

NIOSH Conformity Assessment Notice

**NIOSH CA 2019-1016
MAY 2019**

**Summary of the Federal Register comments concerning the Department of
Transportation Special Permit 16320**



**Centers for Disease Control
and Prevention**
National Institute for Occupational
Safety and Health

Subject: Summary of the Federal Register comments concerning the Department of Transportation Special Permit 16320

1 SUMMARY

On October 1, 2018, NIOSH published a request for information (RFI, [Federal Register](#)) concerning the Department of Transportation (DOT) special permit (SP) 16320 issued to Digital Wave Corporation (DWC). SP 16320 uses Modal Acoustic Emissions (MAE) testing to extend the service life (requalification) of carbon-fiber reinforced aluminum-lined cylinders (CFFC). The intent of the RFI was to obtain information about the potential impact of SP 16320 on CFFCs used with NIOSH-approved self-contained breathing apparatus (SCBA). The public comment period for the RFI closed on November 30, 2018.

The comments included 15 general comments, and 7 sets of comments addressing one or more of the four questions included in the RFI. Users and those representing user groups provided general comments in support of using SP 16320 to extend the service life of the 15-year CFFC, especially based on cost. Several commenters indicated the safety of the approach must be ensured and implied NIOSH provide this assurance. SCBA manufacturers generally did not support the use of cylinders requalified for use beyond their 15-year service life. SCBA manufacturers stressed the use of these requalified cylinder voids the product's warranty and possibly the NIOSH approval since third party MAE requalification is not in the manufacturer's supply chain and out of the NIOSH Approval Holder's control.

NIOSH's analysis and review of these comments resulted in the validation of the NIOSH Respiratory Protective Device Information Notice [NIOSH CA-2018-1006] included in the Federal Register Notice (FRN). NIOSH revised the notice in February 2019 to include an update about the completion of the FRN and the referenced supplemental information outlined in ACTION 1, below.

2 AUTHORITY

[42 C.F.R. Part 84, Respiratory Protective Devices](#)

[December 28, 2001 Letter to All Interested Parties, Acceptance of Applications for the Testing and Evaluation of SCBA for use Against Chemical, Biological, Radiological and Nuclear \(CBRN\) Agents](#)

[NIOSH Statement of Standard, SCBA with Chemical, Biological, Radiological and Nuclear \(CBRN\) Protection used to Protect Emergency Responders Against CBRN Agents in Terrorist Attacks](#)

3 BACKGROUND and SUPPLEMENTAL INFORMATION

Federal Register Questions

NIOSH asked four questions in the Federal Register:

- 1) Are users of DOT CFFC cylinders that have been requalified for service life beyond 15-years, pursuant to the provisions of DOT SP 16320, exposed to any elevated safety or health risk as a result of either the modal acoustic emission requalification testing itself or the service life extension? If so, identify the concern or concerns and provide substantive data, studies, references, and information to further characterize and/or quantify the concern.
- 2) Does the service-life extension offered by DOT SP 16320 or the modal acoustic emission testing itself provide a benefit to either end users or institutional users (e.g., fire departments)? If so, please provide any relevant data, studies, references, or other corroborating information.
- 3) What factors do respiratory protection program managers consider in determining whether to replace an expiring cylinder with a new replacement cylinder or requalify the expiring cylinder using modal acoustic emission testing?
- 4) In which industries and operations are modal acoustic emission-requalified cylinders currently being used?

Summary of the Public's Comments

Question 1

No users or user groups responded to Question 1. A qualified testing laboratory and SME stated the DOT permit process is rigorous and meets the requirements of Title 49. The laboratory also stated the permit improves safety since SP 16320 includes an internal visual inspection of the liner and identifies the presence of contaminants allowing the testing lab to inform departments about this issue. The SME claimed internal corrosion is an issue, even before the conclusion of the original 15-year service life.

Cylinder and SCBA manufacturers were concerned about the test method's ability to detect critical flaws and corrosion of the interior aluminum liner. They were also concerned about the potential for small leaks to reduce the amount of breathing air available to the user. One commenter stated MAE is limited to identifying broken fibers and delamination, not liner issues, which is the primary mode of failure. Another commenter provided the August 2012 report developed under NAVSEA Contract

N00024-11-C-4314, Final Report on the SCBA Cylinder Life Extension Study. The report included several recommendations in favor of using MAE to identify defective SCBA cylinders that will burst at or below minimum design burst pressure and identified the predominant failure mode associated with cylinder damage as cylinder leakage. The same commenter provided a study of compressed natural gas (CNG) composite cylinders. This study similarly concluded the MAE analysis may provide a good evaluation of the damage level to the composite, but seems insufficient for the leakage risk prediction.

Additionally, the commenter provided a third reference, DOT CFFC Basic Requirements for Fully Wrapped DOT CFFC (fifth revision) Appendix A. The DOT Pipeline and Hazardous Materials Safety Administration's (PHMSA) basic requirements state the "cylinder manufacture must submit a Service Life Extension Plan." The commenter concluded by saying "*an entity other than the manufacturer to apply for an extension of a manufacturer's product, without the involvement, consent or agreement of that manufacturer, creates an opportunity for miscalculation or danger to the end user.*"

Question 2

No users, user groups, or SMEs responded to Question 2. A qualified testing laboratory referenced a DOT PHMSA economic impact study and claimed, to date, the SCBA Cylinder Life Extension has provided savings of \$2,891,525.00 to fire departments. The commenter stated, "*hydrostatic testing is a centuries old methodology that was inherited from metallic pressure vessel testing where gross plastic deformation due to locally thinned areas would be detected; unfortunately, the hydrostatic test methodology is ineffective in evaluating the integrity of composite pressure cylinders, which respond in an elastic fashion.*"

A manufacturer trade association provided a comment and said the use of the SP conflicts with OSHA regulations given in 29 CFR 1910.134(h)(4) requiring only those people officially sanctioned by the respirator manufacturer can make repairs or adjustments to a respirator. The commenter also pointed out 1910.134(h)(4)(iii) states "...valves ... shall be adjusted or repaired only by the manufacturer or a technician trained by the manufacturer." The commenter emphasized that private sector employers, whose employees use NIOSH-approved SCBAs, would also be violating 29 CFR 1910.134(h)(4) if the employer uses MAE-requalified cylinders on NIOSH-approved SCBAs. There would be an additional violation for using a rebuilt valve. The commenter also referenced active NIOSH Respirator User Notices:

- Meaning of NIOSH Approvals, March 17, 2006
- Use of Replacement and Spare Parts, May 4, 2007
- Care and Maintenance of Self-Contained Breathing Apparatus (SCBA) Units, June 29, 2012

Several SCBA manufacturers responded to the question and indicated the cost benefit is false due to liability (one commenter stated there have been as much as \$40 million in liabilities involving SCBAs).

Another commenter said the method does not evaluate the complete cylinder and potentially provides a false sense of performance to the life support equipment.

Question 3

A qualified testing laboratory, SCBA manufacturers, and their trade association responded to Question 3. The qualified laboratory stated the MAE inspection and use of SP 16320 offers a level of safety to end users and the public that is almost equivalent to what is required by law (49 CFR) and at a fraction of the cost for replacement cylinders.

One SCBA manufacturer and the trade association stated consideration must be given to safety, regulatory or legal compliance, and liability issues while another manufacturer questioned whether users are aware of violating OSHA regulations by servicing their SCBAs in a manner not approved by the respirator manufacturer. The same manufacturer commented further by questioning awareness of the issues highlighted in previous responses about the failure modes of composite wrapped cylinders that are not inspected by MAE. One commenter further advised if those in the fire service seek a safe option for a 30-year cylinder, they may purchase a 30-year cylinder and indicated these differ from 15-year cylinders in two important ways: thicker carbon-fiber walls and a liner that can withstand more use cycles.

Question 4

SCBA and cylinder manufacturers, including their trade association, a qualified testing laboratory, and a SME responded to Question 4. No users or users groups responded to this question. The responders indicated modal acoustic emission-requalified cylinders are used during firefighting operations, life raft inflation, air rifle and paint gun filling, package gas service, hydrogen ground storage, bulk gas transport, aeronautics (manned and unmanned flight), and ambulance service.

The manufacturers stated for non-SCBA cylinders, MAE is a valid technique for assessing the condition of composite structures and is used to assess Type 4 composite cylinders (with polymer liners) at the time of manufacture and at periodic inspection. The commenters also stated (1) these cylinders are used to transport gases, or as fuel tanks on vehicles and are not used in life support applications and (2) MAE is not being used to extend the life of these cylinders beyond their design life, which is fixed. They also stated, while MAE may be used in other industries, none have environments similar to structural firefighting, in which cylinders are exposed to extreme conditions and are used for life support in immediately dangerous to life and health environments.

NIOSH Actions

ACTION 1: NIOSH will review, as required, and update its previously issued NIOSH Respiratory Protective Device Information Notice and relevant Respirator User Notices. **Action in process.**

In February 2019, NIOSH CA 2018-1006 (Subject: Self-contained breathing apparatus (SCBA) user information regarding compressed breathing gas containers (cylinders), NIOSH approval holder user instructions, and Department of Transportation (DOT) permit and marking) was revised. The revised notice, [NIOSH CA 2018-1006R1](#), updated stakeholders about important information provided in SCBA user instructions, supplemental informational inserts, on labels, including safety precautions and warranty information.

Additionally, NIOSH revised and superseded the March 17, 2006 Respirator User Notice, *Meaning of NIOSH Approval* and the May 15, 2015 Letter to All Respirator Manufacturers – *NIOSH Respirator Certificate of Approval, Approval Labels and User Instructions*. Stakeholders are encouraged to read [NIOSH CA 2019–1012](#) (Subject: NIOSH Respirator Approval Contents and Meaning), completed and posted in February 2019.

NIOSH is reviewing and potentially updating two additional notices, *Use of Replacement and Spare Parts* (May 4, 2007), and *Care and Maintenance of Self-Contained Breathing Apparatus (SCBA) Units* (June 29, 2012).

Note: The DOT requirement was included in 42 CFR 84 to provide a level of safety for the handling of SCBA hardware provided by NIOSH applicants, before, during, and after test evaluations. NIOSH completes evaluations and issues approvals in accordance with 42 CFR Part 84 for general industrial use. Uses specific to the fire service and first responders must meet additional requirements for potential chemical, biological, radiological, and nuclear (CBRN) exposures. The NIOSH SCBA CBRN Statement of Standard and National Fire Protection Association (NFPA) standards define the additional requirements. When updating the notices, NIOSH may seek input from the NFPA, the International Safety Equipment Association (ISEA), and the Occupational Safety and Health Administration (OSHA).

NIOSH may consider developing and coordinating the review of additional notices with the appropriate entities based on input received and in response to concerns about the quality of the breathing air contributing to liner corrosion.

ACTION 2: NIOSH will work with DOT to develop consistent messaging to provide stakeholders information to better understand (1) the benefits and limitations of SP 16320 and (2) the rigor of the peer review process DOT used to accept the studies completed by Digital Wave Corporation in support

of issuing it. This includes alignment with the requirements in DOT CFFC Basic Requirements for Fully Wrapped DOT-CFFC (fifth revision) Appendix A. **Action in process.**

ACTION 3: In response to question two in the RFI, several SCBA manufacturers indicated the cost benefit announced to the public by DOT is incomplete because it does not adequately address liability issues. NIOSH will recommend that SCBA manufacturers and the manufacturers' trade association, ISEA, review the cost benefit analysis to reflect the potential for increased liability. **Action completed.**

4 REFERENCES

[Approval of Respiratory Protective Devices, 42 C.F.R, Part 84](#)

[December 28, 2001 NIOSH Letter to All Interested Parties, Acceptance of Applications for the Testing and Evaluation of SCBA for use Against Chemical, Biological, Radiological and Nuclear Agents](#)

[NIOSH Statement of Standard, SCBA with Chemical, Biological, Radiological and Nuclear Protection used to Protect Emergency Responders Against CBRN Agents in Terrorist Attacks](#)

Federal Register, Docket No. CDC-2018-0093-NIOSH-320, Document No. 2018-21256, p. 49388-49389, October 1, 2018. <https://www.federalregister.gov/documents/2018/10/01/2018-21256/self-contained-breathing-apparatus-compressed-breathing-gas-containers-request-for-information>

References cited or provided in response to the RFI:

[Pipeline and Hazardous Materials Safety Administration \(PHMSA\) New Cylinder Special Permit Maintains Safety Standards While Offering Cost Savings to First Responder Industry](#)

<https://www.phmsa.dot.gov/technical-resources/hazmat-technical-resources/self-contained-breathing-apparatus-scba-composite-cylinder-life-extension-research-project>

<https://www.phmsa.dot.gov/technical-resources/hazmat-technical-resources/self-contained-breathing-apparatus-scba-composite-cylinder-environmental-exposure-effects-on-dot-cffc-cylinders-with-modal-acoustic-emission-examination>

<https://www.phmsa.dot.gov/technical-resources/hazmat-technical-resources/fatigue-life-improvement-dot-cffc-composite-cylinders>

The Compressed Gas Association publication CGA -C22 Water Corrosion of Composites Cylinders with AA6061 Liners.

1910.134 OSHA Personal Protective Equipment, Respiratory Protection
<https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.134>

1910.134(h)(4) **Repairs.**

The employer shall ensure that respirators that fail an inspection or are otherwise found to be defective are removed from service, and are discarded or repaired or adjusted in accordance with the following procedures:
1910.134(h)(4)(i)

Repairs or adjustments to respirators are to be made only by persons appropriately trained to perform such operations and shall use only the respirator manufacturer's NIOSH-approved parts designed for the respirator;
1910.134(h)(4)(ii)

Repairs shall be made according to the manufacturer's recommendations and specifications for the type and extent of repairs to be performed; and
1910.134(h)(4)(iii)

Reducing and admission valves, regulators, and alarms shall be adjusted or repaired only by the manufacturer or a technician trained by the manufacturer.

Appendix A, Basic Requirements for Fully Wrapped Carbon Fiber Reinforced Aluminum Lined Cylinders (DOT CFFC), March 2007 (Fifth Revision). <https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/technical-resources/55751/basic-requirements-fully-wrapped-carbon-fiber-reinforced-aluminum-lined-cylinders.pdf>

Flage, D. Hunter, D Robinson, S., Self-Contained Breathing Apparatus (SCBA) Cylinder Life Extension Study <https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/technical-resources/55976/navy-self-contained-breathing-apparatus-scba-composite-cylinder-life-extension-research-project.pdf>

Structural Integrity Evaluation of CNG Composite Cylinders by Acoustic Emission Monitoring, Olivier Skawinski, Patrice Hulot, Christophe Binétruy And Christian Rasche, J Acoustic Emission, 26 (2008) pp 120-131.