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PANTHER™

Self-Contained Breathing Apparatus (SCBA)

Product Specification Sheet

I. Purpose

To establish minimum standards for open-circuit self-contained breathing apparatus (SCBA).

II. Type

The open-circuit self-contained breathing apparatus covered by this specification shall be of the type using compressed air.

III. Approvals

A. The apparatus shall be certified by the National Institute for Occupational Safety and Health (NIOSH) under Title 42, Part 84 of the Code of Federal Regulations for 30-, 45-, or 60-minute rated service life and for storage at temperatures between -30°F and 160°F.

B. The apparatus shall be compliant with all performance requirements of the National Fire Protection Association's 2002 edition of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire and Emergency Services.*

C. All electronic components shall be certified as intrinsically safe per UL 913 for use in Classes I, II, III, Division 1, Groups A through G hazardous locations.

IV. Facepiece

The TwentyTwenty Plus facepiece shall:

A. Be constructed (in the rims, Air Klic, and nozzle cover) of a super-tough material that will withstand a 30-foot drop onto concrete without sustaining breakage. The bottom of the nozzle cover shall have a molded lip to serve as an anchor point for flash hoods. the nozzle cover shall have two openings through which the Heads-Up Display (HUD), mounted on the second stage regulator, may be easily viewed by the user. Two wireforms that attach at the juncture of the upper and lower facepiece rims shall be available as an option, providing two additional flash hood anchor points.

B. Be available in silicone rubber in three color-coded sizes to fit various facial shapes and sizes. The facepiece shall have a mask skirt sealing area of not less than 1½" in width.

C. Contain a replaceable, non-shatter-type, polycarbonate, single-curve, conical-shaped lens located to provide a satisfactory field of vision. The lens shall be coated on the outside and inside surfaces to help prevent abrasion. The lens shall be secured in the facepiece by a durable plastic retainer. The lens shall have anti-fog appliqués installed on the exterior of each side of the flat surface at the bottom of the lens.

D. Allow air to enter the facepiece in a manner that will reduce the possibility of moisture accumulation on the lens.

E. Employ an adjustable 5-strap silicone rubber headband assembly held in place by buckles designed to prevent inadvertent loosening. An optional 5-strap Headnet™ mesh-style assembly shall be available and shall be interchangeable with the silicone rubber headband. It shall be necessary to tighten the chin straps and the temple straps to secure the Headnet to the face. The top strap shall be stationary. All straps for both the silicone headband assembly and the Headnet shall be attached to the rim of the facepiece, rather than the silicone skirt, to reduce distortion of the sealing surface when tightened.

F. Contain an easily removable exhalation module which employs a natural rubber exhalation valve designed for easy cleaning.

G. Utilize a Kapton® material speaking diaphragm which is retained by the facepiece nozzle and is easily removable for cleaning and maintenance.

H. Have field-replaceable components throughout.

I. Employ a factory-installed, removable nose cup for use below 32°F. The nosecup shall be able to be removed and re-installed without special tools. The nosecup shall be available in three sizes.

J. Have provision for mounting corrective lenses inside the facepiece. The corrective lens kit shall not require tools for installation.

K. Have a removable adapter (Air Klic), onto which the second stage regulator attaches, which has an opening that is small enough to be easily covered by one hand for a negative pressure fit check.

V. Regulator System, Intermediate Pressure Hose, and RIC UAC

The regulator system shall be designed to operate in two independent stages. The first stage reducer shall be mounted directly on the cylinder valve. There shall be no hoses or links carrying high pressure except for the hose joining the first stage regulator and the transducer module, or the optional pressure gauge line. The second stage shall be designed to provide positive pressure during an NFPA breathing machine test at 70 psi inlet pressure.

A. If the first stage regulator is Panther-style, it shall:

1. Contain an overpressurization relief valve designed to vent relief pressure to the atmosphere should failure of the regulator's primary elements occur.

2. Contain a pressure-reducing valve to reduce pressure from the cylinder to 80-150 psig. The reducing valve assembly shall be a balanced valve design and shall provide uniform flow performance throughout the full cylinder pressure range. This valve shall have a sintered metal inlet filter to retain particles of 120 microns or greater, shall be in an open position against the high pressure inlet, and shall seat in the direction of air flow.

3. Be attached to a CGA handwheel with a threaded stainless steel core, color-coded to denote low or high pressure systems. This handwheel shall secure the first stage regulator assembly to the cylinder valve.

4. Incorporate a Rapid Intervention Crew/Company Universal Air Connection (RIC UAC). The RIC UAC shall be an integral component of the forged body of the first stage regulator. The RIC UAC system shall consist of a male fitting, a dust plug, and a relief valve designed to vent excess pressure during filling operations. The relief valve shall be designed to activate at the correct pressure in 2216, 3000, and 4500 psig versions.

5. Utilize a fill hose with a mating female fitting, which shall be purchased as a separate item and shall not be deemed part of the RIC UAC; it shall be available as a 10-foot component of the UAC Rapid Intervention Kit, or as separate 4-, 10-, and 20-foot hoses.

6. Incorporate quick-disconnect fittings on the fill hose and the RIC UAC assembly, which shall be able to be coupled and uncoupled with pressure in the fill hose and with the SCBA activated. The RIC UAC system shall accomplish fully filling a 30-minute SCBA cylinder in approximately 45–60 seconds.

B. If the first stage regulator is Mark 2-style, it shall:

1. Contain an automatic back-up system to permit flow of air at a controlled pressure from the cylinder through the regulator should failure of the regulator’s primary elements occur. The flow passage shall be integral to the regulator and designed to feed relief pressure through the regulator, providing continuous uninterrupted operation with no air loss to the user.

2. Contain a pressure-reducing valve to reduce pressure from the cylinder to 80-150 psig. The reducing valve assembly shall be a balanced valve design and shall provide uniform flow performance throughout the full cylinder pressure range. This valve shall have a screen metal inlet filter to retain particles of 30 microns or greater, shall be in an open position against the high pressure inlet, and shall seat in the direction of air flow.

3. Be attached to a CGA handwheel with a threaded stainless steel core, color-coded to denote low or high pressure systems. This handwheel shall secure the first stage regulator assembly to the cylinder valve.

4. Incorporate a Rapid Intervention Crew/Company Universal Air Connection (RIC UAC). The RIC UAC shall be mounted between the CGA handwheel and the first stage regulator. The RIC UAC shall consist of a male fitting, a dust plug, and a relief valve designed to vent excess pressure during filling operations. The relief valve shall be designed to activate at the correct pressure in 2216, 3000, and 4500 psig versions.

5. Utilize a fill hose with a mating female fitting, which shall be purchased as a separate item and shall not be deemed part of the RIC UAC; it shall be available as a 10-foot component of the UAC Rapid Intervention Kit, or as separate 4-, 10-, and 20-foot hoses.

6. Incorporate quick-disconnect fittings on the fill hose and the RIC UAC assembly, which shall be able to be coupled and uncoupled with pressure in the fill hose and with the SCBA activated. The RIC UAC system shall accomplish fully filling a 30-minute SCBA cylinder in approximately 45–60 seconds.

C. The second stage regulator shall:

1. Be constructed of a super-tough material that will withstand a 30-foot drop onto concrete without sustaining breakage. The upper portion of the regulator, including the shutoff button, shall be covered by a rubber boot for impact absorption.

2. Be a "pilot valve" type. It shall contain a spring-biased diaphragm, responsive to respiration demand, to actuate a pilot valve which, in turn, operates a flexible main valve to meet the user's flow demand during inhalation.

3. Reduce pressure from 80-150 psi to .036-.054 psi.

4. Produce a static pressure in the facepiece of 1.0 to 1.5 inches of water.

5. Contain a 40-mesh metal screen filter at the outlet port to prevent entrance of particles into the regulator.

6. Contain a bypass valve that provides a separate flow path around the regulator primary demand valve. In the event of a failure or blockage of the primary, the bypass valve shall be operable by either of the user's gloved hands.

7. Employ a two-point fastening system which allows the regulator to be quickly mounted into the facepiece in any orientation by pushing and turning the regulator until the two fasteners attach to the facepiece adapter. The regulator shall remain secured to the facepiece should one of the fasteners inadvertently be released.

8. Employ a first-breath-on feature which allows the user to actuate regulator flow by inhaling after the regulator is secured to the mask.

9. Contain a safety override button which allows the wearer to manually start the regulator flow.

10. Not obstruct the wearer's downward vision.

11. Contain a manual shutoff button located directly in front of the top release button to prevent loss of air after removal from the mask.

D. The second stage regulator intermediate pressure hose shall:

1. Be attached to the second stage regulator with a swivel connector.

2. Attach to the first stage regulator intermediate pressure hose—if the SCBA is equipped with a PASS device—by a swivel connector that has a limited swivel range of 90°. If no PASS device is installed, the intermediate pressure hose shall not employ a swivel connector between the second stage regulator and the first stage regulator.

3. Contain a metal screen inlet filter to retain particles of 120 microns or greater.

VI. Primary Audible Alarm

The user shall have the option of choosing either a continuous whistle alarm, a warbling whistle alarm, or a bell alarm.

A. The continuous whistle alarm and the warbling whistle alarm shall be mounted on the first stage regulator and shall be air-actuated, automatically operating when air pressure in the supply cylinder reaches approximately 25% of original full pressure. The alarm flute shall be downward-facing, so as to prevent blockage. The alarm shall have a metal shroud to further prevent blockage. Both alarms shall work off intermediate pressure (the pressure after reduction by the first stage regulator) and shall have a discrete start, rather than a "ramping up" effect, with constant performance across the pressure range. They shall operate without interruption until the cylinder pressure reaches approximately 100 psig. The continuous whistle alarm shall be a continuous tone. The warbling whistle shall incorporate a "shuttling piston" to create a distinctive chirping effect through frequency variations, so that the alarm is easily differentiated from other sounds in the user's proximity.

B. The bell alarm shall be mounted on the first stage regulator and shall be an air-actuated, self-cocking, continuous ringing bell, automatically operating when air pressure in the supply cylinder reaches approximately 25% of original full pressure.

VII. Heads-Up Display (HUD) and Secondary (Redundant) Alarm

The SCBA shall incorporate an electronic visual alarm system that informs the user of remaining cylinder pressure and acts as a redundant end-of-service-time indicator (EOSTI). The HUD shall:

A. Utilize a transducer module to sense cylinder pressure and generate an electronic signal to the HUD module. The transducer module shall be joined to the first stage via a high pressure, low volume hose. The first stage regulator shall incorporate a restrictor that limits leakage to a maximum of 15 liters per minute should the hose be severed.

1. The transducer module shall utilize a 2/3-A lithium battery to power the transducer and the HUD module. The battery compartment shall be easily accessible via a spring-loaded, slotted cap, which can be removed or secured by using a coin. The battery shall last a minimum of one year if the SCBA is used for 30 minutes a day. A picture of the correct battery orientation within the transducer module shall be molded into the exterior of the transducer module.

2. An amber LED shall be mounted on the transducer module to indicate battery status prior to activating the SCBA. The battery status indicator shall flash once every 10 seconds to indicate a “battery OK” mode, once every two seconds to indicate a low battery mode, and not at all to indicate a dead battery. When the low battery mode initiates, a minimum of 8 hours of battery life shall remain. The amber LED on the transducer module no longer shows battery status once the cylinder valve has been activated.

3. The transducer module shall be mounted on the cylinder band and shall incorporate an extension onto which a remote alarm module for the integrated PASS device may be installed.

B. Utilize an electronic cable, routed through a protective sleeve over the left shoulder strap, to join the transducer module to the HUD module.

C. Utilize a silicone extrusion to fully encapsulate the intermediate pressure hose and the electronic cable between the swivel connector at the PASS device (if so outfitted) and the second stage regulator. If a PASS device is not installed, the extrusion shall extend from a point just above the transducer module to the second stage regulator.

D. Incorporate a HUD module mounted to the second stage regulator. When docked in the Air Klic in the facepiece, the HUD module and second stage regulator shall align with the openings in the facepiece nozzle cover so that the user shall have an unobstructed view of the HUD while wearing the facepiece. The HUD module shall contain a “gas gauge”-style, wide-span LED display of pressure remaining. The HUD module shall:

1. Incorporate an amber LED to inform the user of a low battery condition. When the low battery mode initiates, signified by the flashing of the amber LED, a minimum of 8 hours of battery life shall remain.

2. Contain four green LEDs. When the pressure in the cylinder is full and the cylinder valve is activated, all four green LEDs shall be lit. All four shall be continuously lit until 75% of full pressure remains. At 75% pressure remaining, the fourth green LED shall no longer be lit; the remaining three green LEDs shall be lit. All three shall be continuously lit until 52% of full pressure remains. At 52% of full pressure, the third and fourth green LEDs shall no longer be lit; the remaining two green LEDs shall be lit. At 50% pressure remaining, the second green LED shall flash for 20 seconds to indicate that the 50% level has been reached. After 20 seconds of flashing, the second green LED shall return to a continuous mode, and the two LEDs shall be continuously lit until 27% of full pressure remains. At 27% pressure remaining, the second, third, and fourth green LEDs shall no longer be lit; the remaining green LED shall be lit. At 25% pressure remaining, the remaining LED shall change color to red and shall commence flashing to indicate that the 25% level has been reached. This

flashing red LED shall serve as the redundant EOSTI. The red LED shall flash continuously until 10% of full pressure remains. At 10% pressure remaining, the red LED shall commence flashing significantly faster to indicate that the 10% level has been reached. The red LED shall flash continuously until all the air in the cylinder has been consumed. At that point, all LEDs shall flash simultaneously several times; then no LEDs shall be lit.

3. Incorporate a red flashing LED on the front of the exterior of the module to inform other personnel within eyesight that the user has reached the 25% and 10% low air levels. The exterior LED shall flash significantly faster to indicate that the 10% level has been reached.

4. Utilize a photodiode on the top of the exterior of the module to brighten or dim the HUD pressure level LEDs in relation to the ambient light level. In bright ambient light conditions, the LEDs shall operate in the bright setting so that they can be easily seen. In low-light or no-light conditions, the LEDs shall operate in the dim setting so that they are not distracting to the user.
5. Use photoluminescent labels to identify Full ("F"), "¾," "½, "¼," and the low battery icon.

VIII. Cylinder

A. The volume of the 30-minute cylinder shall be approximately 45 cubic feet when filled to 2216 psig or 4500 psig pressure and shall conform to the DOT approval or exemption numbers listed in section G below.

B. The volume of the 30-minute cylinder shall be approximately 60 cubic feet when filled to 3000 psig pressure and shall conform to the DOT exemption numbers listed in section G below.

C. The volume of the 45-minute cylinder shall be approximately 66 cubic feet when filled to 4500 psig pressure and shall conform to the DOT exemption numbers listed in section G below.

D. The volume of the 60-minute cylinder shall be approximately 87 cubic feet when filled to 4500 psig pressure and shall conform to the DOT exemption numbers listed in section G below.

E. The cylinder shall contain a closing valve which incorporates a pressure gauge to indicate the cylinder pressure at all times. The handwheel shall be at a 90° angle from the longitudinal axis of the cylinder.

F. The cylinder shall be either an all-aluminum, fully wrapped, or hoop-wrapped design. Wrapped cylinders shall be constructed of a deep-drawn, seamless aluminum liner wound with high-strength fiberglass or carbon filaments impregnated with epoxy resin.

G. Cylinders, less air and cylinder valves, shall not exceed the following weights:

1. 30-minute, all-aluminum, 2216 psig: 17.3 lb (DOT-3AL).
2. 30-minute, fiberglass hoop-wrapped, 2216 psig: 11.8 lb (DOT-E-7235).

3. 30-minute, fiberglass fully wrapped, 2216 psig: 9.4 lb (DOT-E-8059/9634).
4. 30-minute, carbon fully wrapped, 2216 psig: 6.7 lb (DOT-E-10915).
5. 30-minute, carbon fully wrapped, 3000 psig: 9.3 lb (DOT-E-10915).
6. 30-minute, fiberglass hoop-wrapped, 4500 psig: 11.5 lb (DOT-E-9894).
7. 30-minute, fiberglass fully wrapped, 4500 psig: 10.3 lb (DOT-E-8059/9634).
8. 30-minute, carbon fully wrapped, 4500 psig: 6.4 lb (DOT-E-10915).
9. 45-minute, carbon fully wrapped, 4500 psig: 8.6 lb (DOT-E-10915).
10. 60-minute carbon fully wrapped, 4500 psig: 11.6 lb (DOT-E-10915).

IX. Cylinder Valve

A. The cylinder valve shall be fitted with a two-sided luminous boldface dial-type gauge with rubber and metal protective guards. The cylinder valve body shall be permanently coated to prevent galling and corrosion.

B. The cylinder valve shall have as an option a large rubber-coated handwheel with a safety locking collar device to keep the handwheel locked open during use.

C. The cylinder valve outlet shall conform with the Compressed Gas Association (CGA) standard for threaded connection: for low pressure, number 346; for high pressure, number 347.

X. Harness and Backpack

The harness and backpack shall be available in a configuration called the MightyLight® backpack. The backpack and harness assembly shall weigh approximately 4 pounds. No tools shall be necessary to replace any harness components. No adhesives shall be necessary to secure any replaceable components. The backpack harness shall be readily adjustable for various wearer sizes, and shall include the following components:

A. Harness straps of Kevlar®/Nomex® composite construction to provide maximum resistance to high temperatures, flame, and abrasion. The harness shall have a coating to prevent the straps from becoming limp. The shoulder straps shall have thick, Kevlar/Nomex-covered neoprene padding attached for user comfort and shall have snap-open hose loops for ease of maintenance. All harness straps shall secure to the backpack without fasteners, utilizing the WedgeLock™ style of attachment.

B. A two-piece Kevlar/Nomex waist strap, adjustable from both sides, with a front-release metal automotive-style belt buckle. The waist strap shall be tightened by pull-forward-style straps.

C. A waist-strap-mounted holder for the second stage regulator so that the regulator may be kept actuated in a stand-by mode during use, and so that the regulator may be stored protected from the environment when not in use. The holder shall have a provision for relief of excess pressure when the regulator is actuated, and it shall have a vacuum breaker to prevent the regulator from being accidentally actuated upon removal from the holder.

D. A fiber-reinforced, flame- and heat-resistant polymer backplate contoured to the user's back. The backplate shall incorporate a friction pad in the tank band area to help keep the cylinder in the proper position.

E. A tubular stainless steel cylinder support and an adjustable Kevlar/Nomex cylinder band to properly secure various sizes of cylinders. The cylinder band shall be secured to the backpack with a cam-over style buckle that attaches to a spring-loaded catch.

F. A thick, Kevlar/Nomex-covered, neoprene-padded (4 inches minimum) lumbar support for user comfort and safety.

G. Fiber-reinforced, flame- and heat-resistant polymer hinged and padded "wings" to position the backpack comfortably and securely on the hips and to stabilize the backpack during movement.

H. A snap hook-style mask hanger situated on the right or left shoulder strap for attachment of the facepiece in a convenient, protected, stand-by position.

XI. Buddy Breather and Auxiliary RIT Connection

A. A buddy breather shall be available as an optional accessory. It shall utilize a two-step, push-pull, female quick-disconnect fitting designed to prevent accidental release. The female quick-disconnect fitting shall be attached at the terminus of a separate intermediate pressure hose routed over the right shoulder strap. A separate male plug with a pressure shutoff shall be located adjacent to the female quick-disconnect fitting. The “buddy” shall attach his mating male fitting to the buddy breather female quick-disconnect fitting or his mating female fitting to the buddy breather male fitting in order for both users to share the remaining air supply in both cylinders.

B. As a separate option, an auxiliary connection utilizing the same two-step, push-pull, female quick-disconnect fitting used in the buddy breather described above shall be available at the bottom of the integrated PASS device housing. This can be used for conventional supplied air; for accepting a remote air supply from a Rapid Intervention Team; or, in conjunction with the buddy breather described above, for “daisy chaining” multiple users.

XII. Carrying Case

If specified, a molded carrying case shall be provided to retain the complete apparatus and instruction card or booklet. The carrying case shall have replaceable front latches.

XIII. Instruction Card or Booklet

An instruction card or booklet shall be provided with each apparatus. Instructions shall contain complete operation and maintenance procedures.

XIV. Warranty, Flow Test, and Overhaul Cycle

A. The apparatus shall carry a limited warranty of not less than twelve (12) years, with the exception of the cylinder, which shall carry a limited warranty of not less than fifteen (15) years, the first stage regulator, which shall carry a limited warranty of not less than the lifetime of the SCBA, and the HUD, which shall carry a limited warranty of not less than two (2) years. Other electronic accessories may carry limitied warranties of different durations.

B. An annual flow test shall be done by a Survivair-certified technician to meet the requirements of NFPA 1852. A periodic overhaul shall be done by a Survivair-certified technician to meet the requirements of NFPA 1852. The overhaul cycle for the apparatus, including the regulators, shall be a period of not less than six years.

XV. Accessories

The following NIOSH-certified accessories shall be available for the apparatus:

A. Supplied air attachment.

B. Anti-fog solution.

C. Radio communication system.

D. Mask-mounted voice amplification system.

E. Integrated PASS device.

F. Remote alarm module for integrated PASS device.

G. Chest-mounted analog gauge.

H. Chest-mounted analog gauge with visual alarm.

I. Chest-mounted digital gauge with visual alarm and electronic audible alarm.

J. Haz-mat suit pass-through fitting.

K. Neck strap.

L. Chest strap.

M. APR adapter.

N. CN/CS adapter.

O. Escape filter canister (not NIOSH-certified).