TR: Vehicle Rescue
Lesson One
Large Vehicle Rescue

DOMAIN: COGNITIVE / PSYCHOMOTOR

LEVEL OF LEARNING: COMPREHENSION / APPLICATION

MATERIALS

IFSTA Principles of Vehicle Extrication, 2nd Edition; NFPA 1006 Standard For Technical Rescuer Professional Qualifications, 2008 Edition; Vehicle Rescue and Extrication by Ronald E. Moore; NFPA1670 Operations and Training for Technical Rescue Incidents; laptop computer; multimedia projector; whiteboard or flipchart; marking pens. Have available various types of rescue equipment used by the AHJ (Authority Having Jurisdiction) to include but not limited to stabilization devices such as cribbing block, step chocks, shims, pneumatic lifting bags, pneumatic shoring struts, timber, rope and rigging material, “crutches”, high lift jacks (tow trucks are optional per instructor level of knowledge) basic hand tools, pneumatic and hydraulic and electric operated tools (corded and or cordless), and rated chains. Generators and lighting equipment; various types of vehicles available to Authority Having Jurisdiction (AHJ); suggestions may include a passenger vehicle, medium or large truck, school bus, a farm tractor, or farm implement. A combination of 2 - 3 types of vehicles may prove challenging.

NFPA 1006, 2013 Edition JPRs

10.1.1 Preplanning for a vehicle incident
10.1.2 Establish scene safety zones
10.1.3 Establish fire protection and fire control support
10.1.4 Stabilize a vehicle
10.1.5 Isolate potential harmful hazards
10.1.6 Determine vehicle access and egress points
10.1.8 Disentangle victim(s)
10.2.1 Plan for a commercial/heavy vehicle incident

10.2.2 Stabilize commercial/heavy vehicles
10.2.3 Determine access and egress points for heavy vehicles
10.2.4 Create access and egress points for a rescue
10.2.5 Disentangle victim(s) from a Level II incident
10.2.6 Isolate and manage potentially harmful energy sources from a commercial/heavy vehicle

Junior Member Statement:

Junior Member training activities should be supervised by qualified instructors to assure that the cognitive and psychomotor skills are completed in a safe and non-evasive manner. While it is critical that instructors be constantly aware of the capabilities of all students both mentally and physically to complete certain tasks safely and successfully, the instructor should take every opportunity to discuss with departmental leaders and students the maturity and job awareness each participant has for the hazards associated with fire and rescue training.

TERMINAL OBJECTIVE

The Technical Rescuer candidate shall correctly identify and discuss design features, stabilization procedures, and procedures for gaining access, hazards and disentanglement procedures as they relate to large vehicle rescue operations.

ENABLING OBJECTIVES

1. The Technical Rescuer candidate shall correctly identify and discuss design features and rescue considerations for various types of bus extrication.

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MOTIVATION

With OSHA's efforts to enhance the safety of the work force in the industrial and agricultural arena. Manufacturers of industrial and agricultural vehicles and machinery are making major strides to provide state of the art technology regarding machinery with safety being the top priority. Accidents involving buses, tractors, and industrial and agricultural machinery present special problems to rescuers. Size, weight, and design materials all challenge rescuers and rescue equipment capabilities. Rescue tools that work well on passenger vehicles may perform poorly on the heavy construction designs of large vehicles. Knowledge is the key. Rescuers must be well versed in design features and potential hazards if they are to operate safely around these vehicles and successfully disentangle victims from the wreckage. This lesson plan presents information that will assist the rescuer with developing and implementing procedures that will enhance the candidate's knowledge base to effectively plan and initiate an effective operation.

PRESENTATION

ENABLING OBJECTIVE #1

The Technical Rescuer candidate shall correctly identify and discuss design features and rescue considerations for various types of bus extrication.

1. Identify the skeletal system of school buses.
    a) All body units are comprised of a roof, floor, two sidewalls, and a front and rear assembly.
    b) The skeletal design will dictate how the bus will respond to a collision and form the basis of the protection provided to the occupants.
    c) Sidewalls are constructed of vertical load bearing frame members and in some designs the 11 - 14

gauge roof bows extend down to form the support members, and serve as partitions between window openings.

d) A collision beam runs horizontally at the base of each sidewall to limit penetration of an object into the passenger compartment.
e) 20 gauge finish panel are fitted onto the exterior and 22 gauge onto the interior of the sidewall frame members.
f) As many as four 16 gauge rub rails are also attached to the full length of the sidewalls for added reinforcement.
g) The rear skeletal system is reinforced with an “A-frame” structure member.
h) 14 gauge or 16 gauge girders reinforce the roof bows and run the full length of the bus.
i) Some newer model buses are actually glued at the roof bows and rub rails.

2. Discuss the different types of buses.
   a) Type A - consists of a bus body constructed upon a cutaway front-section vehicle with a left side driver's door, designed for carrying more than 10 persons. This definition includes two classifications: Type A-I, with a gross vehicle weight rating (GVWR) of 14,500 pounds or less, and a Type A-2, with a GVWR of 14,500 pounds or more.
   b) Type B - consists of a bus body constructed and installed upon a front-section vehicle chassis, or stripped chassis, with a gross vehicle weight rating of more than 10,000 pounds, designed for carrying more than 10 persons. Part of the engine is beneath and/or behind the windshield and beside the driver’s seat. The entrance door is behind the front wheels. B1 has a GVWR of 10,000 lbs or less. B2 has a GVWR of 10,000 lbs or more.
   c) Type C - also known as a "conventional," is a body installed upon a flat-back cowl chassis with a gross vehicle weight rating of more than 21,500 pounds, designed for carrying more than 10 persons. The entire engine is in front of the windshield and the entrance door is behind the front wheels. 85% - 90% of all school buses are Type C or D.

d) Type D - also known as a transit-style, is a body installed upon a chassis, with the engine mounted in the front, mid-ship, or rear with a gross vehicle weight rating of more than 10,000 pounds, and designed for carrying 80-90 persons. The engine may be behind the windshield and beside the driver's seat; it may be at the rear of the bus, behind the rear wheels; or mid-ship between the front and rear axles. The entrance door is ahead of the front wheels. Type D school buses are referred to as RE for "rear-engine," and FC for "forward control."

Reference: Jones and Bartlett Vehicle Extrication, pages 273 and 274.

3. Discuss the battery location in buses.
   a) Batteries for type A and some type B buses are located in the engine compartment.
   b) On most type B, C, and D buses the batteries are located in a separate compartment on the driver's side.
   c) Commercial bus batteries are located in various locations.
   d) MCI Model 7, 8, and 9 passenger side front of baggage compartment.
   e) In GMC models the batteries are located behind the left rear wheel or behind front right wheel.
   f) In the Eagle Model 05 the batteries are located on the driver and passenger side behind the rearmost axle.
   g) In the Eagle Model 10 the batteries are located on passenger side behind the rearmost axle.

4. Point out that some buses will have emergency escape hatches on the roof as well as at the rear of the bus.

5. Point out that with many full size buses, a heavy-duty vinyl or rubber floor is applied over plywood decking and 14 gauge metal flooring panels.
   a) Smaller buses may have 1/2" or 5/8" plywood over existing vehicle floor.
   b) Floor joists can be spaced as little as 9" apart.

6. Point out that breaching the floor is time consuming and should not be considered as a primary entry point.

7. Emphasize that the under carriage is reinforced with 8 gauge and 10 gauge channel stock and 14 gauge sheet metal.

8. Bring up that guard loops protect the full length of the drive shaft.

Reference: Jones and Bartlett Vehicle Extrication, pages 274 and 276.

9. Discuss the operational characteristics of school bus doors and windows.
   a) Doors found on some Type A and B buses are stock designs and utilize the Nader latching mechanism.
   b) The passenger side may be modified with fixed windows and a bi-fold door.
   c) Doors on Type C and D buses may open in a variety of ways.
   d) Some side doors are air operated with an emergency release switch located in the stairwell.
   e) Type A buses may have one or two rear doors.
   f) Type B, C, and some D buses have one large rear exit door without a locking mechanism.
   g) The rear exit door is secured by a one point, or three point latching mechanism.
   h) Rear engine Type D buses do not have rear exit doors but are required a large rear exit window.

10. Identify various methods for gaining access into a bus through the front door.
    a) Displace the front windshield and operate controls.
    b) Pry open the door.
    c) Dismantle a hinged door.

Reference: Jones and Bartlett Vehicle Extrication, pages 293 – 296.

11. Identify various methods for gaining access into a bus through the rear door.
    a) Latch method.
    b) Pry open the rear door.
    c) Enlarge the rear door area.

Reference: Jones and Bartlett Vehicle Extrication, pages 289 – 293.

12. Identify various methods for gaining access into a bus through the windows.
    a) Through the windshield.
    b) Through a side window.

13. Identify the procedures for gaining access into a bus through the roof.
    a) Three-side cut on the roof panel with the vehicle on its side.
    b) Displace the front windshield.
    c) Cut posts.
    d) Make hinge cuts on roof just behind the driver seat.

Reference: Jones and Bartlett Vehicle Extrication, pages 281 and 284

14. Point out that some states require buses with large capacities to have an extra exit door on the driver's side of the bus.
    a) The latching mechanism is the same as the rear door.

Reference: IFSTA Principles of Vehicle Extrication, 2nd Edition, pages 105 - 106.

15. Discuss construction designs of commercial buses.
    a) Commercial buses are of integral body construction.
    b) Formed tubular steel is used to support the upper body portion.
    c) The upper body structure is secured to Carline supports (gusset plates) located on the floor of the bus, to support the sidewalls of the bus.

16. Discuss the operational characteristics of bus doors and windows.
    a) Most commercial bus doors have a single door up front, opposite the driver's position.
    b) Some of the doors are a bi-fold working off a hinge.
    c) The opening mechanism can be manual, pneumatic, hydraulic, or electric.

d) Some doors operate off pneumatic pressure with an emergency by-pass valve that allows the door to be manually opened in the event of a pneumatic failure.
e) The emergency release is located inside above the door, outside in right front wheel well, under left of door, or below center of windshield.
f) Some doors have mechanical pivot arm openers similar to school buses.
g) The operating controls are usually located on the drivers left side.
h) The emergency release for the pivot arm is a knob or latch located under center of windshield.
i) Commercial buses have windows hinged in various places. However, the majority are hinged at the top. The window is opened by raising the horizontal bar at the bottom of the window and pushing the window out from the bottom.

Reference: IFSTA Principles of Vehicle Extrication, 2nd Edition, pages 107 - 112.

17. Discuss the various types of fuel used for school and commercial buses.
    a) Most school buses use gasoline or diesel.
    b) Some are powered by a mixture of diesel and kerosene fuel.
    c) Some are powered by Compressed Natural Gas (CNG), Liquefied Petroleum Gas (LPG) or Hydrogen.

SUMMARY

This lesson plan discusses various features of buses and machinery that may have an impact on a rescuer's ability to perform extrication procedures safely and efficiently. Accidents with these types of vehicles and machinery do happen and all incidents are unique.

Review with the students any specialized training and pre-planning done by the AHJ that covers the specialized rescues involving buses, agricultural, industrial vehicles and machinery.

The instructor should familiarize the students with the various types of vehicles and machinery and the potential

hazards and obstacles they present during rescue so the students can be effective team members during actual incidents.