VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

W. L. STEWART
VICE PRESIDENT
NUCLEAR OPERATIONS

May 16, 1986

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
Attn: Mr. Lester S. Rubenstein, Director
PWR Project Directorate No. 2
Division of PWR Licensing-A
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
Gentlemen:

Serial No. 85-816
NO/DAS:acm
Docket Nos. 50-280
50-281
50-338
50-339
License Nos. DPR-32
DPR-37
NPF-4
NPF-7

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION
NORTH ANNA POWER STATION
RESPIRATORY PROTECTION PROGRAM
10CFR20.103(e) EQUIPMENT AUTHORIZATION
REQUEST FOR CONCURRENCE OF TEST PROTOCOL

10CFR20.103(c) specifies that respiratory protection equipment be certified or have certification extended by the National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA) in order to make allowance for protection factors. 10CFR20.103(e) permits a licensee to request specific authorization by the Commission to assign protection factors for equipment which has not been tested and certified by NIOSH/MSHA. A prerequisite for such authorization is demonstration by testing or reliable test information that the "material and performance characteristics of the equipment are capable of providing the proposed degree of protection under anticipated conditions of use." This letter transmits for your concurrence proposed test protocol for demonstrating the acceptability of using 35% oxygen enriched breathing air with open-circuit Self-Contained Breathing Apparatus (SCBA).

The SCBA to be tested has been NIOSH certified for compressed air applications. The North Anna and Surry Power Stations have subatmospheric containments and require 35% oxygen enriched breathing air to compensate for the oxygen deficient atmosphere of the containment. The proposed testing will confirm oxygen compatibility of the subject SCBA for 35% oxygen applications. The test will not affect the assignment of protection factors, which have been established in the NIOSH certification process for compressed air applications.

Attachment 1 provides the proposed test protocol and a summary of the proposed testing. Attachment 2 provides the vendor's assessment of commonality of proposed test equipment to actual service equipment, ensuring that test results "envelope" service application.

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We request your review and concurrence of the proposed test protocol by July 31, 1986. It is our intention following successful completion of testing to submit a request pursuant to 10CFR20.103(e) to use the presently assigned protection factors for the subject SCBA's in 35% oxygen applications. If you have any questions regarding the proposed testing, please contact us.

Very truly yours,

W. L. Stewart

Attachments

cc: Dr. J. Nelson Grace
Regional Administrator
Region II

NRC Senior Resident Inspector
North Anna Power Station

NRC Senior Resident Inspector
Surry Power Station

Mr. L. B. Engle
NRC North Anna Project Manager
PWR Project Directorate #2
Division of PWR Licensing-A

Mr. Chandu P. Patel
NRC Surry Project Manager
PWR Project Directorate #2
Division of PWR Licensing-A

ATTACHMENT 1

PROPOSED TEST PROTOCOL

AND SUMMARY

Proposed Test Protocol and Summary

Background:

The containments at both North Anna and Surry Power Stations are designed to be maintained at subatmospheric pressure during power operations. Actual containment environment varies depending on the unit load as well as the time of year. However, the range of pressure is nine to eleven pounds per square inch absolute. This pressure is roughly equivalent to the atmospheric condition found at 13,000 feet altitude.

It is necessary for station personnel to periodically enter containment while the units are operating in order to perform routine inspections or maintenance as required. The resultant oxygen deficient environment has been observed to cause minor physiological effects (e.g. dizziness, stomach cramps, and breathing difficulties) in personnel working in containment. These effects can be mitigated by simply enriching the breathing air in the open-circuit self-contained breathing apparatus (SCBA) used for radiological protection. By enriching the breathing air to 35% oxygen, we have found that personnel may work in the subatmospheric environment without experiencing the physiological effects of oxygen deficiency. Correspondingly, no adverse physiological effects have been experienced or are expected due to the use of 35% oxygen enriched breathing air.

In discussions with Mine Safety Appliances Company (MSA), the National Institute for Occupational Safety and Health (NIOSH) has stated that they would not perform the certification test for open-circuit SCBA's for 35% enriched oxygen use because of the limited application. As a consequence, independent testing is required which will be followed by a 10CFR20.103(e) authorization request. NRC authorization requires a demonstration by testing or reliable test information that the "material and performance characteristics of the equipment are capable of providing the proposed degree of protection under anticipated conditions of use."

Purpose:

The purpose of the proposed testing is to verify 35% oxygen compatibility with self-contained breathing apparatus in a manner which is representative of actual use conditions. The proposed test is not intended to address protection factors, which have previously been established by NIOSH in certifying the SCBA for compressed air applications.

Equipment to be Tested:

Oxygen compatibility testing will be performed on the MSA Custom 4500 Dual-Purpose Breathing Apparatus. As documented in Attachment 2, MSA states that testing the Custom 4500 unit will "envelope" the lower

pressure Ultralite and Model 401 Ultralite upgrade units in terms of oxygen compatibility testing. This assessment is based on an MSA determination of commonality of parts, materials, and functional design (except for maximum operating pressure). In the case of operating pressure, the Custom 4500 has a higher maximum operating pressure thereby, "enveloping" the other two units' design.

Test Organization:

NASA, White Sands Test Facility, New Mexico

Test Facility and Setup:

The White Sands Test Facility (WSTF) has been assigned the responsibility by NASA for testing all materials used in the space program for oxygen compatibility. From 1967 to 1972, approximately twenty-two hundred Apollo space program materials and components were tested for 100% oxygen service at WSTF. Approximately seven hundred more materials were tested for 70% oxygen service during the Skylab program. To date, nearly thirteen thousand materials and components have been tested for oxygen compatibility in the Space Shuttle program.

WSTF has numerous test facilities which are designed and equipped for oxygen compatibility testing. Most of the individual test cells (reinforced concrete rooms) are set up to conduct specific tests such as flame spread rate testing. These test cells are instrumented to a control room where personnel monitor the testing using ultrahigh-speed video equipment. Relevant data from test instrumentation is fed into computers for storage and subsequent processing.

In our proposed test, the subject breathing apparatus will be fully assembled with the facepiece connected to an anthropometric head form. This head form will be connected to a breathing machine which will cycle the apparatus in a manner identical to the NIOSH testing done to determine SCBA service time. The entire breathing apparatus will be inside a test chamber which will simulate the containment environment with regard to temperature and pressure.

Test Protocol:

Oxygen Compatibility Test: The objective of this test is to establish that the operation of the subject SCBAs with 35% oxygen enriched breathing air is 95% reliable at a 90% confidence level for general purpose in-containment applications.

Initial Conditions:

- Air cylinders and airlines charged with 40% oxygen and 60% nitrogen. (The 40% value for oxygen is based on conservatively accounting for uncertainty in the breathing air mixture. The vendor who supplies our breathing air is required to test and

certify that the oxygen content is within 2% of the specified 35% volume percentage.)

- o Temperature and pressure in the test cell will be maintained at 130°F and 9 psia respectively. (This elevated temperature conservatively accounts for localized temperature conditions in containment. Containment average air temperature is required to be less than or equal to 120°F by Technical Specification at Surry and 105°F at North Anna.)

Assumptions:

- o Maximum mission time of 4 hours. (This number is conservatively based on multiple air bottle stay times and does not consider heat stress limitations on stay time.)

- o Maximum usage frequency of 40 missions per apparatus per year. (This number is based on historical data for annual containment entries per SCBA.)

In order to statistically obtain a 90% confidence level, 45 complete breathing apparatus will be tested. Each of the 45 units will be cycled 60 times with each cycle lasting 6 minutes (i.e. total test time per apparatus 360 minutes). The individual test cycle consists of the following steps:

1. Mainline and bypass valves fully closed, airline hose is pressurized, but not connected to regulator.

2. Apparatus is contained in a chamber at 21% oxygen, 79% nitrogen, and 9 psia.

3. Cylinder valve is fully opened (5 sec. to open valve).

4. Mainline valve is fully opened (5 sec. to open valve).

5. Breathing machine respiration for 1.5 minutes.

6. Airline is connected to the regulator fitting.

7. Breathing machine respiration for 2 minutes.

8. Airline is disconnected from the regulator.

9. Bypass valve is opened (5 sec. to open valve) and mainline valve is closed (5 sec. to close valve), allow bypass flow for 30 seconds.

10. Bypass valve is closed (5 sec. to close valve) and mainline valve is opened (5 sec. to open valve).

11. Breathing machine respiration for 1.5 minutes.

12. Stop breathing machine respiration, close cylinder valve (5 sec. to close valve) and bleed off trapped pressure and close mainline valve (5 sec. to close valve).

13. Repeat steps 3-12 for a total of sixty cycles per test unit.

Flame Propagation Test: The objective of this test is to quantify the relative severity of flame spread with respect to time and magnitude for the subject SCBA in order to subjectively assess whether the in-containment use of 35% oxygen enriched breathing air for firefighting or spark producing applications is acceptable. The proposed test is similar to Type 1 Configuration Test NHB-8060.1B for flame propagation. The results of this test will be subjectively compared to the results of a similar flame propagation test on a SCBA using standard compressed air.

The flame propagation test is being performed independent of the testing required for the 10CFR20.103(e) authorization request for general purpose in-containment applications.

Initial Conditions:

- Test chamber will be maintained at 21% oxygen, 79% nitrogen, 14.7 psia pressure and 130°F, (Atmospheric pressure is considered the most conservative test condition in terms of fire propagation. In subatmospheric conditions, the reduced pressure environment would tend to impede fire propagation. The proposed test pressure would be representative of a situation following the breaking of containment vacuum. Based on the test results, it will be determined whether further testing at subatmospheric pressures should be performed. The specified test chamber temperature conservatively represents localized average containment temperatures but does not attempt to account for localized temperature effects due to a fire.)

- Ignition elements will be placed at several points along the breathing tube to initiate combustion.

The test cycle will consist of the following steps:

1) With breathing tube and facepiece containing a breathing gas mixture comprised of 40% oxygen, 60% nitrogen and pressurized to 1.5" of water above ambient pressure, initiate combustion through ignition elements.

2) Flame propagation, combustion severity and time sequence will be noted and recorded on film.

3) A second test will be run with the facepiece and breathing tube containing standard compressed air as the breathing gas.

Test Report: Following test completion, the results will be evaluated and conclusions will be made by Virginia Electric and Power Company and MSA. A summary of these test results and conclusions will be provided to the NRC for review and appropriate action.

ATTACHMENT 2

Vendor Statement of

Commonality of Proposed

Test Equipment

with Actual Service Equipment

MSA

Mine Safety Appliances Company • P.O. Box 426 • Pittsburgh, PA 15230

Telephone: (412) 273-5000

Writers Direct Dial No.
412/273-5194

April 18, 1986

Mr. Dave Sommers
Virginia Electric Power Company
1 James River Plaza
Richmond, VA 23261

Dear Dave:

The objective of the proposed program is to test a complete Custom 4500 Dual-Purpose Breathing Apparatus in a manner that is representative of actual use conditions. The Custom 4500 Dual-Purpose was selected because it "envelopes" the lower pressure Ultralite Dual Purpose Breathing Apparatus. The materials and functional design of the Custom 4500 DP and Ultralite DP are basically identical with the exception of the maximum operating pressure (4500 psig in the Custom 4500 DP and 2216 psig in the Ultralite DP). Therefore, if the Custom 4500 DP successfully completes the test protocol, we would expect that the Ultralite DP would also pass the test. In addition, Model 401 Air Masks that have been upgraded with the Regulator Conversion Kit (P/N 476838), Audi-larm Conversion Kit (P/N 475705), Aluminum Cylinder Valve Assembly (P/N 473664) and the other applicable Ultralite Parts transform the 401 Air Mask into an Ultralite Air Mask for the purpose of this testing and would therefore also be "enveloped" under the proposed testing.

Our Bill Lambert (MSA Engineer) confirmed that the Custom 4500, Ultralite Dual Purpose, Ultralite, and Model 401 (that has been upgraded to Ultralite status) Self-Contained Breathing Apparatus will positively be "enveloped" under the proposed MSA/NASA test program which utilizes Custom 4500 Dual-Purpose Breathing Apparatus tests units.

Sincerely,

Eric J. Beck

Eric J. Beck
Nuclear Industry Specialist

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