and the repaired parts were tested for negative impact. No negative impact was found.

**Important:** The removal of structural components or drilling of holes in any panel is not recommended and may void the General Motors Corrosion Warranty.

**Evaluating Damage**

**Note:** Paint-less dent repair should be used for both warranty "out dent" repair and transportation damage where damage type code "14- dented no paint damage" is used on the delivery receipt. Dents which exceed severity code 3-Damage over 3 inches (8 cm) up to and including 6 inches (15 cm) in length/diameter may still require conventional paint repairs.

General Motors has a published position on the use of paintless dent repair.

Many vehicle makers approve of the use of PDR to repair. Others do not have a



specific statement about PDR. Those that do include:

- General Motors. GM's position on paintless dent repair is explained in TSB number 99-08-51-001A.
- Toyota. Toyota has published a Collision Repair Information Bulletin (CRIB) #146, that provides Toyota's position on PDR and recommendations for its use.
- Chrysler.

Most vehicle makers allow PDR, but do not have a formalized position statement on when and how PDR should be performed.



Refer to Module 3, "Video: Paintless Dent Repair" in the presentation. This video discusses tools and techniques used to perform paintless dent repair.



*Glass that is damaged from hail is not repairable. The damage pulverizes the glass at the point of impact, making repair impossible.*

When analyzing glass damage:

- hail size is directly related to damage. Hail storm damage, unless severe, generally does not damage laminated glass.
- hail does not create repairable damage such as a bull's eye, starbreak, or crack. Large hail typically results in a smash-type damage that is not repairable.
- pit marks are often caused by every day driving, not hail.



*Convertible tops that are older or damaged by ultraviolet rays are more susceptible to hail damage.*

Convertible tops are also susceptible to hail damage. Depending on the size of the hail stones, damage may include:

- rips.
- tears.
- puncture.

Possible convertible top repair options include:

- sewing seams.
- replacing fabric.
- repair or replacing the frame.
- replacing the back window.

The older the top, the more damage that may occur. This is due to degradation of the fabric that can occur over time from weather and UV exposure.



*Hail fraud is often made using a golf ball and a sock, however, this combination leaves a residue and an imprint behind.*

With regard to hail, common fraud indicators include:

- rounder dents common with a golf ball or ball peen hammer.

- residue from material such as a sock embedded into the finish.

Compared to these, natural hail:

- has a slightly steeper dent with no creases.
- dents do not have paint transfer or scratches, usually a consistent size, but that can vary.

It is also recommended to verify that a hail storm actually occurred.



*Look for inconsistency with hail damage. Generally, there is not a pattern to hail damage.*

Other fraud indicators include:

- damage on all panels and sides. Often, hail damage is directional, meaning that it is typically on upper panels (hood, roof, deck lids) and side panels on one side of the vehicle.
- dents to metal panels but not on chrome or belt moldings.
- an even dent pattern. Hail falls on random points of the vehicle. There is no specific pattern to hail damage. Specific patterns may be an indication that the damage is not hail related.

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If your company is a subscriber and you need to request user authorization, please complete the [Access Authorization Form](#).

**For Law Enforcement Users:**  
To request user authorization and for all other questions, please contact the NICB by calling 1-800-447-6282, or by e-mail at: [techsupport@nicb.org](mailto:techsupport@nicb.org).

**For companies interested in information on the Child Support Lien Network (CSLN):**  
Follow the link to the [CSLN website](#).

**For all other questions regarding ISO ClaimSearch:**  
Please contact ISO ClaimSearch Customer Support at 1-800-888-4476, or by e-mail at: [nlsupport@iso.com](mailto:nlsupport@iso.com).



**ISO ClaimSearch**  
ISO ClaimSearch is the only comprehensive all-claims database and system for claims processing and fraud detection — serving property/casualty insurers, self insured organizations, TPAs and many state workers compensation insurance funds.

The Insurance Service Office (ISO) provides background information for specific vehicles.

Fraud may be difficult to prove, even when suspected. One tool used to help determine if there have been previous claims on a vehicle includes checking Insurance Service Office (ISO) reports. Prior damage is not covered under new policies.

The ISO:

- is a data collector.
- services the insurance industry specifically.
- has a portion of the business devoted to auto claims information.
- needs information about the claim and zip code and / or VIN to retrieve the required data.
- can find the size, cause, and amount of a previous loss.

## Wind Damage

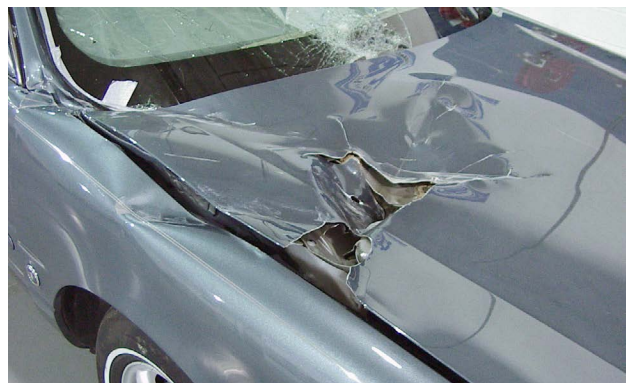


Falling trees are common sources of wind-related damage.

High winds can cause vehicle damage. While the wind does not cause the damage itself, it commonly occurs from falling objects, such as:

- tree limbs.
- home roofing materials.
- miscellaneous flying debris, essentially anything that can fall or become a projectile from high winds.

Wind damage is often directional, similar to hail damage.



The roof panel on this vehicle was crushed due to falling storm debris.

Common methods of repair from wind-related damage include:

- structural repairs, depending on the extent of damage. For example, a tree falling on a vehicle can damage the upperbody structure where the A-pillar, B-pillar, or upper rail may require straightening or replacement.
- dents and dings in the panels, which may allow PDR or conventional dent removal techniques.
- refinishing.
- suspension repair that may occur from heavy objects falling on a vehicle.



*Wind-blown sand has scarred the headlamp lens on this vehicle.*

Another type of damage that is more common in the desert regions is wind-blown sand. Blowing sand can create a sandblasted-type damage on a vehicle that can affect the:

- finish, which can etch / scratch the clearcoat if not deeper.
- trim.
- chrome.
- headlamps
- wheels.

Some storms have been known to damage the windshield. Sand storm damage can cause sand to blow through the crankcase breather tube into the oil crank case. Generally, damage cannot simply be repaired by applying clearcoat. Most times, the finish must be sanded and reapplied.

### Lightning



*Lightning strikes on a vehicle, though uncommon, can occur.*

Lightning is essentially a large spark of electricity that can reach over eight kilometers (five miles) in length, raise the temperature of the air by as much as 27,700°C (50,000°F), and contains a hundred million electrical volts. These strikes, many of which go cloud to ground, occur about 22 million times per year in the United States.

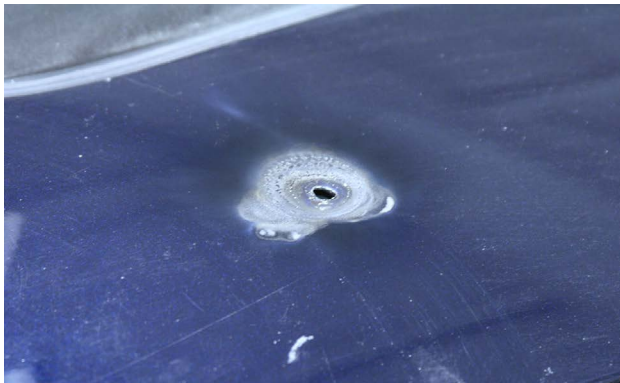
There are also approximately 246 million registered vehicles in the United States. The odds of a lightning bolt striking a vehicle or striking near a vehicle are good, but a rarity to witness.

Lightning causes damage in one of two methods, including:

- a direct strike.
- electromagnetic induction (EMI).

A direct lightning strike to a vehicle is difficult to determine. Generally, there are no large areas of damage that occur to the vehicle structure. Often the damage shows up as a small puncture in the metal.

A lightning strike near a vehicle may cause damage in the form of electromagnetic induction or EMI. EMI can travel hundreds of feet and cause damage to automotive electronics.



*Lightning generally strikes the higher points of a vehicle.*

For direct strikes to the vehicle, note that lightning:

- strikes the highest points on a vehicle. This is generally the roof or antenna.
- may cause the antenna to burn, melt, and / or bend.
- may cause the antenna mounting location to show signs of burning or melting.



*A direct lightning strike can blow a hole into the outer sheet metal of a vehicle.*

Other signs of direct damage include:

- pitting or burning on the metal.
- shattering of tempered glass.

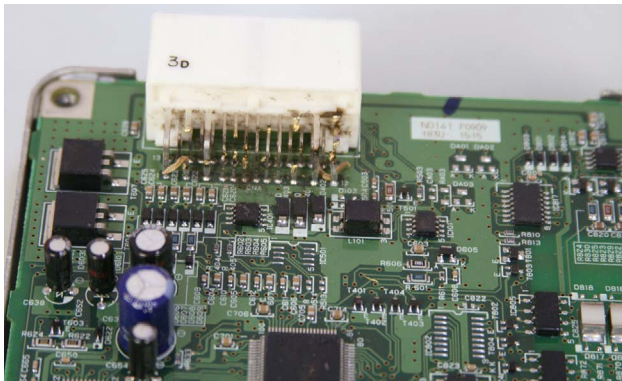
In some cases, the lightning may pass or blast through the exterior plastic panel to reach the metal beneath.



Checking vehicle malfunctioning indicator lamps is recommended to determine if there is damage to the vehicle electronics.

Lightning strikes may also occur nearby a vehicle. In these cases:

- there is no apparent physical damage to the vehicle.
- damage occurs to the vehicle electronics.
- low voltage systems are most prone to damage.



Lightning can cause damage to internal electronics, such as this burned control module.

When analyzing damage to a vehicle with possible lightning damage, it is recommended to:

- verify a thunderstorm occurred. This can be done by checking recent local weather reports. This is done to ensure it was a potential lightning strike damage, and not some other type of damage that may have affected the vehicle systems.
- verify damage to electrical or mechanical parts by turning the vehicle on and checking for malfunction indicator lights. In some cases, the vehicle may not run due to extensive damage to the electronic systems.
- determine if there is damage to more than one system. This will most likely be the case. Lightning usually affects more than one system. It is rare for only one system to be affected by EMI.
- check for evidence of burning, carbonization, or charring on circuit boards, wire connectors, or fuse box.



If lightning strike damage is suspected, check the fuse box for open fuses.

Other items to check during a lightning strike damage analysis include determining if:

- several fuses opened at once.
- multiple claims were made for vehicles parked nearby.



*Repair options may require starting with replacing the main control modules and working down to smaller sub-systems.*

During the repair process, technicians may:

- have to start by replacing the main control modules, such as the powertrain control module / engine control module (PCM / ECM). This may be necessary to just get the vehicle running.
- have to work down to smaller sub-systems, essentially working from the top down.
- call a factory representative to determine what should be repaired first after a lightning strike.

Damage cannot be determined through visual inspection alone, which makes damage analysis very difficult. It could be just a few systems that were affected by the strike, or multiple systems requiring replacement of multiple control modules. Vehicles are equipped with dozens of computers that control even more electronic systems. Until the technician gets into full diagnostics, it is impossible to know the extent of damage. Just because a vehicle has been repaired and operating properly does not ensure a long-lasting repair. Parts can be partially damaged from a lightning strike, and fail at a later time, even after repairs have been made and delivered to the customer.

### Infestation



*Underhood areas are a common place for infestation.*

Infestation can cause serious damage to a vehicle.

Common intruders include:

- mice.
- squirrels.
- rabbits.

Common infestation problems include:

- electrical issues with various systems, commonly caused by chewing through wiring harness insulation, and nesting in fuse boxes.
- nesting in heating, ventilation, and air conditioning ducts. This can block ducts, leading to heating and cooling problems.
- nesting in the engine compartment.

Infestation is more common in vehicles that have not been used for a period of time. Common types include RVs, or collector vehicles that have been in storage. It is also more common in rural areas compared to more urban areas.



*Check hole plugs to ensure rodents have not created entryways into the passenger compartment.*

Underhood may be indication of further infestation. Items damaged may include chewed:

- hoses.
- underhood insulation.

Also, the interior should be inspected to determine if there is infestation damage to the seats, carpeting, headliner, etc. Also, insulator areas, or hole plugs should be checked. Essentially, rodents are looking to gain access. Anywhere there is a possible access point covered by a rubber grommet or plug could potentially be eaten away so the rodent has access to the interior.

When inspecting a vehicle for infestation, all accessible cavities should be checked, including the trunk. If necessary, a borescope may be used to see inside panels or inside HVAC ducts without disassembly. If nests or remnants are found, the parts can be disassembled for proper cleaning.



*Cleaning up underhood infestation generally requires removing the nest and using an all-purpose cleaning solution to disinfect the area.*

Cleaning up infestation debris can be as simple as removing a nest from an engine compartment to calling in a specialist who deals specifically with cleaning biohazardous materials. It is important to determine when specialists are required. Often if the infestation includes the interior or ductwork of the vehicle,



professional cleaners are recommended. They will be properly equipped to deal with potential biohazards that accompany infestation.

With mice, one of the larger risks includes exposure to the “hantavirus.” The hantavirus is a deadly disease that is carried by small rodents such as deer mice, cotton rat, and the white-footed mouse. While not particularly common, this is a health risk that must be considered when treating infestation.

Common removal techniques include:

- removing the nest.
- vacuuming up the residue. Do not blow the material out of the affected area.
- using a recommended cleaning solution (allpurpose cleaner, bleach solution, etc.) to wipe down the area.

Other infestation health hazards include exposure to disease prone parasites, such as fleas and ticks, which often accompany rodents such as mice and rabbits.

For more information on infestation health concerns, reference the Center for Infectious Diseases (CDC) web site at the following web link: [www.cdc.gov](http://www.cdc.gov). Some repair facilities may create a list of standard operating procedures (SOPs) for working with this type of hazardous material. The SOP should outline how the facility cleans the infected areas and

personal protection equipment that is used by the cleaning personnel.

### Module Wrap-Up

Topics discussed in this module included:

- hail damage.
- repair options for hail damage.
- wind damage.
- lightning damage indicators and repair issues.
- infestation and potential damage.

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