

Fatal Work Injuries in Construction in Texas, 1991-93

Construction laborers have a higher incidence of fatalities than other construction occupations

Scott Richardson and Rene' Reyes

In Texas, construction workers face a higher risk of dying on the job than workers in the State's other industries. Between 1991 and 1993, the construction industry in Texas averaged one fatal work injury every 4 days.¹ Construction fatalities represented 17 percent of all fatal work injuries over the period studied, even though construction workers accounted for only 5 percent of the employed workforce.² In fact, there were more fatal work injuries in construction than in any other major industry division in the State over the 3-year period.

Historically, construction fatality rates have been higher in Texas than the Nation as a whole. A National Institute for Occupational Safety and Health (NIOSH) study of fatal occupational injuries that occurred from 1980-89 showed that while nationally construction fatality rates declined during the 1980s, the rates for Texas did not,³ and even increased during the last 2 years of the decade.⁴

More recent results from the Census of Fatal Occupational Injuries (CFOI) appear to confirm these trends. In 1992, the Bureau of Labor Statistics (BLS) reported that the fatal work injury rate for construction in Texas was 21 fatal work injuries per 100,000 construction workers—a

rate 50 percent higher than the national rate.⁵ In 1993, Texas' rate dropped to 18 fatal work injuries per 100,000 workers, but still remained well above the national rate of 14 per 100,000.

This article looks at the characteristics of both the incidents and the victims of fatal work injuries in construction in Texas for the years 1991 through 1993.

Profile of selected characteristics

Event or exposure. Event or exposure describes the manner in which the injury was produced or inflicted. (See tables 1 and 2.) Falls were the leading manner of traumatic workplace death in construction over the 3-year period (77 fatalities or 28 percent of the total). Transportation incidents accounted for 65 (24 percent) construction fatalities, including 26 (9 percent) involving highway incidents, and another 26 resulting from workers being struck by vehicles. Electrocutions resulted in 57 fatalities or 21 percent of the fatality total. Another 22 workers (8 percent) died as the result of being struck by an object; 19 of the 22 involved workers struck by falling objects. Eleven workers were caught in or crushed by collapsing materials (primarily collapsing structures).

While 26 of the 65 fatal work injuries involving transportation incidents occurred on the highway, the remainder involved nonhighway and pedestrian events. Seven of the 10 workers involved in nonhighway accidents fell from and were struck by a vehicle. Of the 26 workers struck by vehicles, 8 were pedestrians in the roadway.

Of the 57 electrocutions recorded over this period, 10 involved overhead power lines, 7 resulted from contact with the electric current of a machine, tool, appliance or light fixture, and 6 occurred after contact with wiring, transformers, or other components.

Source of injury. The source of injury identifies the object, substance, bodily motion, or exposure which directly produced or inflicted the injury. Surfaces (floors, walkways,

¹ The data presented in this study were gathered through the Census of Fatal Occupational Injuries (CFOI) program, a cooperative program sponsored by the U.S. Department of Labor, Bureau of Labor Statistics and participating State agencies. The CFOI collects data on all fatal occupational injuries, including those involving private wage and salary workers, the self-employed, and government employees. Fatal workplace injuries are substantiated by two independent sources before being included in the CFOI total. See Guy Toscano and Janice Windau, "Further Testing of a Census Approach to Compiling Data on Fatal Work Injuries," *Monthly Labor Review*, October 1991, pp. 33-36. All fatal workplace injuries in construction that occurred in Texas in 1991, 1992, and 1993 are included in the data presented here with the exception of five fatalities that were excluded because the injury occurred before 1991 or because bodily conditions unrelated to the injury may have been a factor.

² Bureau of Labor Statistics, U.S. Department of Labor, *Geographic Profile of Employment and Unemployment, 1991*, (Bulletin 2410), 1992 (Bulletin 2428), and 1993 (Bulletin 2446).

³ NIOSH, National Traumatic Occupational Fatality Surveillance System.

⁴ University of Houston, Health Law and Policy Institute, *Occupational Injury and Illness in Texas*, Report to the Texas Legislature, March 1993, p. 72.

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⁵ The fatality rates represent the number of fatal work injuries per 100,000 employed and were calculated as: $(N/W) \times 100,000$ where N = the total number of fatal work injuries, and W = total employment, based on the Bureau of Labor Statistics, Current Population Survey. "N" was adjusted to maintain consistency with employment coverage (W) in the rate calculations.

ground) were the source of injury in the highest number of fatalities (66 or 24 percent) due to the high number of falls. Highway vehicles were the source of injury in 49 fatalities (18 percent); machine, tool, and electric parts accounted for another 35 fatalities (13 percent). Most of the fatal work injuries associated with machine, tool, and electric parts involved power lines, transformers, and converters (20 of the 35 fatal work injuries in that category). The two main sources of injury under “machinery” were road grading and surfacing machinery and cranes, each accounting for seven fatal work injuries. (See table 3.)

Industry. Under the Standard Industrial Classification (SIC) system,⁶ there are three major groups within the construction industry: Building construction (SIC 15), heavy construction other than building construction (SIC 16), and special trade contractors (SIC 17). Of these groups, special trade contractors had the largest number of fatal work injuries (152 or 55 percent of the total). Heavy construction had 92 fatalities, or 33 percent; building construction recorded 32 fatal work injuries, or 12 percent of the total. Falls comprised the highest percentage of fatal events among both special trade contractors (36 percent) and building construction industries (44 percent). In heavy construction, which includes highway and street construction, transportation incidents accounted for the highest percentage of fatal work injuries (38 percent). The specific industries with the highest number of fatal occupational injuries are presented in table 4.

Occupation and employee status. The combined total for two occupational divisions—the precision production, craft, and repair division (which includes construction trades) and the operators, fabricators, and laborers division—accounted for more than 9 out of 10 fatal work injuries in construction over the 3-year period. The highest number of fatalities in construction were recorded by the following occupational groups: Construction trades (111 fatalities); handlers, equipment cleaners, helpers, and laborers (83 fatalities); and transportation and material moving occupations (29 fatalities). Ten percent of the fatally injured workers were self-employed. (See table 5.)

Falls accounted for 41 percent of the fatal work injuries in the construction trade occupations. Most of the fatal injury events involving handlers, equipment cleaners, helpers, and laborers were divided nearly evenly between exposure to harmful substances or environments (28 percent), transportation incidents (27 percent), and falls (25 percent). Transportation incidents accounted for 3 out of 5 fatal work injuries among transportation and material movers.

Falls were the leading manner of fatal work injury for construction laborers (20 fatalities), roofers (13), supervisors (7), carpenters (6), structural metal workers (5), and

welders and cutters (3). Electrocution was the leading manner of fatal injury for electricians (10 fatalities). Fatal work injuries among painters in construction were divided between electrocutions and falls; each of which accounted for 3 fatalities. The most frequent fatal injury events for truck drivers were highway incidents at 4. For grader, dozer and scraper operators, it was falling from and being struck by vehicles (2).

Construction laborers (in the operators, fabricators, and laborers occupational division) were involved in 1 of every 4 fatal work injuries over the 3-year period—more than four times the number for the occupation with the next highest total. Some differences were observed when the percent distribution of fatal events for laborers was compared to the distribution for all other construction occupations. Laborers had a higher percentage of fatalities from:

- Being struck by falling objects (13 percent versus 6 percent for all other construction occupations);
- Being struck by vehicles (15 percent versus 7 percent);
- Exposure to temperature extremes (7 percent versus 1 percent);
- Exposure to oxygen deficient environments (4 percent versus 1 percent).

Time of day and day of week. The time of injury is known in 231 of the 276 cases. Of those, more than 1 in 4 (62 of the 231 cases) occurred toward the end of the construction worker’s day between 1:00 p.m. and 2:59 p.m. The 2-hour period between 10:00 a.m. and 11:59 a.m. experienced the second highest total (53 fatal work injuries). Mondays, Tuesdays, and Thursdays recorded the most fatal work injuries with about 50 each.

Demographic profile. Of the 276 construction workers who died on the job between 1991 and 1993, all but 2 were male. (See table 6.) White workers accounted for 93 percent of the fatalities. Hispanic workers accounted for over 40 percent of the fatalities in construction, somewhat above their one-third share of all construction workers.⁷

Over 70 percent of the fatalities involved workers between 25 and 54 years of age; another 18 percent of the workers were under 25 years of age. Some differences between the types of events suffered by younger and older workers were observed. For example, younger workers (16 to 44 years of age) had a higher percentage of fatalities resulting from exposure to harmful substances or environments (e.g., electrocutions) than workers 45 years of age and over (32 percent versus 12 percent, respectively). But, older workers had a higher percentage of fatal falls than younger workers (38 percent versus 25 percent, respectively).

⁶ Industries in this article are defined according to the *Standard Industrial Classification Manual*, 1987 edition, issued by the U.S. Office of Management and Budget.

⁷ Hispanic workers can be of any race and are counted separately in the totals for race.

Hispanic workers in construction. Nearly 7 out of 10 of the 75 construction laborers who died on the job during the 3-year period were Hispanic. Hispanic workers also suffered 37 percent of the fatal injuries in the construction trade occupations and 31 percent of the fatal injuries in the transportation and material moving occupations.

Available employment data indicate that the percentage of fatalities involving Hispanic construction workers is higher than their share of employment.⁸ In 1991, for example, Hispanic workers comprised about 40 percent of the employed workforce in the handlers, equipment cleaners, and laborers occupational group, but were involved in over 60 percent of the fatalities reported for that group. (Construction fatalities accounted for over 50 percent of the fatalities recorded for that occupational group in 1991.) Overall, Hispanic workers accounted for about 34 percent of the employed workforce in construction in 1991 but were involved in 41 percent of the fatal work injuries.

It is clear that at least some of the fatal work injuries involve undocumented workers or those with false documentation. The exact number of such situations is unknown. However, a study of fatal work injuries involving excavation cave-ins from 1976-1985 found that 32 of the 93 fatalities (or 34 percent) involved workers who were not U.S. citizens.⁹

Table 7 lists the construction occupations and industries recording the most fatal work injuries from 1991 through 1993 by number and percentage of Hispanic workers.

⁸Employment data for most of the specific populations and time periods explored in this study were not available. The employment data cited in this section are unpublished data from the 1991 Current Population Survey conducted by the Bureau of Labor Statistics.

Conclusion

While recent efforts by the Occupational Safety and Health Administration (OSHA) to strengthen safety standards in construction should improve safety in some areas (fall protection and scaffolding standards are two that were recently revised), other preventable accidents also deserve the attention of safety professionals. For example, workers who were struck by vehicles (as pedestrians) ranked behind only falls to lower levels and electrocutions as the leading manner of traumatic workplace death on the State's construction sites. In addition, due to the large number of Hispanics working in construction in Texas, safety professionals and employers should provide training, instructions, and written materials in Spanish as needed.

In response to these and other data, the Texas Workers' Compensation Commission has developed several publications and training programs for employers and employees in Texas, including an accident prevention plan and safety inspection checklist for construction; training programs and publications on fall protection, scaffolding safety, hand and power tool safety, personal protective equipment, and control of hazardous energy in addition to the 10- and 30-hour construction standards courses. Most programs are free or involve only nominal charges. All of them will be available in Spanish in the near future.

⁹See P. Honchar and L. Suarez, "Excavation Cave-In Fatalities—Texas, 1976-1985," *Morbidity and Mortality Weekly Report*, 1986; vol. 35, pp. 313-14. Further study of undocumented workers and workers who live out of State could explain, in part, the relatively high fatality rates in Texas. The employment figures used in the denominator to calculate rates are based on the State where the worker resides. The fatality figures are based on the State where the incident occurred. The rate calculation would, therefore, be affected if a State had a large number of workers who resided in another State or country or who were missed in employment counts because of their legal status.

Table 1. Fatal occupational injuries in construction by event, Texas, 1991-93

| Event or exposure | Number | Percent |
|---|--------|---------|
| Total fatalities | 276 | 100 |
| Falls | 77 | 28 |
| To lower level | 74 | 27 |
| From roof | 27 | 10 |
| From scaffolding | 15 | 5 |
| Exposure to harmful substances or environments | 74 | 27 |
| Contact with electric current | 57 | 21 |
| With overhead power lines | 10 | 4 |
| With machine, tool, appliance, or light fixture | 7 | 3 |
| With wiring, transformers, other components | 6 | 2 |
| Contact with temperature extremes | 7 | 3 |
| Exposure to environmental heat | 5 | 2 |
| Caustic, noxious, or allergenic substances | 6 | 2 |
| Oxygen deficiency, n.e.c. | 4 | 1 |
| Transportation incidents | 65 | 24 |
| Pedestrian, nonpassenger struck by vehicle | 26 | 9 |
| Struck by vehicle, mobile equipment in roadway | 8 | 3 |
| Highway incident | 26 | 9 |
| Collision between vehicles, mobile equipment | 12 | 4 |
| Nonhighway accident, except rail, air, water | 10 | 4 |
| Fell from, struck by vehicle, mobile equipment | 7 | 3 |
| Contact with objects and equipment | 41 | 15 |
| Struck by object | 22 | 8 |
| Struck by falling object | 18 | 7 |
| Caught in or crushed in collapsing materials | 11 | 4 |
| Caught in or crushed in collapsing structure | 6 | 2 |
| Caught in or compressed by equipment or objects | 8 | 3 |
| Fires and explosions | 10 | 4 |
| Explosion | 5 | 2 |
| Fire—unintended or uncontrolled | 5 | 2 |
| Assaults and violent acts | 8 | 3 |
| Assaults and violent acts by persons | 6 | 2 |
| Other or nonclassifiable | 1 | (1) |

¹ Less than 0.5 percent.

n.e.c. = not elsewhere classified

NOTE: Events are coded according to the 1992 BLS Occupational Injury and Illness Classification Structures. Division totals may include data for specific event cat-

egories not shown separately. Percentages may not add to total due to rounding.

SOURCE: Texas Workers' Compensation Commission, Census of Fatal Occupational Injuries, 1991-93.

Table 2. Fatal occupational injuries in construction involving falls, Texas, 1991-93

| Type of fall | Number | Percent |
|---|--------|---------|
| Total falls | 77 | 100 |
| Fall from roof | 27 | 35 |
| Fall from roof, unspecified | 13 | 17 |
| Fall through roof surface | 5 | 6 |
| Fall from roof edge | 5 | 6 |
| Fall through skylight | 3 | 4 |
| Fall from scaffold | 15 | 19 |
| Fall from building girders or other structural steel | 8 | 10 |
| Fall from ladder | 6 | 8 |
| Fall from floor, dock, or ground level | 5 | 6 |
| Fall from nonmoving vehicle | 4 | 5 |
| Other or nonclassifiable | 12 | 16 |

n.e.c. = not elsewhere classified

NOTE: Events are coded according to the 1992 BLS Occupational Injury and Illness Classification Structures. Totals may include data for specific event categories not shown separately. Percentages may not add to total due to rounding.

SOURCE: Texas Workers' Compensation Commission, Census of Fatal Occupational Injuries, 1991-93.

Table 3. Fatal occupational injuries in construction by source of injury, Texas, 1991-93

| Source of injury | Number | Percent |
|---|--------|---------|
| Total fatalities | 276 | 100 |
| Structures and surfaces | 82 | 30 |
| Floors, walkways, ground | 66 | 24 |
| Other structural elements | 7 | 3 |
| Structures | 5 | 2 |
| Vehicles | 57 | 21 |
| Highway vehicle, motorized | 49 | 18 |
| Truck | 30 | 11 |
| Pickup truck | 8 | 3 |
| Semitrailer, tractor trailer, trailer truck | 6 | 2 |
| Plant and industrial vehicles, tractors | 4 | 1 |
| Parts and materials | 55 | 20 |
| Machine, tool, and electric parts | 35 | 13 |
| Power lines, transformers, converters | 20 | 7 |
| Building materials—solid elements | 15 | 5 |
| Structural stones or slabs, n.e.c. | 6 | 2 |
| Concrete blocks, cinder blocks | 5 | 2 |
| Fasteners, connectors, ropes, ties | 3 | 1 |
| Machinery | 33 | 12 |
| Construction, logging, and mining | 15 | 5 |
| Road grading and surfacing | 7 | 3 |
| Material handling | 10 | 4 |
| Cranes | 7 | 3 |
| Heating, cooling, and cleaning | 3 | 1 |
| Persons, plants, animals and minerals | 8 | 3 |
| Nonmetallic minerals, except fuel | 5 | 2 |
| Chemicals and chemical products | 6 | 2 |
| Containers | 5 | 2 |
| Tools, instruments, and equipment | 5 | 2 |
| Hand tools—powered | 3 | 1 |
| Other sources | 23 | 8 |
| Atmospheric and environmental conditions | 14 | 5 |
| Fire, flame, smoke | 6 | 2 |
| Ammunition | 5 | 2 |
| Steam, vapors, liquids, n.e.c. | 3 | 1 |
| Nonclassifiable or unknown | 2 | 1 |

n.e.c. = not elsewhere classified

specific source categories not shown separately. Percentages may not add to total due to rounding.

NOTE: Sources of injury are coded according to the 1992 BLS Occupational Injury and Illness Classification Structures. Division totals may include data for

SOURCE: Texas Workers' Compensation Commission, Census of Fatal Occupational Injuries, 1991-93.

Table 4. Construction industries with 10 or more fatal work injuries, Texas, 1991-93

| Industry | Total fatalities | Most frequent fatal events | Number |
|--|------------------|---|--------|
| | | Type | |
| Highway and street construction (SIC 1611) | 35 | Pedestrian struck by vehicle | 13 |
| Roofing, siding, and sheet metal work (SIC 1761) | 30 | Fall to lower level | 22 |
| Electrical work (SIC 1731) | 26 | Contact with electric current | 15 |
| Water, sewer, and utility line construction (SIC 1623) | 23 | Fall to lower level; contact with electric current | 5 5 |
| Special trade contractors, n.e.c. (SIC 1799) | 20 | Contact with electric current | 7 |
| Heavy construction, n.e.c. (SIC 1629) | 19 | Struck by object; fall to lower level | 3 3 |
| Bridge, tunnel, and elevated highway construction (SIC 1622) | 13 | Contact with electric current | 4 |
| Carpentry work (SIC 1751) | 11 | Fall to lower level | 5 |
| Plumbing, heating, air conditioning (SIC 1711) | 11 | Contact with electric current | 6 |
| General contractors—single family houses (SIC 1521) | 10 | Fall to lower level | 4 |

n.e.c. = not elsewhere classified

SOURCE: Texas Workers' Compensation Commission, Census of Fatal Occupational Injuries, 1991-93.

NOTE: Industries are coded according to the *Standard Industrial Classification Manual*, 1987 edition.

Table 5. Fatal occupational injuries in construction by occupation and employee status, Texas, 1991-93

| Worker characteristic | Number | Percent |
|---|--------|---------|
| Total fatalities | 276 | 100 |
| Occupation | | |
| Precision production, craft, and repair | 129 | 47 |
| Construction trades | 111 | 40 |
| Electricians | 18 | 7 |
| Roofers | 18 | 7 |
| Supervisors, n.e.c. | 17 | 6 |
| Carpenters | 16 | 6 |
| Plumbers, pipefitters, steamfitters | 9 | 3 |
| Painters | 6 | 2 |
| Structural metal workers | 6 | 2 |
| Mechanics and repairers | 12 | 4 |
| Precision production | 4 | 1 |
| Operators, fabricators, and laborers | 125 | 45 |
| Handlers, equipment cleaners, helpers, and laborers | 83 | 30 |
| Construction laborers | 75 | 27 |
| Helpers, construction trades | 4 | 1 |
| Transportation and material moving | 29 | 11 |
| Truck drivers | 10 | 4 |
| Operating engineers | 8 | 3 |
| Grading, dozer, scraper operators | 5 | 2 |
| Fabricators, assemblers, and handworkers | 11 | 4 |
| Welders and cutters | 11 | 4 |
| Managerial and professional specialty occupations | 9 | 3 |
| Technical, sales, and administrative support | 8 | 3 |
| Other or not reported | 5 | 2 |
| Employee status | | |
| Wage and salary | 245 | 89 |
| Self-employed | 28 | 10 |
| Other or unknown | 3 | 1 |

n.e.c. = not elsewhere classified

rately. Percentages may not add to total due to rounding.

NOTE: Occupations are coded according to the 1990 Census Occupational Classification System, developed by the Bureau of the Census. Division totals may include data for specific occupational categories not shown sepa-

SOURCE: Texas Workers' Compensation Commission, Census of Fatal Occupational Injuries, 1991-93.

Table 6. Fatal occupational injuries in construction by demographic profile, Texas, 1991-93

| Worker characteristic | Number | Percent |
|------------------------|--------|---------|
| Total fatalities | 276 | 100 |
| Sex | | |
| Male | 274 | 99 |
| Female | 2 | 1 |
| Race | | |
| White | 256 | 93 |
| Black | 15 | 5 |
| Other | 2 | 1 |
| Not reported | 3 | 1 |
| Hispanic origin | | |
| Hispanic | 113 | 41 |
| Age | | |
| 16-19 | 10 | 4 |
| 20-24 | 38 | 14 |
| 25-34 | 84 | 30 |
| 35-44 | 75 | 27 |
| 45-54 | 36 | 13 |
| 55-64 | 29 | 11 |
| 65 and older | 4 | 1 |

NOTE: Percentages may not add to total due to rounding.

SOURCE: Texas Workers' Compensation Commission, Census of Fatal Occupational Injuries, 1991-93.

Table 7. Occupations and industries in construction with more than 15 fatal work injuries by Hispanic origin, 1991-93

| Worker characteristic | Total fatalities | Hispanic workers | |
|--|------------------|------------------|-----------------------------|
| | | Number | Percent of total fatalities |
| Occupation | | | |
| Construction laborers | 75 | 51 | 68 |
| Roofers | 18 | 11 | 61 |
| Electricians | 18 | 1 | 6 |
| Supervisors, n.e.c. | 17 | 4 | 24 |
| Carpenters | 16 | 8 | 50 |
| Industry | | | |
| Highway and street construction (SIC 1611) | 35 | 15 | 43 |
| Roofing, siding, and sheet metal work (SIC 1761) | 30 | 21 | 70 |
| Electrical work (SIC 1731) | 26 | 3 | 12 |
| Water, sewer, and utility lines (SIC 1623) | 23 | 7 | 30 |
| Special trade contractors, n.e.c (SIC 1799) | 20 | 7 | 35 |
| Heavy construction, n.e.c (SIC 1629) | 19 | 10 | 53 |

n.e.c. = not elsewhere classified

NOTE: Occupations are coded according to the 1990 Census Occupational Classification System, developed by the Bureau of the Census. Division totals may include data for specific occupational categories not shown sepa-

rately. Percentages may not add to total due to rounding. Industries are coded according to the *Standard Industrial Classification Manual*, 1987 edition.

SOURCE: Texas Workers' Compensation Commission, Census of Fatal Occupational Injuries, 1991-93.