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Workers' Memorial Day, April 28, 2004

On April 28, Workers' Memorial Day, the United States will join the international labor community in remembering those workers who have died or been injured on the job. On an average day in the United States, as a result of work-related injuries or illnesses, nearly 11,000 workers are treated in emergency departments, and approximately 200 of these workers are hospitalized (*1*). An estimated 7,000 private-sector workers require time away from their jobs (*2*), 15 workers die from their injuries (*3*), and 134 die from work-related diseases (*4*). The emotional, economic, and social costs of these injuries and illnesses are immense. In 2001, workers' compensation costs for employers alone totaled $64 billion (*5*).

Workers' Memorial Day also will commemorate the 33rd anniversary of the signing of the U.S. Occupational Safety and Health Act, which created the National Institute for Occupational Safety and Health within CDC and the Occupational Safety and Health Administration within the U.S. Department of Labor to lead the effort to create safer workplaces. Additional information about workplace safety is available at http://www.cdc.gov/niosh/homepage.html or telephone, 800-356-4674.

References

1. CDC. Work-Related Injury Statistics Query System. Available at http://www2a.cdc.gov/risqs.
2. Bureau of Labor Statistics. Workplace injuries and illnesses in 2002. Available at http://www.bls.gov/news.release/pdf/osh.pdf.
3. Bureau of Labor Statistics. National census of fatal occupational injuries in 2002. Available at http://www.bls.gov/news.release/pdf/cfoi.pdf.
4. Steenland K, Burnett C, Lalich N, Ward E, Hurrel J. Dying for work: the magnitude of US mortality from selected causes of death associated with occupation. Am J Ind Med 2003;43:461–82.
5. National Academy of Social Insurance. Workers' Compensation: Benefits, Coverages, and Costs, 2001. Available at http://www.nasi.org/usr_doc/workers_comp_report_2001_final.pdf.

Occupational Fatalities During Trenching and Excavation Work — United States, 1992–2001

Fatalities associated with trench collapses and other excavation hazards continue to occur despite Occupational Safety and Health Administration (OSHA) standards that specify safe work practices to reduce such hazards to workers (*1*). To assess the hazards of trenching and excavation work in the United States, CDC reviewed data from national occupational fatality records and investigative reports of fatal injuries. This report summarizes the results of that analysis, which indicated that 76% of the deaths were caused by cave-ins and 47% of the deaths occurred among employees of companies with ≤10 workers. Employers can reduce the risk for future deaths by adhering to OSHA standards and by using education and training resources on safe excavation and trenching practices offered by the National Institute for Occupational Safety and Health (NIOSH), OSHA, and labor and trade organizations.

CDC reviewed data for 1992–2001 (the most recent data available to CDC) from the Census of Fatal Occupational Injuries (CFOI) maintained by the Bureau of Labor Statistics (BLS) and reviewed reports from the NIOSH Fatality

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Assessment and Control Evaluation (FACE) program. CFOI is a national reporting system for occupational deaths that derives data from multiple sources (e.g., death certificates, medical examiner/coroner reports, workers' compensation reports, and police reports). The CFOI research file provided to CDC does not include data for New York City (*2*). Trenching and excavation cases were identified in the CFOI database by using specific codes and keywords*. After the initial case selection, a manual review of narratives was performed to select appropriate cases.

Trenching and Excavation Fatalities, 1992–2001

During 1992–2001, CFOI data identified 542 fatalities associated with trenching and excavation (*2*). Annual totals ranged from a low of 44 in 1993 to a high of 65 in 1996 and averaging 54 fatalities per year. The average age of decedents was approximately 38 years (range: mid teens to late 70s). Of the fatalities, 256 (47%) occurred among employees of companies with ≤10 workers, and 381 (70%) occurred in companies with <50 workers. The industries most frequently reporting fatalities were those involved in "excavation work," followed by "water, sewer, pipeline, and communications and power-line construction" (Table 1). A total of 507 (94%) decedents were employed in private industry, 31 (5%) decedents were local government workers, and the remaining four (1%) were employed elsewhere. Although excavation and trenching fatalities occurred in various occupations (Table 2), the largest proportion of deaths occurred among construction laborers. Cave-ins accounted for 76% of fatalities (Table 3). Among decedents, the average length of employment with their employer was 6.7 years (range: <1–40 years); 86 (16%) deceased workers had been with their employer for ≤1 year.

FACE Investigation Reports

Researchers with the FACE program target specific areas and conduct onsite investigations of certain fatalities to characterize the circumstances that resulted in death and to identify prevention strategies (*3*). Reports of FACE investigations, which provide more detailed information than CFOI, were examined for 1990–2000. During that period, 30 incidents with 31 fatalities related to trenching and excavation were

* Cases were selected for initial review if the fatal event was coded as an excavation or trenching cave-in (Occupational Injury and Illness Classification System [OIICS] event code 041); inhalation in enclosed, restricted, or confined space (OIICS event code 3411); depletion of oxygen from cave-in or collapsed material (OIICS event code 383); depletion of oxygen in other enclosed, restricted, or confined space (OIICS event code 384); the worker was employed in the Standard Industrial Classification (SIC) code 1794 (Excavation Work); or if the case narrative contained one or more of the following keywords: "trench," "excav," "shaft," "ditch," or "tunnel."

TABLE 1. Number and percentage of excavation and trenching fatalities, by industry and SIC* code — United States, 1992–2001

Industry and SIC code	No.	(%)
Excavation work (SIC 1794)	141	(26.0)
Water, sewer, pipeline, and communications and power-line construction (SIC 1623)	131	(24.2)
Plumbing, heating, and air conditioning (SIC 1711)	59	(10.9)
Heavy construction, not elsewhere classified (SIC 1629)	27	(5.0)
General contractors, single-family homes (SIC 1521)	19	(3.5)
Highway and street construction, except elevated highways (SIC 1611)	16	(2.9)
General construction — nonresidential buildings, other than industrial buildings warehouses (SIC 1542)	14	(2.6)
All other industries	135	(24.9)
Total	**542**	**(100.0)**

Source: Census of Fatal Occupational Injuries (excludes New York City).
* Standard Industrial Classification.

TABLE 2. Number and percentage of excavation and trenching fatalities, by occupation — United States, 1992–2001

Occupation	No.	(%)
Construction laborers	236	(43.5)
Plumbers/pipe fitters	42	(7.8)
Excavation machine operators	38	(7.0)
Construction trades, not elsewhere classified	33	(6.1)
Construction supervisors, not elsewhere classified	27	(5.0)
All other occupations	166	(30.6)
Total	**542**	**(100.0)**

Source: Census of Fatal Occupational Injuries (excludes New York City).

TABLE 3. Number and percentage of excavation and trenching fatalities, by event — United States, 1992–2001

Event (OIICS* code)	No.	(%)
Excavation/trenching cave-in (041)	411	(75.8)
Struck by object (02)	35	(6.5)
Pedestrian struck by vehicle/equipment (43)	19	(3.5)
Caught in or compressed by equipment/objects (03)	14	(2.6)
All other events	63	(11.6)
Total	**542**	**(100.0)**

Source: Census of Fatal Occupational Injuries (excludes New York City).
* Occupational Injury and Illness Classification System.

identified among incidents investigated by the FACE program. Although the FACE program is not targeting trenching and excavation fatalities, two recent cases (for which Hispanic workers were targeted) were selected as examples.

Case 1. In January 2003, two Hispanic construction laborers (brothers aged 15 and 16 years), who were employed by a company with 65 employees, died when the trench in which they were working caved in (*4*). The laborers were installing conduit in a trench 8 feet deep and 2 feet wide. When work started, the jobsite foreman instructed the crew leader to operate a backhoe to dig the trench and then left the site to check on another job. Approximately 1 hour later, the trench collapsed, burying the two laborers. Co-workers uncovered the two workers and removed them from the trench as the rescue squad arrived. The workers could not be revived. The FACE investigation indicated an absence of protective equipment or precautions (e.g., no trench box, benching, sloping, or shoring) that could have prevented the collapse of the trench.

Case 2. In May 2003, a Hispanic male pipe layer aged 23 years died after being struck by the teeth of an excavator bucket while in a trench (*5*). The pipe layer, who worked for a company with 95 employees, was installing concrete water drainage piping along a roadway. The work process involved the excavator operator cutting a trench and lowering in a new section of pipe, while the pipe layer was in the trench connecting the pipe sections and working around the moving excavator bucket. In this operation, the walls of the trench reportedly were sloped back or benched to prevent cave-ins. A "spotter" designated to ensure that workers remained out of the way of the moving excavator and its bucket had been assigned temporarily to another task at the time of the incident. The operator was reversing the excavator to make a new soil cut when the pipe layer was struck by the bucket at the right-side chest and neck area, causing fatal injuries.

Reported by: *T Lentz, D Votaw, H Ahlers, Education and Information Div; K Hendricks, S Pratt, Div of Safety Research; P Coleman, Spokane Research Laboratory; M Gillen, R Ehrenberg, Office of the Director, National Institute for Occupational Safety and Health, CDC.*

Editorial Note: Although previous trend analysis indicated the rate of fatalities from trench collapses declined by 66% from approximately 5 years before to approximately 5 years after OSHA excavation standards were revised in 1989 (*6*), fatalities continue to occur during excavation and trench work. OSHA's standards for excavation are comprehensive and effective; key elements of the regulations can reduce the risk for trench collapse and associated injuries and deaths (Box).

The findings in this report are subject to at least two limitations. First, because narrative descriptions provided by CFOI are limited and data from New York City are excluded, the

BOX. Key elements of Occupational Safety and Health Administration excavation standards

- Designate a competent person to conduct daily inspections of excavations, adjacent areas, and protective systems, and take appropriate measures necessary to protect workers.
- Use adequate protective systems (e.g., shoring, shields, or trench boxes) or sloping or benching of the sides of excavations to protect workers from cave-ins (Figure).
- Develop, implement, and enforce a comprehensive written safety program for all workers that includes training in hazard recognition and avoiding unsafe conditions.
- Ensure that the spoil pile and heavy equipment are kept away from the edge of the trench or excavation if workers must be present in the trench.

FIGURE. This properly installed support system for trench work includes a shoring system with crossbracing and vertical plates extending at least 18 inches above the lip of the trench

Photo/CDC

cases identified by using CFOI data likely are undercounted. Second, because no employment data were available regarding the number of workers involved in excavation and trenching, meaningful fatality rates could not be calculated for this work setting.

To reduce the risk for fatalities associated with trenching and excavation, OSHA standards should be followed, and safety interventions should be directed toward companies and workers who perform such work. NIOSH, in partnership with OSHA, labor and trade organizations, insurers, and underground utility contractors, is developing education and training options on safe excavation and trenching practices. These resources will include a computer-based (CD-ROM) safety and health training module; a NIOSH Alert (in English and Spanish) characterizing excavation hazards and providing recommendations for engineering controls, training, and safe work practices; and a clearinghouse of resources (e.g., "toolbox talks," safety checklists, and training videos) describing excavation hazards and how to prevent them. Additional Spanish-language materials also will be available for Spanish-speaking workers, who are a growing percentage of the U.S. workforce.

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References

1. U.S. Department of Labor, Occupational Safety and Health Administration. 29 CFR Part 1926 (subpart P), Sections 650–2. Excavations.
2. National Institute for Occupational Safety and Health. NIOSH analyses of the Bureau of Labor Statistics' Census of Fatal Occupational Injuries special research file. Morgantown, West Virginia: U.S. Department of Health and Human Services, CDC, National Institute for Occupational Safety and Health, 2004.
3. National Institute for Occupational Safety and Health. Comments of the National Institute for Occupational Safety and Health on the Occupational Safety and Health Administration Regulatory Flexibility Act Review of the Excavations Standard. Cincinnati, Ohio: U.S. Department of Health and Human Services, CDC, National Institute for Occupational Safety and Health, 2002.
4. National Institute for Occupational Safety and Health. Two Hispanic construction laborers (ages fifteen and sixteen) die after trench collapse—South Carolina. Morgantown, West Virginia: U.S. Department of Health and Human Services, CDC, National Institute for Occupational Safety and Health, 2003. (Fatality Assessment and Control Evaluation program report 2003-07).
5. National Institute for Occupational Safety and Health. Hispanic pipe layer dies after being struck by excavator (track hoe) bucket on construction site—South Carolina. Morgantown, West Virginia: U.S. Department of Health and Human Services, CDC, National Institute for Occupational Safety and Health, 2003. (Fatality Assessment and Control Evaluation program report 2003-12).
6. Suruda A, Whitaker B, Bloswick D, Phillips P, Sesek R. Impact of the OSHA trench and excavation standard on fatal injury in the construction industry. J Occup Environ Med 2002:44:902–5.

Carbon Monoxide Poisonings Resulting from Open Air Exposures to Operating Motorboats — Lake Havasu City, Arizona, 2003

During February 1997–August 2002, two fatal and six nonfatal cases of carbon monoxide (CO) poisoning occurred in vacationers who were wading in or boating near the Bridgewater Channel of Lake Havasu (Lake Havasu City [LHC], Arizona) (*1*). The vacationers were near operating motorboats, primarily in the channel area, where large numbers of boaters congregate during holiday weekends (Figure). One person had a carboxyhemoglobin (%COHb) level of 40% on autopsy. To evaluate CO exposure among municipal employees working in the channel, CDC and the Havasu Regional Medical Center Emergency Department (HRMCED) conducted an initial investigation during Labor Day weekend 2002 (August 31–September 1). CO concentrations in channel air exceeded all short-term exposure criteria*; four of 12 patients reporting to HRMCED because of

*The National Institute for Occupational Safety and Health (NIOSH) ceiling limit for CO exposure is 200 parts per million (ppm), which should not be exceeded at any time. The American Conference of Governmental Industrial Hygienists (ACGIH) excursion limit for CO is 125 ppm (or five times the threshold limit value time-weighted average [TLV-TWA]), which should not be exceeded under any circumstances. The Environmental Protection Agency National Ambient Air Quality Standard for 1-hour CO exposure is 35 ppm.