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ANATOMY OF AN AUTOMOBILE


O S F M

TERMINOLOGY

- If you use the proper terms as a habit, then you will use them when under stress.

TERMINOLOGY

Common Terminology

In order to avoid confusion and provide consistency, some common vehicle terminology was used throughout this guide. See *Figs. 5, 6, 7, and 8.*

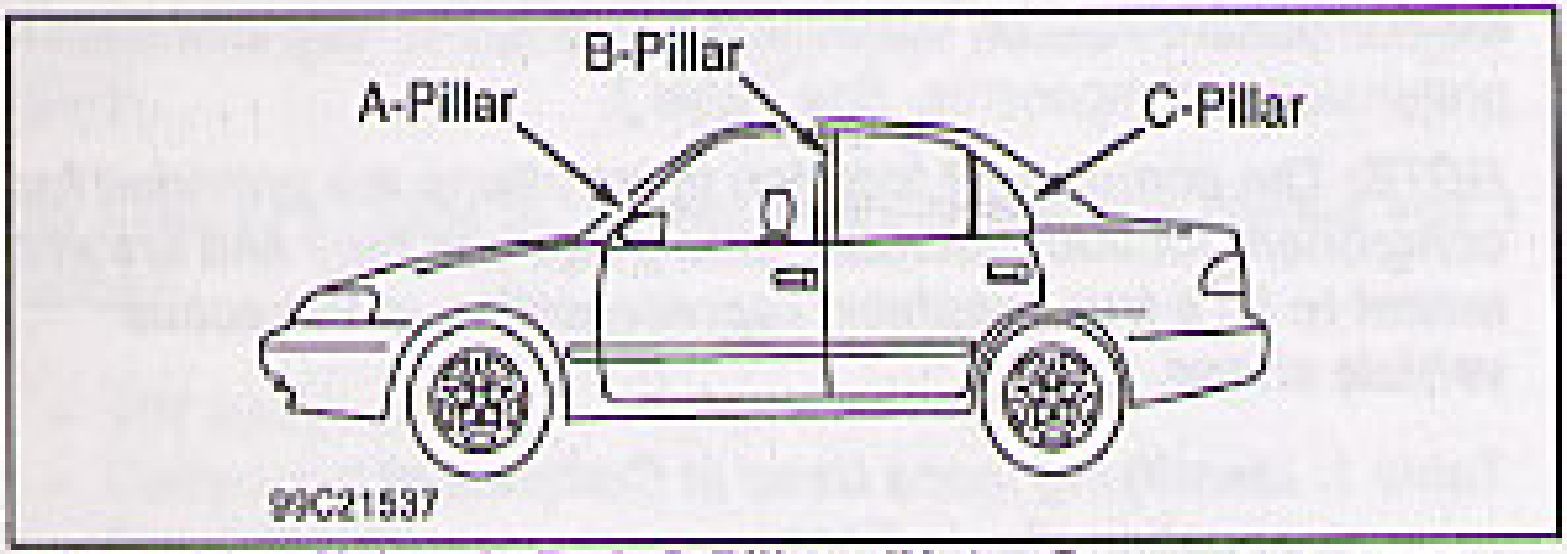

Fig. 5: Identifying A, B, & C-Pillars (Note: On wagons, vans, buses etc., continue down the alphabet rearward for each additional pillar.)

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TERMINOLOGY

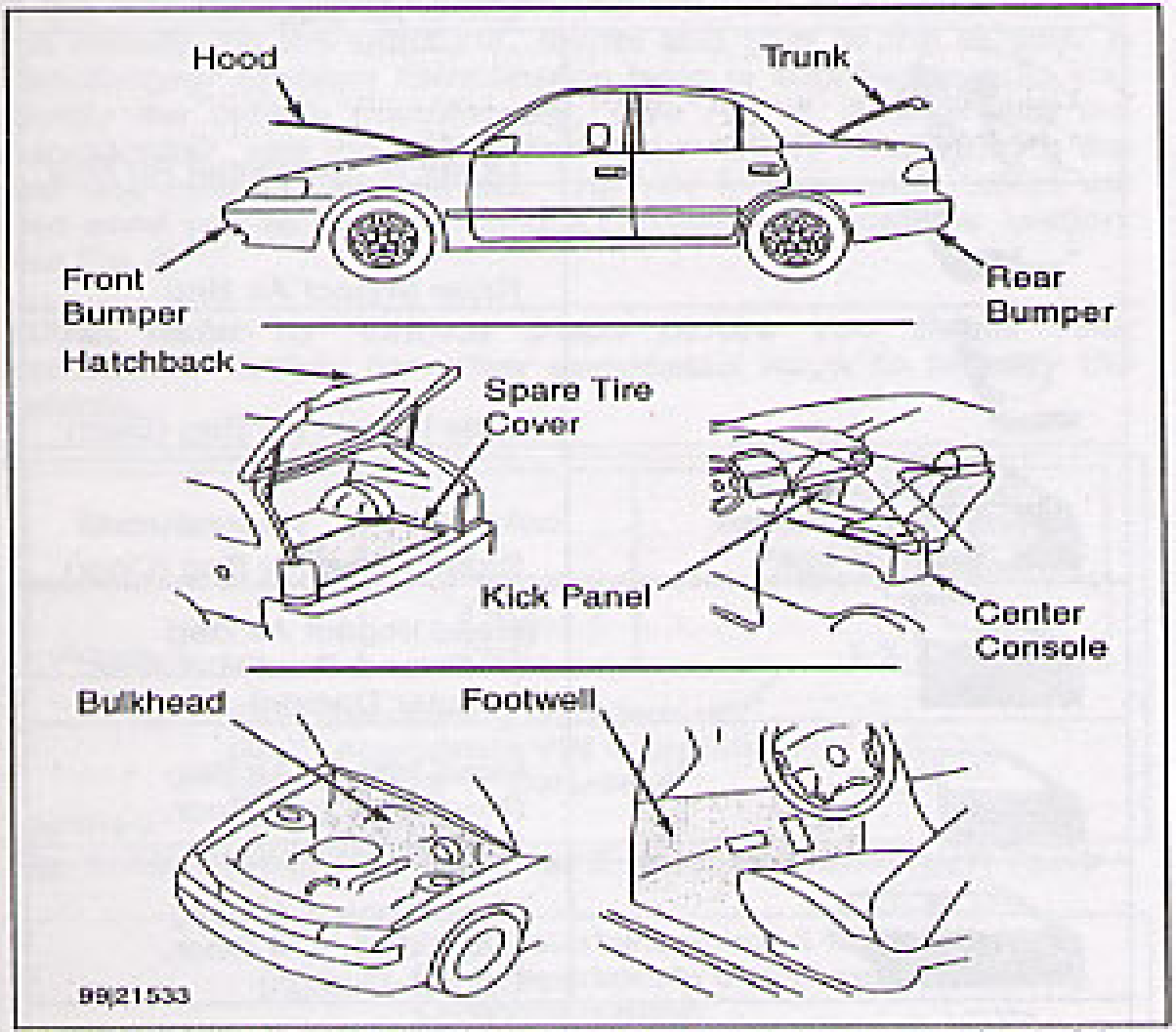

Fig. 6: Identifying Common Terminology Used in This Guide

TERMINOLOGY

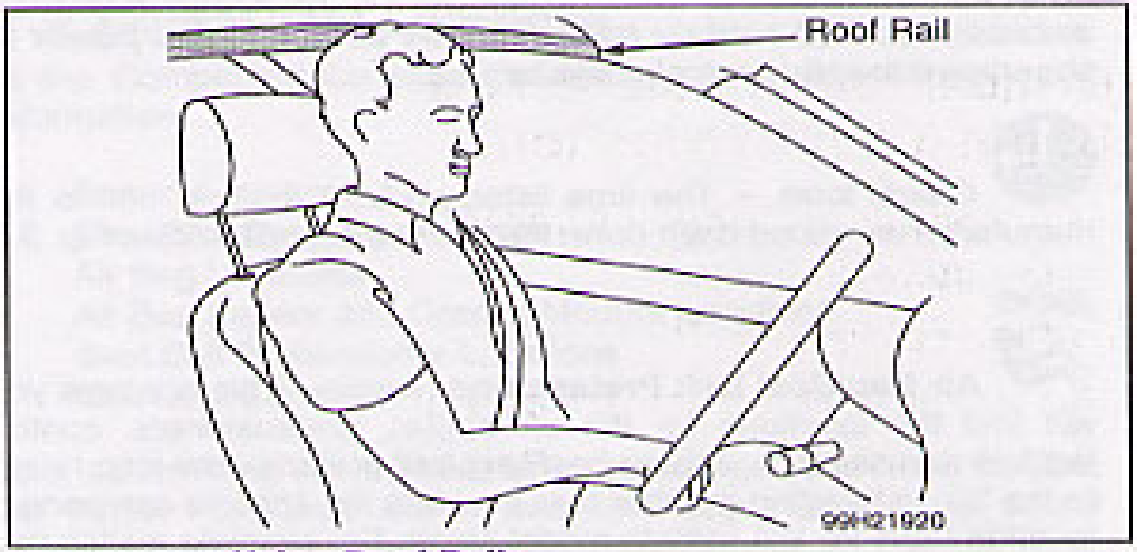

Fig. 7: Identifying Roof Rail

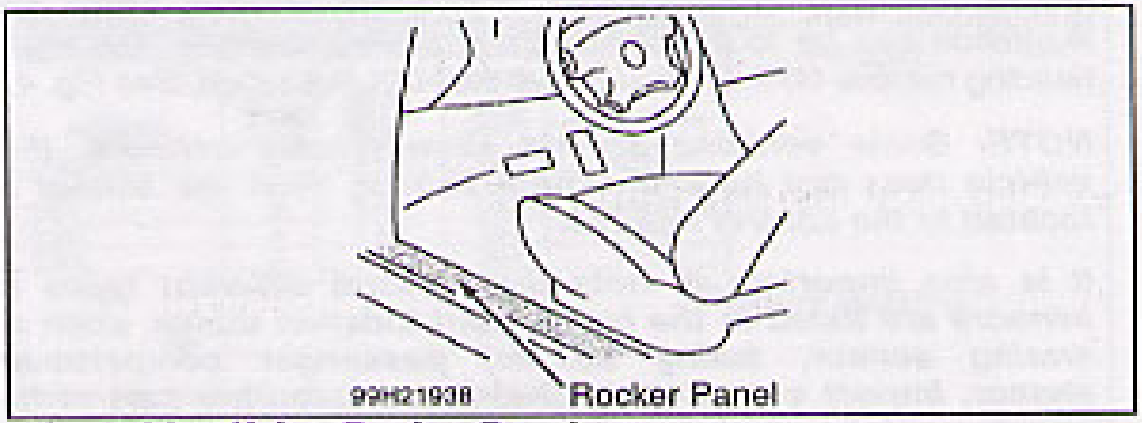

Fig. 8: Identifying Rocker Panel

The rescuer must resist the tendency to be intimidated by the appearance of the crashed metal and regard each piece of the automobile as if it were intact.

The well-informed rescuer will know what to expect as a result of taking action on a specific component of an automobile.

Result = Smoother/safer total operation.

The following vehicle design trends and parts of cars will be discussed in the way rescuers will see them.

- Batteries
- Glass
- Frame design
  - Doors, Bumpers, Wheels, etc…
- Air Restraint Bags
  - Seat Belts, Center Consoles, etc…

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Video

Halmatro 2

BATTERIES

The heart of any vehicle's electrical system is the battery, or batteries.

The most common battery used is still a wet-cell, acid type.

New hybrid vehicles and electrical vehicles have different technology batteries. They will be discussed later.

BATTERIES

One of the first considerations taken is to D/C the power, i.e.… BATTERIES.

NOTE: It is important to remember that today's vehicles are power operated. Take care to:

- Unlock doors.
- Lower windows.
- Retract Seats.
- Any other action to aid in extrication.

BATTERY LOCATIONS

Due to the large draw for power (on-board computers, navigational systems, light-emitting diode (L.E.D.) instrumentation)

SEVERAL DIFFERENT BATTERIES MAY BE FOUND.

- Traditional: Under the hood.
- Left Front Wheel-well mounted.
- Rear Seat.
- Trunk.
- Under the front seat.

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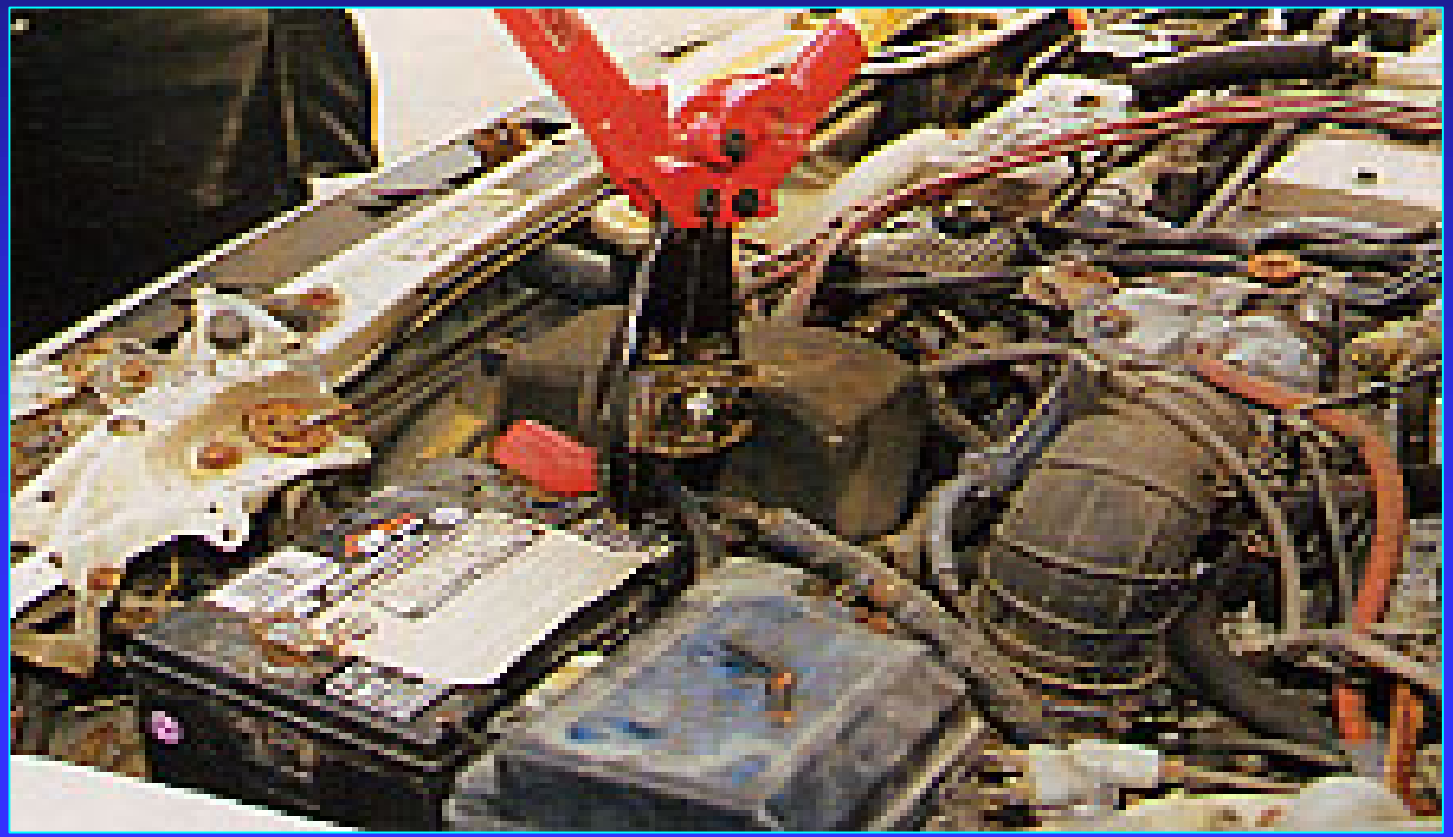
Battery design in cars built or imported into NAFTA (U.S.A., Canada and Mexico) are:

RED positive(+) and Black negative (-)



To D/C the power:

1. disconnect the Black negative (-)
2. and then the RED positive (+)

Cut wire(s) in two sections and remove the center.

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Battery Power Feed Back

- As of 2005 many manufactures have been using Power Feed Back system through the 12 Volt adapters to feed power back to the battery system in order to power up the vehicle prior to the battery instillation. A standard cell phone battery has up to 200 volt far exceeding the 2 volt required to activate air bag system. **Unplug everything!!!**

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Video

0675 to 0850

Halmatro 3

GLASS REMOVAL

Almost all vehicle accidents involving a trauma patient also involve some broken glass.

- **Glass is the most common contaminate that patients present within the emergency room.**

GLASS REMOVAL

Glass is…

- invisible to X-Ray equipment
- invisible to the eye when contaminated with blood
- Impossible to irrigate from a wound
- Legal complications

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GLASS REMOVAL

If we injure a patient or aggravate existing injuries while removing glass we become legally liable

PROTECT THE PATIENT AT ALL TIMES

GLASS REMOVAL

After the vehicle is stabilized remove all of the side windows…

If possible utilize the following steps…

GLASS REMOVAL

1. Remove glass as far away from the patent(s) as possible.
2. Protect the patent(s) from glass debris with fire blanket or sheets.
3. If the patient(s) condition is critical, don't waste time in removing the windshield, use an axe, but protect the patient.

TYPES OF GLASS

- TEMPERED
- LAMINATED
- SECURITY GLASS

TYPES OF GLASS

- Tempered glass is traditionally found in all doors and non-moving side windows of passenger cars and most light duty trucks and in most rear windows. (This is changing.)
- Tempered glass is a single plate of glass that has been tempered or hardened to withstand sever blows.
- The same manufacturing process which makes it hard, also makes it brittle.

TEMPERED GLASS

When tempered glass does break, it dissolves into thousands of pieces, each with razor-sharp sides.

LAMINATED GLASS

- Laminated Glass is traditionally found in the windshields of all vehicles.
- Laminated glass is made of two pieces of glass bonded with a thin sheet of adhesive plastic.
- Laminated glass may be mounted in mastic glue or epoxy, or it can be rubber mounted.

LAMINATED GLASS

This design is intended to hold the glass together and keep the victim's lacerations to a minimum.

SECURITY GLASS

Constructed as follows:

- A layer of glass, a layer of laminated film, a layer of impact-resistant polycarbonate, a layer of laminated film, a layer of glass, and finally, a layer of anti-lacerative film.

- Doors can be forced at the hinge or lock as if they have no glass and it can be cut with a reciprocating saw.

SECURITY GLASS

If the glass is cracked or crushed during the accident or during door removal, it will flake off to the outside of the vehicle.

TOOLS and METHODS
for breaking tempered glass

In General:

With any method of breaking tempered glass, it is important to remember to choose a window away from the patient(s). Break one window to gain access and attempt to roll all others down and break them inside the doors.

Tempered Glass Removal…

Spring-Loaded Center Punch

- Punch imposes a very high load on an extremely small area (compressive). It causes a pinpoint of expansion that spread throughout the glass almost instantaneously.

Tempered glass removal…

SPRAY ADHESIVE

- Addresses the problem of shattered glass falling on the patient.
- The adhesive causes the glass pieces to adhere to one another.
  - Note this method is time consuming and generally not productive.
- Duct tape can also be used but will not adhere to dirty or wet glass

Tempered glass removal…

Spray adhesive

- Spray a layer of adhesive over the entire surface of the glass.
- Repeat at least two more times to adequately coat the window.
- Allow to set up 15 seconds.

Tempered glass removal…

Spray adhesive

- Break with spring loaded punch.
- Gently push one or two fingers through the upper corner of the window and begin pulling the glass outward in fairly large sheets.

Tempered glass removal…

Hammer

- Roll the window down in the door until ¼ inch is exposed.
- Cover exposed glass with duct tape over both sides.
- Glass will shatter and fall inside the door

Tempered glass removal

Diagonal Pliers or Channel Locks

- Roll the window down in the door until ¼ inch is exposed. Duct tape exposed edge.
- Grip upper edge of glass with pliers and bend glass outward.

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Tempered glass removal

Axe

- Roll the window down in the door until1/2 inch is exposed. Duct tape exposed edge.
- Strike the top edge of the window with the axe blade to shatter glass.

TOOLS and METHODS for breaking laminated glass

Remember:

With any method of breaking laminated glass, it is important to remember to choose a window away from the patient(s). Breaking laminated glass usually involves the windshield. Remember: Protect the Patient.

Laminated glass removal

Axe

- **The quickest and easiest method for removing laminated glass is with an axe.**
- **Warning: it creates a large amount of glass debris.**
- **Use an axe only if you believe the patient does not have time for other methods.**

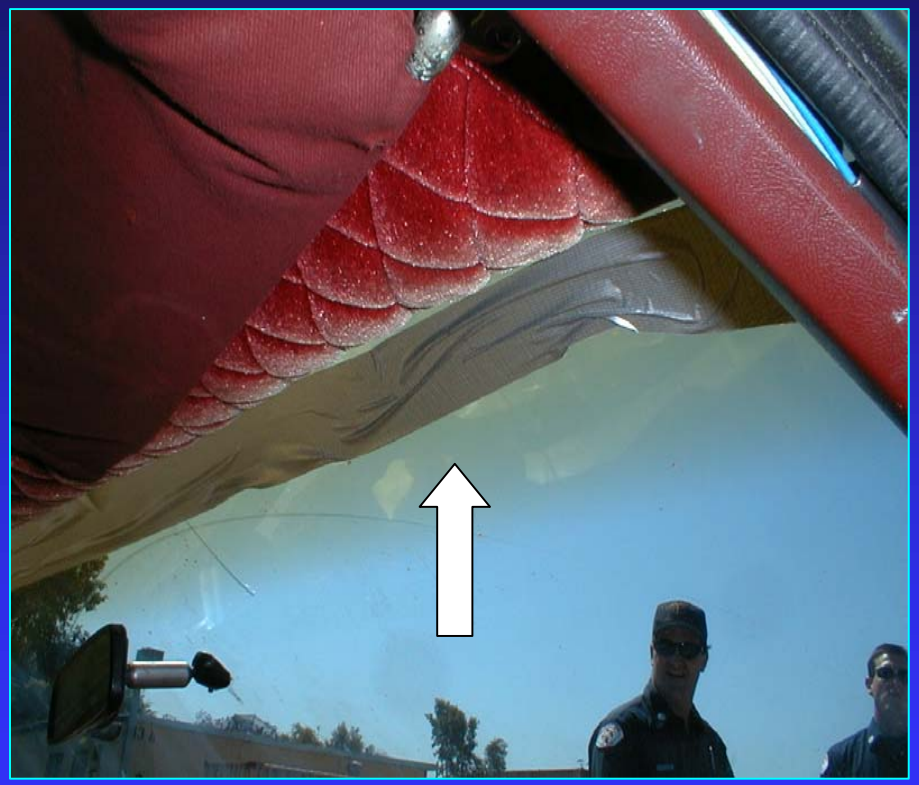
Laminated glass removal

Axe

- With one rescuer on either side of the windshield, grasp the top of the glass with one hand and with free hand, reach inside and support the windshield.
- Fold out from the top down onto the hood.

Laminated glass removal

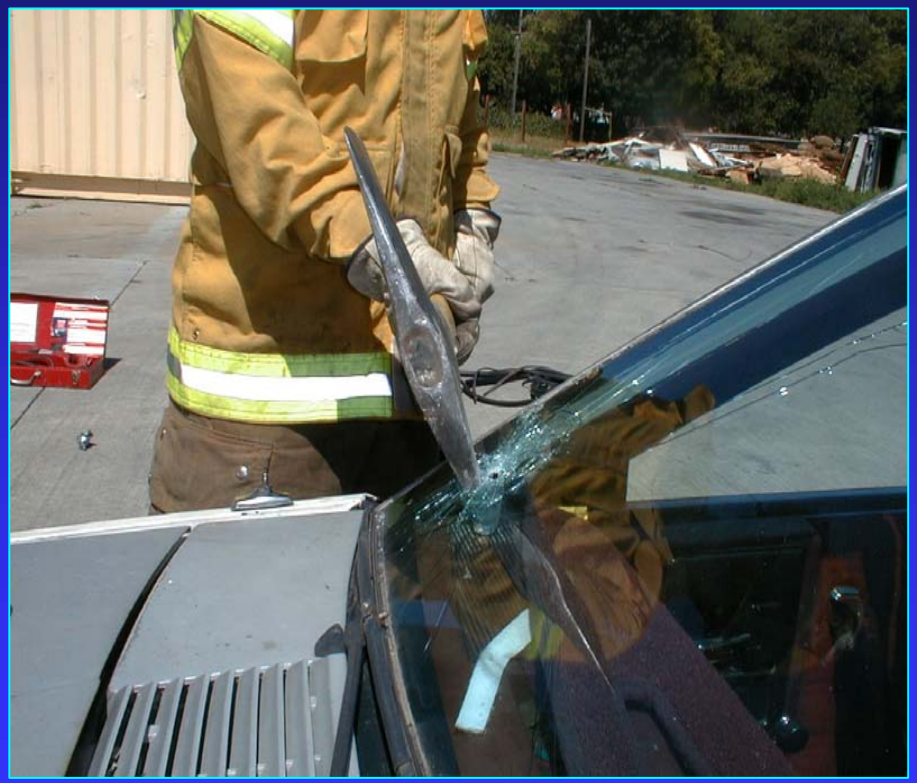
Reciprocating Saw or Sawzall



- Quick and effective.
- Place duct tape inside the windshield along the intended cutting line. (Can be skipped)
- Tape top and sides.

Laminated glass removal

Reciprocating Saw or Sawzall



- Use an axe or halligan to punch a hole at the base of the windshield at either corner.
- Make the hole big enough to accept the saw blade.

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Laminated glass removal

Reciprocating Saw or Sawzall

- Start your cut and continue cutting the windshield along the middle of the duct tape.
- Remove the windshield as mentioned previously.

Laminated glass removal

Reciprocating Saw or Sawzall

- Interior view of the blade being used to cut through the windshield.
- Use caution with the blade pointed toward the patient.

TOOLS and METHODS for removing mounted or set windshields

- **Remember again:**

  With any method of breaking or removing laminated glass, it is important to remember to protect the patient(s).

Removing mounted or set windshields

Hand operated mastic cutter

- Mastic cutters under the right conditions can work well, but it is import to note that some windshields have plastic tabs that interfere with the blade.
- Even under ideal conditions windshield removal is slow work.

Removing mounted or set windshields

Hand operated mastic cutter

- Cutter is equipped with an L-shaped blade.
- By tilting the fixed handle away from you and pulling towards your body with the cable handle, you cut the adhesive between the glass and frame.

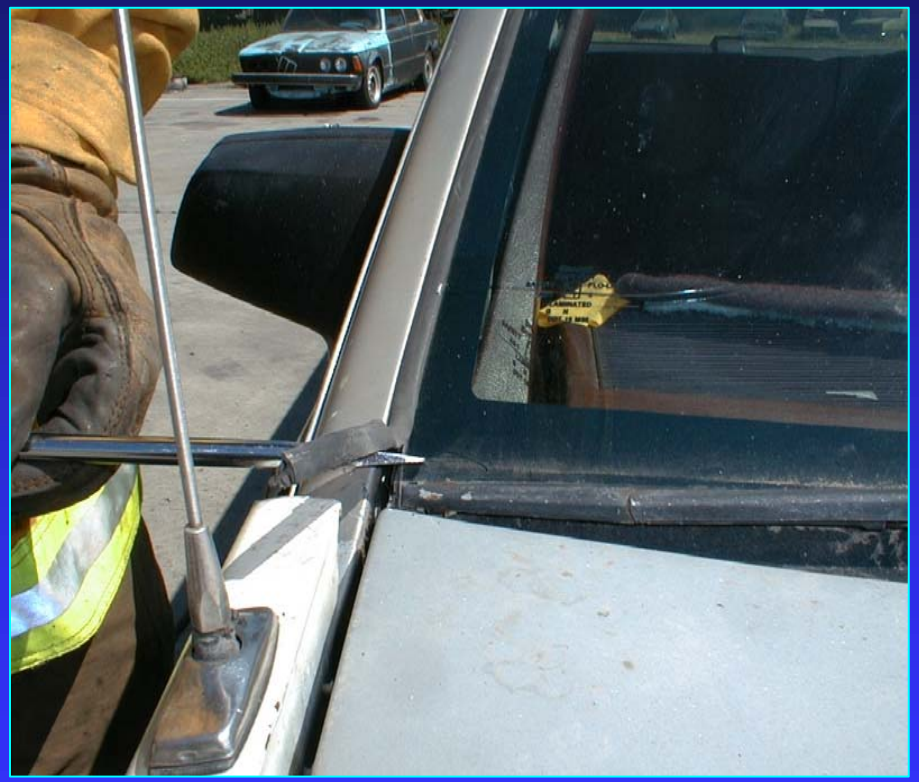
Removing mounted or set windshields

Air chisel mastic cutter

- The air chisel is fitted with a slotted bit that fits the blade handle.
- The air chisel power pushes the cutter around the windshield greatly increasing the efficiency time.

Removing mounted or set windshields

Mastic cutter identification…



- Mastic set windows can be identified by a simple chrome piece of trim around the windshield. There will be no rubber gasket visible between the chrome and glass.
- First remove chrome.

Removing mounted or set windshields

Rubber set windshield removal

- Cut “H” gasket by inserting the tip of a carpet knife under the gasket with the blade flat against the glass.
- Cut through to the indent where the small inset gasket used to rest.

Removing mounted or set windshields

Suction cups

- 3 inch suction cups assist with removal of a windshield once it has been cut free, regardless of the method used to mount the windshield.
- Wet inside of cut before applying to glass.

Windshield removal

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EXTRICATION TOOL

- There are numerous manufacturers of extrication equipment. As well as many different designs.
- As we enter into the aspects of vehicle extrication that require these tools we will look at some of the equipment

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TAKE 5

EXTRICATION TOOL

- The “Jaws of Life” was the name given to the HURST® Performance Inc. system of Auto Extrication tools.
- Hurst originally manufactured out of Warminster, PA and the tool was designed in 1972, the race car extrication.
- Other manufactures such as Holmatro,Phoenix and other have created similar tool

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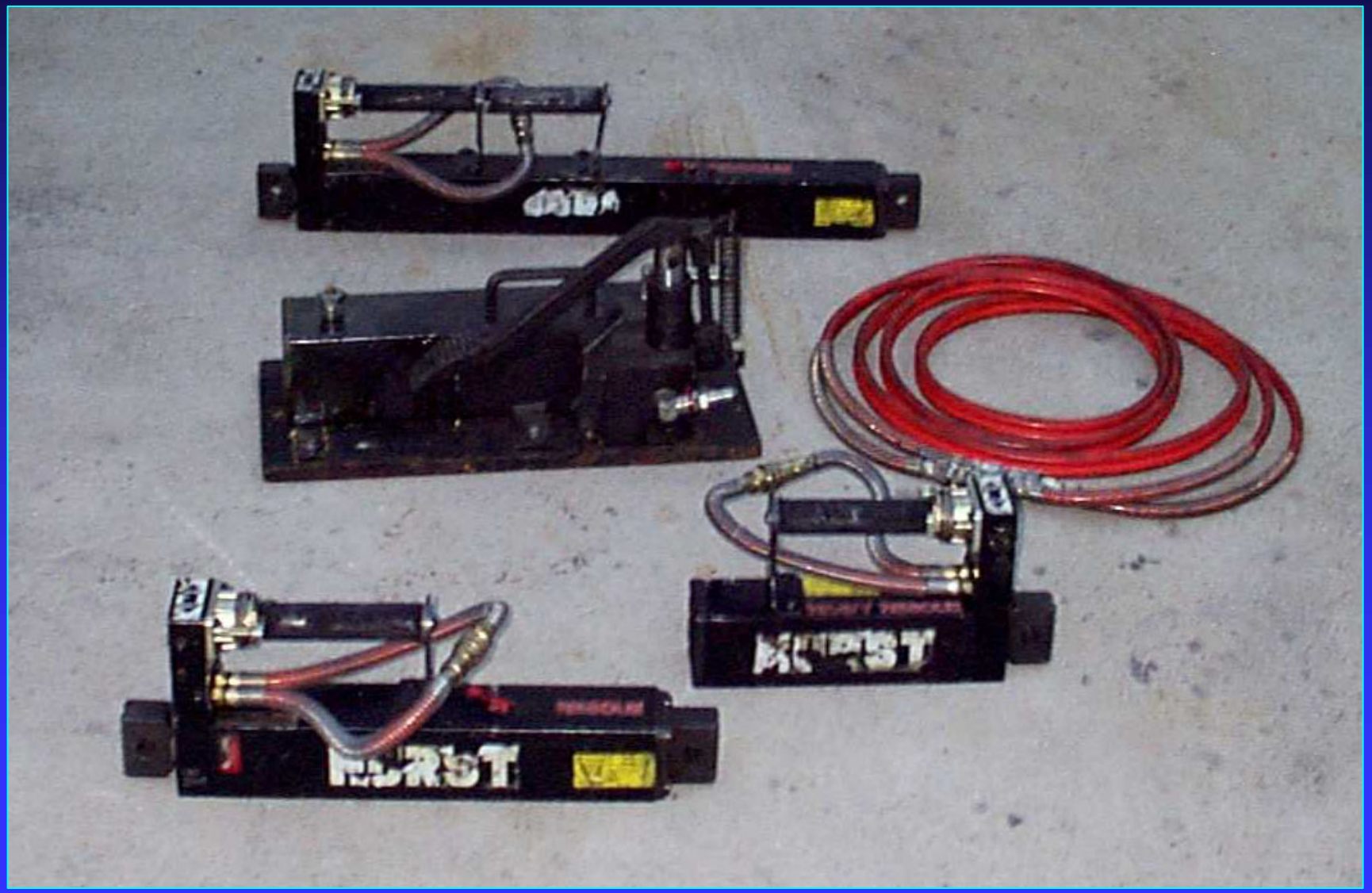
Hurst tool

EXTRICATION TOOL

Hurst tool

EXTRICATION TOOL



Hurst tool

EXTRICATION TOOL

- Basic power unit
- Comes in several different models
- Consists of a hydraulic pump in a reservoir driven by an engine.
- Pumps at 5,000psi

Hurst tool

EXTRICATION TOOL

- Hose consists of 16, 30 and 100 feet section.
- ¼ inch inside diameter.
- Teflon coated.

Hurst tool

EXTRICATION TOOL

- Cutters or Shears…
- 70,000 lbs Cutting force
- 7.25 Inch spread

Hurst tool

EXTRICATION TOOL

- Rams
- Several sizes
- Up to 15,708 lbs of pushing force
- Weight 18 to 36 lbs
- 15 to 60 inches of spread

Hurst tool

EXTRICATION TOOL

- Accessories Set:
- Base Plate
- “V” Block
- Wedge
- Jaws adapter
- 2 FAS-PINS

Chains and Shackles

EXTRICATION TOOL

- 2 Shackles
- 1- 12 foot chain
- 2- 6 foot chains
- Rating of C8

Air Chisel (Zip Gun)
EXTRICATION TOOL

- Tool consists of several different bits for different application.
- Operates at 150 psi
- Designed to cut sheet metal only.

Cable Come-Along
EXTRICATION TOOL

- Rated at 2000 pounds with a 20’ pull
- Can be used in double cable mode for 4000 with a 10’ pull

Claw Tool or Hayward Lock Breaker

EXTRICATION TOOL

- Made of tool steel, 1 ½ feet to 3 ½ feet in length
- Particularly used in forcible entry but has numerous auto extrications applications

Pry bar

EXTRICATION TOOL

- 4 to 6 feet in length.
- Primary use is prying or moving heavy objects

Halligan Tool

EXTRICATION TOOL

- Made of heavy cast steel.
- Adz, pick and fork ends.
- 8 Pounds.
- Ideal for making a purchase point for power tools.

Sledge Hammer

EXTRICATION TOOL

- Usually 8 pounds

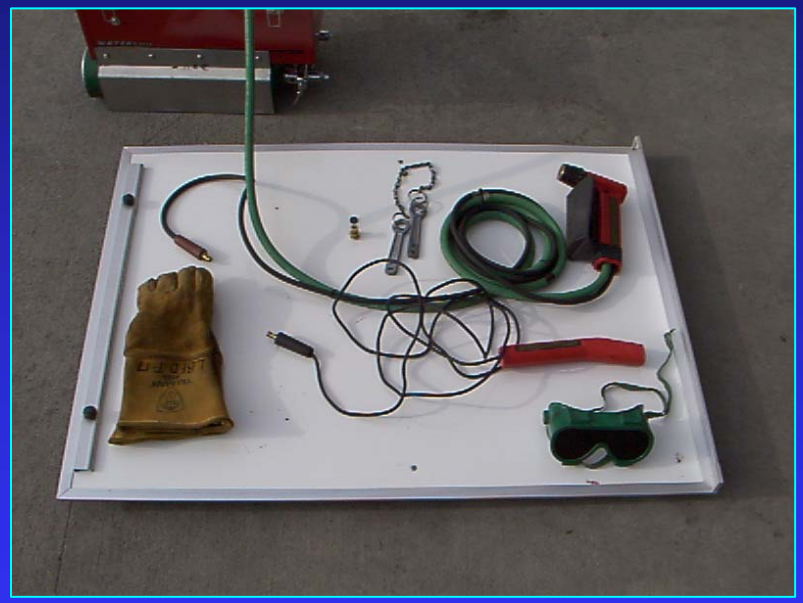
Reciprocating Saw or Sawzall

EXTRICATION TOOL

- Comes in Power Cord and Battery Models
- Special blades can cut through most soft metals, ideal for cutting sheet metal

Cutters, ARC Air

EXTRICATION TOOL



- Air “Slice pak” cutting torch system
- 12 volt battery, striking pad, 0_2 supply, regulator, torch and exothermic rods
- 6500 degree F and will cut thru anything

EXTRICATION TOOL

- You must know all the aspects and limitations of every tool at your disposal. Someone's life may depend on it.
- Further, on probation you will have to give drills on the each of the tools specific to your fire department.

Test 5