



A Division of Bacou USA Safety, Inc.

## TECHNICAL BULLETIN

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### COLD WEATHER OPERATION SIGMA, OMEGA, SECOBA, LO-PRO, MARK 3, MARK 2, MARK 1, XL-60, XL-30, AND S-30

#### INTRODUCTION

SURVIVAIR has issued Technical Bulletins #56 and #88 regarding the use of SCBA in cold weather operations. NIOSH also issued a user letter dated 1/15/92 providing similar cold weather use information. Nevertheless, users have indicated that further information on use and maintenance of SCBA in cold weather conditions would be valuable. **Please provide the following information to users of SURVIVAIR SCBA.**

#### SAFETY PRECAUTIONS

The Warnings, Cautions, and Notes contained in this bulletin have the following significance:

##### \*\*\*\*\*WARNING\*\*\*\*\*

Maintenance or operating procedures and techniques that will result in personal injury or death if not carefully followed.

##### CAUTION

Maintenance or operating procedures and techniques that will result in damage to equipment if not carefully followed.

##### NOTE

Maintenance or operating procedures and techniques or information considered important enough to emphasize.

#### COLD WEATHER OPERATION AND MAINTENANCE

1. Operation of SURVIVAIR SCBA in cold weather, 32°F (0°C) or colder, requires the user to be aware of the potential problems caused by the combination of moisture and low temperatures.

**\*\*\*\*\*WARNING\*\*\*\*\***

- **Moisture entering the regulator system, either from moisture in the cylinder air or by external means, e.g., overspray during fire fighting operations or inclement weather conditions, may cause the regulator system to freeze up, restricting or stopping air flow to the user, and resulting in serious injury or death.**
- **Recharge the cylinders with Grade D or better air conforming to Compressed Gas Association Specification G7.1. Moisture content, expressed as dewpoint, must be maintained at -65°F (-53.9°C) or lower, or less than 24.0 ppm by volume. Air exceeding this moisture content may cause the regulator system to freeze up, restricting or stopping air flow to the user, and resulting in serious injury or death to the user.**

**NOTE**

- Moisture can cause regulator system freezing problems even if the ambient air temperature is above freezing. The air flowing from the SCBA cylinder through the regulator system decreases from cylinder pressure to near atmospheric pressure very rapidly. As this pressure decreases, the air rapidly expands, causing the air and therefore the regulator to cool.
  - Although the ambient temperature may be above 32°F (0°C), the temperature inside the regulator system may be considerably below freezing.
2. SURVIVAIR recommends that SCBA be stored at temperatures above 32°F (0°C). SCBA stored at temperatures below 32°F (0°C) may need to be warmed to at least 32°F (0°C) prior to use if ice has formed on the low pressure alarm, facepiece exhalation valve, AIR KLIC, and/or quick-disconnects.
  3. SURVIVAIR recommends a "change of season" inspection and increased attention to preventive maintenance during cold weather conditions. The following recommended inspections and procedures will help prevent cold weather problems; however, cold weather conditions may also cause other problems not listed below.
    - 3.1. Air Supply

## **NOTE**

Cold weather conditions require very dry air. Moisture entering the SCBA may cause icing and equipment malfunction.

- 3.1.1. Test compressor(s) for air quality and dew point prior to the cold season.
  - 3.1.2. Recharge cylinders with Grade D or better air conforming to Compressed Gas Association Specification G7.1. Moisture content, expressed as dew point, must be maintained at -65°F (-53.9°C) or lower, or less than 24.0 ppm by volume.
  - 3.1.3. Prevent any moisture from entering the SCBA.
  - 3.1.4. Remove ice and water from cylinder valve threads prior to filling in cold weather conditions.
- 3.2. Facepiece and Exhalation Valve, All SCBA and SAR Models

## **NOTE**

Because the XL SAR regulator and exhalation valve are one unit, testing the exhalation valve is sufficient to determine whether there is dangerous icing in the air system.

- 3.2.1 Protect the facepiece from moisture during cold weather conditions to reduce ice formation on the lens, in the exhalation valve, and in the AIR KLIC of SIGMA-style facepieces.
  - 3.2.2 Prior to donning the facepiece in cold weather, inspect for ice on the lens, in the exhalation valve, and in the AIR KLIC of SIGMA-style facepieces.
  - 3.2.3 Melt the ice by placing the facepiece under clothing near the body.
  - 3.2.4 Ice in the exhalation valve may be melted by breathing on it at least six or eight times.
  - 3.2.5 Don the facepiece as specified in the Donning section of the SCBA operation manual.
  - 3.2.6 Verify proper function of the exhalation valve by performing a positive pressure exhalation test and a negative pressure leak check as follows.
- 3.2.7 Perform a positive pressure exhalation test:
- 3.2.7.1 Take a deep breath and place your hand over the AIR KLIC of SIGMA-style facepieces; place your hand over the quick-disconnect end of the low pressure hose of MARK 2 or XL-style facepieces.
  - 3.2.7.2 Exhale normally. If the exhalation valve does not function properly, remove the facepiece.

3.2.7.3 Breathe on the exhalation valve at least six or eight times to melt the ice.

3.2.7.4 Reposition the facepiece, check the straps, and repeat the test.

3.2.7.5 If the exhalation valve continues to malfunction, remove the facepiece from service.

3.2.7.6 Have the facepiece inspected and/or repaired by a SURVIVAIR-certified repair technician before use.

3.2.8. Perform a negative pressure leak check:

3.2.8.1 Place your hand over the AIR KLIC of SIGMA-style facepieces; place your hand over the quick-disconnect end of the low pressure hose of MARK 2 or XL-style facepieces.

3.2.8.2 Inhale and hold your breath for a few seconds. The facepiece should remain collapsed on your face for several seconds without leaking.

3.2.8.3 If the facepiece leaks, breathe on the exhalation valve at least six or eight times. Reposition the facepiece, check the straps, and repeat the leak check.

3.2.8.4 If the facepiece continues to leak, remove it from service.

3.2.8.5 Have the facepiece inspected and/or repaired by a SURVIVAIR-certified repair technician before use.

3.2.9 After the leak checks, verify again that the facepiece, lens, AIR KLIC, and exhalation valve are ice-free.

\*\*\*\*\*WARNING\*\*\*\*\*

**Move to a safe area before removing the facepiece for inspection.**

3.2.10 If the ambient temperature is near or below freezing, place the facepiece and regulator under clothing to keep it warm in case immediate use is necessary.

3.3. Second Stage Regulator, SIGMA-style

\*\*\*\*\*WARNING\*\*\*\*\*

- Ice on the second stage regulator AIR KLIC buttons or the facepiece AIR KLIC adapter may prevent the regulator from being properly engaged.**
- Ensure that the regulator release buttons are properly engaged in the AIR KLIC by rotating and tugging the regulator. Do not inadvertently press the AIR KLIC buttons. This may cause the second stage regulator to loosen or fall out.**

3.3.1 Protect the second stage regulator from moisture during cold weather conditions to avoid ice build-up on its exterior surfaces. Ice can interfere with the emergency bypass or the AIR KLIC buttons.

3.3.2 Inspect the external surfaces of the regulator for ice prior to use.

3.3.3 Melt the ice by placing the regulator under clothing near the body.

3.3.4 Inspect the regulator again for ice, then check the red bypass knob and the AIR KLIC buttons for proper function.

3.3.5 If ice forms on the regulator while it is engaged in the facepiece, the regulator will continue to function properly. When it becomes necessary to remove the regulator, rotate it to break the ice and remove the regulator from the facepiece.

\*\*\*\*\*WARNING\*\*\*\*\*

**Move to a safe area before removing the facepiece.**

3.3.6 If the AIR KLIC buttons are frozen and the regulator cannot be removed, do not force the buttons. Move to a safe area, press the gray regulator shutoff button, and remove the facepiece and regulator as a unit.

3.3.7 If the gray shutoff button does not function, turn off the air supply at the cylinder valve and remove the facepiece and regulator as a unit.

3.3.8 Warm the facepiece and regulator under clothing until the ice melts and the AIR KLIC buttons and/or the gray shutoff button function normally.

3.3.9 If ice forms on the regulator while it is in the regulator receiver, rotate the regulator to break the ice and remove it from the regulator receiver.

3.3.10 If the AIR KLIC buttons are frozen and the regulator cannot be removed from the receiver, do not force the buttons. Unbuckle the waist belt and warm the belt, regulator receiver, and the regulator under clothing until the AIR KLIC buttons function normally.

### 3.4 Second Stage Regulator, MARK 2-style

3.4.1 Protect the second stage regulator from moisture during cold weather conditions to avoid ice build-up on its exterior surfaces. Ice can interfere with the operation of the emergency bypass and regulator.

3.4.2 Inspect the external surfaces of the regulator for ice prior to use.

3.4.3 If ice is present, melt it by placing the gloved hand over the regulator housing.

3.4.4 Inspect the regulator for ice again, and check the red handwheel and quick disconnect for proper function.

3.4.5 If ice forms on the outside of the regulator pin and nut assembly while the regulator is attached to the facepiece, it will continue to function properly. When

it becomes necessary to remove the facepiece, rotate the pin and nut assembly to break the ice, and remove the hose from the regulator.

3.4.6 Ice forming on top of the second stage regulator may obstruct the ambient vent holes and make it difficult to breathe. Remove the ice by rotating the bypass handwheel back and forth, or melt the ice by placing a gloved hand over the top of the regulator.

3.4.7 If ice forms on the quick connect adapter, the facepiece cannot be properly attached to the regulator. Do not scrape the ice off the quick connect adapter. Melt the ice by warming it in a gloved hand.

### 3.5 Regulator Receiver, SIGMA-style SCBA

3.5.1 During cold weather operation, keep the cover on the regulator receiver to keep out moisture and debris.

3.5.2 Inspect the regulator receiver for ice prior to use.

3.5.3 Remove ice by warming the regulator receiver under clothing near the body.

### 3.6 Cylinder Valve

3.6.1 During cold weather conditions, ice can form on the cylinder valve. Ice may interfere with the cylinder ratchet lock mechanism.

3.6.2 Warm the cylinder valve to melt the ice and return the ratchet lock mechanism to proper working order.

#### \*\*\*\*\*WARNING\*\*\*\*\*

**Do not use direct flame or heat above 160°F (71°C) to melt ice.**

#### NOTE

Remove ice and moisture from cylinder valve threads prior to filling in cold conditions.

### 3.7 Gauge/Alarm, SIGMA-style SCBA

3.7.1 During cold weather conditions, ice can form on the gauge/alarm assembly, obstructing the alarm whistle and causing the alarm to be inaudible.

3.7.2 Verify that the gauge/alarm assembly is free from ice on the gauge face and alarm.

#### \*\*\*\*\*WARNING\*\*\*\*\*

**Do not use the SCBA if there is ice on the gauge face or alarm. Gauge or alarm freeze-up could result in a failure of the user to realize that the SCBA air supply is nearly**

**depleted, causing serious personal injury or death.**

- 3.7.3 Remove any ice on the gauge/alarm assembly prior to returning the SCBA to service.
- 3.7.4 During use, turn the gauge to face the body. Check the gauge/alarm frequently for ice build-up.
- 3.7.5 Periodically check for ice on the whistle cover.
- 3.8 First Stage Regulator and Bell Alarm, MARK 2/MARK 3/SIGMA w/ Bell Alarm
  - 3.8.1 Verify that the bell is vertical above the first stage regulator body.
  - 3.8.2 During cold weather conditions, ice can form on the alarm bell, rendering the alarm inaudible. Break the ice or melt it with a gloved hand.
  - 3.8.3 Ice may obstruct the alarm vent holes and the end of the bell piston, interfering with the operation of the SCBA. Melt the ice with a gloved hand.

**\*\*\*\*\*WARNING\*\*\*\*\***

**DO NOT use the SCBA if there is ice on the alarm. Alarm freeze-up could result in a failure of the user to realize that the SCBA air supply is nearly depleted, causing serious personal injury or death.**

- 3.9 First Stage Regulator/Reducer, SIGMA and SAR's

During cold weather conditions, ice may form on the exterior surfaces of the first stage regulator/reducer.

**\*\*\*\*\*WARNING\*\*\*\*\***

**Use extreme care when changing cylinders. Do not allow ice from the exterior of the first stage regulator to enter the regulator system. Ice entering the regulator system may cause the regulator to freeze up, restricting or stopping air flow to the user, resulting in serious injury or death.**

- 3.10 Audible Alarm, XL-60/XL-30/S-30

- 3.10.1 During cold weather conditions, ice can form on the outer surface of the alarm bell, rendering the alarm inaudible. Break the ice or melt it with a gloved hand.

- 3.10.2 Ice may obstruct the alarm vent holes and the end of the bell piston, interfering with the operation of the SCBA. Melt the ice with a gloved hand.

**\*\*\*\*\*WARNING\*\*\*\*\***

**DO NOT use the SCBA if there is ice on the alarm. Alarm freeze-up could result in a failure of the user to realize that the SCBA air supply is nearly depleted, causing serious personal injury or death.**

3.11 Regulator Assembly, XL-60/XL-30/S-30/MARK 1

3.11.1 Protect the regulator from moisture during cold weather conditions to avoid ice build-up on its exterior surfaces. Ice can interfere with mainline valve operation, don-use lever operation, emergency bypass operation, readability of the pressure gauge, and the attachment of the facepiece low pressure hose.

3.11.2 Inspect the external surfaces of the regulator for ice prior to use.

3.11.3 If ice is present, melt it by placing the regulator under clothing near the body.

3.11.4 Inspect the regulator for ice again; check the mainline and bypass valves for proper function.

3.11.5 If ice forms on the regulator quick-disconnect while the regulator is attached to the facepiece, it will continue to function properly. When it becomes necessary to remove the facepiece, rotate the pin and nut assembly (NFPA SCBA) or the nut (industrial SCBA) to break the ice, and remove the hose from the regulator.

3.11.6 Ice on the regulator outlet will prevent the facepiece from being properly attached to the regulator. Do not scrape the outlet to remove the ice. Melt it by warming.

**\*\*\*\*\*WARNING\*\*\*\*\***

**Prevent moisture from entering the regulator when the hose is not attached by covering the regulator outlet with the cap and chain.**

3.12 Quick-disconnect Fitting, Male Coupling, and Buddy Breather Block Assembly, SIGMA-style.

3.12.1 During cold weather conditions, ice may form on the quick-disconnect fitting, the male coupling, or the buddy breather block assembly.

3.12.2 If the quick-disconnect fitting and the male coupling are connected prior to ice build-up, they will continue to function properly.

3.12.3 If the second stage regulator is not connected at the quick-disconnect fitting, ice formation on either the quick-disconnect fitting or the male coupling can make connection impossible.

3.12.4 Prior to use, inspect the quick-disconnect fitting and male coupling for ice.

3.12.5 Remove or melt the ice, and dry the quick-disconnect fitting and male coupling to avoid moisture entering the regulator.

3.12.6 If the SCBA is equipped with a buddy breather, always keep the blue silicone rubber cap installed on the spare quick-disconnect fitting during cold weather conditions when the buddy breather is not in use.

### 3.13 SCBA Equipped with the Accessory SAR Adapter or the Buddy "Y" Adapter, MARK 2-style

3.13.1 During cold weather conditions, ice may form on the quick-disconnect fittings.

3.13.2 If the quick-disconnect fitting and the male coupling are connected prior to ice build-up, they will continue to function properly.

3.13.3 Always keep the blue silicone rubber cap installed when the female couplings are not in use.

3.13.4 Prior to using the SCBA, inspect the quick-disconnect fitting and the female fitting on the buddy "Y" adapter for ice build-up.

3.13.5 Remove or melt the ice, and dry the quick-disconnect fitting. Avoid allowing moisture to enter the fitting, and ensure that the blue silicone rubber cap is installed.

### 3.14 Training and Use

3.14.1 Conduct training sessions with all equipment and accessories that may be used during actual cold weather operations.

#### **NOTE**

A program for use, training, inspection, record keeping, and maintenance is given in National Fire Protection Association Standard 1404, Fire Department Self-Contained Breathing Apparatus Program.

3.14.2 During cold weather operations, do not place cylinders or SCBA in wet or snowy areas.

3.14.3 Remove ice from the cylinder and clean the threads. Ensure that moisture does not enter the cylinder or accumulate on connecting surfaces.

3.14.4 Icing will be accelerated by high air flow conditions. Examples may include, but are not limited to:

- Bypass usage
- Facepiece leakage due to improper sealing
- Allowing the regulator to free-flow when the facepiece is off
- Improperly maintained equipment

3.14.5 After cleaning, allow the SCBA to dry completely before returning it to storage. Be sure the facepiece exhalation valve is dry before placing the facepiece in storage. Coat the facepiece with SURVIVAIR anti-fog solution, P/N 951015 or 951016.

### 3.15 Accessories

Cold weather conditions may adversely effect the performance of SCBA accessories.

3.15.1 Air line hoses may become stiff.

3.15.2 Ice on quick-disconnect couplers may make them difficult or impossible to connect.

3.15.3 Electrical equipment (e.g., radios, P.A.S.S. devices, and lights) may become more difficult to use in cold temperatures, especially if there is ice.

3.15.4 Use SCBA accessories with extreme care in cold weather conditions. Inspect them periodically for ice.