

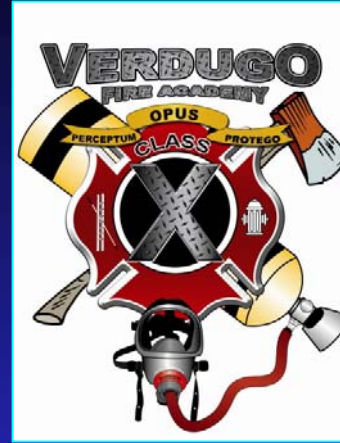


# Vehicle Extrication

**Verdugo Fire Academy**

**Ch.25**

... more than fighting fires





# ***Verdugo Fire Academy***

... more than fighting fires

## ***Ch.25***



# COURSE OUTLINE

- Why we do what we do.
  - An Auto Extrication Overview.
- Extrication in the S.H.A.D.E.
- Anatomy of an automobile.
  - Stabilization.
  - Glass Removal.
  - Gaining Access.
- Rip and tear some cars.





# The California Highway Patrol states the 2 main causes of vehicle accidents are...



- #1 Alcohol
- #2 Cell Phones



The **Golden Hour** philosophy states that the patient's immediate needs and condition dictate the method used to extricate him or her.



# 60 Minutes (National Standard)

<b>5 Minutes</b>	<b>10 Minutes</b>	<b>30 Minutes</b>	<b>5 Minutes</b>	<b>10 Minutes</b>
Time of incident to notification	Time of notification to arrival of the first units	Time of arrival to complete extrication of patients	Time of patient removal & preparation for transport	Time available for transport to appropriate medical facility



The average time for Extrication has to be reduced to a more reasonable time of ten to fifteen minutes.

This **GOAL** is realistic and can be safely met by intensive, uniform training and by obtaining up-to-date knowledge of today's domestic cars and their potential problems.

### 60 Minutes

5 Minutes	10 Minutes	30 Minutes	5 Minutes	10 Minutes
Time of incident to notification	Time of notification to arrival of the first units	Time of arrival to complete extrication of patients	Time of patient removal and preparation for transport	Time available for transport to appropriate medical facility



# 60 Minutes

(With National Average Extrication Time)

<b>5 Minutes</b>	<b>10 Minutes</b>	<b>15 Minutes</b>	<b>5 Minutes</b>	<b>25 Minutes</b>
Time of incident to notification	Time of notification to arrival of the first units	Time of arrival to complete extrication of patients	Time of patient removal and preparation for transport	Time available for transport to appropriate medical facility



National Studies have shown that most of the time consumed in the **Golden Hour** is due to long transport times between appropriate medical centers. By mastering our profession we increase time for transport which in turn increases the patient's chances of survival.



# How do we do this?

**Verdugo Fire Academy**

**Ch.25**

... more than fighting fires



**By implementing a Team Approach!**



# THE TEAM APPROACH

The TEAM APPROACH means that the team pre-plans its moves, trains together as a unit and pre-assigns job functions whenever possible.

This is done by talking about what you are going to do, before you do it, and then trying to follow your plan on the street.



# The Team Approach is NOT

- ...intended to be a rigid plan.
- ...set in stone.
- ...nor is it intended to be a comprehensive set of actions that attempt to address every conceivable situation.
- ...the way the Captain would do it.
- ...the way the instructor taught me.

# The Team Approach is

- ...simply a way to organize in advance the tasks that you expect to perform.
- ...flexible.
- ...creative.
- ...and most of all...
- ...**well communicated!!!**





# Team Approach

- When pre-planning for extrication, it is essential to learn to remove as many variables from each situation as possible.

## How?

- Immediately using the most fail-safe technique for each given job to be performed. This will help reduce wasted effort and wasted time.

Video

Halmatro 1



# REMEMBER...

- There is no such thing as a technique that is 100% effective. We should judge the technique we use against a standard of 100%.
- Use the techniques that work best in most cases in order to save time.



At this point it is important to state that:

# Vehicle Extrication is Dangerous

We as rescuers minimize our own risk by wearing full protective clothing

**AND**

...by being well trained.



# P.P.E. Consists of:



- Helmet.
- Eye Protection.
- Turn-out jacket/Brush jacket.
- Turn-out pants.
- All leather gloves or extrication gloves.
- Optional: Hearing protection



# Vehicle Extrication is Dangerous

We minimize risk to our patients by extricating in a controlled manner and without creating any more significant damage.



# Extrication in the S.H.A.D.E.

**S.H.A.D.E. is an acronym to assist you with extrication.**

**By applying S.H.A.D.E. you will create an environment to better control the scene**



# S.H.A.D.E

# S

- Size – up
- Stabilization
- Scene Management
- Safety



# S

## Size - up

- Begins with dispatch
- Continues enroute
- Relay exact location & best egress to other incoming units
- Once on scene, determine the following...





# Size – up...

Determine the...

1. Number of patients
2. Severity of the injuries
3. Level of entrapment
4. Resources – What is on-scene?
  - a. What is enroute?
  - b. Is anything else needed? Apply the 5 W's
5. Hazards present
6. Continually re-evaluate incident status



# S

## Stabilization

- Involves increasing the number, size and total area of contact between the vehicle(s) and the ground/pavement.
- Orientation of vehicle(s) will determine stabilization needs.
- Consider cribbing, come-a-long, the vehicle itself, air bags, high lift jacks, etc...



# **S** Scene Management

- Interior Zone
- Hot Zone
- Warm Zone
- Cold Zone



# **S** Scene Management

## ■ Interior Zone...

Activities inside the vehicle.  
Includes personnel and equipment necessary for patient care and treatment.



# **S** Scene Management

## ■ Hot Zone...

Immediately adjacent to vehicles being worked on, only those personnel directly involved in patient care or extrication operations should be inside this perimeter.



# **S** Scene Management

## ■ Warm Zone...

- Equipment cache
- Firefighter with pressurized hotline (with air bled out)
- Command Post
- Pumper supplying hotline
- Staging area for:

Personnel and apparatus not currently involved in patient treatment or extrications



# S Scene Management

## ■ Cold Zone...

People and equipment not directly involved in the rescue effort.

- Ambulance Staging
- Media
- Onlookers



# S

# Safety

## ■ Rescuer

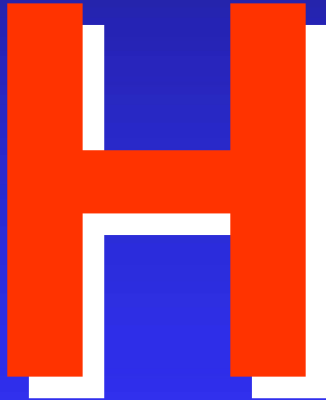
- ◆ All personnel wearing PPE with eye protection
- ◆ Lighting for night responses
- ◆ Identify slip/trip hazards

## ■ Patient

- ◆ C-Spine stabilization as soon as safely possible.
- ◆ Cover patient before starting more aggressive maneuvers



# S.H.A.D.E



Hazard Control



# H Hazard Control

## ■ Consists of...

- ◆ Fuel Leaks
- ◆ Fire suppression
- ◆ Traffic Control
- ◆ Crowd Control
- ◆ Hazardous Materials Involvement
- ◆ Electrical Involvement



# H

# Hazard Control

## ■ Fuel Leaks

- ◆ Secure with class “B” foam
- ◆ Control leaks if possible (wax toilet ring, golf tee or putty)
- ◆ Dike spill or use a small container to reduce size



# **H** Hazard Control

- **Continuous application of foam**

Note: Foam obscures vision and slickens surfaces

## **FIRE CONTROL**

- **HOTLINE ...**

Note: Tests show both boosters combined do not provide enough GPM to protect the nozzle man from volume of fire produced by the amount of gasoline found in a passenger vehicle, if it should ignite unexpectedly! If they will not protect you they definitely won't protect our patient.



# H Hazard Control

## ■ Traffic Control...

- ◆ Law enforcement responsibility on...
  - ◆ FWY
  - ◆ City Streets
- ◆ Expedite CHP/PD by...
  - ◆ calling Cal-Trains, tow trucks, etc..
- ◆ Position apparatus by...
  - ◆ Creating a ring around the scene, heaviest vehicle between site and on-coming traffic, leave space for buffering in case apparatus is struck by another vehicle.



# H Hazard Control

## ■ Crowd Control...

- ◆ Law enforcements responsibility; Military Police, Airport Security or Public Service can assist with barriers



# H Hazard Control

## ■ Hazardous Materials Involvement

- ◆ Notify Dispatch
  - ◆ They will begin required notifications...
- ◆ May initiate calls to the...
  - ◆ Health Department, Hazmat Unit, Chemtrec, Responsible party, OES, etc...
- ◆ Notify in-coming units of ...
  - ◆ Safe approach
  - ◆ Up-hill
  - ◆ Up-wind



# H Hazard Control

## ■ Electrical involvement

- ◆ Downed Lines
  - ◆ Call SCE or appropriate company...
- ◆ Damaged street/traffic lights...
  - ◆ Call Public Service
  - ◆ Note: Street lights are a minimum of 220 volts – 15 amps, most are much higher
- ◆ Battery(ies)...
  - ◆ Do not disconnect unless active arcing/sparking is occurring, with fuel spilled. If not, leave connected for use with power door locks, windows, seats, hatch releases and steering columns.



# S.H.A.D.E

# A

- Access
- Assess
- Assist



# A Access

- Gain access to the patent by...
  - ◆ Trying simple maneuvers. Remember to...

**TRY BEFORE YOU PRY**

- ◆ Utilize the vehicle, slide seats back, tilt steering wheels, power doors, etc...
- ◆ Remove glass

Note: more complex techniques accomplish the same goal, in case simple techniques are unsuccessful



# A Access

## ■ Notes about Glass Removal...

- ◆ It is the most common contaminate of patients wounds
- ◆ Invisible to X-Ray
- ◆ Once mixed with blood impossible to see visually
- ◆ Cannot be irrigated out of wounds
- ◆ Wound usually heals with glass slivers/chips still inside with continues to irritate/delay healing until the skin grows out and naturally sloughs the glass off.



# A Assess

- **Asses the patient's injuries, treatment needed and level of entrapment**
- **Consider "Smash & Grab" if the patients are critical without physical entrapment**
  - ◆ **Example: Remove the roof and extricate patient utilizing KED board.**



# A

# Assist

## ■ Begin Treatment

- ◆ C-Spine stabilization
- ◆ High flow O<sub>2</sub>
- ◆ Dress bleeding
- ◆ Large bore IV's

■ Treatment should begin and continue while access is gained throughout the extrication process.



# S.H.A.D.E

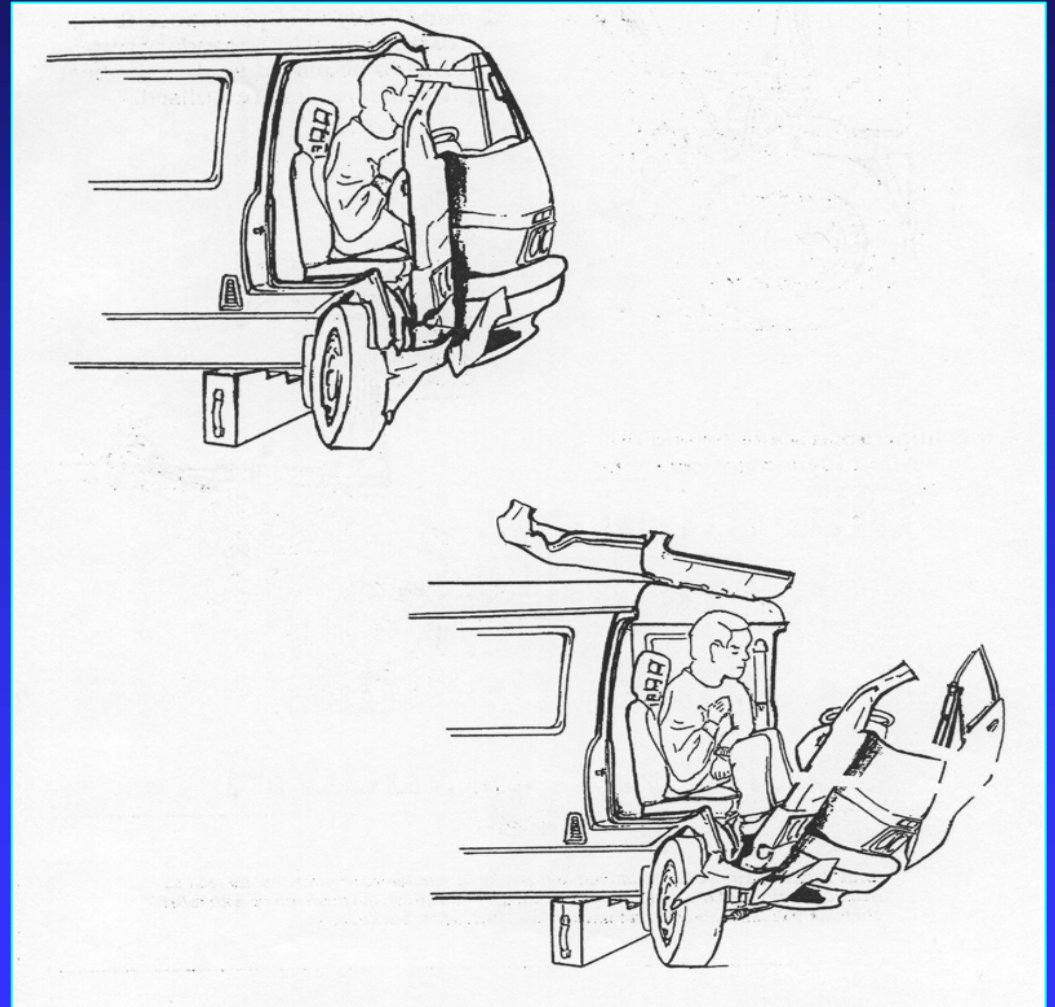
# D

- Disentanglement

# D

# Disentanglement

Process of removing the vehicle away from around the patient with a minimum of manipulation of the patient by...





# D Disentanglement

- ◆ Door removal
- ◆ Force seats
- ◆ Move pedals
- ◆ “B” Pillar Removal on 4-Door vehicles
- ◆ “Third Door” technique on 2-Door vehicles
- ◆ Hatch back considerations
- ◆ Roof Removal
- ◆ Dash/Firewall Push

**Note: Disentanglement take place after simple maneuvers have failed.**



# D Disentanglement



Process of removing the vehicle away from around the patient with minimum of manipulation of the patient by...



# D Disentanglement

Process of removing the vehicle away from around the patient with minimum of manipulation of the patient by...





# Disentanglement

## Door Removal and Pillar/Post Removal

**Verdugo Fire Academy**

**Ch.25**

... more than fighting fires





# Disentanglement

## Roof Removal

**Verdugo Fire Academy**

... more than fighting fires

**Ch.25**





# Disentanglement

## Dash Push





# S.H.A.D.E



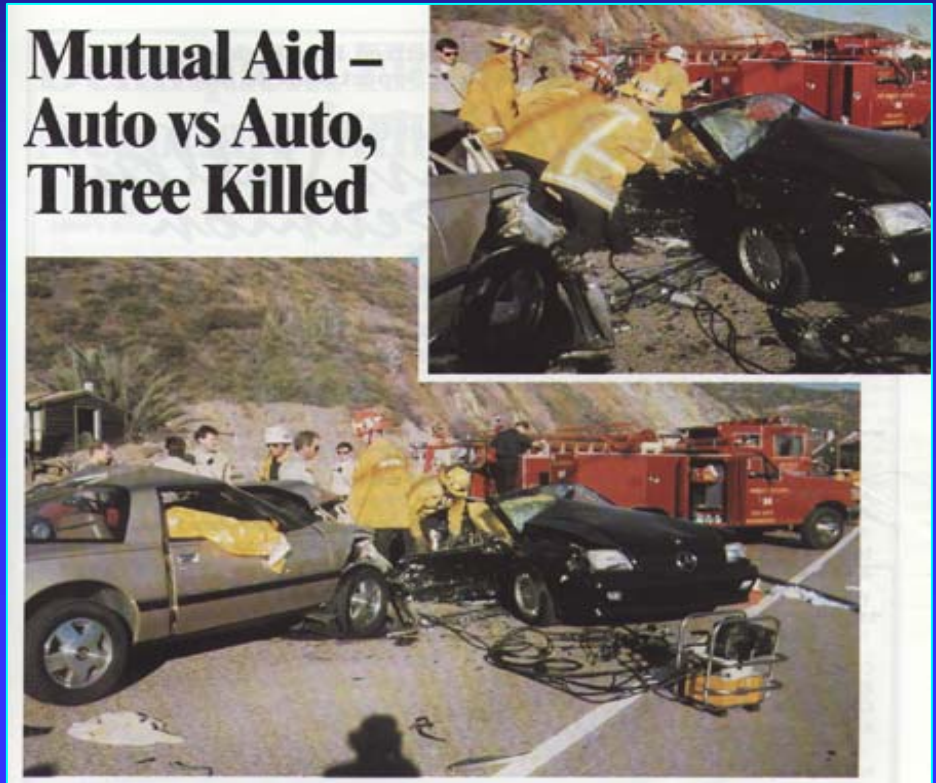
■ Extrication



# **E** **Extrication**

**Patient packaging and removal with minimal manipulation, thereby minimizing aggravation of any injuries.**

**Mutual Aid –  
Auto vs Auto,  
Three Killed**





***Verdugo Fire Academy***

*... more than fighting fires*

***Ch.25***

# Take 5



# Principles of Vehicle Stabilization

It is important to remember that the only reason we manipulate a vehicle at an accident scene is because there is a **VICTIM INSIDE**



# Principles of Vehicle Stabilization

**Verdugo Fire Academy**

**Ch.25**

... more than fighting fires





# Principles of Vehicle Stabilization

**Remember:** There is usually more than one “right” way to stabilize a vehicle. Most rescue situations will call for multiple stabilization techniques that will evolve as the rescue proceeds.

- **With this in mind lets define and explain the purpose and goal of stabilization.**



# Principles of Vehicle Stabilization

## DEFINITION:

The process of assessing for potential movement of the vehicle followed by the practical application of the necessary tools and equipment to reduce or eliminate that movement.



# Principles of Vehicle Stabilization

## PURPOSE of:

To make a safer working environment for the rescuers as they operate in or around vehicles.

AND

To prevent more extensive injuries to the victims involved by reducing or eliminating any further movement of the vehicle(s).



# Principles of Vehicle Stabilization

## Primary GOAL:

To increase the surface area and number of contact points between the vehicle(s) and the ground to prevent further movement.



# Stabilization

## Factors in Assessing Vehicle Stability:

1. Vehicle Position
2. Terrain or Location
3. Understanding the potential for Vehicle Movement



# Stabilization

## Vehicle Position...

This is the main factor determining the stabilization technique used.





# Stabilization

## Vehicle Position...

As seen before vehicles can be found upright, on their side (less than halfway over or more than halfway over), on their roofs, on top of or under another vehicle, or on top of a victim.



# Stabilization

## Terrain or locations...





# Stabilization

## Terrain or Location...

A steep, muddy embankment will obviously necessitate different stabilization methods than will flat, dry ground. A car upright on flat pavement will be relatively simple to stabilize compared to a care overhanging a freeway overpass.



# Stabilization

## Understanding the potential for vehicle movement...

There are 5 basic principles of movement as related to vehicle extrication.

1. Horizontal movement
2. Vertical movement
3. Roll movement
4. Pitch movement
5. Yaw movement

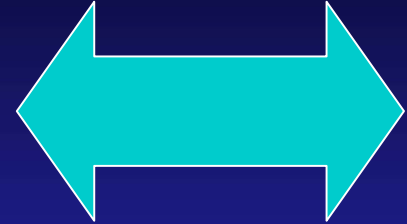


# Stabilization

Understanding the potential for vehicle movement...

Horizontal movement:

The vehicle can move backwards and forwards.



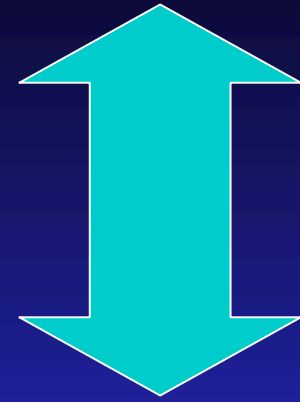


# Stabilization

Understanding the potential for vehicle movement...

Vertical movement:

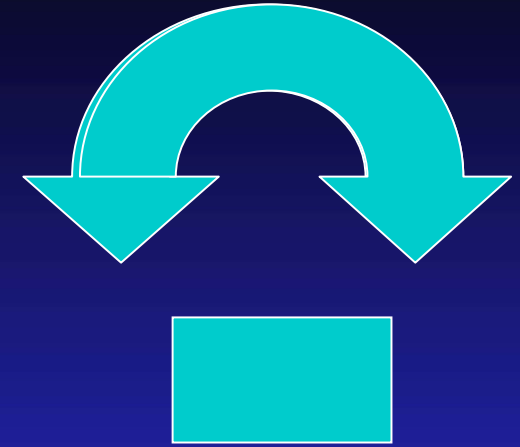
The vehicle can move up or down in relation to the ground.





# Stabilization

Understanding the potential for vehicle movement...



## Roll movement:

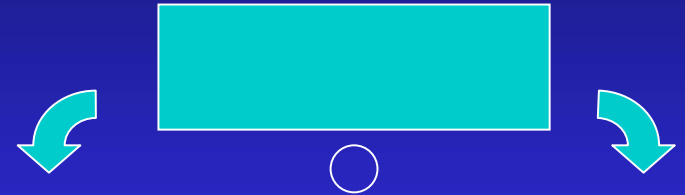
The vehicle can move from side to side. A vehicle on it's side may rock back and forth or roll over.



# Stabilization

Understanding the potential for vehicle movement...

Pitch movement:

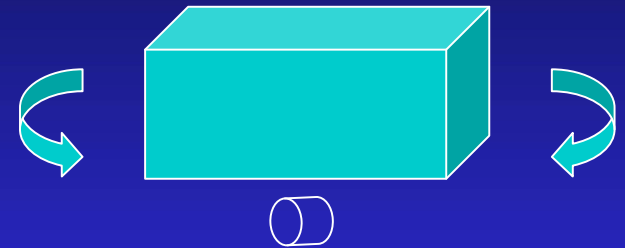


The vehicle can move up or down on its lateral axis, causing the vehicle's front end to rise or fall in relationship to it's rear end.



# Stabilization

Understanding the potential for vehicle movement...



Yaw movement:

The vehicle can rotate on its vertical axis, causing the vehicle's front and rear ends to move right or left in relation to their original position.



# Stabilization

Stabilization Equipment consists of many different tools, for ease we will break the tools into two categories...

1. Cribbing
2. Other tools



# Stabilization

## Cribbing...

Cribbing is ideally made of rough cut lumber because the rough surfaces grip together better.



# Stabilization

## STRAIGHT CRIBBING...

Basic pieces of cribbing carried in 24 inch lengths, and made of 2X4's and 4X4's.





# Stabilization

## WEDGE CRIBBING...

24 inch pieces of 4X4 lumber cut diagonally starting 2 to 2 ½ inches from each end.

They are used to increase surface area contact, snug up cribbing, fill voids, or take up slack as needed when lifting.

**Warning:** Never point load unsupported wedges. These need to rest on a 2X4 or 4X4 base.



# Stabilization

## BASE CRIBBING...

Also referred as base plates are 24 inch by 24 inch squares made by laminating 2 layers of one inch plywood.

Base cribbing provides a platform from other rescue tools such as Hi-lift jacks and air bags. Also, they are used in conjunction with high and low pressure air bags to provide a solid base free of sharp objects and debris.



# Stabilization

## Uses of and types cribbing...

1. Box Cribbing
2. Step Cribbing
3. True Platform



# Stabilization

## Box Cribbing:

Also referred to as cross-tie cribs, they are made from dimensional lumber or **STRAIGHT CRIBBING** stacked on opposing layers.





# Stabilization

## Box Cribbing:

Are 4X4's laid side by side, the completed stack is in firm contact with the vehicles frame. It is important to build the crib as square as possible to maximize stability.

**Warning & General Rule:** When the box crib is square, it can **ONLY** be built twice as high as it is side (2:1 ratio). Irregularly shaped crib systems are limited to a 1:1 ratio.



# Stabilization

## Box Cribbing:

When building a box crib for use with the air bags, build a solid top layer to support the air bags.





# Stabilization

## Step Cribbing:

Used to as a 4 point stabilization for the vehicle.  
Constructed of a 2X6 base with 2X4 stacked on top,  
each 5 inches shorter than the other.





# Stabilization

## True Platform:

It is the most material intensive cribbing. It is a solid platform, constructed like a box crib, but the lumber is laid side by side across each layer so that no void spaces exist within the crib. It is not usually used in auto extrication but many times is necessary in heavy rescue.





# Stabilization

## STABILIZATION KIT:

This is the standard complement of cribbing carried by most truck companies. It consists of:

- 20-4X4X24 Straight Cribs
- 30-2X4X24 Straight Cribs
- 15 pairs of wedges
- 4 step cribs





# Stabilization

## Other Tools...

### Hi-Lift Jacks

Can be used for quick stabilization especially when a car is on its side but should be replaced with wood cribbing for an extended extrication.



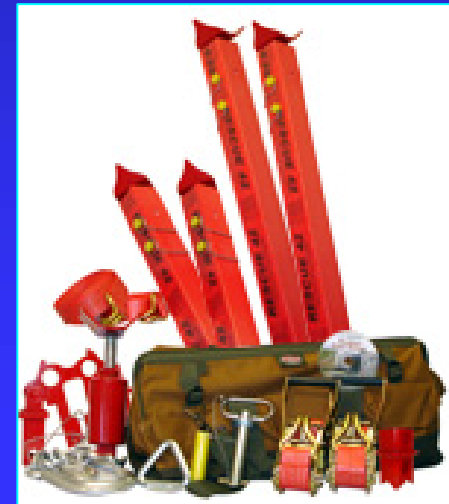


# Stabilization

## Other Tools...

### RESCUE 42

This is one of many new systems that have been developed in place of high lift jacks. They all have strengths and weakness. Find out what your department has and know how to use them.





# Stabilization

## Other Tools...

### Cable come-along

Can be used in conjunction with a substantial anchor point to eliminate further vehicle movement.





# Stabilization

## Other Tools...

Chains, cables, slings, webbing and rope...

All can be used to attach an unstable vehicle to a substantial anchor point to eliminate movement.

**Warning:** These components have different strength ratings, resistance to abrasion and susceptibility to chemical degradation.

***Any system is only as strong as it's weakest component!***



# Stabilization

## Other Tools...

Chains, cables, slings, webbing and rope...

Remember that “Life” rescue rated rope, slings, webbing, etc. should be used only in extreme cases and should then be taken out of service after this type of use.



# Stabilization

## Other Tools...

### High and Low Pressure Air Bags

Should only be used in conjunction with wood cribbing. It must be understood that these are **LIFTING** devices and not stabilizing devices, and as such **DE-STABILIZE** objects when ever used in a lifting evolution.





# Stabilization Other Tools...

Auxiliary equipment

Tow trucks, cranes, Heavy Rescue trucks, etc...





***Verdugo Fire Academy***

*... more than fighting fires*

***Ch.25***

# Take 5

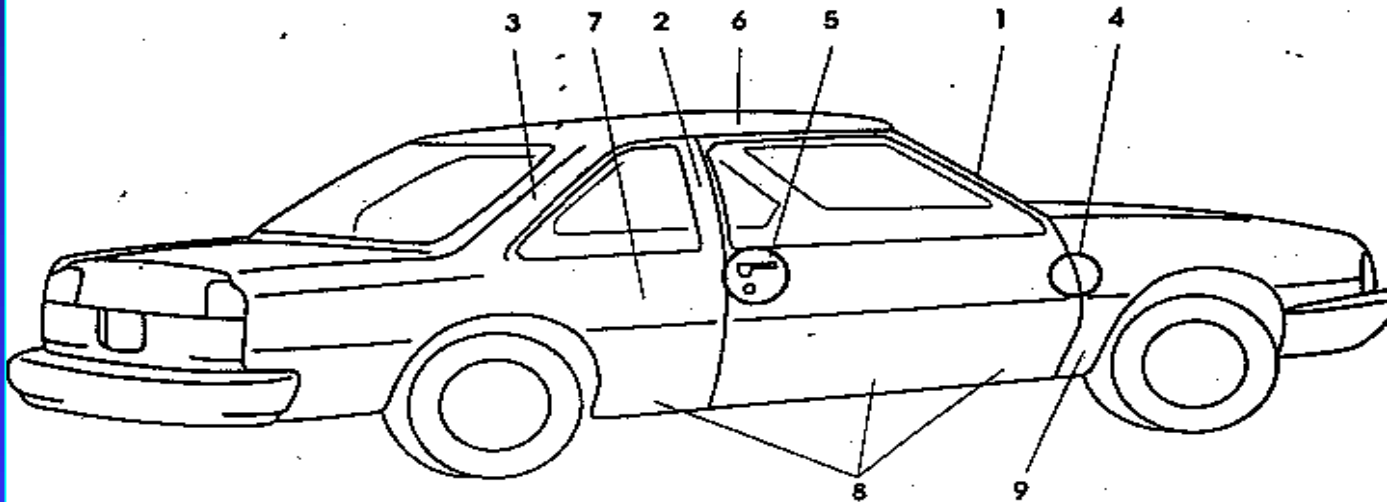
# Specific Methods of Vehicle Stabilization

As mentioned in General Principles of Vehicle Stabilization the factor determining the stabilization method used is the position the vehicle comes to rest in.

This section will deal only with specific methods for stabilizing vehicles found in the 5 most common positions.

# Anatomy... A quick look

## Vehicle Terminology



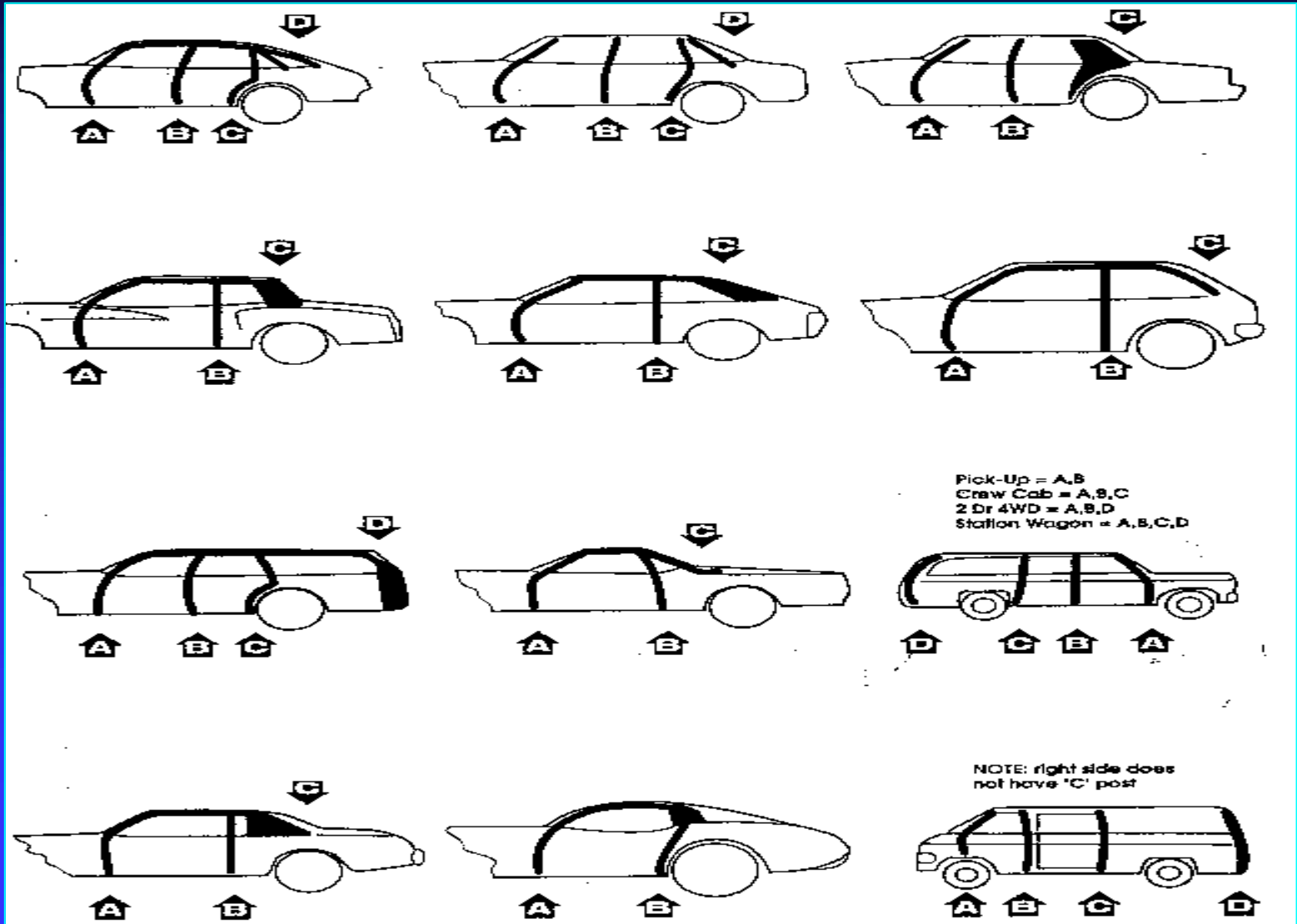
- 1. "A" Post
- 2. "B" Post
- 3. "C" Post

- 4. Hinge Side
- 5. Latch Side
- 6. Roof Rail

- 7. Rear Quarter Panel
- 8. Door Sill
- 9. Kick Panel



# Anatomy... A quick look



# The 5 most common positions...

1. Up right
2. On a side
  - a. Less than half way
  - b. More than half way
3. Upside down
  - a. On their roofs
  - b. Nose down





# The 5 most common positions...

**Verdugo Fire Academy**

**Ch.25**

... more than fighting fires

## Upright

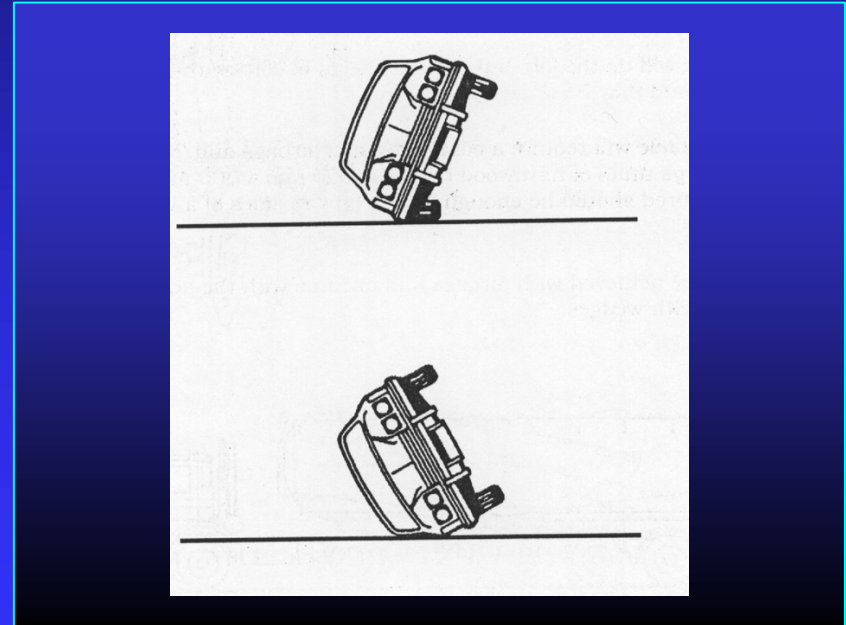




# The 5 most common positions...

## On a Side...

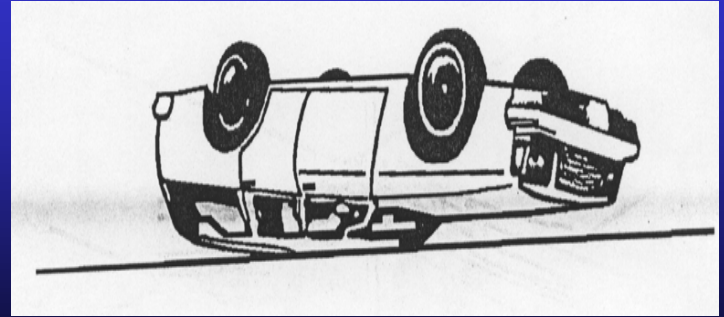
- a. Less than half way
  
  
  
  
  
  
  
  
  
  
- b. More than half way



# The 5 most common positions...

## Upside down...

a. On their roofs



b. Nose down





# What you could see...

**Verdugo Fire Academy**

**Ch.25**

... more than fighting fires





# Still more...

**Verdugo Fire Academy**

**Ch.25**

... more than fighting fires





# Still more...

**Verdugo Fire Academy**

**Ch.25**

... more than fighting fires





# Still more...

**Verdugo Fire Academy**

**Ch.25**

... more than fighting fires



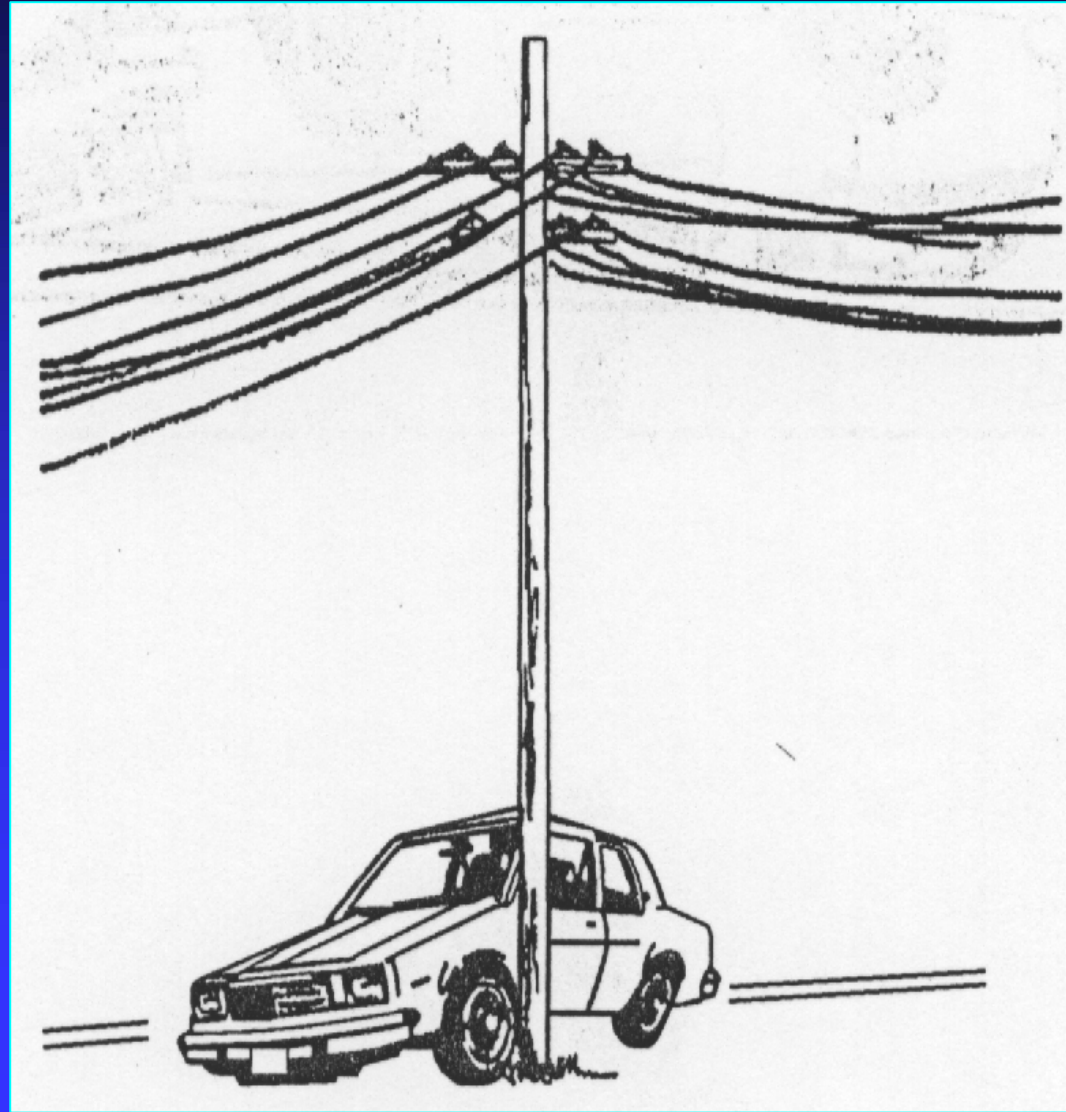


# Still more...What are some considerations?

**Verdugo Fire Academy**

**Ch.25**

... more than fighting fires





# The most common positions...

The methods discussed in this section represent basic, straight forward, and well tested means of stabilizing vehicles in various positions.

Remember: these basic methods only serve as a starting point in your stabilization efforts and may evolve into more complicated methods as the extrication continues.



# ABSOLUTE RULES:

1. As cribbing is built and set in place, the rescuer's hands are never to be placed on top of the cribbing or directly under the lad being cribbed.
2. Cribbing can only be stacked twice as high as the base is wide.
3. Lift an inch, crib an inch.
4. Place crib systems at strong structural components only (Frame, roof rails, etc.) not at point where there is only sheet metal.
5. Build cribbing is to not impede access to the patient.



# VECHILE UPRIGHT

## Four Point Stabilization:

- a. The quickest and easiest method is using 4 step cribs.
- b. Pull or remove the valve stem.
- c. Slash the tires...
- d. Build cribbing at the same points.

**Use caution with this and all other methods.**





# VECHILE UPRIGHT

## Three Point Stabilization:

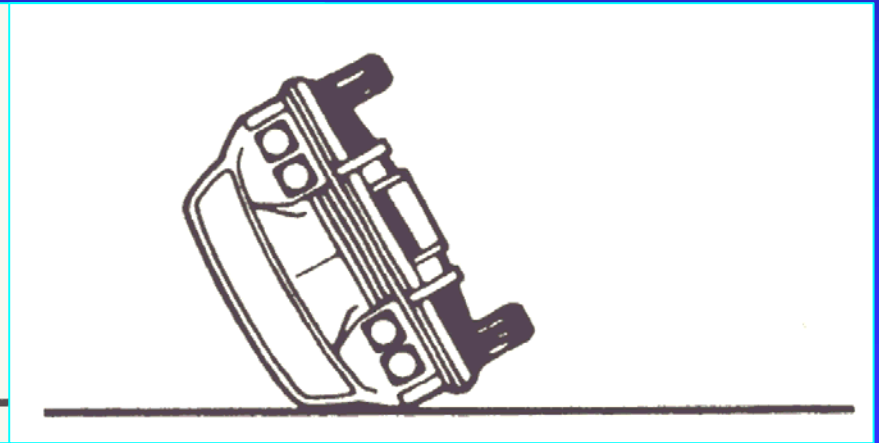
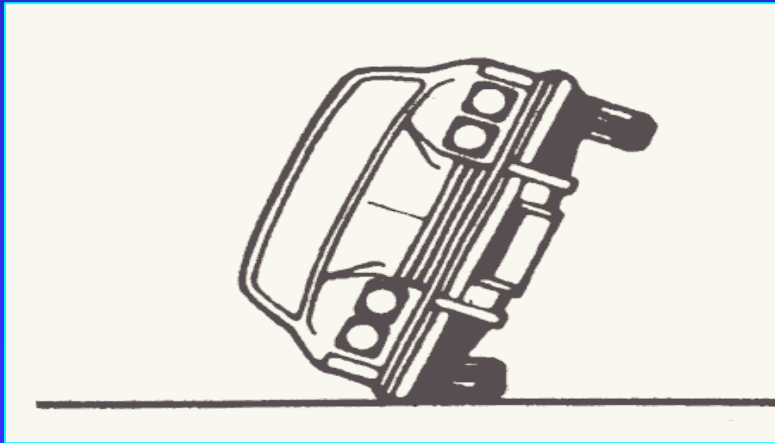
- a. Crib in front of the rear wheel wells (Similar to 4-point with step cribbing).
  
- b. Coming from the front of the vehicle, slide one step crib or other crib between the two front tires until it rests under a frame cross member or under the engine block itself.



# VEHICLE ON ITS SIDE

Will come in one of two positions

- Less than halfway  
(or resting against their wheels).
- More than halfway  
(or resting against their roofs).

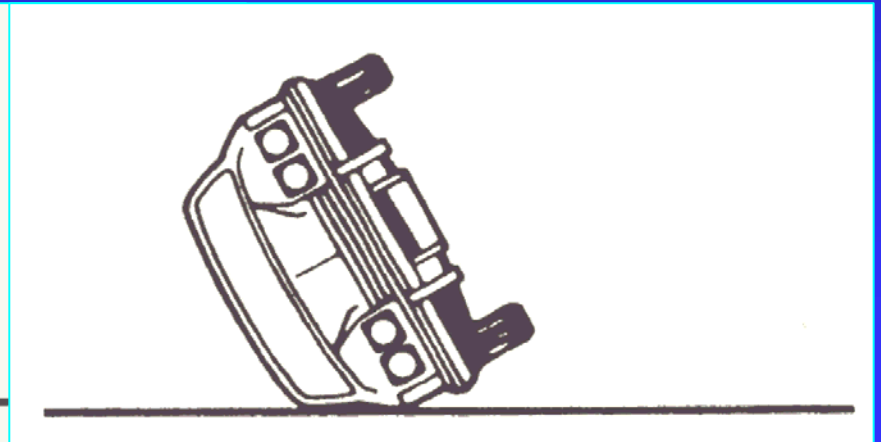
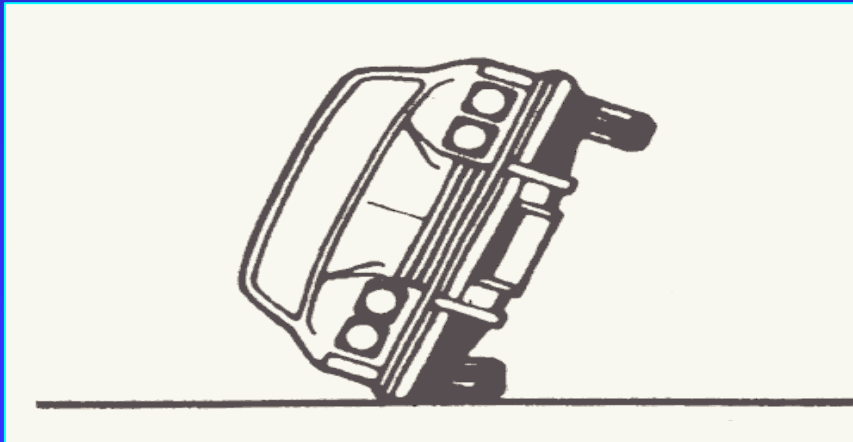




# VEHICLE ON ITS SIDE

Will come in one of two positions

- A vehicle on its wheels will have a tendency to overturn to the upright position.
- A vehicle on its roof will have a tendency to overturn to the upside down position.





# VEHICLE ON ITS SIDE

When stabilizing a vehicle on its side it is important to understand this concept...

The basic principal of stabilizing a vehicle on its side is to build a “Cradle” for the vehicle to rest in and to “Lock” it into place.



# VEHICLE ON ITS SIDE

While “Locking” it into place remember...

1. Vehicle on its side is very unstable. Never push a vehicle to test its stability.
2. Place a safety-person at either end of the vehicle to monitor vehicle movement.
3. Due to being on its side, fuel tank and lines may empty their contents quickly.

# VEHICLE ON ITS SIDE

## To stabilize...

- Locate where the pillars meet the roof , here the strength of the structure is the best place to build a box crib.

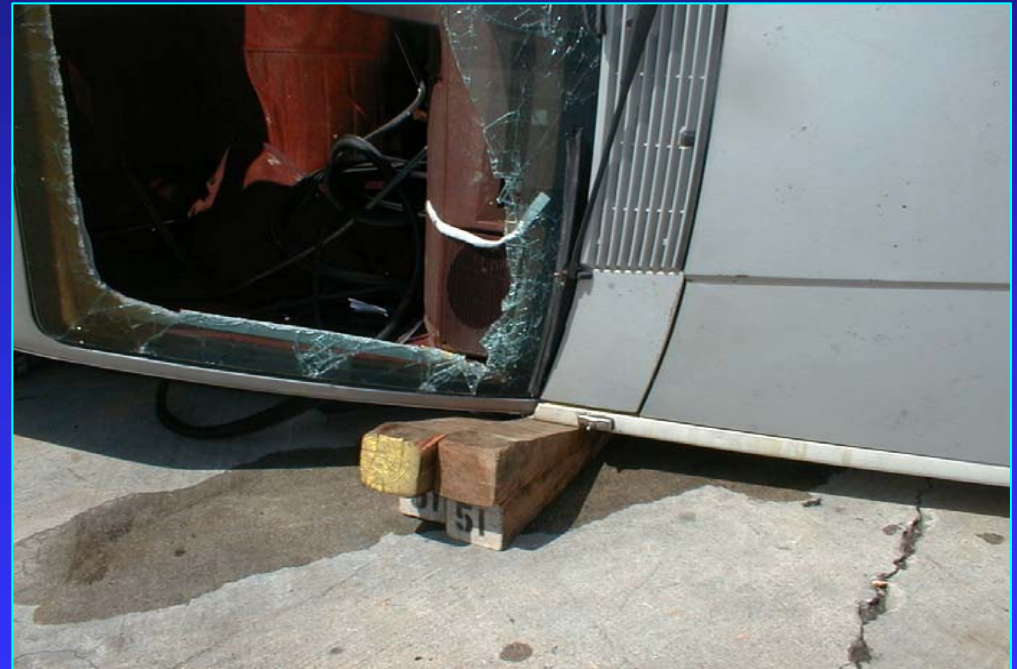




# VEHICLE ON ITS SIDE

## To stabilize...

- **Wedges at various points along the car does not come in contact with the ground.**



# VEHICLE ON ITS SIDE

To stabilize...

- Undercarriage side...High-lift Jacks are usually the first step in stabilizing from the undercarriage side.

**Do not over-jack...**





# VEHICLE ON ITS SIDE

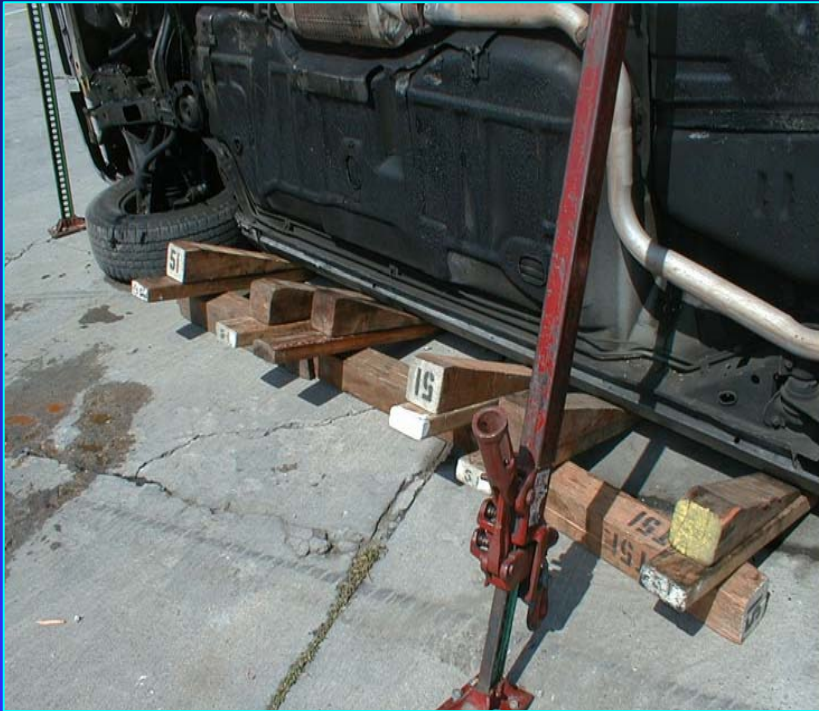
To stabilize...

If there is clearance between the tire and the ground, slide cribbing under the wheel until it is in contact with the metal wheel, not just the tire rubber.



# VEHICLE ON ITS SIDE

To stabilize...



After the Hi-lift Jacks are used:

- Place 4X4's parallel to the car body about 10 to 12 inches away from the car.
- Place 2X4's perpendicular to the car with one end under the car frame and the other resting on the 4X4.
- Use wedges to fill the voids.



# VEHICLE ON ITS SIDE

To stabilize...



If the vehicle is more than half over, start on the roof side.

Use two jacks at the front and rear of the vehicle.

Cribbing can be used as needed.



# VEHICLE ON ITS ROOF

To stabilize...

A vehicle on its roof will present one of two ways...

First, resting solely on its roof with the nose and rear off the ground.



# VEHICLE ON ITS ROOF

## To stabilize...

**Secondly, resting with the front of the hood and the front roof rail resting on the ground.**

**The weight of the engine block will force the vehicle to this position.**





# VEHICLE ON ITS ROOF

To stabilize...

When the vehicle is positioned nose down, there are only 2 contact points between the vehicle and the ground.

The vehicle's center of gravity is now located some where between these two point.

Stabilize as quickly as possible.





# VEHICLE ON ITS ROOF

To stabilize...

Construction of today's smaller , economy cars usually “unitize” sheet metal construction. **The windshield has to be in place and intact in order for the cars to pass government rollover tests.** Compromised windshields pose a risk to patient and rescuer alike.



# Examples of Cribbing

The following slides are to give ideas on how to crib some of the most common positions.

# CRIBBING 101

# Cribbing 101



This picture shows a car on its side with the bottom layer of the box crib built perpendicular to the vehicle, allowing the entire crib to be slid into place.

Note: the rescuer is also showing proper hand placement; hands to the sides of the cribbing and not under the load.



# Cribbing 101

Vehicle on its roof...  
Crib the center at the rear window and two at the front corners where the fire wall meets the side body of the car (3-point stabilization).

**Advantage:** easily built up if lifting vehicle to get the patient out.



# Cribbing 101



- Vehicle on roof, nose down...
- 1<sup>st</sup> Crib the nose of the vehicle. Wedges tapped in along the front. This is to keep the vehicle from sliding.

# Cribbing 101

- Vehicle on roof, nose down...
- Another example of the same procedure using Straight Cribbing.





# Cribbing 101



1. Step cribs are used at the fire wall
2. Jacks at the “B” Pillars
3. Box cribs near the “C” pillar

**This takes the vehicle from 2 points of contact to 6 points of contact.**



# Stabilization

**KEEP IT SIMPLE**

**KEEP IT SAFE**