

# **AN ANALYSIS OF FATAL EVENTS IN THE CONSTRUCTION INDUSTRY 2002**

**Prepared for:** Office of Statistics  
Occupational Safety and Health Administration  
U. S. Department of Labor

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**February 2004**



*This report is based upon OSHA-inspected fatal events in construction during calendar 2002. The data analyzed were provided by Dr. Joseph Dubois, Director, Office of Statistics, Occupational Safety and Health Administration. William R. Schriver, Ph.D., Director and Thomas E. Cressler II, M.S., Senior Associate Administrator, conducted the study and prepared this report; they alone are responsible for all interpretations, conclusions and any errors found in the report.*

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## **I. Introduction**

This paper reports on the causes of fatal events in the construction industry which occurred in calendar year 2002. Seven earlier studies<sup>1</sup> by the Construction Industry Research and Policy Center (CIRPC) analyzed the causes of fatal events in this industry in 1991-1992, 1993-1994, 1995, 1996, 1997, 1998, 1999, 2000 and 2001.

## **II. Data**

The data analyzed in this report, provided by OSHA from Form 170's, consist of narrative descriptions of the 719 fatal events inspected by OSHA resulting from accidents which occurred in construction during calendar year 2002. The Occupational Safety and Health Act of 1970 provides States with the option of administering the Act themselves or accepting Federal administration of the Act. Twenty-nine States and the District of Columbia chose administration under the Federal System, and the remaining 21 States and two Territories chose self-administration under State Plans<sup>2</sup>.

In this report, as in earlier reports, analysis includes all OSHA-inspected fatal construction accidents regardless of Federal or State administration.

Also, as in the earlier studies, non-accidental fatalities on construction sites or contractor yards (such as deaths from non-work related heart attacks, strokes, seizures, etc.) and fatalities of construction workers killed off-site in traffic accidents were excluded from the analysis; these fatalities accounted for about 3 percent of OSHA-inspected fatal construction events in 1991-

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<sup>1</sup> An Analysis of Fatal Events in the Construction Industry, 1991-1992 (1993), An Analysis of Fatal Events in the Construction Industry, 1993-1994 (1995), An Analysis of Fatal Events in the Construction Industry, 1995 (1996), An Analysis of Fatal Events in the Construction Industry, 1996 (1997), An Analysis of Fatal Events in the Construction Industry, 1997 (1999), An Analysis of Fatal Events in the Construction Industry, 1998 (2000), An Analysis of Fatal Events in Construction, 1999 (2001), An Analysis of Fatal Events in the Construction Industry, 2000 (2002), and An Analysis of Fatal Events in the Construction Industry, 2001 (2003), Construction Industry Research and Policy Center, University of Tennessee, Knoxville.

<sup>2</sup> States in the Federal System are: AL, AR, CO, CT, DE, DC, FL, GA, ID, IL, KS, LA, ME, MA, MS, MO, MT, NE, NH, NJ, NY, ND, OH, OK, PA, RI, SD, TX, WV and WI. States and Territories under State Plans are: AK, AZ, CA, HI, IN, IA, KY, MD, MI, MN, NV, NM, NC, OR, PR, SC, TN, UT, VT, VI, VA, WA and WY.

2001 but about 6 percent in 2002. Although the Occupational Safety and Health Act of 1970 requires employers to report fatalities to OSHA within eight hours of the occurrence of the event, all fatalities on construction sites are not inspected by OSHA; for example, OSHA does not inspect fatal construction events involving independent contractors with no employees. Therefore, the results reported upon here do not provide a year-to-year analysis of changes in the absolute number of fatal events or individuals killed on construction sites.

Each narrative record typically consists of a brief description of the event leading to the fatality, although this is not always the case. Where the narrative description was omitted, inconclusive or completely unclear the event cause was coded “unknown cause or other”; otherwise each narrative was analyzed and classified into one of 31 cause categories, although a great deal of collective judgment was often required to classify the cause of many of the accidents.

This report also includes the following classification of each fatal event according to coding by the OSHA compliance officer who investigated the accident: (1) type of construction (new or addition, alteration or rehabilitation, maintenance or repair, demolition, other); (2) estimate of total project value (seven dollar-value categories beginning with “under \$50,000” and ending with “\$20,000,000 and over”); (3) 17 end-use categories, such as “single-family housing,” “multi-family building,” “commercial building,” “street or highway,” etc.; and (4) the construction operation being performed that caused the fatal event (selected from a list of construction operations such as “backfilling and compacting,” “cutting concrete pavement,” “erecting structural steel,” “installing equipment (HVAC and other,” etc.). However, CIRPC’s review of over 1200 case files of fatal construction events occurring in 1997, 1998 and 1999 revealed that coded data for an event were sometimes internally inconsistent or did not comport

with corresponding narrative descriptions. Consequently, the data analyzed in this report are restricted to the direct causes of the fatal events where the authors were able, in most cases, to classify the events with relative certainty according to 31 types of causes, essentially the same types as were used in CIRPC's previous fatality studies. However, coded data are included in Appendix C for the following: (1) end-use of structure; (2) type of construction; (3) occupation of the victim(s); (4) contract value of the construction project; and (5) construction operation associated with the fatality.

In classifying the events a rule of primacy was followed for multiple-cause fatalities (representing less than 1 percent of the fatality events in this study and the earlier studies cited): the first cause in the chain of causes was recorded as the cause of the fatal event. Definitions of the causes are shown in Appendix A.

### **III. Analysis**

#### **A. Distribution of Fatal Events by Cause**

Table 1 shows the cause classification system, the number of times each cause represented a fatal event in 2002, the relative frequency of each cause and the number of victims killed.<sup>3</sup> It can be seen that "fall from/through roof" led all other causes in number of fatal events (85 or 11.8 percent of total fatal events), followed by "fall from/with structure" (64 or 8.9 percent). The third leading cause was "crushed/run-over of non-operator by operating construction equipment" (54 or 7.5 percent); the fourth leading cause was "electric shock from equipment installation/tool use" (47 or 6.5 percent); the fifth leading cause was "lifting operations" (45 or 6.3 percent); and the sixth leading cause was "electrocution by equipment contacting wire" (41 or 5.7 percent). The number and relative frequencies of the remaining

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<sup>3</sup> Each event included at least one person killed and in several events additional workers were killed or injured.

**Table 1. Construction Fatality Event Causes, 2002**

<u>Event Causes</u>	<u>Description</u>	<u>Number of Events and Victims</u>		<u>Percent of Events</u>
		<u>Events</u>	<u>Victims</u>	
1.	asphyxiation/inhalation of toxic vapor	14	17	1.9
2.	caught in/struck by stationary equipment	6	6	0.8
3.	crushed from collapse of structure	26	30	3.6
4.	crushed/run-over of non-operator by operating construction equipment	54	54	7.5
5.	crushed/run-over/trapped of operator by operating construction equipment	36	36	5.0
6.	crushed/run-over by construction equipment during maintenance/modification	17	17	2.4
7.	crushed/run-over by highway vehicle	24	25	3.3
8.	drown, non-lethal fall	8	8	1.1
9.	electric shock by touching exposed wire	22	22	3.1
10.	electric shock by equipment contacting power source	41	42	5.7
		<u>Event</u>	<u>Percent</u>	
a.	ladder	13	1.8	
b.	scaffold	3	0.4	
c.	crane/lifting equipment/boom/dump truck	20	2.8	
d.	contact while handling materials such as gutters, iron rods, etc.	5	0.7	
11.	electric shock from equipment installation/tool use	47	47	6.5
12.	electric shock, other	0	0	0.0
13.	elevator (struck/crushed by elevator or counter weights)	4	4	0.6
14.	fall from/with ladder: includes collapse/fall of ladder	37	37	5.1
15.	fall from/through roof	85	85	11.8
16.	fall from highway vehicle/construction equipment	6	6	0.8
17.	fall from/with scaffold	21	21	2.9
18.	fall from/with bucket (aerial lift/basket)	18	20	2.5
19.	fall from/with structure (other than roof)	64	66	8.9
		<u>Event</u>	<u>Percent</u>	
a.	fall with collapse of structure	20	2.8	
20.	fall from/with platform or catwalk	9	10	1.3
21.	fall through opening (other than roof)	19	19	2.6
22.	fall, other or unknown	10	10	1.4
23.	fire/explosion/scalding	11	12	1.5
24.	hyperthermia/hypothermia	8	8	1.1
25.	hit, crushed, fall during lifting operations	45	50	6.3
26.	struck by falling object/projectile (including tip-overs)	28	28	3.9
27.	crushed/suffocation from trench collapse	29	29	4.0
28.	crushed while unloading-loading equipment/material (except by crane)	15	15	2.1
29.	shock/burn from lightning	4	4	0.6
30.	crushed other	6	6	0.8
31.	unknown cause or other	5	5	0.7
		<b>719</b>	<b>739</b>	<b>100.00</b>

causes of the 719 fatal events analyzed may be read directly from Table 1. (Comparative frequencies for earlier years are shown in Figures B1 through B4 in Appendix B.)

At the risk of misleading the reader by over generalizing, it may be informative to describe frequently occurring specific examples of situations leading to the 10 most frequent causes of fatal events listed in Table 1.

Falls from /with/through Roofs. An inattentive roofer or laborer without fall protection walks backward and off the roof or steps into a skylight opening or on to a covered skylight opening.

Falls from/with Structures. An ironworker without fall protection slips or loses balance while erecting steel frame and falls or a carpenter or an ironworker falls as a result of a collapsing structure or structural component (31.2 percent of falls from/with structures were caused by collapses.)

Crushed, Run-over, Non-operator. A laborer guiding trucks while backing up, a grade checker or a laborer performing site clean-up in proximity of excavating machinery is run-over after getting out of the line-of-sight of an operator/driver.

Electrocution by...An electrician, helper or lineman working “hot” inadvertently contacts an energized source by body, uninsulated tool or jumper.

Lifting Operations... An improperly rigged load slips out of its sling or the sling breaks and the load falls on a worker.

Equipment Contacting Electric Line. Lifting equipment, such as a crane or lull, or a ladder is positioned into an overhead electric line resulting in the electrocution of the worker who becomes a ground.

Falls from/with Ladder. An improperly placed ladder slips, resulting in the fatal fall of a painter or roofer.

Crushed/Run-over...Operator. Mobile construction equipment, such as dozers and fork lifts, goes over an embankment and rolls over or rolls over when encountering uneven terrain, resulting in the crushing of the operator. – (The operator may be crushed inside the equipment or crushed by the equipment while trying to escape.)

Trench Collapse. A laborer or pipelayer is working in an unprotected trench (without sloping, shoring or trench box) and a trench wall collapses, killing the worker.

Struck by Falling Object/Projectile... There were a wide variety of situations in which this type of event occurred, and no typical pattern was evident. Examples of situations were: struck by nails from nail guns, struck by cap on a pressurized line, debris falling during demolition, equipment falling from roof and falling trees.

The number of victims killed by each cause is also shown in Table 1 where it can be seen that in most events only one worker was killed per event. (In one cause category no workers were killed, “electric shock, other”.) There were 21 fatality causes where no event had multiple fatalities; only 9 fatality causes included events with multiple fatalities. “Asphyxiation/inhalation of toxic vapors” was the fatality cause which had the most victims killed per event, i.e., 14 vents and 17 victims or 1.2 victims per event.

Table 2 shows a comparison of the ranks of the causes in 2002 with the average rank of the causes of fatal events during the period 1991 - 2001. It can be seen that the overall rank pattern of the causes in 2002 is very similar to the rank pattern in 1991 – 2001. An overall statistical comparison of the correlation of the rank in 2002 with the average rank in 1991-2001 was calculated using a Spearman rank correlation procedure.<sup>4</sup> The correlation obtained was + .94,  $p < .001$ , indicating that the ranks of the causes in the two time periods are highly and positively correlated, i.e., did not change significantly between 1991 – 2001 and 2002<sup>5</sup>. Since averaging the 1991 – 2001 ranks removed inter-year variance, a somewhat lower correlation would be expected between 2001 and 2002 ranks of causes, i.e., a measure of the short-term

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<sup>4</sup> Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill Book Co., Inc., 1956), p. 219.

<sup>5</sup>Five of the 719 fatal events in 2002 and 17 of 719 fatal events in 2001 had either no narrative or a narrative too incomplete to classify the cause of fatality. These records were coded as “unknown” cause; this was not done in prior years. They were omitted from the calculation of the Spearman Rank correlation in order to avoid data distortion.

**Table 2. Comparison of Ranks of Causes of Fatal Events in 1991 - 2001 with 2002**

<u>Event</u>	<u>1991 - 2001 Average</u>			<u>2002</u>		
	<u>Number</u>	<u>Percent</u>	<u>Rank</u>	<u>Number</u>	<u>Percent</u>	<u>Rank</u>
1. asphyxiation/inhalation of toxic vapor	6.6	1.1	22	14	2.0	19
2. caught in/struck by stationary equipment	5.7	0.9	23	6	0.8	26
3. crushed from collapse of structure	25.6	4.2	9	26	3.6	11
4. crushed/run-over of non-operator by operating construction equipment	47.2	7.7	3	54	7.6	3
5. crushed/run-over/trapped of operator by operating construction equipment	32.4	5.3	6	36	5.0	8
6. crushed/run-over by construction equipment during maintenance/modification	12.2	2.0	20	17	2.4	17
7. crushed/run-over by highway vehicle	24.2	3.9	12	24	3.4	12
8. drown, non-lethal fall	5.6	0.9	24	8	1.1	24
9. electric shock by touching exposed wire	25.4	4.1	10	22	3.1	13
10. electric shock by equipment contacting power source	46.3	7.5	4	41	5.7	6
11. electric shock from equipment installation/tool use	28.0	4.6	8	47	6.6	4
12. electric shock, other	4.8	0.8	26	0	0.0	29
13. elevator (struck/crushed by elevator or counter weights)	2.7	0.4	29	4	0.6	28
14. fall from/with ladder: includes collapse/fall of ladder	24.7	4.0	11	37	5.2	7
15. fall from/through roof	69.6	11.3	1	85	11.9	1
16. fall from highway vehicle/construction equipment	5.3	0.9	25	6	0.8	26
17. fall from/with scaffold	20.5	3.3	14	21	2.9	14
18. fall from/with bucket (aerial lift/basket)	12.5	2.0	19	18	2.5	16
19. fall from/with structure (other than roof)	49.8	8.1	2	64	9.0	2
20. fall from/with platform or catwalk	14.9	2.4	17	9	1.3	23
21. fall through opening (other than roof)	16.3	2.6	15	19	2.7	15

**Table 2. continued**

<u>Event</u>	<u>1991 - 2001 Average</u>			<u>2002</u>		
	<u>Number</u>	<u>Percent</u>	<u>Rank</u>	<u>Number</u>	<u>Percent</u>	<u>Rank</u>
22. fall, other or unknown	4.5	0.7	27	10	1.4	21
23. fire/explosion/scalding	14.1	2.3	18	11	1.5	20
24. hyperthermia/hypothermia	3.6	0.6	28	8	1.1	24
25. hit, crushed, fall during lifting operations	32.9	5.4	5	45	6.3	5
26. struck by falling object/projectile (including tip-overs)	24.1	3.9	13	28	3.9	10
27. crushed/suffocation from trench collapse	29.0	4.7	7	29	4.1	9
28. crushed while unloading-loading equipment/material (except by crane)	11.2	1.8	21	15	2.1	18
29. shock/burn from lightning	15.2	2.5	16	10	1.4	21
<b>TOTAL</b>	<u>615.0</u>	<u>100.0</u>		<u>714</u>	<u>100.0</u>	

cycle as opposed to a longer-term trend. The Spearman rank-order correlation between 2001 and 2002 causes was calculated and found to be insignificantly higher, + .96,  $p < .001$ , indicating that the 1991-2000 pattern changed very little between 2001 and 2002.

The correlation result is not surprising given that the general composition of construction output, and therefore the mix of construction operations required to produce the output, was probably very similar during the time periods examined. This interpretation implies that the rank of a cause is a function of the magnitude of exposure to the cause and/or the inherent danger associated with the cause.

While the number of OSHA-inspected fatal construction events caused by accidents have had an upward trend since 1991, employment in construction establishments has also increased.<sup>6</sup> The trend of these fatal events per 100,000 construction establishment employees is as follows: 1991 – 1992: 13.1; 1993 – 1994: 11.8; 1995: 11.4; 1996: 10.5; 1997: 10.6; 1998: 10.4; 1999: 11.0; 2000: 9.5; 2001: 10.8; and 2002: 10.7.

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<sup>6</sup> Bureau of Labor Statistics, National Employment, Hours, and Earnings.

## **APPENDIX A**

## Definitions of Fatality Causes

1. asphyxiation/inhalation of toxic vapor: lack of oxygen and/or inhalation of toxic gas, (excluding asphyxiation resulting from fire/explosion).
2. caught in/struck by stationary equipment: body or clothing caught pulling worker into equipment.
3. collapse of structure: building or other structure falling on worker, not including falling ladder, scaffold, aerial lift/ basket, platform, with a structure, trench collapse, or wall (earthen) collapse.
4. crushed/run-over of non-operator by operating construction equipment: non-operator run-over or crushed between equipment and ground or another object by an operator controlled piece of construction equipment.
5. crushed/run-over/trapped of operator by operating construction equipment: includes rollover and catching of body in equipment or between equipment and ground or other object while operating the equipment.\*
6. crushed/run-over by construction equipment during maintenance/ modification: includes equipment/parts falling on worker while assembling or disassembling equipment.
7. crushed/run-over by highway vehicle: any run-over by non-construction equipment, including trains.
8. drown, non-lethal fall: non-lethal falls into water and flooding of container, trenches, etc.
9. electrocution by touching exposed wire/source: body part contacting the wire/source except when installing equipment or using a tool.
10. electrocution by equipment contacting wire
  - a. ladder
  - b. scaffold
  - c. crane/lifting equipment/boom/dump truck:
  - d. other: contact while handling materials, e.g. gutters, iron rods, painting equipment, etc.
11. electrocution from equipment installation/tool use: includes failure to de-energize equipment, inappropriate energizing, contacting energized part with tool or body, and inadequately grounded tools or exposed tool wires.
12. electric shock, other and unknown cause

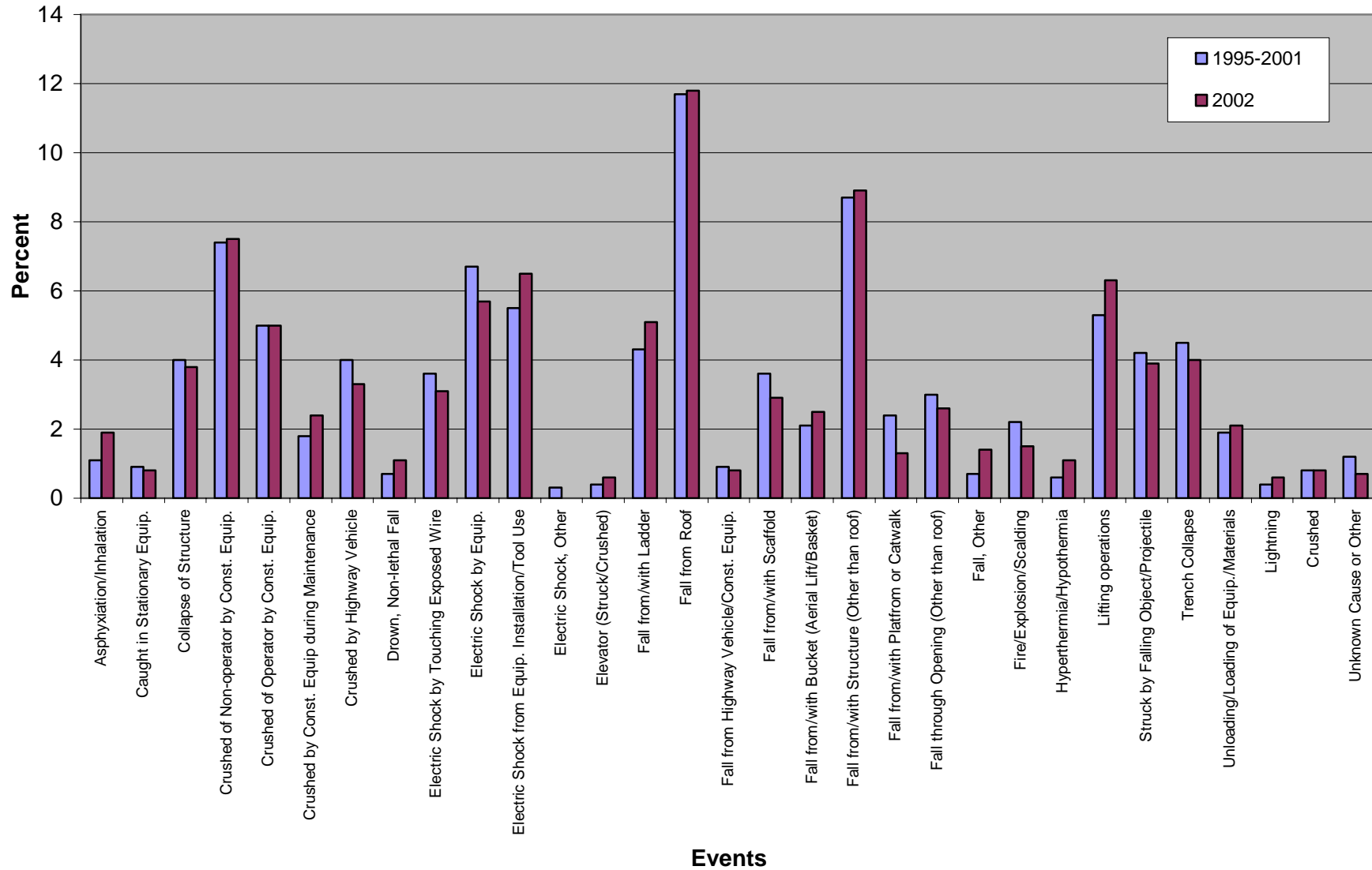
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\*Includes fatalities resulting from asphyxiation/fire/explosion/drowning of trapped operators.

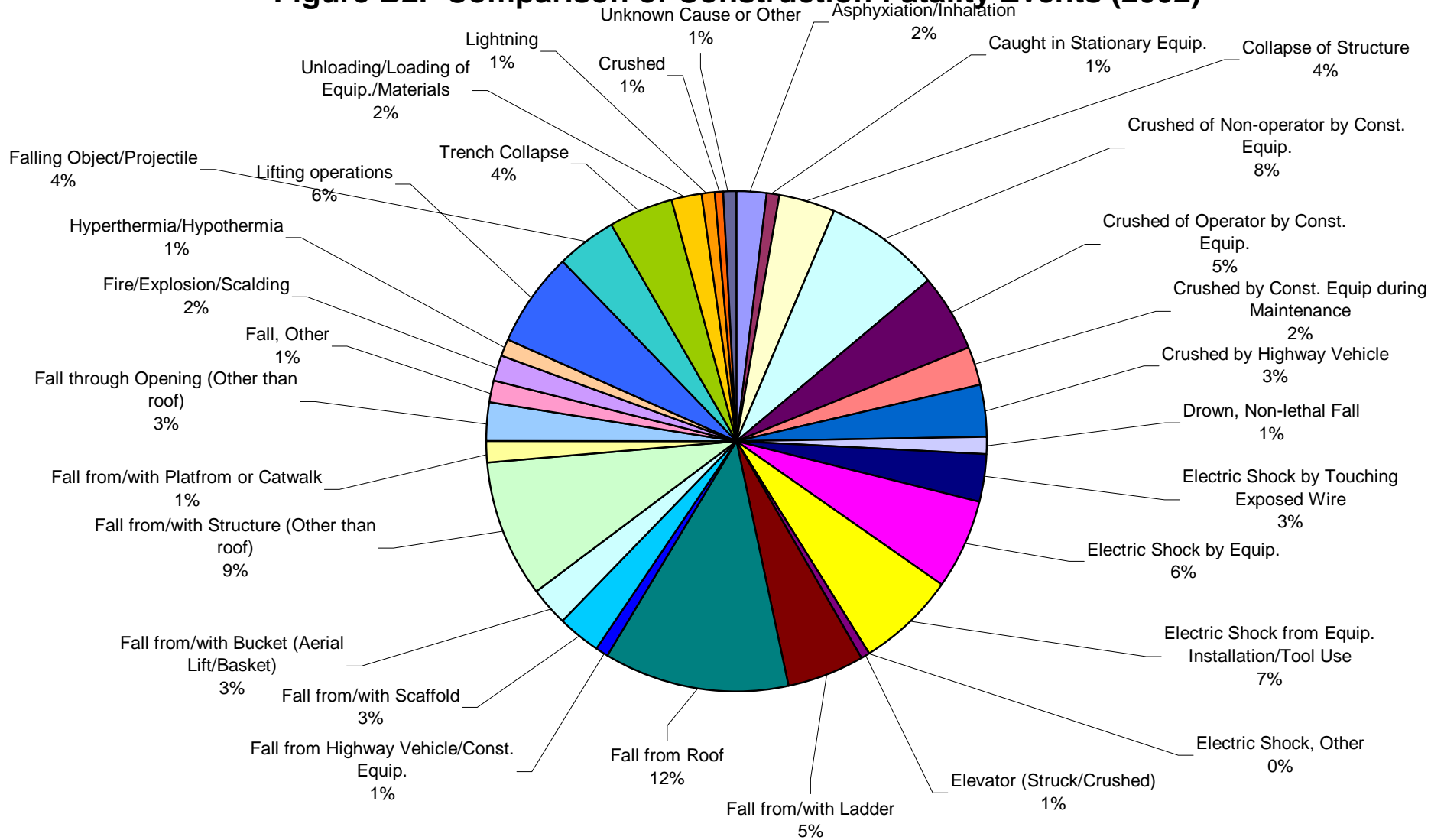
13. elevator (struck/crushed by elevator or counter-weights):
14. fall from/with ladder: includes collapse/fall of ladder.
15. fall from roof; fall through roof: skylight or other opening.
16. fall from vehicle (vehicle/construction equipment): falls from vehicle or equipment while in motion or at rest.
17. fall from/with scaffold: includes collapse/fall of scaffold.
18. fall from/with bucket (aerial lift/basket): includes collapse/fall of bucket.
19. fall from/with structure (other than roof): fall through opening in the side or through the floor (not opening in the floor) and with the structure in a collapse.
  - a. fall with collapse of structure
20. fall from/with platform or catwalk (attached to structure: includes collapse/fall of platform.
21. fall through opening (other than roof): falls through stairwells, equipment openings, or other openings in a floor.
22. fall, other or unknown
23. fire/explosion/scalding, excluding electrical burns/explosions
24. heat/hypothermia
25. lifting operations: failure of equipment, inappropriate lifting, and all loading and unloading by crane operations except electrocution. (Includes objects falling and striking victim during lifting operation).
26. struck by falling object/projectile (including tip-overs): does not include collapse of structure, trench, earthen wall, or lifting operations.
27. trench collapse: includes earthen wall
28. unloading-loading equipment/material (except by crane): includes slipping and tipping over of construction equipment/material while loading and unloading.
29. lightning
30. crushed
31. unknown cause or other

## APPENDIX B

**Figure B1. Comparison of Construction Fatality Events (1995-2001 with 2002)**

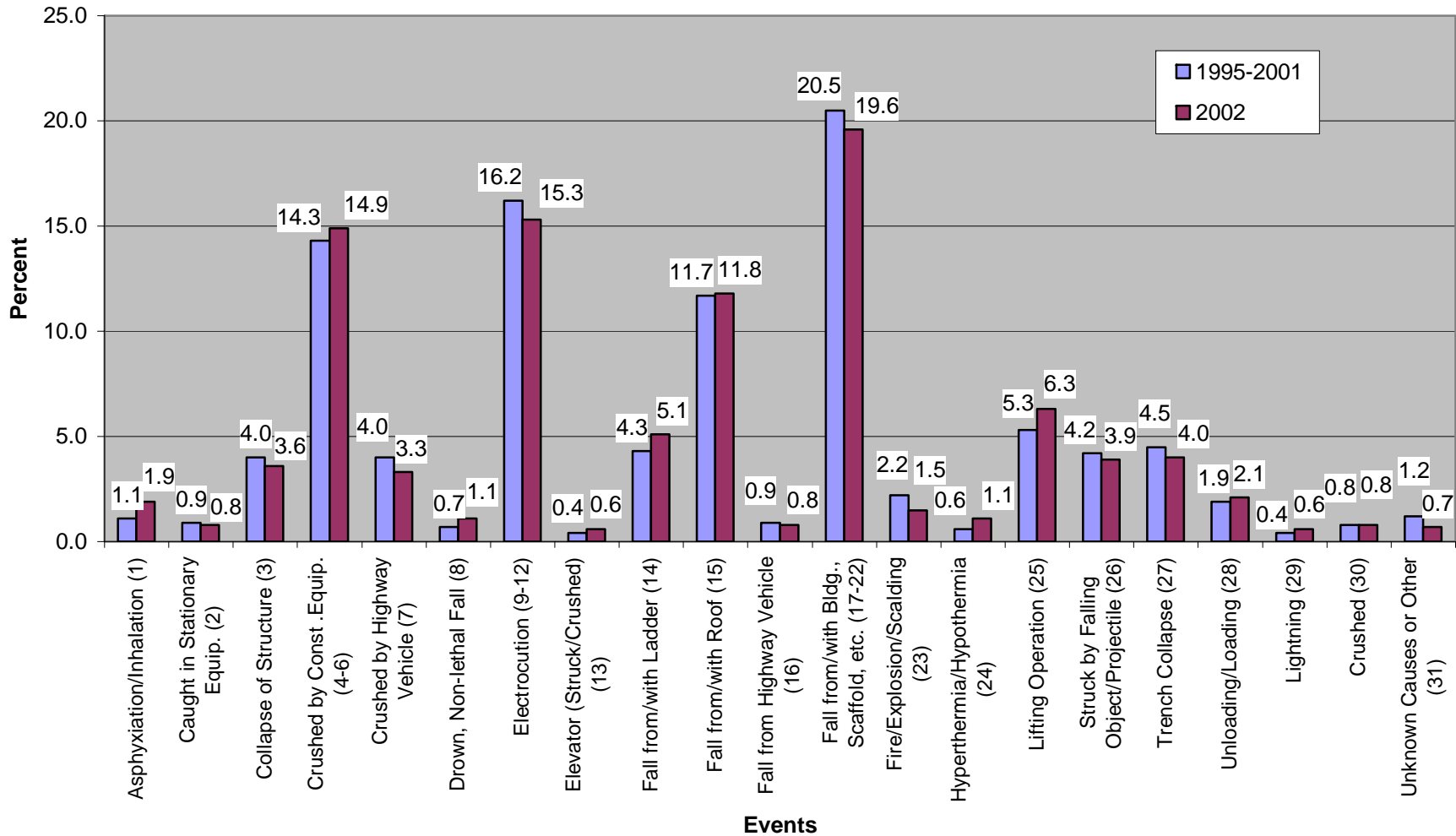


**Figure B2. Comparison of Construction Fatality Events (2002)**





**Figure B4. Comparison of Construction Fatality Events (1995-2001 and 2002)**



## APPENDIX C

**Table C1. Construction Fatal Events by End-Use Type, 2002**

<b>End Use Type</b>	<b>Description</b>	<b>Number of Frequency</b>	<b>Percent</b>	<b>Cumulative Percent</b>
1	Bridge	22	3.04	3.04
2	Commercial Building	148	20.47	23.51
3	Contractor's Yard/Facility	4	0.55	24.07
4	Excavation, Landfill	16	2.21	26.28
5	Highway, Road, Street	84	11.62	37.90
6	Manufacturing Plant	30	4.15	42.05
7	Multi-Family Dwelling	60	8.30	50.35
8	Other Building	101	13.97	64.32
9	Other Heavy Construction	25	3.46	67.77
10	Pipeline	15	2.07	69.85
11	Powerline, Transmission Line	29	4.01	73.86
12	Powerplant	10	1.38	75.24
13	Refinery	4	0.55	75.80
14	Sewer/Water Treatment Plant	14	1.94	77.73
15	Shoreline Development, Dam, Reservoir	7	0.97	78.70
16	Single Family or Duplex Dwelling	130	17.98	96.68
17	Tower, Tank, Storage Elevator	24	3.32	100.00
		<u>723</u>	<u>100.00</u>	

The coding for these data could not be verified.

OSHA records included four events for which there was no narrative statement; therefore, the total in this table differ from the total in Table 1.

**Table C2. Construction Fatal Events by Type of Project, 2002**

<b>Project Type</b>	<b>Description</b>	<b>Number of Frequency</b>	<b>Percent</b>	<b>Cumulative Frequency</b>
1	New, Addition and Alteration Construction	711	98.34	98.34
2	Maintenance, Repair and Demolition	6	0.83	99.17
3	Other	<u>6</u>	<u>0.83</u>	100.00
		723	100.00	

The coding for these data could not be verified.

OSHA records included four events for which there was no narrative statement; therefore, the total in this table differ from the total in Table 1.

**Table C3. Construction Fatal Events by Four-Digit SIC, 2002**

Code	Description	SIC	Number of Frequency	Percent	Cumulative Percent
1	General Contractors - Single Family Houses	1521	28	3.87	3.87
2	General Contractors - Residential Buildings Other than Single Family	1522	11	1.52	5.39
3	Operative Builders - Single Family Housing, Multi-family Housing, Manufacturing, Light Industrial, Commercial, and Institutional Buildings	1531	5	0.69	6.09
4	General Contractors - Industrial Building and Warehouses	1541	19	2.63	8.70
5	General Contractors - Non-residential Buildings, other than Industrial and Warehouse	1542	43	5.95	14.66
6	Highway and Street Construction, Except Elevated Highways	1611	60	8.30	22.96
7	Bridge, Tunnel, and Elevated Highway Construction	1622	17	2.35	25.31
8	Water, Sewer, Pipeline, and Communications and Power Line Construction	1623	52	7.19	32.50
9	Heavy Construction, Not Elsewhere Classified	1629	32	4.43	36.93
10	Plumbing, Heating and Air-Conditioning	1711	37	5.12	42.05
11	Painting and Paper Hanging	1721	31	4.29	46.33
12	Electrical Work	1731	58	8.02	54.36
13	Masonry, Stone Setting, and Other Stone Work	1741	22	3.04	57.40
14	Plastering, Drywall, Acoustical, and Insulation Work	1742	10	1.38	58.78
16	Carpentry Work	1751	32	4.43	63.21
18	Roofing, Siding, and Sheet Metal Work	1761	74	10.24	73.44
19	Concrete Work	1771	25	3.46	76.90
20	Water Well Drilling	1781	1	0.14	77.04
21	Structural Steel Erection	1791	46	6.36	83.40
22	Glass and Glazing Work	1793	1	0.14	83.54
23	Excavation Work	1794	29	4.01	87.55
24	Wrecking and Demolition Work	1795	11	1.52	89.07
25	Installation or Erection of Building Equipment, Not Elsewhere Classified	1796	15	2.07	91.15
26	Special Trade Contractors, Not Elsewhere Classified	1799	64	8.85	100.00
			723	100.00	

The coding for these data could not be verified.

OSHA records included four events for which there was no narrative statement; therefore, the total in this table differ from the total in Table 1.

**Table C4. Construction Fatal Events by Project Value, 2002**

Project Value Code	Description	Number of Frequency	Percent	Cumulative Percent
1	Under \$50,000	218	30.15	30.15
2	\$50,000-\$250,000	129	17.84	47.99
3	\$250,000-\$500,000	63	8.71	56.71
4	\$500,000-\$1,000,000	67	9.27	65.98
5	\$1,000,000-\$5,000,000	109	15.08	81.05
6	\$5,000,000-\$20,000,000	84	11.62	92.67
7	\$20,000,000 and over	<u>53</u>	<u>7.33</u>	100.00
		723	100.00	

The coding for these data could not be verified.

OSHA records included four events for which there was no narrative statement; therefore, the total in this table differ from the total in Table 1.

**Table C5. Construction Fatal Events by Construction Operation, 2002**

Code	Description	Frequency	Percent of Events
2002	Backfilling and compacting	23	3.18
02	Bituminous concrete placement	3	0.41
04	Cutting concrete pavement	4	0.55
05	Demolition	23	3.18
06	Dredging	3	0.41
07	Elevator, escalator installation	6	0.83
08		7	0.97
09	Erecting structural steel	32	4.43
10	Erection of coffer dams, caissons	1	0.14
11	Excavation	28	3.87
12	Exterior masonry	20	2.77
13	Exterior cladding	6	0.83
14	Exterior carpentry	43	5.95
15	Exterior painting	17	2.35
16	Fencing, installing lights, signs, etc.	17	2.35
17	Fireproofing	2	0.28
18	Forming	9	1.24
19	Forming for piers or pylons	7	0.97
20	Installing interior walls, ceilings, doors	7	0.97
21	Installing metal siding	1	0.14
22	Installing windows and doors, glazing	5	0.69
23	Installing culverts and incidental drainage	11	1.52
24	Installing equipment (HVAC and other)	35	4.84
25	Installing plumbing, lighting fixtures	17	2.35
26	Installing underground plumbing conduit	6	0.83
28	Interior masonry	7	0.97
29	Interior plumbing, ducting, electrical work	19	2.63
30	Interior carpentry	13	1.80
31	Interior painting and decorating	13	1.80
32	Landscaping	8	1.11
33	Loading dock forming and pouring	1	0.14
34	Paving	28	3.87
35	Pile driving	6	0.83
36	Placing bridge deck	4	0.55
37	Placing bridge girders and beams	4	0.55
38	Plastering	1	0.14
39	Pouring or installing floor decks	2	0.28
40	Pouring concrete floor at grade	2	0.28
41	Pouring concrete for piers, and pylons	2	0.28
42	Pouring concrete foundations and walls	4	0.55
43	Roofing	70	9.68
44	Seawall construction , riprap placement	2	0.28
45	Site clearing and grubbing	12	1.66

46	Site grading and rock removal	11	1.52
47	Stripping and curing concrete	6	0.83
48	Surveying	1	0.14
50	Temporary work (buildings, facilities)	35	4.84
51	Traffic protection	13	1.80
52	Trenching, installing pipe	21	2.90
53	Waterproofing	7	0.97
54	Steel Erection of Solid Web-Connecting	1	0.14
55	Steel Erection Of Solid Web-Bolting-Up/Detail Work	1	0.14
56	Steel Erection Of Solid Web-Welding/Burning/Grinding	3	0.41
59	Steel Erection Of Solid Web-Landing Materials (Hoisting)	3	0.41
60	Steel Erection Of Open Web Steel Joists-Connecting	2	0.28
61	Steel Erection Of Open Web Steel Joists-Bolting-Up/Detail Work	2	0.28
62	Steel Erection Of Open Web Steel Joists-Welding/Burning/Grinding	3	0.41
63	Steel Erection of open Web Steel Joists – Connecting	1	0.14
64	Steel Erection Of Open Web Steel Joists-Moving Point to Point	1	0.14
66	Installation Of Decking-Initial Laying Deck (Including Layout & Safety)	13	1.80
68	Installation Of Decking-Flashing Of Decking	1	0.14
70	Other Activities-Installing Ornamental And Architectural Steel	1	0.14
71	Other Activities-Post Decking Detail Work	7	0.97
00	Unknown	<u>59</u>	<u>8.16</u>
		723	100.0

The coding for these data could not be verified.

OSHA records included four events for which there was no narrative statement; therefore, the total in this table differ from the total in Table 1.