Objectives

• Present overview of findings from NIOSH fire fighter fatality investigations related to thermal degradation of Self-Contained Breathing Apparatus
Review of 8 recent fatalities in 6 separate events indicated the fire fighters’ SCBA may have been thermally degraded while they were still “on air”
The possibility that the fire fighters were still “on air” when the lenses were thermally degraded was identified through:

- A review of information in autopsies and medical examiner reports (and follow-up calls to the M.E. when possible)
- Radio transmissions (fire ground tapes)
- Examination of SCBA and personal protective clothing worn by the victims
- Witness reports
Review of these 8 fatalities indicate a need for further research into the thermal resistive performance of the SCBA face piece as well as testing conditions for the PPE envelope
FATALITY INFORMATION

#F-2005-31 PA

- Career fire officer (PA), died after being exposed to products of combustion
- Face piece lens was thermally degraded
- Victim was on air at the time of event

VICTIM’S FACE PIECE

NIOSH Photo
FATALITY INFORMATION

#F-2005-31 PA

- Victim was an instructor in a live burn exercise and had entered the burn room stacking pallets.
- "It is hypothesized that excessive heat in the burn room caused a catastrophic failure of the victim’s SCBA face piece lens."

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FATALITY INFORMATION

• “The failure occurred as the victim was carrying pallets in the burn room to add to the existing fire.”

• “The victim then struggled on the ground and crawled towards the exit.”
FATALITY INFORMATION

• “This failure was a result of the heat conditions within the burn room and not a problem with the face piece manufacture”

• The county coroner’s office reported the cause of death as thermal trauma

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ADDITIONAL DATA FOR F2005-31PA

• Mask conditions before event. Other masks at the facility exhibited signs of severe service and repeated exposure to high heat conditions.

• Victim had reported conditions in basement as “hot as hell down there” just prior to event.
ADDITI ONAL INFORMATION

• Additional information on the incident can be found in NIOSH report F2005-31PA
• Additional information on the victim’s SCBA and 2 other SCBA submitted by the fire academy can be found in NIOSH NPPTL report Task No.14292 (May 1, 2007)
• NIST Report; *Fatal Training Fires: Fire Analysis For The Fire Service* by Daniel Madrzykowski
#F-2007-12  VA

- Career fire fighter dies after being exposed to products of combustion during a residential fire.
- SCBA face piece was still on the victim, but the lens and mask were thermally degraded.

NIOSH Photo
FATALITY INFORMATION

- Victim initiated a mayday by radio emergency button and voice and advised "mayday, mayday, mayday, Tower 512 bucket, I’m trapped inside, I don’t know where I am, I’m somewhere in the stairwell, I need someone to come and get me out."
FATALITY INFORMATION

- Victim was still on air during the mayday transmission
- Victim was unable to escape a rapidly growing fire event
- Reports from medical examiner confirmed thermal injuries to respiratory system
ADDITIONAL INFORMATION

- Additional information on the incident can be found in NIOSH report F2007-12VA and the fire department investigative report @ http://www.pwccgov.org/vpresentations/fnr/LODDReport.pdf
- Additional information on the victim’s SCBA unit can be found in NIOSH NPPTL report Task No. TN-15210
#F-2008-34  AL

- Volunteer fire fighter dies after being exposed to products of combustion during a residential fire.
- SCBA face piece and other equipment were found next to the victim possibly burned off, the lens and mask were thermally degraded.
Victim was able to call by radio “I’m hot, come get me, come get me” (victim still on air).

Autopsy records and photos indicate thermal injuries to the respiratory system.

Photo Courtesy of sheriff’s office.
ADDITIONAL INFORMATION

- Additional information on the incident can be found in NIOSH report F2008-34
- NIOSH NPPTL is currently evaluating the victim’s SCBA
FATALITY INFORMATION

- #F-2002-34 FL
- 2 Fire Fighters Die During a Training Fire
- The fire fighters were caught in a flash over after a foam mattress was placed in the room they were to search
FATALITY INFORMATION

• NIST report indicates “the fire fighters’ self contained breathing apparatus (SCBA) face piece was compromised”

• NIST report indicates that the FL incident and the PA incident “were in part the result of fuel loads that generated levels of energy that exceeded the design capabilities of the protective equipment” and the need for further research on the impact of thermal conditions on SCBA face piece lenses under actual use conditions”
ADDITIONAL INFORMATION

- Additional information on the incident can be found in NIOSH report F2002-34FL
- NIST Report: *Fatal Training Fires: Fire Analysis For The Fire Service* by Dan Madrzykowski
- Bureau of Fire Standards and Training, Florida Division of State Fire Marshal. BFST Safety Investigative Report 02-01, July 30, 2002
FATALITY INFORMATION

#F-2009-11  TX

- Career fire officer and fire fighter (TX), die after being exposed to products of combustion
- Face piece lenses were thermally degraded
- Victims were likely on air at the time of event

NIOSH Photo

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FATALITY INFORMATION

#F-2009-11  TX

- Texas State Fire Marshal’s report indicated “a rapid fire growth moved through the narrow hallway with temperatures exceeding ratings of the PPE and SCBA”
FATALITY INFORMATION

Victim 1’s location

Victim 2’s location

Photos courtesy of fire department

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FATALITY INFORMATION

Victim 1’s Face Piece

Victim 2’s Face Piece

NIOSH Photos

CDC

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FATALITY INFORMATION

- Both fire fighters were overcome by rapid fire growth and unable to escape
- Victim 1 died of thermal injuries (including respiratory system)
- Victim 2 died of thermal injuries and smoke inhalation
FATALITY INFORMATION

- Victim 1’s face piece and hood

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FATALITY INFORMATION

• Victim 2’s face piece and SCBA assembly
ADDITIONAL INFORMATION

• Additional information on the incident can be found in NIOSH report F2009-11TX
• Texas State Fire Marshal’s Office, Investigative report number FY 09-01, Texas Department of Insurance, Austin Texas, April 12, 2009
• NIOSH NPPTL SCBA Status Investigation Report is still being developed
• NIST Fire Modeling is still being developed
FATALITY INFORMATION

• Current Investigation MD
• FF died after being caught by rapid fire growth on 3rd floor apartment
• Victim radio’d mayday and made it to the balcony door on side C
• Victim was still on air
• Victim died of thermal injuries
FATALITY INFORMATION

- Victim’s SCBA face piece thermally degraded
INJURY INFORMATION

- VA FF suffers severe burns, face piece is severely degraded.
- FF bailed out of a 2nd story window after being trapped in pre flashover conditions for approximately 2-3 minutes.
INJURY INFORMATION

- Victim was still on air and did not suffer respiratory injuries, but had to retire due to burn injuries.
- Department report states face piece was seconds from failure.

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ADDITIONAL INFORMATION

• Additional information on this incident can be found at http://www.loudoun.gov/Default.aspx?tabid=2384

INJURY INFORMATION

• FF from large metro dept. suffered significant burns while trying to escape residential fire, 2011

• Victim still on air, reported that his mask was moving and used his hand to hold mask in place
INJURY INFORMATION

- FF suffered significant burns, but survived by holding his face piece in place
- Lens separated from face piece skirt after escaping
INFORMATION ON SCBA’s INVOLVED IN FATALITIES SHARED

LETTER TO NFPA

Communication with NIST

- Notified NFPA 1981 of SCBA face piece performance in recent incidents
- Asked NIST to assist with testing of face pieces in similar situations
- Shared photos and FFFIPP reports with NFPA and NIST
NIOSH Fire Fighter Fatality
Investigation and Prevention Program

NI ST Research on Thermal Impact to SCBA face piece

Breathing Facepiece.wmv
Review of Findings From NIOSH FFFI PP Related to SCBA

- All of the fire fighter fatalities involved in the reviewed incidents were likely still “on air” at the time of the event
- Conditions encountered likely exceeded the performance capabilities of the SCBA face pieces
- Review of data suggest that the fire fighters suffered thermal injuries to the respiratory system
- Many of the fire fighters involved in the incidents were close to an escape point
Review of Findings From NIOSH FFFI PP Related to SCBA

- Findings suggest a need for further research into the thermal resistivity capability of SCBA face piece
- Findings suggest a need to bring the present data forward to provide research bodies and other organizations with information to raise awareness and the protection levels of SCBA and PPE
Review of Findings From NIOSH FFFI PP Related to SCBA

- NIOSH will continue to forward investigation reports from any future fire fighter fatality investigations that suggest performance issues with SCBA face piece or components that impact on NFPA certification.
- We welcome suggestions from our stakeholders on specific information that NIOSH could collect during fatality investigations.
Thank You

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