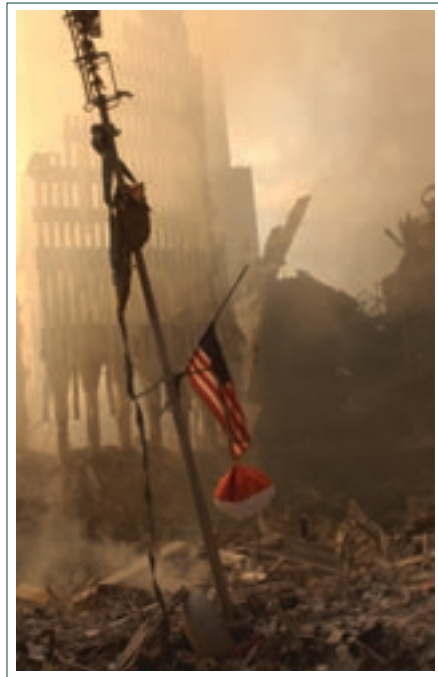


INSIDE THE GREEN LINE

OSHA RESPONDS TO DISASTER



**Occupational Safety
and Health Administration**

www.osha.gov

3189-08R

A green line, painted around the perimeter of the World Trade Center site, defined the recovery area. Within and around this boundary, OSHA worked for 10 months with its partners in safety and health to protect the well-being of workers on the site. Within that space, no workers lost their lives in the recovery effort that followed the tragedy of September 11, 2001.

IN THE AFTERMATH OF the terrorist attacks against our nation on September 11, 2001, thousands of America's workers responded by joining hands to recover the remains of those who had been lost and to reclaim the ground where the twin towers of the World Trade Center once stood. Working around the clock, under unimaginably dangerous conditions, they endured and prevailed.

Out of the chaos emerged a strong and effective public-private partnership that ensured protection for the workers at the site. OSHA joined forces with the City of New York, construction contractors, labor unions, and all levels of government in a pledge to recover the site with no further loss of life.

The partners achieved their goal. On May 30, 2002, when the recovery was complete, not another life had been lost, and illness and injury rates were far below the national average for the industries involved in the recovery.

This is the story of how these remarkable men and women met the challenges to worker safety and health brought on by "9/11."

A handwritten signature in black ink, appearing to read "JLH", with a stylized flourish at the end.

JOHN L. HENSHAW
Assistant Secretary of Labor
for Occupational Safety and Health





PHOTOS BY ANDREA BOOHER/FEMA

PHOTO BY ANDREA BOOHER/FEMA



No one could deal with the catastrophe alone. No one group had all of the answers, equipment, experience—let alone the personnel—to ensure the well-being of workers at the site. How would they accomplish that goal? The answer lay in partnership.

PHOTO BY ANDREA BOOHER/FEMA



It was a nightmare. The twin towers of the World Trade Center were collapsing and crumbling. Scores of people were fleeing and more were trapped as rescue workers raced into the ruins to find survivors. Smoke and fumes from underground fires out of control belched into the air through broken foundations, and spewed from gaping gashes in the ground. Dust settled on the 16-acre site while showers of broken glass from surrounding buildings rained down on the ground where the two towers once stood. Twisted steel and concrete rubble covered the landscape. And beneath the wreckage and trapped within it, there was carnage.

John Henshaw, the new Assistant Secretary of Labor for Occupational Safety and Health, had been on board for less than two months. But he wasted no time in mobilizing and deploying OSHA's resources to what he called the "hallowed ground" of the World Trade Center (WTC). OSHA's goal was to safeguard the health and safety of the recovery workers and "to make sure that, in their zeal to recover victims, they don't become victims themselves," he said. "I'm proud that OSHA professionals have dedicated themselves to the goal of helping protect these American heroes. Our sole purpose is to make sure that no worker suffers another needless tragedy," he said.

It would be no small task. This would be no ordinary demolition project. At the center stood a mountain—all that remained of two skyscrapers that once soared 110 stories high and defined the New York City skyline for decades. No one could deal with the catastrophe alone. No one group had all of the answers, equipment, experience—let alone the personnel—to ensure the well-being of workers at the site. How would they accomplish that goal? The answer lay in *partnership*.

Informal collaboration of initial responders began early. But soon, representatives from every group involved in the recovery effort would formally agree to join in a team effort to protect the safety and health of workers at the disaster site.

Secretary of Labor Elaine Chao led the signing of the formal partnership. Speaking at the ceremony in New York City on November 20, 2001, Chao declared, “American workers—from city, state, and federal government agencies, trade associations, contractors, and labor organizations—formed a partnership to reclaim this site and recover our fellow citizens. They’ve done this with pride, dignity, talent, hard work, and dogged determination.” Chao said that the workers of the WTC recovery effort, “by their presence each day and night, honor the thousands who died.”

OSHA Regional Administrator for New York Patricia Clark is proud of OSHA’s accomplishments in the mission she directed during 10 months of non-stop effort. Clark is quick to point out, however, that the remarkable safety and health record at the site is the result of a unique partnership. “The Building and Construction Trades Council of Greater New York and the Building Trade Employers’ Association were critical because they put tremendous resources of their own into ensuring that management and worker involvement were the basis for addressing and elevating safety and health to the highest priority,” she said.

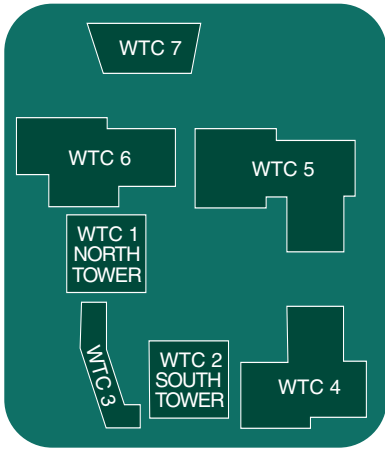
“American workers—from city, state, and federal government agencies, trade associations, contractors, and labor organizations—formed a partnership to reclaim this site and recover our fellow citizens. They’ve done this with pride, dignity, talent, hard work, and dogged determination.”

ELAINE CHAO



PHOTO BY SHAWN REDMAN/DOL

Secretary of Labor Elaine Chao, in green jacket, visits workers at the WTC site.



Signatories to the World Trade Center Emergency Project Partnership Agreement

AMEC Construction Management, Inc.

Bovis Lend Lease LMB, Inc.

Building and Construction Trades Council of Greater New York (BCTC)

Building Trades Employers' Association (BTEA)

Contractors Association of Greater New York (CAGNY)

General Contractors Association (GCA)

New York City Department of Design and Construction (DDC)

Fire Department of New York (FDNY)

Occupational Safety and Health Administration (OSHA)

Tully Construction Company, Inc.

Turner/Plaza Construction Joint Venture

PHOTO FROM FEMA

EVACUATING OSHA

In August 2001, OSHA staff at the Manhattan Area Office completed an uneventful evacuation drill from their offices on the top floor of Building 6 of the WTC complex. Managers felt confident that everyone was ready to escape the building safely in a real emergency, including an employee who recently returned to work in a wheelchair. The evacuation plan had been revised to accommodate his needs. Within weeks, the practice proved more valuable than anyone could have imagined.

On the morning of September 11, these employees had begun a routine day when the first explosion shook the building. Assistant Area Director Kay Gee was the first to shout a warning, "Bomb! Evacuate!" As the first plane hit the North Tower of the WTC, debris began falling on Building 6. Staff rushed into the hallway. Three employees helped their co-worker in the wheelchair down the corridor and into a freight elevator they had used during the practice drill. They descended to the basement, into a garage, down some steps, and into another garage, where they escaped from the building. The group moved outside just as the second plane hit the South Tower. Without the revised evacuation plan and practice drill, they probably would not have made it out alive.

As the group moved away from the site, the North Tower collapsed, destroying the Manhattan Area Office as it fell. The four OSHA employees later reunited with their coworkers at a nearby park. Even in their shock, they knew they had their work cut out for them.



World Trade Center Building 6



PHOTO BY SHAWN MOORE/DOL

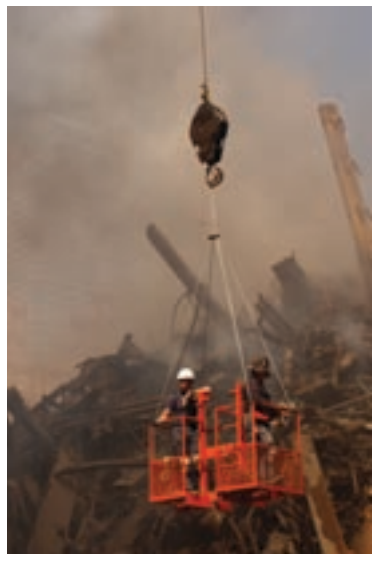


PHOTO BY ANDREA BOOHER/FEMIA



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OSHA had addressed many of these hazards before, but not on such a vast scale. Agency staff watched warily as rescue crews crawled through unstable tunnels of rubble, and worried about what might be in the soot and dust that covered everything.

PHOTO BY ANDREA BOOHER/FEMA



ASSESSING RISK

The day after the towers fell, OSHA began assessing site safety conditions, including fall protection, operation of heavy machinery, and the potential for more structural collapses—a constant concern of everyone at the site. The response was particularly difficult for rescue and recovery teams because New York City’s state-of-the-art Emergency Operations Center, housed in the WTC, was destroyed.

OSHA also recognized the dangers caused by heavy construction equipment and huge industrial trucks that were arriving. Adding to the mix, a flood of rescue workers, heavy equipment operators, construction workers, firefighters, law enforcement officers, health-care workers, and tradespeople also rushed to the site—increasing the likelihood of even more safety and health hazards. The potential for further injuries, illnesses, and deaths was growing daily. OSHA reacted by sending all available local personnel to perform a comprehensive assessment of site conditions, including identifying safety hazards and trends.

“Once we were certain that our people were safe,” explains OSHA Assistant New York Regional Administrator Gil Gillen, “we immediately turned our attention to constructing our own workforce. We called in OSHA professionals from nearby area offices because we needed as many people as possible and all the equipment in the Manhattan office was lost. We also began contacting every possible source to round up sampling materials and personal protective equipment.”

OSHA had addressed many of these hazards before, but not on such a vast scale. Agency staff watched warily as rescue crews crawled through unstable tunnels of rubble, saw voids that might open as the debris pile of the WTC shifted, and worried about what might be in the soot and dust that covered everything. “Based on what happened at the World Trade Center in 1993, our immediate concern was worker exposure to asbestos and silica,” Gillen noted. “We gathered whatever equipment was available and began air sampling for likely contaminants.”

OSHA soon took the first of more than 6,500 air samples in lower Manhattan, which lay under a cover of ash and debris. “We coordinated our air sampling efforts with other federal, city, and state environmental and health organizations. By the 13th, we were conducting air and bulk sampling in the Financial District and other areas in an effort to characterize the air quality,” said Richard Mendelson, Area Director of OSHA’s Manhattan Area Office. Those air sampling tests were critical to the reopening of Wall Street—considered by many to be an important step in the nation’s recovery.

That weekend, the sampling effort continued as OSHA personnel wearing sampling pumps walked the Financial District. OSHA also took air samples on the collapse site and debris pile.

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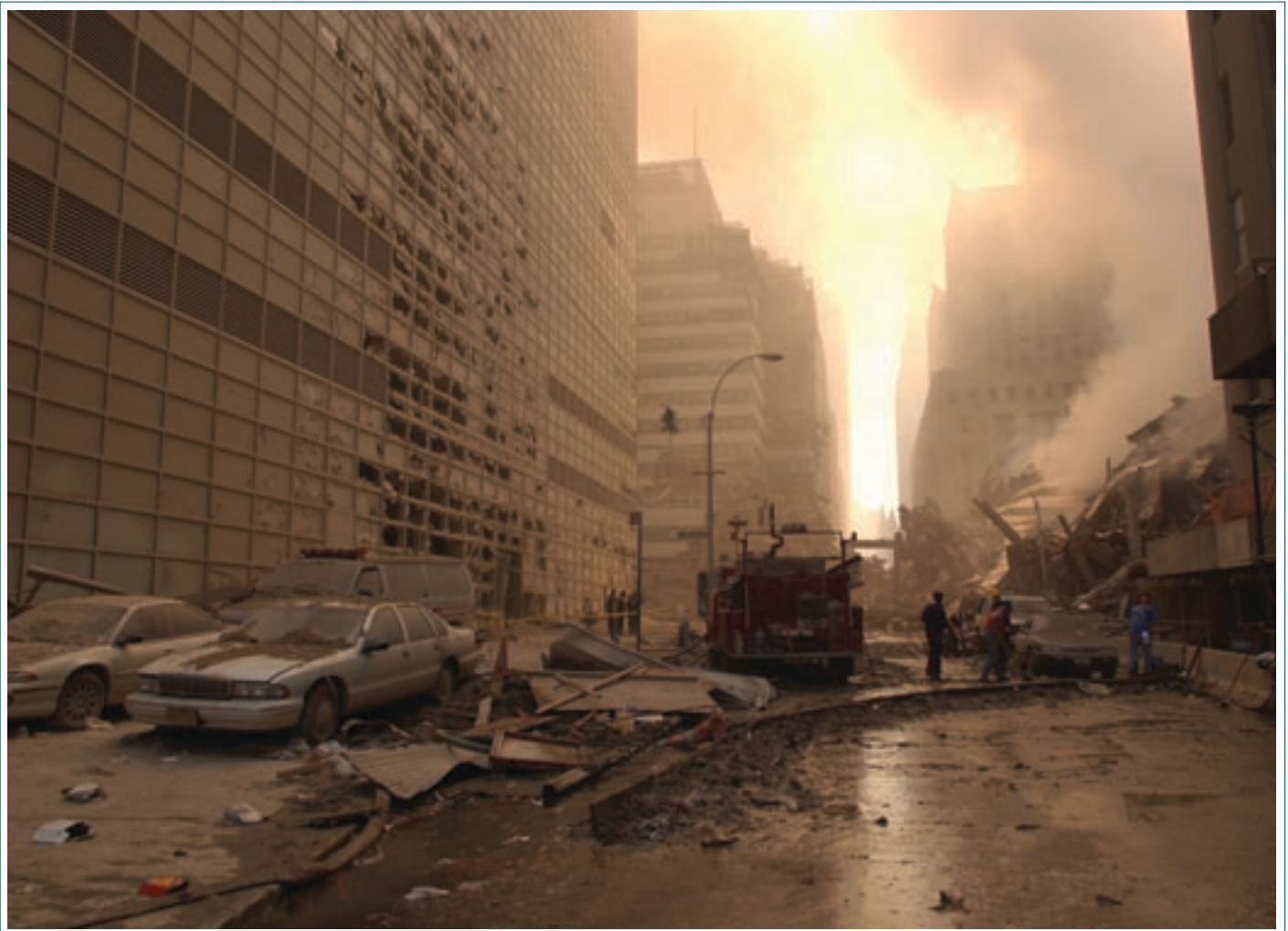


PHOTO BY ANDREA BOOHER/FEMA

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“Our sampling decisions were made in coordination with a number of federal, state, and local organizations concerned with air quality.”

GIL GILLEN

PHOTO BY RICHARD MENDELSON/OSHA



Gil Gillen, Assistant New York OSHA Regional Administrator

Within days, OSHA expanded its sampling efforts to include breathing zone samples taken directly from workers performing specific tasks on the pile. This type of task-specific sampling became an important focus for much of the recovery effort. Among the tasks selected for OSHA sampling were search and rescue, heavy equipment operation, torch cutting or burning of structural steel, manual debris removal, extraction of tanks with the potential for exposure to hazardous material, wash station operations, and concrete cutting or drilling, among others.

“Our sampling decisions were made in coordination with a number of federal, state, and local organizations concerned with air quality,” said Gillen. “Those early meetings with representatives from incident commanders, the New York City Department of Design and Construction (DDC), the Fire Department of New York, the Environmental Protection Agency, and others set the tone for the cooperation that continued throughout the recovery effort,” she added.

One very significant step taken by the city early on was the dust suppression plan, carried out by the New York City Department of Sanitation, said OSHA New York Regional Administrator Patricia Clark. “Initially this meant a continuous washing of the streets, spraying of water across a large part of the recovery area, vehicle washing stands, and watering down of debris loads being trucked off the site,” Clark said. She added that dust is a hazard in itself and OSHA sampling confirmed that the dust at the site contained typical construction debris. OSHA monitoring confirmed that asbestos levels were low.

RESPONDING TO CRISIS

OSHA’s early arrival and direct contact with labor unions and contractors was an essential part of the agency’s effort to establish safety and health awareness in the days after the disaster. Early on, Assistant Secretary Henshaw determined that the best role for the agency at the WTC was to provide guidance and assistance with a sound safety and health plan.

“When we worked out that plan with the site command staff, we agreed that the rescue effort must not be hampered,” explained Clark. “Given that the site was operating under emergency conditions, it was normal that we should suspend our enforcement action and assume the roles of consultation and technical assistance.” Enforcement takes time and can affect the speed of abatement. OSHA’s goal from the start was protection, not citation. The agency went to work with DDC on a plan to provide 24-hour safety monitoring, risk assessment, and personal protective equipment on the site.

Two staff members from OSHA’s New York Region were assigned full-time to work on the safety and health plan. A senior industrial hygienist and a construction safety specialist assisted in developing DDC’s plan to ensure worker safety on the site. The plan’s requirements often exceeded OSHA’s standards. For instance, fall protection was required for work at heights of six feet or more, and respirators were mandatory.

OSHA and its partners agreed that anyone working on, over, or within 25 feet of the debris pile or downwind of the site should be equipped with respiratory protection. Workers on the pile were provided with half-mask respirators with high efficiency particulate air (HEPA) filters for protection

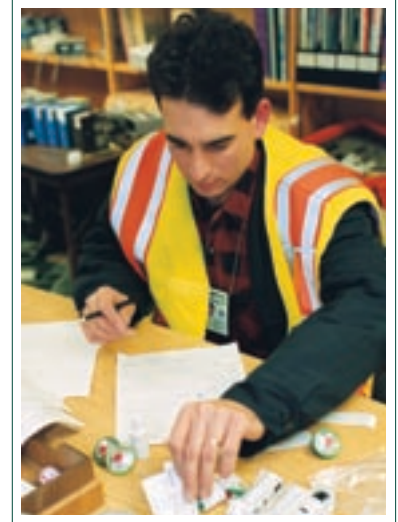


PHOTO BY SHAWN MOORE/DOL

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PATRICIA CLARK



PHOTO BY SHAWN MOORE/DOL



Patricia Clark, OSHA Regional Administrator for New York, with John Henshaw, Assistant Secretary of Labor for Occupational Safety and Health



PHOTO BY SHAWN MOORE/DOL



PHOTO BY MICHAEL REIGER/FEMA



PHOTO BY ANDREA BOCHERI/FEMA

PHOTO BY DONNA MILES/OSHA



John L. Henshaw, Assistant Secretary of Labor for Occupational Safety and Health

“Rescue workers need personal protective equipment and OSHA staff are distributing respirators by the thousands. We are helping arrange the coordination of much-needed equipment and supplies, including voluntary donations from the private sector.”

JOHN HENSHAW

PHOTO BY DONNA MILES/OSHA



against dust. These respirators were soon upgraded to a triple combination cartridge that also protected against organic vapors and acid gases.

“Workers from the New York State Public Employees Safety and Health (PESH) agency were the first to locate and begin providing respirators to everyone possible,” said Gillen. “Thousands of rescue and recovery workers were at the site and in need of protection. There’s no telling how many respirators were handed out those first days.”

Staff selected respirators based on individual workers’ facial size and features and did simple seal checks to ensure the best possible protection. Brief training on the uses, limitations, storage, and cleaning of respirators was also provided.

On September 13, Assistant Secretary Henshaw toured the WTC site and began calling upon the nation’s leading manufacturers of respirators to donate additional supplies. “Rescue workers need personal protective equipment and OSHA staff are distributing respirators by the thousands,” reported Henshaw, adding, “We are helping arrange the coordination of much-needed equipment and supplies, including voluntary donations from the private sector.”

Mine Safety Appliances, Inc. (MSA) was one of the first to respond. The company’s Chief Executive Officer, John Ryan, was in Mexico City when he learned John Henshaw was trying to reach him. Ryan returned the call immediately, reaching Henshaw in New York. He pledged to provide respirators right away. 3M also rushed much-needed personal protective equipment to the site.

While the Assistant Secretary worked to increase donations, OSHA Area Director Robert Kulick, of the Avenel, NJ, Area Office, and others began delivering personal protective equipment to workers who needed it. “We were hitching rides on military transport vehicles, police vehicles, Red Cross vehicles, with trucks into the area and in any way possible to get equipment to the places where it was needed,” Kulick said. OSHA’s role soon expanded when the New York City Department of Health designated the agency as the lead organization for respirator distribution on September 20.

Just one week after the attack, respirator distribution increased to include 24 employees working to hand out more than 4,000 units per day at multiple fit-

check stations. By the third week of September, 36 employees were distributing respirators and other protective equipment. OSHA began planning to upgrade the respirator program to include quantitative fit testing, a move that would afford an even higher degree of protection to workers on the site.

Two groups, the International Union of Operating Engineers (IUOE) and MSA, offered to assist in the operation for the first month. OSHA then assumed complete responsibility for all responder quantitative fit testing at the site and ultimately conducted more than 5,500 tests.

PITCHING IN

More help was needed. Support came when safety and health professionals from across the country began arriving during the third week of September. They were a welcome sight to OSHA employees from the New York Region who had been providing coverage around the clock.

In the months that followed, more than 800 staff from other federal and state OSHA offices throughout the United States joined the more than 250 employees of the New York region to take part in the WTC response. Together they faced the challenge of providing 24-hour-a-day, 7-day-a-week coverage to help protect the thousands of workers involved in recovery, demolition, and site-clearing operations. Their main focus was on providing site safety and health support by performing risk assessment, monitoring air and physical agents, and distributing and fit checking respirators.

Greg Baxter, OSHA Deputy Regional Administrator in Denver, was one of those volunteers. Baxter had personal ties to the WTC. At 22, he spent several months working as an ornamental ironworker on Tower 2. His encounter with a site safety inspector led to his lifetime interest in occupational safety and health. After September 11, Baxter said he “felt compelled to do something, to help respond to this tragedy,” because, to him, “staying 1,900 miles away from New York was just not an option.” He spent eight weeks in New York, working either at the command center, where he served as OSHA’s liaison with other government agencies involved in the effort, or at the WTC, acting as a safety monitor identifying hazards and getting them corrected.

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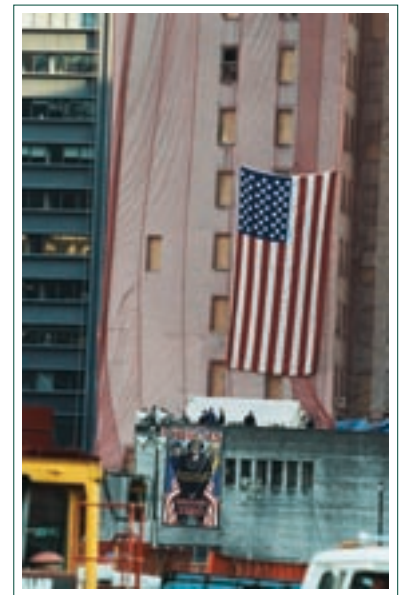


PHOTO BY SHAWN MOORE/DOL

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PHOTO BY SHAWN MOORE/DOL



PHOTO BY ANDREA BOOHER/FEMA

David Doucet, OSHA Assistant Area Director in the Baton Rouge, LA, Area Office, also worked as a safety monitor at the site. He said he offered to work at the World Trade Center “plain and simple, for the preservation of human life.” He said, “I figured the workers at the World Trade Center had enough things on their mind from the tragic event that their personal safety might be overlooked, and I could be the one to help them realize that they, too, have a family waiting for them at home.”

Peggy Peterson, a senior industrial hygienist for the Iowa Division of Labor, was among representatives of 33 OSHA-approved state plan states and OSHA on-site consultation programs who pitched in to support the effort. Of her experience, she said, “I’ve seen the destruction. I heard the sounds of the recovery. I watched the bodies solemnly taken from the pile. I smelled the ash, dust, and smoke. I was there. I feel that I was able, in a very small way, to help the people of New York and the rescue workers.”

With more personnel on the job, control of the work zone continued to improve. Every day, more than 2,000 construction workers negotiated an obstacle course of crawler cranes, grapplers, backhoes, excavators, bulldozers, trucks, and heavy equipment that jammed the 16-acre WTC site. Now, with 24-hour monitoring by OSHA employees walking the beat inside the green line, the agency began to track the safety and health hazards for identification and correction. The tracking and analysis of safety and health interventions became an important tool for focusing everyone’s attention on the need for continued vigilance at the site.

OSHA’s Office of Communications ensured that the media, stakeholders, and general public had access to the information they needed—both in New York and Washington—through press releases, website postings, and other forms of communication.

In addition, the American Industrial Hygiene Association (AIHA), the American Society of Safety Engineers (ASSE), and the National Safety Council offered voluntary assistance to employers. Each of these organizations agreed to set up hotlines to provide pro bono advice.



PHOTO BY GIL BILL WRIGHT/OSHA

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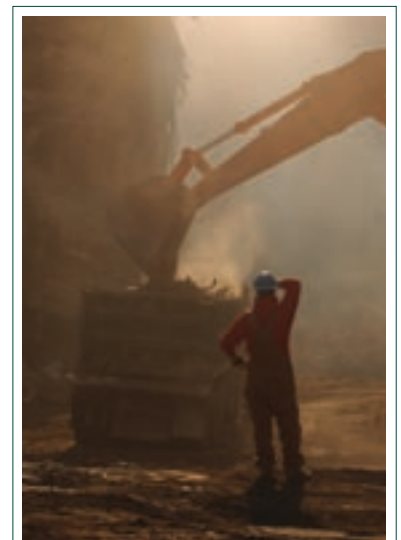


PHOTO BY ANDREA BOOHER/FEMA

PHOTO BY ANDREA BOOKER/FEMA



PHOTO BY MICHAEL RIEGER/FEMA



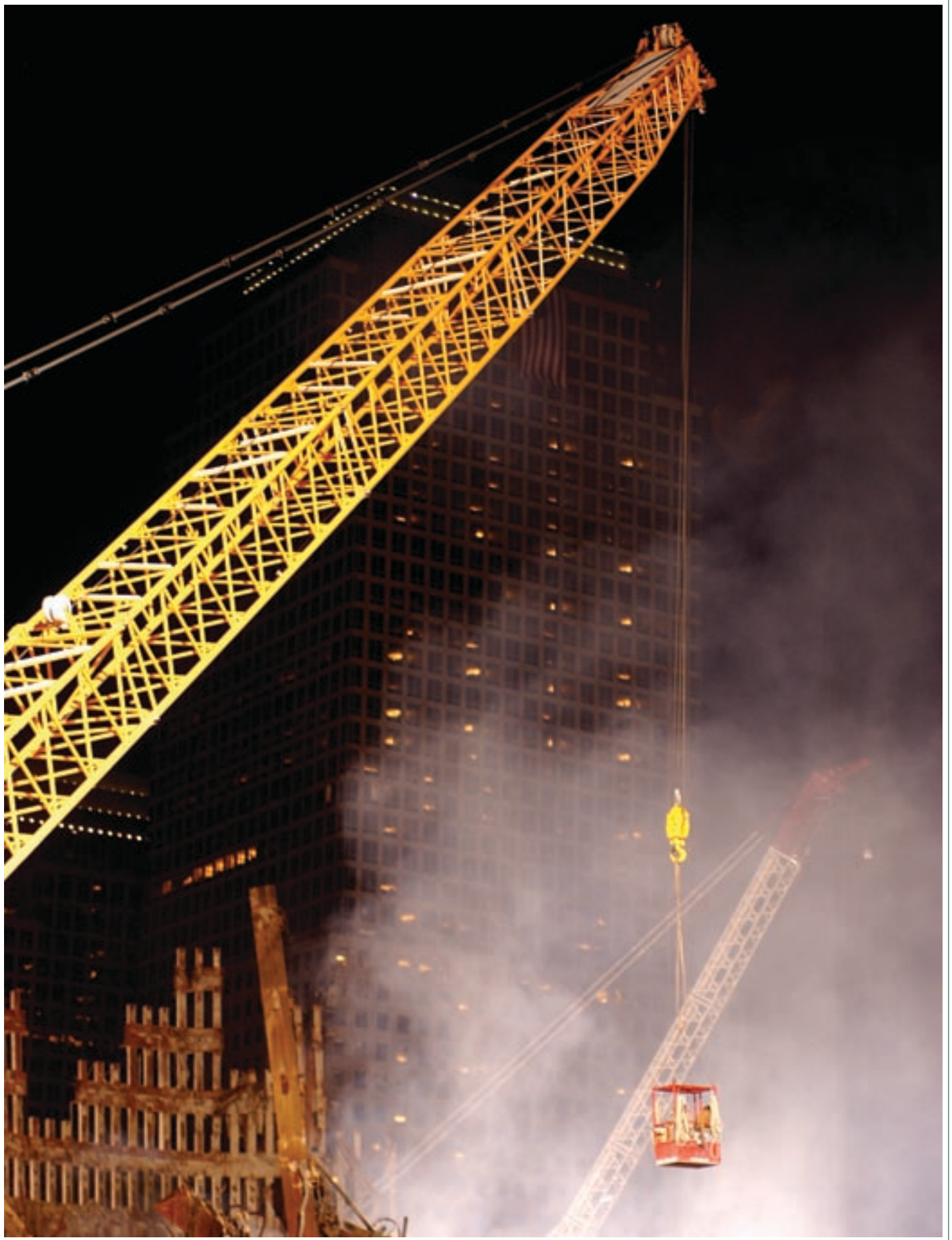
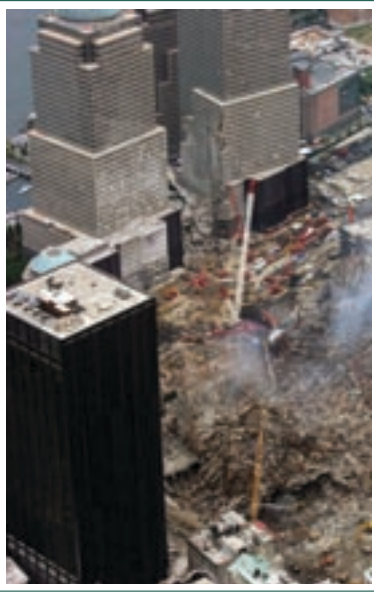


PHOTO BY ANDREA BOOHER/FEMA

PHOTO BY MICHAEL RIEGER/FEMA



The agency consulted with various partners and then launched a Joint Crane Inspection Task Force. Composed of representatives from OSHA, contractors, and the International Union of Operating Engineers, the Task Force spent two days inspecting 17 cranes inside the green line.

PHOTO BY MICHAEL RIEGER/FEMA



IDENTIFYING HAZARDS

Many hazards threatened the safety and health of site workers, ranging from the risks caused by cranes lifting beams of unknown weight and improperly handled compressed gas cylinders that might explode, to threats posed by falling objects, hot steel, confined spaces, and much more.

These were the most dangerous risks facing the WTC recovery workers:

CRANES

More than 30 cranes, including some of the largest in the world, were at work in uncomfortably close quarters inside the green line. In what has been described as an intricate balance of motion and timing, the cranes lifted loads of twisted steel and compacted rubble in an environment fraught with the potential for accidents. High winds, rain, unstable ground, and uncertain loads added to this dangerous mix.

On one particular day, October 17, winds blowing across the site reached 40 miles an hour. Assistant Area Director for OSHA's Manhattan Office Antonio Pietroluongo recognized the danger and quickly alerted city managers of the need to halt all crane operations immediately.

OSHA saw the need for special focus to address the growing concern over crane operations. The agency consulted with various partners and then launched a Joint Crane Inspection Task Force. Composed of representatives from OSHA, contractors, and the IUOE, the task force spent two days inspecting 17 cranes inside the green line. They found numerous serious hazards on more than half the cranes. Most of the hazards involved crane set-up, rigging, and hoisting practices. Crane set-up continued to be an issue because the giant steel towers often rested on unstable platforms as fires burning deep in the pile caused the cranes to shift. The task force identified hoisting personnel with man-baskets as the most serious concern. For example, in the early days of the recovery, workers modified garbage dumpsters with welding torches, then hooked them to cranes to lower workers into the pile.

The crane safety effort yielded further success when inspection teams learned that faulty equipment might be put back into service. The task force



PHOTO BY SHAWN MOORE/DOL



PHOTO BY SHAWN MOORE/DOL



The combination of rescue workers performing recovery operations side by side with demolition workers using heavy equipment in tight quarters and under great emotional stress posed unique challenges.



PHOTO BY ANDREA BOOHER/FEMA

inspected 222 pieces of rigging and found 81 deficient in one sector of the site. Employers in the other three sectors soon began to remove suspect rigging before the task force arrived. OSHA reported 151 safety interventions involving crane operations, about 21 percent of all hazard corrections made inside the green line. The number of problems dropped consistently after organization of the task force.

HEAVY EQUIPMENT

The combination of rescue workers performing recovery operations side by side with demolition workers using heavy equipment in tight quarters and under great emotional stress posed unique challenges. Ordinarily, rescue workers are not present when machines such as excavators, grapplers, and debris trucks are operating. This was not the case here. OSHA consulted with construction personnel, labor representatives, and emergency responders to find a simple solution that made a big difference. The wearing of brightly colored reflective vests made the workers visible to the equipment operators and reduced the potential for serious injury or even death. A mandatory distance between rescue workers and heavy equipment provided additional protection.

The sheer size and instability of the debris pile posed further complications. The mountain of mangled debris rose six stories above ground and descended seven below; voids within caused ever-changing shifts and constant hazards. With heavy equipment operating on such unstable surfaces, there was special cause for concern. Yanking twisted steel from one spot could undermine another and send an operator into a hole several stories deep. Safety officials worried daily about the potential for such falls. They kept a close eye on the number of workers operating heavy equipment and on their proximity to others working on the pile. There were many “near misses,” including an unattended crane that fell 30 feet when the platform of rubble on which it sat gave way. Constant vigilance—and in a few cases, fate and good luck—averted near disaster.

FALLS AND FALLING OBJECTS

Falls are routinely the most common cause of workplace injuries in the United States. At the WTC site, workers often had to operate several stories above ground and in very uncertain environments. The odds for disaster were great. OSHA set up special training in fall prevention methods and technology for the workers and their supervisors to help them reduce or eliminate the risks.

Meanwhile, the DDC worked hard to reduce the hazards of falling debris and structural instability posed by the surrounding buildings. They brought in contractors to secure the premises, install vertical netting, and erect sidewalk sheds and canopies to further protect the workers.

OSHA safety monitors and other safety professionals constantly roved the site, identifying and addressing hazards. Safety personnel often interrupted an activity to ask that workers tie-off or find a safer way to proceed. They also checked scaffolding, performed job risk analyses, and made sure workers understood safety rules for aerial lifts. On one occasion, a load of debris fell directly on a spot where firefighters had stood only moments earlier.

EXPLOSIONS

Numerous compressed gas cylinders used by burners to cut steel beams and rebar were scattered around the site. These cylinders included oxygen and acetylene tanks, both extremely hazardous if not handled properly. In the early days of the rescue effort, these tanks were largely unsecured, lying haphazardly on the ground. To reduce this hazard, OSHA joined forces with the Fire Department of New York to patrol the site and ensure that contractors followed proper storage and handling procedures.

The potential for explosions was always present at the site. In one case, a fuel tank with tens of thousands of gallons of diesel fuel was buried seven stories below ground. With smoldering fires, a rupture could have been disastrous. Once workers located the tank, it was safely emptied, and the fuel was removed from the site.

The parking garage under the WTC held nearly 2,000 automobiles, each tank holding an estimated five gallons of gasoline. When recovery workers reached the cars, they found that some had exploded and burned while others remained intact.

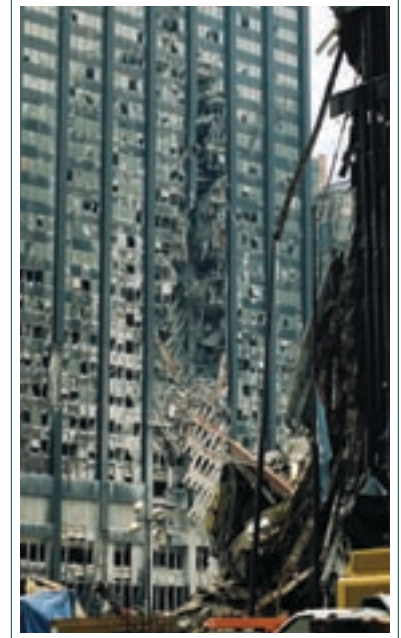


PHOTO BY BRI RODRIGUEZ/FEMA

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PHOTO BY MICHAEL REIGER/FEMA

PHOTO BY ANDREA BOOHER/FEMA



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Building 6, the former site of OSHA's Manhattan Area Office, housed many federal agencies, including the U.S. Customs Service. More than 1.2 million rounds of their ammunition, plus explosives and weapons, were stored in a third-floor vault to support their firing range. OSHA worked closely with other government agencies to determine what protective measures were necessary so that the ammunition could be safely removed.

HOT STEEL

Even as the steel cooled, there was concern that the girders had become so hot that they could crumble when lifted by overhead cranes. As a result, additional safeguards were put in place to limit the dangers associated with lifting the damaged steel and to protect the workers in the vicinity.

Another danger involved the high temperature of twisted steel pulled from the rubble. Underground fires burned at temperatures up to 2,000 degrees. As the huge cranes pulled steel beams from the pile, safety experts worried about the effects of the extreme heat on the crane rigging and the hazards of contact with the hot steel. And they were concerned that applying water to cool the steel could cause a steam explosion that would propel nearby objects with deadly force. Special expertise was needed. OSHA called in Mohammad Ayub and Scott Jin, structural engineers from its national office, to assess the situation. They recommended a special handling procedure, including the use of specialized rigging and instruments to reduce the hazards.

FREON

Huge underground tanks held more than 200,000 pounds of Freon stored to cool the seven buildings of the WTC complex. This had been the largest air-conditioning system in the country.

OSHA personnel were concerned that workers entering areas below grade could be exposed to Freon gas, a known, heavier-than-air, invisible killer. After a leaking tank was discovered, agency staff and the site construction manager carried out special sampling for months until the all the tanks were uncovered and safely removed.



PHOTO BY ANDREA BOOHER/FEMA

Underground fires burned at temperatures up to 2,000 degrees. As the huge cranes pulled steel beams from the pile, safety experts worried about the effects of the extreme heat on the crane rigging and the hazards of contact with the hot steel.

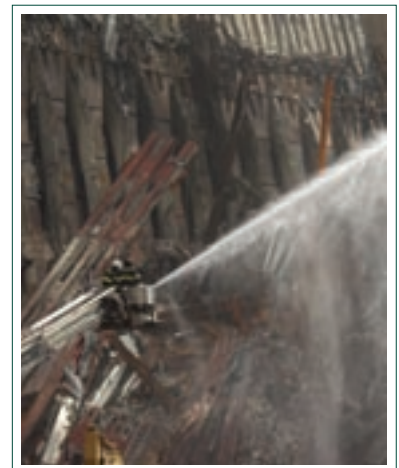


PHOTO BY ANDREA BOOHER/FEMA

PHOTO BY SHAWN MOORE/DOL



PHOTO BY GIL GILLEN/OSHA



Freon tank being removed from the site.

CONFINED SPACE

OSHA has investigated hundreds of cases of carbon monoxide poisoning across the country. Often this hazard is not immediately apparent, and what may seem to be an open-air atmosphere is really a more deadly confined space. Rescue and recovery workers entered collapsed buildings where the atmospheric hazards from fire and toxic fumes could have been fatal.

Besides the usual hazards in confined space, the site conditions at the WTC posed the additional risk of structural instability. DDC designated certain areas for special attention. For example, a sudden and catastrophic release of Freon could overcome workers performing demolition and recovery operations inside collapsed buildings. OSHA helped DDC establish safe entry protocols for these areas.

“On the days following September 11, OSHA had to make a risk assessment about crawling down into holes to see if someone could be rescued,” Mendelson said. “There was always the potential for collapse, but there was also the potential that a rescuer could be overcome by Freon.” OSHA’s experience with confined entry issues protected many recovery workers during the recovery operation.



PHOTO BY MICHAEL REIGER/FEMA

Rescue and recovery workers entered collapsed buildings where the atmospheric hazards from fire and toxic fumes could have been fatal.



PHOTO BY MICHAEL REIGER/FEMA



PHOTO BY GIL GILLEN/OSHA



To promote greater communication, site partners held safety meetings attended by representatives from the Building and Construction Trades Council of Greater New York, Building Trades Employers' Association, the DDC, and the contractors.



PHOTO BY SHAWN MOORE/DOL

WORKING IN PARTNERSHIP

From the earliest days on the site, OSHA knew that partnership was key to getting the job done and, most importantly, saving lives. The informal collaboration that began with OSHA and other parties grew into formal meetings and ultimately a framework for unprecedented cooperation and partnership.

To promote greater communication, OSHA began holding regular safety meetings with representatives from the Building and Construction Trades Council of Greater New York, Building Trades Employers' Association, the DDC, and the contractors. These meetings continued throughout the recovery process, providing frequent and timely opportunities for discussion and resolution of safety and health problems. OSHA staff also met regularly with union stewards at the site to share sampling results, discuss ongoing hazards, and determine how best to reduce or eliminate them.

At the same time, OSHA and city officials were working with others to create a formal safety and health plan for the site. The plan formalized cooperation among all the parties and facilitated creation of a structure for joint labor-management safety and health committees. A site-level group, with representatives from OSHA and the other partner agencies, conducted walk-throughs and follow-up meetings to ensure immediate correction of hazards.

A leadership oversight committee met monthly to address policy issues requiring coordination with high-level city and state officials. This group included the president of the New York building and construction trades; the chief elected officers of the New York locals of the Operating Engineers, Ironworkers, Laborers, Carpenters, and Teamsters; heads of the city construction trade associations; and key staff from city agencies and prime contractors at the site.

“This unprecedented level of management commitment and employee involvement created the energy and impetus for ensuring that the safety and health of workers was paramount at the site,” said Clark, who served as an ex-officio member of the leadership committee.

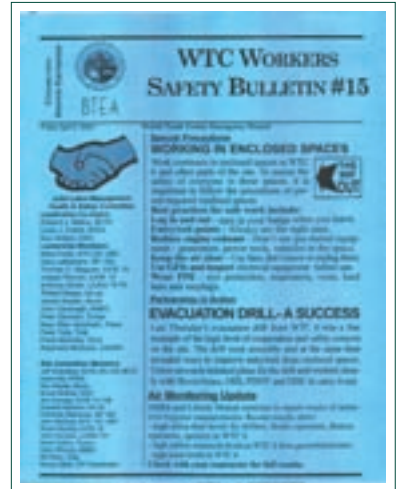
The committee structure also provided unique opportunities to reach workers on the site with vital information about the risks they were facing. In a situation where 12-hour shifts seven days a week were the norm, dissemination

of timely and useful information posed unusual challenges. Multiple communication tools were needed. Union stewards distributed safety and health bulletins to workers on the site and held toolbox talks on a weekly basis. OSHA also distributed risk information to workers on the site, in meetings, at its protective equipment distribution sites, and on its website.

In October, OSHA and the Center to Protect Workers' Rights (AFL-CIO) helped to create an Orientation Training subcommittee to develop and implement formal safety and health education for all workers at the project. More than 50 instructors were trained to deliver the program to nearly 2,000 workers. OSHA also provided a 10-hour construction hazards course for all supervisory personnel working at the site.

Debris from the WTC site was taken to a Staten Island landfill for sorting and disposal. As the debris piled up there, OSHA recognized the need for safety and health monitoring at this site as well. In December, a separate partnership agreement was signed to cover the work at the Staten Island landfill.

On April 10, 2002, in a follow-up to the original November partnership, a second formal agreement further detailed the safety and health responsibilities at the site.



OSHA's commitment to the WTC recovery project involved more than 1,000 agency employees working 24 hours a day, seven days a week, alongside other federal, state, and local agencies to ensure the safety and health of workers at the site.



Staten Island landfill

PHOTO BY ANDREA BOOHER/FEMIA

“While we will long evaluate what we accomplished here and learn useful lessons about how to respond in a similar disaster, we hope we never again need to put those lessons to use.”

PATRICIA CLARK, OSHA
REGIONAL ADMINISTRATOR
FOR NEW YORK



PHOTO BY GIL GILLEN/OSHA

LOOKING BACK

OSHA’s commitment to the WTC recovery involved more than 1,000 agency employees working 24/7 alongside other federal, state, and local agencies to ensure the safety and health of workers at the site. At the height of this effort, OSHA staff worked the site each day and provided more than 15,000 work shifts.

OSHA collected more than 6,500 air and bulk samples to test for asbestos, lead, other heavy metals, silica, and various organic and inorganic compounds; analyzed the samples for more than 81 analytes; and conducted more than 24,000 evaluations of worker exposure. OSHA’s Salt Lake Technical Center worked non-stop to provide sampling results and to support the WTC risk assessment effort. And OSHA’s Cincinnati Technical Center made certain the agency’s 1,000 workers had the sampling instruments and supplies they needed during the entire 10-month period.

At the peak of the respirator distribution activity, OSHA assisted 4,000 responders a day and distributed more than 131,000 respirators, 11,000 hard hats, 13,000 safety glasses and goggles, and more than 21,000 pairs of protective gloves.

OSHA identified more than 9,000 hazards during the recovery and encouraged employers to correct them. OSHA calculations show that in more than 3.7 million work hours, only 57 serious injuries were recorded at the WTC site, resulting in a Lost Workday Injury Rate (LWDI) of 3.1. The closest comparison is specialty construction, which includes demolition and has an LWDI rate of 4.3. These figures reflect the cooperative effort of all participants in the recovery effort and the seriousness of their commitment to worker safety and health. The WTC partnership offers numerous lessons learned and is a model for future public-private collaboration.

After September 11, 2001, not one life was lost inside the green line during the recovery effort.

LESSONS LEARNED

On September 11, 2001, the United States entered a new era—one that requires increased levels of vigilance and stronger commitments than ever before to emergency preparedness. OSHA learned a great deal at the WTC site, lessons that can help the agency improve its own emergency preparedness while also helping employers prepare for emergency response.

EMPLOYER EMERGENCY EVACUATION PLANS

For employers, the value of an effective emergency evacuation plan is reaffirmed. OSHA suggests that workplaces review and practice their plans with an emphasis on the following:

- Find alternate ways to exit the building.
- Develop a method to account for all employees.
- Designate a secondary rendezvous point farther away in case the disaster zone prevents you from gathering at your primary site.
- Develop special procedures for any disabled employees.

EMERGENCY RESPONSE PARTNERSHIPS

Emergency response partnerships, with clear lines of authority for all functions at a site and with special emphasis on safety and health, should be created immediately to promote effective disaster site management. OSHA is working with state emergency management officials and local first responders around the country to prepare for contingencies involving exposures to occupational hazards.

In addition, OSHA recommends the following as key elements for emergency response partnerships to consider in planning for disasters:

Emergency Training

For first responders and federal law enforcement agencies,

- Develop outreach and training material to address new and non-routine hazards faced by these workers, including skilled support personnel.
- Address safety and health issues related to incidents involving terrorism and weapons of mass destruction, such as PPE; respiratory protection; chemical, biological, and radiological hazards; confined space; fall protection; and collapse hazards.



WTC BUILDING 6 PHOTO FROM FEMA



PHOTO BY ANDREA BOOHER/FEMA



PHOTO BY ANDREA BOOHER/FEMA

ACTION TAKEN: OSHA is working to implement this recommendation. OSHA has proposed the creation of a new weapons of mass destruction training course that will address many of these issues for responders and skilled support personnel. OSHA is developing guidance documents for responders, workers, and first receivers on appropriate PPE and work practices during a weapons of mass destruction response.

Outreach

Conduct outreach to state and local emergency management agencies to enhance worker protection. Emergency responders, managers, and incident commanders should:

- Plan for emergency responses, including integration of mutual aid and inter-agency communications, to improve incident management.

- Ensure early and complete implementation of the incident command system (ICS) and/or Unified Command at all incidents.
- Designate one or more safety officers with no collateral duties and sufficient authority to correct hazards or remove persons from exposure.
- Conduct a comprehensive site risk assessment, and repeat it as conditions change.
- Implement safety and health protections as a priority at all incident sites.
- Protect employees from hazards such as falls, voids, and confined spaces; structural instability and collapse; and the risk of being struck by material or heavy equipment.
- Install proper shoring and pay attention to material handling equipment and rigging.
- Monitor worksites for health risks and implement appropriate controls.
- Consider environmental conditions such as weather and lighting, as well as psychological stress and fatigue.
- Control access to the site. Establish a firm perimeter and cold/warm/hot zones.
- Manage volunteers effectively, including off-duty emergency responders and responders from other jurisdictions who are not operating under the ICS. Volunteers who are not trained or experienced in emergency response may put themselves or others at risk.
- Manage donations, especially unsolicited in-kind goods. Donated supplies might not be appropriate for the hazards, or items might have expired or been damaged. Uncontrolled donations present logistical problems and compatibility issues.

ACTION TAKEN: OSHA is coordinating with Department of Homeland Security (DHS), the National Response Team, and Regional Responses Teams at national, state, and local levels. OSHA is also actively participating in the development of the DHS National Response Plan to address many of the issues raised above. OSHA field offices continue to strengthen ties with regional and local emergency response stakeholders.

Pre-fit Testing

- Emergency responders at all levels of government should be quantitatively fit-tested for respirators routinely. This also helps build familiarity with

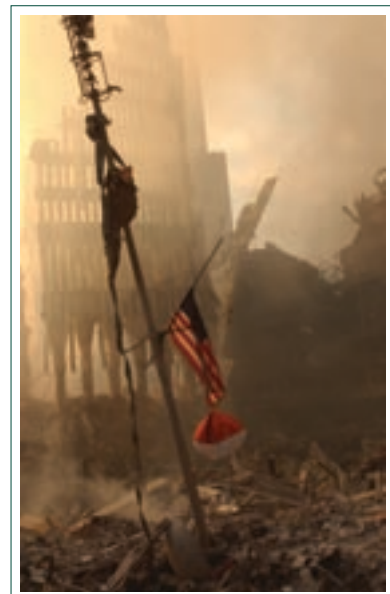


PHOTO BY ANDREA BOOHER/FEMA

negative-pressure air-purifying respirators among employees who might not typically use them.

ACTION TAKEN: Outreach and education efforts are underway to address this need.

Communication

- Improve channels of communication with other local, state, and federal agencies.
- Consider cultivating regular and ongoing relationships with other agencies because they benefit both parties by building trust and learning about each other's capabilities and limitations. To be most effective, these relationships should be established before an emergency occurs.
- Improve emergency communication capability remembering that landline and wireless communication systems may be overloaded in major emergencies.

ACTION TAKEN: Since 9/11 many OSHA personnel have been given access to the Government Emergency Telephone System. The applicability of other emergency communication systems continue to be investigated and tested as they develop.

Transportation

- Coordinate access to military transportation of personnel, equipment, supplies, and samples.
- Plan for emergency transportation. As the events of 9/11 illustrated, security threats and other causes can delay or prevent commercial air traffic.

ACTION TAKEN: OSHA has worked with DHS/FEMA and the U.S. Department of Transportation to identify and use their established protocol for the emergency transportation of personnel and equipment. This protocol will be incorporated into OSHA's National Emergency Management Plan for future use.

OSHA continues to work with other federal agencies across government to improve cooperation and collaboration in the event that a coordinated response on such a massive scale is ever needed again. If the need arises, OSHA will be ready.



PHOTO BY SHAWN MOORE/DOL



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