The Maryland Fire and Rescue Institute of the University of Maryland is the State’s comprehensive training and education system for all emergency services.

The Institute plans, researches, develops, and delivers quality programs to enhance the ability of emergency service providers to protect life, the environment, and property.
Lesson 1-2: Introduction To VME; Passenger Vehicle Anatomy And Hazards

Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe course components and student requirements and identify common passenger vehicle anatomy components and hazards.

Overview

- Introduction to VME
- Common Passenger Vehicle Anatomy
- Vehicle Hazard Identification
- Hazard Isolation/Mitigation
Introduction to VME

- There are 6 million accidents, 2.5 million injuries and 40 thousand deaths on average annually in the United States.

Introduction to VME

- Overview of the extrication process:
  - Size up
  - Plan
  - Stabilize
  - Create access/egress points
  - Disentangle
  - Turn victim over to EMS

Common Passenger Vehicle Anatomy

- Terminology
  - Roof
  - Undercarriage
  - Driver's Side
  - Passenger's side
  - Front
  - Rear
  - Interior
  - Exterior
Common Passenger Vehicle Anatomy

■ Evolution of the modern passenger vehicle:
  – Safety improvements
  – Accident survivability
  – New materials to increase fuel economy

Common Passenger Vehicle Anatomy

■ Vehicle components
  – Roof
  – Roof rail
  – Sun roof
  – Hood
  – Doors

Common Passenger Vehicle Anatomy

■ Vehicle components
  – Quarter panel
  – Side-impact reinforcement
  – Nader pin/latch
  – Hinges
  – Fenders and wheel wells
Common Passenger Vehicle Anatomy

- Vehicle components
  - Posts
    - A Post
    - B Post
    - C Post

Common Passenger Vehicle Anatomy

- Vehicle components
  - Firewall
  - Crush zones
  - Bumpers
  - Seats
  - Dashboard
  - Windows

Common Passenger Vehicle Anatomy

- Vehicle components
  - Batteries
    - Possible locations
    - Dual batteries
    - Hybrid batteries
  - Fuel tank
Common Passenger Vehicle Anatomy

- Vehicle components
  - Safety systems
    - Seatbelts
    - Seatbelt pretensioners
    - Seatbelt G-force limiters
    - Front-impact air bags
    - Side-impact air bags
    - Wheel and engine deflection systems

Vehicle Hazard Identification

- Vehicle interior and exterior hazards
  - Passengers
  - Debris
  - Bodily Fluids
  - Hazardous Materials

Vehicle Hazard Identification

- Environment hazards
  - Terrain
  - Weather
  - Traffic
  - Ignition sources
  - Power lines
Vehicle Hazard Identification

- New vehicle hazards
  - Key Fob/Keyless ignition
  - Seatbelt pretensions
  - Side Curtain airbags
  - Energy Absorbing Struts
  - Hybrid Vehicle Battery Pack
  - Hybrid Vehicle Power Cable

Vehicle Hazard Identification

- Alternative fuels, power sources
  - Propane and Liquefied Natural Gas
  - Auxiliary Fuel Cells
  - Alcohol/Gasoline Blended Mixes
  - Hydrogen
  - Biodiesel
  - Jet Propellant – 8 (JP-8)
  - 100% Electric vehicles

Hazard Isolation/Mitigation

- How things work and how to disable the system or mitigate the danger
  - Air bags
  - Seatbelt pretensioners
  - Electrical power
  - Hybrid power considerations
  - Bumper struts
Hazard Isolation/Mitigation
- Requirements for additional specialized resources
  - Other fire service resources
  - Other government agency resources
  - Private resources

Student Performance Objective
- Given information from discussion, handouts, and reading materials, describe course components and student requirements and identify common passenger vehicle anatomy components and hazards.

Review
- Introduction to VME
- Common Passenger Vehicle Anatomy
- Vehicle Hazard Identification
- Hazard Isolation/Mitigation
Lesson 2-1: Commercial and Heavy Vehicle Anatomy and Hazards

Student Performance Objective

- Given information from discussion, handouts, and reading materials, identify commercial and heavy vehicle anatomy components and hazards.

Overview

- Commercial and Heavy Vehicle Anatomy
- Vehicle Hazard Identification
- Hazard Isolation/Mitigation
Commercial and Heavy Vehicle Anatomy

- Buses
  - Types
    - School buses
    - Transit buses
    - Commercial buses
    - Specialty buses

Bus Types

- School Bus
- Transit Bus
- Commercial Bus
- Specialty Bus

Commercial and Heavy Vehicle Anatomy

- Bus Anatomy
  - Construction types
    - Integral Body Construction
    - Body on Chassis Construction
  - Components
    - Skeletal System
    - Floor and Undercarriage
Commercial and Heavy Vehicle Anatomy

- Doors
  - Two piece, center opening
  - Center hinge
  - Emergency doors
  - Opening systems

Commercial and Heavy Vehicle Anatomy

- Windows
- Seats
- Aisle width
- Roof
- Batteries

Commercial and Heavy Vehicle Anatomy

- Fuel systems
  - Conventional Fuels
  - Alternative fuels
- Brake systems
- Suspension systems
Commercial and Heavy Vehicle Anatomy

- Medium and Heavy Trucks
  - Types:
    - Straight truck
    - Tractor/trailer
    - Specialty

Truck Types

- Tractor Trailer
- Straight Truck
- Specialty Truck
- Specialty Truck

Commercial and Heavy Vehicle Anatomy

- Anatomy
  - Cabs
    - Conventional
    - Cab-Over
    - Sleepers
  - Doors
  - Windows
  - Roof
Commercial and Heavy Vehicle Anatomy

- Batteries
- Fuel systems
- Auxiliary Power and Hydraulic Systems
- Brake Systems
- Suspension Systems
- Fifth Wheel

Commercial and Heavy Vehicle Anatomy

- Trailers
  - Box trailers
  - Livestock trailers
  - Tank trailers
  - Lowboys
  - Dump trailers

Commercial and Heavy Vehicle Anatomy

- Rail Cars
  - Locomotives
  - Passengers cars
  - Lounge/food service cars
  - Baggage cars
  - Material handling cars
Commercial and Heavy Vehicle Anatomy

- Rail car anatomy
  - Electrical systems
  - Windows
  - Doors
  - Walls/roof
  - Trucks
  - Brakes

Commercial and Heavy Vehicle Anatomy

- Industrial and agricultural vehicles
  - Local response area and vehicle types
  - General approach

Vehicle Hazard Identification

- Vehicle interior and exterior hazards
- Environmental hazards (terrain, power lines, weather, traffic, etc.)
- Alternative fuels, power sources
Hazard Isolation/Mitigation

- How things work and how to disable them
- Requirements for additional specialized resources

Student Performance Objective

- Given information from discussion, handouts, and reading materials, identify commercial and heavy vehicle anatomy components and hazards.

Review

- Commercial and Heavy Vehicle Anatomy
- Vehicle Hazard Identification
- Hazard Isolation/Mitigation
Lesson 3-1: Machinery Anatomy and Hazards

Student Performance Objective

■ Given information from discussion, handouts, and reading materials, identify machinery anatomy components and hazards.

Overview

■ Introduction to Machinery Rescue
■ Machinery Anatomy
■ Machinery Hazard Identification
■ Hazard Isolation/Mitigation
■ Lock Out/Tag Out
■ Practical Exercises
Introduction to Machinery Rescue

- What is a machine?
  - A device that uses energy to perform a task
- What types of energy sources are used?
  - Hydraulic
  - Pneumatic
  - Electrical
  - Heat
- What are examples of machines that use each type of power?

Introduction to Machinery Rescue

- Where are machines found?
  - Industrial facilities
  - Commercial establishments
  - Educational facilities
  - Health facilities
  - Residential dwellings
- What machinery exists in your response area?

Introduction to Machinery Rescue

Mechanical Advantage Devices

- Lever
- Pulley
- Wheel & Axle
- Wedge
Introduction to Machinery Rescue
Mechanical Advantage Devices

- Screw
- Gear
- Cam
- Chains and belts

Introduction to Machinery Rescue
Mechanical Advantage Devices

- Ratchet
- Compound Machines
- Crank and Rod

Introduction to Machinery Rescue

- General approach to machinery rescue
  - Size-up (including all sources of information)
  - Incident Action Plan
  - Site and scene control
  - Patient assessment (rescue versus recovery)
  - Hazard identification and mitigation
  - Stabilization
  - Extrication
  - Termination
Machinery Anatomy

- Terminology—varies with the machine being assessed
- Sources of information
  - On-scene personnel
  - On-call personnel
  - In-house procedural documentation
  - Manufacturer documentation
  - Manufacturer telephone hotline

Machinery Hazard Identification

- Environmental hazards
- Machinery power sources
- Stored energy
- Manual versus automatic operation

Hazard Isolation/Mitigation

- How things work and how to disable them
  - Assessment
  - Information sources
- Requirements for additional specialized resources and/or personnel
- Lock out/tag out (to be discussed next)
Lock Out/Tag Out

- Is a way to secure energy sources and prevent operation of a machine
- Generally applies to large and/or complex machines
- Frequently uses physical locks to ensure isolation of energy sources

Devices must be:
- Standardized
- Identifiable
- Durable
- Not used for other purposes
Lock Out/Tag Out

- Operators and maintenance personnel should be involved
- Rescue personnel must assess and verify lock out/tag out
- Stored energy must be considered prior to proceeding with the rescue

Student Performance Objective

- Given information from discussion, handouts, and reading materials, identify machinery anatomy components and hazards.

Review

- Introduction to Machinery Rescue
- Machinery Anatomy
- Machinery Hazard Identification
- Hazard Isolation/Mitigation
- Lock Out/Tag Out
- Practical Exercises
Student Performance Objective

- Given information from discussion, handouts, and reading materials, identify stabilization devices and methods and perform stabilization of a vehicle.

Overview

- Introduction to Stabilization
- Stabilization Devices
- Stabilization Methods
- Thinking Outside the Box in Stabilization
- Skills Sign-Off
Introduction to Stabilization

- Stabilization is the first step in extrication

Stabilization Devices

- Safety and Device Use
- Cribbing
- Chocks
- Shoring

Stabilization Devices

- Rigging
- Webbing
- Pneumatic Lifting Bags
- Tow Trucks
Stabilization Methods

- Safe Stabilization
- Vehicles
  - Center of gravity, position, size, and vehicle integrity
  - Vehicle upright
  - Vehicle on side
  - Vehicle on top
  - Vehicle entangled with another vehicle or object
  - Other positions

Stabilization Methods

- Buses
  - Center of gravity, position, size, and vehicle integrity
  - Bus upright
  - Bus on side
  - Bus on roof
  - Bus in other positions
  - Cribbing considerations
Stabilization Methods

- Trucks
  - Truck upright
  - Truck on side
  - Truck on roof
  - Truck in other positions
  - Unique considerations

Stabilization Methods

- Railcars
  - Railcar upright
  - Railcar on side
  - Railcar on roof
  - Railcar in other positions
  - Unique considerations
Stabilization Methods

- Industrial and agricultural vehicles
  - Center of gravity, position and vehicle integrity
  - Unique considerations

- Machines
  - Lock out/tag out
  - Sources of information
Thinking Outside of the Box
In Stabilization

- Stabilization in unique situations offers a chance to come up with new/unique approaches

Skills Sign-off

- Students will perform skills.

Student Performance Objective

- Given information from discussion, handouts, and reading materials, identify stabilization devices and methods and perform stabilization of a vehicle
Review

- Introduction to Stabilization
- Stabilization Devices
- Stabilization Methods
- Thinking Outside the Box in Stabilization
- Skills Sign-Off
Lesson 5-1: Access and Egress

Student Performance Objective

- Given information from discussion, handouts, and reading materials, identify tools and methods used in access and egress and perform access and egress on a vehicle.

Overview

- Introduction to Access and Egress
- Access and Egress Tools
- Access and Egress Methods
- Skills Sign-Off
Introduction to Access and Egress

- The relationship of stabilization and access/egress
- The main goal: to provide safe and quick access

Access and Egress Tools

- Safety and tool use
- Hand tools
  - Striking
  - Prying
  - Cutting
  - Lifting
  - Mechanic tools
- Air tools
  - Chisels/hammers
  - Wrenches
  - Pneumatic tools
  - Lifting bags
Access and Egress Tools

- Electric tools
  - Spreaders
  - Saws
  - Impact Wrenches
  - Screwdrivers

Access and Egress Tools

- Hydraulic tools
  - Manual
    - Porta Power
    - Hydraulic Jacks
  - Power
    - Spreaders
    - Shears
    - Combination spreader/shears
    - Pedal Cutters
    - Extension Rams

Access and Egress Tools

- Other tools
  - Power Saws
  - Thermal cutting devices
  - Lifting/pulling
    - Winches
    - Come-along
    - Block and tackle
Access and Egress Methods

- Safe access and egress
  - ALWAYS TRY BEFORE YOU PRY!
- Coordination with EMS

Access and Egress Methods

- Car access methods
  - Glass removal
    - Laminated glass
    - Tempered glass

Access and Egress Methods

- Door/side panel removal
  - Door opening removal
  - Factory third/fourth door
  - Third door conversion
Access and Egress Methods

- Roof removal
  - Cutting pillars
  - Flap versus removal

Access and Egress Methods

- Bus access methods
  - Doors
    - Inoperable front door
    - Operable front door
    - Rear door
    - Emergency exit
  - Windows
    - Windshield access
    - Side window access

Access and Egress Methods

- Bus access methods
  - Side wall access
  - Roof access
  - Rear wall access
Access and Egress Methods

- Truck access methods
  - Windows and doors
  - Roof removal
  - Access through floor
  - Cab/sleeper wall access

Access and Egress Methods

- Railcar access methods
  - Locomotive entry
  - Passenger car door entry
  - Passenger Car window entry

Access and Egress Methods

- Railcar access methods
  - Passenger car roof/wall entry
  - Baggage car entry
  - Material handling car entry
Access and Egress Methods

- Industrial and agricultural vehicle access methods
  - Window entry
  - Door entry
  - Roof entry

Skills Sign-Off

- Students will perform skills.

Student Performance Objective

- Given information from discussion, handouts, and reading materials, identify tools and methods used in access and egress and perform access and egress on a vehicle.
Review

- Introduction to Access and Egress
- Access and Egress Tools
- Access and Egress Methods
- Skills Sign-Off
Lesson 6-1
Disentanglement

Student Performance Objective

- Given information from discussion, handouts, and reading materials, identify tools and methods used in disentanglement and perform disentanglement on a vehicle.

Overview

- Introduction to Disentanglement
- Disentanglement Tools
- Disentanglement Methods
- Skills Sign-Off
Introduction to Disentanglement

- Disentanglement is referred to as removing the vehicle/machine from the patient

Disentanglement Tools

- Safety and Tool Use
- The extrication tools used for disentanglement include:
  - Hand Tools
  - Lifting Tools
  - Mechanic's Tools
  - Other tools

Air Tools

- Pneumatic Tools
- Electric Tools
- Hydraulic Tools
- Other Tools
Disentanglement Methods

- Safe Disentanglement
  - Maintain crew safety

- Working with EMS
  - Coordinate with EMS for patient assessment and packaging

- Vehicle Position Considerations

- Operations

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Disentanglement Methods

- Railcar Disentanglement
  - Tunneling
    - Is used when railroad cars are stacked on one another
    - Allows rescuers to tunnel towards victim
    - Requires appropriate shoring

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Disentanglement Methods

- Industrial and agricultural vehicle disentanglement
  - Industrial and agricultural vehicle disentanglement can be difficult due to roll over protection systems (ROPS)
  - Cutting any piece of an intact ROPS may cause the vehicle to fall
  - If the ROPS has been deformed enough to trap the operator an equal amount of force may have to be used to disentangle
Disentanglement Methods

- Operations
  - Pedal cut
  - Dash roll
  - Dash lift
  - Seat removal or seat component removal
  - Foot well access
  - Other methods used locally

Skills Sign-Off

- Students will perform skills.

Student Performance Objective

- Given information from discussion, handouts, and reading materials, identify tools and methods used in disentanglement and perform disentanglement on a vehicle.
Review

- Introduction to Disentanglement
- Disentanglement Tools
- Disentanglement Methods
- Skills Sign-Off
Lesson 7-1: Rescue Management—
Evaluation, Strategy and Tactics

Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe and perform the skills necessary to conduct rescue management.

Overview

- Introduction to Rescue Management
- Performing Planning and Size-Up
- Extrication Strategy and Tactics
- Establishing Safety Zones
- Establishing Fire Protection
- Removing a Packaged Victim
- Terminating a Level I Vehicle/Machinery Rescue Incident
Introduction to Rescue Management

- Now that you are armed with new skills, it is time to focus on how to put it all together.

Performing Planning and Size-Up

- Size-up questions to be answered
  - What is known?
  - What is likely?
  - What is unknown?
  - What is the response situation?
  - Are the resources adequate?

Performing Planning and Size-Up

- The Incident Action Plan
  - Is comprehensive
  - Is communicated to all personnel
  - Has safety as an integral component
  - Provides for status reporting
Performing Planning and Size-Up

- Specific actions required in the plan
  - Scene safety
  - Initial hazard identification
  - EMS triage responsibilities
  - Extrication evaluation
  - Resource requirements
  - Comprehensive hazard identification

Extrication Strategy and Tactics

- Types and numbers of vehicles
- Nature of entrapment
- Impact on other accident vehicles
- Priorities of extrication

Establishing Safety Zones

- Scene hazard identification
  - Vehicular traffic
  - Weather
  - Terrain
  - Energy sources
  - Spectators
  - Apparatus placement
Establishing Safety Zones
- Scene control zones
  - Hot zone
  - Warm zone
  - Cold zone

Establishing Fire Protection
- Local SOPs/SOGs
- Water supply
- Hoselines
- Extinguishers
- PPE

Removing a Packaged Victim
- Packaging (An EMS skill not taught in this class)
- Body mechanics and safe removal
- Emergency, urgent and non-urgent moves
- Types of packaging devices
  - Short board
  - Long board
  - Basket stretcher
  - Flexible stretcher
  - Safety inspections of packaging devices
Terminating a Level I Vehicle/Machinery Rescue Incident

- Restoring the scene
- Local police/fire/EMS protocols
- Responsibilities for scene control
- Hazard mitigation
- Restoring traffic flow

Terminating a Level I Vehicle/Machinery Rescue Incident

- Restoring operational readiness
  - Equipment
  - Apparatus
  - Personnel
  - CISM (Critical Incident Stress Management)

Student Performance Objective

- Given information from discussion, handouts, and reading materials, describe and perform the skills necessary to conduct rescue management.
Review

■ Introduction to Rescue Management
■ Performing Planning and Size-Up
■ Extrication Strategy and Tactics
■ Establishing Safety Zones
■ Establishing Fire Protection
■ Removing a Packaged Victim
■ Terminating a Level I Vehicle/Machinery Rescue Incident