

Disaster Response Disaster Response



*A firsthand account from the most dangerous workplace in the U.S.
By Jeffrey W. Vincoli, Norman H. Black and Stewart C. Burkhammer*

PHOTOS BY JEFF VINCOLI/NORM BLACK

On Sept. 12, 2001, a small group of SH&E professionals from Bechtel Group Inc., led by Stewart Burkhammer, a professional member of ASSE's National Capital Chapter, arrived in New York City to assist the city and state of New York in the emergency recovery effort after the terrorist attacks on the World Trade Center. The sights and experiences of the days and weeks that followed are described here in order to provide fellow SH&E professionals a brief account of the extraordinary challenges encountered at Ground Zero.

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September 11, 2001, began much like any other Tuesday. Norm Black, ES&H manager for special projects with Bechtel Systems and Infrastructure Inc., San Francisco, was on assignment at a project office in midtown Manhattan. Jeff Vincoli, ES&H manager for corporate assessments and audits with Bechtel Construction Operations Inc., had just landed at Washington Dulles International Airport in Virginia when the second plane hit the World Trade Center (WTC). The next 24 hours would be unlike anything either could have imagined.

Within hours of the attack, Black was attending a chaotic meeting of state and city officials near Ground Zero. As a construction SH&E professional, he answered various safety questions in a discussion that led to the formation of a large SH&E team. By mid-afternoon, Bechtel's corporate offices (in San Francisco and Frederick, MD) were asked for additional assistance. On Wednesday, Sept. 12, six SH&E professionals from the Frederick office headed to New York City. Since air travel was prohibited, the group drove in a van. The ride, which would normally take three hours, took nearly six. During that time, the group received continuous cell phone updates about the status of Ground Zero from personnel at the Manhattan project office.

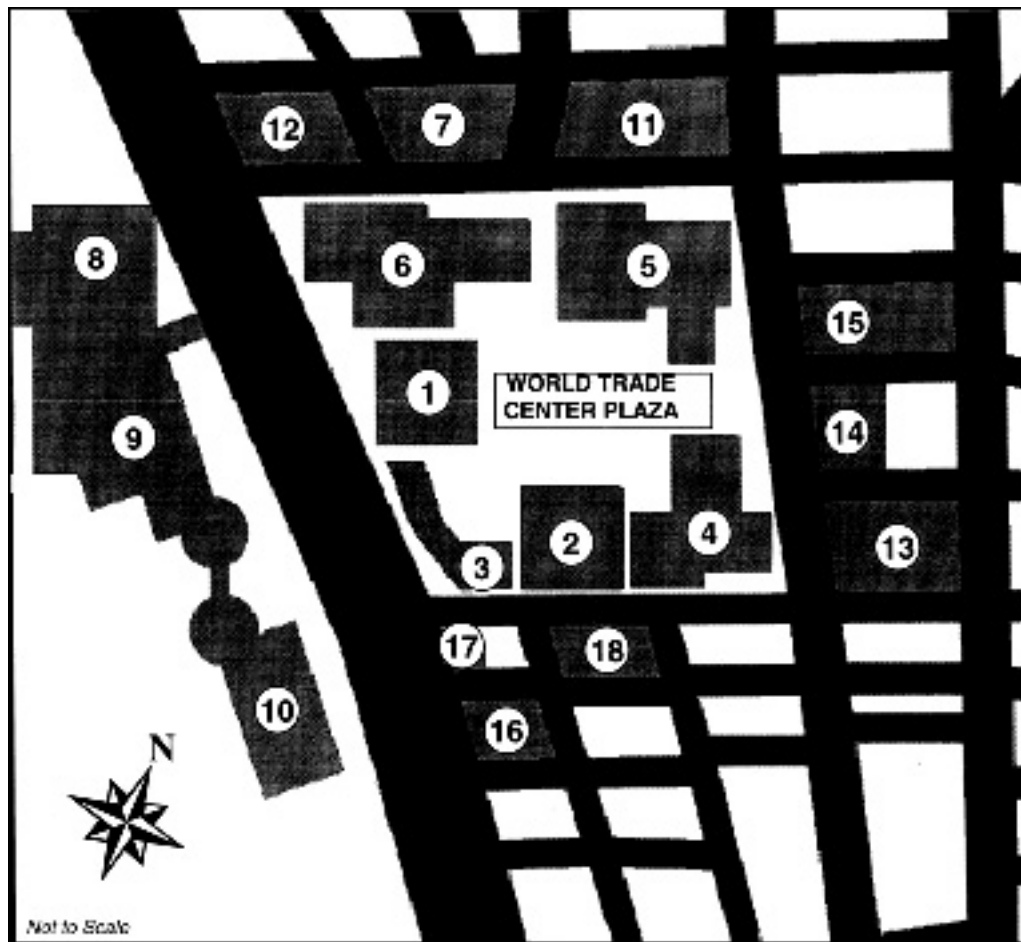
On the morning of Sept. 13, the SH&E group was taken to Ground Zero (see Figure 1 for site orientation), escorted by New York State Dept. of Environmental Compliance (DEC) Police, the New York Police Dept. (NYPD) and a New York Port Authority safety representative. No one in the group was—or could have been—adequately prepared for what came next.

First Impressions: Devastation & Chaos

Dust was one of the first things the group noticed. A fine, gray dust, later determined to be mostly pulverized concrete covered everything at the 16-acre disaster site (Table 1). More than 160 buildings in lower Manhattan were cloaked in the powder and would need to be cleaned. Dust was settling everywhere—on the streets, parked vehicles, buildings, lightposts, fences (Photo 1). A tremendous amount of paper was scattered across the site as well—files, notes, pages from desk calendars, photographs, unopened mail, legal documents and myriad other papers common to an office environment. Papers and dust even blanketed a small cemetery located directly across the street from the site. There were also shoes of all types, styles and sizes scattered everywhere.

The scene was a surreal, horrific and unbelievable sight. At times, we were unsure of what we were seeing—we simply could not process the visual images rapidly enough to comprehend what confronted us. The smoke was thick, acrid and penetrating, with an odor similar to burning electrical insulation or burning ballast, mixed with other indescribable substances. The SH&E group wore half-mask respirators with high efficiency particulate air (HEPA) filters, but the odor was still detectable.

We first walked past the ruins of WTC Building 7 (Photo 2)—a 47-story office building before it collapsed at 5:20 pm on Sept. 11. We then headed toward the corner of Church and Liberty streets. From here, the full impact of the attack was clear. Where WTC Building 4 once stood laid the remains of Tower 2 (the South Tower, WTC-2), which collapsed at 10:00 am on Sept. 11, raining tons of steel, glass and concrete debris onto the southeast corner of Building 4 (Photo 3). All that remained standing of Tower 2 was its lower curtain wall, which was dubbed “the coliseum” because of its odd appearance (Photo 4).



World Trade Center	World Financial Center	Other Affected Buildings
1. Tower 1 (WTC-1) (collapsed)	8. American Express (WFC-3) (major structural damage)	11. Federal Building (minor superficial damage)
2. Tower 2 (WTC-2) (collapsed)	9. Office Building (WFC-2) (minor structural damage)	12. 140 West Street (NY Telephone) (structural damage)
3. Marriott Hotel (WTC-3) (destroyed/collapsed)	10. Dow Jones (WFC-1) (minor structural damage)	13. 1 Liberty (Brooks Brothers) (structural damage)
4. Office Building (WTC-4) (destroyed)		14. Century 21 Building (structural damage)
5. Office Building (WTC-5) (destroyed)		15. Millennium Hilton (serious structural damage)
6. Office Building (WTC-6) (destroyed)		16. 90 West Street (serious structural damage)
7. Office Building (WTC-7) (collapsed)		17. Greek Orthodox Church (destroyed)
		18. 130 Liberty (Bander's Trust) (serious structural damage)

The area where WTC-2 fell became—and would remain—a major focus for search-and-rescue personnel. Even though WTC-2 was the second building to be attacked, it was the first to collapse. An orderly evacuation was in progress when the building crumbled. Many firefighters were climbing the stairwells and were killed when the building fell, as were a large number of WTC-2 workers. Since Tower 1 did not collapse for another 30 minutes, many potential victims had time to escape that building.

As the SH&E group approached Ground Zero, we saw hundreds—perhaps thousands—of people everywhere. Many were getting in each other's way, trying to help yet not knowing what to do or how to do it (Photo 5). Professional rescue workers and civilian volunteers worked side by side in a massive scene of chaos.

Although the site was extremely dangerous, most volunteers wore no personal protective equipment (PPE). Some wore shorts, sneakers and sleeveless shirts. Others wore some combination/variety of protective equipment—hard hats, dust masks, surgical masks and even handkerchiefs used as respiratory protection. Some wore safety goggles and even faceshields, while others wore no eye protection. This equipment was often inadequate, however. The debris pile was unstable and rife with hazards, including shards of glass, erupting fires, collapsing debris, slippery surfaces, and hundreds of rebar “spears” projecting at all angles from the pile. Heavy equipment (dump trucks, excavators and bulldozers) moved about rapidly, often with no apparent regard for the massive number of pedestrians populating the site. As safety professionals, the scene was an



Table 1

WTC Dust Analysis Results

Construction Debris

- Plaster
- Carbonate fragments
- Mica/vermiculite
- Glass Fibers
- Chemically processed cellulose fibers

Quartz Grains

Low-Temperature Combustion Materials

- Includes charred wood fragments

Hair

extremely disturbing, even horrifying sight. Little or no control of the work and limited understanding of the hazards set the stage for a serious accident involving one of the rescuers. Thankfully, none occurred.

Early Days: Accepting the Risk

In those early days at Ground Zero, rescue workers were focused on finding survivors, regardless of personal risks involved. Even though time would later prove that no more survivors were to be found, the hope and faith of the rescue teams did not waver. Risking a life to save a life is a unique attribute of human behavior. Although admirable under these circumstances, this attitude created serious safety and health concerns.

Risk-taking was the norm—not the exception—at Ground Zero. As SH&E professionals, it was difficult to watch these activities. Under normal circumstances, doing nothing to stop risk-taking equates to condoning and accepting the risk, which is contrary to how SH&E professionals are trained to conduct their craft. But work at the site was anything but “normal.” The group quickly learned that trying to control human behavior under such extreme conditions was not possible. In the simplest terms, during those early days, we were forced to accept such risk-taking behavior—not an easy task for any team member.

Since no clear lines of authority had yet been established with regard to the team’s specific responsibilities, it was initially difficult to enforce even the simplest of SH&E principles at the site. As long as work at the WTC was considered “search and rescue” by the mayor’s office, it fell under the jurisdiction of the Fire Dept. of New York (FDNY) and the FDNY incident commander. As a public agency, FDNY took little direction from a private contractor.

First Things First

Telling a firefighter, a police officer or any other worker at Ground Zero not to take risks during the first few weeks was simply not realistic. On one occasion, a senior commander told a safety representative from the Federal Emergency Management Agency (FEMA) that the first person to mention safety issues would literally be thrown off “his” site. He felt he had no time to worry about such things when there could still be survivors.

It was decided that we could begin to infuse correct safety structures by attempting to control the exposure to hazards that personnel faced each minute of every day. Looking at the “big picture,” we categorized hazards into four primary areas: 1) personal safety and hygiene; 2) dust control; 3) heavy equipment operations; and 4) work zone control.

Personal Safety & Hygiene

When the team first arrived on site, people were eating, drinking and smoking in the same areas where they were working—on the debris pile, where dust and smoke were the worst. No thought was given to personal hygiene—and even less regard was given to the use of PPE. Injured persons were being treated in open-air, makeshift triage stations while smoke and ash continued to rain down. The SH&E team recommended that all workers at the site wear, at a minimum, a hard hat, safety glasses, long pants, shirts with sleeves and sturdy shoes (preferably safety shoes). In addition, anyone within 25 feet of the pile or downwind of the site was required to wear respiratory protection. Dust masks were required when exposure was minimal (intermittent or downwind). However, on the pile, half-mask organic vapor

Chrysotile Asbestos Fibers

- Some with adhering carbonate binder, total estimated to comprise <1%

Synthetic Fibers

Cellulose Fibers

- Cotton and paper

Insect Parts

Tar Fragments

Photo 1 (above): Dust covered everything at and around Ground Zero.

respirators with HEPA filters were initially provided; later, organic vapor/acid gas respirators with HEPA filters were required.

The Salvation Army, American Red Cross and other groups provided enclosed eating stations and washing facilities for workers. NIOSH, and later OSHA, operated respirator fit testing stations and distributed thousands of respirators to workers (Photo 6). SH&E team members also helped workers with respiratory protection (Photo 7). Triage stations and first-aid facilities were relocated to tents and other protected structures (such as commandeered restaurants, exercise facilities and other establishments located near Ground Zero).



Photo 2 (above, left): WTC-7, a 47-story building destroyed in the attacks.

Photo 3 (right): The remains of Tower 2 fell on the southeast corner of WTC-4, which can be seen in the background.

Photo 4 (above, right): The curtain wall of Tower 2, which was referred to as “the coliseum.”



Dust Control

In the early stages of the recovery effort, the composition of the smoke and dust coming from the pile was undetermined. A dust suppression plan was implemented to ensure adequate protection of workers and the surrounding neighborhoods as debris was trucked offsite. Vehicle washing stands were erected at perimeter locations, and no vehicle was allowed offsite without first being washed down properly (Photo 8). Task-specific dust-suppression methods were implemented as required—such as to clean peripheral buildings in preparation for reoccupation (Photo 9). This included use of required PPE and specific clean-up techniques (watering, double-bagging, HEPA vacuuming, etc.) to minimize the amount of dust generated. While the use of water created some initial concerns regarding discharge, the benefit of reducing the risk of human exposure/contamination potential took precedence.

Heavy Equipment Operations

The tremendous amount of heavy equipment used at Ground Zero created many opportunities for serious accidents (Photo 10). More than 30 crawler cranes (up to 1,000 ton in capacity), several dozen

excavators, scores of backhoes and dozers, hundreds of trucks and many other types of equipment moved about the site at a hurried pace 24/7. The team's recommendations to use spotters, back-up alarms, properly caged operator cabs, clear zones and related standard operating procedures prevented several accidents.

Work Zone Control

From the beginning, many people with no credentials or work assignments were present at the disaster site. People would help in one area, then wander to another to provide assistance. While their efforts were commendable, had an emergency situation occurred in any area, there would be no way to account for personnel. To gain control of the site, the SH&E team recommended implementation of a positive access accountability system; this eventually resulted in the creation of four separate zones at Ground Zero. Four construction firms were assigned responsibility for demolition and recovery activities, as well as SH&E issues, in each zone.

Each contractor's safety professionals reported to the NYC Dept. of Design and Construction (DDC). Bechtel provided SH&E consultation to the DDC for the entire site. Eventually, the National Guard took responsibility for access control and personnel badges, which substantially decreased work zone control problems. The number of workers at the site dropped from an estimated 10,000 (during the first week) to fewer than 2,500. In addition to firefighters and police department representatives, some 1,500 iron workers and 400 operating engineers were on site, along with many carpenters, laborers and mill workers.



Photo 5 (above left): The site was flooded with people trying to assist, many wearing no or improper PPE.



Photo 6 (above, middle): One of OSHA's PPE distribution centers and respirator fit test stations near the disaster site.



Photo 7 (above right): Norm Black (left) helps a New York City police officer fit her respirator.

Other SH&E Initiatives

A warning system using hand-held air horns was devised to signal site-wide emergencies. Personnel were instructed to stop work and listen for further instructions, how to safely evacuate the area immediately, or return to work depending on the number of horn blasts. Two-way radio communication and cell phone links became the standard for sending and receiving information about Ground Zero status.

A generic accident prevention plan was also quickly developed and implemented. The intent was to take whatever realistic measures were possible to ensure that no one would die or suffer a serious injury as a result of working at the site. To succeed in this unique work environment, the plan had to be simple, concise and easily understood by all personnel while ensuring that essential SH&E issues were adequately addressed. The plan focused on the four primary areas of concern: personal health and hygiene, dust control, heavy equipment use and work zone control. It provided specific details regarding each element and also covered emergency action requirements and site evacuation procedures.

Later, a comprehensive SH&E plan was written and implemented. The plan was an unprecedented undertaking developed with the input and consensus of 26 federal, state and local agencies in partnership with the four primary contractors. Federal (such as OSHA, EPA and FEMA), state (such as the Dept. of Environmental Compliance) and city agencies (such as the Mayor's Office of Emergency Management) approved the plan alongside the private-sector contractors. Later, specific procedures were written to address hazards related to tasks such as confined space entry, working at heights, using compressed gas cylinders, ladder use, and excavation and trenching. These procedures, along with the dust prevention and suppression plan, the storm water prevention plan, and the freon removal and recovery plan, became attachments to the comprehensive plan. In addition, at each of the more than 30 gated entrances to the site, large safety posters advised all who entered of the hazards and required controls.

More Challenges

Soon after our arrival at Ground Zero, the SH&E team received a briefing from Port Authority SH&E personnel regarding hazardous materials and commodities stored in (and under) some WTC buildings. At this early stage, their status was unknown and, therefore, presumed to be a threat to personal safety. The most-serious concerns included:

- Approximately 200,000 pounds of Freon® 22 refrigerant for the heating, ventilation and air conditioning system were located several stories underground in storage tanks. Nearly 180,000 pounds for the primary system and another 20,000 pounds for the backup system were located in separate tanks

Personal Perspective:

Jeff Vincoli

I began my SH&E career on Sept. 14, 1981, as a safety engineer in the country's new Space Shuttle Program at Kennedy Space Center. To say this job was professionally challenging, technically demanding and emotionally overwhelming would be an understatement. It was, of course, exciting to be part of the team that would take the U.S. space program into the next century.



In those early years, I often wondered where my career would take me and what I would be doing in 20 years. Never could I have anticipated that 20 years later—to the day—I would be witness to the massive devastation and horror of this tragic event. Once again, I found myself involved in a professionally challenging, technically demanding and emotionally overwhelming task that was (and still is) beyond description. Being at Ground Zero was, at all times, profoundly sad. The sadness remains for me and all who gave their time, skills, talents and abilities during those dark days. We experienced things that no one was ever meant to experience and saw things that should never have been seen. But it all had to be done. I am sure that the images will be with me forever, but I am also confident that I will be a better person (both personally and professionally) as a result of this experience.

I am proud to say that during our time at Ground Zero, no one on the site suffered a fatality or serious injury. At least 30 rescue workers' lives were saved as a direct result of our team's involvement at Ground Zero. I find personal and professional satisfaction in that fact that we did what we, as SH&E professionals, are trained to do—save lives. The fact that we were able to accomplish our charter under the most bizarre of circumstances is nothing less than remarkable.

Photo 8 (below): A vehicle wash station at Ground Zero. No vehicles were permitted offsite without first being washed.

Photo 9 (right): Laborers clean 1 Liberty Plaza. At the time the work was being performed, consistency of the dust was not known.

Photo 10 (below, right): A massive amount of heavy equipment was mobilized to assist in the recovery effort. This photo shows only the southwest corner of the 16-acre site.



**Personal Perspective:
Norm Black**

In many ways I am proud because I was able to be at the site so quickly, figuring out ways to stop more people from being hurt or killed as a result of this attack. In many other ways, I am frustrated that I was not able to instantly stop all the apparent hazards because of the nature of the rescue-and-recovery process. I was proud to be a part of a valiant effort to make the site whole again, but ashamed of myself as I burst into tears at the site of a rescue dog with bloody paws as he struggled up a debris pile in the hope of finding survivors.



My lessons learned from the experience were in understanding the need everyone has in wanting to help in a rescue, and the impact that attitude has on site safety management. I also learned how important it is to tell loved ones how much they mean to me every day. Life became so much more precious to me following my work at the site.

As a CSP with 25 years in SH&E management, and as a licensed ship's master with countless miles at sea, I have never experienced anything like the WTC recovery efforts and I hope you never will. It will, for better or worse, be with me for the rest of my days.

at two different levels in the WTC basement. While this chemical has a relatively high threshold limit value and is nonflammable, it emits hydrochloric and hydrofluoric acids when heated. Final status: Both tanks were eventually located and inspected; both were damaged and one was leaking slightly. The same contractor that designed, built, installed and serviced the tanks eventually recovered the Freon®.

- 72,000 gallons of diesel fuel were stored in a tank (on basement level 7) for the WTC complex backup generator/power systems. Final status: The tank was eventually located and inspected. Although slightly damaged, no leaks were found. The fuel was removed.

- 1,000 gallons of gasoline, contained in individual five-gallon cans, were located throughout many levels of each of the collapsed towers. Final status: No gasoline cans were ever found; presumed destroyed in the collapse and ensuing fires.

- Unknown quantities of blood and blood products were stored in a blood bank located in Tower 2. Final status: No blood or blood products (from the blood bank) were ever found; it was presumed destroyed in the collapse and ensuing fires.

- 3,600 pounds of lead acid batteries, used for backup power, were located on various floors of the collapsed towers. Final status: No batteries were ever found; presumed destroyed.

- Three underground floors had been used as a parking garage with a total capacity of 2,000 cars. Assuming (conservatively) the garage to be half-full, with

the cars' fuel tanks being anywhere from near empty to full, the explosive potential was extraordinary. With the stability of the debris pile unknown, subsurface fires burning continuously, welding and other hot work being performed on top of the debris, and hundreds of personnel working on the pile, the threat of a massive event with extensive human casualties due to underground explosions was real and serious. Final status: The cars were eventually located and removed. Some had exploded and were completely burned-out while others were in pristine, drivable condition.

- WTC Building 6 housed several federal agencies, primarily U.S. Customs (Photo 11). The third floor—now largely inaccessible—contained a firing range. More than 1.2 million rounds of ammunition were stored on this level, as was a vault used to store other explosives and weapons. A seizure vault was also on the third floor; it contained evidence (such as drugs, cash and evidence files) seized during Customs operations. Final status: At great personal risk, Customs officials, the FBI and contractor representatives located and removed the criminal evidence from Building 6 during the fourth week of the effort. The ammunition was finally located on Oct. 24, 2001, melted together into large “bullet balls” that were extremely dangerous to handle and dispose of properly (Photo 12). At one point, a discharge of a bullet, due to the immense heat in the area, caused a shrapnel wound to the face of one worker.

- A building at 90 West St.—located across the street and just south of WTC-2—was undergoing extensive exterior surface renovation. Before the attack, scaffolding had been erected on the east, west and south sides of the 12-story turn-of-the-century art deco building. When Tower 2 collapsed, the building was pelted with steel, glass and concrete debris. Its first six floors were burned-out and the remaining six floors suffered heavy structural damage. As a result, the scaffolding was in danger of collapse, as was the building itself. With hundreds of rescue workers in the immediate vicinity, collapsing scaffolding presented a serious flying projectile hazard should the scaffolding—or the entire building—come down. Final status: The scaffolding was eventually secured and later safely removed.

- The WTC complex sits over a bathtub-shaped cavern that was hollowed-out to accommodate the underground service areas. During the original construction, an 80-foot tall by three-foot thick slurry wall had been built to keep the Hudson River out, which it successfully did for more than 30 years. However, cracks were discovered in the slurry wall that indicated potential wall failure and a subsequent flooding event under Ground Zero. A massive crack that appeared along Liberty Street indicated a pending failure of the slurry wall. The wall was braced and the entire structure was shored up before the wall could fail. Tiebacks were installed and a concrete/sand mix was pumped into the damaged area. This all took place while tons of debris and heavy equipment were on top of the WTC plaza.

- The debris pile at Ground Zero was always tremendously hot. Thermal measurements taken by helicopter each day showed underground temperatures ranging from 400°F to more than 2,800°F. The surface was so hot that standing too long in one spot softened (and even melted) the soles of our safety shoes. Steel toes would often heat up and become intolerable. This heat was also a concern for the search-and-rescue dogs used at the site. Many were not outfitted with protective booties (Photo 13). More than one suffered serious injuries and at least three died while working at Ground Zero. The underground fire burned for exactly 100 days and was finally declared “extinguished” on Dec. 19, 2001.

Personal Perspective:

Stew Burkhammer

What an experience!

After 39 years in the profession, having an opportunity to lead an effort that affected the lives of many was truly overwhelming. Two



things will remain in my mind forever. First, the strong resolve of America and the thousands of everyday people who would line up and cheer us as we left the site each day. Many handed us flowers, water and ribbons of thanks. Second, the pain, anguish and sorrow on the faces of the many friends we made while working in New York. They lost friends, coworkers, colleagues and family in the disaster, yet they continued to do their jobs in a very professional manner. This is real courage.

- Four or five days following the attack, another disturbing element developed at the disaster site. The smell of decay was overwhelming, raising concerns about infectious disease control. Despite the NYC Dept. of Health's strict directives regarding the handling of human remains, several days of the inescapable odor only added to the mounting difficulties of the work.
- Glass from the many thousands of windows in the still-standing buildings that surrounded Ground Zero was broken; with the slightest wind or vibration, it showered down onto the rescue site. Because it took days for these buildings to be properly draped with protective netting (many stood more than 50 stories high), personnel faced a constant threat when working near these buildings (Photo 14).

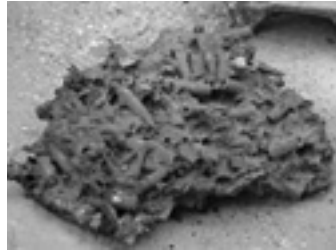


Photo 11 (top left): WTC Building 6 (U.S. Customs) viewed from the roof of a federal building.

Photo 12 (top middle): A bullet ball located near WTC-6, which housed a firing range. More than 1 million pounds of ammunition were lost.

Photo 13 (top right): Jeff Vincoli with Alex, one of the search-and-rescue dogs used at Ground Zero. Alex is wearing protective booties; many other dogs did not wear such gear.

OSHA Compliance

OSHA representatives were on site from the beginning. The OSHA area director's office had been located in WTC Building 6; fortunately, all of his staff evacuated before Tower 1 collapsed and all but destroyed Building 6. OSHA quickly realized that the unique circumstances at Ground Zero required a different approach to workplace safety. In an unprecedented arrangement, the agency worked closely with Bechtel to address specific and general hazards and hazardous conditions. Compliance officers teamed with members of the SH&E group to patrol the site and monitor the work 24 hours per day (Photo 15). When safety issues arose, contractors were given the opportunity to take corrective action without regard to citations or other enforcement actions. No citations were written or even considered during the first three months of the recovery effort.



Photo 14 (top): The north face of 130 Liberty St. The broken windows were eventually covered completely with protective, flame-retardant netting.

Photo 15: OSHA and the SH&E team joined forces to conduct inspections and monitor Ground Zero work activities.

WTC Injury & Illness Rate Low, OSHA Says

After nearly three million workhours, only 35 workers at the World Trade Center recovery site suffered injuries that resulted in lost workdays, OSHA recently reported. Of the 35 reported cases, none were life-threatening.

“The lost workday injury and illness (LWDII) rate at the World Trade Center is 2.3,” says OSHA Administrator John Henshaw. “While the work being done here is clearly unparalleled, the closest comparison is specialty construction which includes demolition. The LWDII for specialty construction is 4.3.”

“Given the extraordinary circumstances involved, this rate reflects the tremendous effort of everyone involved—the workers, Building and Construction Trades Council of Greater NY (BCTC), Building Trades Employer's Association (BTEA), the City of New York and the federal government,” states Patricia K. Clark, OSHA's regional administrator in New York.

The LWDII was obtained by collecting injury and illness data from all contractors at the site. The rate was then calculated as usual—by dividing the number of OSHA-recordable injuries by the number of hours worked. This rate covers all contractor employees working at the WTC site.

OSHA signed a partnership agreement in November 2001 with contractors, employees, employee representatives and governmental agencies participating in the emergency response efforts in lower Manhattan. To continue this cooperative effort to protect all workers at the site and to keep the injury and illness rate as low as possible, OSHA has entered into a new partnership with the construction manager Bovis/Amec, BCTC and BTEA. For more information on the agency's efforts at the recovery site, visit

<http://www.osha.gov/>.

For the most part, normal worksite OSHA compliance was not possible or even feasible at the WTC. The fundamental principles that form the basis for OSHA rules, regulations and standards certainly helped the team analyze hazards, perform evaluations and make decisions. However, strict “compliance” with OSHA requirements simply was not an option at this stage of the emergency effort. We encountered hazards that no rule, regulation or standard had ever addressed. The entire site could have been considered “immediately dangerous to life and health,” but the work had to be performed. The SH&E group's task became one of real-time hazard identification, analysis and control. Team members had to quickly evaluate the hazards and associated risks of a pending task and attempt to determine the safest possible way to perform what was often an unsafe task.

This was how the SH&E team operated, 12 to 14 hours per day, six to seven days per week. Some members were on site for more than three months. At its maximum, our team consisted of more than 40

practitioners. Joined by experts from the Washington Group, the team included industrial hygienists, rigging specialists, environmental engineers, industrial and construction safety engineers, demolition safety experts and even a high-rise/commercial building safety specialist.

Conclusion

Perhaps John Henshaw, Assistant Secretary of Labor for OSH, described work at the WTC best when he said, “The World Trade Center site is potentially the most dangerous workplace in the United States.” (USDOL News Release #01-440, Nov. 20, 2001).

On the professional side, work on this project was mentally and physically exhausting, technically taxing and frequently frustrating. But it was also satisfying to know that we were truly making a difference in the recovery effort. On the human side, it was consistently disturbing and emotionally draining. Team members were on an emotional roller coaster—a ride no one ever got used to. In the same hour, we would go from watching victims being removed from the debris to shaking hands with President Bush, Governor Pataki and Mayor Giuliani. As they greeted us, the adrenaline level was high and the pride immeasurable. But, when the dignitaries left, we had to go back to the task at hand— and the tremendous stresses associated with it.