Research Areas

Advanced Fire Service Technology

Fire Behavior

Fire Fighter Locator

Fire Fighter Training

Fire Investigation

Fire Protection

Hose Streams

Personal Protective Equipment

Positive Pressure Ventilation

Structural Collapse

Thermal Imaging

Wind Driven Fires

Other Fire Protection News

12/12/2012

- NIST, Forest Service Propose System to Help Communities Resist Wildfires

12/5/2012

- NIST and Forest Service Create World's First Hazard Scale for Wildland Fires

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NIST Engineering Laboratory (EL)

Recent News

NIST Fire Research Returns to Governors Island to work with FDNY and UL

A team of researchers from the NIST Engineering Laboratory's Fire Research Division spent three weeks this past summer working with the Fire Department , City of New York (FDNY) and UL to examine the different tactics in fighting fires that started on different levels of the structure. Experiments were conducted with the fires starting in the basement, or in the living room on the first floor, or in a bedroom on the second floor. The objective of the experiments was to examine different ventilation conditions and how they affect the growth of the fire and then examine different tactics that the fire department might employ to rescue potential victims that might be in the home and then extinguish the fire.The tactics included additional ventilation, vent, enter, isolate and search (VEIS), exterior fire attack with manual hose streams.Measurements made during the experiments included temperature, heat flux, and gas velocity at doors and windows. In addition, temperature and gas concentration (oxygen, carbon dioxide, and carbon monoxide) measurements were made in bedrooms remote from the fires to examine the viability of a "potential victim" throughout the fire and the impact of various tactics on the conditions the victim would be exposed to. The report is scheduled for release in March. The results will be presented by representatives of FDNY, NIST and UL at the Fire Department Instructors Conference in Indianapolis, IN on April 25th, 2013.
During the experiments, The Daily Plant, a science show on the Discovery Network, came to the island to film. The segment provides an overview of the fire experiments that were conducted on the island.The segment can be viewed at the following link:http://watch.discoverychannel.ca/#clip784350

These photos show the rapid reduction in heat release rate (fire size) from the application of water from an exterior position from of the "burned side" of the building, when no other vents to the exterior are open.

In 2008, NIST conducted a series of wind driven fire experiments with FDNY. The fire experiments took place in a 7 story building on Governors Island. As a result of those experiments, FDNY added several new tools to their fire fighting arsenal and modified their tactics for fires in "fire proof multiple dwelling units." For more information on those experiments and the impact of positive pressure ventilation fans to pressurize the stairs, wind control devices, and highrise nozzles see the wind driven fires section of this website: http://www.nist.gov/fire/wdf.cfm.

Safety Alert

Exposure to high temperature environments, which firefighters can encounter during fires they are attempting to extinguish, can result in the thermal degradation or melting of a Self- Contained Breathing Apparatus (SCBA) facepiece lens, resulting in elimination of the protection meant for the user's respiratory system and exposing the user to products of combustion and super heated air.

www.nfpa.org/scba

For details, see the report, *Fire Exposures of Fire Fighter Self-Contained Breathing Apparatus Facepiece Lenses* (NIST TN 1724, November 2011.)

Wind blowing into the broken window of a room on fire can turn a "routine room and contents fire" into a floor-to-ceiling firestorm. Historically, this has led to a significant number of firefighter fatalities and injuries, particularly in high-rise buildings where the fire must be fought from the interior of the structure.

Wind-Driven Fire in a Ranch-Style House in Texas, 2009

On April 12, 2009, a fire in a one-story ranch home in Texas claimed the lives of two fire fighters. Sustained high winds occurred during the incident. The winds caused a rapid change in the dynamics of the fire after the failure of a large section of glass in the rear of the house.

Wind Driven Fire in Home, Texas, 2009. Aerial view of damage to the structure. Photo credit: Houston Fire Department.

NIST performed computer simulations of the fire using the Fire Dynamic Simulator (FDS) and Smokeview, a visualization tool, to provide insight on the fire development and thermal conditions that may have existed in the residence during the fire.

Based on the analysis of this fire incident and results from previous studies, adjusting fire fighting tactics to account for wind conditions in structural fire fighting is critical to enhancing the safety and the effectiveness of fire fighters. Previous studies demonstrated that applying water from the exterior, into the upwind side of the structure can have a significant impact on controlling the fire prior to beginning interior operations. It should be made clear that in a wind-driven fire, it is most important to use the wind to your advantage and attack the fire from the upwind side of the structure, especially if the upwind side is the burned side. Interior operations need to be aware of potentially rapidly changing conditions.

See full report, *Simulation of the Dynamics of a Wind-Driven Fire in a Ranch-Style House – Texas* (NIST TN 1729, January 2012.)

For more information, including simulation video, see the Wind Driven Fires page.

Self Contained Breathing Apparatus

Fire fighters are exposed to highly variable environments including elevated temperatures and convective and radiant thermal flux, which can put a significant burden on personal protective equipment. Thermally degraded and melted self-contained breathing apparatus (SCBA) facepieces have been identified as a contributing factor in certain fire fighter fatalities and injuries in the United States. The SCBA facepiece lens is often considered the weakest component of a fire fighter's ensemble in high heat conditions.

NIST conducted experiments (with the support of the Chicago Fire Department, the Department of Homeland Security, and the U.S. Fire Administration) which demonstrated a range of realistic thermal exposures and environmental conditions that firefighters could be exposed to. The environments that caused the failures were identified in an attempt to characterize the thermal performance of SCBA facepieces.

For details, see the report, *Fire Exposures of Fire Fighter Self-Contained Breathing Apparatus Facepiece Lenses* (NIST TN 1724, November 2011.)

For more, see the Personal Protective Equipment page.

Opening the door provided additional air to a smoldering living-room fire and caused the fire to increase in burning rate and flames to extend out the doorway, resulting in high temperatures and heat flows that melted a hole in the mask. Pressure sensor (brass fitting that was mounted on the face of the headform) is visible through the hole in the lens. Credit: NIST

Past News...