Fatal occupational injuries at road construction sites, 2003–07

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During the 5 years from 2003 to 2007, 639 workers were killed at road construction sites, according to data from the Bureau of Labor Statistics Census of Fatal Occupational Injuries (CFOI) program.[1] The majority of these fatal occupational injuries were incurred by workers in the highway, street, and bridge construction industry.[2]

This report is an update of an earlier analysis of fatal occupational injuries at road construction sites from 1995–2002 that was published in the December 2004 issue of the *Monthly Labor Review*.[3] While total fatal occupational injuries declined nearly 10 percent from 1995 to 2007, fatal occupational injuries at road construction sites have increased in number and as a percentage of all fatal occupational injuries. (See table 1.)

There are many ways to define a road construction site. The CFOI program defines road construction sites as including construction, maintenance, or utility work on a road, highway, or street. The 2009 edition of the *Manual on Uniform Traffic Control Devices* from the Federal Highway Administration defines work zones as follows:

> A work zone is an area of a highway with construction, maintenance, or utility work activities. A work zone is typically marked by signs, channelizing devices, barriers, pavement markings, and/or work vehicles. It extends from the first warning sign or high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle to the END ROAD WORK sign or the last TTC [temporary traffic control] device.[4]

The manual also details several elements commonly found at road construction sites, including proper signage, channeling devices such as cones and barricades, buffer spaces and lane tapering to protect workers, and flagger control. It also provides diagrams and procedures for sample work zones based on the type of lane closures required.

This report focuses on the events that resulted in the fatal work injuries at road construction sites as defined by the CFOI program over the 2003–07 period.

Table 1. Fatal occupational injuries at road construction sites by year and percentage of all fatal occupational injuries, 1995–2007

Year	Fatalities	Percentage of all fatalities
1995	94	1.5
1996	93	1.5
1997	94	1.5
1998	113	1.9
1999	124	2.0
2000	106	1.8
2001	118	2.0
2002	102	1.8
2003	110	2.0
2004	119	2.1
2005	165	2.9
2006	139	2.4
2007	106	1.9

Overall

From 2003 to 2007, there were 639 fatal occupational injuries that occurred at road construction sites, which accounted for 2 percent of fatal occupational injuries overall. During these 5 years, the high was in 2005 (165 fatalities) and the low was in 2007 (106 fatalities).

Male workers accounted for over 97 percent of the fatal work injuries at road construction sites, compared with 93 percent for all fatal work injuries and 99 percent for fatal work injuries in the construction industry.[5] Hispanic or Latino workers were slightly more likely to be killed at a road construction site than they were in all fatal workplace injuries.

Just under 17 percent of the workers killed at road construction sites from 2003 to 2007 were born outside of the United States. Almost 80 percent of these foreign-born workers were Hispanic or Latino. Approximately 2 out of every 3 foreign-born workers killed at a road construction site were born in Mexico. Texas had the largest number (31) of fatal occupational injuries incurred by foreign-born workers at road construction sites.

Focus on fatal events

The most common event[6] associated with fatal occupational injuries incurred at a road construction site was *worker struck by vehicle, mobile equipment*. Of the 639 total fatal occupational injuries at road construction sites during the 2003–07 period, 305 were due to a worker being struck by a vehicle or mobile equipment. (See table 2.)

More workers were killed by construction-related vehicles or equip-

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Table 2. Fatal occupational injuries at road construction sites due to workers being struck by vehicles or mobile equipment by type of vehicle or mobile equipment, 2003–07

Vehicle, equipment	Fatalities
All cases	305
Truck	177
Dump	73
Pickup	32
Semi	23
Car	70
Steam roller, road paver	15
Grader, leveler, planer, scraper	9
Van	8
Backhoe	5

ment[7] (38 percent) than by cars, tractor-trailer trucks, and vans (33 percent). This finding was consistent with the 1995–2002 data.

A total of 100 fatally injured workers (33 percent) were employed as construction laborers. Another 37 (12 percent) were employed as highway maintenance workers. First-line construction supervisors and managers accounted for 28 (9 percent) of the fatalities, while crossing guards (including flaggers) accounted for 27 fatalities (9 percent). Some other important characteristics involving this type of fatal work injury are as follows:

- Workers were fatally struck 101 times by a vehicle or mobile equipment that was backing up. In 60 of these cases, the worker was fatally struck by a dump truck that was backing up.
- In the cases in which the worker was struck by a vehicle backing up, there were 25 cases in which the back-up alarm was referenced in the case narrative. In 11 of these cases, the back-up alarm of the vehicle or mobile equipment was not functioning or did not exist. In 14 of these cases, the back-up alarm of the vehicle or mobile equipment was functioning but did not alert the decedent.
- Sixty one workers were killed while directing or flagging traffic.
- Ten workers were killed by drunk drivers.

The next most common event leading to a workplace fatality at a road construction site was a *highway or nonhighway incident*.[8] A total of 153 workers were killed at road construction sites in highway or nonhighway incidents. Of these, 87 (57 percent) were due to a collision. In 42 of these collision cases, the decedent was driving a tractor trailer. In 47 of the cases, the decedent's vehicle struck a tractor trailer. (There were 25 cases in which the decedent's tractor trailer struck another tractor trailer.)

Forty fatal workplace injuries resulted from an overturned vehicle or mobile equipment; the decedent was driving a steam roller or road paver in 15 of these cases. There were 21 cases of a victim falling from a vehicle; the decedent was then struck by the vehicle in 15 of the cases.

Over the 2003–07 period, workers at road construction sites were fatally *struck by a falling object* 34 times. In 8 cases, the object fell from a crane (or the crane itself was the falling object), while 4 cases involved the object falling from a backhoe.

A total of 31 workers died as a result of fatal *falls* at road construction sites. Of these, 24 occurred at bridge/overpass construction sites. In the 23 instances in which the height was known for the fall at a bridge/overpass construction site, the median height of the fall was 50 feet.

Twenty three workers were killed as a result of *contact with electric current* at a road construction site. In total, 21 of these cases involved contact with overhead power lines. In 15 of these cases, a machine or item contacted the power lines and electrocuted the decedent rather than the decedent contacting the power lines directly.

Location and time

Approximately 11 percent of fatal workplace injuries at road construction sites occurred in Texas. Florida, California, Georgia, and Pennsylvania also have a sizable number of fatal occupational injuries that occur at road construction sites. (See table 3.)

In terms of time and date, fatalities at road construction sites tend to be more clustered around the traditional work time and workdays than workplace fatalities in general. For example, approximately 70 percent of road construction site fatalities during the 2003–07 period occurred between the hours of 8:00 a.m. and 4:59 p.m. (See table 4.) The corresponding figure for all workplace fatalities during that time was ap-

Table 3. Fatal occupational injuries at road construction sites by State of incident, 2003–07

State	Percentage of road construction site fatalities	Percentage of all fatalities
Texas	11	9
Florida	7	7
California	5	8
Georgia	5	4
Pennsylvania	5	4
Ohio	4	3
Illinois	4	3
Indiana	4	3
Colorado	3	2
Tennessee	3	3

Table 4. Fatal occupational injuries at road construction sites by time of incident, 2003–07

Time of incident[1]	Percentage of road construction site fatalities	Percentage of all fatalities
12:00 a.m.–12:59 a.m.	2	1
1:00 a.m.–1:59 a.m.	2	2
2:00 a.m.–2:59 a.m.	2	2
3:00 a.m.–3:59 a.m.	2	2
4:00 a.m.–4:59 a.m.	1	2
5:00 a.m.–5:59 a.m.	2	2
6:00 a.m.–6:59 a.m.	2	3
7:00 a.m.–7:59 a.m.	5	4
8:00 a.m.–8:59 a.m.	8	6
9:00 a.m.–9:59 a.m.	8	7
10:00 a.m.–10:59 a.m.	8	8
11:00 a.m.–11:59 a.m.	9	8
12:00 p.m.–12:59 p.m.	6	6
1:00 p.m.–1:59 p.m.	9	8
2:00 p.m.–2:59 p.m.	10	8
3:00 p.m.–3:59 p.m.	8	7
4:00 p.m.–4:59 p.m.	5	6
5:00 p.m.–5:59 p.m.	3	4
6:00 p.m.–6:59 p.m.	2	3
7:00 p.m.–7:59 p.m.	<.5	3
8:00 p.m.–8:59 p.m.	1	2
9:00 p.m.–9:59 p.m.	1	2
10:00 p.m.–10:59 p.m.	1	2
11:00 p.m.–11:59 p.m.	3	2

[1] A total of 11 cases for road construction sites and 1,779 cases overall had an unknown time of incident. Percentages were calculated using the number of cases with known time of incident data.

Table 5. Fatal occupational injuries at road construction sites by day of week, 2003–07

Day of week	Percentage of road construction site fatalities	Percentage of all fatalities
Sunday	3	7
Monday	18	17
Tuesday	18	17
Wednesday	21	17
Thursday	18	17
Friday	18	16
Saturday	5	10

proximately 64 percent. In addition, while almost 93 percent of fatal occupational injuries incurred at road construction sites happened on a weekday, just under 84 percent of all workplace fatalities occurred on a weekday. (See table 5.)

Finally, occupational fatalities at road construction sites are more likely to occur between April and October than are occupational fatalities in general. Workplace fatalities at road construction sites during the April–October corridor account for 73 percent of the total, while all workplace fatalities during the April–October corridor account for 62 percent of the total. In 2007, 65 percent of the hours worked in the highway, street, and bridge construction industry were in the April–October corridor.[9] (See table 6.)

Industry and occupation

Not surprisingly, 500 of those workers fatally injured at road construction sites were working in the construction industry (private and public). Approximately 62 percent of all fatally injured workers were employed in the highway, street, and bridge construction industry. Other notable industries included truck transportation (8 percent), engineering services (2 percent), and utilities (2 percent).

Government workers constituted 14 percent of all fatalities at road construction sites from 2003–07. During that same period, they constituted 9 percent of all workplace fatalities.

Those working in the occupation construction laborers incurred 28 percent of fatal occupational injuries

Table 6. Fatal occupational injuries at road construction sites by month of incident, 2003–07

Month	Percentage of road construction site fatalities	Percentage of all fatalities
January	5	8
February	5	7
March	6	8
April	9	8
May	9	8
June	11	9
July	13	10
August	9	10
September	10	8
October	11	9
November	6	8
December	6	7

at road construction sites from 2003 to 2007.[10] In fact, two-thirds of the workers killed at road construction sites were construction-related workers. (See table 7.)

Conclusion

Fatal occupational injuries at road construction sites accounted for 2 percent of all fatal occupational injuries from 2003 to 2007. Workers at road construction sites were often injured by being struck by a vehicle or mobile equipment. In fact, almost 10 percent of the fatalities resulted from a worker being struck by a dump truck that was backing up. Twenty-five cases involved a worker being struck by a vehicle that did not employ a back-up alarm or whose back-up alarm did not alert the worker. Drunk drivers caused the death of 10 workers in road construction sites during the 5-year period. Several entities have made increasing safety at road construction sites a priority.[11] □

Table 7. Fatal occupational injuries at road construction sites by occupation, 2003–07

Occupation	Fatalities	Most frequent event
Construction laborer	181	Worker struck by vehicle, mobile equipment (100)
Truck drivers, heavy and tractor trailer	76	Highway incident (45)
First-line supervisors/managers of construction trades and extraction workers	52	Worker struck by vehicle, mobile equipment (28)
Operating engineers and other construction equipment operators	51	Nonhighway incident (17)
Highway maintenance workers	41	Worker struck by vehicle, mobile equipment (37)
Paving, surfacing, and tamping equipment operators	35	Worker struck by vehicle, mobile equipment (17)
Crossing guards	28	Worker struck by vehicle, mobile equipment (27)
Construction managers	14	Worker struck by vehicle, mobile equipment (7)

Notes

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[1] All data in this analysis are from the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI). For more information, see the CFOI homepage on the BLS Web site at **http://www.bls.gov/iif/oshcfoi1.htm**. All data in this report are final. A previous analysis (see note 3) found that the location code for road construction was not being assigned uniformly throughout the data set during this period. Starting in 2003, the CFOI program incorporated a more rigorous examination of road construction site cases that included many of the techniques used in the analysis to identify road construction site cases to ensure that the location code is properly assigned. Because of this enhanced review, no additional case identification measures were undertaken for this analysis. There were, however, a few cases in which the coded data were changed after a review of the case narrative.

[2] The 2002 North American Industry Classification System (NAICS), which CFOI used to code its 2003-08 data, defines the highway, street, and bridge construction industry as follows: "This industry comprises establishments primarily engaged in the construction of highways (including elevated), streets, roads, airport runways, public sidewalks, or bridges. The work performed may include new work, reconstruction, rehabilitation, and repairs. Specialty trade contractors are included in this group if they are engaged in activities primarily related to highway, street, and bridge construction (e.g., installing guardrails on highways)." For more information, see the definition for this industry on the 2002 NAICS page of the U.S. Census Bureau Web site at **http://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=237310**.

[3] Stephen Pegula, "Fatal occupational injuries at road construction sites," *Monthly Labor Review*, December 2004, pp. 43–47, on the Internet at **http://www.bls.gov/opub/mlr/2004/12/resum2.pdf.**

[4] For more information, see *Manual on Uniform Traffic Control Devices for Streets and Highways,* 2009 edition (Federal Highway Administration, December 2009), on the Internet at **http://mutcd.fhwa.dot.gov/pdfs/2009/pdf_index.htm** (visited Nov. 12, 2010); see page 552 for cited definition.

[5] This includes both the private and public sector construction industry.

[6] *Event* is defined using the Occupational Injury and Illness Classification System (OIICS). For more information, see the OIICS page on the BLS Web site at **http://www.bls.gov/iif/oshoiics.htm**.

[7] OIICS is also used to classify the source of the fatal occupational injury. Construction-related vehicles are defined as dump trucks (source 8252 in OIICS) and construction, logging, and mining machinery (source category 32*). The construction, logging, and mining machinery category includes backhoes, bulldozers, steam shovels, loaders, scrapers, and pavers.

[8] These events are separate from the *worker struck by vehicle, mobile equipment*, events noted previously in that these events originate with the worker operating the vehicle, mobile equipment, prior to the incident.

[9] Hours data are from the Current Employment Statistics (CES) survey and are not seasonally adjusted. The CES uses the 2007 North American Industry Classification System (NAICS) to classify industries. More information on the CES program can be found on the BLS Web site at **http://www.bls.gov/ces/**.

[10] CFOI defines occupations using the 2000 Standard Occupational Classification (SOC) system. For more information, see the SOC (2000) page on the BLS Web site at **http://www.bls.gov/soc/2000/socguide.htm**.

[11] For more information on safety measures at road construction sites, see Workplace Safety & Health Topics, National Institute of Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention, on the Internet at **http://www.cdc.gov/niosh/topics/highway-workzones/**; also, the National Work Zone Safety Information Clearinghouse, on the Internet at **http://www.workzonesafety.org/** (visited Nov. 12, 2010).