Vehicle Parts and Construction

Note: The major part of this exam consists of questions regarding this section.
Types of Collision Damage

Damage Analysis

- Overview of damage
- Visualize the repair
- Direction and force of impact
- Collision energy transfer
- Structural damage indicators
- Changes in handling or operation
- Is the vehicle drivable?
- Is the vehicle non-drivable? - A vehicle is non-drivable when any safety system has been disabled such as airbag or seat belts or other safety issues.

There are two basic types of damage caused by a collision, direct and indirect.

Direct damage is usually found at or near the point of impact. It is the primary and immediate damage caused by a collision with another object. It is easy to locate and identify.

Indirect damage is more difficult to locate as it can be found anywhere on the vehicle. It occurs behind the area of impact and may even be found at the opposite side or end of the vehicle. Indirect damage is normally the last damage caused by the impact. This kind of damage is the result of collision shock forces traveling throughout the body and of the weight and mass of inertia forces. This creates the issue of concealed damage and may require damage repair supplements.

The unibody vehicle is designed to fold and collapse as it absorbs the energy of a collision penetrating the body. This design allows the force of the collision to spread to an ever-increasing area until it is completely dissipated.

Locating and identifying secondary structural or underbody damage is much more difficult and may require removal of some components and the use of measuring equipment. Removal of some items such as trim panels and carpeting will give you better visual access.
Make a complete inspection of the primary point of impact. Work in the direction of the impact and look for indirect damage throughout the rest of the vehicle. Follow these simple steps:

- Look for gaps between sheet metal. Is the gap too narrow or too wide? Is the gap uneven? Does it widen or narrow?
- Check the doors, hood and trunk lid for proper alignment. How do they fit in the opening? Is there a proper or even gap?
- Look at how the doors, hood and deck lid open and close. Are they hard to open or close? Is there any unusual resistance or sticking when trying to open or close them?
- Check spot welds and mounting points for damage. Are the spot welds broken or stressed?
- Check body and structural seams and seam sealers. Are they stressed, cracked or distorted?
- Look at the surface of body panels. Do you see any broken or stressed paint? Do you see paint stress in interior panels, under moldings, or at bends in the metal?
- Look for minor buckles or ripples in the fenders, roof and quarter panels in areas away from the point of impact. Check for distortion of inner panels.
- Check for cracked or broken glass.

Weight and mass inertial damage usually occurs on the inside of the passenger compartment and luggage storage areas and is caused by unrestrained occupants, loose luggage or other contents during a collision.

**Visual Inspection**

A thorough visual inspection of the entire vehicle will help you to write a more accurate damage report and will help reduce supplements. The following damage diagnosis procedures are just a sampling of checking procedures available. They are simple in nature and are an indicator of possible collision damage that may not be apparent. These procedures are for estimating inspection purposes only and may not be conclusive as to the accuracy or the complete extent of all damage. In some cases, the use of specialized equipment and the expertise of trained personnel may be necessary to diagnose the damage more accurately.

The collision impact to unibodies is absorbed by adjacent body and sheet metal components in a shape similar to a cone, the point of impact being the beginning or tip of the cone. The direction and force of the collision determines the center line, direction, span and the depth of damage.
Make a complete inspection of the primary point of impact and list all the damaged components that will need to be repaired or replaced. Work your way in the direction of the impact and look for indirect damage throughout the rest of the vehicle. Depending upon the force of the impact, there are usually visible signs of indirect damage.

For a **front-end collision**, follow these steps:

1. Look behind and underneath the bumper. Is it properly aligned with the front end sheet metal? Does the radiator support look straight? Are the frame rails pushed back?

2. Check the gaps between the fenders and the doors. Are they even, or wide? A narrow gap may indicate that there is additional damage to the apron, the rail, or the frame. A wide gap on one side and a narrow gap on the other side may indicate that the front of the vehicle is swung over.
3. Check the gaps between the hood and the fenders. Are they even, narrow or wide? A wide gap in the front on one side and a narrow gap on the other side may indicate that the radiator support on the front of the frame rails is swung over.

4. Look at the lower frame rails. Are there any tears, bends or buckles? Is the paint cracked? Now look at the upper reinforcement rails. Do they line up with the apron and the fender? Pay careful attention to the convoluted areas of the rails and aprons. Are there any visible signs of collapse such as paint cracking?
Front Structural Components

5. No matter how slight the impact may appear, always open the hood and inspect all components visible in the engine compartment. Does the hood open and shut properly? Look for cracked or chipped parts like the radiator fan blades, fan shrouds and closure panels. Check the headlamp assemblies and check their mounting brackets from inside the hood, because brackets could be sheared off without appearing to be broken from the outside.

6. Look for signs of movement and damage to the air conditioning condenser and lines, the radiator and the hoses. Check all the components that attach to the radiator support, both aprons and the firewall. Look at the bolts to see if they have shifted, indicating possible structural or secondary damage.
7. Does the engine assembly appear to be aligned and in place in the Engine compartment? Are the engine mounts torn or pulled? Are the engine mounting brackets straight? Look for damage to the components attached to the engine: exhaust manifold, oil filter, oil pan, pulleys, belts and the valve covers.

8. In more severe impacts, look at the gap between the front doors and the top of the windshield pillars. If there is an uneven gap there, it may indicate that the cowl is pushed back or that the frame has sagged at the cowl area. If there is a wide gap at the pillar, it is possible that the stress pressure has buckled or warped the roof panel. Look carefully for any distortions or even mild buckles in the roof.
9. Always look under the vehicle. Even minor impacts can cause damage.

10. Test all power equipment and electrical systems. Listen carefully for unusual noise and make sure all systems are operating properly.

For **rear end collisions**, follow these steps:

1. Look behind and underneath the rear bumper. Is the bumper properly aligned with the rear sheet metal and inner structure? Does the rear end of the vehicle appear to be square?

2. Check the gap between the quarter panels and the doors. Are they even, narrow or wide? A narrow gap may indicate that the quarter and the floor and rail were driven forward. A wide gap on the other side may indicate that the rear of the vehicle is swung over. Open and shut the doors. Do they operate properly or do they hesitate when opening or closing?

3. Check the gap between the trunk lid and the quarters. Are they even, narrow or wide? A wide gap in the front on one side and a narrow gap on the other side may indicate that the frame rails are swung over.

4. No matter how slight the impact, always open the trunk lid and remove the carpeting and trim to view the rear trunk floor and spare tire well. Check for dents, buckles, or cracked paint.
5. In more severe rear impacts, look at the gap between the top of the doors and the roof at the quarter sail area. A wide gap may indicate body sag at the dogleg area. Look carefully for any distortions or even mild buckles in the roof or rail portion of the quarter panel.

Check Gaps - Door and Roof

6. Inspect the underside of the vehicle for damage. Examine the floor and frame rails for damage. Pay careful attention to the convoluted areas of the rails for visible signs of collapse. Also look at the exhaust system and rear suspension components and their mounting positions, as well as attaching parts, such as brackets and hangers.

Check Underside for Damage
7. Inside the passenger compartment, examine the seats, the front seat frame, and the tracks and adjusters.

Seats and Components