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Mr. Dan Rossos  
Chair, Technical Committee on Respiratory Protective Equipment  
National Fire Protection Association  
1 Batterymarch Park  
PO Box 9101  
Quincy, Massachusetts 02269-9101

Re: NFPA 1981: Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for  
Emergency Services

The purpose of this letter is to provide written documentation to the National Fire Protection Association (NFPA) Committee responsible for NFPA 1981, Standard on Open-circuit Self-contained Breathing Apparatus (SCBA) of the findings from several National Institute for Occupational Safety and Health (NIOSH) fire fighter fatality investigations. These findings raise issues concerning the performance of SCBA facepiece lenses in fire environments experienced by fire fighters in these events investigated by NIOSH. These findings have previously been verbally communicated at Committee meetings by Mr. Stephen Miles from the NIOSH Fire Fighter Fatality Investigation and Prevention Program (FFFIPP) who serves on the Committee.

Review of five recent fatalities in four separate events indicated that the fire fighters' SCBA facepiece lenses may have been thermally degraded while the fire fighters were still "on air," potentially exposing their respiratory systems to superheated gases prior to them being overcome by the fire. The possibility that the fire fighters were still "on air" when their lenses were thermally degraded was identified through a review of information in autopsies and medical examiner reports, radio transmissions, examination of the SCBA and personal protective clothing worn by the victims, and witness interviews. It cannot be determined with certainty if the fire fighters were "on air" when the facepiece lenses were thermally degraded, and it is not known if the fire fighters would have survived for longer durations if the facepiece lenses would have remained intact for longer periods of time. However, the review suggests that further research is needed.

It should be noted that current NFPA standards for SCBA facepieces require testing at different temperatures and durations than for other parts of the personal protective equipment (PPE) envelope, such as the turnout coat, hood, and helmet. Research is warranted on whether individual components of the PPE envelope should have different testing requirements from other components, as well as the fire testing conditions that should be used to foster sufficient protection for fire fighters. Consideration should be given to the possibility that protection at higher heat levels may negatively impact fire fighter safety by allowing fire fighters to work in conditions that precede extreme fire events and environments where the potential for survival will be reduced.

Enclosed, please find three finalized NIOSH fatality investigation reports from three separate incidents that specifically illustrate a need for further research into the thermal resistivity performance of the SCBA facepiece, as well as testing conditions for the PPE envelope:

- A career officer (Pennsylvania) died after being exposed to products of combustion during a training fire. The victim's facepiece lens was thermally degraded while he was participating in live burn training at a training academy structure. (#F2005-31; <http://www.cdc.gov/niosh/fire/reports/face200531.html>)
- A career fire fighter (Virginia) died after being exposed to products of combustion during a residential fire. The SCBA facepiece was still in place on the victim's face when he was recovered, but the lens was thermally degraded. Reports from the medical examiner confirmed thermal injuries to the respiratory system. (#F2007-12; <http://www.cdc.gov/niosh/fire/reports/face200712.html>).
- A volunteer fire fighter (Alabama) died after being exposed to products of combustion in a flashover in a residential fire. The victim's lens was thermally degraded and autopsy records and photos indicate thermal injuries to the respiratory system. (#F2008-34; <http://www.cdc.gov/niosh/fire/reports/face200834.html>).

NIOSH is currently investigating an incident in Texas that resulted in the deaths of two fire fighters during which similar circumstances were encountered, #F2009-11. We will forward the report of this investigation to the Committee when completed.

The NIOSH review of these cases has identified contributing factors in the fire events that could have affected the ability of these fire fighters to escape and survive the fire events. One of the common factors is a rapid fire escalation that overtook the fire fighters. With the exception of the Pennsylvania training incident (F2005-31), all of the fire fighters were trying to escape and all of the fire fighters were most likely still "on air" at the time they were overrun with fire. All of the fire fighters were found with their facepieces still in place and the lenses were thermally degraded. All of the fire fighters suffered thermal injuries to their respiratory system as well as inhalation injuries from products of combustion.

An additional enclosure is a report by the National Institute of Standards and Technology (NIST), *Fatal Training Fires: Fire Analysis For The Fire Service*. The NIST report notes facepiece lens failure in two fire fighter fatality incidents: NIOSH case F2005-31 referenced above; and two fire fighter fatalities that occurred in a Florida live fire training evolution, NIOSH case #F2002-34; <http://www.cdc.gov/niosh/fire/reports/face200234.html>. The NIST report includes experimental estimates of thermal conditions experienced in these events. NIOSH has verbally communicated concerns regarding the thermal resistivity of the facepiece lens to NIST staff. Per a November 5, 2009 article in *FireChief*, the U.S. Fire Administration and NIST have begun research on the thermal performance of facepieces, with the intent to provide findings to the NFPA 1981 Committee (enclosed).

We will forward fatality investigation reports from any future NIOSH investigations that suggest performance issues with the SCBA facepiece or components that impact on NFPA certification. We welcome suggestions from the Committee on specific information that NIOSH could collect during fatality investigations that would be of specific utility to the Committee during consideration of revisions to NFPA 1981. Please feel free to correspond directly with Mr. Miles at 304-285-6276 or [smiles@cdc.gov](mailto:smiles@cdc.gov).

Sincerely,

A handwritten signature in black ink that reads "Nancy Stout". The signature is written in a cursive, flowing style.

Nancy Stout, Ed.D.

Director

Division of Safety Research

6 Enclosures

Cc: Les Boord