

**ATTACHMENT 13**  
**Naval Sea Systems Command, Commercial Item Description: Emergency Escape**  
**Breathing Device (EEBD)**

**COMMENTS TO PROPOSED RULE ON APPROVAL TESTS AND**  
**STANDARDS FOR CLOSED-CIRCUIT ESCAPE RESPIRATORS**

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**42 CFR pt. 84**

**NIOSH Docket #005**

**Prepared by Ocenco, Incorporated**

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## COMMERCIAL ITEM DESCRIPTION

## EMERGENCY ESCAPE BREATHING DEVICE (EEBD)

The General Services Administration has authorized the use of this commercial item description for all federal agencies.

1. **SCOPE.** This commercial item description covers requirements for a self-contained closed-circuit emergency escape breathing apparatus/device for use in providing breathing air for escape from spaces aboard Navy ships where atmospheres are classified as Immediately Dangerous to Life or Health (IDLH). The EEBD is primarily intended for escape from shipboard smoke and fire.

2. **SALIENT CHARACTERISTICS.**

2.1 **Physical and performance characteristics.** The self-contained closed-circuit emergency escape breathing apparatus shall consist of the breathing device, the storage case, and the secondary container.

2.1.1 **Breathing device.** The EEBD shall be certified by the National Institute for Occupational Safety and Health (NIOSH) in accordance with Title 42 of the Code of Federal Regulations Part 84 (42 CFR 84).

2.1.2 **Duration.** The device shall have a ten-minute or greater service time classification as defined by 42 CFR 84, service time; classification.

2.1.3 **Donning time.** The donning time (time required to obtain respiratory protection) shall be less than ten seconds and the additional donning time (time required to obtain eye protection and attach/adjust all straps) shall be less than five seconds when tested as follows:

- a. Ten test subjects with no prior experience or training on emergency escape breathing devices shall be used for the donning test. Five of the test subjects shall wear eyeglasses, eight shall be men, and two shall be women.
- b. Each subject shall be provided no more than one-half hour of instruction in donning the device.
- c. The test shall be conducted in a room illuminated by one 50-watt red incandescent bulb. Test subjects shall be allowed no more than 10 seconds for adjustment to the illumination before the start of the test.
- d. A minimum of three subjects shall be tested at a time to approximate the additional confusion that can result from several persons donning the device in close proximity.
- e. The test subjects shall wear a long sleeve shirt and their arms shall be wet with water to at least the elbows. The storage case shall be worn on a belt, and the arms shall be hanging straight at the sides at the start of the test (i.e., the hands shall not be on the storage case).
- f. The time from the start of the test to the time to obtain respiratory protection shall be measured for each subject, and shall be the donning time for each test subject.
- g. The donning time for the device shall be the average of the donning times for all ten test subjects.

Beneficial comments, recommendations, additions, deletions, clarifications, etc. and any data that may improve this document should be sent to: Commander, Naval Sea Systems Command, ATTN: SEA 05Q, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to [commandstandards@navsea.navy.mil](mailto:commandstandards@navsea.navy.mil), with the subject line "Document Comment". Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

- h. The additional time from the time when respiratory protection is obtained to the time when eye protection is donned and straps are fastened and adjusted shall be measured for each subject, and shall be the additional donning time for each test subject.
- i. The additional donning time for the device shall be the average of the additional donning times for all ten test subjects.

2.1.4 Secondary container opening time. The opening time of the secondary container shall be less than or equal to five seconds when tested as follows:

- a. Ten test subjects with no prior experience or training with the device, storage case and secondary container shall be used for the opening time test.
- b. Each subject shall be provided no more than one minute of instruction on opening the secondary container and removing the device and storage case.
- c. The test shall be conducted in a room illuminated by one 50-watt red incandescent bulb. Test subjects shall be allowed no more than 10 seconds for adjustment to the illumination before the start of the test.
- d. A minimum of three subjects shall be tested at a time to approximate the additional confusion that can result from several persons in close proximity.
- e. Each secondary container shall be in an EEBD stowage rack (see Figure 1). The secondary container in the stowage rack shall be approximately 48 inches from the floor. The test subject shall stand adjacent to the stowage rack with arms hanging straight at the sides at the start of the test (i.e., the hands shall not be on the secondary container).
- f. The opening time for each test subject shall be the time from the start of the test to the time when the test subject completely separates the device and storage case from the secondary container.
- g. The opening time of the secondary container shall be the average of the opening time for all ten test subjects.

2.1.5 Eye protection. A hood attached to the device shall be provided for eye protection against smoke. The hood shall not restrict the user from wearing corrective lenses.

2.1.6 Field-of-view. The field-of-view while wearing an operating device, including eye protection, shall allow the user to see tripping hazards and to see an overhead hatch release while standing on an escape ladder. Field-of-view shall be determined as follows:

- a. Five test subjects shall be used for the field-of-view test. At least one test subject shall be a female with near 5th percentile female head and face dimensions as specified by ASTM F1166. At least one test subject shall be a male with near 95th percentile male head and face dimensions as specified by ASTM F1166.
- b. The test subjects shall wear an operating device with eye protection, shall stand with their arms hanging straight at their sides, shall position their head in the straight ahead direction, and shall hold their chin in the horizontal (tipped neither up nor down) position.
- c. The vertical and horizontal field-of-view (in degrees) shall be measured for each test subject while the test subject stands in the position described above. The test subject shall be allowed to move their eyes while measuring field-of-view.
- d. The vertical field-of-view for each test subject shall extend at least 45 degrees up and at least 30 degrees down. The horizontal field-of-view for each test subject shall extend at least 45 degrees to each side.

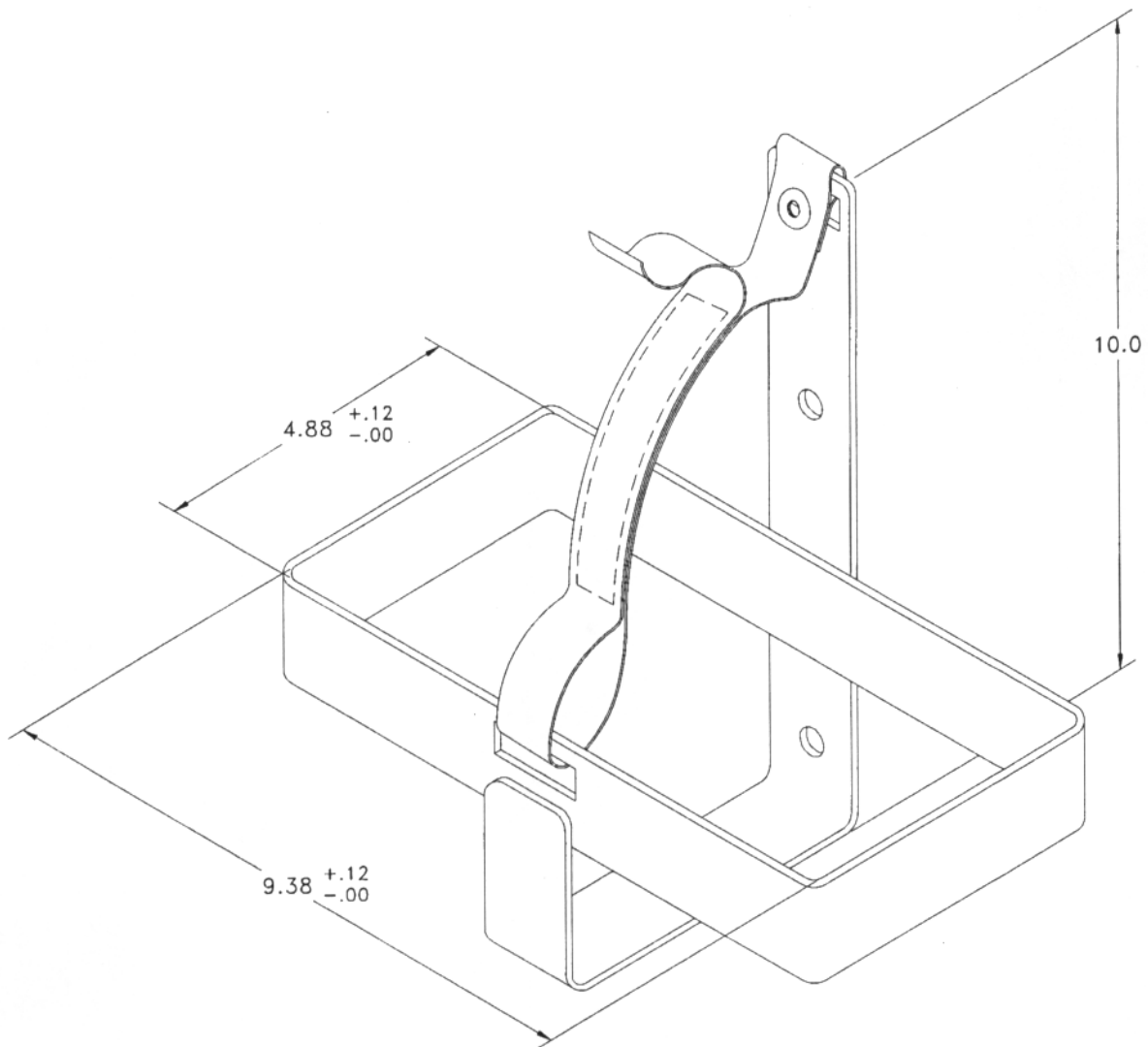


FIGURE 1. EEBD stowage rack.

2.1.7 Head mobility. Head mobility while wearing an operating device, including eye protection, shall allow the user to see up a vertical escape trunk or down an inclined ladder and shall be measured as follows:

- a. Five test subjects shall be used for the head mobility test. At least one test subject shall be a female with near 5th percentile female head and face dimensions as specified by ASTM F1166. At least one test subject shall be a male with near 95th percentile male head and face dimensions as specified by ASTM F1166.
- b. The test subjects shall wear an operating device with eye protection, shall stand with their arms hanging straight at their sides, shall position their head in the straight ahead direction, and shall hold their chin in the horizontal (tipped neither up or down) position.
- c. The test subjects shall move their head vertically (up and down) to the maximum extent possible without interfering with the operation of the device (for example, pinching off the breathing tube, breaking the neck seal, pulling the mouthpiece out of the mouth).
- d. The allowed vertical travel (up and down) of the chin of each test subject shall be measured. The allowed vertical travel of the chin of each test subject shall be at least 3 inches up and 3 inches down.

- e. The test subjects shall move their head horizontally (side-to-side) to the maximum extent possible without interfering with the operation of the device (for example, pinching off the breathing tube, breaking the neck seal, pulling the mouthpiece out of the mouth).
- f. The allowed horizontal travel (side-to-side) of the chin of each test subject shall be measured. The allowed horizontal travel of the chin of each test subject shall be at least 3 inches to the right and 3 inches to the left.

2.1.8 Collapse of breathing bag. The device shall continue to provide breathing air after a collapse of the breathing bag. The manufacturer shall determine the maximum collapse of the breathing bag that could occur from falling or collision with a bulkhead. After this collapse, the device shall provide at least 0.8 liters of oxygen [Standard Temperature Pressure Dry, (STPD)] within 15 seconds and 4.1 liters (STPD) within 75 seconds.

2.1.9 First breath. The device shall function properly regardless of whether the user's first breath is an inhalation or an exhalation. For example, a device that generates oxygen with potassium super oxide shall not require an exhalation first to start the unit, and a device that uses compressed oxygen shall not develop an hypoxic condition if the user exhales first. First breath shall be measured as follows:

- a. Four devices shall be tested according to the 42 CFR 84 Subpart H, requirements for Man-Test 4.
- b. Tests of two of the four devices shall require the test subject to inhale first after donning. To obtain a full first inhalation, the test subject shall exhale a full breath prior to donning.
- c. Tests of the other two devices shall require the test subject to exhale first after donning. To obtain a full first exhalation, the test subject shall inhale a full breath prior to donning.
- d. The average inhaled oxygen concentration shall be continuously monitored during each test.
- e. Test acceptance criteria are that for each of the four devices the average inhaled oxygen concentration shall be equal to or greater than that specified in 42 CFR 84 Subpart H, Breathing gas; minimum requirements, for the rated device duration, and the test subject shall report no difficulty breathing.

2.1.10 Reliability. The reliability of the device shall be as follows:

- a. The probability that the device starts (oxygen produced by the device is made available to the user) shall be equal to or greater than 0.999 at the 90 percent confidence level.
- b. The probability that a constant-flow device produces a flow rate of oxygen greater than required by 42 CFR 84 Subpart H, Gas flow test; closed-circuit apparatus, shall be equal to or greater than 0.990 at the 90 percent confidence level.
- c. The probability that the device has a carbon dioxide concentration less than specified in the 42 CFR 84 Subpart H, Man-Test 4; Test for carbon dioxide in inspired gas; open- and closed-circuit apparatus; maximum allowable limits, shall be equal to or greater than 0.990 at the 90 percent confidence level.
- d. The probability that the device has a breathing gas temperature less than specified in the 42 CFR 84 Subpart H, Man-Test 4; man tests; performance requirements, shall be equal to or greater than 0.990 at the 90 percent confidence level.

## 2.2 Design and construction.

2.2.1 Form and fit. The device shall be usable by persons with physical characteristics between the 5th percentile female and the 95th percentile male as specified by ASTM F1166. This requirement shall be met with one size of the device.

2.2.2 Ready-for-use indication. There shall be a visual indicator that the device is ready to provide respiratory protection. Written instructions shall be included on the storage case to describe the status of a visual indicator on a device that is ready to provide respiratory protection.

2.2.3 Puncture resistance. The device shall be able to withstand abuse while being worn, such as may result from the wearer falling, colliding with equipment, or catching the device on equipment or in passageways. The breathing bag shall be puncture resistant. The puncture resistance of the breathing bag material shall be a minimum of 13.2 pounds (6.0 kg) according to MIL-STD-3010, Method 2065. The storage case and the secondary container shall protect the device from puncture. The puncture resistance of the storage case and secondary container materials shall each be a minimum of 80 pounds (36.3 kg) according to MIL-STD-3010, Method 2065.

2.2.4 Storage case. A storage case shall be provided to protect the device before use while stored or worn on belt.

2.2.4.1 Labeling. The storage case shall be marked with instructions for donning and operation of the device, and operating cautions. The storage case shall also be marked with the manufacturer name, model number, serial number, National Stock Number, and date of manufacture of the device.

2.2.4.2 Portability. The storage case shall have belt loops so the storage case may be worn on a belt 1 1/4 inches wide and 1/8 inch thick. When worn on a belt, the storage case shall be flat against the wearer's body (the storage case design and location of the belt loops shall prevent the storage case from tipping away from the wearer's body).

2.2.4.3 Weight. The weight of the device in its storage case shall be less than or equal to 1.4 kg (3.1 pounds). This does not include the weight of the carrying belt. The weight of the secondary container shall be less than or equal to 0.5 kg (1.15 pounds).

2.2.4.4 Size. The thickness of the storage case shall be less than or equal to 3.0 inches (the thickness is the dimension that extends away from the body when the storage case is worn on a belt). The volume of the storage case shall be less than or equal to 175 cubic inches (measured by water displacement).

2.2.4.5 Tamper resistance. The storage case design shall prevent or discourage tampering.

2.2.4.6 Tamper indication. The storage case shall have an obvious visual indicator to show if the storage case has been opened or otherwise tampered with.

2.2.4.7 Finish. There shall be no sharp edges or rough surfaces on the storage case that could cause personnel injury. There shall be no projections from the storage case that could catch on equipment, ladders, access scuttles or along passageways.

2.2.5 Secondary container. A secondary container shall be provided for the device in its storage case.

2.2.5.1 Construction. The secondary container shall be made of molded plastic. A carrying strap attached to the secondary container shall be provided. The ready-for-use indicator (see 2.2.2) must be visible through the secondary container. The inside of the secondary container shall be configured to firmly retain the device and storage case and prevent their movement.

2.2.5.2 Size. The outside dimensions of the secondary container with carrying strap shall be 4.25 inches by 8.25 inches by 9.25 inches, with a tolerance of  $\pm 0.25$  inch on each dimension in order to fit into existing shipboard EEBD stowage racks and lockers.

2.2.5.3 Labeling. The outside of the secondary container shall be labeled with the Manufacturer Name, Model Number, National Stock Number, the label "10-MINUTE EMERGENCY ESCAPE BREATHING DEVICE," and written and pictorial device donning instructions. The donning instructions shall tell when the device should be taken off because it is exhausted. The donning instruction label shall be on the 8.25 inches by 9.25 inches face.

2.2.5.4 Color. The secondary container shall be florescent orange semigloss, Color Number 28915 in accordance with FED-STD-595.

### 2.3 Material requirements.

2.3.1 Fire resistance. The device shall be resistant to fire and heat that may be encountered during an escape from a fire. Fire resistance will be determined as follows:

- a. The device shall be tested for flammability in accordance with BS-EN-13274-4, Method 3, with the exception that the speed at which the device passes over the flame shall be 20 mm/sec versus 60 mm/sec.
- b. A minimum of three devices shall be tested. The device shall be tested in a fully open configuration (to approximate the donned configuration).
- c. Test acceptance criteria are: acceptance criteria as specified in BS-EN-13794, Flammability Requirements, including the leak tightness check, and the device must be functional after the test. Device functionality shall be evaluated with a visual inspection of the device, and by activating and using the device.

2.3.2 Fluid resistance. Materials used for the storage case and the secondary container shall not degrade when exposed to turbine fuel, hydraulic fluid, or lubricating oils.

2.3.3 Corrosion resistance. The secondary container and storage case shall not degrade or corrode from exposure to below decks shipboard atmosphere when tested as follows:

- a. Three devices in their storage case and three empty secondary containers shall be given a salt fog test in accordance with MIL-STD-810.
- b. The storage case and secondary container shall be positioned in approximately the stored configuration.
- c. The test duration shall be two cycles, where one cycle includes a 24-hour salt fog exposure followed by a 24-hour drying time.
- d. At the conclusion of the test, each device, storage case and secondary container shall be inspected and shall have no visual evidence of degradation, corrosion, or failure.
- e. The device shall be removed from the storage case and inspected. There shall be no evidence of storage case leakage.

2.3.4 Non-aging materials. Actuation mechanism components that are significantly stressed when the device is activated (such as activation pull rings or lanyards) shall be made of materials that do not significantly degrade in strength or elasticity with age.

## 2.4 Environmental requirements.

2.4.1 Storage environment and service life. The device, storage case, and secondary container shall be designed for storage at temperatures between -4 °F (-20 °C) and 149 °F (65 °C), relative humidity up to 95%, and pressure between 0.8 and 1.2 atmospheres. To support the low temperature storage requirement, flexible materials used in the device (including as a minimum the breathing bag, hood, neck seal, flexible hoses, and mouth bit, if these components are used in the device) shall have a stiffening temperature (T<sub>2</sub>) of -4 °F or colder in accordance with ASTM D1053. The service life of the device, storage case, and secondary container in an EEBD stowage locker aboard a ship shall be at least 15 years. Belt-worn usage of at least 5 years shall not lessen the total service life below the 15-year minimum requirement. The high temperature storage requirement and service life will be determined as follows:

2.4.1.1 Materials and parts. Elastomeric materials used in the construction of the device, storage case, and secondary container shall be exposed to heat aging in accordance with ASTM D3045 to establish a service life of the materials at the maximum storage temperature (149 °F). For flexible elastomer materials (including the breathing bag, hood, neck seal, flexible hoses, and mouth bit, if these components are used in the device) the service life at 149 °F shall be 15 years (90,000 hours) based on a 50% change in the flexibility (or drape stiffness) of the material. Flexibility (or drape stiffness) is measured in accordance with ASTM D1388. For rigid plastics (such as for structural components) the service life at 149 °F shall be 15 years (90,000 hours) based on a 50% change in the bending modulus of the material. Bending modulus is measured in accordance with ASTM D747.

2.4.1.2. Secondary container. Three closed secondary containers shall be aged for 100 hours at the minimum temperature that results in aging equivalent to the aging that occurs in 15 years at a temperature of 149 °F in accordance with the ASTM D3045 aging procedure. After returning to room temperature, the secondary containers shall be disassembled and inspected. There shall be no evidence of cracking, embrittlement, or material failure.

2.4.1.3 Assembled device and storage case. Nine complete devices in their storage cases shall be aged for 100 hours at the minimum temperature that results in aging equivalent to that which occurs in 15 years at a temperature of 149 °F in accordance with the ASTM D3045 aging procedure. After the units are returned to ambient temperature, three devices and storage cases shall be disassembled and inspected. There shall be no evidence of cracking, embrittlement, or material failure. The remaining six devices shall be tested for proper functioning by meeting the following 42 CFR 84 Subpart H requirements:

- a. Two devices shall be tested for oxygen flow (gas flow test; closed-circuit apparatus).
- b. Two devices shall be tested for breathing resistance (breathing resistance test; inhalation and breathing resistance test; exhalation).

- c. Two devices shall be tested for the Man-Test 4 performance requirements, including the carbon dioxide concentration requirement (Test for carbon dioxide in inspired gas; open- and closed-circuit apparatus; maximum allowable limits.) The man tests shall be done with one test subject, who is approximately a 95th percentile weight male as specified by ASTM F1166.

2.4.2 Operating environment. The device shall operate at temperatures between 21 °F (-6 °C) and 110 °F (43 °C), relative humidity up to 95%, and pressure between 0.8 and 1.2 atmospheres. The operating environment shall be tested and measured as follows:

- a. To demonstrate the low-temperature operating requirement, the manufacturer shall perform the 42 CFR 84 Subpart H, Tests during low temperature operation, at a temperature of 21 °F.
- b. To demonstrate the high-temperature operating requirement, the device shall be hot soaked at 110 °F for a minimum of four hours prior to the test. The device shall be tested according to the 42 CFR 84 Subpart H, Tests during low temperature operation, at an ambient temperature of 86 °F (30 °C).

2.4.3 Shock. The device, storage case, and secondary container shall function as intended after exposure to shock loads that may occur during an attack on the ship while the device is in its stowed condition and determined as follows:

- a. The shock tests shall be performed in accordance with MIL-S-901, Shock Grade A, Equipment Class 1, Test Type A.
- b. Shock tests shall be performed on eight devices. Each device to be shock tested shall be assembled in a storage case and secondary container. The device, storage case and secondary container assembly shall be shock tested while stowed in an EEBD stowage rack (see Figure 1).
- c. After the shock test, two device, storage case and secondary container assemblies shall be disassembled and inspected.
- d. There shall be no evidence of damage to the secondary containers. There shall be no evidence of damage to the devices or storage cases that would impair function.
- e. The remaining six devices shall be tested for proper functioning by meeting the following 42 CFR 84 Subpart H requirements.
- f. Two devices shall be tested for oxygen flow (gas flow test; closed-circuit apparatus).
- g. Two devices shall be tested for breathing resistance (breathing resistance test; inhalation and breathing resistance test; exhalation).
- h. Two devices shall be tested for the Man-Test 4 performance requirements, including the carbon dioxide concentration requirement (Test for carbon dioxide in inspired gas; open- and closed-circuit apparatus; maximum allowable limits). The man tests shall be conducted with one test subject, who is approximately a 95th percentile weight male as specified by ASTM F1166.

2.4.4 Vibration. The device, storage case, and secondary container shall function as intended after exposure to shipboard vibration loads while the device is in its stowed condition and determined as follows:

- a. The vibration tests shall be performed in accordance with MIL-STD-167-1, Type I.
- b. Vibration tests shall be performed on eight devices. Each device to be vibration tested shall be assembled in a storage case and secondary container. The device, storage case and secondary container assembly shall be vibration tested while stowed in an EEBD stowage rack (see Figure 1).
- c. After the vibration test, two device, storage case and secondary container assemblies shall be disassembled and inspected.
- d. There shall be no evidence of damage to the secondary containers. There shall be no evidence of damage to the devices or storage cases that would impair function.
- e. The remaining six devices shall be tested for proper functioning by meeting the following 42 CFR 84 requirements.
- f. Two devices shall be tested for oxygen flow, which shall be in accordance with 42 CFR 84, Gas flow test; closed-circuit apparatus.



- g. Two devices shall be tested for breathing resistance, which shall be in accordance with 42 CFR 84, Subpart H, Breathing resistance test; inhalation and breathing resistance test; exhalation.
- h. Two devices shall be tested for the Man-Test 4 performance requirements, including the carbon dioxide concentration requirement of 42 CFR 84, Test for carbon dioxide in inspired gas; open- and closed-circuit apparatus; maximum allowable limits. The man tests shall be done with one test subject, who is approximately a 95th percentile weight male as specified by ASTM F1166.

2.5 Maintenance and training unit requirements.

2.5.1 Maintenance. The device, storage case and secondary container shall require no periodic maintenance.

2.5.2 Training unit. A training unit that is similar to the working unit shall be available as an accessory. The training unit shall resemble the EEBD device in every aspect that is practical including size, shape, weight, storage case and secondary container. The storage case shall have a warning label with "WARNING Training Unit Only" in a visible location. The secondary container color shall be light blue. The secondary container shall be labeled as a training unit and contain the same instructions as a working unit. The training unit shall be reusable and only require cleaning before use by others. The training unit shall require no periodic maintenance.

3. REGULATORY REQUIREMENTS. The offeror/manufacturer is encouraged to use recovered materials to the maximum extent practicable, in accordance with paragraph 23.403 of the Federal Acquisition Regulation (FAR).

4. PRODUCT CONFORMANCE PROVISIONS.

4.1 Product conformance. The products provided shall meet the salient characteristics of this Commercial Item Description, conform to the producer's own drawings, specifications, standards, and quality assurance practices, and be the same product offered for sale in the commercial market. The government reserves the right to require proof of such conformance.

4.2 Inspection requirements. Bid samples may be required as specified (see 6.3).

5. PACKAGING. Preservation, packing, and marking shall be as specified in the contract or order.

6. NOTES.

6.1 Source of documents.

6.1.1 ASTM. ASTM standards are available from ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959 or online at [www.astm.org/](http://www.astm.org/).

6.1.2 BS-EN. British Standards are available at Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112 or online at [www.global.ihs.com/](http://www.global.ihs.com/).

6.1.3 CFR. The Code of Federal Regulations (CFR) may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20401 or online at [www.gpoaccess.gov/index.html](http://www.gpoaccess.gov/index.html).

6.1.4 FED-STDs. Federal Standards are available online at <http://astimage.daps.dla.mil/quicksearch/> or <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Bldg. 4D, Philadelphia, PA 19111-5094.

6.1.5 MIL-STDs. Military Standards are available online at <http://astimage.daps.dla.mil/quicksearch/> or <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Bldg. 4D, Philadelphia, PA 19111-5094.

6.2 National stock numbers (NSNs). The following is a list of NSNs assigned that corresponds to this CID. The list may not be indicative of all possible NSNs associated with the CID.

4240-01-439-5937 Emergency escape breathing apparatus (EEBD)

4240-01-459-0078 Training Device, EEBD

6.3 Ordering data. The contract or order should specify the following:

- a. CID document number and revision.
- b. Product conformance provisions.
- c. Packaging requirements.

6.4 Keywords.

Emergency egress

#### MILITARY INTERESTS

##### Custodians:

Army – EA  
Navy – SH  
Air Force – 03

##### Preparing Activity:

Navy – SH  
(Project 4240-0695-000)

##### Review Activities:

Navy – AS  
Air Force – 11, 84, 99

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://assist.daps.dla.mil>.