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**THE
FIRE PROTECTION
RESEARCH FOUNDATION**

Celebrating 25 years of research in support of the NFPA mission

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FIRE AND EMERGENCY SERVICE PERSONAL PROTECTIVE EQUIPMENT
SUMMARY OF RESEARCH NEEDS
MAY 2008

NFPA's Fire and Emergency Service Personal Protective Equipment (PPE) Technical Correlating Committee oversees the activities of NFPA Technical Committees developing standards in support of the fire service needs in this technical area. These Committees are currently challenged by rapid change in today's fire ground conditions and an accompanying rapid development of new technology in PPE. At the request of the TCC, the Fire Protection Research Foundation facilitated a needs assessment workshop on Thursday, 29 May 2008, at the NIOSH/NPPTL facility in Bruceton, Pennsylvania. The objective of the meeting was to benchmark current research issues related to enhancement of NFPA PPE standards and to develop a prioritized research needs agenda. The following list summarizes to priorities identified by the Committee.

- 1) **Fire/Chemical Environment Characterization.** Define the fire/chemical environment encountered by today's fire service from the perspective of fire fighter exposure, with a specific focus toward improving the design and use of personal protective equipment used by fire fighters. This includes addressing fire/chemical environment characteristics such as gases, temperatures, products of combustion, and heat release rate, to clarify the relationship between these characteristics and how fire fighters are fatally and non-fatally injured.
- 2) **Field Study of Deployed Equipment.** Initiate a survey of PPE equipment deployed in the field over a range of applications and ages. Characterize details such as equipment age, frequency of use, type of use, status of maintenance and certification, and so on, to demonstrate the impact of care and maintenance as it relates to application and age.
- 3) **New Materials and Technologies Development.** Identify potential advancements for new materials and new technologies that relate to fire fighter PPE, and outline the approaches needed to implement these advances for the fire service with a particular focus on standards development. Develop test methods that will facilitate these new materials and new technologies.

- 4) **Research Agenda Clearing House.** Establish an on-going mechanism to bring information on new technologies to the standards development process and to identify and prioritize the research needed to advance the implementation of PPE technology for the fire service..
- 5) **Establishing Performance Criteria for Data and Voice Telemetry.** Develop performance criteria for data and voice telemetry to enable fire fighters to complete their job tasks under the wide range of applications to which they are exposed. The intent will be to improve the reliability of data and voice telemetry used by the fire service within structures, and to clarify the degree that dysfunctional performance can be tolerated. Establish RF test protocols, clarify technical issues such as mesh networking, and address challenging applications such as RF signal propagation in steel reinforced concrete buildings with sub-surface floors.
- 6) **Fire Service PPE Needs Assessment.** Survey the fire service user community to identify their specific PPE needs from the users' viewpoint. Identify the what, when, where, how and why of fire service requirements relating to specifically to detailed aspects of PPE.
- 7) **Establish Physiological Monitoring Protocol.** Develop and establish a protocol for the physiological monitoring of fire fighters during the performance of their job tasks. Clarify baseline information that can ultimately be used by fire ground Incident Commanders for the real time, remote monitoring of fire fighters, by measuring physiological characteristics such as core temperature, pulse, and other key physical parameters.
- 8) **Improve PPE Ergonomics. Identify current PPE** characteristics and identify areas for ergonomic improvement, with the intent of minimizing overall weight of the entire PPE ensemble and respiratory protection.
- 9) **Define Parameters for Fire Fighter Location/Monitoring.** Define the fire service perspective on performance parameters for fire fighter location and monitoring technologies. Development performance criteria/specifications for this equipment.
- 10) **Establish Electronics Integration Platform.** Develop an electronics integration platform for integrating different sensors or electronic devices in the CBRN PPE ensemble. The intended purposes for the development of this platform are to establish the industry standard for how electronic devices are integrated into protective ensembles, permit consistent development of electronic systems without compromising innovative approaches for sensors and other electronic systems wearable as part of the protective ensemble, and to create the power supply and user interface specifications that will allow unencumbered integration of different electronic systems.