



RESEARCH FOUNDATION

RESEARCH FOR THE NFPA MISSION

Improved PPE Cleaning Best Practices/Exposure Assessment

Expanding Firefighting PPE Cleaning Validation Procedures by Improving Best Practices and Exposure Assessment Methods

(For more information see www.nfpa.org/PPECleaning)

PROJECT SUMMARY

Last updated: 7 July 2022

Background: While significant progress has been made in the first two projects that has included establishing cleaning verification as a mandatory NFPA 1851 requirement for structural firefighting coats and pants by independent service providers (ISPs), manufacturers, and verified organizations and extending cleaning verification to other ensemble elements, gaps remain for comprehensively defining fire service best practices for cleaning and decontamination. Specific investigation approaches are detailed for filling these gaps by applying a series of designed experiments that measure contaminant removal for isolated cleaning variables (e.g., machine vs. manual cleaning, contaminant type, and the impact of cleaning on PPE performance) that vary with the individual ensemble element.

Additional parts of this research are being undertaken for transitioning cleaning verification procedures to a simple, resource-friendly kit that fire departments can employ, extending the field disinfection procedures developed in response to COVID-19 for broader application to all PPE elements and to address additional forms of biological contamination, and developing a reliable and quick-turnaround method for fire departments to assess PPE contamination levels to inform their cleaning and decontamination needs.

Robust analytical techniques are being applied in each of these investigations that entail the adaptation of standard or previously developed test methods, which are then combined with field validation efforts to demonstrate utility and reliability. The overall project approach is a logical extension of earlier research projects for developing procedures that can consistently address contamination and decontamination of PPE elements.

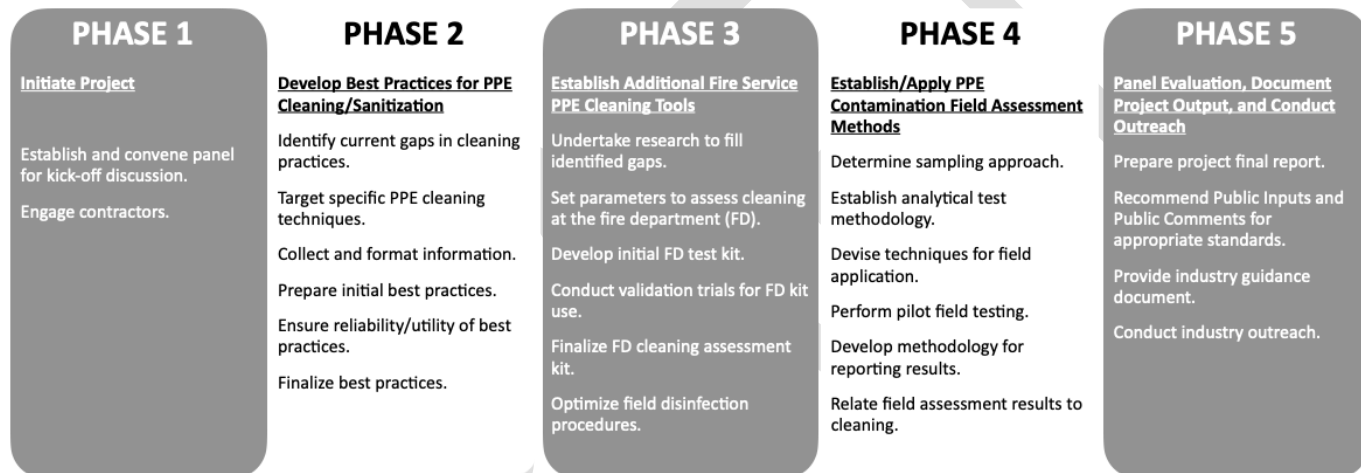
Purpose and Objectives: This project will build on and augment research conducted from two prior DHS projects (AFG FOA FY14: “How Clean is Clean” and AFG FOA FY17: “Broadening PPE Cleaning Validation Applications”) to establish and communicate comprehensive best practices the fire service can apply to effectively clean and sanitize firefighter PPE. The over-arching purpose of this research is to lessen firefighter exposure to harmful contaminants from uncleaned or improperly cleaned PPE to improve firefighter health and safety.

The principal aims for this new effort are to comprehensively identify the most effective and practical decontamination approaches for each element of the firefighter ensemble (garments, helmets, hoods, gloves, footwear, and SCBA/PASS), to create simple, easy-to-implement tools that fire departments can use to assess PPE contamination from individual structural fires and the effectiveness of their internal cleaning procedures, and to fully establish metrics by which PPE material and clothing suppliers, ISPs, and cleaning equipment/supply companies can improve their products and services for efficient contamination removal.

Project Objectives:

| YEAR 1 | YEAR 2 | YEAR 3 |
|--|---|--|
| Identify and prioritize cleaning gaps by PPE element Study and fill gaps in cleaning best practices | Define and verify PPE element cleaning best practices | Finalize, prepare, and publish best practices for cleaning PPE elements including submitting recommendations to all relevant standards and organizations for publication |
| Define the approach to assess fire department cleaning effectiveness | Initially develop fire department cleaning effectiveness assessment kit | Complete and publish fire department cleaning effectiveness assessment kit |
| Assess efficacy of field application of disinfection techniques | Finalize field disinfection procedures and define best practice Investigate techniques to assess field contamination | Validate and publish field disinfection assessment procedures with interpretation guidelines Refine and test field contamination assessment |

Study Design and Methods: This project is composed of five phases and multiple tasks as follows:



Deliverables (Projected): Through the execution of research conducted in each of the proposed project elements, the project aims to develop the following deliverables:

- 1) **Provide Evidence-Based Best Practices for Cleaning, Decontamination, and Sanitization/ Disinfection of Fire Service PPE:** The results of prior research from the FPRF Project Team and other sources will be combined with new research to fill gaps and allow for the completion of individual procedures to provide guidance and recommend the most effective techniques for each type of PPE (garments, helmets, gloves, footwear, hood, and SCBA/PASS) that can be integrated into relevant standards and disseminated to the fire service through multiple outlets.
- 2) **Create Practical Tools for Firefighters to Assess Cleaning and PPE Contamination Types/Levels In-house:** Test kits and procedures will allow fire departments to determine the adequacy of their in-house cleaning procedures and characterize fireground exposures that inform effective cleaning.
- 3) **Establish Metrics by Which PPE Manufacturers, Material Suppliers, Independent Service Providers, and Cleaning Equipment/Supply Companies Can Improve Products or Services for More Effective Fire Service Contamination Removal:** Overall findings from the research will provide a means for demonstrating differences in material and clothing contamination retention following cleaning. This will allow the fire service to make informed choices in selecting both PPE that can be easily cleaned and cleaning products/services that provide the highest levels of contaminant removal.

Project Support & Schedule: This three-year effort is supported by the DHS FEMA Assistance to Firefighters Grant (AFG), Award No.: EMW-2020-FP-00865. The effort is projected to be completed by September 2024.

