

Hail, Theft, Vandalism Damage Analysis

Self-study Narrations



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Module 1 - Analyzing Vandalism

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Learning Objectives

People vandalize vehicles for many different reasons but it is important to know some of the different types of vandalism that are done to vehicles. It is also important to know how to write a damage report on the different types of vandalism.

Module 1 will discuss the terminology for vandalism, and how the different surfaces and fluids can be damaged or contaminated.

The 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.

Course Overview

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, and weatherrelated 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.

Two Types Of Vandalism

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 when someone damages the exterior while 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.

Fuel Contamination

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, and water. Some less common items that have been found in fuel systems include fire extinguisher residue, soda water, varnish, and paint.

Most solid contaminants do not dissolve in gasoline or diesel fuel. Typically they 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.

Obtaining A Fuel Sample

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 using the fuel from the supply line to the engine. Operate the fuel pump to gather one-half liter or one pint of fluid. Once the sample is gathered, allow the sediment to gather, if it exists.

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.

Determining Fuel Contamination

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.

In some instances, 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 if 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.

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

Wrong 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 driveability conditions and deterioration of some fuel system parts.

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. The vehicle makers may also provide specific recommendations and tools for purging the fuel system of E85 and other contaminants.

Some vehicle owners may accidentally mix gasoline with diesel, which can cause damage to emissions parts, pistons, connecting rods, fuel injectors, and other diesel engine parts that are not designed for gasoline.

Water can also contaminate a fuel system. 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.

Fuel Contamination Cleaning

To clean a contaminated fuel system, the tank must be drained and cleaned and fuel lines and filters must be clear. Also, plugged filters and fuel lines are replaced. Finally, the fuel injectors must be cleaned or replaced depending on the severity of damage. Moisture can corrode and pit newer fuel injectors.

Engine Oil Contamination

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 type of fluid to a reservoir. Improper fluid can cause damage. For example, the wrong brake fluid can disintegrate seals on some systems.

Fluid Level Tampering

Other types of vandalism include fluid level tampering. This includes vandals disconnecting or loosening the oil filter, transmission fluid plug, and coolant drain plug. As the fluid drains out, the engine or transmission locks up from overheating.

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

Finish Damage

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. However, if damage is into the basecoat or down to bare metal, the panel must be refinished.

Eggs

Eggs are commonly used to vandalize vehicles. While eggs seem fairly harmless, they can etch the 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, and even this small amount of alkalinity will damage the clearcoat. However, quick removal of the egg residue may avoid damage.

The impact of egg shells may chip or crack the finish depending on how hard they are thrown at a vehicle.

Key Scratches

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. For example, 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.

However, for deeper scratches, where a fingernail catches on the scratch, the panel will 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 one-half mil of clearcoat. This will require monitoring the finish thickness during the buffing process.

Spray Paint

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, or latex.

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

Graffiti may be able to be removed with detailing clay. Detailing clay used with a water-based lubricant can be used to remove some forms of overspray and paint on non-porous surfaces such as glass and finish. In some instances, a pressure washer may be used to remove latex-based paint.

Graffiti remover may also be either a solvent-based or water-based spray-on cleaner. 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 a hidden 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.

Miscellaneous Fluids

Other types of fluid that may be used to vandalize a vehicle include brake fluid, paint thinner, or 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.

What Custom Finish Repairs May Require

If the clearcoat scratches cannot be repaired, repair to custom finishes may require determining the refinishing process by finding documentation about the finish from the company that finished the vehicle. Depending on the damage or the type of finish, it's possible that the entire panel may have to be stripped. Unlike a traditional finish, custom finishes are difficult to blend.

Common Damage To Interior Items

Vandals that gain access to the vehicle interior can do considerable damage. Common types of damage include slashed seats or upholstery and slashed airbag covers. There are no repair options for this type of damage. The slashed airbag covers require replacement of the airbag module.

Another type of vandalism is 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.

Finally, vandalism may include stains on seats, stained or cut carpeting, or contamination from various other materials.

Torn Seat Cover Damage Analysis

Seats that are slashed may require replacement of the fabric, if it is sold separately from the seat, the seat cushion, seat cushion heaters, or the 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 depends 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.

Underhood Damage

Common items that may be damaged underhood include wire harnesses or radiator hoses, both of which can be cut.

It is rare to find underhood items that 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.

Fabric Convertible Top

Damage to a fabric convertible top may include cuts to the top and 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.

A 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.

Damage To Tires

Slashed tires are tires that have been intentionally punctured through various methods such as knives and ice picks or 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. However, 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.

Tire Repair Methods

Tire repairs are limited to patch or plug-patches on punctures that are 6 mm, or quarter inch, or smaller. Tire plugs should not be used because they do not seal the inner liner and will void the tire warranty.

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. Also, 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 Summary

Module 1 has discussed the terminology for vandalism, and how the different surfaces and fluids can be damaged or contaminated. Topics covered 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, tire damage repair and replace options.

Module 2 - Theft Analysis

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Learning Objectives

People steal vehicles for many different reasons. It is important to know how to write a damage report on vehicles that have been stolen or had parts stolen from them.

Module 2 will discuss some of the commonly stolen vehicles, some of the commonly stolen parts, and some of the potential fraud indicators.

The learning objectives for this module include: identifying 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.

Industry Statistics

Some of the top 10 U.S. insurance theft losses for 2007 – 2009 include the Cadillac Escalade, the Ford F-250 Crew 4WD, and the Infiniti G37 2-door.

This list on your screen 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 event of a theft recovery. Some of the most popular vehicles stolen in the U.S. include the 1994 Honda Accord, the 1995 Toyota Camry, and the 1989 Toyota Camry.

U.S. cities with the highest most stolen vehicles per capita include Laredo, Texas; Modesto, California; and Bakersfield, California.

Common Stolen Items

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 are also a very popular stolen item. There are over 75,000 airbags stolen every year, which cost the industry approximately 50 million dollars. Several initiatives are currently underway to curtail the installation of stolen airbags for collision repairs.

Other common items include vehicle maker emblems, wheels, hubcaps, and 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.

Smash And Grab Stolen Items

One of the more common types of theft is the smash and grab, where windows are broken to quickly retrieve items inside, such as MP3 players, computers, portable navigation systems, DVD players, phones, purses, and radar detectors.

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

Factory Stereos

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. They are also more difficult to remove from the dash.

Automotive Electronics - Aftermarket

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 and custom televisions.

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 a part that was stolen and asking the vehicle owner for receipts, an owner's manual, or original packaging for proof of ownership.

If the equipment is dealer-installed, it may be helpful to verify 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 is also a clue for thieves looking to determine if there is a navigation system inside the vehicle.

Permanent Install Aftermarket Electronics

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, or larger gauge speaker wire.

Other items include part-specific mounting brackets, such as those used for a subwoofer, aftermarket brackets attached to the interior of the vehicle, or 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.

The I-CAR Position On Fraud

This I-CAR training course has been designed 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.

General Fraud Considerations

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 a customer looking to total the vehicle, increase repair amounts, or 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 or physical indications not consistent with the claim.

Theft And Fraud Indicator Items

Inspection items that may raise red flags with regard to fraud include a clean vehicle. Thieves are typically not worried about cleanliness. Also, look for wires that are unplugged. In most situations, a thief will cut the wires, as it takes considerably less time. Items that are unscrewed from their mounting with the screws or bolts on the floor may also be an indication of fraud. Most theft items are torn out with little regard for appropriate removal methods or making sure there is no damage to adjacent parts.

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.

Stolen Vehicle

Instead of breaking in and stealing parts of the vehicle, some vehicles are stolen and driven somewhere and disassembled for parts. Others are taken for joy rides, where thieves take the vehicle for short periods of time and then abandon it, or they take it for personal use. These types of theft are typically recovered within 30 days.

When the vehicles are stolen, they are often driven very hard, which can cause damage to the brakes, motor, or transmission.

Initial Inspection

When doing an initial inspection following a theft recovery, it is important to look for vehicle damage beyond the obvious areas of damage. Also, 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.

Other inspection items include checking for missing parts or equipment from the interior. Check for the presence of the original license plate. License plates can be stolen and reattached to another vehicle for the purpose of committing crimes. Also make sure the vehicle registration stickers are still on the license plates. These can be taken off and reattached to another plate.

Initial Inspection (cont'd)

The entire vehicle should be inspected for damage. This includes checking the fluid levels such as coolant, brake fluid, and power steering fluid. Check the vehicle underbody, looking for damage that may have occurred from riding over rough terrain, potholes, and curbs. Riding over objects may damage the exhaust system, so it is important to verify that there is no damage to the muffler, catalytic converter, or exhaust pipes. Finally, check the suspension, which can be damaged from hard driving or driving on rough road surfaces at high speeds.

Damage From Accessing Interior

Gaining vehicle access is one of the first steps in stealing a vehicle. The common methods include accessing lock cylinders 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. Other areas of potential damage include door lock cylinders, broken ignition cylinders, weatherstripping, and beltline moldings. Door frames are often bent from being pulled out to access

the door locks and window regulators are broken when thieves will push the window down.

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.

Common Interior Damage

When analyzing a theft recovery, common interior damage includes cigarette damage such as burns or smoke damage, cut up interior parts such as headliners, seats and trim, human waste, garbage, stains, and broken arm rests.

Theft Vs. Prior 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, which may be indicated by corrosion, and consistency to the damage. For example, minor damage to a panel that is not adjacent to the majority of the damage, may not be 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. It may also be helpful to check for prior claims made on the vehicle.

VIN Compromising

For recovered theft, it is important to check the VIN plates to make sure that they were not altered or 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. The act also is responsible for the creation of a national database that can be used to trace parts.

The National Insurance Crime Bureau, or NICB, is also a source that can be used to verify VIN number authenticity.

Drivetrain

When analyzing the drivetrain following a theft recovery, check for signs of an abused engine, which may include a low engine oil level, engine knock, or overheating. In some instances, it may be recommended to have an engine oil analysis performed. This makes sure there are no metals or additives present in the oil. Harsh metals can lead to engine wear problems.

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.

Brake Abuse

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.

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 or pads that are worn down to the rivets.

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.

Ignition Damage

Steering column damage occurs from thieves trying to remove the ignition lock cylinder. Lock cylinders are removed from the housing by chiseling or 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 Panel Damage

When analyzing theft recovery, check for damage to the instrument panel. This includes damage from aftermarket radio removal or from vandalism, such as cuts, tears, and stains. Also check for broken plastic on the instrument cluster. During the investigation portion, fingerprint powder may have been used which leaves a residue that will need to be removed. The residue may be located throughout the vehicle.

Tires / Wheels / Hubcaps

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, and damaged or missing hubcaps.

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

Possible Indicators Of Fraud With Vehicle Theft

Indications of possible fraud regarding vehicle theft include multiple accidents with no repair, or the owner has multiple deductibles. This may be indicated by 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.

Possible Indicators Of Fraud With Vehicle Theft (cont'd)

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 Summary

Module 2 has discussed some of the commonly stolen vehicles, some of the commonly stolen parts, and some of the potential fraud indicators. Topics covered 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.

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***Module 3 - Analyzing
Damage From
Natural Causes***

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Learning Objectives

When preparing an estimate for a vehicle with damage from natural causes, it is important to know what type of damage typically happens from these natural causes. It is also important to know what the proper steps are in order to repair the vehicle.

Module 3 will discuss the damage that can occur from hail, wind damage, lightning strikes, and from infestation. This module will also cover some of the repair options to repair vehicles that were damaged from natural causes.

The 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

Types of weather-related vehicle damage include hail, wind, and lightning.

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

Hail Damage Identification

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. However, 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 refinished.

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.

Repair / Replace Hail-Damaged Panel

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.

Other factors include the 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. Another consideration may include the 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.

It is also recommended to look at the repairability of the part. Some parts, such as trim pieces, are difficult to repair, or repair cost effectively.

Finally, look at the 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 as least invasive as possible during the repair process.

Temporary Repairs

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

Conventional Dent Removal

Hail dents can be removed through conventional dent removal techniques. This may include using a hammer and dolly, heat shrinking, stud welding, or body filler, which would be used following initial straightening.

Paintless Dent Repair (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 film build. This is common on custom finishes or previous refinishes. This may also occur on panels that have been exposed to exceedingly large hail or on a finish that is aged.

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 body filler and less primer.

Paintless Dent Repair (PDR) (cont'd)

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.

Also consider the shape and / or size of the dent. Some PDR specialists state that repairing anything larger than a credit card is not practical. In addition, there must be access to the panel backside. This is required for the PDR process. In some instances, depending on the panel type, there may be reinforcements that 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.

Combination Repair

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 and smaller dents may be repaired with PDR.

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

Finish / Panel Condition Considerations For PDR

Pre-existing panel condition is also taken into consideration when determining possible PDR options. For example, a finish that is scratched, chalked, or dull may not be the best PDR candidate because 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 will also affect the ability to perform PDR. If there is body filler beneath the finish, the part cannot be repaired using PDR, as 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 may not be the best candidate for PDR. 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.

Hail Damage Inspection Tips

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. Also, 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.

When looking for hail damage, 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.

Hail Damage Inspection Tips (cont'd)

When hail damage is being inspected, follow a systematic order to ensure all panels are inspected and an accurate dent count has been made. Water-soluble markers may be used 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.

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

Hail Damage Inspection Tips (cont'd)

When hail damage is being inspected, reflection off the panel surface 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 is also a key element in highlighting hail 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.

PDR Matrix

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 and dent quantity and 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.

Additional Estimate Items for PDR

Items that may be added to the PDR estimate include part removal. To access the backside of the dents, parts may require removal. In addition, some safety systems, such as the airbag system, may require deactivation. Airbags are located along the roof rail, which may limit access to the roof panel or roof rail.

Other items that may be added to a PDR estimate include 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.

Additional items that are added to the estimate includes corrosion protection for the panel backside, damage that exceeds the half dollar size, and roof repairs for certain vehicles, such as minivans, SUVs, and extended cab pickup trucks.

Common PDR Access Points

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 and tail lamp assembly mounting areas. Common places also include the A-pillar at the leading edge of the front door, beneath the hood with the insulation removed, and factory plug holes.

Other parts that may require removal include interior trim and window regulators.

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

Roof Panel PDR Access Points

The roof panel also requires adjacent parts to be removed to access the panel backside. This may require removal of the hatch, luggage rack, headliner, and / or sunroof.

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.

PDR Limitations

One of the major limitations for PDR repair includes not drilling 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.

Additionally, no foams should be removed. It would be difficult to reinstall foams in many situations.

Other parts should not be damaged during the PDR process, such as elongating an access hole by placing pressure on it during the dent removal process.

It's also important to note that the finish may be damaged during dent removal.

PDR And Aluminum Panels

Aluminum PDR is slightly different when compared to steel. One notable difference is that aluminum dents are shallower than steel dents, as they resist impacts better than steel. For this reason, panels may have less damage compared to steel panels 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. Aluminum also has less memory than steel, so it is more difficult to return it to its original position.

PDR And Aluminum Panels (cont'd)

When working with aluminum panels, PDR requires different repair techniques. For example, some PDR technicians may heat the panel to make the metal more malleable. The common temperature range is 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.

PDR technicians will also find that 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. For this reason, more time may be required to PDR aluminum if the spot becomes work hardened.

Post PDR Repair / Inspection

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.

Vehicle Maker PDR Recommendations

Many vehicle makers approve of the use of PDR to repair. Others do not have a specific statement about PDR. Those that do include Toyota, Chrysler, and General Motors. Toyota has published a Collision Repair Information Bulletin #146 that provides Toyota's position on PDR and recommendations for its use. GM's position on paintless dent repair is explained in TSB number 99-08-51-001A.

Glass Damage From Hail

When analyzing glass damage, note that 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 bullseye, starbreak, or crack. Large hail typically results in a smash-type damage that is not repairable. Pit marks that are common on windshields are often caused by every day driving, not hail.

Convertible Top

Convertible tops are also susceptible to hail damage. Depending on the size of the hail, damage may include rips, tears, and punctures.

Possible convertible top repair options include sewing seams, replacing the fabric, repair or replacing the frame, or 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 Damage Fraud Indicators

With regard to hail, common fraud indicators include rounder dents common with a golf ball or ball peen hammer and residue from material such as a sock embedded into the finish. Comparatively, natural hail has a slightly steeper dent with no creases. Hail dents do not have paint transfer or scratches, and usually they are a consistent size.

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

Hail Damage Fraud Indicators (cont'd)

Other fraud indicators include damage on all panels and sides. Often, hail damage is directional, meaning that it is typically on upper panels, such as the hood, roof, and decklid, and side panels on one side of the vehicle. Another indicator is when there are dents to metal panels but not on chrome or beltline moldings. Finally, look for 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.

Insurance Service Office (ISO)

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

The ISO is a data collector that services the insurance industry specifically. The ISO has a portion of the business devoted to vehicle claims information. To access ISO information, they need information about the claim and zip code and/or VIN to retrieve the required data. Generally they can find the size, cause, and amount of a previous loss.

Causes 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, and miscellaneous flying debris, essentially anything that can fall or become a projectile from high winds.

Wind damage is often directional, similar to hail damage.

Wind Damage Repairs

Common repairs from wind-related damage include structural repairs, or even suspension 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.

Wind-related damage can also cause dents and dings in the panels, which may allow for PDR or conventional dent removal techniques. Some wind-related damage may require refinishing.

Wind And Sand

Another type of damage that is more common in the desert regions is wind-blown sand, or sand storm. Blowing sand can create a sandblasted-type damage on a vehicle that can affect the finish, which can etch or scratch the clearcoat, if not deeper. Blowing sand can also damage trim, chrome, headlamps, and wheels. Generally, damage cannot simply be repaired by applying clearcoat. Most times, the finish must be sanded and refinished.

Some storms have been known to damage the windshield. Sandstorm damage can cause sand to blow through the crankcase breather tube into the oil crankcase.

Lightning Strikes

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 contain one 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 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 or an electromagnetic induction, commonly referred to as 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 EMI. EMI can travel one thousand feet and cause damage to automotive electronics.

Lightning - Direct Damage

For direct strikes to the vehicle, note that lightning strikes the highest points on a vehicle. This is generally the roof or antenna. These strikes may cause the antenna to burn, melt, or bend and burn or melt the antenna mounting location.

Lightning - Direct Damage (cont'd)

Other signs of direct damage include pitting or burning on the metal and even shattering of tempered glass.

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

Lightning - Indirect Damage

Lightning strikes may also occur nearby a vehicle. In these cases there is no apparent physical damage to the vehicle, however, damage occurs to the vehicle electronics. Low voltage systems are most prone to this type of damage.

Lightning Damage Analysis

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

Next, 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. Lastly, check for evidence of burning, carbonization, or charring on circuit boards, wire connectors, or fuse box. This would be more common with a direct strike.

Lightning Damage Analysis (cont'd)

Other items to check during a lightning strike damage analysis include determining if several fuses opened at once and checking to see if multiple claims were made for vehicles parked nearby.

Lightning Damage Repair

During the repair process, technicians may have to start by replacing the main control modules, such as the powertrain control module or engine control module. This may be necessary to just to get the vehicle running. After replacing the main control modules, the technician may have to work down to smaller sub-systems, essentially working from the top down. It may be helpful to 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 the vehicle is delivered to the customer.

Types of Infestation

Infestation can cause serious damage to a vehicle. Common intruders include mice, squirrels, and rabbits.

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

Infestation Inspection Items

Underhood there may be further indications of infestation. Items damaged may include chewed hoses and underhood insulation.

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.

Infestation Cleaning Considerations

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 the deer mouse, cotton rat, and 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 and vacuuming up the residue. Do not blow the material out of the affected area. After the nest is removed, use a recommended cleaning solution 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 web site at www.cdc.gov.

Some repair facilities may create a list of standard operating procedures, or 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 Summary

Module 3 has discussed the damage that can occur from hail, wind damage, lightning strikes, and from infestation. This module has also covered some of the repair options to repair vehicles that were damaged from natural causes. Topics covered in this module include: hail damage, repair options for hail damage, wind damage, lightning damage indicators and repair issues, infestation and potential damage.