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**Subject:** SRS COMMENTS ON NIOSH DOCKET 148A - AIR-FED ENSEMBLES  
**Attachments:** SRNS Comments on NIOSH Docket 148A.pdf

The attached document includes Savannah River Nuclear Solutions (SRNS) comments regarding NIOSH docket 148A, "Air-Fed Ensembles".

Sincerely  
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**Savannah River**

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A Fluor Daniel Partnership

October 15, 2009

SRNS-J6000-2009-00050

NIOSH Docket Office  
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Reference: Docket 148A – Air-Fed Ensembles  
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### **COMMENTS ON THE NIOSH AIR-FEED ENSEMBLE PROPOSAL**

Following are comments regarding Docket 148 – A Air-Fed Ensembles, the National Institute for Occupational Safety and Health (NIOSH) proposal dealing with Air Fed Ensembles discussed at the Public Meeting on 9/17/2009. We support NIOSH's efforts at standardizing air fed ensembles and hope the comments prove useful. Should the NIOSH staff have any questions or would like to discuss the comments further, please contact me at 803 952-6521 or via e-mail, [heather.farrer@srs.gov](mailto:heather.farrer@srs.gov).

#### **General comments**

Air-fed ensembles, or supplied-air suits or simply suits as they are referred to within the Department of Energy (DOE), have been used successfully within DOE facilities for over forty years and the approval process is recognized in ANSI Z88.2. These devices have evolved over time and protect workers from airborne and transferable radioactivity, non-radiological agents, the physical effects of working at elevated temperatures caused by ambient conditions as well as the use of protective clothing, and combinations of these conditions. At the Savannah River Site (SRS), well in excess of 200,000 suits have been successfully used - attesting to their effectiveness. It is suggested that suits approved under existing recognized processes be 'grandfathered' within the regulation provided they are used as approved and their fit, form, and function are not altered. This approach is that currently being followed by the DOE as part of the guidance in DOE-STD-1167-2003.

#### **Specific comments on the proposal**

**Section 2.2 Air-fed ensembles; concept description, Paragraph 2** - The proposal discusses use of these devices in Immediately Dangerous to Life and Health (IDLH) environments. Unless provided with a self-contained back-up supply of breathing air, entry into and work in IDLH atmospheres should not be permitted. In general, these devices are designed as a single-use device or a single-use device with reusable components and are not engineered with the degree of protection provided by 30-minute or greater self-contained breathing apparatus (SCBA). Exceptions can be made in situations such as 1) working with chemical or biological agents where the agent presents primarily a contact IDLH hazard, or 2) the agent presents an IDLH hazard via inhalation but is separated from the wearer through alternative containment systems such as a glovebox or inward laminar flow hood. However, unless the device is provided with a self-contained back-up supply, based on the infrequent but occasional loss of air event these devices will experience, entry into and work in IDLH environments should be limited to respiratory protection devices engineered to meet current SCBA criteria.

**Section 2.2 Air-fed ensembles; concept description, Paragraph 3** - The proposed concept states that air shall be distributed to the limbs as well as the torso and the breathing zone. Distribution of air to the limbs is primarily related to comfort rather than respiratory protection. Requiring that the air flow into and out of the limb area continuously can impact the status of devices currently being used successfully. It is suggested that air distribution to the limbs be 1) optional or 2) that the limb areas be allowed to be maintained at positive pressure relative to the work environment (although brief negative excursions are acceptable) but that air does not have to continuously exhaust through the limb areas.

**Section 2.4 Practical Performance, Paragraph 1** - The proposal addresses comfort of the body harness, comfort of the device, and speech transmission. Since NIOSH requires the use of a body harness with hoods it appears this feature is being incorporated in supplied-air ensembles. Use of a harness should be optional provided the design of the device's air distribution system is robust enough that, when used according to approved instructions, it prevents the device from being pulled away from the user in an uncontrolled fashion should the breathing air hose be accidentally pulled. Regarding comfort, defining what is or is not comfortable will be highly subjective and the end-user market will adequately determine if a device will or will not be successful, in large part, based on comfort. Regarding ease of speech transmission, it is suggested that this be defined simply as the noise level must be less than 80 dBA at the user's ear and the hood/helmet portion of the device must not prevent normal movements of the user's mouth as could occur if a tensioned strap were required to hold a hood/helmet or component in position against the wearer's head or face.

**Section 2.4 Practical Performance Paragraph 2** - The preconditioning testing should be performed with the device in the normal shipping containers as received by user rather than removed and laid flat or suspended from a hook. This assures that the materials of construction (plastics and films), assembly techniques, and packaging methods (i.e., perhaps folded tightly) will affect device performance when exposed to temperature extremes during transit. SRS has learned that the combined effects of temperature extremes, packaging methods, and movements during shipping can affect the development of holes in suit films.

**Section 2.4 Practical Performance Paragraph 3** - Regarding exhaust valves, a supplied-air ensemble can be designed without exhaust valves, in particular if the device is a two-piece system. As such, when the term "valve(s)" is/are used, consider substituting the phrase "valve(s), when applicable,"

**Section 2.4 Physical Properties of Materials used in construction; minimum requirements** - Consider adding cold crack resistance testing with minimum use temperatures to be specified by the device manufacturer. SRS has learned that cold crack specifications, while not ideal, are useful in determining how cold a film can get and still remain flexible enough to not fail during use.

**Section 2.4 Permeation Resistance of material used in construction; minimum requirements** - Relative to breakthrough and permeation, it would be impractical for manufacturer's to be required to test a device's outer film against all possible chemicals an end user might encounter. NIOSH should identify select agents such as a corrosive, an organic, a particle size, etc. for testing. Use against gases, vapors, or liquids other than these would then require the end user to obtain or perform their own testing, request that the manufacturer conduct the testing, or that representative data in nationally recognized (i.e., AIHA compilations of test data) sources be used. Only a recognized method for the breakthrough and permeation testing, i.e., ASTM F-739, should be used.

**Section 2.4 Visor; minimum requirements** - As written, the phrase "...generally align the covering with the mouth..." can be inferred to require that the respiratory air inlet be close to and directed towards the user's mouth. Rather than requiring that the respiratory air inlet be close to and directed to the user's mouth, it should be sufficient to require that the oxygen and carbon dioxide levels are maintained at acceptable levels. It is suggested that the second sentence be reworded as follows. "The air supply shall be designed so the breathing air supplied to the user maintains the carbon dioxide and oxygen levels at an acceptable level."

**Section 2.4 Fall arrest harness; minimum requirements** - The following is provided regarding NIOSH's request for information about the use of external fall arrest harnesses with air-fed ensembles. SRS has used supplied-air suits for well over forty years. The supplied-air suit was approved by the Los Alamos National Laboratory which was the approving entity for the Department of Energy. The two-piece design of the SRS suit is such that in the event of a loss of air, the user is trained to remove the top. This design requires that the fall

arrest harness be donned before the suit; if the fall arrest harness were donned over the suit, this could increase the time required to remove the top and result in an undesirable level of carbon dioxide in the helmet of the suit. It is strongly suggested that if an air-fed ensemble is intended for use with a fall arrest harness, the following considerations be addressed in the design of the device and appropriate guidance/warnings be incorporated in the user's manual.

- Wearing the fall arrest harness may not delay the user from removing the helmet or obtaining a supply of 'fresh air' in a timely manner if the breathing air supply is lost.
- Wearing the fall arrest harness may not prevent a co-worker from providing a source of 'fresh air' to the user in a timely manner if the breathing air supply is lost and the user is unconscious.
- A fall arrest harness, in particular if worn over the device, may not impact the distribution of the air supply.
- If the fall arrest harness is worn beneath the device, suspension trauma/orthostatic intolerance devices may not be usable or function as intended.

**Section 5.2 Couplings; minimum requirements** - Requiring at least 2 different motions to disconnect fittings or prevent unintentional disconnection is warranted but requiring that "Inadequate connections be visually evident." may be impractical to achieve considering that many of these components are single-use and disposable.

**Section 5.2 Couplings; minimum requirements**- Requiring that the compressed air supply tube adjacent the wearer be designed to prevent unintentional interruption of the air supply is warranted. However, requiring a swivel be incorporated may be unnecessary; a male plug that spins freely within the female coupling is generally satisfactory. Consider making this a performance-based requirement rather than specifying a swivel be used. Require that the connection adjacent to the wearer be designed so the connectors move freely such that the user can easily remove twists in the breathing air supply line without disconnecting the hose.

**Section 2.5 SAR type air supply; minimum requirements** - In addition to CGA requirements, OSHA requires that breathing air for SAR devices have a dew point ten degrees F below ambient.

**Section 2.5 SAR type air flow rate; minimum requirements** - Requiring that pressure inside the ensemble shall remain above ambient at all times during testing is unlikely to be achieved with a constant flow system. Users can expel the majority of the air in a device by squatting, and as a result the pressure inside the ensemble may become neutral or even slightly negative for brief periods, relative to the outside atmosphere. This condition should be acceptable for most agents except those that may be IDLH through skin contact. The AIHA Journal article, Simulated Workplace Protection Factor of Powered Air-Purifying and Supplied Air Respirators, AIHAJ 62:595-604 (2001), confirms that even well-designed and effective supplied-air respirators may experience negative pressure for brief periods.

**Section 2.5 PAPR type air flow rate; minimum requirements** - Requiring that pressure inside the PAPR ensemble shall remain above ambient at all times during testing is unlikely to be achieved with a constant flow system. Users can expel the majority of the air in a device by squatting, and as a result the pressure inside the ensemble may become neutral or even slightly negative for brief periods, relative to the outside atmosphere. This condition should be acceptable for most agents except those that may be IDLH through skin contact. The AIHA Journal article identified above and comments to OSHA during the rulemaking process for Assigned Protection Factors (Assigned Protection Factors; Final Rule - 71:50121-50192) confirm that even well-designed and effective PAPRs may experience negative pressure for brief periods.

**Section 2.5 Exhaust vents, minimum requirements** - As currently written, "The ensemble shall be provided with one or more exhaust vents or devices...", it can be inferred that mechanical devices such as exhaust valves

are required for supplied-air ensembles to exhaust air. A supplied-air ensemble can be designed without exhaust valves, in particular if the device is a two-piece system. As such, when the term "vent(s)" or valve(s)"is/are used, consider substituting the phrase "vent(s) or valve(s), when applicable".

**Section 5.2 Exhaust vents, minimum requirements** - Paragraph 4 states that "A positive pressure shall be maintained, while testing...". As stated earlier, comments made to OSHA during the APF rulemaking as well as the AIHA Journal cited indicate that positive pressure may not be maintained at all times and that brief periods of negative pressure are not necessarily unacceptable.

**Section 5.2 Exhaust vents, minimum requirements** - Paragraph 6 states NIOSH will consider using the exhaust device pull test, given in EN 1073. As stated earlier, supplied-air ensembles can be designed without exhaust devices (i.e., valves). It is suggest that this paragraph be reworded as follows "...using the exhaust device pull test, given in EN 1073 when mechanical exhaust devices are used."

Sincerely,



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