

Maryland Fire and
Rescue Institute



12

University of Maryland
College Park, Maryland
20742

4

November 29, 1977

Mr. Edward J. Baier
Acting Director
National Institute of Occupational Safety and Health
5600 Fishers Lane
Rockville, MD 20857

Dear Mr. Baier:

This testimony is in response to the public hearing notice announced in the Federal Register, Volume 42, No. 208, Friday, October 28, 1977, concerning "Respirator Testing and Approval". It is with great concern that the Maryland Fire and Rescue Institute of the University of Maryland makes known its feelings about this most important subject.

The Institute (formerly the Fire Service Extension Department) provides ambulance, fire and rescue service training and education to all departments throughout the State of Maryland. The training and education involves course work ranging from the very basic entry level through management and leadership for the officer ranks. Mobile teaching laboratories are operated out of the Academy for several courses, the main one being Breathing Apparatus. One of the labs is the trailer maze used in teaching this subject. It is scheduled around the state to service those areas too far away from College Park to use the Academy facilities. This Institute maintains 80 units of demand type self-contained breathing apparatus for its students and is presently working toward converting these units to Pressure Demand. In examining the Academy breathing apparatus training records for the past 10 years, the Institute has trained 22,500 firefighters, totalling 67,500 student hours of instruction, compressed 1,463,200 cubic feet of air, used individual demand units 25,036 times, which has accounted for 125,180 wearings; that is, donning and doffing.

For years, the Institute has been worried about the validity of the respirator testing and approval procedures as they affect the firefighters of Maryland and the Nation. Within recent years, O.S.H.A. has conducted hearings on "Proposed exposure standards" for specific toxic gases and compounds. These standards call for the use of pressure demand apparatus when the level of exposure is unknown. For the firefighter, this is virtually all the time when fighting an interior fire. It calls for a phase-in period of 90 days, which is totally unrealistic. Three to five years would be more realistic. Unfortunately, the fire service has had little if any real input into this standard. The same was probably true when the initial test for respirators was developed. This has proved to be very frustrating for the fire service. The National Aeronautics and Space Administration spent thousands of tax dollars to re-invent the wheel and redesign the demand apparatus. Something industry should have done on its own! This developmental work brought about many good advances in breathing apparatus design and equipment for the fire service. However, the validity of the time duration man test of the unit is questionable since N.A.S.A. personnel in excellent physical fitness performed the duration test - a fact not widely publicized. This is hardly a valid method of determining the time duration of that unit. In addition, higher pressure (4500 vs. 2200 lbs.) was used to get longer duration units. When N.A.S.A. was asked about how fire departments would increase their capability for filling higher pressure bottles at a November 1975

Final Program Review meeting in Houston, the answer came back, "We don't see any problem." Herein lies the problem for the fire service! Professionals designing apparatus for environments and working conditions they know little or nothing about. This same thing can be said about the present respirator testing and approval procedures. Some Federal employees who are inflexible and intolerant of the fire service problem, other Federal employees at higher levels who are aware of inferior workmanship and materials but are afraid of embarrassing the manufacturers because of their political clout and fear of a reduction in their budgets because of that clout; these are all symptoms of the problem. In addition, it could be said that the "approval" has little meaning for the fire service since "approved" units are often drastically altered to suit the individual or fire department who uses it. The fire service needs desperately its own standard for approval, for it is the fire-rescue services who use breathing apparatus more than those in industry. While the fire service may be 40% of the sales market for the manufacturer in any given year, it probably is 80 to 90% the user. However, the fire service has had little - if any - input into the development of those standards it is affected by. A lack of communications, inadequate public hearing notification, and a lack of travel money for fire service experts to participate in the making of standards are additional problems encountered. It is unfortunate that the fire service has been unable to participate in the past for these and other reasons, but we will no longer stand aside and watch outsiders determine the fate of our personnel.

I would like to take this opportunity to go through some of Title 30, Part II and describe some areas of concern. This does not infer that these points cover all of the Testing and Approval Procedures but rather a selection of items that come readily to focus.

Subpart H

II.71 Self Contained Breathing Apparatus - Required Components

This section does not have a requirement or standard for any pressure reducing regulator as a component part of the system. Performance standards, applicable to the fire service must be developed. Between manufacturers, there is too much variance in the regulator diaphragm in regards to tear or rip strength, low and high temperature performance and durability. Criteria for this important item must be developed.

II.71a6 Warning Devices

Performance standards must be developed for this part of the apparatus. Some have questionable reliability and require constant preventative maintenance. Improvement is vitally needed in this area!

II.76 Facepieces; Eye Pieces; Minimum Requirements

(a) Vague - should be more specific

(b) There are no provisions for heat or cold as being job related. Presently, manufacturers are only giving the wearer one size of any given type of face-piece. Facepieces should be available to the fire service to meet the needs of the many different head sizes and shape characteristics of their wearers.

Two-way communication criteria must be expanded for both radio transmitter and voice amplification from within the facepiece. Impact criteria for materials used in, on, and around the facepiece, while at low and high temperatures is a must.

11.77 Inhalation and Exhalation Valves

This whole section is vague. Inboard leakage at this location is a very serious factor. Pressure Demand Valves have not been sufficiently tested in real firefighting environments.

11.78 Head Harness

There are no provisions for making the harness so that it will fit under the firefighter's helmet. This is a serious problem along with the helmet itself. In addition, the harness needs to be redesigned so that it can stand rougher treatment.

11.79 Breathing Gas

The Compressed Gas Association commodity specification, Type I. G-7.1 Grade D or higher air does not express a dewpoint for the air. This is a serious problem especially when fire departments compress their own air. Moisture and rust inside the bottle is the culprit of many regulator malfunctions. Guidelines for proper air processing should be developed in order to achieve and maintain the grade air desired. There are many misconceptions about air processing and the word "purify". Some air purification and/or compressor manufacturers give the impression of not knowing how to properly purify air for human respiration. Even worse, salesmen are not properly trained to know the system they sell. There is no standard for degradation of air purification systems during - or over - the life span of the cartridge or materials used in the process.

There is a strong belief throughout the fire service that oxygen should not be used in open circuit apparatus.

11.80 Gas Containers

The standard should allow for the interchangeability of air bottles between different manufacturers. There is no reason why this cannot be accomplished as long as minimum performance standards are met. These would also have to be developed. Concern over aluminum and wrapped bottles from scratching and scarring is serious. U.S. Department of Transportation standards are not relevant to the fire service. Its concern is with safety as applied to the shipment of pressure vessels across state lines. Aluminum bottles are already being scratched and scarred to a questionable degree. Some

suppliers of air would not fill aluminum bottles for apparant safety reasons.

It is our understanding that wrapped bottles can only be filled at a slow rate (200 to 300 PSIG/min) for fear of separation between the metal bottle and the wrapping and should not be submerged in water during the filling process. These bottles are to be hydrostatically tested every three years versus five years for steel and have only a life span of fifteen years. Any fracture causing unwinding of the wrappings would also require a test before a recharge would be permitted. These are all highly questionable variables, both for durability and cost, the fire service will have to contend with. These variables should be known to the consumer before it was marketed.

The steel bottle, although heavier, appears to be more durable. There should be performance criteria for bottles being exposed to both low and high temperature Included in this should be criteria for Shock Temperature Shifting; this is, going from a low to a high temperature in seconds. Temperature variance may be from -20F (or lower) up to 500F (or higher).

11.81 Gas Pressure Gages

Gages in general do not last and do not stay in calibration for any length of time. They are hard to see and/or read by the firefighter while working.

11.83 Hand Operated Valves

Research must be carried out to determine whether or not there should be an option, given by manufacturers, to switch from demand to pressure demand. If pressure demand is going to be required, as it looks now, this option has to be clarified; and if the option continues, then a quick turnon (quarter turn) main line valve must be given serious consideration.

11.83e There is no true by-pass system on existing regulators, with possible exception of the 4.5. If the diaphragm blows or ruptures, contaminated air can be sucked into the breathing tube. This applies to pressure demand as well as demand.

11.85-3b Breathing Bag Test

How valid is this test for the firefighter?

11.85-10 Service Time Test

The whole question of service time needs to be researched, studied and validated for the firefighter. This test is antiquated and invalid!

11.85-13a Test During Low Temperature Operations

The applicant (manufacturer) should conform to a job related standard developed for the firefighter, not industry; they are different. The temperature requirements should be researched as to the real world of firefighting. This should include high and low temperature fire-environment performance. Consideration must also be given the shock temperature shifting as referred to in 11.80.

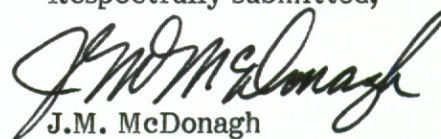
10. Development of a Shrader type connector for the breathing tube connector to the regulator.
11. Performance standards for wear, scratch and dent resistance of the bottle, as well as rust prevention, must be established for the firefighting environment.
12. Performance criteria presently is non-existent for air purification systems. This must also be developed. Some advertising borders on being blatantly false. The term "Purified Air" must be defined so that the manufacturers have a standard to go by.
13. Apparatus maintenance criteria should be developed so that the shroud of mystique is lifted. There is a common misconception that only the factory or service center can touch the apparatus or something ominous will happen. This misconception must be changed. Most people with any mechanical ability can perform 90 to 95% of the maintenance required to keep the apparatus operational.
14. Consideration must be given auxiliary connections to allow for rescue "Buddy Breathing". These connections can be made a part of the regulator or could be connected as a component part.

It is time for N.I.O.S.H. and M.E.S.A. to recognize the fire-rescue service and to develop standards which are applicable for it. We realize that the original and current standard was developed for industrial needs. The manufacturer has not had to provide anything different because of the lack of a unified fire service stand. After these hearings, it is our hope that the outlook of the federal agencies and industry will be drastically changed by the testimony offered. It is our fervent hope that the records of these proceeding will remain open for an additional comment period of at least sixty (60) days, in fact we make this a strong request.

In reference to the notice appearing in the Federal Register, Vol. 39, No. 227, Friday, November 22, 1974, concerning the termination of approval dates of the Bureau of Mines, Schedule 13-13E equipment as being March 31, 1979, that this date be changed in order to give an additional five (5) years to conform to the quality control requirements. The manufacturers should develop quality control conversion kits and/or schedule equipment in for its quality control checks before termination of approval. More effective publicity must be offered. A mere thirty (30) day notice for public hearings in the Federal Register is totally inadequate.

In behalf of Director John W. Hoglund and the entire faculty, staff, and over three hundred field instructors of the Institute, I would like to thank the officials of N.I.O.S.H. and M.E.S.A. for the opportunity to render this testimony. We stand ready to assist in any way that we can in order to enhance the firefighters' breathing apparatus situation. This is a most important project and we are in full support of change for the better.

Respectfully submitted,



J.M. McDonagh
Maryland Fire & Rescue Institute
University of Maryland

- 11.85-13b There is no test for the apparatus during immediate temperature changes. This is job-related and should be a part of the test.
- 11.85-13e2 In the real world of firefighting, there is no way presently to prevent fogging of the lens in low temperature work.
- 11.85-14 Man Tests
This test should be restructured so that it is job-related for the firefighter.
- 11.85-15 Man Tests
These requirements should be restructured and upgraded to meet the job-related activities of the firefighter. There should be more information than ever available to N.I.O.S.H. and M.E.S.A. to accomplish this.
- 11.85-15a2 The firefighter doesn't have time to gradually increase his work patterns.

The comments on the Items above are specific in nature only to show some of the inadequacies of the procedures. Maybe the best approach would be to SCRAP the existing procedures and research and develop new ones specifically designed to meet the needs of the firefighter. Performance criteria should be developed and implemented for the following areas:

1. Approval should be based upon performance standards for component parts, as well as for single complete unit apparatus. This would provide independent manufacturers with the ability to provide approved components in some cases at a much lower cost to the consumer.
2. Interchangeability of bottles, facepieces and breathing tube connectors that attach to the regulators without loss of approval.
3. Temperature variance and shock temperature shifting, as related to the real world of firefighting.
4. Impact test on lens of facepieces and other applicable materials as related to 3 above.
5. Corrosion criteria as related to different metals being used together (causing electrolysis) and exposure of these metals to chemicals as produced by the fire (acids, etc.).
6. Time Performance and Duration Criteria which is valid for the job of firefighting.
7. Closer Quality Control of defects reported and recall procedures which are enforced. Equipment failure records should be maintained by the manufacturer for review by N.I.O.S.H. or the user.
8. Criteria for communications, both voice and radio, should be researched and improved for firefighter breathing apparatus.
9. Flame retardance criteria for all materials used as component parts of the unit.