

Auto Body Construction

There are two basic types of construction used in the manufacturing of automobiles:-

1. The conventional (body-over-frame)
2. The unitized body construction

1. Conventional (body-over-frame) construction

The body and the frame are two entirely separate units and are held together at various points with body bolts that are usually tightened with torque wrenches to the manufacturer's specifications. Rubber insulators and various thickness of shim stock separate the body and frame at these points; they prevent squares from developing and road noises from being transmitted through the frame to the body. By either removing or adding shims at these points the body and frame can be easily and accurately aligned when necessary.

Most conventional frames are wide at the rear and narrow at the front. The narrow front construction enables the vehicle to make a shorter turn. A wide frame at the rear provides better support of the body.

Other Characteristics of frame type vehicles are:

1. Load-induced vibrations that are transferred to the body via the frame, thus resulting in a smooth ride.
2. Rubber mountings between the body and frame insulate it from vibrations, providing a quiet interior
3. High amounts of energy are absorbed during a collision
4. Under surface of the body are protected over rough roads
5. Suspension and power train parts can be quickly assembled on the basic frame
6. Heavy frame made of thick sheet metal is approximately 3/64 to 1/8 inch
7. The vehicle profile is generally high off the ground

2. UNITIZED BODY CONSTRUCTION

In automobiles that feature unitized body construction, including the new unitised high-strength steel constructed automobiles both the frame and the body are made from a large number of sheet-metal renewals of varying sizes and shapes. Many of these are assembled and welded in to a single unit. This type of construction gives an overall rigidity to the internal body construction. The strength that these bodies possess is drawn from each of the many individual panels, which after they have been welded together make up the body shell. The attachments required to hold the power train and the suspension system are members; these are called the under body section.

Utilized- body characteristics

1. It is made by combining pieces of thin sheet metal pressed to form panels of various shapes and joined in to an integrated structure by spot welding. This light weight structure is highly rigid to bending or twisting.

2. Vibration and noise from the drive train and suspension enter the floor pan and are amplified by the body, which acts as an acoustic chamber making it necessary to add extra components to the body to suppress vibration and noise.
3. Once deformed, special procedures which do not cause additional damage are needed to restore it to its original shape.
4. With the thin sheet metal body close to the road surface adequate measures must be taken to prevent the deterioration in strength from corrosion. This is particularly important when dealing with reinforcing materials that make up the under body.

The major advantage of unit-body vehicles is that they tend to be more tightly constructed because the major parts are welded together. This design characteristic that helps protect the occupants during a collision causes damage patterns that differ from those of frame type vehicles.

Chapter One

Typical Body and paint shop operations

The repair method used for restoring a vehicle damaged in a collision is determined by the area that is damaged, the extent of damage, paint refinishing requirements, the repair costs, and other similar conditions.

The vehicle is first brought in to the shop where a damage estimate is prepared. Then the decision is made whether the damage is major (a vehicle that requires body or frame repairs) or minor (a vehicle that requires only outer panel or cosmetic repairs). Repairs instructions are written down on the repair order (Ro) and the repair operations are carried out according to those instructions. Once the repair produces follows a step-by-step pattern.

Most body and paint shop operations can be classified by size as small, medium and large.

There are two basic work areas in every collision repair and refinishing shop (1) metal working (or body) and 2) paint. What ever the physical size of the overall shop. The work flow (and the car) should be as continuous as on a factory production line. That is the vehicle should move from its entrance in to the shop to the metal work area on to the refinishing area. In most shops, however, the vehicle is through washed to remove mud, dirt, and water soluble contaminates. The car should be washed and thoroughly dried before moving it to metal working area.

A metal working shop

The metal working area is where the vehicle body is repaired. This damage can be either the result of a collision or deterioration. The repair tasks in this area of the shop are performed by body technicians or mechanics and their helpers.

In most shops the estimator makes an appraisal of the damage to the vehicle and how much it will cost to repair once the owner and/or the insurance company approves the appraisal, the vehicle is turned over to the Body shop supervisor for the start of the repair work. If the shop is large enough the supervisor and one of the body technicians go over the repair order from that was filled out by the shop manager of estimator.

In repairing any type of collision damage, the body technicians must first study and diagnose the damage that has occurred. One the damage has been evaluated, the mechanic must determine whether it will be cheaper to straighten or repair the damaged section or replace it. Is the cost of repair more or less than the cost of replacement parts plus the cost of installation in some shops, the estimator, shop manager of even the owner are involved in these decisions. However the body mechanic is usually consulted.

Once the extent of the damage and how it is to be corrected are determined, the repair must be completed in the body shop. For example, if a panel is creased, torn, or caved

in, it can be straightened by hammers, picks, spoons, and hydraulic jacks. Accurate adjustment of body assemblies such as hoods, rear deck lids, and doors might have to be made by the technician. If they are not correctly done, the assemblies are difficult to close and will rattle when the car is driven over a rough road. In addition, they are also to leak excessive amounts of rain and dust. Such failures on the part of the body technician to perform a job competently are bound to cause customer complaints.

Today because of changing auto construction design, more and more body shops are offering complete collision services such as wheel alignment, cooling system repairs, auto electric checkouts, and diagnosing strut damage. While many of these repairs are still done by so-called "auto specialty shops" the interest of body repair shop owners in these jobs has made it necessary for the body technician to have some knowledge of these systems.

The metal working mechanic must also be able to correct and repair minor defects such as scratches, chips, dents, surface rust, and rust outs. More and more auto body shops are providing rust proofing services to their customers either before rust occurs or after repairing the problem.

B. Paint shop

Auto refinishing or painting is a very important part of the auto repair business. Not only do major collisions and wrecks and minor damage have to be painted but also many automobiles are repainted to enhance their beauty. New and used car dealers repaint automobiles to attract buyers. Also some times the owner gets tired of looking at the same old colour. Often times the finish on many automobiles needs attention because it has been neglected or damaged by weather conditions.

The paint shop area is where the car is refinished by refinishing technicians or painters. Here a series of operations is performed on the vehicle as it passes through the following stages. Make-Ready, spraying, drying, and final cleaning.

A. Make Ready

In the initial make-ready the car is prepared for the spraying operation. The preparation procedure generally includes.

1. Remove wind shield wipers, emblems, name plate mirrors, and other small pieces of trim.
2. Degrease the car by wiping down each area with a solvent or grease. To will remove grease and road tar.
3. Machine and hand-sand any chips and scratches.
4. Clean both the interior and exterior carefully. All dust is removed with a dusting gun and wiped with a tack rag.
5. Inspect all surface to be sure that they are properly cleaned before moving the vehicle to the masking area. In the masking area the parts of the car that are not to be painted windows, chrome, lights, vinyl top are covered with masking paper and held in place with tape. In large shops the preparation jobs are handled by the sander, while the masking operation is

performed by a masker. In small shops, the make-ready jobs are usually done by the painter or his helper.

B. Spraying

When the vehicle moves in to the spray booth the painter takes over. If a sealer is to be used it is applied next following by the topcoat. If the topcoat is is-drying lacquer the masking is removed right after the spraying. If the topcoat is enamel. The masking is removed once the paint film is tack free.

C. Drying

In the drying room, most shops use drying equipment to speed up the drying. This is especially useful in trying Enamel. In some small paint shops the drying operation is often done with portable equipment in the spray area.

F. Final Cleaning

After the finish is dried the car moves to the final make ready area. If the car has been refinished with enamel, the masking is now removed. Compounding or polishing is done in the final make-ready area, along with other tasks such as polishing all chrome cleaning glass and over spray replacing removed items vacuuming the interior, and cleaning vinyl top and tires. In large shops the jobs are usually performed by the detailer.

In addition to being able to apply the new finish properly, the painter or refinishing technician must have knowledge about paint products and how to mix and match them. Remember: If the refinishing job looks good and colour matches well, the customer will usually be satisfied with all of the other repair work done while the car was in the shop.

Shop safety practices and Health Protection

The most important considerations in any repair and refinishing shop should be accident prevention and safety carelessness and the lack of safety habits causes accidents. Accidents have a far-reaching effects, not only on the victim, but on the victim's family and society in general. More importantly accident can cause serious injury, temporary or permanent or even death. Therefore it is the obligation at all shop workers, instructors and students to foster and develop a safety habit to protect the health and welfare of those involved.

1. AIR PASSAGES AND LUNGS PROTECTION

Abrasive dust vapour from caustic solutions and solvents spray mist from undercoats and finishes-all present dangers to the air passages and lungs, Especially for workers who are among them day in, day out. The cartridge filter or organic vapour type of respirator, which covers the nose and mouth is equipped with a replacement cartridge that removes the organic vapours by chemical absorption painting with out this equipment it is harmful to our respiratory organ.

The dust respirator or mask is worn to protect against dust from sanding and grinding. These operations in the body shop create dust that can cause bronchial irritations and possibly long term lung damage such as silicosis (well known in mining areas). Keep in mind that these respirators are good for removing solid particles from the air and have little if any ability to remove vapours. They should never be worn when spray painting use cartridge filter.

2. **EYE AND FACE PROTECTION**

Eye protection is required where there is a possibility of an eye injury from flying particles, chips, and so forth clear protective safety goggles, glasses or face shields should be worn when using grinders, disc sanders, power drills, pneumatic chisels, removing shattered glass, or when working underneath the auto. When they are in the metal working or painting areas of the shop locations there is always the possibility of flying objects, dust particles or splashing liquids entering the eyes. Not only can this be painful it can also cause loss of sight. Remember eyes are irreplaceable. Get in the habit of wearing safety goggles, glasses, or face shields in the working areas.

A welding helmet or welding goggles with the proper shade lens must be worn when welding. These will protect the eyes and face from flying molten pieces of steel and from harmful light rays.

3. **EAR PROTECTION**

Panel beating the piercing noise of sanding, the radio blaring full-blast-it is impossible to hear any thing else. It is enough to deafen a person and that is exactly what it will do if proper precautions are not taken. When in metal working areas, wear ear plugs or ear muffs to protect the eardrums from damaging noise levels.

4. **BODY AND HAND PROTECTION**

Loose clothing unbuttoned shirt sleeves, loose Jewelry are very dangerous in body shop. Instead wear approved shop work clothes. Trousers should be long enough to cover the top of the shoes. This will prevent sparks from going down in to the shoes. Especially when using welding equipment. The harmful effects of liquid undercoats and finishes on the hands can be prevented very effectively by wearing proper gloves. When using any body or paint shop chemicals, be sure to wash the hands with soap and water before eating or smoking.

5. **FOOT PROTECTION**

Wear safety work shoes that have metal toe inserts and no slips. The inserts protect the toes from falling objects, the soles help to prevent falls. In addition, good work shoes provides support and comfort for some one who is standing for a long time. Never wear plastic (rubber) or sandal none of this shoes provided adequate protection in a body shop.

Vehicle handling in the shop

When handling a vehicle in the shop, keep the following safety precautions in mind.

- Set the parking brake when working on the vehicle. If the car has an automatic transmission, set it in park unless instructed otherwise for a specific service operation. In the vehicle has a manual transmission, it should be in reverse (Engine off) or neutral (engine on) unless instructed otherwise for a specific service operation.
- Use safety stands whenever a procedure requires work under the vehicle
- To prevent serious burns avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe, catalytic converter and muffler.
- Keep clothing and oneself clear from moving parts when the engine is running. Especially the radiator fan blades and belts.
- When moving a vehicle around the shop. Be sure to look in all directions and make certain nothing is in the way.
- Do not smoke while working on vehicles.

Handling of solvent and other flammable liquids

- Both the body mechanic and refinisher will be working with various solvents to clean surface and equipment and to thin finishes. These solvents are extremely flammable. Fumes in particular can ignite explosively. The following safety practices will help avoid fire and explosion.
- Use only approved explosion proof equipment in hazardous locations.
- Keep all solvent containers closed, except when pouring
- Handle all solvents (or any liquids) with care to avoid spillage. Extra caution should also be used when transferring flammable materials from bulk storage.
- Discard or clean all empty solvent containers. Solvent fumes in the bottom of these containers are prime ignition sources.
- Do not light matches or smoke in the spraying and paint area, and make sure that the hands and cloth are free from solvent when lighting matches or smoking in other areas of the shop where smoking or an open flame is permitted.
- Paints thinners solvents and other combustible materials used in the body and paint shop must be stored in approved and designated storage cabinets or rooms. Storage rooms should have adequate ventilation. Storage rooms should have adequate ventilation never have more than one day's supply of paint outside of approved storage areas.
- When spraying paint follow these procedures.
- Remove portable lamps before spraying
- Ventilation system must be turned on
- Spray areas must be free from hot surface such as heat lamps
- The spray area must be kept clean of combustible residue.
- Ventilation system must be left on while the paint is drying.

Fire protection

- Every auto body and paint shop requires fire extinguishers. Since fires are classified as classes there are different types of extinguishers specially designed for a particular class of fire.

Classes of fires _ Fires are classified according to the type of fuel energising the fire. Knowledge of the classes of fires is important since the type of fuel involved will determine the method of extinguishing the fire. Each class of fire requires a specialized action.

Class A Fires

These fires result from the combustions of carbonaceous materials such as wood, textiles and papers. For class A fires, extinguishers containing water, which will cool and quench the burning material, are suitable. Dry chemical extinguishers may also be used since they provide a fire-retardant blanket to prevent reflash.

Class B Fires

These fires result from materials that become gaseous when heated such as oil, grease and paints. For class B fires, carbon dioxide extinguishers are excellent. Dry chemical extinguishers are also useful in these fires.

Class C Fires

Live electrical equipment is the cause of class C fires. For class C fires, use either a carbon dioxide extinguisher (carbon dioxide is non-conductive) or a dry chemical extinguisher. Dry chemical extinguishers are called tri-class extinguishers since they can be used on class A, B and C fires.

Class D fires

The specialized classification includes fires from combustible metals, such as magnesium, titanium, zirconium and potassium. It should be noted that the same fire may involve more than one class as soon as the fire spreads to other materials. Also, once electricity is disconnected, a class C fire becomes another class of fire.

For class D fire, special extinguishing powders may be applied by a scoop or shovel.

Good Housekeeping

- Sound safety practices and good work habits usually run hand in hand more often than not in the demanding requirements of body work and refinishing. The safe, efficient worker is also the most productive.
- The body and refinishing shop has its potential safety and health hazards. Any person working in this business should be aware of them, and what is important, keep them foremost in mind. In short, think safety.

