

1 Purpose	To outline the requirements for the safe use of Self-Contained Breathing Apparatuses.
2 Application	Applies to all NTPC employees and contractors required to use Self-Contained Breathing Apparatuses.
3 Definitions	<p>Airline Respirator A breathing device that consists of a full-face mask with a long hose that connects to a freestanding tank of compressed air.</p> <p>Air-Purifying Respirator A respirator with an air-purifying filter or cartridge that removes specific air contaminants by passing ambient air through the air-purifying element.</p> <p>Air-Supplying Respirator A respirator that delivers clean breathing air from a compressor and/or a cylinder to a worker.</p> <p>Cartridge A component of a respirator that removes vapours and/or gases from the air inhaled by the person wearing the respirator.</p> <p>Escape Respirator A respirator (either air-supplying or air-purifying) to be used only for escape purposes.</p> <p>Facial Seal The seal of the tight-fitting respirator face mask to the face.</p> <p>Immediately Dangerous to Life or Health (IDLH) Circumstances in which the atmosphere is deficient in oxygen or the concentration of a harmful substance in the atmosphere:</p> <ul style="list-style-type: none"> • is an immediate threat to life; • may affect health irreversibly; • may have future adverse effects on health; or • may interfere with a worker's ability to escape from a dangerous atmosphere. <p>Particulate Respirator A disposable half-face mask used for protection against airborne particles (i.e., dust, mist, fumes).</p> <p>Respirator An apparatus worn over the mouth and nose or the entire face to prevent the inhalation of dust, smoke, or other noxious substances.</p> <p>Seal Check An action conducted by the user to determine if the respirator is properly seated to the face.</p>

	<p>Self-Contained Breathing Apparatus (SCBA) A respirator with independent air supply carried by the user.</p> <p>Tight-fitting Face Mask A respirator inlet covering that forms a complete seal with the face. This includes:</p> <ul style="list-style-type: none"> • Quarter-face mask (covers nose and mouth above chin). • Half-face mask (covers nose and mouth under chin). • Full-face mask (covers eyes, nose, and mouth under chin).
4 References	<ul style="list-style-type: none"> • NWT Safety Act 1988 • NWT Occupational Health & Safety Regulations 2015 • NWT Code of Practice: Respiratory Protection PPE • CSA Standard Z94.4: Selection, Use and Care of Respirators • CSA Standard Z180.1: Compressed Breathing Air and Systems • Health & Safety Management System Element 06: Personal Protective Equipment • Health & Safety Management System Element 14.07: Respiratory Protection • Health & Safety Management System Element 14.13: Confined Spaces • SWP 4.01: Personal Protective Equipment • SWP 4.09: Respiratory Protective Equipment
5 Equipment	<ul style="list-style-type: none"> • Nil
6 PPE	<ul style="list-style-type: none"> • Self-Contained Breathing Apparatus (SCBA)
7 Training	<ul style="list-style-type: none"> • NTPC Respiratory Protection <ul style="list-style-type: none"> ○ Includes fit testing along with training in the use, care, maintenance, and limitations of the respiratory protective equipment. • Self-Contained Breathing Apparatus (SCBA) Training (use and care)

8 Work Practice

General

- A Self-Contained Breathing Apparatus (SCBA) is a special type of air-supplying respirator that provides an independent air supply from a pressurized tank on the user's back.
- SCBAs are normally used when there is a short-time need to enter and escape from atmospheres which are or may be immediately dangerous to life and health (IDLH), such as work in tanks or sewers.
- SCBAs are also used for medium work rates (i.e., work involving sustained hand and arm movements, or similar to brisk walking) and heavy work rates (i.e., heavy manual work requiring a lot of exertion and energy).
- Only workers trained in the use and care of SCBAs shall use them.
- SCBAs consist of a wearable, clean-air supply pack and full-face respirator mask (see Figure 1).
- SCBAs provide a small positive pressure inside the mask, and contain a demand valve designed to provide air flow as demanded by the user.

Figure 1: Self-Contained Breathing Apparatus



- Open-circuit SCBAs provide air for 30-60 minutes.
- Closed-circuit SCBAs, which recirculate exhaled gas, provide air for up to 4 hours. These are used when a longer-duration supply of air is needed (e.g., mine rescue, long tunnels).
- SCBAs shall meet the requirements of *CSA Standard Z94.4: Selection, Use and Care of Respirators*.

- Employees shall requisition SCBAs and related equipment through their manager, selecting only items listed on *Form 6.2: Approved HSE Equipment Purchasing List*.
- NTPC shall provide SCBAs to employees as required and/or engage contractors to conduct work requiring SCBAs.
- Respiratory battery packs shall be fully charged before use. Follow the manufacturer's instructions for charging and discharging.
- Air used in a SCBAs or airline respirators:
 - Shall be of a quality that meets the requirements of *Table 1 of CSA Standard Z180.1: Compressed Breathing Air and Systems*; and
 - Shall not contain a substance in a concentration that exceeds 10% of its occupational exposure limit.

When are SCBAs required?

- When a worker is required to enter a worksite where breathing conditions at a worksite are, or may become, Immediately Dangerous to Life or Health (IDLH), workers shall wear:
 - A full-face, positive pressure airline respirator with an auxiliary supply of air in case the primary supply fails;
 - A positive pressure open-circuit SCBA with:
 - A capacity of at least 30 minutes, unless the hazard assessment indicates the need for a greater capacity; and
 - A low pressure warning device or an escape respirator; or
 - A closed-circuit SCBA.
- SCBAS shall provide full face protection in situations where contaminants may irritate or damage the eyes.
- Workers shall wear SCBA or an airline respirator having a capacity of at least 30 minutes if worksite conditions are not or cannot become IDLH, but:
 - The oxygen content of the atmosphere is or may be less than 19.5% by volume;
 - The concentration of airborne contaminants exceeds or may exceed that specified by the manufacturer for air-purifying respiratory equipment.
- Where a worker is required to enter an atmosphere that is IDLH (see *Health & Safety Management System Element 14.13: Confined Spaces*):

- A second worker, suitably equipped and trained, shall be present and in communication with the worker at all times; and
- Suitably equipped personnel trained in rescue procedures and fully informed of the hazards shall be readily available to rescue the endangered worker immediately if the worker's atmosphere-supplying respirator fails or the worker becomes incapacitated for any other reason.
- SCBAs shall have an alarm to warn of low pressure. If an alarm sounds, the worker shall exit the hazardous atmosphere immediately.
- Air-supplying respirators are approved for use under conditions where air-purifying respirators will not be effective:
 - In atmospheres where contaminants do not emit a detectable odor or taste or cause irritation at safe concentrations.
 - To protect against substances that would generate a high heat reaction with the absorbent in an air-purifying respirator.
 - Where chemicals in the atmosphere are absorbed very poorly by the absorbents used in air-purifying respirators, causing very short service life, or where the chemicals are not absorbed at all.
 - Where there are two or more contaminants in the atmosphere for which different air-purifying elements are recommended, such as ammonia and benzene, and a combination element is not available.
 - When the concentration of a substance is greater than the approved limit for an air-purifying respirator.
- Only competent workers trained in the use of the equipment and job procedures shall enter an atmosphere requiring an air-supplying respirator.
- An individual under 18 years of age shall not conduct work requiring the use of an air-supplying respirator.

Escape Respirators

- Escape respirators shall be of the type required for the anticipated hazard.
- Escape respirators shall be kept only for emergency use and shall not be used routinely. They shall be quickly accessible at all times and shall be clearly marked.
- Workers who may be required to use escape respirators shall receive semi-annual training in its safe use.

- Escape respirators shall be inspected at least once every month by a competent worker to ensure it is in satisfactory working condition.
 - The date of the inspection and the name of the worker who conducted the inspection shall be recorded and conspicuously displayed at the location where the respirator is stored.
 - Any defects identified in the inspection shall be corrected immediately by a competent worker or the device shall be removed from service.

Fit Testing

- Workers shall undergo fit-testing with their assigned respiratory protective equipment prior to use in a hazardous environment. The fit test shall ensure a satisfactory fit and effective face seal when using a tight-fitting face mask.
- Retesting shall be performed a minimum of every two years, or more often if changes to the user's physical condition occur that could affect respirator fit. Examples include:
 - A shift in weight by 10 lbs.
 - Dental modifications that change the contour of the jaw.
 - A traumatic or medical change to the facial contour or skin.

Inspection

- SCBAs shall be inspected before and after each use and during cleaning to ensure they are in satisfactory working condition.
- Any defects identified during the inspection shall be corrected immediately by a competent worker or the SCBA shall be immediately taken out of service.
- Face Mask
 - Ensure no cracks, holes, or tears are present.
 - Ensure face mask edges are not rippled or distorted.
 - Check rings and clamps securing the lens for bends or bulges in the metal.
 - Check for missing mounting clips and cracked, scratched, or loose-fitting lenses.
- Head Strap/Harness
 - Check webbing for breaks.

- Look for deterioration of elasticity or fraying edges.
- Inhalation and Exhalation Valves
 - Ensure the valve and valve seat are free of dust particles or dirt that may cause a poor seal or reduce efficiency.
 - Check the exhalation valve to ensure that it is properly located and that the valve cover is in place.
 - Test the exhalation valve. Block the air intake opening and exhale gently. If the exhalation valve is not working properly, a heavy blow-by will be felt at the temples. Inhale and a partial vacuum will be formed.
- Regulator
 - Check the regulator, breathing-tube threads, pressure gauge, and bypass and mainline valves for impact damage.
 - Store with the cylinder valve completely closed.
 - Bleed off air remaining in the regulator after each use, following manufacturer's instructions.
- Breathing Tube
 - Stretch the breathing tube and check for cracks, tears, abrasions, and punctures.
 - Check gaskets.
 - Check clamps and rings to ensure that they are tight, properly located, not dented, and not excessively corroded.
- Air Supply System
 - Inspect the air-supply hose and end-fitting attachments for breaks, cracks, or kinks.
 - Test the tightness of connections.
 - Ensure the proper operation and condition of all regulators, valves, and other airflow devices.
 - Monitor the operation of air-purifying elements and carbon monoxide or high-temperature alarms.
 - Check seams in the suit or blouse for rips and tears.
 - Ensure that protective screens are intact and fit correctly over the face mask (abrasive blasting hoods and blouses).
- High-Pressure Hose
 - Check the hose for cracks, cuts, bubbles, and abrasions.
 - Check the fitting between the high-pressure hose and the regulator for damage.
- Cylinder
 - Inspect for cuts or gouges that can cause the unravelling

of the composite fibers of the cylinder overwrap.

- Check unwrapped cylinders for impact damage.
- Check for evidence of exposure to heat. Look for discoloured paint or melted gauge lenses.
- Air pressure readings on storage bottles shall be at 75% or greater prior to each use.
- Escape pack cylinders shall be 100% full prior to entry into a confined space or potentially hazardous atmosphere (see *Health & Safety Management System Element 14.13: Confined Spaces*, Section 4).
- Audible alarm
 - Check the audible alarm for damage.
 - Ensure that the alarm is working. If the alarm does not go off when the pressure reaches 20-25% of service time, the unit is defective. Remove the unit from service.
- Backpack
 - Inspect the straps of the backpack for excessive wear, broken stitching, and damaged or missing hardware.

Facial Seal

- SCBA require an effective facial seal for safe use.
- Respirators requiring a tight fit in order to perform effectively shall not be worn when an effective seal to the face of the user cannot be achieved and maintained.
- Workers wearing these respirators shall be clean shaven where the face mask of the equipment seals to the skin of the face and shall adhere to the facial hair standards (see Figure 2). Note: The red area is the face mask seal surface. No hair is permitted in this area.
- Side arms on eyeglasses or any other materials such as hair, cloth, tissue, straps, or jewellery shall not pass between the face and the sealing surface of the face mask or interfere with the seal of the tight-fitting face mask to the face or with the operation of the respirator.
- Other personal protective devices or equipment shall not interfere with the seal of the face mask to the user's face.

Figure 2: Facial Hair Standards



- The respirator user shall perform a pre-use inspection of the respirator to ensure it is in proper operating condition with an air tight seal, a functional exhaust valve, and an intact lens seal. Immediately after donning the respirator the user shall conduct the following seal checks:
 - Positive Pressure Seal Check
 - Close off the exhalation outlet with the palm of the hand (see Figure 3);
 - Exhale gently to slightly inflate the face mask; and
 - Hold the breath for 10 seconds.
 - If the face mask puffs away from the face slightly and no outward leakage is detected, the respirator fit is adequate.
 - If outward leakage is detected the respirator fit is inadequate.

Figure 3: Positive Pressure Seal Check

Cover exhalation
valve and try to
exhale



- Negative Pressure Seal Check
 - Remove the cartridges and close off the inlets with the palm of the hand (see Figure 4);
 - Inhale gently to slightly collapse the face mask; and
 - Hold the breath for 10 seconds.
 - If the face mask remains collapsed and no inward leakage is detected, the respirator fit is adequate.
 - If inward leakage is detected the respirator fit is inadequate.

Figure 4: Negative Pressure Seal Check

Cover inlets
and try to inhale



Cleaning

- All SCBA equipment shall be maintained in a clean and sanitary condition and shall be cleaned using a disinfectant cleaner following each daily use.
- Do not clean SCBA with solvents.
- Wash hands before cleaning the SCBA to protect it from further contaminants.
- Disassemble the SCBA removing backpack, cylinder, and regulator assembly. Take care not to lose any seals or washers that may be in place with the filters or cartridges. If required, consult the written instructions that came with the mask.
- Face Mask
 - Hand-wash the face mask in warm water with a mild dish detergent or a combination of detergent and disinfectant. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
 - Individually wrapped respirator cleaning wipes and respirator cleaning kits are also available, if required.
 - To rinse, run clean water through the mask by placing the palm of the hand over the breathing tube connector on the exhalation-valve body; or rinse once with a disinfectant and once with clean water. The clean water rinse removes excess detergent or disinfectant that can cause skin irritation or dermatitis.
 - Wash the breathing tube separately and allow to air dry. If it is permanently attached to the face mask, allow the breathing tube to dry for several days before using.
 - Hand-dry the mask with a clean lint-free cloth, or air-dry it away from direct sunlight and direct sources of heat on a rack or clean surface. Position the mask so that the face mask rubber will not set crookedly as it dries.
- Once all components are dry, reassemble the SCBA.
- Test the SCBA to ensure all components work properly.
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- Clean bells or whistles of audible alarm.
- Wipe the regulator, high-pressure hose, audible alarm, air cylinder, backpack, and harness with a damp cloth.
- Dry with a cloth.

Storage


- Proper storage of SCBAs helps to maintain their protective qualities. Keep your SCBAs in good condition so they can protect you.
- Heat, ultraviolet light, and certain chemicals can damage respiratory protection. Store SCBAs in a place where they will not be subject to:
 - Direct sunlight.
 - Chemicals.
 - Temperature extremes.
- Store SCBAs so they are protected from dirt, moisture, vermin, and potential damage from other objects.
- 10.5.4 Storage of Cylinders Not in Current Use
- Cylinders not in current use or in long-term storage shall be stored at reduced pressure in the vertical position with the valve up (never inverted). Reduced pressure and vertical storage both reduce the extent of corrosion.
- Cylinders shall be stored indoors in a warm, dry environment.
- Unpressurized cylinders shall be stored with the main valve closed.

Maintenance

- SCBAs and escape packs shall be shop tested and tanks shall be hydrostatically tested at intervals as per Table 1.

Specific Equipment	Type of Test	Test Interval
face mask & exhaust valve	visual & air test	prior to each use
regulators	bench test	2 years
high pressure bottles	hydrostatic test	after 3 years; then every 2 years after
complete harness, mask, & hoses	visual inspection	prior to each use
	bench test & certification	2 years

- Only trained, manufacturer-certified personnel shall

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	Monitor: Director, Health, Safety & Environment	SWP #: 4.10

	<p>maintain SCBAs.</p> <ul style="list-style-type: none"> • Do not mix parts from different manufacturers. • Do not mix demand and pressure-demand face masks and regulators. • Damaged or questionable components on any SCBA shall not be used by any worker and shall be reported immediately to the manager. • Damaged or questionable SCBAs, less the storage cylinder, shall be sent for repair and testing at an approved facility before being returned to service. • Maintain a complete record for each SCBA face mask and cylinder.
9 Documentation	<ul style="list-style-type: none"> • Form 6.2: Approved HSE Equipment Purchasing List

Development

Name	Position	Date
Prepared by: J. Clark	Environmental Analyst	Oct. 21, 2014
Reviewed by: A. Crowther	Health & Safety Coordinator	May 10, 2016
Approved by: E. Smith	Director, Health, Safety & Environment	Jul. 11, 2016

Revision History

#	Revised Sections	Description of Revisions	Revised by (name, position)	Approved by (name, position)	Issue Date
01					
02					
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04					
05					
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07					