

SAUDI ARABIAN OIL COMPANY (Saudi Aramco)
GENERAL INSTRUCTION MANUAL

G. I. NUMBER **APPROVED**
1780.001

ISSUING ORG. FIRE PROTECTION DEPARTMENT

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SUBJECT ATMOSPHERE-SUPPLYING RESPIRATORS

APPROVAL BFQ
PAGE NO. 1 OF 8

* **CONTENT**

1. Scope
2. References
3. Definitions
4. Applications
5. Respirable Air Specifications
6. Respirator Specifications
7. Fire Protection Department Responsibilities
8. Proponent Organizations Responsibilities
9. Approval

* **SUPPLEMENTS**

- 1780.001-1 Table: Compressed Breathing Air Quality Requirements
1780.001-2 SCBA Allocation Guidelines

* **1. SCOPE**

This general instruction establishes requirements and guidelines related to the use of atmosphere-supplying respirators in Saudi Aramco industrial facilities.

This instruction covers the following atmosphere-supplying respirators used by Saudi Aramco during operations:

- Self-Contained Breathing Apparatus (SCBA)
- Supplied Air (airline) Breathing Apparatus (SABA)
- Combination-Type Supplied Air Breathing Apparatus (SABA) with self-contained escape air supply
- Emergency Escape Breathing Device (EEBD)

* **2. REFERENCES**

- ANSI/CGA G-7.1-2011, *Commodity Specification for Air*.
NFPA 1852, *Standard on Selection, Care, and Maintenance of Open-Circuit Self-Contained Breathing Apparatus (SCBA); 2013 Edition*
NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency, 2013 edition*.
NFPA 1989, *Standard on Breathing Air Quality for Fire and Emergency Services Respiratory Protection, 2013 edition*
ANSI Z88.2-2015, *American National Standard for Respiratory Protection*
CGA C-6.1-2013, *Standards for Visual Inspection of High Pressure Aluminum Compressed Gas Cylinders*
GI 1781.001, *Inspection, Testing, & Maintenance of Fire Protection Equipment*
GI 1783.001, *Fire Fighting Training Company Personnel*

* CHANGE

** ADDITION

NEW INSTRUCTION

COMPLETE REVISION

SAUDI ARABIAN OIL COMPANY (Saudi Aramco)
GENERAL INSTRUCTION MANUAL

G. I. NUMBER **APPROVED**
1780.001

ISSUING ORG. FIRE PROTECTION DEPARTMENT

ISSUE DATE 08/29/2018
REPLACES 03/01/2011

SUBJECT ATMOSPHERE-SUPPLYING RESPIRATORS

APPROVAL BFQ
PAGE NO. 2 OF 8

* **3. DEFINITIONS**

3.1 Approved Air Compressor: An air compressor whose quarterly air sample has been certified as “Within Normal Limits’ by JHAH Environmental Chemistry Laboratory or a laboratory approved by them or the Lab Research & Development Center, per the standards of the latest edition of NFPA 1989, *Standard on Breathing Air Quality for Fire and Emergency Services Respiratory Protection, Section 5.6 Breathing Air Quality Requirements; 2013 edition*. Oil-lubricated approved air compressors shall be provided with an instrumentation to provide an alarm upon excessive concentration of carbon monoxide.

3.2 Atmosphere-Supplying Respirator: A class of respirators that supplies pressurized respirable atmosphere independent of the ambient atmosphere.

3.4 Cascade System: A series of cylinders manifold together containing respirable air under pressure that is used either to fill other cylinders or to provide respirable air to SABA.

3.5 Continuous-Flow Respirator: An atmosphere-supplying respirator that provides a continuous flow of respirable air to the respiratory inlet of the face piece.

3.6 Emergency Escape Breathing Device (EEBD): A self-contained respirator used during escape from an oxygen deficient or contaminated environment.

3.7 Hazardous Atmosphere: An atmosphere that contains a contaminant(s) in excess of the exposure limit, the maximum allowable concentration of a contaminant in the air to which an individual may be exposed, or is oxygen deficient or both.

Note: Hazardous atmospheres may be immediately dangerous to life or health (IDLH) or non-IDLH. Refer to the definitions of IDLH atmosphere.

3.8 High Risk Area: An area with high probabilities of the atmosphere containing a contaminant at a concentration at or above its IDLH concentration or an oxygen deficient atmosphere, or both. Examples include Drilling & Workover, Manned Offshore Platforms, Refinery Distillation, Chlorine Handling Areas, Chemical Mixing Buildings, Fractionation Modules, Sulfur Plants, Large Chemical Warehouses, laboratories, GOSPs, and Gas Treatment Plants.

3.9 Immediately Dangerous to Life or Health (IDLH) Atmosphere: An atmosphere that poses an immediate hazard to life or poses immediate irreversible debilitating effects on health.

Note: In Saudi Aramco operations IDLH contaminant concentrations are adopted from the USA National Institute of Occupational Safety and Health, NIOSH. Refer to the NIOSH Pocket Guide to Chemical Hazards. Employees may contact the Industrial Hygiene representative in their area for IDLH contaminant concentrations.

3.10 Open-Circuit SCBA: An SCBA in which the breathing air is exhaled to the atmosphere after each breath.

3.11 Self-Contained Breathing Apparatus (SCBA): A positive pressure atmosphere-supplying respirator in which the respirable pressurized air source is carried by the wearer.

SAUDI ARABIAN OIL COMPANY (Saudi Aramco)
GENERAL INSTRUCTION MANUAL

G. I. NUMBER **APPROVED**
1780.001

ISSUING ORG. FIRE PROTECTION DEPARTMENT

ISSUE DATE 08/29/2018
REPLACES 03/01/2011

SUBJECT ATMOSPHERE-SUPPLYING RESPIRATORS

APPROVAL BFQ
PAGE NO. 3 OF 8

- 3.12 Supplied Air Breathing Apparatus (SABA): A positive pressure atmosphere-supplying respirator in which the main supply of respirable air is not carried by the wearer and may well have an escape set designed to provide a supply of emergency air to egress/escape from the area if the main supply of breathing air fails

* **4. APPLICATIONS**

- 4.1 Employees using SCBA shall operate in teams of two or more. Teams shall be able to communicate with each other through visual, audible, or physical means to coordinate their activities, and they must remain in close proximity to each other to provide assistance in case of an emergency. Two additional qualified standby users with two additional, fully charged, spare SCBA shall be immediately available when rescue is required. Standby wearers shall be equipped with the same standard and duration of SCBA as the original team.
- 4.2 EEBDs shall only be used for escape from a dangerous breathing environment to a place of safety. Deployment of EEBDs requires the proponent to complete a comprehensive assessment to justify their benefit, and proponents must also address training and maintenance, as well as how contractors and visitors will be handled. Use of EEBDs must be incorporated into emergency response plans. Placement or deployment of EEBDs shall be conducted by the proponent in coordination with Loss Prevention Department and Fire Protection Department.
- 4.3 Thirty-minute SCBA shall be located within the battery limits of all facilities that have the potential to release toxic gases or present other hazards necessitating the use of SCBA in addition to workover and drilling rig floors. They are provided for emergency activities only. Additional thirty-minute SCBA shall be provided in a bank outside the control room for plant work of short durations.
- 4.4 Allocation of SCBA shall be in accordance with the guidelines in supplement 1780.001-2.

* **5. RESPIRABLE AIR SPECIFICATIONS**

- 5.1 Air in cascade and SCBA cylinders and SABA shall be supplied from a cascade system equipped with a low air alarm system or directly from a respirable approved air compressor as per the specifications in Supplement 1780.001-1.

* **6. RESPIRATOR SPECIFICATIONS**

- 6.1 Atmosphere-supplying respirators shall be certified by the United States National Institute for Occupational Safety and Health (NIOSH) and shall meet operational and maintenance guidelines in NFPA 1852 and 1989 Standards 2013 editions.
- 6.2 Supplied Air Breathing Apparatus (SABA) shall not be used to enter an IDLH atmosphere unless provided with a self-contained air supply. Air from the cylinder shall be then used for escape/egress only.

* CHANGE

** ADDITION

NEW INSTRUCTION

COMPLETE REVISION

SAUDI ARABIAN OIL COMPANY (Saudi Aramco)
GENERAL INSTRUCTION MANUAL

G. I. NUMBER **APPROVED**
1780.001

ISSUING ORG. FIRE PROTECTION DEPARTMENT

ISSUE DATE 08/29/2018
REPLACES 03/01/2011

SUBJECT ATMOSPHERE-SUPPLYING RESPIRATORS

APPROVAL BFQ
PAGE NO. 4 OF 8

- 6.3 Supplied Air Breathing Apparatus used by Saudi Aramco shall be Continuous-flow (positive-pressure) where air is supplied continuously to a loose-fitting face piece, tight-fitting face piece, hood, or helmet.
- 6.4 Cylinders for SCBA and SABA with escape/egress cylinders shall be recharged to their maximum allowable working pressure if they have a valid hydrostatic test date stamp (metal) or label (composite).
- 6.5 Care, maintenance, inspection, and storage for respirators shall be in accordance with GI 1781.001 and NFPA 1852.

* **7. FIRE PROTECTION DEPARTMENT RESPONSIBILITIES**

- 7.1 Recharge air cylinders on request with air meeting the respirable air specifications of Section 5. Other organizations may also refill cylinders, provided the air specifications of Section 5 are met.
- 7.2 Service SCBA and supplied air breathing apparatus for all Saudi Aramco organizations with the exception of abrasive-blasting helmets, hoods and contractor barges, drilling rigs, marine vessels from this requirement. This servicing includes: (i) periodic hydro testing, inspection, and marking of air cylinders per GI 1781.001 and manufacturer's recommendation; (ii) performing manufacturer certified regulator service and flow testing annually, and (iii) maintenance and repairs. Parts shall be charged to the proponent organization.
- 7.3 Maintain up-to-date records of cylinder and regulator service.

* **8. PROPONENT ORGANIZATIONS RESPONSIBILITIES**

8.1 User Organizations:

- 8.1.1 Ensure that employees who may use atmosphere-supplying respirators, such as supervisors, respirator issuers and employees who need or may need to use these respirators in their work or in emergencies shall be trained and retrained periodically by a qualified person(s). Employees shall receive training in accordance with GI 1783.001 "Fire Fighting Training Company Personnel."
- 8.1.2 Conduct and coordinate for the care, maintenance, inspection, and storage of respirators in accordance with GI 1781.001 & NFPA 1852.
- 8.1.3 Arrange for their respirable air compressor's quarterly air sampling and testing of the air used in their atmosphere-supplying respirators through the laboratories in Section 8.3.
- 8.1.4 Ensure that atmosphere-supplying respirators are available as needed.
- 8.1.5 Ensure that damaged EEBD or those that fail visual inspection are removed from service.

* CHANGE

** ADDITION

NEW INSTRUCTION

COMPLETE REVISION

SAUDI ARABIAN OIL COMPANY (Saudi Aramco)
GENERAL INSTRUCTION MANUAL

G. I. NUMBER **APPROVED**
1780.001

ISSUING ORG. FIRE PROTECTION DEPARTMENT

ISSUE DATE 08/29/2018
REPLACES 03/01/2011

SUBJECT ATMOSPHERE-SUPPLYING RESPIRATORS

APPROVAL BFQ
PAGE NO. 5 OF 8

8.1.6 Provide employees, who require vision correcting lenses and are expected to wear SCBA or SABA as a normal part of their duties, with appropriate lenses and attachments to wear during the use of atmosphere-supplying respirators.

8.1.7 Develop a formal written respiratory protection program containing a specific policy on the use of EEBDs (which are to be used only for escape purposes), as well as detailed requirements for, at a minimum, EEBD specifications, distribution, inspection, maintenance, and personnel training.

8.2 Johns Hopkins Aramco Healthcare (JHAH)

8.2.1 The Environmental Chemistry Laboratory of JHAH Dhahran Health Center or a laboratory approved by them shall analyze the respirable air used in cascade and SCBA cylinders when requested by user organizations to assure that it meets the specification in the table of Supplement 1780.001-1.

8.3 Research & Development Center

8.3.1 The Research & Development Center of the Technology Oversight & Coordination Organization shall analyze the respirable air supplied from compressors directly to supply air-breathing apparatus when requested by user organizations to assure that it meets the specifications in Supplement 1780.001-1.

8.4 Loss Prevention Department

8.4.1 Verify that organizations using atmosphere-supplying respirators comply with this instruction.

8.4.2 Recommend appropriate atmosphere-supplying respirators as required.

8.4.3 Review and verify that air analysis and record keeping are performed in accordance with recognized standards.

SAUDI ARABIAN OIL COMPANY (Saudi Aramco)
GENERAL INSTRUCTION MANUAL

G. I. NUMBER **APPROVED**
1780.001

ISSUING ORG. FIRE PROTECTION DEPARTMENT

ISSUE DATE
08/29/2018

REPLACES
03/01/2011

SUBJECT ATMOSPHERE-SUPPLYING RESPIRATORS

APPROVAL
BFQ

PAGE NO.
6 OF 8

9. APPROVAL

Recommended by:

Approved by:

_____ Date _____

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Manager, Fire Protection Department

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Concurred By:

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MOHAMMAD M. SAGGAF
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* CHANGE

** ADDITION

NEW INSTRUCTION

COMPLETE REVISION

SAUDI ARABIAN OIL COMPANY (Saudi Aramco)
GENERAL INSTRUCTION MANUAL

G. I. NUMBER **APPROVED**
 1780.001

ISSUING ORG. FIRE PROTECTION DEPARTMENT

ISSUE DATE 08/29/2018
 REPLACES 03/01/2011

SUBJECT ATMOSPHERE-SUPPLYING RESPIRATORS

APPROVAL BFQ
 PAGE NO. 7 OF 8

* SUPPLEMENT 1780.001-1

TABLE: COMPRESSED BREATHING AIR QUALITY REQUIREMENTS

Oxygen (O ₂), percent by volume (Balance shall be predominantly nitrogen.)	19.5 to 23.5
Dew point of water vapor at atmospheric pressure, maximum degrees Centigrade OR concentration of water, maximum parts per million by volume.	Dew Point ≤ -54°C Water Concentration ≤ 24
Non-methane volatile organic compounds (VOCs) content	Non-methane VOC ≤ 25
Oil (condensed), maximum milligrams/cubic meter at atmospheric pressure and normal room temperature	05
Carbon monoxide (CO), maximum parts per million by volume	05
Carbon dioxide (CO ₂), maximum parts per million by volume	1000
Odor	No pronounced odor
Particulates, maximum milligrams/cubic meter at atmospheric pressure and normal room temperature	02
<p><i>Note:</i></p> <p>The specifications in this table are the same as those in <i>NFPA 1898, Standard on Breathing Air Quality for Fire and Emergency Services Respiratory Protection, Section 5.6 Breathing Air Quality Requirements; 2013 edition.</i></p>	

* CHANGE

** ADDITION

NEW INSTRUCTION

COMPLETE REVISION

SAUDI ARABIAN OIL COMPANY (Saudi Aramco)
GENERAL INSTRUCTION MANUAL

G. I. NUMBER **APPROVED**
1780.001

ISSUING ORG. FIRE PROTECTION DEPARTMENT

ISSUE DATE 08/29/2018
REPLACES 03/01/2011

SUBJECT ATMOSPHERE-SUPPLYING RESPIRATORS

APPROVAL BFQ
PAGE NO. 8 OF 8

SUPPLEMENT 1780.001-2

ALLOCATION OF SELF CONTAINED BREATHING APPARATUS (SCBA)

1. GENERAL GUIDELINES

- 1.1 All new, additional, or changes in SCBA placement shall be done only after Fire Protection, Loss Prevention, and the proponent have conducted a joint survey. The survey team must exercise their judgment and understanding of the operations in determining the specific locations and number and type of SCBA required. The team must consider such factors as types and severity of hazards, normal wind direction, probable approach and egress paths, congestion of the area, actions required and time available for those actions to be taken, and FrPD response.
- 1.2 A minimum of two (2) SCBA sets shall be located at opposite ends of the risk area. The survey must take into account the potential for serving more than one risk area by spacing and locating SCBA appropriately.
- 1.3 Self-contained breathing apparatus shall be clearly identified. Where wall mounting is used, location of permanently installed boxes for emergency equipment shall be marked by a safety green border or background as per SAES-B-067, Section 4.2.2.b. The weatherproof box for SCBA shall be installed no more than 36 inches from the bottom of the box to grade.

2. SCBA ALLOCATION GUIDELINES

2.1 High Risk and Medium Risk Areas

- 2.1.1 Control Rooms: The number of SCBA provided shall be equal to the number of personnel on shift in the control room plus a suitable number of spares based on risk or the maximum expected number of personnel in the control room at any time.

In all cases, it is advisable to install at least two SCBA inside an operator shelter. The operators may be inside the shelter when an emergency occurs and will need to use SCBA. The number of SCBA shall be sufficient for the number of operators in the shelter.

- 2.1.2 Outside Operating Areas: SCBA shall be located where there is a potential for product release creating an IDLH atmosphere or it is expected that personnel working in the area need to take immediate action to minimize the release or the event of fire. The number of SCBA provided shall be equal to the number of workers per shift. Additional SCBAs shall be determined as per LPD assessment from a joint survey performed as required in Section 1.1 of this supplement.

2.2 Low Risk Areas

- 2.2.1 SCBA shall be provided based on a survey as specified in Section 1.1 of this supplement.

* CHANGE

** ADDITION

NEW INSTRUCTION

COMPLETE REVISION