Applied Radiological Control, Inc.

HEALTH AND SAFETY PROCEDURE

TITLE Respiratory Protection Program

NUMBER 1.4

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ARC

APPLIED RADIOLOGICAL CONTROL, INC.

HEALTH & SAFETY PROCEDURE 1.4

RESPIRATORY PROTECTION PROGRAM

1.0 Purpose and Scope

1.1 This procedure describes the program for control, use, and maintenance of respiratory protection equipment in accordance with Regulatory Guide 8.15 "Acceptance Programs for Respiratory Protection."

1.2 Provides Guidance that will limit the inhalation of radioactive materials below the limits of 10CFR20 and As Low As Reasonably Achievable (ALARA).

1.3 This procedure is applicable to all ARC employees required to wear respiratory protection at job sites not covered under another respiratory protection program.

2.0 Definitions

2.1 ANNUAL LIMIT ON INTAKE (ALI): The derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the reference man that would result in a committed effective dose equivalent of 5 Rem or a committed dose equivalent of 50 Rem to any individual organ.

2.2 ATMOSPHERE SUPPLYING RESPIRATOR: Respiratory protection device which provides the wearer with a continuous supply of air from an approved source.

2.3 BIOASSAY PROGRAM: A Program providing analysis for evaluation of personnel exposure to radioactive materials taken into the body as a result of inhalation, ingestion, absorption, or injection.

2.4 CONTINUOUS FLOW RESPIRATOR: Respiratory protection device which allows the user to adjust the air flow to a comfortable level without violating the National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) certification.

2.5 DERIVED AIR CONCENTRATION (DAC): The concentration of a given radionuclide which, if breathed by the reference man for a working year of 2000 hours under conditions of light work (inhalation rate 1.2 cubic meters of air per hour), results in a intake of one ALI.

2.6 DPM: Disintegrations per minute.

2.7 DUAL-FLOW RESPIRATOR: A respiratory protection device that provides the user with the option of receiving supplied air or breathing through a filter canister.

2.8 FULL FACEPIECE AIR PURIFYING RESPIRATOR: A respiratory protection device that covers the face from the forehead to the chin and provides the user with filtered air during inhalation via an attached filter media canister.

2.9 GRADE D BREATHING AIR: Respirable air meeting the following specifications:

2.9.1 Oxygen - atmospheric (19.5% - 23.5%)

2.9.2 Condensed Hydrocarbons - < 5 mg/cubic meter

2.9.3 Carbon Dioxide - < 10 ppm

2.9.4 Carbon Monoxide - < 1000 ppm

2.9.5 Odor - no pronounced

2.10 HALF FACE AIR PURIFYING RESPIRATOR: A respiratory protection device that covers the face from below the eyes to the chin and provides the user with filtered air during inhalation via attached filter media canisters. Some half face respirators have the filter media built into the mask body.

2.11 IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH): Atmosphere which is Immediately Dangerous to Life and Health. Inhalation of such an atmosphere will cause acute deleterious effects and may result in immediate death.

2.12 MPC-HOURS: A unit of measurement used to assess intake of airborne radioactive material. MPC-Hours = (fraction of MPC) x (stay time in hours).

2.13 NOBLE GAS: A gas which is chemically inert.

2.14 NOT IMMEDIATELY DANGEROUS TO LIFE AND HEALTH: Inhalation of such atmosphere will result in delayed or chronic deleterious effects on health and may eventually lead to death.

2.15 OXYGEN DEFICIENT ATMOSPHERE: Air in which the oxygen percentage by volume is less than 19.5%. Atmospheres which contain less oxygen cannot support human life.

2.16 PERMISSIBLE EXPOSURE LIMIT (PEL): An exposure limit that is published and enforced by the Occupational Safety and Health Administration as a legal standard.

2.17 POWERED AIR PURIFYING RESPIRATOR (PAPR): A respiratory protection device where air is mechanically forced through a filter media before being inhaled.

2.18 PRESSURE DEMAND RESPIRATOR: An atmosphere supplying respiratory protection device that provides breathing air to the user at a constant positive pressure.

2.19 PROTECTION FACTOR (PF): A measure of the degree of protection afforded by a respirator, defined as the ratio of the concentration of airborne radioactive materials outside the respiratory protection equipment to that inside the equipment (usually inside the facepiece under conditions of use). It is applied to the ambient airborne concentration to estimate the concentration inhaled by the wearer using the following formula:

$$\text{CONCENTRATION INHALED} = \frac{\text{AMBIENT AIRBORNE CONCENTRATION}}{\text{PROTECTION FACTOR}}$$

Non-radiological protection factors are found in the current edition of the Threshold Limit Value for Chemical Substances published by the American Conference of Governmental Industrial Hygienists.

2.20 RESPIRATOR: A NIOSHA/MSHA approved device designed to protect the wearer from the inhalation of harmful atmospheres.

2.21 RADIOLOGICALLY CONTROLLED AREA (RCA): Any area controlled by Health Physics for the purpose of occupational exposure to radiation and radioactive materials (e.g. radiation areas, high radiation areas, contaminated areas and airborne radioactivity areas, etc.).

2.22 SELF-CONTAINED BREATHING APPARATUS (SCBA): A respiratory protection device utilizing a full facepiece respirator and a portable cylinder of compressed breathing air.

2.23 SHORT TIME EXPOSURE LIMIT (STEL): The maximal concentration of an airborne substance to which workers can be exposed to for a period not exceeding 15 continuous minutes without suffering from: 1) irritation 2) chronic or irreversible tissue change, or 3) narcosis of sufficient degree to increase accident proneness, impair self-rescue, or materially reduce work efficiency. No more than four excursions are permitted per day with a least 60 minutes between exposures. The total of these four exposures can not exceed the TLV-TWA. The STEL should not be exceeded anytime during a workday even if the 8 hour TWA is within the TLV-TWA.

2.24 THRESHOLD LIMIT VALUE (TLV): That concentration of a non-radioactive substance in air that represents a condition under which it is believed that nearly all workers may be repeatedly exposed daily without adverse effects. TLV values are listed in the current edition of the Threshold Limit Values for Chemical Substances published by the American Conference of Governmental Industrial Hygienists.

2.25 TIME WEIGHTED AVERAGE (TWA): Concentration of contaminants in air over a specified period of time.

3.0 Responsibilities

3.1 The Radiation Safety officer or his designee shall have the overall responsibility for the ARC Respiratory Protection Program.

3.2 Health and Safety Supervisors are responsible for:

3.2.1 Determining if respiratory protection equipment is appropriate for an actual or potential airborne radioactive material concentration.

3.2.2 Following the selection guidelines in this procedure to determine the specific type of respirator to be used for a radiological job.

3.2.3 Ensuring that respirators are cleaned and sanitized.

3.2.4 Determining the type of protection, frequency of surveillance, and any other restrictions associated with non-radiological airborne hazards.

3.2.5 Determining if all users of respiratory protection devices are medically qualified.

3.3 Health Physics Technicians shall be responsible for:

3.3.1 Inspecting, issuing, and maintaining all respiratory protection equipment.

3.3.2 Ensuring that the respiratory protection equipment is properly utilized during job coverage.

3.4 All personnel are responsible for complying with the respiratory protection requirements established by Health and Safety personnel. Any individual is also responsible for halting work activities if he/she believes that conditions are no longer safe.

4.0 Procedure

4.1 Radiological Respirator Protection Methods

4.1.1 Respiratory Protection equipment shall be utilized only after all other methods of respiratory hazard reduction are evaluated.

4.1.2 The following engineering controls should be considered prior to the prescription of radiological respiratory protection equipment:

4.1.2.1 Ventilating the area using the normal plant ventilation system and/or portable ventilation units.

4.1.2.2 Decontamination of the area and/or component.

4.1.2.3 Construction of containment devices around the area and/or component.

4.1.2.4 Reduction of system leaks to the extent practicable.

4.1.2.5 Depressurization, flushing, or purging of the system or component.

4.1.2.6 Delay of work to allow for the short-lived nuclides to decay.

4.1.3 When it is not feasible to apply engineering controls to limit the concentration of airborne radioactive materials to less than 25% of a DAC (excluding noble gases) or while such controls are being evaluated and/or implemented, other precautionary controls shall be used to keep internal exposures ALARA. These controls include, but are not limited to:

4.1.3.1 Increased surveillance

4.1.3.2 Working time limitations

4.1.3.3 Issue and wearing of respiratory protection devices

4.1.4 In situations where the use of respiratory protection devices impede work tasks so as to significantly increase external dose, a comparison of internal dose versus external dose shall be conducted. This comparison is to determine if respirator use supports the ALARA philosophy.

4.2 Non-radiological Respiratory Protection Methods

4.2.1 Respiratory protection devices are to be used only after all other methods of respiratory hazard reduction have been evaluated.

4.2.2 Any one or a combination of the engineering controls in step 4.1.2 may be implemented under the direction of Health and Safety.

4.2.3 Whenever such process equipment and engineering controls are not effective in reducing the hazardous material airborne concentration to less than the TLV or STEL, the utilization of respiratory protection devices is warranted.

4.3 Respiratory Protection Equipment User Requirements

4.3.1 Respiratory equipment users shall have an annual physical examination prior to wearing a respirator for any purpose.

4.3.2 The Examining Physician will determine if the employee is physically qualified to use respiratory protection devices.

4.3.3 Individuals shall receive annual formal training in the donning, use, removal and limitations of respiratory protection devices.

4.3.4 Fit Testing

CAUTION: An individual with facial hair in the area where the respirator facepiece seals shall not be fit tested.

4.3.4.1 Each individual shall be tested annually for fit on the type of mask he/she may be expected to wear. Such test will normally be a quantitative fit in which the adequacy of the respirator mask-to-face seal is determined.

4.3.4.2 Individuals shall have a current respirator physical for fit testing.

4.3.4.3 Individuals shall have current respiratory protection training prior to Fit testing.

4.3.4.4 Fit test shall be reperformed when the wearer's physical condition changes such that in the opinion of the Health and Safety Supervisor or the user, requalification is warranted.

4.3.4.5 Fit testing is required for all respiratory protection devices except for air-supplied hoods. Hoods used in conjunction with a PAPR unit are also exempted from fit testing.

4.3.5 Whole Body Counting

4.3.5.1 All respirator users required to work inside a RCA shall receive a baseline whole body count and an annual whole body count thereafter.

4.3.5.2 Individuals will be sent for special whole body counts when deemed necessary by Health and Safety.

4.3.6 Non-radiological respiratory protection user requirements are the same as described above with the exception of step 4.3.4. Whole body counts are not necessary if the individual does not enter a RCA.

4.4 Classifications of Respiratory Hazards

4.4.1 Oxygen Deficient

CAUTION: All entries into oxygen deficient areas require the Corporate Radiation Safety Officer verbal approval.

4.4.1.1 Immediately dangerous to life and health (IDHL)

4.4.1.2 Oxygen level below 19.5% by volume.

4.4.2 Gas and Vapor Contaminants

4.4.2.1 Depending on the properties and concentration of the contaminant it can be either:

a. Immediately dangerous to life and health (IDLH).

b. Not immediately dangerous to life and health.

4.4.2.2 Contaminant is molecular in nature, and it is not a particle.

4.4.3 Particulate contaminants.

4.4.3.1 Depending on the properties and concentration of the contaminant it can be either:

a. Immediately dangerous to life and health (IDLH).

b. Not immediately dangerous to life and death.

4.4.3.2 Particulate contaminants can be in the following forms.

a. Dust - Solid particle.
b. Fume - Solid condensation particle, usually from a vaporized metal.
c. Mist - Liquid condensation particle.

4.4.4 Combination of Gas, Vapor, and Particulate Contaminants.

4.4.4.1 Depending on the properties and concentration of at least one contaminant it can be either:

a. Immediately dangerous to life and health (IDLH).

b. Not immediately dangerous to life and death.

4.4.4.2 Contaminant consists of both molecules and particles.

4.5 Radiological Respiratory Protection Equipment Selection.

4.5.1 Respiratory protection equipment should be utilized after all other process and/or engineering controls have been evaluated and determined not feasible.

4.5.2 All respiratory protection equipment used shall have MSHA/NIOSH certification or approval; or NRC approval. No modifications shall be made which void these conditions.

4.5.3 The following respiratory protection devices are authorized for use:

4.5.3.1 Full-face respirators.

4.5.3.2 SCBA face pieces.

4.5.3.3 Air-supplied hoods and suits.

4.5.4 When supplied air is required, the air quality shall be in compliance with Grade D specifications as described in ANSI/CGA G-7.1989 (Commodity Specification for Air).

4.5.7 Air sampling shall be performed to determine the most effective type of respiratory protection equipment.

4.5.8 The selection of the appropriate respiratory protection equipment for any specific situation requires the careful evaluation of the following aspects:

4.5.8.1 Is the hazard immediately dangerous to life and health (IDLH)?

4.5.8.2 The physical and chemical properties of the hazard.

4.5.8.3 Extent of the hazard.

4.5.8.4 Combinations of hazards.

4.5.8.5 Pathways of intake into the body.

4.5.8.6 Working environmental conditions.

4.5.8.7 Work requirements.

4.5.8.8 Escape routing for workers in the event of an emergency.

4.5.8.9 Past experience with a particular work evolution.

4.5.8.10 Characteristics and limitations of the available respiratory protection equipment.

4.5.9 Action levels for Airborne Radioactivity Area.

4.5.9.1 Air sample results indicate > 10% DAC. Action should be taken at this concentration to determine the source, and an attempt made to eliminate or reduce the source, if applicable.

4.5.9.2 Air sample results indicate >25% DAC. This shall be posted as a Airborne Radioactivity Area and a RWP will be required for entry. If process and/or engineering control measures do not reduce the airborne levels below 25% DAC, the appropriate respiratory protection equipment should be considered for use.

4.5.9.3 In situation where respirators are not to be used, exposure time keeping will commence and personnel stay times within the airborne area will be adjusted accordingly.

4.5.9.4 If airborne levels increase unexpectedly personnel should be evacuated or supplied with SCBAs. An investigation of the increased airborne levels should be initiated.

4.5.9.5 For non-routine entries into areas where the airborne radioactivity concentrations are not known and the potential exists for an internal exposure, personnel will be required to use SCBAs.

4.5.10 Action Levels for Contamination

4.5.10.1 At contamination levels above 50,000 dpm an evaluation of the appropriate engineering controls is required. This evaluation includes but not limited to: wetting, decontamination, ventilation, or contamination devices. If it is not possible to reduce the contamination levels significantly, the appropriate respiratory protection devices shall be required at the discretion of cognizant Health Physics Supervision.

4.5.10.2 At contamination levels from 5,000 to 50,000 dpm visual inspections may be performed without respiratory protection. If physical work is to be done where an uptake potential exists, the appropriate engineering controls should be evaluated and proved ineffective before the issue of respiratory protection equipment.

4.5.10.3 At contamination levels from 1,000 to 5,000 dpm inspections, assembling, or disassembling may be performed without respiratory protection provided that there is adequate ventilation in the work area. Grinding, welding, or brushing operations require the evaluation of engineering controls to significantly reduce the airborne hazard. If engineering controls are not practical, respiratory protection equipment will be required, at the discretion of cognizant Health Physics Supervision.

4.6 Non-radiological Respiratory Protection Equipment Selection

4.6.1 Health and Safety personnel shall perform the appropriate evaluations and subsequent selection of all respiratory protection requirements for all non-radiological airborne hazards.

4.6.2 A Non-radiological Respiratory Protection Permit (NRP), authorized by the Health and Safety Division, is required prior to issue of any respiratory protection equipment planned for use against a non-radiological breathing hazard.

4.6.3 Supervisors responsible for any job that requires non-radiological respiratory protection shall request a NRP from Health and Safety.

4.6.4 Only Health and Safety personnel may make changes to a NRP.

4.6.5 The NRP shall be valid for 30 calendar days unless terminated due to changing job conditions, completion of the job, or termination upon the request of Health and Safety personnel.

4.6.6 The following Respiratory Protection devices are authorized for use against non-radiological hazards.

4.6.6.1 Full-face respirators.

4.6.6.2 SCBA face pieces.

4.6.6.3 Half-mask respirators.

4.6.6.4 Air-line hoods and suits.

4.7 Emergency Respiratory Protection Equipment

4.7.1 All Emergency Program respiratory protection equipment shall be NIOSH/MSHA certified.

4.7.2 The emergency program's respiratory protection equipment shall only be utilized for actual emergencies and drills.

4.7.3 Health and Safety shall be notified immediately if any emergency respiratory protection equipment has been used, tampered with, moved, damaged, or lost.

4.7.4 Authorized emergency respiratory protection equipment types are as follows:

4.7.4.1 Full-face negative pressure respirators.

a. Not to be used in a IDLH atmosphere.

b. Used only under the direction of Health and Physics.

c. Equipped with a iodine canister or a combination organic/HEPA canister.

d. Not authorized for fire fighting.

4.7.4.2 Self-contained breathing apparatus (SCBA).

a. Primary emergency respiratory protection device.

b. Approved for IDLH atmosphere.

c. Used any time personnel enter an area where the atmospheric conditions are not known.

d. Only authorized respiratory protection device for fire fighting.

4.7.5 Users of emergency respiratory protection equipment shall meet all the user requirements specified in Section 4.3.

4.8 Use of Respiratory Protection Equipment

4.8.1 Only personnel who meet all the applicable user's requirements specified in Section 4.3 are permitted to wear respiratory protection devices.

4.8.2 Individuals shall be issued one respirator at a time. There shall be no multiple issues of respirators to a single individual. Any exceptions shall be approved by the Health and Safety Supervisor.

4.8.3 Users shall be clean shaven on the areas of the face required for respirator seal prior to the donning of respiratory protection equipment.

4.8.4 Users shall perform the pre-use visual inspection and the pre-use negative and positive pressure seal test prior to entering the airborne hazard. These test shall be consistent with the proper method as presented in Addendum 3.

4.8.5 Users shall perform the inspection, donning and removal stages to ensure that the SCBA is in proper working condition. These checks shall be consistent with the correct method as presented in Addendum 3.

4.8.6 The user shall immediately report any defective respiratory protection equipment to Health and Safety.

4.8.7 Wearers of respiratory protection devices may leave the work area at any time for relief in the event of equipment malfunction, physical or psychological distress, procedural noncompliance, communications failure, significant deterioration of operating conditions, or any other circumstances requiring such relief.

4.8.8 The wearer is solely responsible for the proper receipt, use, and return of all issued respiratory protection equipment.

4.8.9 Special issue/return instructions may be implemented for specific jobs. Such guidance will be administered by Health and Safety personnel.

4.9 Respiratory Protection Equipment Inspection and Maintenance

4.9.1 Respiratory protection devices shall be cleaned, disinfected, inspected, and tested after each use.

4.9.2 Equipment repair shall be performed only by qualified Health and Safety personnel or the vendor.

4.9.3 Prior to issue, equipment shall be inspected in accordance with the appropriate Health and Safety procedures.

4.9.4 Disposable half-face respirators require no maintenance and only a pre-use visual inspection by the wearer.

4.9.5 Inspections on "Available for Use" respiratory protection devices shall be performed once per calendar month. These inspections shall be separated by a minimum of 14 days.

4.9.6 Emergency Plan respiratory protection devices shall be restored to service or replaced within 24 hours after use.

5.0 Program Effectiveness

5.1 Respiratory equipment users may be whole body counted at the Health and Safety Supervisor's discretion. Reasons may include but not limited to:

5.1.1 Internal contamination of a respirator.

5.1.2 Defective respirator or respirator parts.

5.1.3 Suspected personnel internal uptake.

5.1.4 Loss of supplied air to an individual.

5.1.5 Assessment of the effectiveness of the Internal Exposure Control Program.

5.2 Further investigation should be performed by Health and Safety Supervision when air sample results and subsequent calculations indicate that the breathing atmosphere inside the mask could have exceeded 1 MPC (excluding noble gases).

6.0 References

6.1 10CFR20 (Standard for Protection Against Radiation)

6.2 29CFR1910 (Occupational Safety and Health)

6.3 30CFR11 (Respiratory Program Devices)

6.4 NRC Reg Guide 8.15 (Acceptable Programs for Respiratory Protection)

6.5 NUREG-0041 (Manual of Respiratory Protection Against Airborne Radioactive Materials)

6.6 ANSI Z88.2-1980 (Practices for Respiratory Protection)

6.7 ANSI Z88.6-1984 (Physical Qualifications for Respirator Use)

6.8 ANSI/CGA G-7.1-1989 (Commodity Specification for Air)

6.9 American Conference of Governmental Industrial Hygienists (Threshold Limit Values and Biological Exposure Indices, latest edition)

6.10 USNRC Memorandum dated June 5, 1989 from F.R. Congel and R.E. Cunningham.

6.11 NIOSH Guide to Industrial Respirators Protection - September 1, 1987.

7.0 Support Documents

7.1 Non-Radiological Respiratory Protection Permit (NRP)

7.2 Non-Radiological Respiratory Protection Permit (NRP) Issue Log

7.3 ADDENDUM 1 - Major Types of Respiratory Protection Devices

7.4 ADDENDUM 3 - Guidelines For Use of Respiratory Protection Equipment

APPLIED RADIOLOGICAL CONTROL

NON-RADIOLOGICAL RESPIRATORY PROTECTION PERMIT (NRP)

Job Number _____

*Job Supervisor/Planner/Foreman _____ Ext ____ *Company Dept._____
*Date of Work Initiation _____ *Location _____

*Brief Description of Work _____
_____

Potential Hazard _____
Is work project work area regulated by an RWP? Yes { } No { }

Engineering Controls to be utilized _____
Type of Mask and filter to be issued _____
Other Personal Protective Equipment _____
Authorization _____ Date _____ Expires _____
Signature Safety Dept.

Extended _____ Date _____ Expires _____
Signature Safety Dept.

Extended _____ Date _____ Expires _____
Signature Safety Dept.

Permit Terminated by _____ Date _____

_____

Special Instructions (use addition sheet if necessary)

_____

*To be completed by Job Supervisor/Planner/Foreman

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APPLIED RADIOLOGICAL CONTROL, INC.

Non-Radiological Respiratory Protection Permit (NRP)

Issue Log

NRP#_____

Name	Social Security #	Date	Issued By	Comments

ARC

ADDENDUM 1
MAJOR TYPES OF RESPIRATORY PROTECTION DEVICES

1. Air Purifying Respirator - Negative Pressure Mode

   Protection Factor: 50

   This is the most commonly used respirator. A single or dual high efficiency filter is used to mechanically remove airborne particulate contamination.

   Advantages

   - Small, relatively inexpensive and easily maintained
   - Restricts movement of an individual the least
   - Easy to use

   Disadvantages

   - Cannot be used in an oxygen deficient or gaseous contaminated atmospheres immediately dangerous to life or health.

2. Air Purifying Respirator - Positive Pressure Mode

   Protection Factor: 1,000

   This respirator uses a battery powered blower to draw the contaminated air through dual high efficiency filters.

   Advantages

   - More comfortable to wear for extended periods of time than negative pressure respirators.
   - The positive pressure in the facepiece prevents inward leakage of contaminated air during inhalation.
   - If blower malfunctions, the respirator still offers protection in a negative pressure mode.

- The inward flow of air into the mask assists in reducing wearer fatigue.

Disadvantages

- Cannot be used in oxygen deficient or gaseous contaminated atmospheres immediately dangerous to life or health.
- Extra weight of battery pack.
- Battery has a limited operational time of approximately four (4) hours.

3. Air Hoods

Protection Factor: 1,000/2,000

The factor of 1,000 can be used when air pressure and hose length are supplied according to the manufacturer's requirements. A calibrated pressure gauge shall be used to monitor system pressure.

A factor of 2000 can only be used if, in addition to the previous requirements, the air pressure is maintained at the manufacturer recommended pressure range and the gauge is periodically monitored during operation to assure a correct flow.

This special purpose respiratory equipment is sometimes used to provide protection from splashing and spraying contaminants. Continuous flow airlines are used to supply breathing air to these units in accordance with the manufacturer's requirements.

Advantages

- Vision limitation is minimal.

4. Self-Contained Breathing Apparatus (SCBA)

Protection Factor: 10,000

This type of respirator has a limited supply of breathing air that is carried by the wearer. The positive pressure unit offers a high degree of wearer protection against both particulate and gaseous contaminated atmospheres and is the only approved respirator to be used in oxygen deficient environments. The SCBA will be used for emergencies, escape, and rescue operations.

Advantages

- Can be used in oxygen deficient atmospheres or other environments immediately dangerous to life and health.
- Wearer mobility is only limited by the weight and bulk of the unit.
- Can be used for rescue operations.
- Can be used to enter unknown and potentially hazardous atmosphere.

Disadvantages

- The weight and bulk of the unit can limit wearer movement in close spaces and cause increased fatigue.
- Limited breathing air supply.
- Unit is more difficult to use than most other types of respirators.
- Can limit communication.

5. Half Mask Respirators

5.1 Gas and Vapor Respirator

Protection Factor: 10. NOT authorized for radiological hazards. The device is equipped with built in activated Charcoal filters.

5.2 High Efficiency Particulate Respirator (HEPA)

Protection Factor: 10. If used for radiological hazards, the device must have a MSHA/NIOSH certification for protection against radionuclides. It shall also have a 4-point harness assembly.

Advantages

- Comfortable and lightweight.
- Disposable - no maintenance required.
- Normal prescription safety glasses can be worn.

Disadvantages

- Provides no eye protection.

6. Approved Emergency Equipment

6.1 Only NIOSH/MSHA approved respiratory devices may be used during emergencies.

6.2 Positive Pressure Self-Contained Breathing Apparatus (SCBA)

6.2.1 Only the positive pressure SCBA will be selected for emergency use, rescue, and re-entry into a hazardous contaminated area in which air concentration cannot be evaluated. The slight positive pressure in the respirator facepiece provides a minimum protection factor of 5000 to 10,000 when the equipment is properly used.

6.2.2 In addition to the Health Physics Division's normal supplies of SCBAs, SCBAs will be stored at emergency stations throughout the plant. These emergency SCBAs are marked EMERGENCY USE ONLY or EMERGENCY EQUIPMENT and are not to be used for routine purposes.

6.3 Filter type respirators will only be used during emergencies when directed by Health Physics. No protection factor may be claimed for iodine charcoal cartridges without prior NRC approval.

ADDENDUM 2

GUIDELINES FOR USE OF RESPIRATORY PROTECTION EQUIPMENT

1.0 Guidelines for Use of Full Face Respiratory Masks (Cartridge, SCBA, and Air Supplied)

Donning

1. Inspect facepiece.
2. Pull all head harness straps out to end tabs.
3. Insert chin in facepiece and lay seal surface against face.
4. Stretch straps over head.
5. Adjust the headband straps as follows:
   a. Check to see that headband is flat against head.
   b. Tighten the two lower or "neck" straps.
   c. Tighten the two side or "temple" straps. Take care not or pull straps too tight since this could cause headache or other discomfort during extended use.
   d. Tighten forehead or "front" strap as necessary, to position the lens for best vision.
6. Perform pre-use negative and positive seal test.
   a. Perform a negative pressure seal test by covering all the air inlet ports with your hands then inhaling deeply. The mask should collapse toward your face. If it doesn't, adjust your straps again. Hold your breath about 10 seconds and keep the inlet ports covered. If the mask stays collapsed, there is no leakage. If the mask releases from your face and returns to its original form, this indicates leakage. If this is the case, readjust the straps and perform another negative pressure check. If you still have leakage, get another mask.
   b. A positive pressure seal test shall also be performed. To do this, cover the

exhalation port and slowly exhale evenly until the mask rises slightly from the face. If there is no leakage in either test, you have an acceptable seal. A positive pressure seal test is not required for a SCBA face piece.

Doffing

1. Remove the full face respirator mask by bending forward at the waist, grasping the snout area, and pulling the facepiece down and away from the face. Do not pull the respirator mask back over the head and neck.

2. Place in the proper receptacle.

2.0 Additional Considerations for Use of SCBAs

CAUTION: Should the unit fail any of the following performance checks, notify Health and Safety. DO NOT USE THE UNIT. Should the mask seal check fail, adjust straps and retry. Should the seal check continue to fail, DO NOT USE THE MASK.

Donning

1. Check to see cylinder is $\geq$ 4000 psi. Remember cylinder pressure from gauge on air cylinder.

2. Visually inspect equipment for indications of damage or defects. Pay particular attention to the regulator.

3. Ensure regulator by-pass valve (red knob) is shut, regulator mainline valve (gold knob) is closed.

4. Ensure that rubber cap is on the regulator outlet connection.

5. Fully open the cylinder valve. Ensure low pressure alarm rings briefly as pressure builds up.

6. When pressure has equalized open the mainline valve (gold knob) until it clicks and locks. Ensure regulator gauge reads within 10% of the cylinder gauge.

7. Close the cylinder valve fully. Observe the regulator gauge for 30 seconds to see if there is a leak. The gauge should not drop more than 100 psi.

8. Slowly remove the regulator outlet cap, allowing air to escape. The alarm should ring at 1200-1800 psi.

9. Close the mainline valve, then open the cylinder valve fully.

10. Place the unit on a horizontal surface, with cylinder valve away from wearer and the backplate up. Extend all straps.

11. Lean forward and grasp both edges of the back plate, just above the waist belt area.

12. Swing the apparatus straight up and over the head keeping the elbows close to the body. Rest the apparatus on the back while slightly bent over. The shoulder straps will slide along the arms and into place.

13. Connect the chest buckle, and pull down firmly on the side straps to adjust the harness.

14. Connect and adjust the waist buckle.

15. Extend all headband straps. Insert chin into facepiece, and pull head harness back over the head. This may be accomplished by either; pulling the harness over the head while inserting the face, or initially place the straps over the lens, inserting the face, then pulling the harness over the head.

16. Adjust and tighten head straps.

17. Perform a negative pressure check by placing the palm of your hand over the opening of the hose and inhaling. Hold for ten seconds. If leakage is detected, readjust for a better fit.

18. Connect breathing tube to regulator outlet while simultaneously opening the mainline valve. Tighten the knurled hose ring.

19. Test the emergency bypass valve by cracking it open briefly, then closing it.

20. Check regulator pressure gauge upon arriving at work location to determine how much air was used for entry. At least the same amount of air will be required for safely exiting the area.

ADDENDUM 3

GUIDELINES FOR USE OF RESPIRATORY PROTECTION EQUIPMENT

NOTE: Emergency operation: This operating mode is for emergency usage only; consequently, the duration of the air supply is greatly reduced when the unit is operating through the by-pass valve. Only use this operating mode to escape to a safe area.

Should the regulator become damaged or inoperative during use, proceed as follows:

Open by-pass valve (red knob) to allow an acceptable flow and turn the main line valve (gold knob) fully OFF.

Adjust the by-pass valve to suit the requirements of the user, then exit the area.

21. Check the regulator pressure gauge occasionally for remaining air supply to allow sufficient time to exit the hazardous area.

22. If the low pressure alarm bell sounds, leave the area immediately. This alarm indicates that approximately 20-25% of the air remains in the cylinder.

Doffing of SCBA

1. Remove outer gloves (if applicable).

2. Close cylinder valve.

3. Loosen the knurled hose ring.

4. Disconnect breathing tube

5. Close mainline valve.

6. Remove the facepiece by bending forward, grasping the snout area, and pulling the facepiece down and away from the face. Place respirator in proper receptacle as instructed by Health Physics.

7. Place the entire unit in a large poly bag, and place in the proper receptacle for return to the respirator cleaning facility.

Cylinder Replacement Guidelines

CAUTION: Cylinder replacement shall be performed in a safe atmosphere. Practice proper contamination control if applicable.

1. Close cylinder valve.

2. Loosen the knurled hose ring.

3. Disconnect breathing tube from regulator allowing air pressure to escape from regulator.

4. Shut mainline valve.

5. Disconnect high pressure hose coupling from the cylinder valve.

6. Pull the cylinder clamping lever out and turn counter clockwise to release cylinder from back plate.

7. Lift the cylinder out of the backplate and replace with a fully charged cylinder. Start at the top of the backplate and lower until properly positioned.

8. Turn cylinder clamp handle clockwise until cylinder is secure. Fold handle down, leaving the proper side out (marked as such on handle).

9. Check the o-ring inside the coupling to ensure it is free of defects and in proper position.

10. Attach and hand tighten the regulator hose coupling to cylinder valve.

11. Open the cylinder valve.

12. Connect breathing tube to regulator outlet while simultaneously opening the mainline valve.

13. The apparatus is now ready for reuse.

3.0 Additional Considerations for Use of Powered Air-Purifying Respirators (PAPR)

Donning

1. Check blower and battery operation by turning the unit on and allowing it to run for a minute or two.

2. Mount blower assembly on belt, then don belt.

3. Don facepiece and perform a pre-use negative and positive pressure test.

4. Connect breathing tube to facepiece and then turn blower on.

CAUTION: The PAPR unit should not be used for longer than six hours without replacing the battery module.

Doffing

1. Remove outer gloves.

2. Turn blower off.

3. Remove the facepiece by bending forward, grasping the snout area, and pulling the facepiece down and away from the face.

4. Remove the belt.

5. Double bag entire unit and return it to the issue point.

4.0 Guidelines for Use of Half Face Respirators (cartridge and canister)

1. Place the upper harness on to the top of head. The plastic strap portion should run from the top to the back side of the head.

2. Clip the lower harness around the back of the neck at the base of the head of the head.