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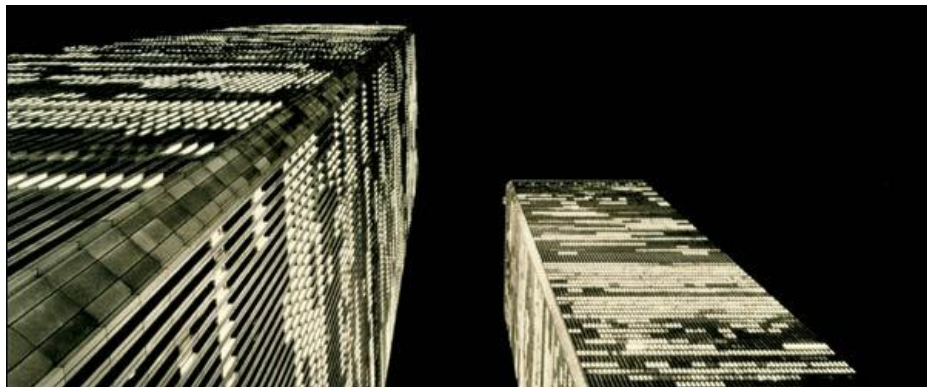
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Author(s): Fred Durso. Published on September 1, 2011.

9/11: A SPECIAL 10TH ANNIVERSARY REPORT



A Decade of Difference

Following the terrorist attacks of September 11, NFPA launched a widespread effort to strengthen codes and standards for first responder safety, the built environment, emergency preparedness, and more. Ten years later, those efforts continue — and they're making America safer.

NFPA Journal®, September/October 2011

By Fred Durso, Jr.

It is a hot July day in downtown Brooklyn, located across the East River from Lower Manhattan, and Fire Commissioner Salvatore Cassano is giving a tour to a reporter inside the headquarters of the New York City Fire Department (FDNY). He opens a door to a small room, no larger than a couple of standard-sized offices, filled with racks of humming computer servers. Ten years ago, on September 11, this was the room that housed FDNY's operations center. Cassano was the assistant chief back then, and this was where he tried to monitor what was happening across the river at the World Trade Center after one hijacked airplane, then another, struck the towers. "We had a few phones, a couple of TVs, and that was it," he says. "I was trying to get a handle on what was going on at a 16-acre [6.5-hectare] site, trying to round up where our people were, which hospitals they were in. None of that was available to us at our fingertips."

Cassano, 66, is the city's highest-ranking fire official, a post he assumed last year and the culmination of his 42 years with the FDNY. He is mild-mannered but possesses a commanding voice, with a fast-talking New York accent. He cracks jokes and says hello to passers-by. But his buoyant mood alters instantly when the topic of 9/11 comes up. That's when his features, punctuated by a shaved head and a graying mustache, seem to show the weariness of his decades as a New York City firefighter, and the weight of one particularly tragic day. On 9/11, Cassano lost 243 of his FDNY comrades

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somberly. The two of them worked side by side at the World Trade Center site on 9/11, he says, and the disease may have been linked to hazardous exposure at the site in the days and weeks following the towers' collapse. "Ten years later, that event still haunts us every day," he says.

Cassano closes the door to the server room. "That's where we were," he says, moving down the hall, "and this is where we are."

He enters a large glass-enclosed room, dimly lit and dominated by five large display screens on the front wall. This is the \$17 million FDNY operations center that opened in 2005, after the events of 9/11 made it painfully clear that the FDNY's monitoring and communications resources were no match for an emergency on the scale of the World Trade Center attacks. The screens display a listing of current fires and other incidents throughout New York's five boroughs, photos of building exteriors from around the city pulled from Google Maps, live feeds of New York's busy thoroughfares, and national news broadcasts. A half-dozen FDNY employees monitor the screens while answering phones and analyzing data on their own computers. It's a long way from the rudimentary tools Cassano had to work with a decade ago, and an example of how the FDNY has evolved in the post-9/11 era.



the post-9/11 world. (Photograph: Courtesy of FDNY)

NFPA has undergone an evolution of its own in the decade following one of the most calamitous moments in America's history. On that day, nearly 3,000 people died in attacks on the World Trade Center and the Pentagon, and in an airliner that crashed near Shanksville, Pennsylvania. A wealth of new provisions have entered NFPA codes and standards as a direct result of 9/11, changes that have affected building safety, first responder safety, and much more. A new NFPA committee has taken high-rise safety to new heights by strengthening NFPA's life safety and building codes. Firefighter uniforms and breathing apparatuses have undergone significant upgrades, thanks to provisions safeguarding users against an array of chemical, radiological, biological, explosive, and nuclear threats. New discussions are taking place about the role of elevators during emergencies in high-rise buildings. Federal agencies and departments formed after 9/11 have reshaped the concept of emergency preparedness using [NFPA 1600, Disaster/Emergency Management and Business Continuity Programs](#), to help launch an array of efforts designed to enhance public safety and preparedness throughout the U.S.

"9/11 will always be considered one of the worst days in American history, and it will also certainly be one of the most important days in the history of NFPA because of our long, forceful advocacy of preparedness, further safeguards to the built environment, and support for emergency responders that followed the attacks," says NFPA President James Shannon. "NFPA has been a very important part of the country's effort to do everything we can to prepare, in case anything like 9/11 ever happens again."

On this tenth anniversary of 9/11, three efforts stand out as examples of the crucial role NFPA has played in helping create a br culture of safety: communications and interoperability for emergency responders, high-rise building safety, and emergency preparedness. Each is a direct outgrowth of 9/11, and each is central to that event's legacy of safety — a legacy that promises t shape fire and life safety initiatives for years to come.

EMERGENCY RESPONDER SAFETY

Aircraft slamming into national landmarks on 9/11 gave emergency responders a new sense of the lengths terrorists would go to disrupt American society. Fire service agencies and related organizations, including NFPA, realized the need to take an all-hazards approach to emergency response, outlining procedures and protections against such large-scale threats as chemical and biological warfare.

Since 9/11, NFPA committees have worked on a range of code provisions that address this all-hazards approach. [NFPA 1981, Open-Circuit Self-Contained Breathing Apparatus \(SCBA\) for Emergency Services](#), for example, now requires all SCBA gear to adhere to certifications that provide respiratory protection against chemical, biological, radiological, and nuclear attacks. Provisions in [NFPA 1851, Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting](#), now address the cleaning and decontamination of personal protective equipment soiled by such threats. And [NFPA 1561, Emergency Services Incident Management System](#), provides requirements for using "clear text" terminology during an incident rather than radio codes, with the intent of providing a much clearer picture of what's actually occurring at the scene.

No emergency-responder issue received more discussion in the wake of 9/11, though, than communications capabilities, specifically what's known as "interoperability," the ability to send and receive urgent messages during an emergency incident as quickly as possible. "Giving everybody a portable radio isn't the answer to interoperability post 9/11," says Ken Willette. NFPA's

YOUTUBE VIDEO FEATURES

NFPA's Response to September 11...



NFPA President James M. Shannon recounts how the attacks of September 11th changed the National Fire Protection Association.

developed infrastructure to support this technology."

Willette's notion of interoperability exemplifies why FDNY's old operations center needed an upgrade. Since it only monitored and reported on daily FDNY activities, the old center lacked infrastructure and communications capabilities to support inter-agency coordination and citywide operational planning. This was one of the findings of the 2002 report *Increasing FDNY's Preparedness*, also known as the McKinsey report, which analyzed the department's response tactics on 9/11 and suggested improvements to interoperable communications and technology, including the development of a new operations center.

In its new ops center, FDNY has created an information powerhouse that can put a wealth of critical data at the department's fingertips. On a typical day, the center tracks 1,400 fires and 3,500 EMS runs. Multiple-alarm fires and other major incidents are watched more closely than others; special vehicles equipped with cameras are now sent to the scene and beam back images to the operations center as workers tap into city databases for more information. The Department of Buildings, for example, can inform the FDNY about the type of building that's on fire, how many people are housed on each floor, and any outstanding building violations. The Department of Environmental Protection database informs them if a commercial property has any registered chemicals in the building. FDNY also has 1,300 blueprints of high rises, information on a building's emergency action plan, and contracts to obtain live video feed from news helicopters. "We want to see it live, we want to hear it live, we want to see what it looks like geospatially," says Timothy Herlocker, who directs FDNY's ops director. "We present the incident commander with all of this information" — the kind of information Cassano was desperate for back on 9/11.

New York City has also taken steps to change how this kind of information is delivered. In 2009 the city launched the New York City Wireless Information Network (NYCWIn), a \$358 million system that offers the city's public safety agencies real-time information — video feeds, automatic vehicle location, city databases — via a broadband wireless network. The network was the answer to another recommendation in the McKinsey report, a result of commercial wireless networks that were overwhelmed on 9/11 and prevented emergency responders from receiving crucial information. In addition, radio communication during the efforts at the World Trade Center towers was problematic, as chief officers stationed in the lobby of Tower 1 received only sporadic information from the teams sent up into the buildings. The McKinsey report also states that when Tower 2 collapsed, the first battalion chief at the operations post at Tower 1 ordered an evacuation of that building over his radio, but many firefighters didn't hear it. To ensure clear, unobstructed lines of communication, the new wireless system is designed solely for use by city agencies.

"The nature of point-to-point radios is that they are limited to a specific geographic area," says Steven Harte, associate commissioner of wireless technologies for New York's Department of Information Technology and Telecommunications. "What we've been able to do through NYCWiN is bridge that gap. No matter where you are in the city, you can turn to a radio channel and hear the audio that's being transmitted over NYCWiN, and immediately hear what's going on in real time." The system can also assist firefighters in emergency situations. In the event of a distress call, the department's new Electronic Fireground Accountability System can pinpoint the origins of the call via tracking devices on firefighter gear that send information back to an incident commander's laptop.

Other technological advancements have improved interoperability around the country over the past decade. Through state grants, fire service agencies in Massachusetts were able to purchase field communication units that transmit data to all emergency responders on the scene of an incident. "After 9/11, we asked ourselves, 'How can we protect our first responders?'" Willette says. "I think everything we do to make our communities safer, to make America safer, is a lasting tribute to the legacy of everyone who lost their lives that day."

HIGH-RISE BUILDING SAFETY

The National Institute of Standards and Technology (NIST) released its landmark reports in 2005 and 2008 on the investigation of three buildings — the 110-story towers, and the 47-story Building 7 — that collapsed on 9/11 at the World Trade Center. The 2005 report alone outlined 30 recommendations for NFPA and other standards development organizations to address, ranging from the design, construction, and maintenance of new high-rises to evacuation and emergency response.

NFPA had already addressed a number of the NIST recommendations in its

Investigating Ground Zero



NFPA senior fire investigator Robert Duval talks about his work with the Building Performance Assessment Team (BPAT) which assessed the structural performance of all the buildings at the World Trade Center.

September 11 and the Fire Service



Public Fire Protection Division Manager Ken Willette discusses the experience of the fire service following the terrorist attacks on the World Trade Center.

CODE IMPACT

A sampling of 9/11-related provisions that have entered NFPA's codes and standards. The years listed reflect the edition of the codes where new provisions appeared.

2002

Provisions added to NFPA 472, Competence of Responders to Hazardous Materials/Weapons of

technical committees evaluated where we stood when the recommendations came out, and we were in a pretty good place," says Kristin Collette, an NFPA fire protection engineer. "But because of these recommendations, a number of important life safety changes were already in place or in discussion for inclusion in the codes."

Looking at the potential impact that changes to its codes and standards could have, NFPA gathered a team of engineers, architects, fire service officials, and public advocacy groups to form the High-Rise Building Safety Advisory Committee (HRBSAC) in 2004. The committee was formed to develop public proposals and comments primarily for [NFPA 1, Fire Code](#); [NFPA 101, Life Safety Code](#); and [NFPA 5000, Building Construction and Safety Code](#). The committee also helped NFPA set priorities for the NIST recommendations.

"We have an interesting committee," says HRBSAC chair Jim Quiter, a principal with the consulting firm Arup. "It's composed of people who believe that there is much to be done to make high-rise buildings safer, and those that think the status quo is fine because 9/11 was such an unusual event."

Committee members have worked to find a middle ground where elements of high-rise building safety can be changed or improved upon. At its first meeting in 2004, the committee came up with a concept to identify enhancements to high-rise building designs that could be applied on a voluntary basis by building owners. The concept, called the Leadership in Life Safety Design, identified 12 topical areas where the code provisions could be augmented. The concept was further refined in a Fire Protection Research Foundation (FPRF) project in 2007.

NFPA has acted on a variety of the NIST recommendations. The behavior of a building's structural frame and support system as a whole under severe loading conditions, such as during a fire event, resulted in adoption of the "structural frame" approach in NFPA 5000, which requires more scrutiny of the primary and secondary structural members, as well as the connections that tie the frame together. The NIST recommendation for improving building evacuation led to a change that increased the width of an exit stair when a cumulative occupant load of 2000 or more was expected to use the stairs.

Relatively recent code provisions outlining the use of elevators for occupant evacuation during emergencies have also been completed. The American Society of Mechanical Engineers formed two task groups in 2004, including representatives from NFPA, to analyze the features necessary for the safe operation of elevators by building occupants as a means of evacuation and by first responders for building access during an emergency. The findings prompted the committees for NFPA 101 and NFPA 5000 to move the occupant evacuation elevator provisions of the 2009 edition of the codes out of the annex and into the body of the 2012 editions of the codes. Detection of smoke in the elevator hoistway, machine room, or lobbies stops the elevators from being used during a fire, and buildings must satisfy all egress requirements without reliance on elevators.

EMERGENCY PREPAREDNESS

In 2003, on the second anniversary of 9/11, NFPA, the American National Standards Institute, the National Commission on Terrorist Attacks Upon the United States (also known as the 9/11 Commission), and others met in New York, two blocks from Ground Zero, to discuss how the private sector could be better prepared for another terrorist attack. Donald L. Schmidt, chair of NFPA's Technical Committee on Emergency Management and Business Continuity, gave a presentation on NFPA 1600, Disaster/Emergency Management and Business Continuity Programs, which outlines business preparation and recovery procedures following human-caused, technology-based, or natural disasters. (NFPA 1600 has been offered as a free download at nfa.org/1600 since 2005.) Schmidt had been closer to the 9/11 disaster than most; he was a 20-year employee with Marsh USA, a subsidiary of Marsh & McLennan, a risk and insurance company that saw 295 of its employees die at the World Trade Center on 9/11. Schmidt was supposed to participate in a seminar on emergency response and business continuity at Tower 1 that day, but it had been moved to another site to accommodate more registrants.

The 2003 meeting led to the recommendation in the 2004 9/11 Commission Report encouraging the private sector to adopt NFPA 1600. Following its formation in 2003, the Department of Homeland Security (DHS), which integrated the Federal Emergency Management Agency (FEMA) and 21 other departments and agencies under one entity, also designated NFPA 1600 to be used as the

2003

First edition of NFPA 5000, Building Construction and Safety Code, includes hourly fire-resisting ratings used in certain tall buildings. Code also includes performance-based design options, including collapse prevention scenarios.

NFPA 101, Life Safety Code, includes new information on issues to be addressed by an emergency plan.

Standards Council approves NFPA 1026, Incident Management Personnel Professional Qualifications.

2004

The National Commission on Terrorist Attacks Upon the United States, known as the 9/11 Commission, recognizes NFPA 1600, Disaster/Emergency Management and Business Continuity Programs, as a voluntary "national preparedness standard" in its list of recommendations following 9/11.

2006

NFPA 101 and NFPA 5000 increase the minimum exit stair width from 44 inches (112 centimeters) to 56 inches (142 centimeters) when the stair handles a cumulative occupant load of 2,000 or more. Information on stair descent devices for people with mobility impairments, and requirements for tactile exit signs, such as Braille dots and raised letters, are also included in these editions.

First edition of NFPA 730, Guide for Premises Security, addresses reducing security vulnerabilities for buildings and facilities.

First edition of NFPA 731, Installation of Electronic Premises Security Systems, is the security system counterpart to NFPA 72.

2007

Provisions added to NFPA 72, National Fire Alarm and Signaling Code, for fire alarm and mass notification systems that allow mass notification signals to take precedence over fire alarm signals.

2009

NFPA 1, Fire Code, revised to include annex for in-building public safety radio enhancement systems. Requirements added to the code for training building personnel on emergency plan execution, procedures to relocate or evacuate building occupants, a system to account for building occupants following an evacuation, and visual inspection of structural fire resistance-rated assemblies every five years.

NFPA 101 revised to require specific evacuation procedures appropriate to the building, occupancy, and emergency, as well as appropriateness of elevator use, during an emergency; to require an elevator lobby two-way communication system in new construction for persons with mobility impairment and outlines the installation of exit stair path markings; and to introduce the concept of "situation awareness" to allow fuller consideration of the status of systems, features, and occupant movement during a building emergency.

The Department of Homeland Security's SAFETY Act Office certifies 15 NFPA standards as

Recommendations of the 9/11 Commission Act and managed by FEMA, PS-Prep accredits entities to certify the preparedness plans of private-sector businesses that meet the requirements of NFPA 1600 and other standards that promote emergency management and business continuity.

"It's hopeful that PS-Prep will improve private-sector preparedness," says Schmidt, CEO of Preparedness, LLC, a Massachusetts-based consulting firm specializing in this area. "PS-Prep has generated a lot of interest. Many companies, especially larger companies, are taking a hard look at their preparedness programs and using NFPA 1600 and other standards to evaluate them."

Schmidt is also working with NFPA staff to update the "Ready Business" portion of [Ready.gov](#), a FEMA public service campaign that educates Americans on how to prepare for, respond to, and recover from emergencies, including terrorist attacks, using elements in NFPA 1600. Launched by DHS in 2004, Ready Business offers information on business preparedness and resiliency — departmental buzzwords that have received considerably more attention in the decade since 9/11.

DHS, for its part, continues to embrace NFPA codes and standards. It has adopted 27 of NFPA's standards, including NFPA 1600 and a number of standards addressing personal protective equipment for emergency responders. "We just finished our seventh annual program review of standards adopted by DHS," says Bert Coursey, DHS's standards executive. "Our sense is that all of these standards organizations working with DHS have really stepped up to increase the body of standards for public safety and preparedness for the nation."

Despite all those efforts, Schmidt's experience leads him to offer a blunt warning. "If you look at how people today deal with disasters in their facilities and communities," he says, "many businesses are still not adequately prepared."

professional qualifications, incident management, and preparedness. The standards carry the SAFETY Act Certified logo.

The Federal Emergency Management Agency's Voluntary Private Sector Preparedness Accreditation and Certification Program designates NFPA 1600 as a standard to evaluate preparedness plans for business.

2010

NFPA 72 revised to address in-building and wide area mass notification systems; two-way radio communications enhancement systems; and requirements for the inspection, testing, and maintenance of mass notification systems and radio communications enhancement systems.

2012

Performance requirements for the use of elevators for occupant evacuation and fire service access in buildings are incorporated into NFPA 101 and NFPA 5000.

Requirement added to NFPA 1 for fire department evaluation of in-building radio communication capabilities.

GOING FORWARD

It's evening rush hour in Lower Manhattan, and throngs of office workers are making their way along the bustling streets and sidewalks on their way home. Tourists snake through the crowd, cameras at the ready, trying to get a glimpse of the World Trade Center site, which is thick with the sounds of cranes, trucks, power tools, and the banter of hard-hatted workers.

The site, surrounded by a tall fence, is no longer beset by the dust, debris, and death that defined this corner of the city a decade ago. Instead, visitors can cross a footbridge and see for themselves the remarkable rebirth of the 16-acre (6.5-hectare) site, about half of which is devoted to the National September 11 Memorial. The \$700 million memorial will include an underground museum, scheduled to open next year, and a large plaza containing two reflecting pools that are set inside the footprints of the destroyed towers and surrounded by hundreds of swamp white oak trees. When the plaza opens on September 12, it will be the first time that the public has been able to access the site since the morning of September 11, 2001.

Rising above the memorial plaza is One World Trade Center, a 104-story office tower that will stand a symbolic 1,776 feet (541 meters) high and is scheduled for completion in 2013. The plan for the site includes three additional towers, two more than 1,000 feet (305 meters) high and one nearly 1,000 feet (305 meters) high. It's this modern urban imperative for building vertically that makes NFPA's work since 9/11 so important, and why issues around high-rise buildings — design, construction, protection, evacuation, and more — will continue to be an important focus for the organization for years to come.

Ongoing efforts at NFPA and elsewhere are designed to improve the safety of those structures, as well as the safety of those who occupy them and of the emergency responders who arrive when something goes wrong. NFPA's High-Rise Building Safety Advisory Committee is developing Guidelines to Develop an Emergency Action Plan for All-Hazard Emergencies, a document (and yet another response to the NIST recommendations) that will address all types of disasters and instruct authorities having jurisdiction how to help building managers and tenants create emergency action plans tailored to their specific buildings. "If you're in an 80- or 90-story building, it's not always practical or safe to dump all of your occupants out onto the streets, since that could actually be creating additional hazards that occupants are unaware of outside the building," says NFPA's Collette, the staff liaison for the HRBSAC. "These guidelines address different evacuation strategies based on the unique characteristics of the building."

In addition, NFPA, the Fire Protection Research Foundation, and the Council on Tall Buildings and Urban Habitat (an international organization focused on the planning, design, construction, and operation of tall buildings) have been looking at ways to advance the Leadership in Life Safety Design idea, the concept that allows for augmenting code provisions to achieve greater levels of building safety, possibly through federal grants or research projects. The Research Foundation is overseeing a new study, expected later this year, that will develop guidance on elevator messaging strategies. The study will build on earlier Foundation-sponsored work on high-rise safety and the use of elevators; a previous report cited a survey where nearly 80 percent of commercial occupants interviewed believed that using elevators during an emergency is never safe. That finding, and others, suggests that allowing occupants access to elevators during emergencies will require a shift in thinking and additional education on the issue.

Work also continues in the areas of communication and emergency planning. President Barack Obama announced the Wireless

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