

**Page 1**

Residential Fire  
Sprinklers Initiative

**Page 2**

Virtual Reality Firefighter  
Training

Water Mist Systems  
Protect Exposed  
Structure

**Page 3**

Hose Stream  
Performance Measured  
in Sweden

DoD Technology Can  
Help Visualize Fire  
Ground Information

**Page 4**

NIST Studies Trends in  
Firefighter Fatalities Due  
to Structural Collapse

Alfred P. Sloan  
Foundation Funds  
September 11 Digital  
Archive

## Residential Fire Sprinklers Initiative

The US Fire Administration (USFA) working with national fire organizations, such as the National Fire Protection Association (NFPA), International Association of Fire Chiefs (IAFC), National Fire Sprinkler Association (NFSA), and American Fire Sprinkler Association (AFSA), has embarked on a new initiative to increase the number of homes in the United States that are protected with an automatic fire sprinkler system. The renewed support for residential sprinkler use has four component strategies: Develop an aggressive strategy for advocating sprinklers in residential buildings influenced or supported by the federal government; advocate localized sprinkler systems as a means of fire suppression in high risk areas (e.g., kitchens) for retrofit applications; provide advocacy and informational support among stakeholders including state and local decision makers; and ensure that the USFA continues to support research and development in residential fire sprinkler technology.

USFA has several research efforts that are fundamental to the success of this initiative. Working with the National Association of State Fire Marshals (NASFM), USFA is collecting data on residential sprinkler activations from across the nation.

Data from the 1980s suggests that usually only one sprinkler is activated in residential fires. If this can be confirmed with current data, this would support the concept of a residential sprinkler system design based on an increased water flow for a single sprinkler. Currently, NIST is conducting a testing program in conjunction with Underwriters' Laboratories to examine the potential of a single sprinkler design. NIST also is investigating the capabilities of localized suppression systems for controlling kitchen fires. The suppression technologies being examined include: Self contained systems, both dry chemical and wet chemical; a single sprinkler that would be supplied from the domestic water system.

For more information on the program, a copy of the *National Residential Fire Sprinkler Initiative Report* can be downloaded from the USFA website: <http://www.usfa.fema.gov/media/2003releases/03-071503.shtm>.



With single sprinkler protection, damage was limited to the area directly above the fire.



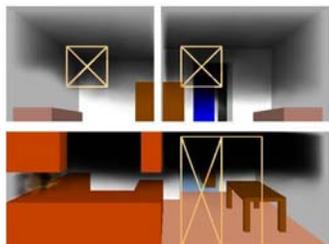
Without sprinkler, the fire spread to flashover in the kitchen. (photo credit: Dan Schuh)



Cooking oil fire in a pan on the stove served as the test exposure fire.

## Virtual Reality Firefighter Training

Fighting fires in a burning building has no equal, but is it the only way to train? Is it the only way to demonstrate how different tactics will affect the fire? NIST has accepted the challenge of creating a virtual reality training



Frame 320  
Time 04:0

*A simulated kitchen fire in a two story townhouse illustrating the newest visibility through smoke layer enhancements.*

simulation of various fire situations to demonstrate how life-threatening conditions can develop in structures and to test firefighting tactics using computers. In turn, firefighters will have a tool that can provide realistic visualization of fire growth and suppression.

NIST experts are reworking their fire modeling software, Fire Dynamic Simulator (FDS), and the fire imaging program, Smokeview. Refinements of FDS will increase the system's ability for simulating smoke and gas flow caused by fire, wind, ventilation and structural conditions. The upgrade also will improve data processing,

resulting in speedier calculations that will permit even the most complex fires (such as a multistory or multi-building event) to be portrayed.

NIST will be working with firefighter instructors to develop a simulation of all possible outcomes for selected fire scenarios used in training. These will be incorporated into a software package, enabling users to change a simulation with the click of a mouse. Instantly firefighters will be able to learn the consequences of their actions such as opening a window, closing a door or focusing a hose spray in a certain directions.

Enhancement of fire-related images, such as visibility through smoke, will add to the "real" feel.

To learn more about NIST's current FDS and Smokeview software packages, see **Understanding Fire and Smoke Flow Through Modeling and Visualization** by G.P. Forney, D. Madrzykowski, K.B. McGrattan and L. Sheppard (*PDF available [HERE](#).*) For more information on the virtual reality project, contact Dr. Glenn Forney, (1) + 301-975-2313 or [gforney@nist.gov](mailto:gforney@nist.gov).

## Water Mist Systems Protect Exposed Structure

Designers and architects are seeking new ways to create a new indoor environment. One example is the Credit Valley Hospital/Carlo Fidani Peel Regional Cancer Centre in Mississauga, Canada designed by Farrow Partnership Architects, Inc. A treelike structure of exposed wood was to be created in the atrium in an effort to create a warm atmosphere; however, it did not meet the **OBC (Ontario Building Code)**. An alternate material choice that would meet

the code requirements was steel, but it would not create the atmosphere sought by the designer. To provide fire protection for the wood structures in the atrium, a water mist system with the nozzles built into the lighting supports was proposed.

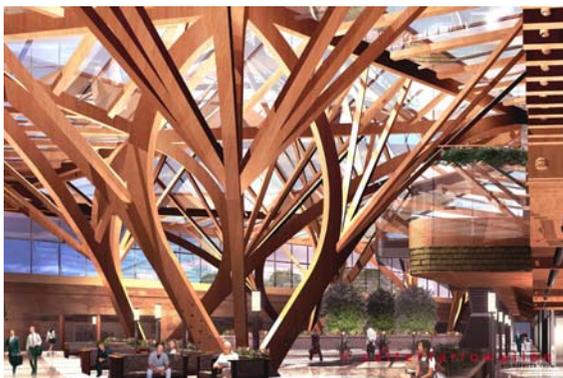
In order to gain approval for the mist system in the health care facility, a full-scale mock up of a portion of the design was constructed and tested by the National Research Council of Canada.

The wooden structure protected by water mist nozzles was subjected to a 7 m<sup>2</sup> heptane pool fire. The test demonstrated that the flame spread was reduced and temperatures measured were well within acceptable limits. There was no evidence of flame attachment or soot deposition on the structure.

Although used in Europe for many years, water mist systems (also known as fog systems) are gaining popularity in North America. These systems do not need a large volume of water to suppress fires. The fine water mist quickly cools hot gasses, while the resulting steam displaces oxygen concentration; both working to suppress fires. Many different configurations of mist nozzles and pressurized water supply are available for applications.

The systems allow greater flexibility in design than traditional suppression systems.

To learn more about this project, a copy of the article is found at <http://irc.nrc-cnrc.gc.ca/ircpubs> or contact Sean Stanwick, [seans@farrowpartnership.com](mailto:seans@farrowpartnership.com).



*Design for atrium area of the Peel Region Cancer Centre.*



*Fire test of water mist spray protection.*

## Hose Stream Performance Measured in Sweden

Drs. Stefan Sardqvist and Stefan Svensson of the **Swedish Rescue Service Agency** recently completed a series of fire tests studying large-scale fire fighting, and the differences between manually applied high-pressure and low-pressure firefighting systems and the effect of heat stress on fire fighters. The complete study is discussed in their paper, "Fire Tests in a Large Hall, Using Manually Applied High- and Low-Pressure Water Sprays", published in *Fire Science & Technology*, Vol. 21, No. 1, pp. 1-17, 2001.

The purpose of the tests was to investigate the capacity of

the fire service to fight fires in large spaces; to obtain data to quantify the capacity; to compare a high-pressure to a low pressure fire fighting system; and to measure the heat stress on fire fighters using breathing apparatus equipment during a fire attack.

The tests provided a lot of data that also may be used for further studies. As anticipated, the capability of the firefighter to extinguish fires in large spaces relies on the ability to reach the burning area of the fuel. When both surface cooling and gas phase effects are considered, the high pressure

system requires only approximately two-thirds of the water required by the low-pressure system to achieve the same extinction capacity in this scenario.

During fire fighting, firefighters experienced an increased pulse rate that appeared to be triggered by mental stress and increased due to increasing skin temperature. Tests with and without cooling vests to vary heat stress showed that under low workload, heat stress and heat penetration through protective clothing may produce dangerous fire fighting conditions, even after a few minutes.

For additional information, contact Dr. Stefan Sardqvist, telephone: (46) + 46 23 36 44, e-mail:

[stefan.sardqvist@srv.se](mailto:stefan.sardqvist@srv.se) or Dr. Stefan Svensson, telephone: (46) + 46 23 35 76, e-mail: [stefan.svensson@srv.se](mailto:stefan.svensson@srv.se).



*Pallet arrangement for manual fire suppression test. The front row of pallets was sufficient to prevent water from reaching the row of pallets behind.*

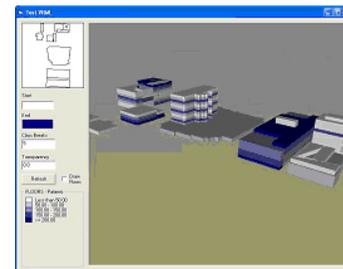
## DoD Technology Can Help Visualize Fire Ground Information

Imagine the Incident Commander (IC), or those assisting the IC, being able to view all of the important information about involved structures and the surrounding neighborhood by using a laptop based intelligent map for display of pre-incident plans and exposures. The intelligent map could be queried to see water sources, cut-offs, population densities and building systems information. From the map the fire flows are calculated, distances measured and map icons placed for the responding apparatus and personnel. Finally, area plan views can be switched to a three-dimensional view of the fire ground with the ability to see and mark occupant locations, sensors, imbedded floor plans and population by floor.

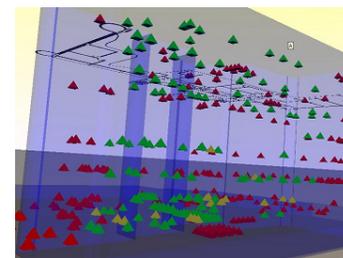
Jim Howard, president of DESC, Inc, believes all this is possible today by taking advantage of current Department of Defense (DoD) technologies and transferring them to the first responders/public safety arena. In addition, by assembling various pieces of the DoD efforts and modifying it for the fire services, fireground accountability could become attainable. The DoD equips combat vehicles with this type of capability for enhanced electronic situational awareness. Pursuing this vision, with research funding from the Defense Threat Reduction Agency, and a grant from the Oklahoma City Institute for the Prevention of Terrorism, DESC, Inc., ([www.descinc.com](http://www.descinc.com)) has been adapting DoD software technology for use by the fire service.

This development is proceeding, keeping in mind that effective software tools for the fire service must be scalable from a house fire to a major terrorist attack or natural disaster. It needs to be interoperable with the major Geographic Information Systems (GIS), Computer Aided Design (CAD) and major office productivity software that are affordable and in used by the fire service. Situational awareness or spatial awareness of emergency events should be enhanced through the software visualization in both 2D and 3D. Lastly, for interoperability and future support needs, there should be other products available that use the same core technologies.

For additional information, contact Jim Howard at (1) + 405-330-9212 or [jhoward@descinc.com](mailto:jhoward@descinc.com).



*Population density of neighborhood by floor.*



*Building occupants and embedded floor plan.*

## NIST Studies Trends in Firefighter Fatalities Due to Structural Collapse

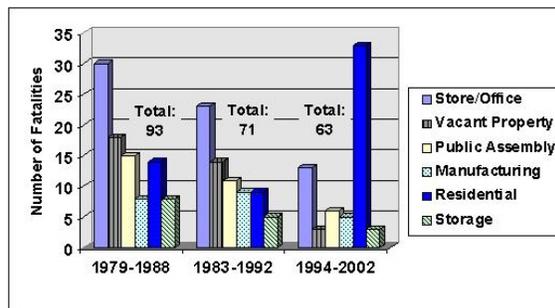
The National Institute of Standards and Technology (NIST) has examined data collected by NFPA on firefighter fatalities due to structural collapse from 1979 through 2002 (not including those firefighters lost in the 2001 collapse of the World Trade Center.) The analysis included, but was not limited to, the following factors: firefighter's age, rank, experience level, and activity at the time of the incident. Also examined were the types of property involved, cause and nature of death, and the time of incident.

Among the trends discovered in the data was that the number of fire fighters lost annually in residential collapses has tripled since the 1980's even though there has been a decrease in the average number of annual fatalities during the same time period. Under the scope of the study no attempt was made to explain the underlying reasons for this and other trends discovered.

The study was sponsored by the U.S. Fire Administration (USFA). Full results are published in the NIST technical

report NISTIR 7069, **Trends in Firefighter Fatalities Due to Structural Collapse, 1979-2002.**

For additional information contact Lori Brassell (1) + 301-975-5644 or [lori.brassell@nist.gov](mailto:lori.brassell@nist.gov)



The number of firefighter fatalities in collapse incidents by property type for three time periods. The totals given are for each period and all property types.

## Alfred P. Sloan Foundation Funds September 11 Digital Archive

The tragic events of September 11, 2001 have led to creative ways to not only capture the events that occurred in New York City, Washington, DC, and western Pennsylvania and their aftermath, but to create a digital record of the history of 911 and its aftermath from the materials submitted by individuals.

The *September 11 Digital Archive* (<http://www.911digitalarchive.org>) was created by the Center for History and New Media, George Mason University, and the American Social History Project/Center for Media and Learning, The Graduate Center, The City University of New York, and

funded by the Alfred P. Sloan Foundation. Its partnership with the Library of Congress assures the long-term preservation of the collection.

Still growing, the *Archive* contains more than 130,000 items. The media categories are: stories, e-mail, still images, moving images, audio, and documents. Anyone who wants to have recorded in the archive what they did, saw or heard on September 11 can do so electronically through the web site <http://www.911digitalarchive.org/stories/add.html>. As examples of the content: under moving images, there is a three minute video production

“September 11 Hero Tribute”, a 19 minute (7 Mb) slide show “America Attacked 911,” and a collection of games and animations dealing with bringing harm to Osama Bin Laden. New images, videos, or original electronic creations can be submitted by contacting the 911 archive organization at [info@911digitalarchive.org](mailto:info@911digitalarchive.org)

Of particular interest to the fire service is a searchable collection of the Fire Department of New York Incident Action Plans for 9/21/01 – 1/17/02 which are available here: [http://911digitalarchive.org/documents/documents\\_collections.htm](http://911digitalarchive.org/documents/documents_collections.htm)

Readers are encouraged to submit material to the site to help all Americans remember 911 though the experiences of those who have direct knowledge of the tragic events and their impact on the nation.



Michael Jehn, Image #2021, The September 11 Digital Archive, (Looking east from the Hudson River.)

### Contact Information:

National Institute of Standards and Technology  
100 Bureau Drive, MS 8660  
Gaithersburg, MD 20899

David Evans  
Email: [editor@fire.gov](mailto:editor@fire.gov)  
Phone: 301-975-6897  
Fax: 301-975-4052

Department of Homeland Security  
FEMA, U.S. Fire Administration  
16825 S. Seton Avenue  
Emmitsburg, MD 21727

Bob McCarthy  
Email: [Bob.McCarthy@dhs.gov](mailto:Bob.McCarthy@dhs.gov)  
Phone: 301-447-1130  
Fax: 301-447-1093

Better Fire Fighting Through Research

**FIRE.GOV**

If you would like to be notified via email each time a new issue is published, an **Online Request Form** is available at [www.fire.gov](http://www.fire.gov).