DRILL OF THE MONTH

INSTRUCTOR GUIDE

Topic:Rescue-Lift Air Bags

Time: 1.5 hours

Equipment:

Rescue-Lift Air Bag(s) Air bag controller Connecting inflation hose(s) Air cylinder Rescue Air Bag Handout Copies of quiz Quiz-taking materials

Enabling Objective(s):

- At the conclusion of instruction, the student should be able to identify the type of air bag(s) available at his or her station
- At the conclusion of instruction, the student should be able to successfully identify the maximum lifting capacity, maximum lifting height, maximum working pressure, and height before inflation of each air bag available for use in his or her station
- At the conclusion of instruction, the student should be able to discuss techniques of use for rescue air bags, specifically related to theoretical versus actual lift capacity of air bags and maximum lift capacity of stacked airbags
- At the conclusion of instruction, the student should be able to demonstrate the ability to set up rescue air bags for use and utilize air bags to lift an object within the station safely with supervision

Motivation:

Rescue air bags provide responders with a versatile tool to utilize in rescue situations in which other means of lifting, jacking, or spreading are unavailable or unconventional for the setting. Proper knowledge of the use of rescue air bags and their potential increases a firefighter's readiness and preparedness for any emergency.

Overview:

- I. Rescue-Lift Air Bags
- II. Need-to-Know Specifications of Air Bags
- III. Techniques for use
- IV. Practical
- V. Quiz

Lesson Plan:

- I. Rescue-Lift Air Bags
 - A. Pneumatic (air) filled bladders, made with rubber or synthetic material

B. Used to assist in rescue by allow rescuers to lift an object or spread two objects apart from one another

- C. Types of rescue air bags
 - 1. Low-pressure lift air bags

a) Used for recovery operations and vehicle stabilization (less common)

b) Lightweight construction, higher height lift than high-pressure bags

c) Less stable than high-pressure airbags, weaker construction

- 2. Medium-pressure lift air bags
 - a) Used for aircraft, heavy-vehicle, and/or bus rescue
- 3. High-pressure lift air bags
 - a) Most commonly used by rescuers for vehicle rescue operations
 - b) Sturdy construction
- II. Need-to-Know Specifications of Air Bags
 - A. Model

1. There are various models of rescue air bags sold to fire departments and emergency responders

2. It is the responsibility of the responder to learn the specifications of the air bags within his or her department in order to be able to properly and safely employ air bags on the scene of an emergency incident

- a) <u>Familiarization and training on air bags is essential</u>
- B. Need-to-know specifications
 - a) Maximum lifting capacity
 - (1) The maximum amount of weight the air bag is intended to lift
 - (2) Differs by brand, material, and size of air bag
 - b) Maximum lifting height
 - (1) The maximum height the airbag can lift an object
 - Maximum height may differ from safe working height
 (a) Just because the airbag can inflate to a certain
 height does not mean it is intended to be used at that height
 - c) Maximum working pressure
 - (1) The maximum pressure at which the air bag should be inflated
 - d) Burst pressure
 - (1) The pressure at which bursting of the air bag may occur
 - Height before inflation
 - (1) The height of the air bag prior to inflation
- III. Techniques for air bag use

e)

- A. Theoretical versus actual lifting capacity
 - 1. Understanding theoretical Lift Capacity formula:

Air Bag Length (in) x Air Bag Width (in) x Operating Pressure in PSI (lbs/sq in) = Theoretical Lift Capacity (lbs)

2. Actual Lift Capacity formula:

Air Bag Length (in) x Air Bag Width (in) x % of Bag in Contact with the Object x Operating Pressure in PSI (lbs/sq in) = Actual Lift Capacity (lbs)

3. Each air bag is rated with a maximum lift capacity per the manufacturer, which is an estimate of the air bag's ability to hold a specific amount of weight, given the available square inches of surface area of that particular bag, assuming that the user will maximize surface area within reason.

4. If an air bag is used improperly and there is minimal surface area in contact with the object being lifted, the actual lifting capacity will be much lower than the theoretical and even the manufacturer's rated lift capacity.

- B. Maximum lift capacity of stacked air bags
 - 1. The maximum lift capacities are **not** added together.

2. When two air bags are stacked, the maximum lift capacity is that of the **smaller bag** (being sure to consider theoretical versus actual lift capacity).

- 3. Never stack air bags more than two units high
- C. Safety
 - 1. Air bags are not stable. Cribbing is essential when using air bags.

a) "LIFT AN INCH, CRIB AN INCH"

2. In particular, square air bags are more unstable with lighter loads and/or greater lifting heights, due to the fact that the bag takes on a spherical shape, and becomes unstable in all directions.

3. Never stack a larger air bag on top of a smaller air bag.

4. Utilize ply wood underneath the bottom-most air bag to lessen the potential for damage to the air bag.

5. Consider burst pressures and ensure pressure regulation when using air bags.

IV. Practical

A. Utilize air bags, air bag controller, pneumatic hoses, and air cylinder to simulate use of air bags with qualified supervisor present

- V. Quiz
 - A. See attached

References:

- Hall, J. (2012, September 11). Air Bag Operations Part 1: An Introduction. Retrieved November 3, 2014, from <u>http://www.firehouse.com/article/10776507/air-bag-operations-part-1-an-introduction</u>.
- Hall, J. (2012, October 16). Air Bag Operations Part 2: The Science of Lifting. Retrieved November 3, 2014, from <u>http://www.firehouse.com/article/10814313/air-bag-operations-part-2-the-science-of-lifting</u>.

Vetter Rescue Products 2011. (2011, July 1). Retrieved November 3, 2014, from <u>http://editiondigital.net/publication/?i=79524</u>.