National Institute of Standards and Technology
U. S. Fire Administration
Federal Emergency Management Agency

FIRE.GOV

Better fire fighting through research

Fall Issue -- 2001

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Slips and Falls Related to Protective Clothing Ensemble

The role of the fire fighter protective clothing ensemble in slips and falls was investigated by Chief Donald Adams while working at **King's Point Volunteer Fire Department** and the **City of Orlando Fire Department** in Florida. The paper resulting from this study was one of the six award winners in the U.S. Fire Administration, National Fire Academy's Executive Fire Officer's Program's in the year 2000. The paper discusses research that was performed to learn more about the slips and falls experienced by firefighters when they wore protective clothing ensembles. The effects of the center of gravity (COG) and balancing ability when wearing a station uniform vs. protective clothing ensembles, including wearing a self-contained breathing apparatus were studied.

The major findings were that slips and falls account for 25 percent of fireground injuries to firefighters, and that protective clothing ensembles impair balance. Further, it was recommended that more research using computer-based assessments to evaluate protective clothing be performed. The complete award-winning paper may be downloaded from the National Fire Academy's web site: http://www.usfa.fema.gov/nfa/tr_ora.htm.

For additional information, contact Chief Donald R. Adams, Sr., currently with the **Osceola County Fire Rescue Department**, Kissimmee, FL, telephone: 407-343-7000 or e-mail: dada@osceola.org

For information on the Executive Fire Officers Program, contact Chuck Burkell, 301-447-1072, chuck.burkell@fema.gov

Sway and Position of COG in Protective Clothing Ensemble

Effect of Protective Clothing Ensemble on Balance

ATF and Kinston, NC Fire and Rescue Burn to Learn

The Bureau of Alcohol, Tobacco and Firearms (ATF) uses buildings of opportunity to conduct fire investigation research and training for agents in the Certified Fire Investigator Program. ATF has developed a unique partnership with the City of Kinston, North Carolina, and particularly the **Kinston Department of Fire and Rescue** (KFD) to use flood damaged buildings for controlled fire experiments. Chief Greg Smith, in cooperation with other city officials, has made available to ATF an entire neighborhood of homes that are part of a FEMA buyout of the flood-damaged properties along the Neuse River. This large area of homes, with the city infrastructure still intact, provided unique opportunities for fire testing.

In 1998, ATF began going to Kinston to conduct live burn training exercises and full-scale fire tests. Tests and training have included such things as origin and cause determination, full-scale house burns to total collapse, electrical studies in fully energized structures and one large (and quite spectacular) burn utilizing large quantities of liquid petroleum gas (LPG). In addition to supporting

Cont. on page 2

ATF Agents Observe August, 2001 House Fire Experiment in Kingston, NC, Before They Dig in the Remains

ATF and Kinston, NC Fire and Rescue Burn to Learn, cont.

KFD protects surroundings as house burning experiment continues.

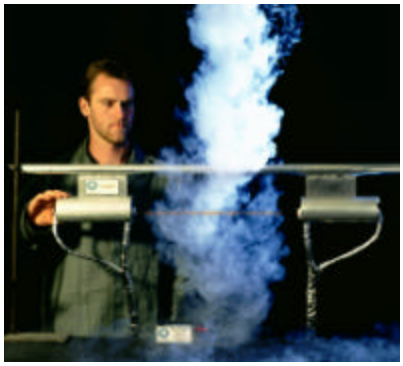
the ATF mission, the fires have provided some unique training opportunities for KFD.

The ATF-KFD relationship has been ongoing and has expanded to include support for fire testing needs of NIST, USFA, Harvey Mudd College, the ATF Fire Research Laboratory, as well as other agencies.

Chief Smith, Commander Crawford, Capt. Reavis and the KFD firefighters have been outstanding in supporting the wide variety of fire test requests. They have demonstrated their professionalism and flexibility during an often challenging and somewhat unpredictable fire test schedule.

ATF is interested in additional opportunities to burn in many different types of structures to add to the storehouse of knowledge that can be used by fire investigators. Contact: Agent Lester Rich, Charleston, SC Office, ATF, 843-727-4275; e-mail LVRICH@charl.atf.treas.gov

New Instrument Measures Smoke Obscuration in Building Fires



Optical Beam Meter with a LED Being Used to Study Smoke

To improve the study of life safety in burning buildings, Australian scientists have developed a smoke meter that allows the accurate study of smoke in building fires and remains undamaged through flashover. Commonwealth Scientific & Industrial Research Organization (CSIRO) Fire Science and Technology Laboratory's smoke meter measures the optical density of smoke, thus allowing researchers to better understand the visibility issues of occupants and fire fighters in a building fire.

The High Temperature Smoke Meter can measure the smoke in regions of the fire not possible with other meters. It is an optical beam type meter using an ultra bright monochromatic focused light emitting diode (LED) as a source. With a double-skinned casing that prevents the sensors from over heating. Cooling is supplied by compressed air.

For additional information, contact Dr. Dilip Manuel, telephone: (61) + 3 9252 6073; e-mail: Dilip.Manuel@dbce.csiro.au

Role of the Fire Service Recognized in Fire Protection Design

SFPE Logo

The Society of Fire Protection Engineers (SFPE) produces guidance documents for engineers performing fire safety designs. These documents are widely accepted statements of best engineering practices. SFPE has created a new task group that will develop guidance on accounting for fire department operations in engineered fire protection design. Viewing the fire service as one of the fire protection systems for buildings, guidance will be provided on how the contributions of the fire service to fire safety can be considered during the building design. Guidance also will be provided on how engineers can best design buildings and fire safety systems so that they facilitate fire department operations. The Evaluating Fire Service Contributions to Engineered Fire Protection Design task group is one of seven SFPE task groups. For information, see http://www.sfpe.org/taskgrm.html or contact Morgan Hurley, SFPE Technical Director, at 301-718-2910 or mhurley@sfpe.org .

NASA Brings Spacesuit Technology to Fire Fighting

NASA's Johnson Space Center together with the **Houston Fire Department**, the Department of Defense, Aerospace Design and Development, Oceaneering Space Systems, ILC Dover, and Lockheed Martin are developing a prototype protective suit that could double the time a firefighter can battle a blaze before needing rehab to cool off. This advanced firefighter suit uses a number of technologies that also protect space-walking astronauts, including new outer garment fabrics and active cooling inner garments that can allow more lengthy exposure to temperatures of up to 260 degree C (500 degrees F), while protecting the firefighter from building up metabolic heat stress.

Work on developing an advanced firefighter suit began in 1997 when two Houston firefighters brought a badly damaged helmet to the Space Center and asked if there were any NASA technologies that could provide better performance.

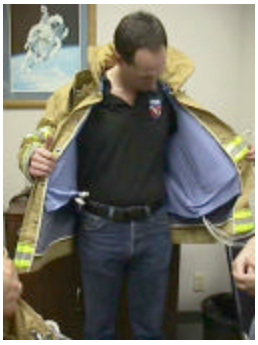
In the evolving partnership, members of the **Houston Fire Department** took the lead with respect to determining goals and requirements for the suit; the Johnson Space Center coordinates the project and develops approaches for the design, integration and testing of the suit and its components.

The Defense Department develops heat stress models and develops, tests and evaluates materials. The NASA contractors build mockups, firefighters try them out and make comments, then the contractors build prototypes for field tests and certification for compliance with minimum firefighter standards.

The development team has identified 40 additional areas from which space suit technology can potentially add improvements to structural firefighter protective gear. These include: integrated helmet, improved gloves, radiant heat protection, and ergonomic evaluation for best fit. The integrated helmet would have a built-in duplex digital radio, bone-conduction headset for noise reduction, infrared imaging to search for fire victims, biodata and temperature sensors, and readouts on the status of its life support system.

For additional information, contact Tico Foley at 281-483-2996; fax: 281-244-5773; tico.foley@jsc.nasa.gov. For information on NASA's Technology Transfer program, visit their web site: http://technology.jsc.nasa.gov.

Prototype Supercritical Cryogenic Air Mobility Pack (SCAMP) for Both Breathing and Cooling



Cooling System Inside Turnout Coat

Nanoparticles Increase Foam Effectiveness

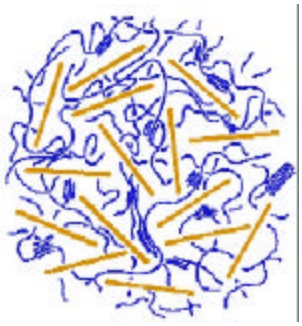
Applying the clay-AFFF foam to a 30 cm diameter heptane pool surrounding the 10 cm hollow cylinder.

To suppress liquid fuel fires, firefighters often use Class B foams; one of these Class B foams is AFFF. During or after foam application, the foam blanket may be broken any number of ways and, if broken, the fuel re-ignites. NIST has shown that microscopic clay particles, containing plates organized like a deck of cards, may significantly increase the flame resistance of polymers when incorporated into the AFFF foam.

Laboratory tests measured the ability of a 30 cm diameter ring of foam to seal a 10 cm diameter hole of burning heptane. Clay-AFFF foam was able to seal the hole and extinguish the fire in 7 seconds. Regular AFFF foam did not extinguish the fire.

Additional fire testing will be done to provide more information on the effectiveness of clay as an inexpensive performance-enhancing additive.

For more information contact: Dr. Rick D. Davis, 301-975-6698; e-mail: rick.davis@nist.gov.



Drawing of Mica-type Nanometer Plates (tan) Mixed into a Polymer Matrix (blue)

NIJ Releases Five Equipment Guides for Fire Responders

Portable Detector Using Infrared Spectrometry Technology Analyzes Ambient Air

Handheld Detector Samples Environment Using an Air Pump With Ion Mobility Spectrometry (IMS) Technology

Responding to the urgent need for guidance in selection of equipment used by first responders to incidents involving chemical, biological, and toxic industrial materials, the National Institute of Justice (NIJ) has released five new guides. Some of the guides are complete and others are in draft form subject to change. All of the documents are available through the web started at URL www.ojp.usdoj.gov/nij/new.htm

The information assembled in the guides on specific equipment and technologies was obtained through literature searches and surveys.

NIJ is the focal point for providing support to State and local law enforcement agencies in the development of counter terrorism technology and standards, including technology needs for chemical and biological defense. This work was part of the research program of the Office of Law Enforcement Standards at NIST.

For further information contact: Dr. Al Fatah, 301-975-2753 or aafatah@nist.gov.

NIJ Guides:

Guide for the Selection of Chemical Agent and Toxic Industrial Material Detection Equipment for Emergency First Responders, NIJ Guide 100-00

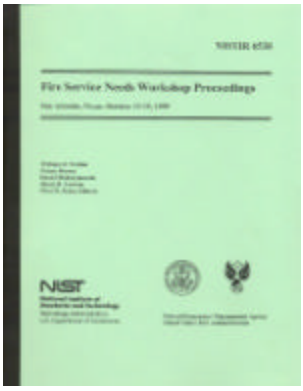
An Introduction to Biological Agent Detection Equipment for Emergency First Responders, NIJ Guide 101-00

Guide for the Selection of Personal Protective Equipment for Emergency First Responders, NIJ Guide 102-00

Guide for the Selection of Chemical and Biological Decontamination Equipment for Emergency First Responders, NIJ Guide 103-00

Guide for the Selection of Communication Equipment for Emergency First Responders, NIJ Guide 104-00

FDNY Chief Ganci Remembered as a Friend of Research



Fire Service Needs Workshop Proceedings

Chief Peter J. Ganci, Fire Deparment - City of New York (FDNY), lost his life commanding the response to the terrorist attack on the New York World Trade Center. We remember him in a special way as a man who helped researchers define the needs of the fire service. The last NIST- USFA fire service needs workshop was held in San Antonio, Texas. Findings of this workshop are used by NIST, USFA and others to set priorities for research funding to address the identified needs.

Chief Ganci provided his insights in the multi-day workshops to help update and sharpen the needs assessment. We were honored to have an officer of Chief Ganci's stature and responsibility assist in the effort. Chief Ganci wanted the best for his department members, so he encouraged their involvement in the research process to keep the equipment and tactics they use on the leading edge. (See FIRE.GOV, Spring, 2001.)

At NIST and USFA we continue to work hard to address the priorities that he helped define.

Click here for a PDF file of the report, *"Fire Service Needs Workshop Proceedings, San Antonio, Texas, October 13-15, 1999."*

Dave Evans - Editor

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