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To: NIOSH Docket Office
Subject: Comments on September 2003 CBRN PAPR raft Standard

CBRN PAPR
DARD COMMENTS

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Please find attached my comments on this draft standard.

Thanks

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<<CBRN PAPR STANDARD COMMENTS JDN.doc>>

COMMENTS ON DRAFT CBRN PAPR CONCEPT PAPER DATED SEPTEMBER 15 2003

From: Jim Naylor, Market Development Manager-Protection, Avon Technical Products.
Member of ISO TC 94 SC15 and CEN TC79 committees, including SC8 powered respirator committee.

Background.

- My comments inevitably draw from a background in European products and standards.
- I am taking as established that the test requirements flow from the risk assessment of CBRN scenarios, and that the total protection requirements and filter gas test concentrations/breakthrough times are as already established.
- I accept and understand that most users will wish to ensure that filters procured for PAPR use should be the same as those approved for negative pressure APR use

Issues.

I have some concerns about what is proposed on the following grounds:

- The standard is unnecessarily restrictive from a design perspective.
- The standard does not adequately reflect the state of the art with respect to modern PAPR design.
- There are some clauses that contain ambiguity.
- Fundamental safety issue

I am convinced these issues can easily be resolved without modifying significantly the spirit or intent of the standard.

Clause by clause.

2.2 B. Crisis Provision Mode: I am convinced that use of PAPR devices as currently envisioned is not safe for emergency egress from IDLH environment. PAPR devices are relatively complicated, and will typically take too long to don. In addition they offer little advantage in terms of comfort or protection in a short term scenario.

I accept that more suitable PAPR devices could be developed for this kind of application, but feel that their requirements deserve further thought. I would therefore recommend that these devices form a separate class or sub class, and that requirements for them are not compulsory for all CBRN PAPR at this stage.

3.1.1. Filter connection.

I accept that most applications will require standard filters with this connection, however use of these filters does limit airflow (see below for more discussion). I would like to see an optional class that allows the use of novel filter designs (nevertheless meeting the same challenge concentrations, breakthrough times and penetration requirements). This optional class should seek to limit total unit weight, but not individual filter weight, number of filters, or filter resistance. These specialised units would probably address applications where very high workrates are envisaged, e.g. SWAT or specialised rescue teams.

3.1.4. Blower must be able to receive the maximum weight of the canister. How is this verified?

3.2 Breathing Resistance
This requirement is fine as it stands, however should optional special filter systems be allowed as detailed above, there would only be a need to verify the variation in resistance between filters (3.3.2), since the filters would not be used on negative pressure APRs.

3.5 Carbon dioxide
It is not clear from the requirement what flowrate would be used during this test. Normally it would be expected that the CO_2 performance would be better the higher the flow and that therefore a minimum design flow should be used in this test (worst case condition). This might be detailed in the NIOSH test procedure, but I do not have visibility of this.

3.7.5.2 Low Flow Indicators.
This clause contains a term "identified flow rate", with which I am not familiar. I assume that again the low flow indicator should show when the flow approaches the manufacturer's intended minimum. In European standard EN12941, the manufacturer is required to state their minimum flow rate, and in the case of most loose fitting devices, provide a warning for the user in the event the flow drops below this level. The system performance is also measured at this minimum level (CO_2 and Total Inward Leakage).

The requirement as written seems not to be clear, it implies an assumption that the flow is dropping throughout the battery or filter life, and that there should be a warning when the flow drops to 10% above the identified flow rate. Many modern units supply a constant regulated flow up to the limits of the battery life and filter clogging, they would presumably have to give a warning immediately the unit was unable to maintain the stated flow (a tolerance of 10% on this measurement would be sensible given the constraints of the technology and measurement methods, and this may be what is intended here).

There are on the market tight-fitting devices which do not necessarily supply air at a constant flowrate, but more on demand, or reactive to the wearer's breathing rate. In this case the concept of a minimum design condition is useful (see EN12942). The minimum design condition may not be a flow, but could for example be in-mask pressure. In the case of a reactive flow device, the manufacturer could be required to ensure that there is a warning at this condition, and would have to pass the performance requirements at this condition.

3.7.5.3 Operational Controls.
In (b), it is not clear how this requirement could be verified. Also it does not seem to be to do with operational controls.

3.8 Noise levels.
The 80 dB(A) requirement seems a little high, 75 dB(A) is easily achievable with modern fan designs. 80 dB(A) will soon be the lower action limit in Europe for voluntary hearing protection use, suggesting that prolonged exposure to 80 dB(A) might eventually have adverse health effects. This noise level would inhibit communication.

3.9 Airflow
In the case of using the standard thread filters, which presumably will already have been tested to the APR standard, this requirement seems sound.
It is well known that in extreme circumstances catastrophic breakthrough of contaminants through charcoal beds can occur if the residence time is too low, and the bed depth consequently falls below the critical level. It is therefore imperative that the gas life of filters is tested at the maximum flow potential of the device. For loose fitting devices, the flow will rarely exceed the running null pressure flow of the system, since the hood will collapse before additional air can be drawn through the filters. In the tight fitting scenario, this is not the case; it is well known that in heavy work, instantaneous flow rates can exceed 400 l/min. Filter penetration testing should reflect this potential (this actually applies to negative pressure APR just as it does not PAPR). The average flow through the gas filter element may actually exceed the manufacturer's stated flow.
This is where the concept of interactive flow rate is useful; the flow through the system is measured with the mask mounted on a breathing machine, which is set at a rate which should reflect the likely work rate. The average flow through the filters measured in this case is the flow at which the filters should be tested.
I believe that manufacturers should have the freedom to specify a higher flowrate than 64 l/min per filter if they wish. Conventionally, this flow should be enough for a full facepiece, with 2 filters, or a loose fitting/neck dam hood, possibly with 3 filters, but it would not be enough, for example for.

- A loose fitting hood with only 2 filters

- A breath responsive or positive pressure device (may be that 6 or 8 filters could be required if testing can only be done at 64 l/min, depending on what breathing rate is specified)

- A full suit (may require up to 300 l/min). This standard does not seem to address PAPR suits, which have already been developed for CBRN and Nuclear industry use, and which could be preferred equipment for long term protection of medical workers dealing with contaminated patients for example.

Practically, it might be better to deal with these requirements by allowing non-standard filters as mentioned earlier should the manufacturer wish to develop this kind of product.

4.3.4, Flow rate for DOP testing.

This seems to be incorrect. Particulate penetration testing should be conducted at the maximum potential flow rate of the unit, divided by the number of filters. This means that for the current minimum requirement of 115 l/min and at least 2 filters, the flow should be at least 58 l/min, not 42.5. Following through the logic of ensuring the filers meet both APR and PAPR requirements would suggest that each filter on the unit should be tested at least at 85 l/min, and the flow should not be divided.
As discussed previously, for tight fitting devices, and especially breath responsive devices, the penetration needs to be carried out at the maximum flow potential of the device, which could be in excess of 400 l/min. The actual flow through the filters should be determined, and the penetration tested at that flow.

4.4 High flow service life testing.
This requirement is assumed to address the mooted escape application, which I believe requires more thought.
It should not be necessary to carry out gas testing twice, as long as the testing is carried out at the maximum interactive flow of the system

4.8 LRPL
Testing should be carried out at the minimum design flow or minimum design condition (this may already be the case, I am not sure)

A general comment would be that there is no mention of Intrinsic Safety. I would expect a requirement along the lines of " If the device is claimed to be Intrinsically Safe, it shall meet the requirements of……, and be marked accordingly" I think it is important that NIOSH takes a view of what I.S. classification night be necessary for CBRN application.

JDN
4/12/03
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