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Safety and Health of Heavy Equipment Operators at Ground Zero

Bruce E. Lippy, CIH, CSP*

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BACKGROUND

The despicable attacks on the World Trade Center and the Pentagon have galvanized this nation into action against terrorism. We have begun unprecedented efforts to respond more effectively if we suffer other attacks, but we must do more to remember the workers in our planning. The Natural Resources Defense Council reported that ''Environmental health protection for workers at Ground Zero was given lower importance compared to other priorities.'' [Nordgren et al., 2002]. That was the experience of the author, the head of a team of safety and health specialists from the International Union of Operating Engineers (IUOE), who arrived at Ground Zero on September 17th to ensure the protection of the heavy equipment operators toiling in the smoking, twisted piles of debris. The team collected approximately 150 air samples and distributed 11,000 respirators.

The drive to clean up this outrage against our nation was the overriding priority at the World Trade Center. It became a juggernaut, demanding two 12-hr workshifts, 7 days a week. Safety and health professionals performed admirably but were constantly playing catch-up to protect weary workers in what the head of the Occupational Safety and Health Administration (OSHA) called ''potentially the most dangerous workplace in America'' [OSHA, 2002a, March 3rd]. No one was killed cleaning up the destruction but there were approximately thirty near misses that could have resulted in fatalities. Through October 10th, there were 7,160 visits to the medical tents or to New York City emergency rooms, with 30 fractures and 342 lacerations reported [New City Department of Health, 2001]. One worker's toes were cut off when a steel beam fell on his foot, another had his leg fractured by an oxygen bottle. The chief physician for New York City's firefighters reported 22% of a sample of the 7,000 firefighters involved with rescue and recovery at Ground Zero had respiratory complaints and tested positive for asthma-like conditions [Prezant, 2001].

METHODS

Compliance with respiratory protection requirements by heavy equipment operators was evaluated by observing with binoculars the operator of every piece of heavy equipment within the restricted zone once each day for 9 days in October 2001.

All IUOE air samples were collected inside the cabs of heavy equipment operating inside the restricted area at Ground Zero. Sampling media were positioned to approximate the breathing zone of seated operators but not attached directly to the operators. All asbestos samples were collected for analysis by transmission electron microscopy following the EPA's Asbestos Hazard Emergency Response Act (AHERA) protocol found at 40 CFR 763. Sampling for metals, organic vapors, total dust, silica, and lead was conducted following the National Institute of Occupational Safety and Health (NIOSH) Manual of Analytical Methods. A broad screen for volatile organics was conducted with evacuated cylinders following the EPA TO-15 method. All samples were analyzed by American Industrial Hygiene Association Accredited laboratories. Real-time instruments with alarms were installed in cabs to monitor agents—like carbon monoxide—that could pose immediate, life-threatening risks.

RESULTS

Compliance with respiratory protection was generally poor at Ground Zero. As Figure 1 indicates, less than one-

Director of Research and Special Projects, Operating Engineers National Hazmat Program, (until 8/9/02)15 Wyndcrest Avenue, Baltimore, Maryland

*Correspondence to: Bruce E. Lippy, Director of Research and Special Projects, Operating Engineers National Hazmat Program, 15 Wyndcrest Avenue, Baltimore, MD 21228. E-mail: lippy@erols.com

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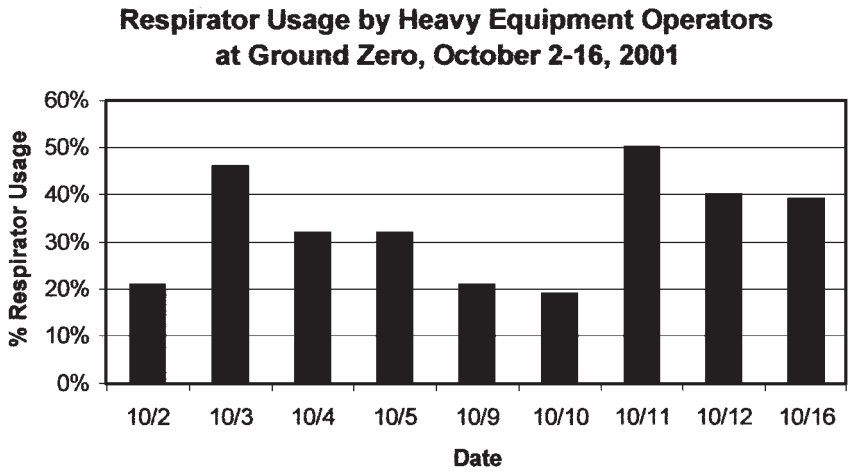

FIGURE 1. Respirator usage by heavy equipment operators.

half, and sometimes less than one-third, of the heavy equipment operators were wearing their respirators while working on the pile. Anecdotally, this was fairly representative of most other trades at Ground Zero. Unlike other trades, however, heavy equipment operators were able to close their cab doors during particularly smoky or dusty days, which reduced exposures. The rate of compliance with respiratory protection at the Fresh Kills dumpsite on Staten Island, where the debris from Ground Zero was taken, was regularly reported around 90%.

OSHA estimated that they provided a total of 130,000 half-face, cartridge respirators overall [OSHA, 2002b, May 30]. EPA reported giving out approximately 22,000 and the IUOE provided 11,000. This is far in excess of the number of workers ever on site, which is particularly ironic considering the lack of compliance.

The number of air samples collected at Ground Zero was similarly impressive. OSHA reported collecting 6,000 primarily personal samples by the formal conclusion of cleanup on May 30th [OSHA, 2002b]. Although concerned more about community exposures, the EPA collected 9,608 asbestos air samples in lower Manhattan by May 25, 2002 [EPA, 2002]. Private contractors collected an unknown quantity, although one reported taking more than 400,000 during the cleanup of several large buildings near Ground Zero [Glass, 2002].

The 150 samples collected by the IUOE team represent a very minor fraction of the total but they allowed the team to come to the same conclusion as the other organizations: half-face respirators with cartridges protective against fine particles, organic vapors, and acid gas (P-100/OV/AG) were adequately protective, *if conscientiously worn*. Sampling results should be used to determine appropriate control strategies for protecting workers. The selection of respirator and cartridge types did not change at the site from the first week, so it is unclear what control decisions required collecting thousands of additional samples.

The IUOE sample results—like those reported by other organizations—were nearly all below OSHA Permissible Exposure Limits and the majority were below limits of detection for the analytical methods. The broad scan for 60 chemical compounds under EPA TO-15 on September 22, 2001 revealed all to be below the limits of detection except for acetone, hexane, and toluene, all of which were far below the limit recommended by the American Conference of Governmental Industrial Hygienists (ACGIH).

The few overexposures measured at the site were almost always associated with specific tasks, e.g., silica exposures while drilling into the slurry wall. The exception was asbestos, which generated the most concern and confusion among workers and the greatest challenge for government. One obvious source of difficulty was the conflict between the EPA and OSHA allowable concentrations. At 40 CFR 763, EPA's AHERA regulations require analysis by transmission electron microscopy (TEM) of asbestos fibers greater than 0.5 μm in length. Under the OSHA standard, 29 CFR 1926.1101, fibers shorter than 5.0 μm are not counted and the analytical method is optical microscopy, not electron microscopy. The EPA standard is primarily focused on releasing asbestos abatement projects for re-occupancy by school students; the OSHA regulations deal with worker exposures. Additionally, the OSHA Permissible Exposure Limit of 0.1 fibers/cm^3 is an order of magnitude higher than the EPA AHERA clearance level of 0.01 structures/cm^3.

Rather than attempt to explain these differences, governmental communications blurred the distinctions in the eagerness to declare the New York financial district safe for re-occupancy. On September 14, 2001, OSHA, in conjunction with the EPA, published a national news release that quoted John Henshaw, the Assistant Secretary of Labor,

saying ''Our tests show that it is safe for New Yorkers to go back to work in New York's Financial District'' [OSHA, 2001, Sept. 14]. The release further indicated that, ''new samples confirm previous reports that ambient air quality meets OSHA standards and consequently is not a case for public concern. New OSHA data also indicate that indoor air quality in downtown buildings will meet standards.''

The OSHA asbestos standard has never been applicable to ambient air quality, and was particularly inappropriate for the World Trade Center. The incredible force of the destruction pulverized the sprayed-on insulation, releasing asbestos fibers that were mostly less than the OSHA cut-off of 5.0 μm in length and below 0.25 μm in width, which is widely regarded as the limit of resolution for optical microscopy. Ninety-five percent of the asbestos fibers observed with TEM, in eleven samples collected inside buildings near Ground Zero shortly after the destruction were reported as below the width visible to optical microscopy [Granger et al., 2001]. Four days after the OSHA pronouncement of acceptable air quality, one of the most respected electron microscopists in North America ran samples inside an apartment building near Ground Zero and reported elevated results, one as high as 3.74 structures/cm^3 of air, 37 times greater than the OSHA standard [Chatfield and Kominsky, 2001].

Sixty percent of the samples collected by the IUOE inside heavy equipment cabs were greater than the EPA clearance criteria of 0.01 structures/cm^3 of air, when counting fibers greater than 0.5 μm in length. Almost none of the fibers were greater than the OSHA cut-off. The approach of the IUOE team was to assume that shorter fibers, if not as hazardous, still posed potential risks.

OSHA has maintained that the 5.0-μm cutoff is based solely on health concerns, but a far different perspective is provided in the proceedings from a 1984 international conference of asbestos experts held in Toronto. When asked whether fibers longer than 5 μm were being chosen because of ''biological effects or just for the convenience of the analytical method alone,'' Patrick Sebastien responded that ''During a meeting of the British Asbestos Research Council in London, in the 1960s, the technician who was in charge of counting fibres in the microscope commented that it was difficult, and that it was easier if only fibres longer than 5 μm were counted. From that time, simply from this statement, the 5 μm length limit was established'' [Ontario Research Foundation, 1985].

DISCUSSION

Safety and health professionals worked long and diligently to ensure the workers at the site were protected but were hampered by not only the pace and difficulty of the cleanup but also by the complexity of the lines of authority. Participants at the December 2001 NIOSH conference on worker safety at the WTC noted ''the lack of a clear command structure at the World Trade Center (site) thwarted efforts to enforce PPE (personal protective equipment) use and risk-reduction behaviors.'' They repeatedly expressed the ''need to rapidly establish a single controlling authority or unified command'' [Jackson et al., 2002].

OSHA has been criticized for not enforcing the agency's standards at Ground Zero but under the Federal Response Plan—the blueprint for coordinating and applying the resources of the federal government to any disaster beyond the capabilities of an individual state—OSHA's role is clearly one of consulting to the Federal Emergency Management Agency (FEMA). From the plan, OSHA's support ''may include safety consultation and training programs, air contaminant sampling and analysis, and other safety services preparatory to, during, and/or following disaster operations under the FRP [Federal Emergency Management Agency, 1999].''

The difficulties noted above manifested themselves as delays in critical safety and health activities. As Figure 2 indicates, respirator fit tests were not offered widely onsite until October 17, thirty-six days after the attack. The safety

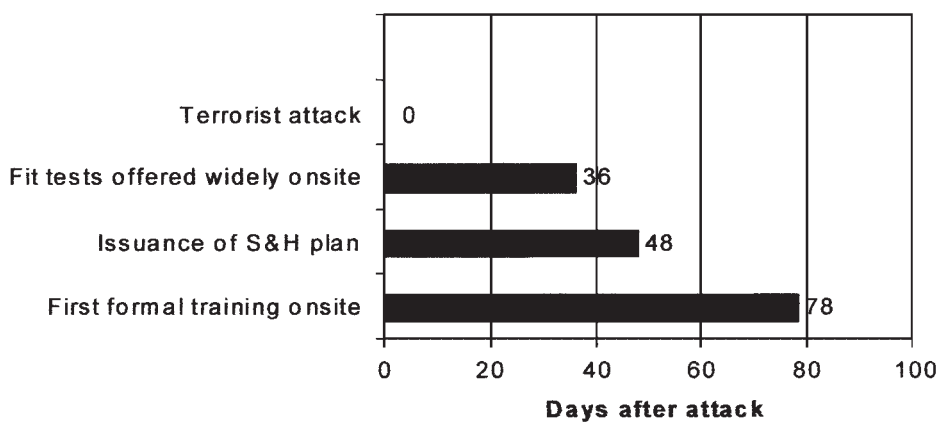

FIGURE 2. Events timeline after World Trade Center Attack.

and health plan—the main guidance for the site—did not receive all of the official signatures until October 29, forty-eight days after the towers fell. The safety awareness training began to be offered on November 29.

RECOMMENDATIONS

- Reconsider OSHA's role: Even in its proscribed role under the Federal Response Plan, OSHA performed admirably, garnering praise from contractors and the union for its crane inspection efforts, for instance. FEMA, on the other hand, did not distinguish itself for acting competently nor aggressively on the behalf of workers.
- Develop mechanisms to outfit all responders with appropriate personal protective equipment as rapidly as possible: This recommendation from the NIOSH/RAND conference [Jackson et al., 2002] is absolutely critical for preventing much of the respiratory difficulties and eye injuries experienced at the WTC.
- Define mechanisms to provide responders with useful information about the hazards they face and the equipment they need for protection: This recommendation is also from the NIOSH/RAND report. Much more effort is needed to quickly provide information to workers, employing key principles from health education and risk communication, in languages understood by the workers.
- Consider the value of OSHA's Hazwoper Standard: OSHA's Hazardous Waste Operations and Emergency Response Standard (29CFR1910.120) was assiduously avoided at WTC, presumably because its requirements seemed too onerous and there was the misapprehension that Manhattan would have to be declared a Superfund site. Hazwoper is arguably the most proactive OSHA standard, with a set of requirements that are applicable to terrorist actions. The standard requires decontamination procedures to be followed by all workers. At Ground Zero, many site workers saw it as optional. The standard also requires medical surveillance of workers. Many months have passed and this activity has not been carried out for many workers who toiled at Ground Zero, including the heavy equipment operators. Most importantly, hundreds of thousands of workers have received training under the Hazwoper standard and know how to follow the requirements. These workers represent a major untapped reservoir in our war against terrorists.

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