Respiratory Protective Equipment (RPE) Procedure

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1.0 Purpose/ Scope

1.1 Purpose:

The purpose of this document is to provide guidance, outline responsibility and authority for management of all types of Respiratory Protective Equipment (RPE) used in KOC facilities/ sites/ areas.

This procedure provides basic information/ guidelines for selection, provision, use, care, storage, maintenance, inspection, testing of RPE and specifies the key elements of quantitative respirator fit testing and medical evaluation. These guidelines describe the responsibility, authority and precautions to be taken by all authorized personnel as per this procedure.

The contents of this procedure should not be taken as a substitute to safe work procedure/ safe work environment as stated under various KOC HSE Procedures. This procedure applies to all respirator users at KOC.

1.2 Scope:

This procedure is applicable for open circuit type RPE (Self-Contained Breathing Apparatus (SCBA), Escape-only Respirator, Air Purifying Respirators, Air Purifying Escape Respirators (APRs) and Supplied Air Respirators (SAR)) having clean and breathable atmospheric air stored in cylinders under pressure at KOC facilities/ sites/ areas.

1.3 Exception:

This procedure does not cover other types of supplied air respirators such as, closed circuit, underwater, marine service breathing apparatus, pure oxygen operated breathing apparatus, piped breathing air system installed in the process plants, dedicated breathing air compressor operated systems except as defined in Appendix-4 of this procedure.

2.0 Definitions:

Air Purifying Escape Respirator means a non-atmosphere supplying respirator which purifies ambient air through filter cartridges; to be used only for emergency exit.

Assigned Protection Factor (APF) means the workplace level of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a continuing, effective respiratory protection program.

Note: APFs are numbers that indicate the level of workplace respiratory protection that a respirator or class of respirators is expected to provide to employees when used as part of an effective respiratory protection program. Employers must use APFs to select the appropriate type of respirator based upon the exposure limit of a contaminant and the concentration of the contaminant in the workplace. The APF multiplied by the contaminant's exposure limit gives a Maximum Use Concentration (MUC). If the workplace level of the contaminant is expected to exceed the respirator's MUC, the employer must choose a respirator with a higher APF.

Atmosphere-Supplying Respirator means a respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere, and includes self-contained breathing apparatus (SCBA) units, Escape-only respirator and supplied-air respirators (SARs).

Closed-Circuit SCBA is recirculation-type SCBA in which the exhaled gas is rebreathed by the wearer after the carbon dioxide has been removed from the exhalation gas and the oxygen content within the system has been restored from sources such as compressed breathing air, chemical oxygen, liquid oxygen, or compressed gaseous oxygen.

Escape-only Respirator means a respirator intended to be used only for emergency exit. It can be SCBA type or APER type (normally 15 minutes duration).

Fit Factor means a quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

Note: The fit factor is derived from a quantitative fit test (QNFT). A fit factor of 100 means that the air inside the respirator is 100 times cleaner than the air outside.

Respiratory Fit Test means the use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual.

Note: Fit testing detects for air leaks around the seal between the respirators facepiece and face of the worker. If there isn't a good seal, contaminated air will leak into the respirator and the worker may not get the level of protection that is needed to protect their health.

Immediately Dangerous to Life or Health (IDLH) means one that poses a threat of exposure to airborne contaminants when that exposure is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment.

Negative Pressure Respirator in which the pressure inside the facepiece, in relation to the pressure surrounding the outside of the facepiece, is negative during any part of the inhalation or exhalation cycle when tested.

Open-Circuit SCBA: SCBA in which exhalation is vented to the atmosphere and not rebreathed.

Oxygen Deficient Atmosphere is an atmosphere having less than 20.9 percent of oxygen (when the reason for the reduction is unknown or not controlled), or less than 19.5 percent of oxygen by volume. Oxygen deficient atmosphere is treated IDLH for this procedure.

Positive Pressure Respirator in which the pressure inside the facepiece, in relation to the pressure surrounding the outside of the facepiece, is positive during both inhalation and exhalation when tested.

Personal Alert Safety System (PASS) is a device for personal safety of the SCBA entrant/ user in confined/ dangerous place. This is also known as Distress Alarm Unit.

Quantitative Fit Test (QNFT): An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

Note: Quantitative fit testing is the process to measure the precise amount of leakage into any tight-fitting facepieces. Instead of relying on bitter-tasting chemicals and your senses, the test is performed by a machine calculating the measurements.

Respirator is a protective device that covers the nose and mouth or the entire face or even head to guard the wearer against hazardous atmospheres. The respirator supplies the breathable air/ nontoxic air to the wearer in conjunction with the respective device designed for the purpose.

Respirator Medical Evaluation is a health assessment that determines if an employee is medically fit to wear a respirator on the job. This is done before using the respirator at work.

RPE Controller is a trained and authorized person designated to control the overall use of SCBA for a group of SCBA wearers at designated workplace during any maintenance/ emergency/ drill including the standby crew.

RPE Coordinator is a person nominated by line management for carrying out the responsibilities mentioned in clause 4.2 of this procedure.

Supplied-Air Respirator (SAR) or airline respirator means an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

Self-Contained Breathing Apparatus (SCBA) means an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

SCBA Wearer is any personnel in KOC facilities who are authorized by the respective Team Leader to use SCBA, Escape-only Respirator, SAR by means of training (theoretical & practical) and having passed the subsequent test.

Tight fitting face piece: Any respirator face piece that relies on a “mask to face” seal to provide protection. This class includes quarter, half, and full face piece masks used in both negative and positive pressure modes in air purifying and supplied air respirators. Excluded from this classification are hoods and helmet style respirators.

TLV-Ceiling is airborne concentration of a toxic substance in the work environment, which should never be exceeded.

TLV-STEL is maximum allowable concentration to which workers can be exposed for a short period of time (15 minutes) for only four times throughout the day with at least one hour interval between consecutive exposures.

TLV-TWA is a time-weighted average concentration under which most people can work consistently for 8 hours a day, day after day, with no harmful effects.

3.0 General Requirements

- KPC HSSE Policy
- KOC HSSE Management System Framework Guide – Element HSSE-05, Operations and Maintenance, and Element HSSE-07, Emergency Preparedness and Management
- KPC-HSSE-E06-SA-S03 – KPC HSSE Management System Standard “Occupational Safety Management”

- KPC-HSSE-E06-SA-S02 – KPC HSSE Management System Standard "Occupational Health Management"

4.0 Key Responsibilities

4.1 Team Leader (Controlling Team) / Asset Owner / Operation Team Leaders / Fire (Support Services) Team

- Implementation of this procedure and other related standards/ Safety, Health & Environment Procedures at respective KOC facilities.
- Carry out risk assessment in consultation with Asset/Directorate HSE to identify required type of SCBA, Escape-only Respirator, APER and SAR for all concerned personnel (KOC employees & Contractor personnel) as per findings of risk assessment.
- Provision of adequate numbers of SCBA, Escape-only Respirator, APERs, and SAR in ready to use condition at identified areas inside the facility/ site/ areas where H2S, toxic exposure or oxygen deficiency is a hazard (considering emergency access or work in sour environment or emergency escape from toxic release location). Keep provision of spare Escape only Respirator for Visitors to H2S prone facilities.
- Ensure immediate replacement of Escape Mask (Cartridge Type) once it is used.
- Ensure the Contractors / Sub-Contractors provide required RPE to their employees working in H2S prone areas.
- Post appropriate signs at the locations where SCBA and Escape-only Respirator are kept for easy identification.
- Training, certification and issue of Authorized User Card as per Appendix-3 for all RPE wearer in use of SCBA, Escape-only Respirator and SAR provided at site (certified RPE training courses to be included in the PDP of RPE users). However, Authorized User Card for KOC fire-fighters are exempted due to their special nature of job and training.
- Ensure medical evaluation and fitness test as per Section 5.6 & 5.8 of this procedure for employees and contractors
- To ensure implementation of this Procedure as described in Appendix 4 for Drilling Operations by respective Contractors.
- Ensure RPEs are inspected (using Appendix 6 & 7 where necessary) and maintained by RPEs Co-coordinator and copy of records available at site. At least 5% of such inspection/ servicing carried out by concerned third parties / contractors shall be witnessed/ verified by respective controlling team

4.2 RPE Coordinator

- Ensure proper upkeep and maintenance of SCBA, Escape-only Respirator and SAR all the time. The pressure in cylinder must not be less than 90% of full capacity at all times.
- Ensure SCBA, Escape-only Respirator and SAR inspection, maintenance & test are carried out, copy of records available at site. At least 5% of such inspection/ servicing carried out by concerned third parties/ contractors shall be witnessed/ verified by Controlling Team/ Controlling Teams/ Operations.
- Inform the concerned Team (responsible for SCBA Maintenance Contract Execution) about any change in the inventory/ installation of SCBA, Escape-only Respirator and SAR

- Ensure that defective, exhausted, contaminated SCBA, Escape-only Respirator and SAR are tagged “Out of Service” and segregated from other equipment
- Keep at least one set of manufacturers’’ user/ operation and maintenance manuals of all the makes/ models of SCBA, Escape-only Respirator and SAR. Forward a copy of such manuals to concerned Team (responsible for SCBA Maintenance Contract Preparation & Execution) whenever requested.
- Establish and maintain a database / list of RPEs at the site / facility level as per established requirement. The list shall be made available at the site / facility for ready reference and must be updated periodically.
- Ensure that the required number and types of SCBA, Escape-only Respirator and SAR as per the list / database as per previous bullet point are provided and maintained
- Ensure that all SCBA users are authorized for use of the SCBA.
- Provide list of respirator users and updated list of respirators available at facilities to Preventive Medicine Services for Medical Examination.

4.3 RPE / Maintenance Contract Preparation & Execution (By Fire (Support Services Team))

4.3.1 Contract Preparation

- Collect and collate the data from all Controlling Team/ Operations Teams, Asset/ Directorate HSE Teams related to SCBA, Escape-only Respirator and SAR available at all KOC facilities/sites/ areas. The data collected shall include make, model, year of make, type, capacity, supplier, availability of manuals, spare cylinders etc.
- Establish and maintain a Company level SCBA database based on the data collected as per point a) above. Each SCBA, Escape-only Respiratory and SAR shall be assigned a unique ID which can then be utilized for tracking and follow up of inspections, maintenance and final disposal.
- Define the scope (inclusions and exceptions) of maintenance of SCBA, Escape-only Respirator and SAR conforming to user requirement, relevant KOC standards, HSSE MS Procedures, international standards and manufacturers’ requirements.
- Prepare, raise the request and coordinate until award of contract with Contracts Team.

4.3.2 Contract Execution

- Receive the copy of the maintenance and inspection contract after award of the contract.
- Collate and verify the inventory as per approved contract document.
- Prepare a maintenance plan as per the contract SCOW and instruct, supervise the concerned contractor(s) for the maintenance at KOC facilities/ sites/ areas.
- Ensure that the contractor(s) has setup the minimum required facilities as mentioned in the contract document.
- Ensure that contractor’s maintenance staff are trained and certified from various SCBA, Escape-only Respirator and SAR manufacturers or as mentioned in the contract.
- Ensure execution of the periodic inspection, maintenance, repairs, refilling, etc., as mentioned in the contract.

- Establish provision of onsite charging of air supplied Escape Sets & SCBAs after its use to assure required level of respiratory coverage at sour facilities in KOC
- Ensure weekly inspection records are maintained for Escape only Respirators, and SCBAs specifying detail information such as cylinder pressure, physical condition of hose, facemask, pressure gauge, isolation valve etc.
- Activities of SCBA, Escape-only Respirator and SAR inspection, maintenance, repairs, and tests are recorded, original records maintained centrally, copy maintained at respective facilities up to satisfactory level as per Maintenance Contract/ KOC HSSE MS Procedure.
- Advice the Controlling Team/ Operations / HSE Group/ Asset/ Directorate HSE Teams in all matters related to provision, use, training, maintaining, audit, inspections etc. as per this procedure, as and when required.

4.4 Team Leader (Occupational Health & Safety):

- Provide technical assistance whenever required (e.g., for preparation of PPE spec. etc.)

4.5 Team Leader (Asset/ Directorate HSE)

- Ensure that the Controlling Teams/ Operations/ users are aware about the respiratory protection requirements for SCBA, Escape-only Respirator and SAR as per KOC standards and related HSSE MS Procedures.
- To advise the Controlling Teams/ Operations in implementation of this procedure at their respective facilities/sites/ areas.
- To advise user teams in training the employees responsible for use, upkeep and maintenance of SCBA sets.
- To monitor the availability of SCBA, Escape-only Respirator and SAR at facility/ site through different tools as inspection checklist to ensure compliance to this Procedure.
- HSE (E&D) Team to support Drilling Groups in implementation of this procedure through Appendix 4 in all KOC Drilling Operations by respective Contractors.

4.6 RPE User

All individuals working in KOC facilities (who are exposed to respiratory hazards) shall be:

- Aware about the respiratory hazards at their workplace, KOC HSSE MS Procedures, available protective arrangements in this regard.
- Aware about the locations of SCBA, Escape-only Respirator and SAR available at their workplace.
- Trained and certified for use, care, upkeep of SCBA, Escape-only Respirator and SAR. User shall possess valid “Respirator use authorization card”.
- Aware about the checks on SCBA, Escape-only Respirator, SAR before and after use to ensure good working condition of the equipment at all times.
- Periodically undergo medical evaluation and Fitness tests for safe use of SCBA/ respirators.
- All tight-fitting respirator wearer shall, according to manufacturer’s instructions, be clean shaven to ensure an adequate face seal with the mask.
- All SCBA, Escape-only Respirator and SAR wearers shall ensure that they are trained and certified in the use of SCBA and/or Escape-only Respirator.

- SCBA, SAR users shall ensure minimum the following:
  - Minimum of two SCBA wearer are present (Other than Escape-only Respirator).
  - SCBA don (put on) and doff (put off/ remove) procedure.
  - Standby Crew with standby SCBA present in safe area.
  - SCBA Control Procedure established with a trained and assigned onsite SCBA Controller during use.

4.7 SCBA Controller

Monitor the use of SCBA at a work area by recording the pressure contained within the SCBA Set / cylinder as well as the entry and exit time of all personnel working inside the work area. An adequate SCBA Entry Control Board should be utilized for this purpose. In the case of Confined Space Entry, please comply with requirements of KOC.SA.007 – Entry into Confined Spaces.

4.8 Specialist Vendors

In the event that SCBA, Escape-only Respirator and SAR are supplied to KOC facility/ sites by a specialist vendor as part of contract, the vendor shall be responsible for ensuring that the equipment supplied are:

- In accordance with relevant KOC standards, KOC HSSE MS Procedures, specifications for use in KOC facilities/ sites.
- Fully certified by internationally recognized test agencies / organizations as NIOSH/ EN etc. as acceptable to KOC controlling team.
- Fully functional and fit for the purpose of use.
- Ensure adequate spare parts are available when needed
- To inform controlling team about any change or modifications to the system.
- It will be responsibility of the vendor, concerned controlling team to ensure awareness, usage training for all concerned employees and contract workers before hiring/ placing the SCBA, Escape-only Respirator and SAR at relevant facilities/ sites.
- Upkeep and maintain these equipment supplied to KOC at least to the minimum standards prescribed in this procedure. Maintain records of such activities.

4.9 Contractors/ Contractor Employees:

- Contractors engaged in KOC under various contracts shall ensure that their employees are fully aware about the KOC requirements. All the SCBA, Escape-only Respirator and SAR (owned by contractor) shall conform to KOC requirements as prescribed in this procedure.
- Ensure that the fit testing and recordkeeping requirements of this procedure have been met before you use a respirator for protection against hazardous exposures at work.
- Contractor RPE users can complete their medical evaluation and Respirator Fit testing through any KOC approved Medical Center. Fit test can also be done by the RPE Suppliers / OEM representatives, by following the standard protocol mentioned in this procedure.
- Contractor shall ensure RPE authorized users possess training and certification from an approved third party training agency.
- Ensure availability of required number of RPE for the field workers.

4.10 Preventive Medicine Services Team

- Carry out Preventive Medical Examination

- Maintenance of records as per the requirements highlighted in Clause-8: HSE Records.

4.11 Training & Career Development:

- Provide certified training to RPE users (theory and practical) as per their PDP

5.0 Procedure

5.1 General

Self-Contained Breathing Apparatus (SCBA) shall be used where there is a possibility of presence of toxic gases (e.g. H2S, CO etc.), asphyxiant gases (e.g. N2, CO2 etc. more than normal atmospheric conditions) or oxygen deficiency (O2 less than 19.5%) in the breathing zone (e.g. work place or inside a vessel) or IDLH prone areas etc. The air purifying respirator mentioned in this procedure is for escape purpose (APER – Air Purifying Escape Respirator) and for activities such as painting, chemical handling, etc.

The atmosphere in certain areas in KOC facility may, at times, present a hazard to the health of personnel, by the accidental/ sudden release of toxic or unpleasant gas, fumes, smoke, dust etc. Where such an atmosphere occurs, if possible, the source of hazardous or toxic substance should be removed/ isolated or rendered inert and the area subjected to forced / exhaust ventilation as per risk assessment / KOC HSSE MS Procedure.

The atmosphere in the area must then be tested before personnel are allowed to enter to ensure that the air is free from hazardous or toxic substances and that the atmosphere is safe for breathing. Where this is not possible or air quality cannot be guaranteed (e.g. in an emergency situation) or where accidental/ sudden release of toxic gas or fumes may occur instantaneously and without warning; an approved, tested self-contained breathing apparatus (SCBA) must be worn and Escape–only Respirator used for evacuation. Confined Space Work Permit System shall be followed wherever applicable. Entry into such dangerous areas shall be restricted to rescue operations by competent personnel, or such action to avert any further mishap.

5.2 Provision:

5.2.1 Selection (Quantity & Type)

Selection of RPE shall be carried out for all facilities based on hazard assessment (Refer 5.3 and 5.4 of KOC.SA.010) by Controlling Team along with Asset / Directorate HSE Team to assess the type and number of SCBA and Escape-only Respirator required at each facility/ site/ areas. Such risk assessment shall be carried out for all new facilities during design phase and during major upgradation of the existing facilities. The risk assessment shall consider the requirements of KOC-L-009 – KOC Standard for Fire Protection Systems and Safety Equipment, KOC.GE.036 – Managing Hydrogen Sulphide Hazards and KOC.PS.007 – Guidance on Safe Design of Infrastructures for Sour Service.

If the number and type of SCBA and Escape-only Respirator (15/ 10 minutes) required are not available or need to be replaced as per outcome of the risk assessment; required type and number of such Equipment shall be purchased by Controlling Teams/ Operations or hired from an authorized service provider (Specialist Vendor).

Note:

1. *SCBA for emergency services (Fire Group) shall compulsorily be positive pressure type with minimum 45 minutes duration and confirming to NFPA 1981 or equivalent international standards.*

5.2.2 Specifications

The specifications for purchasing the SCBA, APER, Escape-only Respirator and SAR shall be made by the Controlling Team/ User/ Asset/ Directorate HSE Team for RPE which are not available in the system. Such specifications should be conforming to this Procedure, KOC Standard KOC-L-009 and other international standards referred. International standards NFPA 1981, NIOSH, BIS, EU shall be prescribed along with third party certifications as UL listed/ FM approved as applicable. Comments from Fire (Support Services) Team shall be taken before finalizing the purchase request (only for KOC procurement, not for contractors).

Following shall be a part of specifications and essential requirements:-

- System and part details of the SCBA required
- Working duration/ Capacity/ pressure/ type of material of the breathing air cylinder
- Storage/ carrying case
- Positive pressure feature
- Integrated PASS for SCBA
- Size of the face masks required (Small/ Regular/ Large)
- complete part list with details to ensure right equipment selection
- User Manuals and Service Manuals,
- Approval certificates, cylinder approval certificates
- List of authorized service centers, (including local)
- Warranty statement,
- Site Acceptance Test, Factory Acceptance Test (as applicable)
- List of any special equipment, spare cylinders, maintenance tools, refilling tools, adaptors etc.
- Compatibility of using with prescribed glasses, supplied air, second line attachment, if required
- User & maintenance training,
- Preventive maintenance checks refill and repair details.

Note: *Sample specifications for Escape-only Respirator, Air Purifying Escape Respirator (APER) (Appendix-1) and SCBA (Appendix-2) are enclosed at the end of the procedure.*

5.2.3 Procurement

The following points shall be given due weightage during procurement of the product (SCBA, Escape-only Respirator, SAR) for use in the company:

- Compliance to KOC specifications, HSSE MS Procedure and other requirements.
- Interface with other existing SCBA sets or Escape-only Respirator (as the case may be) and PPEs being used.
- Positive Pressure Type option.
- Similar or existing make of SCBA sets, Escape-only Respirator for ease of inventory control and maintenance.
- Size, weight, rated service time, ease of donning and doffing, comfort.
- Fit range and available number of face piece sizes, nose cup.

- Ease of operation, maintenance, refilling. Face piece vision area, end of service time indicator, communication capability, supplied air compatibility.
- Integrated PASS feature, emergency egress escape system.
- Cylinder type, rapid cylinder filling option, spares cylinders.
- Field Performance test (as listed in table 7.5.2 of NFPA 1981) before acceptance.
- Cross contamination between users and ease of cleaning and decontamination.
- Certificates of approval from the approved test laboratory.
- Due weight-age for local after sales and maintenance support.
- APF (Assigned Protection Factor)

Comments shall be taken on the final evaluation/ recommendation from Maintenance Contract Preparation & Execution Team {Fire (Support Services) Team} before processing the purchase order.

5.3 RPE Coordinator

RPE Coordinator shall be nominated (at least at Supervisor/ Engineer level) from each facility/ Project site by respective Team Leader as a focal point for proper use, care, upkeep, maintenance and training of SCBA, Escape-only Respirator and SAR. However, Supervisor or person in charge on duty shall be responsible for the upkeep, care and use of SCBA, Escape-only Respirator and SAR during their respective shift/ working hours. RPE Coordinator shall ensure that periodic inspection & maintenance of SCBA and Escape-only Respirator is carried out by the concerned personnel/ agency and records maintained in coordination with Fire (Support Services).

A list of such types, numbers with location of SCBA, Escape-only Respirator and SAR available at facility/ site shall be displayed at a prominent place (e.g. Control Room). Also, name of the RPE coordinator shall be displayed at a prominent location.

5.4 Use, Care, Maintenance, Inspection & Storage:

5.4.1 Use, Care and Maintenance

RPE Coordinator in liaison with Fire Support Services team shall ensure that RPE are used and maintained as per manufacturer's instructions and this procedural requirements. Consultation may be taken from Users/ Asset/ Directorate HSE Team & Fire (Support Services) Team, if required.

5.4.2 Defective RPE

Where SCBA, Escape-only Respirator and SAR is suspected to being defective it should be tagged "Out of Service" and segregated from other equipment by the Controlling Team and inform Maintenance Contract Preparation & Execution Team (Fire Support Services Team). Tag shall include date of incident and suspected defect.

5.4.3 Storage

SCBA, Escape-only Respirator and SAR shall be stored in their original carrying case or storage cases or on wall or apparatus bracket designed for quick, easy removal and protection of the equipment. Brackets for securing SCBA in vehicles shall meet the requirement of 14.1.10 of NFPA 1901, Standard for Automotive Fire Apparatus.

SCBA, Escape-only Respirator and SAR, spare cylinders, spares face piece, other spares shall be stored in controlled environment, free from dust, high temperature, high humidity, corrosive gases etc. to ensure proper working during emergency.

SCBA, Escape-only Respirator and SAR shall be stored with cylinder valves closed. Other valves shall remain as per manufacturer's recommendations.

Face piece shall be carefully stored to avoid distortion of parts. All harness straps shall be adjusted to the maximum length during storage.

SCBA, Escape-only Respirator and SAR shall be stored to control and minimize exposure to shock, vibration, sunlight, heat, extreme cold, excessive moisture, chemicals, environmental elements. All breathing air cylinders shall be stored fully charged. Cylinder shall be sent for refilling when pressure drops to 90% of the specified pressure.

Filter cartridges should be left sealed in the original packaging until just prior to use. APER cartridges once used, must not be kept for reuse. All cartridges must be stored in a cool and dry location and as per the manufacturer's recommendations.

5.4.4 Training

Training shall be provided to all RPE Authorized Users on potential respiratory hazards at workplaces, available Escape-only, SCBA and airline respirators covering proper use, care, maintenance, inspection & storage, proper fit, selection, limitations such as impact on communication. The training must be comprehensive, understandable, and recur at least annually and more often if necessary. Medical evaluation for use of SCBA and fit test shall be carried out in accordance with clause 5.6 & 5.7 of this Procedure.

Personnel who are designated to perform monthly inspections of respirators maintained for use during emergencies (and who have not received previous training related to respirator inspections) should receive training in the requirements of this procedure. Employee training required to by this procedure shall be documented for each employee. Copies of training / awareness records shall be maintained by KOC Human Resources and / or Asset/Directorate HSE Teams, as needed.

All visitors shall be briefed about the usage of Escape-only / SCBA Respirator during site orientation. 'Authorized User Card' shall be issued after adequate training, fit test and medical examination. The controlling team shall issue the card after verifying that these requirements are fulfilled. Validity of this card shall not exceed 12 months. While entering the validity date in the card, controlling team must ensure that it is well within the validity date of medical examination. Only authorized RPE users are permitted to use RPE. RPE wearer shall undergo refresher training annually. Contractor shall ensure RPE authorized users possess training and certification from an approved third party training agency.

5.4.5 General Inspection Requirements for Respiratory Protective Equipment

The following sections outline general inspection requirements for the various types of respirators used at KOC facilities. In addition to the requirements in this procedure, the respirator manufacturer's recommended instructions shall be reviewed to determine if additional inspection requirements apply to this procedure. In the event of a conflict between this procedure and the respirator manufacturer's recommended procedures, the more stringent requirement shall be implemented.

Inspection frequencies for each of these respirator categories include the following:

Respirator Category	Inspection Frequency	Responsible Person
1. Respirators for regular or routine use (e.g., Welding fumes respirator, dust mask (particulate respirator) and chemical respirators)	Before each use and during cleaning (i.e., after each use)	End user
2. Respirators maintained for use in emergency situations	At least monthly (in accordance with the manufacturer's recommendations) and checked	Fire (Support Services) Team

	for proper function before and after each use	
3. Emergency escape-only respirators (e.g., Self-Contained Breathing Apparatus (SCBA) and Air Purifying Escape Respirator (APER).	Before being carried into the workplace for use	End user

Each inspection of respiratory protective–equipment excluding APERs (see section 5.2.5.a), should include the following:

- A check of respirator function;
- Tightness of connections;
- Condition of the respirator inlet covering;
- Condition of the face piece lens, if applicable;
- Condition of the head straps;
- Condition of the valves and valve covers;
- Condition of the connecting tube, if applicable;
- Condition of o-rings and/or gaskets at cartridge/filter or canister connections;
- Condition of the cartridges, canisters or filters;
- Condition of the elastomeric parts for pliability and signs of deterioration
- Cartridge change schedule / shelf life;
- Compressed breathing air meet Grade D breathing air criteria as per ANSI/CGA G-7.1 or EN 12021. The testing of breathing air can be performed using an appropriate direct read out instruments or breathing air can be sampled and tested in the analytical laboratories that are certified by Compressed Air Proficiency Testing (CAPT) Program of American Industrial Hygiene Association (AIHA).
- A check of elastomeric parts for pliability and signs of deterioration.
- Adequate air pressure and / or airflow should be maintained as per manufacturer's recommendation. Air and Oxygen (O2) cylinders shall be maintained in a fully charged condition and shall be recharged when pressure falls to 90% of the manufacturer's recommendation.

Respirators that do not pass an inspection shall be immediately removed from the service and repaired or replaced, as applicable. The respirator that do not pass an inspection shall be immediately tagged as "OUT OF SERVICE".

Respirators that are provided "for escape only" must be certified for escape from the atmosphere in which they are to be used. They must not be used for re-entry or work. Users must be trained in the use and limitations of escape only respirators.

Respirators must be cleaned, disinfected, inspected, repaired, maintained and stored using the procedures recommended by the respirator manufacturer or equivalent. Develop schedules for cartridge replacement, cleaning, disinfecting, storing, inspecting, repairing, discarding, otherwise, maintaining respirators and a procedure for regularly evaluating the effectiveness of the programme.

A. Air-Purifying Escape Respirator (APER) Inspection Procedures

Air-purifying escape respirators come sealed in an aluminum pouch, contained in a nylon fabric carry bag, and are intended for single use only. To inspect, ensure that:

- The foil containment seal has not been broken.
- The carrier bag is in good condition.

If the foil seal has been broken, the APER must be taken out of service and disposed off. The shelf life serviceability limitations of APER shall be followed.

B. Air-purifying respirators (APR) Inspection Procedures

Generally, while inspecting condition of the filter, following need to be considered:

- The filters must be replaced whenever they are damaged, soiled, or cause noticeably increased breathing resistance
- The filter once opened from the seal must be replaced after 6 month regardless of its use
- Before each use, the outside of the filter material must be inspected. If the filter material is physically damaged or soiled, the filter must be replaced or in case of a filtering face piece respirator, the respirator must be discarded.
- Filtering face piece respirators can be reused by the same worker, if it is found to be suitable, shape remains unchanged, and the filter material is not physically damaged or soiled

C. Atmosphere Supplying Respirators (ASR) Inspection Procedures

The following ASR inspection procedures shall be performed:

- Check SCBA backpack and harness assembly for defective straps/buckles or other damage.
- Verify that SCBA breathing air cylinder is current on periodic hydrostatic test (i.e., 5 years for steel cylinders or 3 years for composite cylinders).
- Check SCBA breathing air cylinder and/or airline hoses for signs of damage, deterioration or missing components.
- Check tightness of all connections to breathing air cylinders.
- Check high pressure and low pressure hoses for signs of deterioration, abrasion, loose fittings or other damage.
- Slowly open valve of SCBA breathing air cylinder and verify proper operation of the face piece regulator.
- Verify that the pressure reading on the remote pressure gauge corresponds to the pressure reading on the breathing air cylinder gauge.
- Verify proper operation of the emergency bypass valve.
- Close SCBA cylinder valve slowly and verify proper activation and operation of the low pressure alarm (to sound at approximately 25% of cylinder capacity).
- Breathing air cylinders shall be inspected at least monthly to ensure that breathing air cylinders are maintained in a fully charged state and that the regulator and warning devices function properly. Cylinders shall be recharged when the pressure falls to 90% of the respirator manufacturer's recommended pressure level as indicated on the cylinder pressure gauge. Develop procedures for adequate air quality, quantity and flow of breathing air for supplied-air respirators.
- Maintain Air, oxygen cylinders in a fully charged state according to the manufacturer's instruction
- Check airline hoses for signs of deterioration, abrasion, loose fittings, or other signs of damage.

- Check hood of escape-only respirator for signs of deterioration and damage.
- Inspection procedure include check of the regulator and warning devices to ensure their proper function.
- If compressors are used for airline respirators, monitoring equipment, alarms and filters that are installed on the equipment to ensure Grade D breathing air is delivered to the respirator user must be inspected and checked for proper function prior to each shift.

5.5 Technical Maintenance and Repairs

The following aspects shall be taken due care while carrying out technical maintenance:-

- All SCBA, Escape-only Respirator and SAR shall be subjected to tests / inspection on receipt and on a regular frequency thereafter as per manufacturer's recommendations.
- Repairs to respirators must be performed only by those certified (by manufacturer) to do so and they must only use the respirator manufacturer's approved parts designed for the respirator. Repairs must be made according to the manufacturer's recommendations and specifications.
- The Technician shall be qualified and authorized for repairs or rebuilt required.
- Parts and tools not specified by the manufacturer shall not be used.
- All components used are clean and free from contamination. No component shall be damaged during repairs or maintenance.
- Breathing air cylinder shall be inspected, and maintained as per manufacturer/ DOT or local regulations whichever is most stringent.
- All SCBA, Escape-only Respirator and SAR shall be subjected periodical tests as per manufacturer's recommendations.
- Cylinder shall be used/ discharged to refill at least annually.
- Necessary repairs and maintenance shall be carried out by an authorized person/ agency duly certified by manufacturer.

5.6 Medical Evaluation:

SCBA, and SAR users shall be medically evaluated against identified parameters consisting of written, oral questionnaire, medical examination/ history and lab tests to ascertain their medical fitness for use of the type of respirators without any ill effects. The medical evaluation parameters shall be developed by qualified physician for this purpose as per international practices (Refer OSHA Appendix C to Sec. 1910.134: OSHA Respirator Medical Evaluation Questionnaire for further guidance). Controlling Teams/ Operations Team Leaders shall be responsible for ensuring that all employees under jurisdiction have undergone the required medical evaluation and other related tests at defined interval prior to issuing of Authorized User Card.

Note: Authorized user card shall be issued after medical evaluation, fit test and training.

5.7 Respirator Fit Testing:

A "fit test" tests the seal between the respirator's face piece and your face. It takes about fifteen to twenty minutes to complete and is performed at least annually. After passing a fit test with a respirator, the authorized user ~~you~~ must use the exact same make, model, style, and size respirator on the job. This information (make, model, style and size of respirator) shall be highlighted in the Authorization Card for RPE user.

Not everyone can get a good fit with one specific respirator. If the respirator fails the fit test, then another make, model, style, or size must be tried until one is found that fits you properly.

Respirator Fit Testing shall be performed as per the OSHA's accepted protocol. Refer to *Appendix-9: Respirator Fit Testing Procedure* for additional details.

5.8 Supplied Air Respirator (SAR)

Airline set (SCBA type) has its own independent air supply from a bank of compressed SCBA cylinders located outside the area to be entered. When this type of Respirator is being used, the short duration fully operational backup cylinder shall be connected for each user to enable emergency evacuation. Such SAR shall be in compliance to international standards as NFPA 1981 or equivalent.

5.9 Re-Charging of Breathing Air cylinders

The following aspects shall be taken due care while refilling BA Cylinders:-

- Prior to refilling breathing air cylinders, inspection shall be performed as per manufacturers' recommendations and/or NFPA 1981.
- SCBA, Escape-only Respirator and SAR manufacturer specified pressure shall not be exceeded.
- Breathing air cylinder shall be refilled as soon as possible.
- Cylinder filling facility shall have arrangement of protection of personnel (such as fragmentation shield to contain the cylinder in the event of failure) due to catastrophic failure of cylinder during refilling.
- SCBA cylinder shall be re-qualified as per manufacturer/ DOT or local regulations whichever is most stringent.
- Re-charging of breathing air cylinders should only be undertaken by authorized competent persons using a breathing air compressor.
- Whilst re-charging breathing air cylinders, breathing air compressor should be located in an area free from contaminants, e.g. hydrocarbon vapors, exhaust gases etc.
- The compressor should be operated, maintained and the filter elements replaced in accordance with manufacturer's instructions.
- Periodic checks should be made of the output air quality of the compressor. The frequency of these checks depends on the amount of use of the compressor but it should at least once in every 3 months and after each filter change.

The breathing air shall confirm to the following requisites as per NFPA 1989 "Standard on Breathing Air Quality for Emergency Services Respiratory Protection":

Component	Permissible Values
Carbon monoxide, ppm	Up to 5
Carbon Di-oxide, ppm	Up to 1000
Odor	No Pronounced Odor
Oil (condensed) (mg/m3 at 22°C (72°F) and 760 mm (30 in.) of Hg)	Up to 2
% Oxygen, balance predominantly N2	19.5 - 23.5
% Nitrogen, Balance predominantly Oxygen	75 - 81

Total volatile hydrocarbons, ppm (as methane equivalent)	Up to 25
Water, ppm v/v	Up to 24
Water, dew point °F at 1 atmosphere	- 65

Note: SCBA sets, spare rubber/ neoprene components should not be stored in the same enclosure that of an air compressor due to the potential presence of airborne contaminants, (e.g. oil mist, exhaust gases, ozone) which may cause materials to deteriorate.

6.0 Key Documents/ Tools/ References

- KOC Life Saving Rules
- KOC.SA.004 - Permit to Work Procedure
- KOC.SA.007 – Entry into Confined Spaces
- KOC-L-009 - KOC Standard for Fire Protection Systems and Safety Equipment
- KOC.GE.005 – KOC HSE Compliance Register
- KOC.HE.007 – Occupational Health and Medical Surveillance Procedure
- KOC.HE.018 – Occupational Health Risk Assessment Procedure
- KOC.HE.022 – KOC Guidelines for Employee Health Surveillance
- KOC.GE.026 – KOC Corporate Emergency Response Plan
- KOC.GE.036 – Managing Hydrogen Sulfide Hazards
- KOC.PS.007 - Guidance on the Safe Design of Infrastructures for Sour Service
- KOC. PS.015 - Rule Sets for Quantitative Risk Assessment
- KOC. PS.010 - Strategy and Rule Sets for Identification and Management of H_2S Simultaneous Operations (SIMOPs)
- KOC. PS.011- Guidelines for Development of Emergency Planning Zones (EPZs) for H_2S Operations
- ANSI/ Compressed Gas Association Commodity Specification for Air,G-7.1-1989
- NFPA 1852 – ‘Standard on Selection, Care & Maintenance of Open Circuit Self-Contained Breathing Apparatus’
- NFPA 1981 Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services
- NFPA 1982 ‘Standard on Personal Alert Safety Systems (PASS)’
- NFPA 1989 – ‘Standards for Breathing Air Quality for Fire & Emergency Services Respiratory Protection.’
- NIOSH Respirator Selection Logic, Article IV – Escape Respirators
- http://www.cdc.gov/niosh/docs/2005-100/pdfs/2005-100.pdf
- OSHA 29CFR1910.134 (Respiratory Protection)

Appendix

- Appendix 1 – Sample Specifications for Escape-only Respirator and Air purifying escape respirator

- Appendix 2 – Sample Specifications for Self-Contained Breathing Apparatus Set (SCBA)
- Appendix 3 – Self-Contained Breathing Apparatus (SCBA) & Escape-only Respirator Authorized User Card
- Appendix 4 – Self-Contained Breathing Apparatus (SCBA) for Drilling Operation
- Appendix 5 – SCBA (Self Contained Breathing Apparatus) Monthly Inspection Checklist
- Appendix 6 – Respiratory Equipment Inspection (Except SCBA) Checklist
- Appendix 7 – Respirator Fit Testing Guideline

7.0 Abbreviations:

- APER – Air Purifying Escape Respirator
- APR – Air-Purifying Respirator
- ASR – Atmosphere-Supplying Respirator
- RPE – Respiratory Protective Equipment
- SAR – Supplied-Air Respirator
- CFR – Code Federal Regulations
- DOT – Department of Transport, US
- FM – Factory Mutual
- HSE – Health, Safety & Environment
- HSSE – Health, Safety, Security and Environment
- HSSE MS – Health, Safety, Security & Environment Management System
- KOC – Kuwait Oil Company
- KPC – Kuwait Petroleum Corporation
- NFPA – National Fire Protection Association
- NIOSH – National Institute of Occupational Safety and Health
- OEM – Original Equipment Manufacturer
- OSHA – Occupational Safety and Health Administration
- PASS – Personal Alert Safety System
- SCBA – Self Contained Breathing Apparatus
- SCOW – Scope of Works
- UL – Underwriters Laboratory
- QNFT – Quantitative Respirator Fit Testing
- PMS - Preventive Medicine Services

8.0 HSE Records (Retention Period)

- Daily SCBA and Escape-only Respirator inspection shall be recorded in shift logs. Such records shall be maintained for a minimum of one year.
- All the inspection, test and maintenance records shall be maintained centrally with the Maintenance Contract Executing Team [Fire (Support Services) Team] with a

copy of the records at respective sites/ facilities. The records retention period shall be as prescribed under TS/QSP 6.3.1-01 – Fire Services.

- The records of Audit/ inspection shall be maintained by the respective teams as per KOC.GE.016 - HSE Audit, Inspection and Self-Assessment Procedure.
- Inspection Record (5 yrs.)
- Training Records (5 yrs.)

Review and Revision Log:

Review/ Revision Date	Revision Details
5th March 2004	Initial draft prepared and circulated for review
8th May 2004	Approved and issued for Implementation
25th June 2006	Comments added after review and revised
7th May 2012	Title changed from BA to SCBA; Document Author changed to M (S&F) as per the current Organization; KOC.HE.015 and KPC HSE standards inputs taken in revision, air quality reference made to NFPA 1989; Key responsibilities added as required; sample specifications added as Appendices; Requirements for Drilling Operations added in Appendix-4.
18th October 2015	Author changed to TL Fire (Support Services), Changes are per KOC.GE.036 Managing H2S Hazard Procedure/SHELL/ HSE (Gas) inputs incorporated.
27th July 2016	The document was formatted as per the latest “Document Control Procedure”, Title of the procedure changed from “SCBA Procedure” to “RPE Procedure” after including ‘Air Purifying Escape Respirator (APER)’ in the scope of the procedure, Author of the procedure changed from TL Fire to TL Safety, Key Responsibilities for ‘RPE Coordinator’ and ‘SCBA Controller’ included under clause 4.0, Requirements for ‘Training’ included under a new clause 5.4.4, Reference to OSHA included under clause 5.6 for Medical evaluation, Clause 5.9 (Audit & Inspections) and Clause 5.10 (Emergency drills) deleted as they are covered under responsibilities, Clauses 1.0, 2.0, 4.0, 5.1, 5.2, 5.3, 5.4, 5.5 and 5.7 amended to reflect the change in the scope of the procedure, Specification for APER included under ‘Annexure – 1’, Criteria for issuing ‘Authorization card for RPE user’ included in ‘Annexure – 3’, ‘Examples for face piece to accommodate facial hair’ included as new Annexure – 4.
19th January 2020	Respiratory Protective Equipment (RPE) procedure (KOC.SA.005) was updated by amalgamating with the existing Respiratory Protective Equipment (RPE) Inspection procedure (KOC.HE.015) in line with the IC directives to streamline the HSSE procedures; The document was formatted as per KOC.GE.013 - HSSE Document Control Procedure; The scope of this procedure has been revised to include the inspection requirements of all types of RPE and key elements of quantitative respirator fit testing; Definitions related to ‘Respirator fit testing’ included under Clause 2.0; Key responsibilities for H&E Team, Preventive Medical Services and Occupational Health and Training & Career Development Group included under Clause 4.0; General Inspection Requirements for RPE included under Sub-clause 5.4.5;

	Requirements for "Respirator Fit Testing" included under Sub-clause 5.7; Inspection checklists for SCBA and RPE (except SCBA) included under Appendix 6 and Appendix 7 respectively; "Sample specification for Quantitative Respirator Fit Testing Equipment" included under Appendix 8; Records for Inspection, Training and Employees' fit test included under Clause 8.0; Validity of "Authorization card for RPE user" reduced from 18 months to 12 months.
29th October 2023	Sections 1.1 & 1.2 Purpose / Scope: Contents related to 'Purpose' transferred from 'Scope' to 'Purpose' and Air purifying respirator included under 'Scope'; Section 2 Definitions: Explanatory notes included for definitions – Assigned protection factor, Fit factor, Respiratory fit test, and Quantitative fit test for better understanding / New definition included for "Respirator medical evaluation"; Section 4 Key Responsibilities: Amended roles & responsibilities for OH&S Team / Removed "Health & Environment" Team roles and responsibilities; Section 4.6 – Provision for accommodating workers with facial hair removed as per KPC's 2nd Party Audit recommendation; Section 4.9 – Training requirement included for contractor RPE users; 4.10 – "RPE face fit testing" responsibility removed from the (Preventive Medicine Services) PMS Team; Section 5.2.1: Notes referencing 'Quarter mask' and 'external document' are removed; Section 5.6.1: OSHA requirements for 'Assigned protection factor' removed and included under 'Appendix'; Section 5.7: Requirements for 'face fit testing' removed and included under new Appendix – 7; Existing Appendix – 8 for "Sample specification for Quantitative Respirator Fit Testing Equipment" deleted as it is not relevant to be kept in this procedure; Appendix-3: Template for 'Authorization card' modified to include 'Make/Model/Style/Size' and 'Air purifying respirator'; similarly amended in Appendix-4; Appendix-4: Frequency for 'Air quality test' changed to three months from one month, to ensure uniformity within the procedure; Appendix-5: "Examples for face piece to accommodate facial hair" deleted, as per KPC 2nd party audit recommendations.
27th November 2024	Few minor changes were done based on the recommendations from KPC 2nd party audit conducted on 24, 25 & 26 Sept. 2024: Section 4.6 RPE User (Key Responsibilities): Bullet # 6 modified for more clarity; "Different types of respirators (SCBA, Escape only respirator and SAR)" replaced with "tight-fitting respirators" – this is to ensure all tight fitting respirators are covered. Appendix 3 - Authorization Card For RPE User: Template for the Authorization card for RPE user modified by introducing a table for better understanding – this is to ensure that details of different types of RPE are included, if more than one type is used. Appendix 4 - Authorization Card For Drilling Contractor RPE user: Template for the Authorization card for RPE user modified by introducing a table for better understanding – this is to ensure that details of different types of RPE are included, if more than one type is used.

APPENDIX – 1

SAMPLE SPECIFICATION FOR ESCAPE-ONLY RESPIRATOR

1. Performance		
Description	**Parameters/ Requirements**	
Total Capacity (Minutes) *(tick applicable)*	10	15
Maximum weight with filled cylinder	7 kg.	
Regulator	2 nos. (First Stage and Pressure - Demand Regulator)	
Operating Temperature	-10 to 55^{o}C	
System of operation	Breathing air conforming to NFPA 1989 compressed under pressure in cylinders.	

2. Specifications	
Description	**Parameters/ Requirements**
Cylinder	
Construction	▪ Carbon composite with 20 years life. ▪ Interchangeable with other equivalent makes of SCBA.
Valve Assembly	▪ Nickel plated brass material. ▪ Right angled Valve. ▪ Inbuilt pressure Gauge. ▪ Flow control Feature. ▪ Flame resistant hand wheel. ▪ Interchangeable with other equivalent makes of SCBA.
Operating Pressure Range	0-200 Bar
Regulators	
Regulator	▪ Nickel plated brass material. ▪ Constant flow regulator with no external adjustment. ▪ Flow rate 40 liters per minute.
Back Plate Carrier & Harness	
Facepiece	▪ Made from EPDM rubber. ▪ Standard universal size and Black Colour. ▪ Fitted with Inhalation check valves, exhalation valve, and speech transmitter. ▪ Field replaceable parts e.g. Nose cups, non-shatter type lenses (visor). ▪ Adjustable Head harness made from nylon or Kevlar.
Carrying Case	▪ *Hard Case for rack storage or wall mounting. and/ or* ▪ *Soft case for carrying on shoulder.*

3. Approvals
▪ NIOSH 42 CFR Part 84, NFPA 1981 or EN 137:2006 or equivalent
▪ EN 12245 or DOT, USA or equivalent for Breathing Air Cylinders
▪ EN 144 for Valves or equivalent
▪ UL Listed/ FM Approved or equivalent

SAMPLE SPECIFICATION FOR AIR PURIFYING ESCAPE RESPIRATOR (APER)

1. Performance		
Description	**Parameters / Requirements**	
Total Filtration Capacity (Minutes)	Minimum 5000 ppm H_2S Preferred 10,000> ppm H_2S	15 min
Maximum weight – ready to use	1.4 lbs (635 grams)	
Filter	Dual HEPA filters	
Operating Temperature	0c to 70^{o}C	
System of operation	Breathing Air Purification through dual filters.	

2. Specifications	
Description	**Parameters / Requirements**
APER	
Shelf Life	▪ 5.5 years from date of manufacture.
Maintenance	▪ Maintenance free for entire shelf life
Speed of Donning	▪ < 30 seconds
Overall Protection Factor	▪ 2000 or greater
Hood	**Parameters / Requirements**
APER shall be full hood type (**no** half or quarter masks)	▪ Hood protects lungs, head eyes, face ▪ Clear hood for full visibility ▪ Dual sealing provisions – silicone neck dam and face cup. ▪ Dual tensioning straps
Packaging	▪ Packaged in puncture and waterproof laminate barrier
User Specifications	**Parameters / Requirements**
APER performance requirements will maintain overall protection factor	▪ For users with beards ▪ For users with long hair ▪ For users with eye glasses ▪ Universal size – one size fits all ▪ Adjustable Head Harness
Carrying Case	▪ APER to include nylon carry pouch

3. Approvals
▪ NIOSH 42 CFR Part 84, or equivalent

APPENDIX – 2

SAMPLE SPECIFICATION FOR SELF-CONTAINED BREATHING APPARATUS SET (SCBA)

1. Performance		
Description	**Parameters/ Requirements**	
Total Capacity *(tick applicable)*	30 Minutes	45 Minutes
Maximum weight	14 kg.	
Regulator	2 nos. (First Stage and Pressure-Demand Regulator)	
Operating Temperature	-10 to 55^{o}C	
System Operation	Breathing air conforming to NFPA 1989 compressed in cylinders.	

2. Specifications	
Description	**Parameters/ Requirements**
Cylinder	
Construction	▪ Carbon composite with 20 years life. ▪ Interchangeable with other equivalent makes of SCBA.
Valve Assembly	▪ Right angled Valve. ▪ Inbuilt pressure Gauge. ▪ Flow control Feature. ▪ Flame resistant hand wheel. ▪ Interchangeable with other equivalent makes of SCBA.
Operating Pressure Range	0-300 Bar
Regulators	
First-Stage Regulator	▪ Made of strong aluminum alloy. ▪ Adjustable outlet pressure not exceeding 10 Bar. ▪ Redundant operation.
Mask Mounted Regulator	▪ Pressure-Demand regulator with positive pressure option. ▪ Neoprene or silicone hose with quick connection. ▪ Wide/ full field of vision visor. ▪ Disengagement of second stage regulator stops the air supply. ▪ Quick release for second stage regulator from face piece.
Low pressure warning Whistle/ Device	▪ Air actuated, self-cocking, continuous ringing bell when pressure drops app. 25% (50-60 Bar) of the rated service. ▪ Audio more than 90 dBA.
Back Plate Carrier & Harness	
Harness	▪ Nomex/ Kevlar/ Nylon Straps. *(tick applicable)* ▪ Double pull adjustable waist belt with nylon/ steel buckles. Lumber Pad at lower back support. ▪ Three stage adjustable height.

Backplate	▪ Glass reinforced composite material or aluminum alloy. ▪ Large side handles for pulling and dragging. ▪ Carabiner attachment of 1000 lb. load capacity. ▪ Cylinder band: Kevlar/ nylon with adjustable nylon buckle or Stainless steel with quick opening device. ▪ Integrated First stage regulator and breathing hoses.
Facepiece	▪ Standard universal size and Black Colour. ▪ Inhalation check valves, exhalation valve, speech transmitter. ▪ Field replaceable parts e.g. Nose cups, non-shatter type visor. ▪ Adjustable Head harness made from nylon or Kevlar.
PASS or DSU	Fitted with integral PASS (Personal Alert Safety System) or DSU (Distress Signal unit). Intrinsically safe battery housing etc.
Carrying Case	▪ Hard Case for rack storage or wall mounting. and/ or ▪ Soft case for carrying on shoulder.

3. Approvals
▪ NIOSH 42 CFR Part 84, NFPA 1981 or EN 137:2006 or equivalent
▪ EN 12245 or DOT, USA or equivalent for Breathing Air Cylinders, EN 144 for Valves or equivalent
▪ UL Listed/ FM Approved or equivalent

APPENDIX – 3

AUTHORIZATION CARD FOR RPE USER

Ref. No: **Date:**

Kuwait Oil Company (K.S.C.)

Authorization Card for RPE User

Name:

Designation: **KOC/ Id. No:**

Company/ Contractor: **Card Valid until**: *(Maximum 1 Year)*

√ *	Type	Manufacturer	Model / Style	Size
	Self-Contained Breathing Apparatus:			
	Escape-only Respirator:			
	Air Line Set/ (SAR)			
	Air Purifying Respirator:			

* Tick the types for which the user is authorized

Authorized by:

Signature:

Name:

Team Leader – (Team Name)

- Authorized user card shall be issued after medical evaluation, fit test and training
- The controlling team shall issue the card after verifying that these requirements are fulfilled.
- Validity of this card shall not exceed 12 months. While entering the validity date in the card, controlling team must ensure that it is well within the validity date of medical examination

APPENDIX – 4

SELF CONTAINED BREATHING APPARATUS (SCBA) FOR DRILLING OPERATION

1.0 Purpose

This appendix provides guidance for safe and effective management of Self-Contained Breathing Apparatus (SCBA) in KOC drilling operation facilities which include Escape-only Respirator. SCBA at drilling operation facilities are owned, used and maintained by the respective drilling contractors shall be complied with this Procedure as defined in this appendix as minimum and/ or approved from respective Controlling and HSE (D&T) Teams.

2.0 General

Positive pressure respirator connected to Self-Contained breathing air cylinder or approved continuous breathing air supply system is fit for entry/ continuous work in confined/ contaminated environments. However, such use shall be limited to emergency situations and shall not be substitute to safe working environment.

Following types breathing air supplied self-contained breathing (SCBA) apparatus shall be used at KOC drilling operation facility with sufficient numbers;

CLASS	TYPE	USED FOR
Air Supplied	Escape unit *(10 or 15 minutes capacity)*	Emergency Escape only
	Self-Contained Breathing apparatus *(Minimum 30 minutes capacity)*	Emergency response. Not intended for long and continuous use
	Airline respirator (Cascade System) along with SCBA cylinder for emergency evacuation	Long continuous periods

SCBAs used at drilling operation facilities shall be in compliance with NFPA 1981. Risk Assessment shall be carried out to type and number of respiratory protection equipment including Escape-only, SCBA and airline respirators, breathing air compressor required for the facility including the safe location of breathing air compressor in the facility.

3.0 Breathing Air Compressor

All KOC Drilling Operation facilities shall be equipped with breathing air compressor system used to supply breathable air (for refilling of Escape-only, SCBA, Cascade cylinders and/or supply to piped BA network), equipped with;

- A filter to remove oil mist
- Sorbent pads/ charcoal to remove oil vapor

Sorbent beds and filters shall be replaced periodically following the manufacturer's instructions.

The compressor air intake is located away from air contaminants such as engine exhaust, ventilation exhaust, process vents, welding fumes, or paint spray etc.

4.0 Air Quality Test

Compressed breathing air supplied to Escape-only, self-contained breathing apparatus (SCBA) or airline respirators shall meet at least the requirements of NFPA 1989 (2008)) "Standard on Breathing Air Quality for Emergency Services Respiratory Protection" as prescribed in section 5.8 of this Procedure. Breathing air quality at the discharge of the compressor shall be checked at least once in three months/ whenever the compressor is taken for maintenance/ as per the drilling contractor relevant HSSE MS procedure

whichever is more stringent. Appropriate records confirming air purity shall be maintained at the drilling site.

5.0 Training

Training shall be provided to all SCBA Authorized Users on potential respiratory hazards at workplaces, available Escape-only, SCBA and airline respirators covering proper use, care, maintenance & storage, proper fit, selection, limitations such as impact on communication. The training must be comprehensive, understandable, and recur at least annually and more often if necessary. Medical evaluation for use of SCBA and fit test shall be carried out in accordance with clause 5.6 & 5.8 of this Procedure/ as per contractor relevant HSSE MS procedure whichever is more stringent.

All visitors shall be briefed about the usage of Escape-only/ SCBA Respirator by the drilling contractor representative during site orientation. 'Authorized User Card' shall be issued after adequate training to the contractor personnel by Tool pusher/ HSE Manager as approved by KOC Controlling Team (Sample card format is attached with this appendix). Validity of this card shall not exceed 12 months/ as per respective contractor HSSE MS whichever is more stringent.

6.0 Use and Maintenance

- SCBA shall be stored away from direct heat and sunlight in such a way that it shall be accessed easily in case of emergency.
- Respective drilling contractors are responsible for periodic maintenance of Escape-only, SCBA, airline system and associated equipment's as per OEM requirements.
- Maintenance on respiratory protection equipment including breathing air compressor and refilling the cylinders for air-supplied respirators shall be performed only by OEM/ OEM authorized qualified personnel.
- BA cylinder shall be refilled and respirator face piece shall be cleaned and disinfected after each use.
- All Escape-only, SCBA respirators shall be inspected before and after each use or at least on monthly basis as per clause 5.5 of this Procedure as applicable. Respective drilling contractor HSSE MS procedure/ OEM instructions shall be followed while carrying out maintenance. All defective sets shall be removed from service. A record of these inspections shall be maintained.
- SCBA and airline systems BA cylinders shall contain tag/ label with hydro test date/ monthly inspection as a minimum.
- All Escape-only, SCBA cylinders shall be hydro tested as per OEM/ relevant contractor HSSE MS procedure/ local regulations, whichever are most stringent, and appropriate records to be maintained.
- Pressure gauges on Escape-only/ SCBA sets/ cascade cylinder bank/ manifolds (shale shaker, mud pits, rig floor & monkey board etc.) shall be calibrated appropriately and fittings to be maintained clean. 80-100 psi pressure shall be maintained at air supplying manifolds of piped BA network for effective supply of air.
- Manifolds, connections, plugin points and fittings on piped BA network system shall be inspected monthly and properly maintained.
- Cylinder shall be recharged/ discharged at least on annual basis.

AUTHORIZATION CARD FOR DRILLING CONTRACTOR RPE USER

Name of the Drilling Contractor with LOGO

Authorization Card for RPE User

Name: **Ref. No.:**

Designation: **Id. No:**

Unit/Facility: **Card Valid until**: *(Maximum 1 Year)*

√ *	Type	Manufacturer	Model	Size
	Self-Contained Breathing Apparatus:			
	Escape-only Respirator:			
	Air Line Set/ (SAR)			
	Air Purifying Respirator:			

* Tick the types for which the user is authorized

Authorized by:

Signature:

Name:

Designation:

APPENDIX – 5

SELF CONTAINED BREATHING APPARATUS (SCBA) MONTHLY INSPECTION CHECKLIST

Indicate acceptable condition with a check mark or "OK". Unacceptable conditions should be marked "NOT OK" and the unit removed from service for repair			
Unit #			
Air Cylinder			
	Inspection for damage		Full Pressure(>90% rated capacity)
	Hydro current		Thread damage
Back frame and Harness Assembly			
	Clean / dry		Cylinder restraint functions
	Inspect assembly for damage		Inspect high pressure hose for damage
	Straps loosened		Buckles function properly
Facepiece			
	Clean / dry		Loosen straps
	Check lens for racks / damage		Check seal area for damage
	Check harness for damage		Check storage bag for damage
Mask Mounted Regulator			
	Inspect for damage		Ensure low pressure hose swivels
	Check gasket for damage		Ensure regulate lock functions

Function Check
Slowly turn on air cylinder to pressure up system
Ensure the low level alarm activates briefly while the pack pressures up
Check remote gauge for accuracy (close to the bottle pressure)
Press on the center of the mask mounted regulator to activate air flow
Press doffing switch to stop air flow
Turn bypass valve on and off to ensure function
Close the air cylinder valve
Open the bypass valve and slowly bleed off the air pressure
Watch the remote gauge while pressure bleeds off. Ensure low level alarm activates at approximately 25% of the rated cylinder capacity
Close bypass valve after air pressure is bled off of pack
Comments

Signature of the person inspected: _____	**Date: _____**

APPENDIX – 6

RESPIRATORY EQUIPMENT INSPECTION (Except SCBA) CHECKLIST

Indicate acceptable conditions with a check mark or "OK". Unacceptable conditions should be marked "NOT OK" and implement action required						
Description	**Yes**	**No**	**Action required**	**Date**	**Name of the person inspected**	**Remarks**
DISPOSABLE RESPIRATORS						
Holes in filter			If yes, then obtain new respirator			
Deterioration or loss of elasticity in straps			If yes, then obtain new respirator			
Deterioration of metal nose clip			If yes, then obtain new respirator			
AIR-PURIFYING RESPIRATORS (half mask, full face piece, hood or helmet)						
Rubber Face Piece						
Excessive dirt			If yes, then clean all dirt from face piece			
Cracks, tears, or holes			If yes, then obtain new respirator			
Full face respirators cracked, scratched, or loose fitting lenses			If yes, then obtain new respirator			
Head Straps						
Breaks or tears			If yes, then replace head straps			
Loss of elasticity			If yes, then replace head straps			
Broken or malfunctioning buckles			If yes, then obtain new straps & buckles or respirator			
Inhalation Valve and Exhalation Valve						
Detergent residue, dust particles, or dirt on valve or valve seat			If yes, then clean with water or a weak solution of Clorox and water -- one cup of bleach per gallon of water			
Cracks, tears, or lack of flexibility in the valve material			If yes, then obtain new valve			
Cracks and flexibility of valve seats			If yes, then obtain new respirator			
Filter Element						
Proper filter for the hazard			If no, then retrieve the appropriate filter			
Worn threads; both in filter and face piece			If yes, then replace filter or face, as applicable			
Cracks or dents in filter housing			If yes, then replace filter			
Cartridge gaskets in place			If applicable			

APPENDIX – 7

RESIRATOR FIT TESTING GUIDELINE

As per the OSHA accepted protocol, there are two types of fit tests: qualitative fit test (QLFT) and quantitative fit test (QNFT). However, only quantitative fit test is acceptable in KOC.

Quantitative fit testing (QNFT) uses a machine to measure the actual amount of leakage into the face piece and does not rely upon your sense of taste, smell, or irritation in order to detect leakage. The respirators used during this type of fit testing will have a probe attached to the face piece that will be connected to the machine by a hose. There are three quantitative fit test methods accepted by OSHA:

- Generated aerosol;
- Ambient aerosol; and
- Controlled Negative Pressure.

Quantitative fit testing can be used for any type of tight-fitting respirator.

OSHA 29CFR1910.134 requires the fit factor to be at least 100 for tight fitting HALF face, and equal to or greater than 500 for tight fitting FULL face

1. Prerequisites:

a) Calibration of equipment**:** Fit test equipment used as per this procedure shall be calibrated on an annual basis by the manufacturer of equipment, or by an equivalent, independent calibration service provider.
b) Persons being fit tested: Only persons who have documented records of compliance with the Respiratory Protection Program requirements of KOC are allowed to be fit tested. It is the role of the fit tester to verify compliance with the Respiratory Protection Equipment Procedure requirements prior to commencing the fit test. Persons being fit tested shall be medically cleared to wear RPE prior to fit testing.

2. Precautions:

a) Equipment Contamination: It is possible that some individuals may have an undiagnosed contagious disease that could be transmitted from person to person by close contact with face-pieces if the equipment is not properly sanitized between users. In all cases, respirators used for fit testing must be thoroughly sanitized before use by another employee. Medical division shall use appropriate sanitizer.
b) Fit testers are not authorized to conduct fit testing on persons with known contagious infectious diseases.
c) Personal Protective Equipment (PPE) for fit tester: The operation of the fit test equipment does not expose the fit tester to any hazard. Personal protective equipment is not required.
d) Hazard Determination: The operation of fit test equipment does not cause exposure to any chemical, physical, or radiological hazards.
e) Environmental Impact and Waste Disposal: The fit testing procedure does not pose any adverse impact on the environment.

3. Fit Testing Procedure:

a) Respirator Fit Test equipment shall be procured and conduct fit test by following the procedure provided in the fit testing equipment manual to get the results (Pass/Fail). Sample specification for the fit testing equipment is provided in Appendix-8.
b) The equipment must be kept clean, and is maintained and calibrated according to the manufacturer’s instructions to operate at the parameters for which it was designed.

4. Assigned protection Factor (APF):

OSHA under 29 CFR 1910.134(d)(3)(i)(A) has described the Assigned Protection Factors (APF) for different types of respirators to ensure safety of users as below:

Type of respirator	~~Quarter mask~~	Half mask	Full facepiece	Helmet / hood	Loose-fitting facepiece
1. Air-Purifying Respirator	~~5~~	10	50	-	-
2. Powered Air-Purifying Respirator (PAPR)	-	50	1,000	25/1,000	25
3. Supplied-Air Respirator (SAR) or Airline Respirator • Demand mode • Continuous flow mode • Pressure-demand or other positive- pressure mode	 - - -	 10 50 50	 50 1,000 1,000	 - 25/1,000 -	 - 25 -
4. **Self-Contained Breathing Apparatus (SCBA)** • Demand mode • Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)	 - -	 10 -	 50 10,000	 50 10,000	 - -

Table 1: APF as per OSHA under 29 CFR 1910.134(d)(3)(i)(A)

The intended APF required for SCBA use is given below:

SCBA TYPE	APF	Remark
Demand Mode Full-Face piece	50	Use time limited by worker training and cylinder capacity. Bulk and weight limits use for strenuous work and work in confined spaces.
Pressure-demand (positive pressure)	10,000	Positive-pressure units with at least a 30-minute capacity and fitted with low-capacity warning alarm may be used in IDLH situations.

Table 2: APF with use of SCBA for various intended uses

During Fit Test, it shall be ensured to achieve minimum values as defined in table 2 above for the intended users.

5. Fit Test Report:

Print the fit test record.

a) Explain the results to the employee and obtain the employee's signature.
b) Save the test results to computer memory (Soft copy). File the record under the employee's name.
c) Disinfection of the respirator has to done by the employee's as per the instruction given by the occupational health nurses during the fit test.

Note: The Fit Test Report shall contain the following information (minimum):

- Date of the test
- Name of the person fit tested
- Respiratory equipment details such as make, model, size, etc.
- Fit test equipment model / name
- Result: Pass or fail
- Name of the person carrying out fit test
- Any additional information

6. Training:

The personnel carrying out fit test must be trained prior to carrying out the fit test. The training shall consist as a minimum the following:

Knowledge:

a) A general understanding of Respiratory Protective Equipment (RPE) used in the workplace
b) The nature of potential hazards which RPE can protect against the need for training in the use of RPE
c) The role of RPE Fit Testing

Skills:

a) Use a suitable connector and adaptor to prepare the respirator for fit test
b) Fit test exercises
c) Practical demonstration/ Hands on Training of a quantitative fit test using the Fit testing equipment on an individual wearing a respirator.