

# Egg Harbor Fire Department and First Responders Standard Operating Guideline

**Subject: Air Bags**

**SOG 311**

**Purpose:** This guideline addresses the use of air bag systems. Although only Squad 24 carries this equipment, any responding company may be required to operate this equipment. Familiarity with this guideline will maximize the effectiveness of air bag use during an emergency response. The system includes rescue bags that are inflated with air from a compressed air tank or air from an Engine air supply line, and used as lifting devices. The system is made up of the SCBA bottle, controls, hoses and lifting bags.

**Scope:** This procedure applies to all members of the Egg Harbor Fire Department.

## **Guideline:**

The selection and use of high pressure air bags must be determined based on factors such as the lifting requirements, weights, size, and/or shape of the object(s) to be lifted. The lifting capacities and lifting heights of the air bags themselves should also be considered before they are used.

## **Operational Guidance:**

### **I. Calculating lifting capability**

A. The lifting capacity of an air bag is dependent upon a number of varied factors, including the following:

1. The amount of air pressure in the bags.
2. The surface contact area between the air bag and the load being lifted.
  - a. The more surface area contact between the air bag and the load, the greater the lifting capacity.
  - b. As the air bag inflates, it takes on a double-dome shape, decreasing the surface area contact between the load and the air bag thus decreasing the lifting capacity.
  - c. The rated lifting capability is possible for the first inch of lift, and decreases thereafter.
  - d. The lifting capacity of two or more air bags placed side by side and inflated together is the combined capacity of both air bags.
  - e. The lifting capacity of two air bags -- stacked and inflated -- is the maximum capacity of the smallest air bag.

## II. Operating instructions

- A. Develop a lifting strategy by considering the following:
  - 1. The maximum lifting capacity for each air bag.
  - 2. The maximum inflation height of each air bag.
  - 3. The maximum load that can be lifted at full inflation height for each air bag.
- B. Setting up the system
  - 1. Make necessary connections according to the manufacturers instructions.
    - a. Connect the air supply hose from the Airbag command console to the air supply (SCBA bottle or airline from Apparatus).
    - b. Connect the inflation hose to the appropriate outlet of the Airbag command console.
    - c. Connect the inflation hose to the nipple of the air bag.
  - 2. Ensure that all connections and/or couplings are locked and are secure.
  - 3. Ensure that all valves are in the closed position.
  - 4. Open the SCBA bottle or turn on air at supply valve on Apparatus.
- C. Placement considerations
  - 1. Always estimate the center of gravity to determine the best placement of the bags.
  - 2. If a one point-of-lift is used to make a one-sided or rolling lift, position the air bag in-line with the estimated center of gravity.
  - 3. If two points-of-lift are desired, place one air bag on either side of the estimated center of gravity.
  - 4. Sweep broken glass, small metal parts, and other potentially-damaging debris from the surface on which the bag will be placed.
  - 5. Spread a layer of sand, gravel, or other granular material when the bag must be placed on an icy or oil-slick surface.
  - 6. Lay down a solid base of cribbing or a plywood panel when an air bag must be used on soft ground.
- D. Lifting beams
  - 1. An air bag's maximum lifting capability cannot be obtained when the air bag takes on the shape of a saddle during inflation; additionally, lifting beams may damage the air bag.
  - 2. Position a plywood panel or rubber mat between the air bag and the load being lifted and between the ground surface and the air bag to distribute the load and to protect the air bag.
- E. Lifting a cylindrical object
  - 1. Avoid lifting a large diameter cylindrical object with a single air bag due to instability.

2. Use two air bags, one under each side of the cylindrical object, and inflate the air bags simultaneously.

#### F. Pushing with air bags

1. Position the air bag between the object to be moved and another stable object. The object that is less secure, or has less mass, will move first.

#### G. Cribbing

1. There are two types of cribbing used with air bags.
  - a. Box cribbing is used to support a load that has been lifted.
    1. Always build a box crib to support the load once the object is lifted.
    2. Rescuers should never solely rely on the air bag to support the load.
    3. Rescuers should never place any body part under the load unless the load is supported by a box crib.
    4. Assess the need for additional cribbing needs and call for additional resources if needed.
  - b. Support cribbing is used to support the air bag while lifting.
    1. Support cribbing maximizes lifting capacity and the lifting height of the air bag.
    2. The bottom of the air bag should rest on a solid layer of cribbing base and the top of the support crib must be equal to, or greater than, the surface area of the air bag.
    3. It is important to protect the lifting surface of the airbag by using a plywood panel.

#### H. Stacking air bags.

1. Position air bags with the nipples pointing away from the load and opposite each other.
2. Use the following guidelines when stacking air bags of different sizes,
  - a. Always place the larger air bag on the bottom.
  - b. The smaller air bag must be centered on top.
  - c. Use different colored hoses to distinguish between air bags.
  - d. Never stack more than two air bags.
3. The result of stacked air bags include:
  - a. Less surface contact area.
  - b. A decreased lifting capacity.
  - c. Instability between the two air bags.

4. To prevent the two air bags from slipping, maintain a lower pressure in the bottom air bag than in the smaller air bag, so that the smaller air bag is cradled by the larger one.

**III. Air bag inflation**

- A. Don full PPE.
- B. Establish a hot zone of at least 50 feet around the lifting operation.
- C. Establish verbal commands and hand signals between the officer in charge, the air control valve operator, and the rescuer placing the bag.

1. Only one person is to issue commands as indicated in Table 1 below:

**Table 1**

**Voice and Hand Signals**

<b>Command</b>	<b>Voice Signal</b>	<b>Hand Signal</b>
Inflate	“up on (hose color)”	Thumb up
Stop inflation	“stop on (hose color)”	Clenched fist
Deflate	“down on (hose color)”	Thumb down

2. Anyone can stop the lifting operation for safety reasons by calling “STOP.”

- D. Pressurize the air bag system slowly.
- E. If stacking air bags follow routine inflation guidelines, in addition to the following criteria:
  1. Inflate the bottom air bag until the top air bag firmly contacts the underside of the load, then inflate the top air bag.
  2. Anticipate and prepare for shifting loads.
    - a. Place wheel chocks.
    - b. Use cribbing.
    - c. Establish safety zones.
  3. Continue inflation until the air bag reaches the desired height or until the bag reaches the maximum working pressure.
  4. Always build a box crib to support the load once the object is lifted.
  5. Never work under a load without cribbing.

**IV. Air bag deflation**

- A. Deflate the air bag slowly.

- B. If stacking air bags deflate the top air bag first followed by bottom air bag.
- C. Deflate the air bag(s) and allow the load to settle on the box cribbing if more working space is needed.

## **V. Inspection, storage and maintenance**

### **A. Storage**

#### **1. Vertical storage.**

- a. Store air bags with nipples pointing upward and outward with protective caps in-place.

#### **2. Accessory storage.**

- a. Store hose in a coiled position.
- b. Store the air valve controller with relief valves open.
- c. Store the regulator with adjusting knob open.

### **B. Maintenance and cleaning**

Visual Checks. (This series of visual check should be conducted after each use of the bags prior to stowage.)

#### **1. Regulator**

- a. Check that o ring on cylinder connection (Inlet seal) is free from wear and damage.
- b. Check that DIN Thread (on cylinder connection) run freely, no visual damage.
- c. Check that pressure gauges are free from visual damage.
- d. Check that pressure gauge protective cap is free from visual damage.
- e. Check that pressure adjusting valve moves smoothly / look for signs of abrasion.
- f. Check that flow control valve moves smoothly / look for signs of abrasion.
- g. Check that regulator hose is free from cracks, kinks, cuts, abrasion, hardening effects of chemicals heat etc.
- h. Check that hose connector is free from visual damage.

#### **1. Inflation hoses**

- a. Check that couplings are free from damage.
- b. Check that hoses are free from cracks, kinks, cuts, abrasion, punctures, hardening effects of chemicals heat etc.

- c. Check that coupling & nipple connections firmly and positively couple and easily connect and disconnect.
2. Controller (D Type deadman)
    - a. Check that entry coupling are free from damage, and work freely.
    - b. Check that control stick works smoothly.
    - c. Check that pressure gauges are free from damage.
    - d. Check that pressure gauge working pressure = 8/10 bar max.
    - e. Check that safety valve is free from damage and top cap seal intact.
  3. Air Bags
    - a. Dirty Bags should be cleaned with warm soapy water after use.
    - b. Check that airbag connecting nipple is free from damage.
    - c. Check that airbag surface and edges are free from cuts, cracks punctures, abrasions, heat marks, traces of acid.
    - d. Check that carry loops are intact.

Functional Checks (Set up the air bags and accessories in accordance with standard operating procedures. When connecting hoses to controller and bags ensure the couplings are working correctly and couple with a firm and positive action.

1. Regulator
  - a. Check that the inlet pressure gauge works correctly and shows the pressure of air in cylinder.
  - b. Check that the discharge pressure gauge works correctly and shows the set pressure.
  - c. Check that the pressure adjusting valve A is not adjusted over range, set discharge pressure at 8/10 bar.
  - d. Check that the flow control shut-off valve works correctly. Close so no air is flowing. Ensure there is no pressure movement after 5 mins.
  - e. Flow control shut- off valve, open so air can flow.
2. Controller (D Type deadman)
  - a. Check that shut off control stick, ensure smooth action of the control sticks. Close valves.

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- b. Check for air leaks, with valves in the closed position listen for air leaks. Ensure there are no leaks.
- c. Check gauges to ensure correct operation of gauges.

### 3. Air Bags

- a. Inflate air bag until 4 bar is showing on the controller gauge (half Working Pressure). Check for uncommon dents.
- b. Check airbag surface and edges should be free from opening cuts, punctures, cracks and bulges.
- c. Inflate air bag until 8/10 bar is showing on the controller gauge (full Working Pressure). Check again for opening cuts punctures cracks, bulges and uncommon dents.

Cleaning of air bags. The lifting bags and equipment should be cleaned after each operation. Cleaning is normally carried out with warm water and a detergent.

## **VI. Safety considerations**

- A. The use of air bags should be considered an inherently dangerous operation. It is important to maintain the following safety considerations when performing such operations.
  - 1. Always wear full PPE.
  - 2. Never work under a load without cribbing.
  - 3. Never exceed the manufacturer's recommended working pressure.
  - 4. Never stack more than two air bags on top of each other.