



RESEARCH FOUNDATION

RESEARCH FOR THE NFPA MISSION

Firefighting Foams: Fire Service Roadmap

Project Summary

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1. Background

For decades, firefighters have been using Aqueous Film Forming Foams (AFFF) as the dominant Class B firefighting foams for the vapor suppression and extinguishment of flammable liquid fires. AFFFs and other possible exposures in the fire ground are a critical concern for long-term firefighter health including possible cancer exposures. Today, fire departments are seeking replacements for AFFFs and other agents containing fluorosurfactants such as per- and polyfluoroalkyl substances (PFAS), and this includes state-based legislations that is phasing out the use of the older foams. The currently available AFFF alternatives may have reduced capabilities and require additional knowledge and guidance to effectively address the wide range of Class B fires encountered by firefighters. Today, fire departments desperately need guidance to move these replacements forward. This is a complex problem, with concerns that include fire extinguishing performance, health exposure, environmental contamination, and other concerns. This project will aim to proactively educate the fire service on the current and anticipated future issues on firefighting foam operations and handling by developing a strategic roadmap and recommendations of best practices to assist fire departments during this transition period in firefighting foam history.

2. Project Goal & Objectives

The overall goal of this project is to develop a strategic roadmap for the fire service while transitioning from fluorinated foam (i.e., AFFF) usage to fluorine free foam technology. The project aims to enhance firefighter safety and health by developing recommendation of best practice for firefighting foam operations and handling, by summarizing currently available information, reporting existing knowledge gaps, including all types of applications of firefighting foam that provide possible exposure pathways to firefighters and others.

The project includes the following specific objectives:

- Develop recommendations of best practices for foam operations and handling for firefighters to reduce death, injuries, and long-term adverse health impacts.
- Summarize learnings from the existing published literature, ongoing research studies, current fire service practices (including that of municipal, industrial facility, military fire departments), and standards that address the health and environmental issues associated with firefighting foam usage.
- Summarize existing trends in firefighting foam applications in the fire service for fire suppression operations and handling.
- Provide clarification of the different foams and their proposed replacements, including wetting agents and other substances used to replace fluorinated foams.
- Identify factors that influence fire suppression performance characteristics of fluorine free foams and develop recommendations to effectively deploy/use these products.
- Identify knowledge gaps and future research requirements that need to be addressed while transitioning to fluorine free foam technology.
- Stimulate a cross dialogue between ongoing diverse research efforts.

- Evaluate and refine the findings with stakeholders from fire service, to guide research, best practices, policy, etc.

3. Project Tasks

This project will be completed in 1-year timeframe with six primary tasks that will be accomplished in four phases as follows:

Phase I: Project Initiation

Task 1: Identify & Appoint Panel. FPRF will lead this task to establish an advisory panel with key stakeholders including fire service and subject matter experts to provide input, guidance and feedback throughout the project and dissemination.

Task 2: Project Workplan & Kick-off Meeting. The research team will develop a project workplan and convene with the advisory panel to clarify and obtain conceptual buy-in of the project work plan, scope, schedule and related details.

Phase II: Baseline Content Development

Task 3: Literature Review, Equipment/Agent Industry Survey, & Assessment. Conduct a comprehensive review of available information and summarize the learnings from the existing published literature, ongoing research studies, current fire service practices, and standards that address the following:

3.1. Firefighting foam landscape and surveillance: Existing trends in firefighting foam applications and operations in fire service; Identify various types of applications (Petrochemical fires, Aircraft rescue firefighting etc.); Current landscape of the use of fluorine free foams and replacements in fire departments; Guidelines for acceptable alternatives to fluorinated foams including the consideration of wetting and emulsifying agents.

3.2. Health & Environmental Issues: Health and environmental overview of issues associated with fluorinated foam usage; Identify best practices and standards for care, cleaning and contamination control for firefighters (e.g., firefighter gear); Existing foam disposal and remediation practices that are followed by various States and Fire Departments; Identify the target thresholds for cleaning existing hardware; and summarize best practices for cleaning existing hardware; and Best practices for foam disposal from ongoing research studies.

3.3. Firefighting foam technology: Overall firefighting foam technology and properties of fluorine free foams technology; Fire suppression performance characteristics of fluorine free foams and identify the factors that influence the firefighting performance of fluorine free foam technology including types of foam, fuel and hardware technology; Recommendations of best practices for using foam proportioning systems, and discharge devices.

Phase III: Evaluation & Gap Analysis

Task 4: Stakeholder Workshop. A workshop of at least two dozen subject matter experts and key stakeholders will be conducted to evaluate the baseline information established in the literature review and guide the development of best practices for firefighters. This workshop will bring together the project advisory panel, members of the fire service and additional stakeholders to review and provide direct feedback on the draft content. Recognizing the current and post Covid-19 pandemic situation for hosting in-person meetings, options such as virtual meetings or a hybrid approach of virtual/in-person meeting will be fully evaluated with the project panel to assure that all project aims, and outcomes will still be met or exceeded due to any venue realignment.

Task 5: Gap Analysis & Future Issues. Identify existing knowledge gaps for implementing fluorine free foam technology and summarize the future research requirements that needs to be addressed. Infer the risk trade-offs associated with firefighting foams operations and handling by considering fire protection effectiveness, health issues, and environmental issues, recognizing that any single detrimental factor could hinder or negate realistic progress in implementing promising replacements.

Phase IV: Reporting & Dissemination

Task 6: Reporting & Dissemination. A final report summarizing the overall effort will be generated along with a separate proceeding from stakeholder workshop that will be published online. This material will be reviewed with the advisory panel to clarify and confirm final enhancements to the project deliverables. The deliverables will be broadly circulated through the extensive outreach venues.

4. Implementation and Schedule:

The project is funded by a DHS/FEMA Assistance to Firefighters Grant (AFG) Program. This research project is led by the Fire Protection Research Foundation (FPRF) with collaborative support from project partners, Jensen Hughes, Inc., DFW Dynamics, DSRAE, LLC. The project is scheduled to be completed by October/November 2021.



5. Project Deliverables

This 1-year project consists of three primary components (1) Baseline content and material development; (2) Stakeholder workshop for evaluation; (3) Dissemination and outreach.

The baseline content and material development includes investigating existing published literature, the current environmental and legislation landscape on use restrictions and remediation, past and on-going research, current fire service practices, and standards, current industrial fire brigade practices, and standards for addressing the issue of firefighting foam operations and handling.

A comprehensive workshop (coordinated by the Project Team) will be designed to review the baseline information, stimulate cross dialogue between ongoing research efforts, facilitate discussion to receive commentary from fire service representatives, and industrial fire brigade subject matter experts to improve project deliverables and develop the strategic roadmap for fire service during this foam technology transition. Most importantly, this comprehensive evaluation will also focus on understanding the knowledge gaps and identify future research elements to serve the needs of fire service.

The entire project effort will be documented through a final written report and a standalone Proceeding will summarize workshop discussions. The project will produce summary recommendations of best practice brochures for fire service. All these deliverables will be published in the FPRF website.