



# RESEARCH FOUNDATION

RESEARCH FOR THE NFPA MISSION

## Effectiveness of Exposure Mitigation Strategies for Fire Investigators

### PROJECT SUMMARY

(Last Updated: 2 February 2021)

#### **Background:**

Fire investigator health and safety research has not kept pace with that of traditional structural firefighting and, while some information can be brought from the firefighter environment to that of the fire investigator, some cannot. While a significant amount of attention and research has been directed toward understanding the occupational exposures in the fire service, most of these efforts have been focused on structural, and to a lesser extent, wildland firefighting, which has resulted in a few under-researched groups that have their unique exposures and needs. For fire investigators, the occupational exposure studies that have been conducted have focused primarily on the respiratory hazards (respirable dust, volatile organics, metals) experienced in the post-fire environment but have not significantly assessed the possibility of exposure through skin contamination and absorption.

#### **Implementation and Schedule:**

This project is led by the Fire Protection Research Foundation (FPRF) in collaboration with project partner, North Carolina State University (NCSU) Textile Protection and Comfort Center (TPACC). This is a three-year DHS/FEMA Assistance to Firefighters Grant (AFG) with a targeted completion date of September 2023.



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#### **Project Goal:**

The overall goal of this project is to better understand the effectiveness of exposure mitigation strategies for fire investigators. The project aims to improve the health and safety of fire investigators by determining the effectiveness of PPE, post-fire skin-cleansing wipes, and on-scene decontamination methods for mitigating exposures to toxic fireground contaminants while conducting investigations. More specifically, the primary goals or targets of this study are to reduce fire investigator exposures to toxic fireground contaminants through (1) ensuring fire investigators have PPE that provides the necessary levels of vapor and particulate protection while also affording an essential level of thermal comfort, (2) confirming that skin cleansing wipes for on-scene decontamination of fire investigators are effective, and (3) determining the efficacy of simple on-scene wet decontamination as well as doffing and bagging gear as a means to limit secondary exposure.

#### **Project Tasks:**

This project is composed of three phases and multiple tasks as follows:

##### **Phase A: Laboratory Assessments of Fire Investigator Ensembles**

Task 1: Assess Vapor Protection of Fire Investigator Ensembles

- Adjusting MIST protocol for relevance to fire investigators
- Conducting MIST evaluation on maximum of nine test ensembles with four subjects each

Task 2: Assess Particulate Protection of Fire Investigator Ensemble

- Design and construction of particulate exposure box for fire investigator ensemble testing
- Verification and validation of function and repeatability of method
- Conducting particulate protection evaluation on maximum of nine test ensembles with four subjects each

Task 3: Evaluation of Thermal Burden of Fire Investigator Ensembles

- Conducting thermal sweating manikin evaluations of maximum nine ensembles

### **Phase B: Efficacy of Primary Exposure Reduction with Skin-Cleansing Wipes**

#### Task 4: Dermal Absorption Studies for Selection of Skin Surrogate

- Working in conjunction with the NC State College of Veterinary Medicine to conduct dermal absorption studies on skin surrogates
  - Investigate different chemicals, temperatures, and wipe solutions

#### Task 5: Realistic Vapor and Particulate Contamination Protocol

- Develop method of contaminating the skin surrogate surface with particulate and chemical in a repeatable and realistic manner
- Conduct verification and validation testing to ensure repeatability of contamination

#### Task 6: Development of Standardized Protocol for Dynamic Contact Transfer

- Evaluate existing contact transfer/wipe test methods for suitability in the fire service application
- Work with wipe manufacturers to evaluate products for efficacy in the laboratory

### **Phase C: Evaluation of Exposure Mitigation Strategies in the Field**

#### Task 7: Comparison of Laboratory Assessments to Live-Fire Scene Field Evaluation

- Organize with NC Office of the State Fire Marshal for the in-field exposures
- Secure approval for in-field testing protocol with NC State IRB and submit to DHS/FEMA for review
- Lead and conduct the field assessments according to IRB-approved protocol to compare PPE effectiveness and on-scene decontamination strategies for fire investigators
  - Potential mitigation strategies to be included are: PPE, wipes, soap and water/on-scene decon, doffing/bagging gear for transport

### **Project Deliverables:**

The anticipated outcomes from this three-year study is a thorough evaluation of performance across a wide range of currently fielded PPE and recommendations to the NFPA committee governing appropriate standard. It will also provide new methods for evaluating particulate protection as well as a standard method for evaluating post-fire wipe efficacy.