

FINAL PROGRESS REPORT

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LIST OF ABBREVIATIONS

CFOI: Census of Fatal Occupational Injuries
CFR: Child Fatality Review
CO: Carbon Monoxide
COBWEB: Coalition for a Better Work Environment for Brazilians
DOE: Department of Education
DOS: Division of Occupational Safety
FACE: Fatality Assessment and Control Evaluation
FACE CC: FACE Coordinating Committee
ISD: Inspectional Services Department
MA FACE: Massachusetts Fatality Assessment and Control Evaluation
MassCHIP: Massachusetts Community Health Information Profile
MassCOSH: Massachusetts Coalition for Occupational Safety and Health
MDPH: Massachusetts Department of Public Health
ME: Medical Examiner
NIOSH: National Institute for Occupational Safety and Health
NVDRS: National Violent Death Reporting System
OHSP: Occupational Health Surveillance Program
OSHA: Occupational Safety and Health Administration
PDA: Personal digital assistant
TBI: Traumatic Brain Injury
TURI: Toxics Use Reduction Institute
UML: University of Massachusetts at Lowell
USDOL: United States Department of Labor
Viet-AID: Vietnamese American Initiative for Development

ABSTRACT

Fatal occupational injuries continue to be a significant public health problem in Massachusetts as they are throughout the United States. Each year in Massachusetts approximately 70 workers are fatally injured at work. Information about the work settings and the specific circumstances in which these deaths occur is essential to develop effective prevention measures at the state and national levels. Since 1990, the Massachusetts Department of Public Health (MDPH) has participated in the NIOSH Fatality Evaluation and Control Evaluation (FACE) program. This program has allowed MDPH to build the Massachusetts surveillance system for fatal occupational injuries, to increase understanding of risk factors leading to fatal events through investigations of targeted fatalities, and to undertake activities to prevent fatal occupational injuries in the Commonwealth.

This Cooperative Agreement enabled MDPH to continue and enhance the Massachusetts FACE project from 9/1/01 through 10/31/06. The long range goal of the project was to reduce the incidence and accompanying human and economic burden of work-related fatalities in the Commonwealth. Specific aims were to: 1) maintain the current case ascertainment system for timely identification and collection of data on all fatal occupational injuries to identify high risk workplaces and populations; 2) conduct onsite investigations of targeted fatalities using FACE investigative methods to identify risk factors and develop recommended countermeasures to control or eliminate identified risks; 3) disseminate surveillance findings, FACE reports, NIOSH Hazard Alerts, FACE Facts and other injury prevention information to workers, employers and health and safety professionals and advocates who can intervene in the workplace to prevent workplace deaths; and 4) develop, implement and evaluate prevention projects targeting specific industries, groups of workers or hazards to reduce the incidence of fatal occupational injuries in Massachusetts.

During the project period, Massachusetts FACE collaborated with the Massachusetts Census of Fatal Occupational Injuries to identify and document 327 fatalities, conducted 40 in-depth field investigations, and prepared and disseminated 32 FACE reports (additional reports in progress.) New efforts were undertaken to document deaths involving immigrant workers. Massachusetts FACE developed a data collection supplement to collect information on immigrant worker deaths, subsequently adapted for use by NIOSH and other states, and completed 19 investigations of immigrant worker deaths. As part of this effort, Massachusetts FACE developed new working relationships with community organizations serving immigrant groups that assisted in both data gathering and outreach. Greater emphasis was also placed on development of user friendly materials. Eight short, user friendly safety alerts - *FACE Facts* - were developed and thousand of copies were disseminated to stakeholders across the state. The feasibility of conducting investigations of deaths of public sector workers, who are not covered by OSHA in Massachusetts, was also explored.

Increased emphasis was also placed on translation of data into public health action. Massachusetts FACE expanded its ongoing Fall Prevention project, establishing a working group of government and community stakeholders to address falls in residential construction. Massachusetts FACE also provided technical assistance to a community initiated task force on floor finishing safety that has led to changes in local practices, new efforts to educate the industry and consumers, and proposed state policies to regulate the floor finishing industry and use of flammable lacquer sealers. FACE activities also helped focus local attention on workplace violence hazards faced by teens contributing to changes in state child labor laws to require adult supervision of young workers after 8 pm. In addition, FACE collaboration with the Massachusetts Department of Education helped bring a new health and safety focus to vocational education in the Commonwealth.

The experience over the project period has led to several new initiatives in the ongoing Massachusetts FACE project. These include the addition of public sector deaths as a target for investigation, increased collaboration with community partners to document and prevent immigrant worker deaths, and continued coordination of stakeholders in a prevention project to address falls in residential construction.

HIGHLIGHTS / SIGNIFICANT FINDINGS

The Occupational Health Surveillance Program (OHSP) at the Massachusetts Department of Public Health (MDPH) has had NIOSH funding since 1990 to establish a state-wide system for surveillance, investigation, and prevention of fatal occupational injuries. This project has provided Massachusetts with an invaluable opportunity to build the Commonwealth's fatal occupational injury surveillance system, to increase understanding of risk factors leading to fatalities through investigations of targeted incidents and to undertake activities to prevent fatal occupational injuries in the Commonwealth. Aggregate data have identified high risk industries and populations, while the in-depth investigations have provided the specific data on interaction of the worker, the work environment and work processes necessary to develop recommended prevention strategies. FACE investigations have likewise provided the stories or "faces" necessary to make the statistics real and influence public policy makers and they have served as an important vehicle for providing technical assistance to employers in Massachusetts. Increased emphasis during this project period on information dissemination and translation of findings into user-friendly injury prevention materials and collaborations with prevention partners throughout the Commonwealth has extended the project's reach. The project's new focus on immigrant worker fatalities has also enabled Massachusetts to address an overarching public health goal – reducing health disparities among racial and ethnic groups.

Major accomplishments of the Massachusetts FACE project from September 1, 2001 through October 30, 2006 are highlighted below.

Surveillance

- In collaboration with Massachusetts Census of Fatal Occupational Injuries, used multiple data sources to identify and document 327 fatal occupational injuries.
- Maintained 24-hour Occupational Fatality Hotline and other procedures for timely notification of fatalities; identified 41% of all fatalities by the day following the incident and 69% within ten days of the incident.
- Successfully collected information on race, ethnicity, and country of origin in a timely fashion and added Hispanic and immigrant worker deaths as targets for investigation.
- Identified an increase in Brazilian worker fatalities (1 death during 1991-2001 vs. 14 deaths during 2002-2006), and a cluster of deaths of Vietnamese floor sanders.
- Developed working relationship with the Massachusetts National Violent Death Reporting System to improve surveillance of work-related violent deaths.

FACE Investigations

- Completed 37 in-depth field investigations of 34 fatalities and three serious injuries to identify factors leading to these incidents; three additional investigations are ongoing; finalized 32 FACE reports that include recommended countermeasures which go beyond compliance to identify innovative prevention measures.
- Successfully added Hispanic and Other Immigrant worker deaths as targets for investigation, and completed 19 Hispanic/immigrant worker fatality investigations.
- Developed data collection supplement for immigrant worker deaths that served as the basis for the *Investigation Guidelines for Immigrant Workers/Limited English Speaking Workers* supplement used by NIOSH and other states.
- Maintained and expanded collaborative working relationships with other government agencies in conducting investigations including OSHA, Massachusetts Division of Occupational Safety (public sector deaths) and the Massachusetts Department of Education (serious injuries to vocational students).
- Developed new working relationships with community organizations serving Brazilian, Vietnamese and other immigrant communities that have assisted in data gathering and outreach.

Information Dissemination

- Disseminated 32 FACE reports to employers, unions and others individuals involved in the incidents including Hotline reporters, to over 50 health and safety experts in Massachusetts, and to stakeholders in targeted industries.
- Developed eight shorter *FACE Facts*; disseminated over 13,000 copies through initial mailings and in response to requests. Two additional *FACE Facts* are under final review.
 - In response to three fire related deaths of Vietnamese floor finishers during a 10 month period, collaborated with the state Fire Marshall in developing and disseminating a fire safety alert on fire hazards of floor finishing. (See more under Targeted Prevention below.) Currently developing a floor finishing fire safety checklist in response to industry requests.
 - Disseminated to all vocational programs an alert based on an investigation of an incident in which a vocational education student was seriously injured on an unguarded machine in shop class; this contributed to the Massachusetts Department of Education's inclusion of safety audits based on OSHA standards in their periodic review of vocational educational programs and a new initiative to provide OSHA training to vocational education teachers and students in Massachusetts.
 - Disseminated an alert prompted by three separate fatal incidents involving police officers directing traffic in highway work zones; state legislation increasing fines for speed limit violations in work zones was subsequently passed.
- Developed a bilingual sticker to be used on forklifts indicating that minors are not allowed to operate these machines; disseminated over 3,400 in Massachusetts in response to requests. US DOL has disseminated 100,000 nationally.
- In collaboration with CFOI, published annual Fatality Update and a comprehensive nine year report of occupational fatalities in Massachusetts.
- Informed next-of-kin that FACE investigations were underway, including families of immigrant workers in other countries (in language of the country). Developed a new fact sheet on workers' compensation death benefits to be disseminated to families of deceased workers.
- Recognizing fatal incidents as important teachable moments, initiated *Safety Alerts* that include brief summaries of incidents involving immigrant workers, general prevention messages, and local health and safety resources; these were translated and disseminated to community organizations and newspapers serving immigrant groups.
- Published FACE articles in three trade journals as well as a NIOSH eNews article on floor finishing deaths.
- Developed extensive, industry specific databases for dissemination of FACE materials in Massachusetts, e.g. forklift sales and rentals, roadway construction companies, tire repair stations, vehicle mounted lift rental agencies, home heating oil companies and dry cleaners.

Targeted Prevention

- Participated in community initiative bringing together industry, labor and community organizations to address hazards in floor finishing; this effort has resulted in changes in local industry practices, new efforts to educate the industry and consumers, and proposed state policies to regulate the floor finishing industry and use of flammable lacquer sealers implicated in several fatal fires.
- Continued and expanded a project to prevent falls in residential construction, disseminating materials through building permit offices, developing new culturally sensitive materials, and initiating a Fall Prevention work group comprised of labor, industry, community, and government stakeholders.
- Provided assistance to community initiative addressing violence faced by teens in retail settings; this initiative contributed to changes in state child labor laws to require adult supervision of working youth after 8 pm.
- Established new model collaboration with the Massachusetts Child Fatality Review Program.
- Continued collaboration with the Engineering School and the Department of Work Environmental at U Mass Lowell to identify technological solutions to hazards.
- Exploring options to enhance surveillance and prevention of fishing-related fatalities.

TRANSLATION OF FINDINGS

Translation of findings is an integral component of the *Massachusetts FACE Project*. Surveillance, by definition, includes the dissemination of surveillance findings to those in a position to use the data to take action. Massachusetts FACE not only provided information to stakeholders but developed working relationships with stakeholders in the community to effect change. Intervention activities based on surveillance findings were carried out both directly by project staff and by staff working in collaboration with partners in the community to address identified risks. Notably there are important opportunities to address worker health and safety through other government agencies and community organizations as well the workplace and translation activities were carried out in all of these venues.

Following each FACE investigation, recommended counter measures were developed with input from experts. Emphasis was placed on developing feasible, clearly worded recommendations with employers as the key target audience. FACE reports were disseminated to all those involved in the specific incidents and to other stakeholders in the Commonwealth. Increased emphasis this period was placed on developing shorter, user friendly documents targeting both workers and employers to be more widely disseminated. These included *FACE Facts*, several of which were translated into other relevant languages chosen on the basis of workforce demographics of the relevant industry. The *FACE Facts* were in general well received as evidenced by requests for additional copies. Over 13,000 copies were distributed initially and in response to requests. In addition over 100,000 copies of the young workers forklift sticker developed by FACE have been disseminated nationwide. As part of the ongoing Massachusetts FACE project, additional efforts will be made to follow up with employers receiving materials to assess self-reported changes in work practices.

Translation activities this project period went beyond materials dissemination and included working with partners to promote implementation of recommendations. Key examples of collaborations that have resulted in recommended changes are described below. Notably in each of these examples, Massachusetts FACE was one of many stakeholders whose work influenced changes in policy and practice.

Massachusetts FACE conducted investigations of three deaths of Vietnamese floor sanders killed in explosions caused by use of highly flammable lacquer sealers, prepared FACE reports, and collaborated with the state fire Marshall in issuing a bilingual fire safety alert, recommending, among other things, the use of less flammable products and culturally and linguistically appropriate worker training and education. Massachusetts FACE also participated in a community initiated task force, bringing together industry, labor and community organizations to address hazards in floor finishing. This effort has resulted in changes in local practices, new efforts to educate the industry and consumers, and proposed state policies to regulate the floor finishing industry and use of flammable lacquer sealers implicated in fatal fires. Many local distributors of floor finishing products have voluntarily pulled flammable lacquer sealers off the market. Training has been offered in Vietnamese to local floor finishing contractors, and information for Vietnamese floor finishers has been disseminated through the both the local Vietnamese TV station and newspaper. Legislation to requiring licensing of floor finishers has been proposed, and legislation banning use of flammable lacquer sealers is under consideration. In response to requests from employers, Massachusetts FACE is currently working with the State Fire Marshall and industry experts to develop a safety checklist for floor finishing.

Massachusetts FACE also provided assistance to a community initiative addressing violence faced by teens in retail settings. This initiative contributed to changes in state child labor laws to require adult supervision of working youth after 8 p.m.

This period Massachusetts FACE also collaborated with the Massachusetts Department of Education (DOE) to conduct an investigation of an incident in a shop class in which a student had her finger amputated on an unguarded wood-working machine. A FACE alert based on this incident and including a recommendation that all schools comply with OSHA standards was disseminated to vocational programs throughout the Commonwealth. DOE has subsequently issued requirements that schools comply with OSHA standards,

incorporated safety audits based on OSHA standards in the periodic reviews of state vocational education programs, and introduced OSHA 40-hour training for vocational education teachers who in turn are providing OSHA-10 hour training for students.

Massachusetts FACE also collaborated with Region I OSHA to convene a working group of community and government stakeholders to address falls in residential construction. The objective of the group was to 1) share information about current fall prevention activities; and 2) identify opportunities for collaboration and gaps that remain to be addressed.. The Working Group prompted a review of built-in anchor systems in residential construction, provided expert input to a PDA ladder risk assessment tool being developed as part of a NIOSH funded research project, and helped get occupational falls on the state's public health agenda to prevent traumatic brain injuries (TBI). Recommendations to address falls in construction are now included in the state's TBI prevention plan. The working group also promoted collaboration between group members conducting training for immigrant construction workers in Massachusetts and those working to provide OSHA-10 hour training to teens. Massachusetts FACE will continue to bring these stakeholders together as part of the ongoing FACE project to share information and to undertake a collaborative prevention project.

Massachusetts FACE this period also extended its work to include investigations of Hispanic and other immigrant worker deaths. As part of this effort, we developed working relationships with community organizations serving newcomer groups that have assisted both with data gathering and community outreach. We have found that documenting immigrant worker fatalities is often challenging as is development of recommendations to prevent additional immigrant worker deaths. Massachusetts FACE will continue to work with these community partners in the future to gather information, to refine our recommendations regarding culturally and linguistically appropriate training, supervision and communication in the workplace and to develop recommendations for new community-based approaches to protecting immigrant worker safety and health.

OUTCOMES / RELEVANCE / IMPACT

Among the key factors in determining the relevance of a public health problem are severity of the health event, evidence of disparities in risk among racial and ethnic groups and preventability – or the potential for effective public health intervention.

Fatal occupational injuries continue to be a significant public health problem in Massachusetts as they are for the country as a whole. Each week in Massachusetts, 1-2 workers are fatally injured at work. In Massachusetts, as elsewhere across the nation, the fatality rate for Hispanic workers exceeds that for whites. Evidence from the Massachusetts FACE project suggests that other newcomer populations may also be at high risk. These deaths are preventable. Information about the work settings and specific circumstances in which workers are fatally injured is essential to develop effective prevention strategies at state and national levels. The Massachusetts FACE project has collected in-depth information about factors leading to fatal injuries at work, used this information to develop recommended countermeasures, disseminated these recommendations to employers, workers and health and safety professionals and engaged with partners to promote their implementation. Massachusetts FACE has also included deaths of Hispanic and other immigrant workers among its priorities for investigation and prevention and enlisted newcomer communities in this effort.

Given the five year time frame for this Cooperative Agreement, OHSP has looked to the following shorter term intermediate outcomes as measures of program impact: changes in policy, effectiveness of information dissemination, and development of effective partnerships. Massachusetts FACE activities appears to have contributed to the development of new state safety policies and practices, including proposed legislation to regulate the floor finishing industry, periodic safety audits of vocational education shops and changes to state child labor laws to require adult supervision of teens employed after 8 p.m. Massachusetts FACE has also increased public awareness of risks and control measures as reflected in requests for thousands of copies of

FACE materials and use of FACE materials in training programs within and outside of the Commonwealth. The project has also led to the development of active new interagency and public-private partnerships thus strengthening the infrastructure for occupational health and safety in Massachusetts.

SCIENTIFIC REPORT

Introduction

This report is for the Massachusetts Fatality Assessment and Control Evaluation project (MA FACE) Cooperative Agreement period: September 1, 2001 to August 31, 2006. Some project activities were continued through October 2006 with carry over funds approved for use on printing materials that were delayed in the review process. This final report begins with a brief statement of the problem and background information. Project activities and accomplishments from September 1, 2001 to October 31, 2006 are then summarized. The information is organized according to the four aims in the Cooperative Agreement application.

Background and Significance

Fatal occupational injuries continue to be a significant public health problem in Massachusetts as they are throughout the United States. Each year in Massachusetts, approximately 70 workers are fatally injured on the job. These deaths are not random events, but occur in predictable industries, occupations and circumstances. Because they are predictable, they are largely preventable. Information about the work settings and the specific circumstances in which traumatic occupational fatalities occur is essential to develop effective prevention measures at the national and state levels. Data gathered through a comprehensive surveillance system and in-depth, on-site fatality investigations can provide the information necessary to guide the development of appropriate educational and regulatory activities, inform the development of new control technologies, promote policy change, and target further research.

Fatal Occupational Injuries in Massachusetts: During 1991-2002, 803 workers in Massachusetts sustained fatal injuries on the job. The fatality rate varied from a high of 2.9 in 1991 to a low of 1.4 in 2002, with no consistent downward trend. On average, the occupational fatality rate for Massachusetts was about half that of the nation (2.2 vs. 4.7 per 100,000 workers). This is explained in part by differences in the industrial composition of Massachusetts' workforce as compared to that of the nation. Proportionately fewer Massachusetts workers were employed in high risk occupations and industries (MDPH, 2005). In addition, Massachusetts had low rates of homicide and fatal motor vehicle incidents in the general population, two events that contribute substantially to the occupational fatality burden (MDPH, 2002).

Worker Demographics: Many of the demographic trends in occupational fatalities were similar to those observed nationally (MDPH, 2002; BLS, 2004). Most victims (93%) were men, and the fatality rate for men was more than eight times that for women. The largest number of deaths (52%) occurred among workers aged 25-44 who comprised the largest share of the workforce. The highest rate, however, was observed among workers 65 or older. There were 10 deaths of minors (less than 18 years of age) – a group targeted by both Massachusetts FACE and the OHSP *Teens at Work* Project.

Fatal occupational injury rates varied by race and ethnicity in Massachusetts. Whereas the rate for Black workers (2.3 per 100,000 workers) was similar to that for Whites (2.2 per 100,000 workers), the rate of 3.2 per 100,000 for Hispanic workers (n=47) was significantly higher. The rate for Hispanic workers remained high even after adjusting for an estimated 10% underreporting of Hispanics in the workforce and is consistent with evidence that Hispanic workers are at high risk of fatal occupational injury nationally (BLS, 2004;Richardson,

2004; Dong and Platner, 2004). Half of the Hispanic victims in Massachusetts were foreign-born¹, slightly less than the proportion reported for the nation (Richardson, 2004).

Brazilians, the largest immigrant group to arrive in Massachusetts during the last decade, do not usually consider themselves Hispanic and most are not included in the Hispanic fatality count for the state² (MassINC, 2005; Diaz, 2005). Prior to 1999, no Brazilian-born individuals reportedly died as a result of occupational injuries in Massachusetts, yet there were 15 Brazilian victims between 1999 and October 2006.

Overall 17% of the fatalities in Massachusetts involved foreign-born workers, higher than their representation in the workforce (MassINC, 2005). Nationally, foreign-born workers have been found to be at high risk (Loh and Richardson, 2004). In both the US and Massachusetts, homicide was the leading fatal event among the foreign-born workers followed by falls to a lower level (Loh and Richardson, 2004).

High fatality rates for Hispanic and foreign-born workers are consistent with evidence that they are disproportionately represented in higher risk jobs. (Frumkin and Pransky, 1999; Friedman-Jimenez and Ortiz, 1994; Frumkin et al. 1999; Levin and Ginsberg, 1999; Murray, 2003). Other potential factors include literacy, language, and cultural barriers at work, inexperience, lack of information about health and safety rights and resources, and limited job opportunities that make workers hesitant to speak up. Hispanic construction workers in the US have been found to have higher fatality rates than non-Hispanic workers even within the same occupations (Dong and Platner, 2004). Loomis and Richardson (1998) reported higher risk among black workers in North Carolina after controlling for employment patterns suggesting that 'within job' factors such as race-based task assignments may also contribute to the disparity in risk.

Self-employed workers are at high risk of fatal occupational injury in Massachusetts as they are nationwide. The rate for self-employed (5.5 per 100,000 workers) was close to triple that for wage and salary workers (1.8 per 100,000). Again it appears that this increased risk may be at least in part, explained by the concentration of self-employed workers in high-risk jobs such as construction and agriculture/forestry and fishing.

Events: From 1991-2002, falls to a lower level led all other fatal work events in Massachusetts, accounting for 18% (n=148) of all deaths. The majority of falls (62%) occurred in the construction industry, predominantly from scaffolds (24%), roofs (21%) and ladders (18%). Of the construction-related falls for which height information was known, 52% were from 20 feet or lower.³ Homicides and highway motor vehicle incidents followed falls as leading events – accounting for 13% and 12% of the deaths respectively. Robbery was the most frequently reported circumstance for work-related homicides (49%). Disputes between co-workers/employers accounted for only 16% of the homicide cases where perpetrator was known.³ Truck drivers were the victims in approximately 26% of the highway motor vehicle incidents. Transportation incidents involving watercraft made up another 7% of the deaths.

Massachusetts's distribution of fatalities by event differed markedly from that of the nation as a whole, underscoring the importance of using state data in setting to set state prevention priorities. Nationwide, highway incidents led all other events accounting for 22% of the deaths. Falls to a lower level accounted for only 9% of all the deaths nationally, and only 2% were due to incidents involving watercrafts (MDPH, 2002). These differences likely reflect the differences in the industrial make-up of the state versus the nation. Also, as discussed, Massachusetts has both lower overall homicide rates and motor vehicle-related fatality rates; and the predominance of other events in Massachusetts in this proportional analysis may be partially accounted for by a reduction in homicides and highway incidents as competing causes of death.

¹ Foreign-born as defined by CFOI refers to all people born outside of the US, and excludes individuals born in US territories. It includes those defined by the US Census Bureau as legal immigrants, legal non-immigrants (for example refugees and persons on student or work visas), and undocumented persons residing in the US. The terms foreign-born and immigrant, while not strictly synonymous, are used interchangeably in this report.

² 1 of the 15 Brazilian victims in Massachusetts between 1991- October 2006 was identified as Hispanic.

³ Statistic based on Massachusetts CFOI data for 1991-1999 only.

High Risk Industries and Occupations: Surveillance findings highlight the construction industry as a priority for prevention efforts in Massachusetts. The construction industry had both the highest number of occupational fatalities and the second highest fatality rate. Between 1991-2002, 180 construction workers were fatally injured at work, accounting for 22% of all deaths. The fatality rate for construction was 10.0 per 100,000 workers, approximately 4.5 times the overall rate for the state and close to the construction fatality rate for the nation (MDPH, 2002). The leading fatal event among construction workers was falls (52%), followed by contacts with objects and equipment (19%). Approximately 68% of the Massachusetts construction workers killed at work were employed by companies with ten or fewer employees, underscoring the need to target small firms for prevention.

Although the number of deaths in agriculture was much lower than that for construction, the fatality rate of 11.9% per 100,000 workers was the highest of all industrial sectors. Close to two-thirds of the deaths within agriculture occurred in Landscaping and Horticultural Services and involved landscapers, arborists, and tree trimmers. Fatalities related to tree work also appeared in a number of other categories (e.g. loggers in manufacturing, public utility workers) highlighting the importance of looking across industries by source of injury to compile a comprehensive picture of fatality patterns.

Fishing stands out as an exceptionally high risk job in Massachusetts. There were 61 fishing-related deaths between 1991-2002. Due to inadequate denominator data, it was not possible to compute a fatality rate for the fishing industry specifically. Occupation specific rates, though also limited by inadequate denominator data, suggest that the fatality rate for fishers may be as high as 108 per 100,000 workers. An exceptionally high rate for fishing workers has also been reported nationally (BLS, 1998; Kaplan and Kite-Powell, 2000).

In Massachusetts, federal OSHA coverage does not extend to state and municipal workers. During 1991-2002, 89 public sector workers were fatality injured. The fatality rate for the public sector (2.0 per 100,000 workers) was similar to the private sector rate. Over 40% (n=38) of the public sector deaths involved individuals employed in protective services, such as firefighters and police; the remainder were employed in a wide variety of jobs within public agencies ranging from construction to transportation services. Homicide led all other events in the public sector (n=17) followed by roadway motor vehicle incidents (n=16) and pedestrian deaths (n= 14).

Establishment Size: The finding that many of the victims were employed in small establishments was not limited to the construction industry. Almost half (49%) of all Massachusetts fatalities occurred in establishments with 10 or fewer employees in a variety of industries. An additional 9% occurred in establishments with 11-19 workers. In Massachusetts, approximately 23% of the workforce is employed in establishments with less than 20 employees (MDCS, 2004). These findings indicate that workers in small establishments are at high risk and highlight the need to develop strategies to reach small businesses across industrial sectors (NIOSH, 2000).

Massachusetts's surveillance findings also underscore the limitations of relying on OSHA to investigate work-related deaths. Fatal occupational injuries often occurred in either industries or circumstances outside of OSHA's jurisdiction, such as self-employed workers and public sector employees, or were due to causes not addressed by OSHA (i.e. homicides and roadway motor vehicle incidents). From 1991-2002, 65% of identified fatalities fell into categories not addressed by OSHA.

Gaps in Knowledge: While these summary statistics provide essential information, more in-depth information is required to understand the specific factors leading to these fatal events in order to develop effective intervention strategies. On-site, research-oriented fatality investigations are needed to provide this critical information (NIOSH, 1998). Consider, for example, the fatality of a 37-year-old plant operator. Surveillance data indicate that he suffered blunt trauma to the head when he fell nine feet from the top of a home heating truck at a Massachusetts oil supply terminal. These data do not reveal what should be done to prevent similar incidents in

the future. The Massachusetts FACE investigation identified multiple factors that contributed to this incident and resulted in a number of specific recommended countermeasures, including: 1) the use of a system to stabilize the fuel loading boom; 2) installation of mechanical devices to reduce the build up of pressure; and 3) the manufacture of trucks loaded from the bottom rather than the top so workers can fill the tanks from the ground. All these recommendations have reportedly been implemented by the industry (Ranalli, 2000).

Also data collection is only an essential first step. Intervention activities guided by surveillance findings and knowledge gleaned from field investigations are needed at the national, state and local levels to reduce the human and economic burden of preventable deaths at work.

Aims of the Cooperative Agreement

Since April 1990, the Occupational Health Surveillance Program (OHSP) in the Massachusetts Department of Public Health (MDPH) has participated in the NIOSH Fatality Assessment and Control Evaluation (FACE) program. In September 2001, MDPH entered into a five year cooperative agreement with NIOSH to continue and enhance the Massachusetts FACE project. A two month no cost extension enabled us to continue work on this project through October 2006. The long range goal of this five year project was to reduce the incidence and associated human and economic burden of traumatic occupational fatalities in the Commonwealth. Specific aims were:

Aim 1. Surveillance: To maintain the current surveillance system for timely identification and collection of data on all traumatic occupational deaths to identify high risk workplaces and populations in Massachusetts.

Aim 2. FACE Investigations: To conduct a minimum of 10 on-site investigations of targeted fatalities per year using FACE investigative methods to identify risk factors and develop recommended countermeasures to control or eliminate identified risks.

Aim 3. Information Dissemination: To disseminate surveillance and investigative findings, FACE reports, NIOSH Hazard Alerts, FACE Facts and other injury prevention information to workers, employers and health and safety professionals and advocates who can intervene in the workplace to prevent workplace deaths.

Aim 4. Targeted Prevention: To plan, conduct and foster collaborative prevention activities targeting identified industries, groups of workers or hazards to reduce the incidence of traumatic occupational fatalities in Massachusetts.

The remainder of this report is organized according to these aims. Under each aim, accomplishments of the Massachusetts of the Massachusetts FACE project during the project period are summarized, challenges in meeting aims are identified, and implications for future fatality surveillance activities in Massachusetts are discussed.

Aim 1. Maintain the current surveillance system for timely identification and collection of data on all traumatic occupational deaths to identify high risk workplaces and populations in Massachusetts.

Throughout the project period, Massachusetts FACE continued to work closely with numerous municipal, state and federal agencies to identify and document all traumatic occupational fatalities in Massachusetts on a current basis. We collaborated with the Massachusetts Census of Fatality Occupational Injuries (CFOI), also housed within OHSP, in collecting surveillance data. Over 25 diverse sources were used to identify and verify these deaths. These included, among others, death certificates, Occupational Health and Safety Administration (OSHA) records, workers' compensation records, Coast Guard records, police reports, and media reports collected through a clipping service, as well as calls from OHSA, police, town clerks and medical examiners (ME).

In our experience, Massachusetts FACE has found that notification within the first few days after the incident is critical for initiating successful investigations. Since potential notifiers are not always aware which incidents are targeted for investigation, it is important to encourage timely reporting of all fatalities. Throughout the project period, Massachusetts FACE maintained its 24-hour Occupational Fatality Hotline, first established in 1991, and conducted outreach to MEs, police and fire departments, town and city clerks (who issue death certificates for burial purposes), and local Boards of Health, encouraging them to report all workplace fatalities immediately. In 2001, 2002, 2003, and 2004, Hotline reminders together with annual Fatality Updates were sent to a statewide network of over 2,000 potential reporters. In 2001 and 2004, Hotline rolodex cards were disseminated with the reminders. The annual Fatality Update is a joint product of Massachusetts FACE and the CFOI program. Given changes in CFOI staff, this update was not produced in 2005. A two year update and Hotline reminder is scheduled to be disseminated to potential reporters by the end of 2006.

Massachusetts FACE continued its reciprocal referral agreement with OSHA Region I to immediately report work-related deaths. The agreement with OSHA was confirmed at annual meetings with the Regional OSHA director. During the project period, 131 referrals were received from OSHA, the majority of which were referred within days of the incident. In turn, Massachusetts FACE referred identified fatalities to the OSHA regional office.

This period, Massachusetts FACE also met with the new Massachusetts Chief Medical Examiner and re-established contact with the Fishing Vessel Safety Coordinator for the Coast Guard. In addition, as discussed below, Massachusetts FACE piloted investigating deaths of public sector workers. This effort has led to an expanded working relationship, including mutual referrals of public sector deaths, with the Division of Occupational Safety (DOS) in the Massachusetts Department of Labor and Workforce Development.

Massachusetts FACE continued to use an electronic "First Report" data base system to maintain and manage fatality records. A new and improved data base system developed with much help from the Alaska FACE program was implemented in 2002. Telephone or written follow-back to potential information sources was conducted to complete First Report information on work-related fatalities as necessary. Whereas we had originally proposed to electronically submit First Report data to NIOSH bi-weekly, we discontinued doing so in 2002 upon request of NIOSH and consensus of the FACE Coordinating Committee (FACE CC). Massachusetts FACE has continued to forward to NIOSH notice of all Massachusetts deaths within the targeted categories on a monthly basis.

Between September 2001 and October 2006, 306 fatal incidents resulting in 327 work-related deaths were identified and entered into the First Report data base. Hotline calls were the second most frequent source of first notification (30%), following local new media (42%). Hotline calls were received for 68% of the fatalities. Although the most frequent and the timeliest caller to the Hotline was OSHA, calls from MEs increased dramatically this past year. Of the 306 fatal incidents during this time period, 54 (18%) were identified by Massachusetts FACE on the day of the incident, 71 (23%) were identified on the day following and an additional 85 (28%) identified from two - ten days after the death. Seventy-eight percent were identified within 30 days of the death. Summaries of first notification sources and Hotline calls are included in Appendix 1.

Feedback is an essential component of any active reporting system and Massachusetts FACE continued its efforts to provide feedback to Hotline reporters. Hotline reporters were routinely sent thank you letters as well copies of the relevant FACE reports when the cases were investigated.

As proposed, Massachusetts FACE also established a working definition of warehouse related fatalities and added indication of these deaths in the surveillance database. We had also proposed working with the FACE CC to establish an operational definition of emerging technologies to highlight sentinel events for investigations. While this topic was raised for discussion with the FACE CC, an operational definition of emerging technologies was never developed.

In Year 1 (2001), Massachusetts FACE also undertook a new initiative to explore the feasibility of collecting information on race, ethnicity, and country of origin for all identified fatalities in a timely enough fashion to target fatality investigations based on these worker characteristics. We found that this information was usually available to us early on and subsequently included race, ethnicity, and nativity information in the First Report data base, updating it as necessary. Media, OSHA, and police reports often contain some indication, sometimes just the name, that a minority or immigrant worker was involved. The key source of information, however, is the death certificate which we request directly from the town once we learn of a death; these are readily available to us within several days. In 2002, we formally added Hispanic/immigrant worker deaths as a target for in-depth field investigations (See Aim 2).

As proposed, Massachusetts FACE worked to improve its procedures to assure completeness of accuracy of surveillance data. First Report data were reviewed quarterly to verify case counts and to identify missing information and any data discrepancies. Massachusetts FACE worked with CFOI staff to resolve identified problems.

Work-related homicides are a leading cause of fatal occupational injuries in Massachusetts as they are nationwide. While investigating homicides is considered beyond the scope of FACE, further documentation of these deaths may not be. As a new initiative during this period, Massachusetts FACE and CFOI collaborated with the MDPH Injury Surveillance Program that implements the new National Violent Death Reporting System (NVDRS) in Massachusetts to verify counts of work-related violent deaths and to collect information on intent and relationship of the perpetrator to the victim. We are continuing this effort under our new cooperative agreement to determine whether the information sources used by NVDRS include information about several additional data elements relevant to occupational homicides, including number of employees on site at time of the incident, and worksite training on violence prevention.

Established procedures were followed to assure confidentiality of FACE information. Electronic data were maintained in password protected files. Names of persons interviewed were deleted from paper files when case reports were completed. Data sharing between FACE and CFOI was carried out in accordance with FACE and CFOI confidentiality rules and with data sharing agreements that have been established with data providers. Of note, death records are public in Massachusetts.

Aim 2. Conduct on-site investigations of targeted fatalities using FACE investigative methods to identify risk factors and redevelop recommended counter measures to control or eliminate identified risks.

As proposed, Massachusetts maintained a full-time FACE investigator throughout the project period. A total of 55 FACE investigations were initiated. Thirty-seven field investigations were completed using FACE investigative methods and an additional three are ongoing. Supplemental data collection instruments developed by the NIOSH FACE program were routinely used in collecting information during the course of investigations.

Initially proposed targets for investigation included the national targets of work zone, machinery-related fatalities and state specific targets of warehouse and chemical related fatalities. In 2002, we added the then new NIOSH investigation target of Hispanic workers but expanded this to include other immigrant worker deaths in Massachusetts. We also piloted investigations of public sector fatalities. The fatal incidents investigated this period include 16 machine-related fatalities, three highway work-zone fatalities, three public sector worker deaths, four struck-by fatalities, and one young worker death. We investigated nineteen Hispanic/immigrant worker fatalities of which seven were also included in the machine-related category. (See list of completed investigations in Appendix 2.) Of the remaining 16 investigations that were initiated, but never completed, five involved travel to the incident location and/or the employer's office. All of these 16 cases involved multiple phone calls and/or letters and time searching for phone numbers, addresses and other approaches to try and proceed with the investigations. Additional details on investigation of targeted fatalities are provided below.

Work zone and machinery-related deaths. Massachusetts FACE initiated investigations of all work zone deaths (n=5) and 22 of the 27 of the machine-related deaths. The five machine-related incidents for which investigations were not initiated were deaths in which either there were no witnesses or substantial time had elapsed prior to identifying the deaths and we did not feel we could adequately document the incidents. Of the work-zone and machine investigations initiated, 3 and 16 were completed respectively.

Young worker fatalities. OHSP has a longstanding interest in work-related injuries to youths under age 18 and conducts statewide surveillance of non-fatal as well as fatal injuries in this population. Massachusetts FACE has attempted to conduct investigations of all deaths among young workers since 1991 and works closely with the OHSP *Teens at Work* Project in conducting these investigations and developing recommended countermeasures. During the project period, Massachusetts FACE initiated investigations of the three young worker deaths identified and completed one investigation. In the remaining two cases, either the family or employer was unwilling to cooperate. The *Teens at Work* Project has also piloted the use of FACE methodology to investigate serious non-fatal incidents; this period, Massachusetts FACE collaborated with *Teens at Work* in investigating two serious non-fatal incidents involving vocational students. One resulted in an alert disseminated to vocational education programs statewide (See Aim 3 below). Massachusetts FACE also assisted OHSP staff responsible for tracking serious chemical poisonings in investigating a carbon monoxide (CO) exposure resulting in four workers being treated for CO poisoning.

Immigrant worker deaths. This project period, Massachusetts successfully expanded the focus of our investigations to include incidents involving Hispanic and other immigrant workers. As part of this effort, we developed a first draft of a data collection supplement for immigrant worker fatalities that served as the basis for the *Immigrant Workers/Limited English Speakers Workers Investigation Guidelines* now used by NIOSH and other FACE states. Given difficulties in both collecting and reporting data pertaining to the employment status of immigrant workers, the supplement focuses on training and communications in the workplace. We have found that even collecting information about the English language capability of the victim can be challenging. To improve our ability to document these deaths, Massachusetts FACE also conducted outreach to develop working relationships with a number of community organizations serving immigrant groups. These included, for example, the Brazilian Immigrant Center, the Vietnamese - American Initiative for Development (Viet-AID), and the Immigrant Worker Project at the Massachusetts Coalition for Occupational Safety and Health (MassCOSH), a longstanding OHSP partner. In a number of our FACE cases, our community partners provided valuable assistance in interfacing with family members and collecting additional information about the victims' work experience in the US and English language capabilities. They also assisted with translating materials. Our experience underscores that input from newcomer communities can be key in documenting immigrant worker deaths and in the development of recommendations for effective prevention strategies. We have proposed to continue and expand our work with newcomer communities in our ongoing FACE project now incorporated under our Expanded Surveillance Program cooperative agreement.

Warehouse-related deaths. Our experience during an earlier project period had identified warehouse-related fatalities as a potential emerging problem in light of increases in web-based purchasing and just-in-time production. As proposed, we proceeded to develop a draft data collection instrument for warehouse-related deaths. However, since the development of the data collection instrument, only one warehouse-related fatality has occurred in Massachusetts. This fatality was identified multiple months after the incident and was not investigated by Massachusetts FACE.

Public sector workers. Massachusetts does not have public sector OSHA coverage. The Division of Occupational Safety (DOS) in the Massachusetts Department of Labor and Workforce Development, however, provides technical assistance to state and municipal agencies. DOS has right of access to most but not all state and municipal workplaces. As a new initiative this project period, Massachusetts FACE collaborated with DOS in conducting non-regulatory investigations of several public sector worker fatalities. Three of five investigations initiated were completed. The two initiated investigations that were not completed involved the

same uncooperative state authority. In response to local concern about lack of coverage for public sector workers, public sector deaths have been added as a target for investigation in our ongoing FACE project.

Fall-related deaths. While fatal falls to lower levels are no longer a national FACE target, they have continued to be a priority in Massachusetts where they have remained the single leading fatal event. As proposed, Massachusetts FACE continued to gather a subset of the information in the fall supplement from secondary data sources on all fatal falls and to include this information in our surveillance database. Whereas we did not prepare full FACE reports for these incidents (with the exception of some fatal falls involving immigrant workers), we have analyzed the data collected and included findings in summary data reports (see below).

FACE reports including recommended countermeasures that move beyond compliance to identify innovative prevention strategies were prepared for all completed investigations. Massachusetts FACE finalized 32 reports this project period. Several additional reports are currently in various stages of development or review. As discussed, Massachusetts FACE has developed the necessary working relationships with local and state public safety agencies to readily obtain information about specific deaths. We have also established relationships with a variety of labor, industry and academic experts to enhance our technical skills in developing innovative yet feasible recommendations. This period, we continued our collaboration with the engineering school at the University of Massachusetts at Lowell (UML). (See Aim 4.). Select FACE reports were forwarded to UML engineers for review, and we met with them as a group at least annually to obtain input regarding recommended countermeasures. We also worked with the Northeast Center for Agricultural and Occupational Health and Safety in completing a report on a 2000 agricultural death.

MDPH does not have legal access to most worksites but in the majority of cases has gained entry to worksites for FACE investigations. The Region I OSHA office continued to be very supportive of Massachusetts FACE throughout the project period, and facilitated FACE access to worksites on several occasions. OHSP staff met annually with the Region I OSHA Administrator to assure continued cooperation and information sharing between agencies and the Massachusetts FACE investigator maintained solid working relationships with compliance officers in the field. OSHA reviewed drafts of all Massachusetts FACE reports involving deaths investigated by both agencies.

In our 2001 Cooperative Agreement application, we had proposed routinely submitting supplemental data to NIOSH for all nationally targeted fatalities. This practice was discontinued in 2002 upon request of NIOSH and consensus of the FACE CC. This information remains available to NIOSH upon request.

The total number of completed investigations during the project period was less than the 12 per year initially proposed in 2001. This in part reflects a mid-course decision, prompted by increased NIOSH focus on demonstrating program impact, to place greater emphasis on intervention activities. In addition, investigations of immigrant worker deaths have been particularly challenging and related efforts to reach newcomer communities have been time consuming. We also experienced somewhat more employer resistance than in previous project periods. We maintain that the field investigations are the core of the FACE program, leading to critical insights about potential countermeasures and providing the compelling case studies that can prompt local action. We believe that approximately ten investigations per year, coupled with related intervention activities is a reasonable aim given available resources, and have proposed to complete ten investigations annually in our ongoing FACE project. Increased emphasis will be placed on targeting for investigation those incidents that promise to provide new information about risk factors and/or contribute to an ongoing intervention focus.

Aim 3: To disseminate surveillance findings, FACE reports, NIOSH Hazard Alerts, FACE facts and other injury prevention information to workers, employers and health and safety professionals and advocates who can intervene in the workplace to prevent workplace deaths.

The proposed information dissemination activities fell into three subcategories; a) worksite based dissemination of FACE reports; b) industry-wide dissemination of FACE reports and other injury prevention information and

broad-based dissemination of surveillance findings. Accomplishments in each of these areas are described below:

Worksite-based dissemination. FACE reports were routinely disseminated to those involved in the incidents (employers, worker representatives, police, medical examiners, etc.). This period 32 reports were disseminated. Next-of-kin of the decedents were informed by letters that investigations were underway and provided with copies of FACE reports upon request. Approximately one third of next-of-kin requested copies of the reports. When requested, Massachusetts FACE provided next-of-kin and family members with information about OSHA involvement including the name and phone number of an OSHA official in the regional office, and the OSHA Fact Sheet: *OSHA's Role When a Worker Dies On the Job*. During this project period, there were several immigrant worker fatalities where the next-of-kin was located in the victims' home countries. In each of these cases, Massachusetts FACE mailed the next-of-kin the informant letter in both English and translated into the primary language of the country.

A review of summary data on workplace fatalities revealed that in many of the fatal incidents, workers' compensation claims for death benefits were not filed. As a new initiative this period, Massachusetts FACE developed a fact sheet on workers' compensation death benefits that is currently under review at the Massachusetts Department of Industrial Accidents. We have proposed to disseminate this document together with the OSHA Fact sheet to surviving families as part of our ongoing FACE project.

Industry-wide dissemination. All FACE reports were also routinely distributed to a core group of other stakeholders in the state. The Massachusetts FACE core dissemination list includes over 51 organizations and individuals. Thirty-two FACE reports have been disseminated to this core list since September 2001. In addition, to disseminate information to those at risk and those who can affect change, for each FACE report, staff worked to develop a specific dissemination list that includes relevant unions, trade associations, employers and other organizations. This period Massachusetts FACE identified and/or developed mailing databases for a number of targeted industries, including, for example, wood floor finishing contractors, forklift sales and rentals, roadway construction companies, tire repair stations, sheet metal companies, public works departments, dairies, state police, vehicle mounted lift rental agencies, home heating oil companies, dry cleaners, building management companies, and stone slab companies, and community organizations serving immigrant communities. Relevant NIOSH alerts and OSHA health and safety bulletins were included with the FACE reports in several of the industry-wide mailings. These included the NIOSH Alert: Preventing Injuries and Deaths of Workers Who Operate or Work Near Forklifts, Building Safer Highway Work Zones: Measures to Prevent Worker Injuries From Vehicles and Equipment, and NIOSH Alert: Preventing Worker Deaths from Uncontrolled Release of Electrical, Mechanical, and Other Types of Hazardous Energy. Massachusetts FACE also disseminated the NIOSH Alert: Preventing Death, Injuries and Illness of Young Workers and the NIOSH CD: NIOSH Safety Checklist Program to 550 high schools, including vocational schools, in Massachusetts.

Over the years, we have come to recognize the importance of developing short, user friendly materials and have increasingly worked to develop one-page FACE Facts based on FACE investigations that can be posted in workplaces. As shown in Table 1, eight FACE Facts were developed and disseminated this project period, and two are in the final stages of development. As noted in the table, several of these FACE Facts were translated into other languages. The languages were chosen on the basis of the demographics of the relevant industry in Massachusetts. Feedback questionnaire / Fax requests forms for additional copies were included when disseminating FACE Facts and proved a useful tool for measuring reader satisfaction and interest.

The investigations of two wood floor finishing incidents that led to three fatalities and three serious burn injuries prompted Massachusetts FACE to collaborate with the Massachusetts State Fire Marshal to release a Fire Safety Alert (FACE Facts) entitled, "Wood Floor Sanders Killed When Floor Finishing Product Catches Fire-Massachusetts." The Fire Safety Alert has been disseminated to wood floor contractors in the state in both English and Vietnamese. The alert also went to manufacturers of wood flooring and wood floor finishing products and the distributors of these products and to members of the Wood Flooring Manufacturers Association

(NOFMA) and the National Wood Flooring Association (NWFA). The State Fire Marshal has disseminated the alert to all hospitals and fire chiefs in the state. The feedback has been overwhelmingly positive with requests for 1,580 copies of the English version of the Alert and 2,547 copies of the Vietnamese version. Examples of comments received to date from floor finishing contractors and floor finishing product manufacturers and distributors include “the alert is long over due in this industry” and “Thank you for this valuable information”.

Table 1. Massachusetts FACE Facts – September 2001-September 2006

Title	Dissemination
Massachusetts welders killed in explosions caused by torch cutting containers (English and Spanish)	Disseminated to 372 city departments of public works, 232 home heating oil companies and 59 sheet metal manufacturing companies. Also provided multiple copies to the OSHA Region 1, Springfield Area office for inclusion in a packet of educational materials on welding safety for a seminar that they sponsored.
A 16-year-old youth was fatally injured at work while operating a forklift (English and Spanish)	This incident also prompted the development of a bi-lingual "forklift" sticker. See discussion below.
Massachusetts police officers killed in highway and street work zones	Disseminated to 351 police departments and to 372 departments of public works in Massachusetts. Received requests for 2,141 additional copies.
A 15-year-old student amputates fingers while operating an unguarded table saw in woodworking class	Disseminated to 365 schools. Received requests for 2,456 additional copies. In a related follow-up effort, we worked with NIOSH, the MA Department of Education to disseminate to all MA high schools two new NIOSH publications: a NIOSH CD titled NIOSH Safety Checklist Program for Schools and a NIOSH Alert: <i>Preventing Death, Injuries and Illness of Young Workers</i> .
Two vehicle mounted work platforms overturn killing the operators	Disseminated 75 copies to 45 work platform rental agencies and a handful of service centers. (To ensure accuracy FACE Facts and feasibility of recommendations, Massachusetts FACE obtained input from the Safety Officer at the Engineers Training Center for the International Union of Operating Engineers)
Worker killed while inflating a tire mounted on a multi-piece rim	Disseminated 112 copies to 56 truck tire service centers, truck driving schools, and trade/union groups. Received requests for 496 additional copies.
Hospital employee clearing snow killed when his skid-steer loader broke through a sidewalk ventilation grate	Disseminated 245 copies to 215 urban snow removal and property management companies. Another dissemination is planned for the beginning of the winter season targeting all municipalities.
Wood Floor Sanders Killed When Floor Finishing Product Catches Fire-Massachusetts (English and Vietnamese)	Disseminated to 718 individuals that consisted of wood floor contractors, wood floor product distributors, wood floor and wood floor product manufacturers, and to the member of the NOFMA and the NWFA. The State Fire Marshal has disseminated it to all hospitals and fire chiefs in the state. To date received requests for over 4,000 copies. Additional dissemination is ongoing.
Roofer Electrocuted When Aluminum Extension Ladder Contacts Overhead Power Line-Massachusetts (translation into Portuguese and Spanish is planned)	Dissemination is ongoing as of December 2006.
Worker Killed When Crushed by Multiple Granite Slabs-Massachusetts (translation into Portuguese is planned)	Dissemination is planned for early 2007.

Prompted by the death of a 16-year-old fatally injured operating a forklift at work, Massachusetts FACE collaborated with the OHSP Teens at Work Project to develop a sticker for use on forklifts illustrating that child labor laws prohibit teens from using these machines. The sticker was disseminated to 596 warehouses, manufacturing facilities, and forklift rentals and distributors with a cover letter signed by the Massachusetts Office of the Attorney General, the U.S. Department of Labor (US DOL), and MDPH. Included in the mailed packet were the related FACE Facts, an MDPH employer guide to the child labor laws, and a fax request sheet for more stickers. Subsequently, Massachusetts FACE has received requests for more than 3,450 "forklift stickers". The NIOSH Alert: *Preventing Injuries and Death of Workers Who Operate or Work Near Forklifts* is included when requested stickers are mailed out. The success of the young worker forklift safety sticker prompted US DOL to ask Massachusetts FACE to develop a bilingual Spanish-English version. The US DOL has since reproduced our bilingual version of the sticker and made it available on their Web site. They estimate that they have disseminated 100,000 copies nationwide.

In a recently completed OHSP research project to document the occupational health experience of immigrant workers, OHSP found that the majority of foreign born workers had limited health and safety training and were unaware of OSHA and other local health and safety resources. Among 834 foreign born workers who completed face to face interviews in one of five languages, 75% reported that they had not heard of OSHA. As a new initiative, Massachusetts FACE developed *Safety Alerts* based on investigated fatalities involving immigrant/minority workers. These tragic events are "teachable moments" for reaching the affected communities. The *Safety Alerts* were targeted to workers and intended to promote community awareness of health and safety risks, legal rights, and resources. Each included a brief synopsis of the incident, general prevention messages, and a list of local health and safety resources. Because they included only very limited information about the incident, they can be more timely than full FACE reports. These one-page alerts were English on one side and translated into the language of the victim on the other. During the project period, five were developed and provided to our community partners for dissemination to the affected newcomer communities through their networks and local newspapers. We have proposed to continue these alerts during Year 1 as part of our ongoing FACE project, and to continue in subsequent years pending an evaluation of secondary distribution of these alerts by community partners.

Massachusetts FACE has also had success this period in publishing case reports in several trade publications, including the *Dry Cleaners News* and the *NITCO Materials Handling Solutions*, an electronic email newsletter and in *Compact Equipment*. In addition, the June 2006 edition of NIOSH eNews (Volume 4, Number 2, June 2006) highlighted the work Massachusetts FACE has been doing around the hazards of using highly flammable lacquer sealers in floor finishing.

Massachusetts FACE also disseminated information through speaking engagements with industry, labor, and academic groups, and has developed case studies based on FACE investigations for use in teaching. Examples of presentations this project period include: Occupational Health and Safety Workshops at the annual Vocational Educators Conference organized by Massachusetts Association of Vocational Administrators, Massachusetts Center for Career and Technical Education, and Massachusetts Department of Education; Brockway-Smith Company, monthly safety and health meeting; University of Massachusetts Lowell Accident Causation course; International Conference on Roadway Work Zone Safety; Northeast Regional Occupational Disease and Injury Surveillance Conference; Massachusetts Education Construction Career Day; Massachusetts Child Fatality Review Annual Conference; and annual lectures in the Injury Control course at the Harvard School of Public Health.

Analysis and dissemination of surveillance findings: OHSP completed annual analyses of the fatality surveillance data. The annual Massachusetts Fatality Update is a joint product of Massachusetts FACE and the CFOI program. This project period annual Fatality Updates were published in 2001, 2002, 2003 and 2004, and disseminated to a mailing list of over 2,000 individuals and agencies. The most recent update was delayed due to changes in CFOI staff but a two year update is currently in the process of being disseminated with a Hotline poster. This period, OHSP also completed a nine-year report *Fatal Occupational Injuries in Massachusetts*,

1991-1999, which was disseminated widely within Massachusetts and to other states. This report included several focused sections on special topics, including commercial fishing fatalities, falls in construction and workplace homicide. Additional and more recent focused analyses have examined falls in construction, all fatal traumatic brain injuries and fatal work-related burns. Data from these analyses have been included integrated into several MDPH wide injury reports.

With the increasing visibility of Massachusetts FACE and the availability of summary statistics, OHSP also responded to numerous public information and media requests for statistics regarding occupational fatalities on an ongoing basis. Examples include requests for deaths to Hispanic and Brazilian workers, fishing related deaths, construction fatalities and fatalities associated with the Central Artery Big Dig project and deaths of young workers. Each year Massachusetts FACE also provided information, including fatality data by town and country, requested by the community in preparing for Worker Memorial Day in April.

Increased emphasis this period was placed on disseminating information through the MDPH/OHSP website. (www.mass.gov/dph/ohsp). The website was revised and updated. All FACE facts, alerts, educational materials and fatality updates were posted on the MDPH/OHSP on the website as were links to the national FACE website and other key health and safety resources. Data on occupational fatalities in Massachusetts was also included in the Massachusetts Occupational Health Indicator report that is posted on the Massachusetts Community Health Information Profile (MassCHIP) – the MDPH's queriable electronic public health information system.

Aim 4. To plan, conduct and foster collaborative prevention activities targeting identified industries, groups of workers or hazards to reduce the incidence of traumatic occupational fatalities in Massachusetts.

Over the course of the project period, increased emphasis was placed on translation of surveillance findings into public health action. Massachusetts FACE undertook in a number of prevention activities that went beyond information dissemination and involved working relationships with stakeholders to promote change. These activities included education and outreach efforts to targeted industries and worker populations, and efforts to foster technological and policy solutions to identified problems.

The Fall Prevention Project: Massachusetts FACE has used surveillance and investigation data to identify specific industries for more in-depth outreach and education. Falls in construction have continued to stand out as a prevention priority. In 1996, Massachusetts FACE initiated a Fall Prevention Project that was continued throughout this project period. We have worked to develop and disseminate educational materials on fall prevention to residential construction contractors. Based on an initial, informal survey of contractors at their job sites, we developed a series of three educational brochures on fall prevention. We then distributed the brochures and a feedback form to a sample of 100 small contractors through direct mail. The response rate was 30% with the majority of responses highly positive. The brochures have subsequently been translated into Spanish, Haitian Creole and Portuguese and disseminated through vocational schools, community health centers, and Inspectional Services Departments (ISDs), the municipal departments that issue construction permits for most residential as well as commercial construction and renovation. In 2001, we contacted 51 ISDs receiving the brochures to replenish their supplies. Of the 51 ISDs contacted 45 had very positive comments and requested more copies. Each year we have expanded the number of ISDs enlisted to disseminate the brochures targeting towns with the highest rates of residential construction.⁴ Materials continued to be requested throughout the project period. As of 2006, brochures are disseminated through 75 ISDs.

Given the continuing problem of fatal falls in construction and the increasing number of immigrant workers employed in construction, over the last two years Massachusetts FACE has expanded efforts to address the problem. We enlisted experts in occupational safety and cross cultural communications from the Hispanics

⁴ This information is available through the Massachusetts Institute for Social and Economic Research (MISER) at U Mass Amherst.

Work Safe Project at University of Massachusetts at Lowell to develop new culturally sensitive educational materials on personal fall protection and on roofing and to field test these new materials and our existing brochures with Hispanic and Brazilian workers. We have just received the results of the field testing which will be used in developing revised editions of the brochures for the next printing.

In 2005, we identified a number of different Massachusetts agencies and organizations with activities underway to prevent falls in residential and small scale construction. In May 2005, together with Region I OSHA, we convened an initial meeting of these stakeholders to: 1) share information about current fall prevention activities; and 2) identify opportunities for collaboration and gaps that remain to be addressed. Since this first meeting this group now called the Preventing Falls in Construction Working Group has met four additional times. Each of these meetings has been well attended. (See list of participants in Appendix 3.) Ongoing and potential intervention activities discussed have ranged from current OSHA efforts to provide OSHA training to municipal building inspectors and vocational education teachers to the possibilities of changing the licensing test for small contractors to include health and safety and the development of an "Ask Cheo" (Hispanic Work Safe Mascot) column in language newspaper, the responsibility for which could be shared by the group. The Working Group prompted a review of built-in anchor systems in residential construction (prepared by an occupational medical resident, previously an architect, doing a public health rotation in the OHSP), provided expert input to a PDA ladder risk assessment tool being developed as part of a NIOSH funded research project, helped develop recommendations for inclusion in the state's Traumatic Brain Injury (TBI) prevention plan (see below), and promoted collaboration between group members conducting training for immigrant construction workers in Massachusetts and those working to provide OSHA -10 hour training to teens. Massachusetts FACE has proposed to continue to bring these stakeholders together as part of the ongoing FACE project to continue to share information and to identify prevention activities that might be undertaken by the group. The aim is to accomplish at least one joint project and to identify potential resources for implementing additional prevention recommendations.

Massachusetts FACE has also participated in the Massachusetts Department of Public Health's TBI Task Force that is developing a strategic plan for prevention of TBIs in Massachusetts. We sought input from the Preventing Falls in Construction Working Group and translated this input into specific recommendations ranged from enhancing surveillance to building infrastructure to address fatal falls in construction. These recommendations have been submitted and included in the Massachusetts strategic plan for prevention of TBIs. Massachusetts FACE's success in getting falls in construction on the statewide TBI agenda is an important example of integrating occupational health into mainstream public health practice and developing new allies for protecting the health of workers.

Violence at Work: A 2004 death of 18-year-old Brazilian drugstore worker stabbed while confronting a shoplifter has raised the visibility of violence as an occupational health concern in Massachusetts. The Massachusetts Coalition for Occupational Safety and Health (MassCOSH) and COBWEB (Coalition for a Better Work Environment for Brazilians) have established a work group to address violence against young workers employed in retail. Massachusetts FACE in collaboration with the *Teens at Work* Project provided assistance to this group, which has guided teen peer health and safety leaders in conducting a survey of teens working in drugstores about their experiences with robberies and shoplifting at work, and violence-prevention training and policies. Of the 70 workers interviewed, 27% reported that they had experienced robberies, but 74% had never received training about robbery or theft situations. The survey report was presented to Boston city government that is considering a local ordinance requiring employers to provide employees training on violence in the workplace. This activity also influenced recently passed legislation passed updating the Massachusetts child labor laws that includes a new provision prohibiting teens from working alone past 8 pm.

Floor Refinishing Safety and Health Task Force. In Massachusetts, three Vietnamese wood floor sanders died within a 10 month period (September 2004 – July 2005) in two separate fires when the flammable lacquer floor sealer they were using caught fire. The 2004 incident prompted local community organizations and health and safety experts to address the problem. In Massachusetts, the industry is largely comprised of minority and

immigrant Vietnamese workers. The victims in these incidents were finishing hardwood floors in residential buildings when the lacquer sealer they were using caused an explosion, igniting the structures. The same lacquer sealer was used in these incidents and was highly flammable with a flash point of 9°F/-13°C. All three of the fatally injured workers and all three of the survivors who sustained various degrees of burns were Vietnamese. Massachusetts FACE, which investigated these incidents and has finalized FACE Reports on each of these incidents, has been participating as a technical advisor to the Floor Finishing Task Force. This task force is spearheaded by several community organizations including Vietnamese - American Initiative for Development (Viet-AID) and MassCOSH. Task Force meetings have included product manufacturers and distributors, union representatives, and Fire Safety professionals as well as the Massachusetts Toxic Use Reduction Institute (TURI). The group enlisted TURI to test the resiliency of environmentally preferable floor sealants, which tend to be less flammable. The task force has submitted legislation that would require certifying floor finishing contractors and workers. Legislation that would ban use of these lacquer sealers is also under consideration.

Massachusetts FACE also collaborated with the Massachusetts State Fire Marshal to release a Fire Safety Alert entitled, "Wood Floor Sanders Killed When Floor Finishing Product Catches Fire-Massachusetts." Viet-AID assisted in reviewing the alert for clarity and appropriateness for dissemination to the Vietnamese community. A key recommendation in this alert is not to use these flammable lacquer sealers. The alert has been disseminated to wood floor contractors in the state in both English and Vietnamese. The alert also went to manufacturers of wood flooring and wood floor finishing products and the distributors of these products. The State Fire Marshal has disseminated the alert to all hospitals and fire chiefs in the state. As described, we have received requests for over 1,600 copies of the alert in English and over 2,550 copies of the alert in Vietnamese. We are now in the middle of a second mailing that includes insurance agencies, facility managers, public housing agencies/associations, and landlord associations. Some of the outreach in this second phase will be via email. Currently, Massachusetts FACE is continuing its work with the Task Force and Fire Marshal to develop a floor finishing safety checklist that will be disseminated to floor finishing contractors. The use of a safety checklist when finishing wood floors was another recommendation in the alert.

Collaboration with the Massachusetts Department of Education. As discussed, Massachusetts FACE collaborated with the Massachusetts Department of Education (DOE) in conducting investigations of several serious injuries to vocational education students. One of these investigations led to a FACE Facts that was disseminated to vocational programs throughout the Commonwealth. In this incident, a student had her finger amputated while working on an unguarded machine. The FACE report called for vocational schools, not covered by OSHA in Massachusetts, to provide working conditions that at a minimum meet OSHA safety and health standards and to train students about these standards. DOE has subsequently required schools to meet OSHA standards and enlisted the DOS to complete full safety audits as part of the periodic formal review of vocational programs. DOE has also entered into an alliance with OSHA to provide OSHA 40-hour training to vocational teachers who, in turn, are offering the OSHA-10 course to students. FACE activities helped to bring this new health and safety focus to vocational education in Massachusetts.

Police fatalities in work-zones. In Massachusetts, municipal police are hired on detail to direct traffic in roadway work zones. Within a 15 month period during 2000-2001, three municipal police officers were killed in work zones while performing traffic details. In two cases, the victims were killed by construction vehicles; in one case they were hit by a passing motorist. Massachusetts FACE conducted investigations of each incident, prepared FACE reports, and also a FACE Facts that combined the lessons learned from the three incidents. One of the recommendations to provide police officers with work zone safety training. A number of municipal departments subsequently expressed interest in training. Massachusetts FACE met with the Police Chiefs Association, who also expressed interest, but we were unable to identify the resources to support police participation in training programs. The possibility of offering this training has recently been raised anew. Another FACE recommendation was that "state government agencies should consider developing state laws that impose increased fines for motorists speeding within roadway work zones." Legislation implementing increased

finer for speed limit violations in work zones was subsequently passed by the Massachusetts legislature. The extent to which the FACE findings contributed to this new legislation is not known.

Collaboration with University of Massachusetts, Lowell: During the last 13 years, Massachusetts FACE has worked to build a collaborative model project with the School of Engineering and the Department of Work Environment at UML. The goal of this project is twofold: 1) to enhance our technical expertise by enlisting faculty/student involvement in the development of recommended countermeasures; and 2) to encourage the incorporation of health and safety considerations into the curriculum of the various engineering departments. Since 1993, Massachusetts FACE has met each year with the engineering faculty, including experts in civil, chemical, mechanical, electrical, and plastics engineering, to review FACE reports and receive faculty input into the development of recommended countermeasures. In addition, individual faculty have provided assistance on an as needed basis. Faculty have, in turn, used FACE reports as case studies in their courses. This project was continued throughout the project period.

Child Fatality Review: In 2000, Massachusetts enacted legislation establishing a Massachusetts Child Fatality Review (CFR) Program. Both state and local CFR teams have been established to review deaths of children under age 18. The purpose of the CFR Program is to examine child deaths from a multi-disciplinary perspective to better understand the causes of these deaths and develop recommendations for changes that will protect the health and safety of children. This period, Massachusetts FACE has developed a working relationship with the CFR Program. We provided technical assistance to the local team investigating the 2004 death of a young worker, and will continue to work with teams in investigations of future deaths. Massachusetts FACE also presented at the 2004 Massachusetts CFR Program meeting. This relationship provides an important opportunity for increasing awareness of occupational health issues of young workers with the pediatric and adolescent health community and may serve as a model for other states.

Fishing Fatalities: Commercial fishing is one of the most dangerous industries in the country. New Bedford, Massachusetts, is the nation's leading fishing port, based on the dollar of the catch (Gavin, 2005). During 1991-1999, Massachusetts, with 57 fishing related deaths, was second only to Alaska in the number of fishers fatally injured at work. From 2000 through 2005 there were an additional 27 fishing fatalities in Massachusetts. Of these, 22 occurred between 2003 and 2005. It has been suggested that new fishing regulations intended to protect the fishing stock may be impacting the safety of those who make their livelihood at sea (Kaplan, 2000). While investigation of fishing-related fatalities, other than machine-related incidents that occur within the three mile limit, is beyond the scope of Massachusetts FACE, we decided this period to take exploratory steps to address the problem. We enlisted the assistance of a fishing safety expert at U Mass Lowell to develop recommendations for improving surveillance and prevention of fishing fatalities in Massachusetts. Based on review of fishing fatalities in Massachusetts over the last five years, and meeting with stakeholders, he has identified data elements that should be recorded for fishing fatalities that would enable us to better assess the potential impact of fishing regulations. We are currently engaged in discussion with the U.S. Coast Guard's Fishing Vessel Safety Coordinator regarding the feasibility of routinely collecting this information.

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PUBLICATIONS

List of Massachusetts FACE reports in Appendix 2
List of Massachusetts FACE Facts in Table 1

MDPH (Massachusetts Department of Public Health). (2002). Occupational Health Surveillance Program. Fatal Occupational Injuries in Massachusetts, 1991-1999.

MDPH (Massachusetts Department of Public Health). (1999, 2000, 2001, 2002). Occupational Health Surveillance Program. Fatal Injuries at Work, Massachusetts Fatality Update.

INCLUSION OF GENDER, MINORITY AND CHILDREN SUBJECTS

Women, individuals under and 18, and minority groups were included in the scope of the project. No individuals were excluded on the basis of race, ethnicity, religion, gender or age. The FACE surveillance system included a full census of children, women and minority individuals were fatally injured at work. Deaths of working children less than 18 years of age and Hispanic and immigrant workers were targeted for in-depth field.

MATERIALS AVAILABLE FOR OTHER INVESTIGATORS

A draft data collection instrument for warehouse-related deaths is available for other researchers and can be obtained from the Principal Investigator on request.

Inclusion Enrollment Report

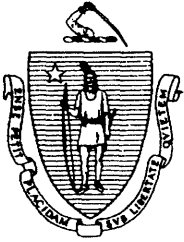
This report format should NOT be used for data collection from study participants.

Study Title: Fatality Assessment and Control Evaluation327 (9/01 - 10/06) - DataTotal Enrollment: provisional pending final edits. Protocol Number: _____Grant Number: U60/OH008331-02

PART A. TOTAL ENROLLMENT REPORT: Number of Subjects Enrolled to Date (Cumulative) by Ethnicity and Race				
Ethnic Category	Sex/Gender			Total
	Females	Males	Unknown or Not Reported	
Hispanic or Latino	2	28	0	30 **
Not Hispanic or Latino	10	219	0	229
Unknown (individuals not reporting ethnicity)	5	53	10	68
Ethnic Category: Total of All Subjects*	17	300	10	327 *
Racial Categories				
American Indian/Alaska Native	0	1	0	1
Asian	1	10	0	11
Native Hawaiian or Other Pacific Islander	0	0	0	0
Black or African American	0	15	0	15
White	12	206	0	218
More Than One Race	0	1	0	1
Unknown or Not Reported	4	67	10	81
Racial Categories: Total of All Subjects*	17	300	10	327 *
PART B. HISPANIC ENROLLMENT REPORT: Number of Hispanics or Latinos Enrolled to Date (Cumulative)				
Racial Categories	Females	Males	Unknown or Not Reported	Total
American Indian or Alaska Native	0	0	0	0
Asian	0	0	0	0
Native Hawaiian or Other Pacific Islander	0	0	0	0
Black or African American	0	1	0	1
White	2	16	0	18
More Than One Race	0	1	0	1
Unknown or Not Reported	0	10	0	10
Racial Categories: Total of Hispanics or Latinos**	2	28	0	30 **

* These totals must agree.

** These totals must agree.



The Commonwealth of Massachusetts
Executive Office of Health and Human Services
Department of Public Health
250 Washington Street, Boston, MA 02108-4619

MITT ROMNEY
GOVERNOR

KERRY HEALEY
LIEUTENANT GOVERNOR

TIMOTHY R. MURPHY
SECRETARY

PAUL J. COTE, JR.
COMMISSIONER

January 4, 2007

Peter E. Grandillo, Jr.
Grants Management Specialist
Centers for Disease Control and Prevention
Procurement and Grants Office
Acquisition and Assistance Field Branch
P.O. Box 18070
Pittsburgh, PA 15236

Dear Mr. Grandillo:

We are enclosing a final Financial Status Report for the Fatality Surveillance and Field Investigations at the State Level/FACE grant # 5 U60-OH08331-02 for the period of September 1, 2005 through October 31, 2006.

If you have any questions, please contact Domenic Bramante at (617) 624-5839 or Paulette Francis at (617) 624-5833.

Sincerely,

A handwritten signature in black ink, appearing to read "Domenic Bramante".

Domenic Bramante
Accounting Director

cc: Letitia Davis
Michael Fiore
Thomas Prendergast
Paulette DiMartino

FINANCIAL STATUS REPORT

(Long Form)

(Follow instructions on the back)

Federal Year: 2006
St Bdgt FY's: 2006 2007

1. Federal Agency and Organizational Element to Which Report is Submitted Centers for Disease Control Public Health Service	2. Federal Grant or Other Identifying Number Assigned By Federal Agency 5 U60 OH008331-02	OMB Approval No. 0348-0039	Page 1	of 1 Pages
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3. Recipient Organization (Name and Complete address, including Zip code)

Massachusetts Department of Public Health **DUNS 878298900**
 250 Washington Street
 Boston, Ma. 02108

4. Employee Identification Number 1-04-6002284-B7	5. Recipient Account Number or Identifying Number 4518-9025	6. Final Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	7. Basis <input checked="" type="checkbox"/> Cash <input type="checkbox"/> Accrual
---	---	--	---

8. Funding/Grant Period (See Instructions) From: (Month, Day, Year) 9/30/1992	To: (Month, Day, Year) 10/31/2006	9. Period Covered by this Report From: (Month, Day, Year) 9/1/2005	To: (Month, Day, Year) 10/31/2006
--	---	---	---

10. Transactions:	I Previously Reported	II This Period	III Cumulative
a. Total Outlays			\$123,961.74
b. Refunds, rebates, etc.			\$0.00
c. Program income used in accordance with the deduction alternative			\$0.00
d. Net outlays (Line a, less the sum of lines b and c)			\$123,961.74

Recipient's share of net outlays, consisting of :			
e. Third party (in kind) contributions			\$0.00
f. Other Federal awards authorized to be used to match this award			\$0.00
g. Program income used in accordance with the matching or cost sharing alternatives			\$0.00
h. All other recipient outlays not shown on lines e.f or g			\$0.00
i. Total recipients share of net outlays (Sum of lines e,f,g and h)			\$0.00

j. Federal share of net outlays (line d less line i)			\$123,961.74
k. Total unliquidated obligation			\$0.00
l. Recipient's share of unliquidated obligations			\$0.00
m. Federal share of unliquidated obligations			\$0.00
n. Total Federal share (sum of lines j and m)			\$123,961.74
o. Total federal funds authorized for this funding period			\$123,969.00
p. Unobligated balance of federal funds (line o minus line n)			\$7.26

Program income, consisting of			
q. Disbursed program income shown on lines c and/or g above			\$0.00
r. Disbursed program income using the addition alternative			\$0.00
s. Undisbursed program income			\$0.00
t. Total program income realized (Sum of lines q, r and s)			\$0.00

11. Indirect Expenses	a. type of rate (Place "X" in appropriate box)			
	<input type="checkbox"/> Provisional	<input type="checkbox"/> Predetermined	<input type="checkbox"/> Final	<input checked="" type="checkbox"/> Fixed
b. Rate 14	c. Base \$80,146.31	d. Total Amount \$10,201.73	e. Federal Share \$10,201.73	

12. Remarks : Attach any explanations deemed necessary or information required by Federal sponsoring agency in compliance with governing legislation.

13. I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays and unliquidated obligations are for the purposes set forth in the award documents.

Department of Health and Human Services Final Invention Statement and Certification <i>(For Grant or Award)</i>	DHHS Grant or Award No. U60 OH008331 Formerly U60 CCU108704
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A. We hereby certify that, to the best of our knowledge and belief, all inventions are listed below which were conceived and/or first actually reduced to practice during the course of work under the above-referenced DHHS grant or award for the period

9/1/2001 through 10/31/2006
original effective date *date of termination*

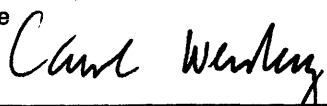
B. Inventions (Note: If no inventions have been made under the grant or award, insert the word "NONE" under Title below.)

NAME OF INVENTOR	TITLE OF INVENTION	DATE REPORTED TO DHHS
	NONE	
<i>(Use continuation sheet if necessary)</i>		

C. First Signature — The person responsible for the grant or award is required to sign (in ink). Sign in the block opposite the applicable type of grant or award.

TYPE OF GRANT OR AWARD	WHO MUST SIGN <i>(title)</i>	SIGNATURE
Research Grant	Principal Investigator Letitia Davis	
Health Services Grant	Director	
Research Career Program Award	Awardee	
All other types <i>(specify)</i> :	Responsible Official	

D. Second Signature — This block **must** be signed by an official authorized to sign on behalf of the institution.

Title Chief Financial Officer Typed Name Carol Weisberg	Name and Mailing Address of Institution MA Department of Public Health 250 Washington Street Boston, MA 02108
Signature 	Date 4/8/07

Appendix 1

First Notification of Fatal Incident by Timeliness (Table A.)

First Notification of Fatal Incident by Source (Table B.)

Occupational Fatality Hotline Calls (Table C.)

**Table A: First Notification of Fatal Incident by Timeliness
(September 1, 2001 – October 31, 2006)**

Same day	54
Local news media (newspaper, TV, radio)	31
Hotline: Police Department	16
Medical Examiner	4
OSHA	2
Fire Department	1
One day later	71
Local news media	56
Hotline: Medical Examiner	5
OSHA	4
Police Department	4
Health Department	1
Newspaper clipping service	1
From 2 to 4 days	47
Local news media	19
Hotline: OSHA	13
Medical Examiner	7
Health Department	3
Fire Department / Marshal	2
Town Clerk	2
Police Department	1
From 5 to 10 days	38
Local news media	13
Newspaper clipping service	12
Hotline: Town Clerk	5
OSHA	2
Medical Examiner	2
Police Department	2
Health Department	1
Union	1
From 11 to 30 days	28
Newspaper clipping service	18
Local news media	5
Hotline: OSHA	2
Police Department	1
Health Department	1
CFOI / DPH / Vitals	1
Thirty plus days	68
CFOI / DPH / Vitals	44
Department of Industrial Accidents	8
Local news media	4
Hotline: OSHA	5
Town Clerk	5
Police Department	1
Newspaper clipping service	1
Total	306

Table B

**First Notification of Fatal Incident
by Source**

(September 1, 2001 – October 31, 2006)

Local news media	128
Hotline	93
OSHA	30
Police Department	24
Medical Examiner	18
Town Clerk	12
Health Department	6
Fire Department	2
Fire Marshal	1
CFOI / DPH / Vitals	44
Newspaper clipping service	32
DIA	8
Union	1
Total	306

Table C
Occupational Fatality Hotline Calls
(September 1, 2001 - October 31, 2006)

	FY 01	FY 02	FY 03	FY 04	FY 05	FY 06*
Total calls	52	36	38	32	50	56
OSHA	21	19	22	17	29	23
Medical examiner	11	5	3	0	0	20
Police Dept.	2	4	5	3	4	7
Town clerk	5	5	4	2	8	2
Health Dept.	8	1	4	7	3	4
Fire Dept.	5	2	0	1	3	0
Fire Marshal	0	0	0	2	2	0
Health Provider	0	0	0	0	1	0
Cases reported	29	29	30	27	36	40

* Fourteen months of data, from 9/1/05 - 10/31/06

Appendix 2

Massachusetts FACE Investigated Incidents September 2001 – October 2006

Massachusetts FACE Investigated Incidents September 2001 – October 2006

Fatal Incidents

- 01MA037 - Boat Handler is Fatally Crushed While Placing Wooden Blocks Under a Partially Supported Boat
- 01MA039 - Police Officer Dies After Being Backed Over by a Dump Truck
- 01MA041 - Vehicle Mounted Work Platform Tips Killing Bridge Inspector
- 02MA001 - Massachusetts Laborer Dies after Arm is Caught in Rock Crushing Machine Conveyor Belt
- 02MA002 - Machine Operator Dies After Becoming Caught in a Shirt Pressing Machine
- 02MA010 - Vessel Mechanic Drowns after Falling from a Ladder between a Tugboat and the Dock
- 02MA016 - Temporary Hispanic Laborer Dies After Being Struck by a Turning Device at a Concrete Product Manufacturing Facility
- 02MA030 - A Spanish Speaking Roofer Dies After Falling From a Roof of a Residential Structure
- 02MA042 - A Portuguese Speaking Laborer Working for a Korean Speaking Employer is Fatally Injured after Falling from an Extension Ladder
- 03MA001 - Hospital Employee Clearing Snow Killed When His Skid-Steer Loader Broke Through a Ventilation Grate Located in a Sidewalk
- 03MA006 - Vibratory Hammer Operator Killed when Crushed Between a Crane Superstructure and its Left Rear Track
- 03MA010 - Two Window Washers Fall 90 Feet When Their Horizontal Static Line Failed
- 03MA018 - Laborer is Killed When Backed Over by Asphalt Milling Machine
- 03MA030 - Crane Operator Killed when Outrigger Sinks into Unstable Soil Causing the Crane to Overturn
- 03MA034 - Youth Killed while Operating a Forklift at a Plumbing Supply Company
- 03MA041 - City Equipment Operator Killed when Run Over by a Rotary Riding Mower
- 03MA057 - Laborer Killed While Inflating a Tire Mounted on a Multi-piece Rim Wheel
- 03MA066 - Watchman Dies After Being Struck by Freight Train While Assisting in Snow Clearing From Train Tracks
- 04MA002 - Assistant Supervisor Dies while Releasing a Jammed Product from a Plastic Injection Molding Machine*
- 04MA005 - Two Tow Truck Drivers Killed When Struck in a Highway Breakdown Lane
- 04MA006 - Worker Killed when Caught Inside a Palletizer Hoist Area*
- 04MA027 - Public Sector Electrician Electrocuted at a Switching Station*
- 04MA032 - Two Vietnamese Floor Sanders Die When Wood Floor Finish Product Ignites
- 04MA042 - Automotive Repair Worker Crushed between a Van and Garage Wall*
- 04MA043 - Airport Ramp Worker Dies after Being Struck by a Deicing Truck*
- 04MA038 - Roofer Electrocuted and Another Severely Shocked When the Aluminum Extension Ladder He was Moving Contacted an Overhead Power Line

Massachusetts FACE Investigated Incidents September 2001 – October 2006

Fatal Incidents (cont.)

- 05MA018 - Hispanic Male Temporary Laborer was Fatally Injured When Becoming Caught between an Idler Pulley and Conveyor Belt at a Recycling Facility*
- 05MA035 – Milling Machine Operator Crushed Inside the Machine's Cabinet*
- 05MA038 - Window Washer Falls 53 Feet from a Building Along With the Rolling Roof Outrigger He Was Hanging From*
- 05MA044 - Floor Sander Dies When Wood Floor Refinish Product Ignites
- 05MA059 - Worker Killed When Crushed By Multiple Granite Slabs
- 05MA074 - Landscaper Caught in a the Auger of an Organic Material Blower Truck*
- 06MA024 – Trackman Crushed between a People Mover and a Clipper*
- 06MA027 – Public Sector Employee Struck by a Car while Repairing a Pothole*

Non-fatal Incidents

- 03MA1NF - A 15-Year-Old Student Amputates Fingers While Operating an Unguarded Table Saw in Woodworking Class
- 03MA2NF - Four Hotel Maintenance Workers Exposed to Excessive Levels of Carbon Monoxide in Boiler Room
- 04MA2NF - A 17-Year-Old Student Severely Injures Leg on a Construction Site While Working at a Steel Erection Company as Part of a Cooperative Work Experience*

* Report not final

Appendix 3

Preventing Falls in Construction Working Group

Preventing Falls in Construction Working Group

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Appendix 4

FACE Facts developed September 2001 – October 2006

Safety Alerts developed September 2001 – October 2006

INFORME DE INVESTIGACIÓN SOBRE FATALIDAD

Datos de FACE

Agosto 2003 Vol. 5, No. 2-Spanish



**Favor de
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Programa de Salud en el Trabajo
Departamento de Salud Pública de Massachusetts
250 Washington Street, 6th Floor
Boston, MA 02108-4619

El Departamento de Salud Pública de Massachusetts con la Cooperación del Instituto Nacional para Seguridad y Salud en el Trabajo, (NIOSH) conducen investigaciones sobre las lesiones fatales relacionadas con el trabajo. El proyecto, conocido como FACE (Fatality Assessment and Control Evaluation), busca identificar los factores que causan fatalidades en el trabajo. El Proyecto FACE ayudará mejorar el uso y el desarrollo de las medidas de seguridad para prevenir lesiones fatales en el futuro.

Esperamos que usted encuentre los Datos de FACE informativos y los compatan con otros esta información. Este documento está disponible para el público y puede ser copiado libremente y está disponible en Inglés.

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Un joven de 16-años de edad de Massachusetts fue lesionado gravemente en el trabajo mientras operaba una carretilla elevadora.

Trasfondo: Al tiempo de terminar sus estudios secundarios muchos adolescentes, cerca de 80 por ciento, ya han tenido un trabajo. Si el trabajo ofrece muchos beneficios, puede también plantear muchos riesgos. Cada año, cerca de 70 adolescentes menores de 18 años de edad mueren en los Estados Unidos de lesiones sufridas en el trabajo. En este incidente la víctima estaba realizando una tarea prohibida para adolescentes según las leyes del trabajo infantil: operación de una carretilla elevadora. Además, el patrón no tenía un plan comprensivo de salud y de seguridad.



Investigación: La víctima, un joven de 16-años de edad que trabaja como ayudante de limpieza a medio tiempo, fue lesionado fatalmente cuando se volcó la carretilla elevadora que estaba operando en una compañía procesadora de ventas de mariscos. La víctima operaba una carretilla elevadora para mover una plataforma de madera cargada con basura. La carga fue levantada aproximadamente a 4 pie y 1/2 cuando la víctima dio la vuelta a la derecha lo cual causó el vuelco de la carretilla. La víctima saltó o fue lanzada del asiento del operador. Cuando la carretilla se volcó la cubierta superior cayó sobre el pecho del joven, aplastándolo.

Estrategias de Prevención: Para prevenir similares incidentes en el futuro, El Proyecto FACE de Massachusetts recomienda que los patrones de los trabajadores jóvenes deben de:

- Entender y cumplir con las leyes estatales y federales sobre el trabajo infantil. (Vease las fuentes de información abajo).
- Exponer las leyes sobre el trabajo infantil en los lugares de trabajo.
- Poner una etiqueta (etiqueta disponible de FACE- 617-624-5628) en todas las carretillas elevadoras que indica prohibido a los trabajadores menores de 18 años de edad quienes que no deben operar las carretillas elevadoras (con excepción en trabajo de agricultura para jóvenes de 16 años y mayores).
- Asegurar que los supervisores de primera línea que dan las asignaciones de trabajo sepan las leyes sobre el trabajo infantil.
- Proveer más supervisión para los trabajadores adolescentes. Los estudios han demostrado que los adolescentes, como otros nuevos trabajadores, tienen porcentaje de lesiones más alto que los adultos. Se ha reportado que aproximadamente el 80% de lesiones en el trabajo en la adolescencia ocurren cuando no hay supervisor presente.
- Proveer orientaciones a todos los trabajadores sobre la salud en el lugar de trabajo, la seguridad y las leyes sobre el trabajo infantil. La orientación debería de enseñar como identificar y eliminar los peligros así como trabajar con seguridad.
- Estimular a los adolescentes en expresarse cuando hay problemas de salud y de seguridad, si las instrucciones para desempeñar el trabajo no son claras, o si se requiere que realicen tareas prohibidas por las leyes sobre el trabajo infantil.

Leyes sobre el Trabajo Infantil:

Las leyes sobre el trabajo infantil establecen las horas del día en que los adolescentes menores de 18 años de edad pueden empezar a trabajar, que tan tarde pueden trabajar, y cuantas horas por día y por semana pueden trabajar. Estas leyes también identifican tareas, industrias y equipo específicos prohibidos para los adolescentes. Según las leyes federales y estatales sobre el trabajo infantil, se prohíbe a los adolescentes menores de 18 años de edad operar las carretillas elevadoras en el trabajo. Las leyes estatales sobre el trabajo infantil también requieren que todos los adolescentes menores de 18 obtengan un permiso de trabajo (llamados certificado educacional para los de 16-y 17-años de edad) de su distrito escolar, antes de comenzar nuevos trabajos. Además de las leyes sobre el trabajo infantil las regulaciones específicas y generales de salud y de seguridad se aplican a todos los empleados sin tomar en cuenta la edad.

Para más información sobre las leyes de trabajo infantil o trabajo para adolescentes en Massachusetts:

- Massachusetts Attorney General's Office, Oficina del Procurador General, División de Trabajo y Prácticas de Negocios Justas 617-727-3465
- Departamento de Trabajo de los Estados Unidos División de Salario y Horario 617-565-2066
- Departamento de Salud Pública de Massachusetts, Proyecto de Prevención de Lesiones para los Adolescentes en el Trabajo 617-624-5632

Información sobre seguridad en el trabajo:

- Departamento de Salud Pública de Massachusetts 617-624-5628 Publicaciones varias en español
- Instituto Nacional para Seguridad y Salud en el Trabajo (NIOSH) NIOSH en español: www.cdc.gov/Spanish/niosh
- Administración de Seguridad y Salud Ocupacional (OSHA) OSHA en español: www.osha.gov/as/opa/Spanish.index.html

***Proyecto de Control y Evaluación sobre Fatalidad en Massachusetts (FACE) • 617-624-5628**

FATALITY INVESTIGATION REPORT

FACE Facts

July 2002 Vol. 5, No. 2



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Occupational Health Surveillance Program
Massachusetts Department of Public Health
250 Washington Street, 6th Floor
Boston, MA 02108-4619

The Massachusetts Department of Public Health, in cooperation with the National Institute for Occupational Safety and Health, conducts investigations of fatal work-related injuries. The project, known as FACE (Fatality Assessment and Control Evaluation), seeks to identify the factors that contribute to occupational fatalities. The Face Project will help in the development and use of improved safety measures for preventing fatal injuries in the future.

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A 16-year-old Massachusetts youth was fatally injured at work while operating a forklift

Background: By the time teenagers leave high school, approximately 80 percent will have held a job. While work has many benefits, it also can pose risks. Approximately 70 teenagers under the age of 18 in the US die each year from injuries incurred on the job. In this incident the victim was performing a task prohibited for teens under the child labor laws, operating a forklift. In addition, the employer did not have a comprehensive health and safety program.



Exceptions in agricultural work for youth 16 and older

Investigation: The victim, a 16-year-old male part-time cleaning helper, was fatally injured when the forklift he was operating overturned at a seafood processing/retail facility. The victim was operating a forklift to move a wooden pallet loaded with trash. The load was raised approximately 4 1/2 feet when the victim made a right-hand turn causing the forklift to overturn. The victim had either jumped or was thrown from the operator's seat. When the forklift overturned the overhead guard landed on his chest, crushing him.

Prevention Strategies: In order to prevent similar incidents in the future, the Massachusetts FACE Project recommends that employers of young workers should:

- Understand and comply with state and federal child labor laws. (See information sources below).
- Post child labor laws in the workplace.
- Affix a warning sticker to all forklifts that states no employees under 18 years of age can operate forklifts (exceptions in agricultural work for youth 16 and older).
- Make sure front-line supervisors who give work assignments know the child labor laws.
- Provide increased supervision for teen employees. Studies have found that teens, like other new workers, have higher on-the-job injury rates than adults. It has been reported that approximately 80% of on-the-job injuries to teens occurred when no supervisor was present.
- Provide all employees with training about workplace health and safety and the child labor laws. Training should address identifying and eliminating hazards as well as how to do jobs safely.
- Encourage teens to speak up if there are health and safety problems, if the instructions to complete tasks are unclear, or if asked to perform tasks prohibited by child labor laws.

Child Labor Laws:

Child labor laws establish the times of day teens less than 18-years-old can start work in the day, how late they can work, and the maximum number of hours per day and per week they are allowed to work. These laws also identify specific tasks, industries, and equipment prohibited for teens. According to both Massachusetts and federal child labor laws, teens less than 18 years of age are not allowed to operate forklifts at work. The state child labor laws also require that all teens under 18 obtain employment permits (called educational certificates for 16- and 17-year-olds) from the school department where they live, before beginning new jobs. In addition to child labor laws, general and industry specific health and safety regulations apply to all employees regardless of age.

For more information about child labor laws or working teens in Massachusetts:

Massachusetts Attorney General's Office:
 Fair Labor and Business Practices Division 671-727-3465

US Department of Labor:
 Wage and Hour Division 617-565-2066

Massachusetts Department of Public Health:
 Teens at Work Injury Prevention Project 617-624-5632

For forklift safety information:

- Massachusetts Department of Public Health (617) 624-5628
 FACE Facts *Three Massachusetts Forklift Operators Killed*
- National Institute for Occupational Safety and Health (NIOSH)
 NIOSH Alert *Preventing Injuries and Death of Workers Who Operate or Work Near Forklifts*, Publication # 2001-109
 (www.cdc.gov/niosh/2001-109.html)
- Occupational Safety and Health Administration (OSHA)
Powered Industrial Trucks 29CFR1910.178
 (www.osha.gov/OshStd_data/1910_0178.html)

Massachusetts Fatality Assessment and Control Evaluation (FACE) Project • 617-624-5628



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Departamento de Salud Pública de Massachusetts
250 Washington Street, 6th Floor
Boston, MA 02108-4619

El Departamento de Salud Pública de Massachusetts con la Cooperación del Instituto Nacional para Seguridad y Salud en el Trabajo, conducen investigaciones sobre las lesiones fatales relacionadas con el trabajo. El proyecto, conocido como FACE (Fatality Assessment and Control Evaluation= Proyecto de Control y Evaluación Sobre Fatalidad), busca identificar los factores que causan fatalidades en el trabajo. El Proyecto FACE ayudará mejorar el uso y el desarrollo de las medidas de seguridad para prevenir lesiones fatales en el futuro.

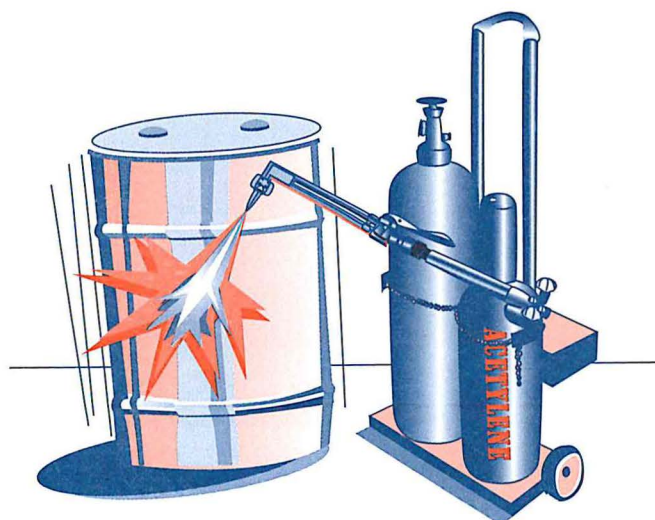
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Soldadores de Massachusetts matados en explosiones causadas al cortar envases vacíos con antorchas.



Riesgo de Explosión

Trasfondo: El cortar con antorcha los envases vacíos tales como tanques, barriles o tuberías puede ser sumamente peligroso. Cantidades restantes de sustancias en los envases pueden causar explosiones riesgosas para los soldadores. Durante los últimos dos años (2000-2001) tres soldadores en Massachusetts fueron lesionados gravemente mientras cortaban con antorchas los envases de metal en el trabajo.

Incidente # 1: Un mecánico supervisor de 61-años con más de 30 años de experiencia en soldadura fue lesionado fatalmente mientras cortaba con antorcha un barril de metal de 55-galones. El barril, que antes contenía combustible acondicionador diesel, explotó mientras el hombre cortaba la tapa para reciclar el envase. La explosión golpeó la cabeza y el pecho de la víctima con la tapa del barril echándolo al suelo. El mecánico fue llevado a un hospital donde estuvo en condiciones críticas y murió siete días después del incidente.

Incidente # 2: Un soldador de 48-años con más de 30 años de experiencia fue lesionado fatalmente mientras usaba una antorcha para instalar un tapón en un nuevo camión de reparto de gasolina. El tanque, cuya capacidad era de 5,000-galones, contenía aproximadamente 2,800 galones de gasolina a la hora del incidente. La explosión causó quemaduras serias a la víctima. El fue trasladado a un hospital local donde murió ocho horas después.

Incidente # 3: Un gerente de servicio de 28- años de edad con seis años de experiencias fue lesionado fatalmente mientras cortaba con antorcha un barril de metal de 55 galones. El barril, que antes había contenido el fluido de arandela para las parabrisas, explotó mientras el hombre cortaba la tapa. La explosión hizo que la tapa golpeará a la víctima y cayó aproximadamente 250 pies de distancia. El fue trasladado a un hospital local donde fue declarado muerto.

Recomendaciones para prevenir similares incidentes:

- Trate cada envase que va a ser cortado con antorcha como si hubiera contenido una sustancia inflamable.
- Jamás solde, corte, o realice otra tarea en un envase caliente a menos que el envase haya sido completamente limpiado y aerado.*
- Examine el ambiente interior del envase, después de haberlo limpiado y aerado y antes de realizar un trabajo en alta temperatura, con un instrumento de lectura directa calibrado para los gases y vapores inflamables.
- Utilice un removedor manual de tapa para quitar la tapa de un barril (en vez de cortar con antorcha o usar una herramienta neumática, que produzca chispas).
- Nunca utilice un envase como sitio para un trabajo de alta temperatura.
- Además, los patronos deben de ofrecer un entrenamiento anual para los soldadores para fortalecer los procedimientos apropiados para cortar con antorcha incluyendo el uso del equipo, el conocimiento del peligro y las prácticas seguras del trabajo.

*La Administración de Seguridad y Salud Ocupacional (OSHA) Ley: 29CFR1910.252

“Welding, Cutting and Brazing”

Esta norma puede ser localizada en: http://www.osha.gov/OshStd_data/1910_0252.html

OSHA en español: www.osha.gov/as/opa/Spanish/

FATALITY INVESTIGATION REPORT

FACE Facts

June 2002 Vol. 5, No. 1



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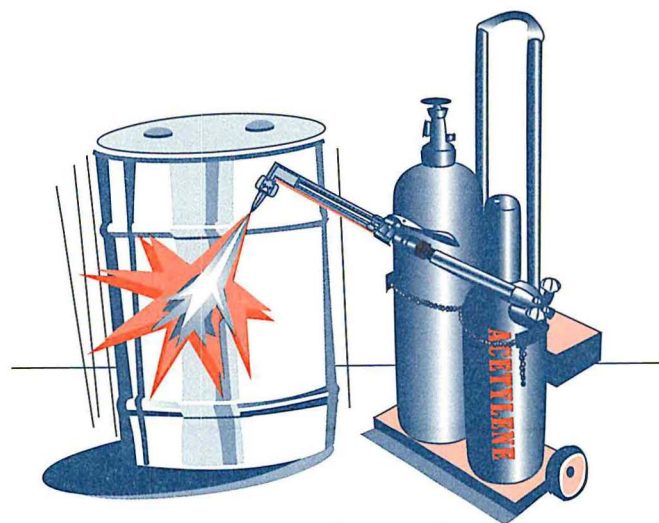
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Massachusetts Welders Killed In Explosions Caused by Torch Cutting Containers



Explosion Hazard

Background: Torch cutting on “empty” containers such as tanks, drums, barrels or pipes can be extremely dangerous. Small amounts of substances remaining in containers can create serious explosion hazards for welders. During the last two years (2000-2001) three welders in Massachusetts were fatally injured while torch cutting on metal containers at work.

Incident # 1: A 61-year-old male mechanic supervisor with over 30 years of welding experience was fatally injured while torch cutting a 55-gallon metal drum. The drum, which had previously contained diesel fuel conditioner, exploded while he was cutting off the lid to recycle the container. The explosion caused the drum lid to strike the victim in

the head and chest knocking him to the ground. He was rushed to a hospital where he was listed in critical condition and died seven days after the incident.

Incident # 2: A 48-year-old male welder with over 30 years of welding experience was fatally injured while using a torch to install a bung in a new oil delivery truck tank. The 5,000-gallon truck tank had contained approximately 2,800 gallons of fuel oil at the time of the incident. The explosion caused severe burns to the victim. He was transported to a local hospital where he died eight hours later.

Incident # 3: A 28-year-old male service manager with six years of experience was fatally injured while torch cutting a 55-gallon metal drum. The drum, which had previously contained windshield washer fluid concentrate, exploded while he was cutting off the lid. The explosion caused the lid to strike the victim and land approximately 250 feet away. He was rushed to a local hospital where he was pronounced dead on arrival.

Recommendations to prevent similar incidents:

- Treat every container to be torch cut as if it contains a flammable substance.
- Never weld, cut, or perform other hot work on a container unless the container has been cleaned and vented thoroughly.*
- Test the internal atmosphere of the container, after cleaning and venting and before performing hot work, with a calibrated direct-reading instrument for flammable gases and vapors.
- Use a hand held manual lid remover when removing a lid from a barrel or drum (instead of torch cutting or using a pneumatic tool, which produces sparks).
- Never use a container as a hot work bench.
- In addition, employers should provide annual training for welders that reinforces proper torch cutting procedures including equipment use, awareness of hazards and safe work practices.

* Occupational Safety and Health Administration (OSHA) Standard: 29CFR1910.252
General requirements. *Welding, Cutting, and Brazing.*
This standard can be found at: http://www.osha.gov/OshStd_data/1910_0252.html



Massachusetts Police Officers Killed in Highway and Street Work Zones



Workers on highway and street construction sites (work zones) are at risk of serious injury from the movement of construction vehicles and equipment within the work zones as well as from passing motor vehicle traffic.

Within a 15-month period during 2000 - 2001, three Massachusetts municipal police officers were fatally injured while performing traffic details in work zones.

Incident #1 A 60-year-old male police officer was fatally injured when he was crushed beneath a dump truck loaded with asphalt in a highway work zone. The work zone was located in front of an entrance way to a parking lot serving a group of retail stores.

Motorists had to pass through the construction site to access the parking lot. The victim was assisting two dump trucks in the work zone to back in front of the parking lot entrance way. While walking away from the dump trucks, in preparation to help them back, the truck involved in the incident started backing without the officer's knowledge and ran over him. In this incident, there was no internal traffic control plan (ITCP) for the work zone; paving was performed during peak retail hours; the

dump truck backup alarm was inoperable; and the officer was wearing the same color as the surrounding temporary traffic control devices.

Incident #2 A 66-year-old male police officer was fatally injured when he was struck by a backing dump truck loaded with asphalt. The dump truck, which had a functioning backup alarm, was backing within a highway work zone to a small unpaved section of a turnout that was located approximately 1,000 feet away from where the truck was stopped. The victim, with his back to the dump truck, was walking towards the turnout at the edge of the work zone in a closed travel lane facing oncoming traffic when the dump truck started backing. The dump truck struck the victim and ran over him. In this incident, there was no internal traffic control plan (ITCP) for the work zone.

Incident #3 A 38-year-old male police officer was fatally injured when a motorist intruded into a street work zone striking him. The victim was directing traffic through a detour at a four-way intersection located several hundred feet after a crest of a hill. Traffic heading west was turning right at the detour and traffic heading south was turning left at the detour. A motorist traveling west failed to turn right and skidded sideways through the detour, striking the victim, the victim's parked truck, a stone wall, and a tree. In this incident, the work zone lacked adequate signage, and the officer was wearing the same color as the surrounding temporary traffic control devices.



Prevention Strategies

To ensure the safety of all individuals in and around highway/street work zones, contractors should:

Develop and implement Internal Traffic Control Plans (ITCP) to coordinate the flow of construction vehicles, equipment, and workers on foot within work zones. To reduce the hazard associated with backing construction vehicles, an ITCP should minimize backing of all construction vehicles and equipment on site. This can be accomplished by reviewing and planning tasks so that vehicles can navigate safely through the construction site while backing as little as possible. The ITCP should also include walkways for workers on foot that are clear of backing construction vehicles and equipment. In addition, some areas within the work zone might have to be designated as areas that are prohibited for workers on foot.

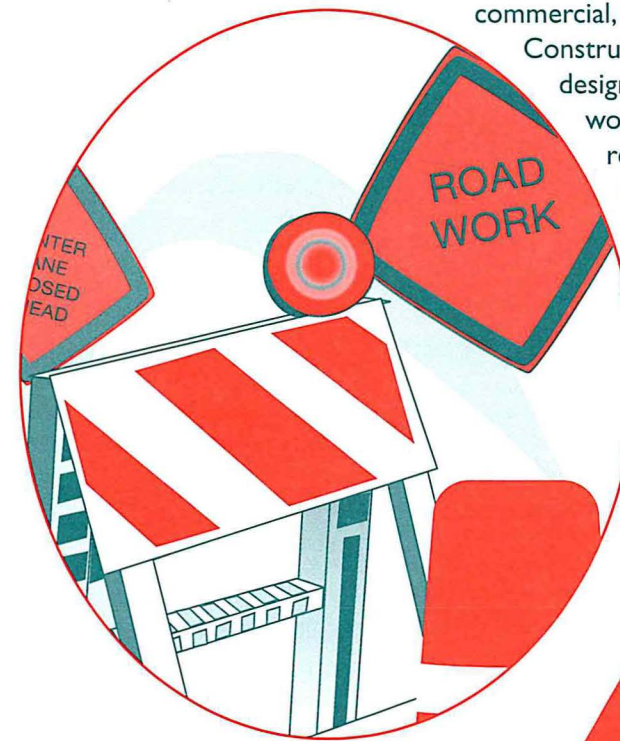
Develop work zone backing procedures to include designated signalers to direct backing construction vehicles. Equipment operators and truck drivers should be aware of who the signalers are and the established backing protocol. Construction vehicle and equipment operators should never start backing in a work zone without a clear and understandable signal from a signaler that he is ready and it is safe to start backing.

Ensure that work zones are setup, at a minimum, in accordance with the *Manual on Uniform Traffic Control Devices (MUTCD), Part 6*, developed by the U.S. Department of Transportation Federal Highway Administration. The MUTCD sets forth the basic principles that govern the design and use of traffic control signs and devices and provides uniform work zone designs. In incident #3, a “road closed” warning sign indicating the distance to the closure should have been setup in the advanced warning area of the work zone.

Consider traffic demands and construction site surroundings (residential, commercial, and/or retail) when scheduling highway/street construction projects.

Construction site surroundings and traffic demands will impact the work zone design, and time of day and year work should be performed. In incident #1, the work zone was located in front of an active entrance way to a parking lot for retail stores, and the work was being performed during retail operation hours and a busy holiday season.

Perform regular preventive maintenance on vehicles and equipment to ensure vehicles and equipment are in safe working condition. When a problem, such as an inoperable back up alarm, is identified, the vehicle or equipment should be taken out of service and repaired before being placed back in service.



Local municipal police departments should consider:

Work zone safety training for officers.

Police officers employed by Massachusetts cities and towns typically do not receive training on work zone safety, although this training is currently available for the Massachusetts State Police. Work zone safety training would provide officers with the knowledge to better protect themselves, construction workers, pedestrians, and motorists. This training should include safe backing procedures and proper work zone setup and design that meet requirements of MUTCD, Part 6.

The effectiveness of officer personal protective equipment.

Officers performing traffic details should wear personal protective equipment (PPE), such as high-visibility safety apparel. Safety apparel should routinely be inspected to ensure it has not faded and that retroreflective properties have not been lost. In addition, to ensure that officers do not blend into the background, choose safety apparel colors that are different than the surrounding construction equipment and landscape.

Manufacturers of heavy construction equipment, such as dump trucks, should:

Explore the possibility of incorporating collision warning devices on their equipment that would assist operators in backing. In incidents # 1 and # 2, the police reported that the truck operators stated they did not see the victims behind the trucks prior to backing over them. Equipment manufacturers should evaluate current research being conducted on navigation and warning aids for mobile equipment to develop collision warning systems for their products. See references for information on these collision warning devices and the research being performed.

References

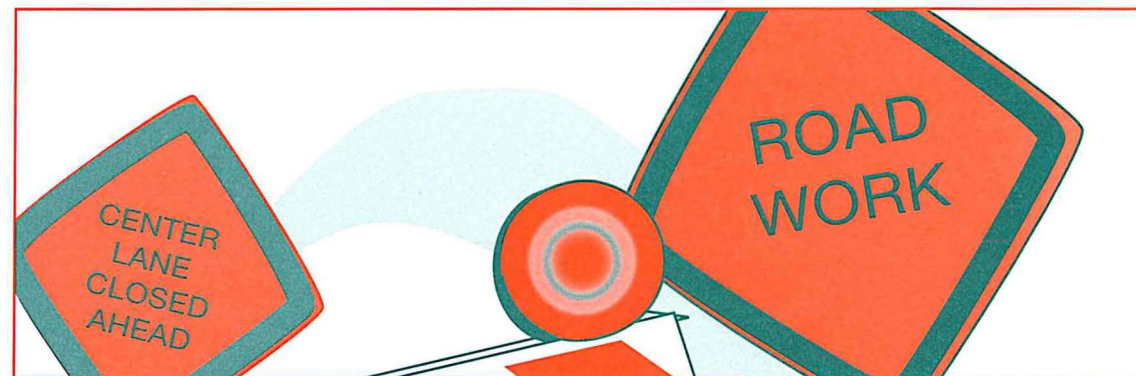
Manual on Uniform Traffic Control Devices (MUTCD), Part 6 (2000). U.S. Department of Transportation, Federal Highway Administration. http://mutcd.fhwa.dot.gov/kno-millennium_12.28.01.htm

Building Safer Highway Work Zones: Measures to Prevent Worker Injuries from Vehicles and Equipment (2001). Department of Health and Human Services, Center for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2001-128. www.cdc.gov/niosh/2001128.html

Code of Federal Regulations, 29 CFR 1926.601; Safety and Health Regulations for Construction U.S. Government Printing Office. Office of the Federal Registrar. www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10768

Program for Mining Research, Navigation and Warning Aides for Mobile Equipment (1998). U.S. Department of Health and Human Services, Public Health Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 98-114. www.cdc.gov/niosh/publistd.html

Test Results of Collision Warning Systems for Surface Mining Dump Trucks (2000). U.S. Department of Health and Human Services, Public Health Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) RI 9652. www.cdc.gov/niosh/pdfs/ri9652.pdf



The Massachusetts Department of Public Health, in cooperation with the National Institute for Occupational Safety and Health, conducts research-oriented investigations of fatal work-related injuries. The goal of the project, known as Massachusetts FACE (Fatality Assessment and Control Evaluation), is to prevent occupational fatalities by identifying factors that contribute to these deaths and then developing and disseminating prevention strategies.

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www.state.ma.us/dph/bhsre/ohsp/ohsp.htm



FACE Facts

FATALITY INVESTIGATION REPORT

Occupational Health Surveillance Program
Massachusetts Department of Public Health
November 2006

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Health and Safety Resources

In Massachusetts:

- ◆ Massachusetts Division of Occupational Safety
Offers free consultation services to help employers to improve their safety and health programs and train employees
www.mass.gov/dos/consult/index.htm
- ◆ Massachusetts Department of Industrial Accidents
Has grants available for providing workplace health and safety training to employers/employees in companies covered by the Massachusetts Workers' Compensation Insurance Law
www.mass.gov/dia/Safety/index.htm
- ◆ Occupational Health Surveillance Program (OHSP): www.mass.gov/dph/ohsp
OHSP Residential Fall Prevention Brochures

Other Resources:

- ◆ National Grid New England Hazard Identification Hotline: 1-888-625-3723
www.nationalgridus.com/masselectric/safety.asp
- ◆ National Institute for Occupational Safety and Health (NIOSH):
www.cdc.gov/niosh/homepage.html
- ◆ NIOSH: Traumatic Occupational Injuries, Electrical Safety:
www.cdc.gov/niosh/injury/traumaelec.html
- ◆ Occupational Safety and Health Administration (OSHA): www.osha.gov
OSHA Construction eTool: www.osha.gov/SLTC/etools/construction/index.html
- ◆ The Center to Protect Workers' Rights
Don't Fall For It (DVD): www.cpwr.com/rp-videosvds.html

The Massachusetts Department of Public Health (MDPH), in cooperation with the National Institute for Occupational Safety and Health, conducts research oriented investigations of fatal work-related injuries. The project, known as FACE (Fatality Assessment and Control Evaluation), seeks to identify the factors that contribute to occupational fatalities. The FACE project will help in the development and use of improved safety measures for preventing future work-related fatal injuries.

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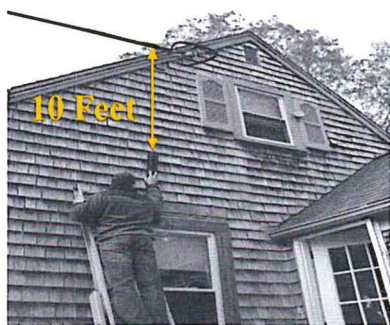
FATALITY INVESTIGATION REPORT

Occupational Health Surveillance Program
Massachusetts Department of Public Health
November 2006



Rofer Electrocuted When Aluminum Extension Ladder Contacts Overhead Power Line — Massachusetts

Background: In Massachusetts, from 1991 – 2004, 18 workers were electrocuted either through direct contact with energized power lines or when the equipment they were using touched the power lines. Fourteen of these electrocutions occurred in the construction industry. As with most occupational injuries and fatalities, these electrocutions could have been prevented.



Keep yourself and equipment a minimum of 10 feet away from energized power lines.

Incident: A 40-year-old male roofer was fatally electrocuted and a 21-year-old coworker was seriously injured when the 32-foot aluminum extension ladder they were unloading from a pickup truck came in contact with an energized overhead power line. The victim and the coworker, who were bringing equipment to the jobsite, parked the pickup truck and started to unload the aluminum extension ladder. As the victim and the coworker lifted the already extended aluminum extension ladder off of the pickup truck, it came in contact with the overhead energized power lines.

Overhead power lines are not insulated!

While some overhead power lines have a coating to protect them from the weather, this coating will **NOT PROTECT YOU** from electric shock.

How can you work safely around overhead power lines?

When you arrive at a jobsite:

- ◆ Always assume all overhead power lines are energized.
- ◆ Survey the jobsite for overhead power lines prior to beginning work, or prior to unloading ladders and other equipment from trucks.

When work is going to bring you closer than 10 feet from overhead power lines:

- ◆ Notify the local electric company for assistance prior to beginning work.

When working near overhead power lines (more than 10 feet away):

- ◆ Keep yourself and all equipment (ladders, scaffolding, tools) a minimum of 10 feet away from power lines.
- ◆ Only use dry and clean nonconductive ladders, such as fiberglass. Never use conductive ladders, such as aluminum or even damp wooden ladders.
- ◆ Never attempt to move or reposition an extended extension ladder.
- ◆ Do not store materials or equipment, such as ladders, below or near overhead power lines.

In addition, employers should train all workers on the hazards and safe procedures of working near energized power lines.



Bộ Y Tế Massachusetts, hợp tác với Viện Quốc Gia An Toàn Và Sức Khỏe Nghề Nghiệp, tiến hành việc điều tra về những tổn thương có thể mạng gây ra bởi công việc làm. Dự án này được hiểu như là FACE (Lượng Định về Rủi Ro Chết Chóc và Đánh Giá Việc Kiểm Tra Kiểm Chế), tìm cách nhận biết cho được các yếu tố đưa đến những rủi ro nghề nghiệp đó. Cảnh báo này đã được phát triển bởi dự án FACE của Tiểu Bang Massachusetts và Chỉ huy trưởng phòng chống cháy.

Vui lòng phổ biến bằng cảnh báo này cho những người khác được biết. Đây là một tài liệu công cộng và có thể tự do sao chép để tìm hiểu và phổ biến: nó có thể được tìm thấy cùng những tài liệu khác tại mạng điện toán DPH <http://www.mass.gov/dph/ohsp>. Nếu quý vị có đề nghị hay thắc mắc gì liên quan, vui lòng gọi Dự án FACE tại số 1-800-338-5223 hay Chỉ Huy Trưởng Chữa Cháy Tiểu Bang tại số 877-9NO-FIRE.

Occupational Health Surveillance Program
Massachusetts Department of Public Health
250 Washington Street, 6th Floor
Boston, MA 02108



Các tổ chức giúp đỡ của Bang Massachusetts

Phân Cục An Toàn Nghề Nghiệp Massachusetts: cung cấp các dịch vụ tham khảo miễn phí giúp các người chủ nhận thức và kiểm tra an toàn nơi làm việc và những nguy hại cho sức khỏe, cải thiện chương trình an toàn và sức khỏe cho họ và huấn luyện cho các người thợ. (www.mass.gov/dos/consult/index.htm).

Cục đặc trách tai nạn kỹ nghệ Massachusetts: trợ cấp cho việc huấn luyện về sức khỏe và an toàn nơi làm việc cho chủ và thợ trong các công ty được bao gồm bởi Luật Bảo Hiểm Đền Bù cho Công Nhân của Bang Massachusetts. (www.mass.gov/dia/Safety/index.htm)

Văn Phòng Chỉ Huy Trưởng Chữa Cháy. Những hoạt động để cứu nhân mạng và của cải từ lửa cháy và sự nổ bằng cách ngăn ngừa, thiết kế xây dựng, giáo dục, và thi hành luật lệ: www.mass.gov/dfs/osfm/fireprevention/index.htm

Tiêu chuẩn cho thông tin về nguy hại từ Tổ chức An Toàn và Sức Khỏe Nghề Nghiệp (OSHA)
(29 CFR 1910.1200)
(www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10099)

CẢNH BÁO VỀ AN TOÀN TRÁNH GÂY CHÁY

Chương Trình Giám Sát Sức Khỏe Nghề Nghiệp - Bộ Y Tế Massachusetts
Văn Phòng Chỉ Huy Trưởng Chữa Cháy Tiểu bang - Cục Phục Vụ Chữa Cháy



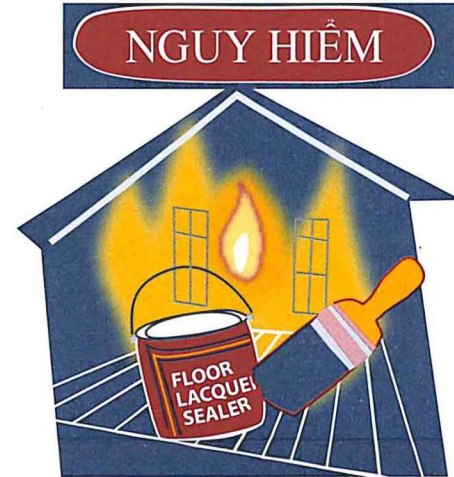
Tháng ba 2006

Những Người Đánh Bóng Sàn Nhà Bằng Gỗ Đã Bị Chết Khi Sản Phẩm Đánh Bóng Sàn Nhà Bốc Cháy- Ở Tiểu Bang Massachusetts.

Bối Cảnh. Việc đánh bóng sàn nhà bằng gỗ có thể gây cho các người thợ, những người cư ngụ trong toà nhà, và những người chủ nhà những thiệt hại do lửa cháy. Tại Bang Massachusetts, ba người thợ đánh bóng sàn nhà đã chết trong vòng thời gian 10 tháng (tháng Chín 2004 đến tháng Bảy 2005) trong hai vụ cháy riêng biệt khi họ đang khàn kín sàn nhà thì lớp sơn sàn nhà nhạy lửa đã bốc cháy. Loại sơn khàn kín sàn nhà dùng trong các sự cố này có độ bén lửa rất cao (độ bén lửa 9° F/-13° C). Cả ba người thợ bị thương và chết này đều là các di dân người Việt Nam.

Sự việc thứ nhất. Hai người đánh bóng sàn nhà đã bị lửa cháy đến chết và hai người bị phỏng một cách nghiêm trọng trong lúc đang đánh bóng lần cuối các sàn nhà bằng gỗ trong một ngôi nhà có ba gia đình cư ngụ. Căn nhà đã bắt lửa trong lúc họ đang khàn kín sàn nhà bằng một loại sơn sàn nhà mà nó đã bốc cháy do ngọn lửa mỗi từ một bếp lò gas mà vẫn còn chưa tắt. Vào lúc xảy ra sự cố, các cửa sổ đều đóng kín và không một phương tiện thông gió nào được sử dụng.

Sự việc thứ hai. Một người đánh bóng sàn nhà bị cháy đến chết và một người khác bị cháy phỏng không nghiêm trọng trong khi những người thợ này đang đánh bóng lần cuối sàn nhà trong một ngôi nhà chỉ có một gia đình cư ngụ. Căn nhà đã bắt lửa khi những người thợ này đang khàn kín sàn nhà bằng một sản phẩm sơn mà nó đã phát hỏa do ngọn lửa mỗi vẫn còn cháy từ máy nước nóng đốt bằng gas đặt trong tủ nhỏ trên cùng lâu sàn nhà đang làm. Tại lúc xảy ra sự cố, cửa trước căn nhà đang mở, nhưng các cửa sổ đều đóng và không một phương tiện thông gió nào được sử dụng.



BÉN LỬA, DỄ CHÁY

Điểm bốc cháy của một chất lỏng là gì?

Điểm bốc cháy là nhiệt độ thấp nhất mà tại đó chất lỏng này sản sinh ra đủ chất hơi bốc cháy khi nó gặp một nguồn lửa mỗi gây cháy. Điểm bốc cháy càng thấp thì chất lỏng đó càng dễ bén lửa. Điểm bốc cháy được liệt kê trong các mẫu giấy ghi các dữ kiện an toàn nguyên liệu có sẵn từ các nhà sản xuất sản phẩm.

CÁC LỜI KHUYÊN NHẪM TRÁNH CÁC SỰ CỐ TƯƠNG TỰ

Dùng các sản phẩm làm bóng sàn nhà bằng gỗ ít nhạy lửa (các sản phẩm với điểm bốc cháy lớn hơn 100° F/38° C) khi làm công việc này bên trong nhà.

Tắt tất cả các ngọn lửa đang cháy và các nguồn gây bắt lửa trước khi bắt đầu công việc làm bóng sàn nhà.

- Tắt ngọn lửa mỗi của các thiết bị dùng gas (nơi các bếp lò, máy sưởi bằng hơi nước, các dụng cụ sưởi nóng, máy sấy quần áo).
- Tắt và rút dây điện các máy thiết bị có động cơ điện (như tủ lạnh, các máy sưởi, máy sưởi bằng hơi nước) và các thiết bị điện khác.
- Không đốt thuốc và hút thuốc.
- Không bật sáng hoặc tắt đèn trong suốt thời gian làm việc đánh bóng sàn nhà (tắt điện chỗ làm việc nếu có thể).

Làm thông gió một cách thích hợp cho khu vực làm việc trong suốt thời gian đánh bóng sàn nhà.

- Mở các cửa sổ; và tiếp tục mở trong khi làm việc cho đến khi sản phẩm làm bóng sàn nhà khô lại. Nếu dùng quạt điện để thông gió thì chúng phải là loại chống nổ và cắm điện vào ổ cắm ngoài nơi làm việc.

Cần ghi nhớ thêm, các người chủ phải:

Cung cấp việc huấn luyện an toàn cho những người thợ, theo yêu cầu của pháp luật*, về các nguy hại của những hoá chất mà họ sử dụng và sự luyện tập về thực hiện công việc một cách an toàn trong lúc làm việc. Sự luyện tập phải đợc cung cấp bằng ngôn ngữ của những người thợ.

*Tiêu chuẩn cho thông tin về nguy hại từ Tổ chức An Toàn và Sức Khỏe Nghề Nghiệp (OSHA) (29 CFR 1910.1200)

Chỉ đạo việc phân tích các nguy hại của công việc làm trước khi làm mỗi công việc. Và phải đòi hỏi những người thợ làm đầy đủ một bản liệt kê các mục cần kiểm tra về sự an toàn trước khi bắt đầu mỗi công việc họ làm.

Trước khi bắt đầu công việc đánh bóng sàn nhà, những người chủ nên tìm có được các thông tin về những khuyến cáo an toàn của các nhà sản xuất sản phẩm đánh bóng sàn nhà, về các nguồn gây cháy và chọn cách thông gió khu vực làm việc. Những thông tin này nên được tập hợp lại và viết vào bản liệt kê các mục cần kiểm tra và giao cho toán thợ trước khi họ đi đến nơi làm việc. Các người chủ cần bảo đảm chắc chắn rằng bản liệt kê các mục cần kiểm tra đã được ghi đầy đủ trước khi bắt đầu làm việc.

Để có bản sao đầy đủ các báo cáo về các sự cố trên hãy liên hệ Massachusetts FACE tại 617-624-5632.



The Massachusetts Department of Public Health (MDPH), in cooperation with the National Institute for Occupational Safety and Health, conducts research oriented investigations of fatal work related injuries. The project, known as FACE (Fatality Assessment and Control Evaluation), seeks to identify the factors that contribute to these occupational fatalities. This alert was developed by the Massachusetts FACE Project in collaboration with the Office of the State Fire Marshal.

Please share this alert with others. This document is in the public domain and may be copied freely; it can be found along with other materials on the MDPH website at www.mass.gov/dph/bhsre/ohsp/ohsp.htm. If you have comments or questions, please call the FACE Project at 1-800-338-5223 or the Office of the State Fire Marshal at 877-9NO-FIRE.

Occupational Health Surveillance Program
Massachusetts Department of Public Health
250 Washington Street, 6th Floor
Boston, MA 02108



Some Massachusetts Health and Safety Resources

Massachusetts Division of Occupational Safety:

Offers free consultation services to help employers to improve their safety and health programs and train employees (www.mass.gov/dos/consult/index.htm)

Massachusetts Department of Industrial Accidents:

Has grants available for providing workplace health and safety training to employers/employees in companies covered by the Massachusetts Workers' Compensation Insurance Law (www.mass.gov/dia/Safety/index.htm)

Office of the State Fire Marshal:

Works to preserve life and property from fire and explosion by prevention, engineering, education, and enforcement (www.mass.gov/dfs/osfm/exec/index.htm)

Occupational Safety and Health Administration (OSHA):

Hazard Communication Standard (29 CFR 1910.1200) (http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10099)

Fire Safety Alert

Occupational Health Surveillance Program- Massachusetts Department of Public Health
Office of the State Fire Marshal Department of Fire Services



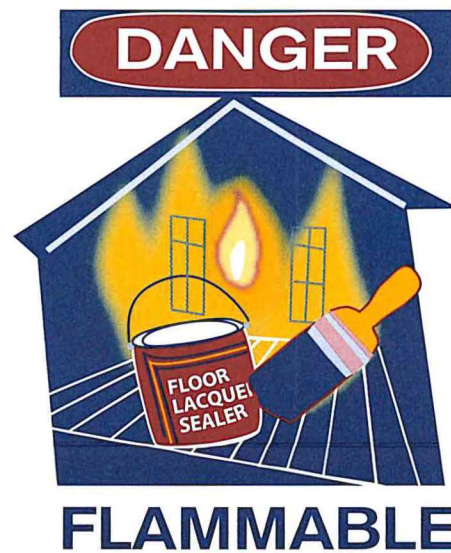
March 2006

Wood Floor Sanders Killed When Floor Finishing Product Catches Fire-Massachusetts

Wood floor finishing can expose workers, building occupants, and homeowners to fire hazards. In Massachusetts, three wood floor sanders died within a 10 month period (September 2004 – July 2005) in two separate fires when the flammable lacquer floor sealer they were using caught fire. The sealer used in these incidents was highly flammable (flash point 9°F/-13°C). All three of the fatally injured workers were Vietnamese immigrants.

Incident 1: Two floor sanders died from burns and two were seriously burned while they were refinishing wood floors in a three-family house. The house caught fire while the workers were applying a lacquer sealer that was ignited by a pilot light in a gas stove. At the time of the fire, windows were closed and no other means of ventilation were being used.

Incident 2: One floor sander died from burns and another received minor burns while finishing wood floors that they installed in a single family house. The house caught fire while the workers were applying a lacquer sealer that was ignited by a pilot light on a gas hot water heater. The heater was located in a closet on the same level of the house where the floors were being finished. At the time of the fire, the front door was open, but windows were closed and no other means of ventilation were being used.



What is the flash point of a liquid?

The flash point is the lowest temperature at which a liquid produces enough vapor to catch fire in the presence of a flame or other ignition source. **The lower the flash point, the more flammable the liquid.** A product's flash point can be found on the *Material Safety Data Sheet* (MSDS), or product label or by calling the product manufacturer.

HOW CAN YOU HELP PREVENT FIRE DURING FLOOR FINISHING?

Use less flammable wood floor finishing products (products with flash points greater than 100°F/38°C) for indoor applications.

Extinguish all open flames and other ignition sources before beginning work.

- Extinguish gas appliance pilots (on stoves, hot water heaters, heating units, clothes dryers, and other appliances).
- Turn off and unplug cycling electrical appliances (such as refrigerators, air conditioners, heating units, hot water heaters) and other electrical devices.
- Do not light or smoke cigarettes while you are working.
- Do not turn light switches on or off during the floor finishing process; turn off power to work area, if possible.

Adequately ventilate work areas during wood floor finishing.

- Open windows; keep open during product application until product is dry.
- If electric fans are used for ventilation, they must be classified as *explosion proof* and be plugged in outside of the work area.

In addition, employers should:

Provide safety training to employees, as required by law,* about the hazards of the chemicals they work with and safe work practices. Training should be provided in the languages spoken by employees.

*The Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 CFR 1910.1200).

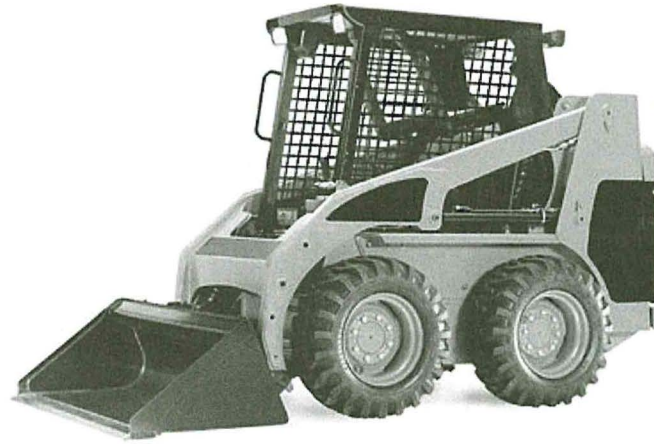
Conduct a job hazard analysis before each job. Also require employees to complete a safety checklist before beginning each job.

Before starting floor finishing jobs, employers should get information on manufacturer's safety recommendations for all products being used, ignition sources in the house and how to keep the work area ventilated. This information should be part of the safety checklist given to the work crew before going to the work site. Employers should make sure that the safety checklist has been completed before anyone starts work.



January 2005 Vol. 8, No. 1

Please Post



Occupational Health Surveillance Program
Massachusetts Department of Public Health
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Boston, MA 02108



The Massachusetts Department of Public Health, in cooperation with the National Institute for Occupational Safety and Health, conducts investigations of fatal work related injuries and occasionally serious non fatal injuries. The project, known as FACE (Fatality Assessment and Control Evaluation), seeks to identify the factors that contribute to these occupational injuries. The FACE Project will help in the development and use of improved safety measures for preventing occupational injuries in the future.

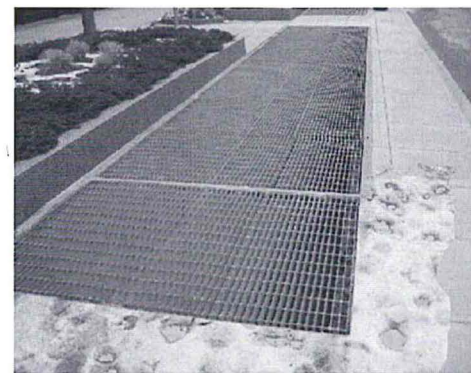
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If you have comments or questions, please call the FACE Project at 1-800-338-5223.



Hospital Employee Clearing Snow Killed When His Skid-Steer Loader Broke Through a Ventilation Grate Located in a Sidewalk - Massachusetts

Background: Many property owners and municipalities now use skid-steer loaders to clear snow from and sweep sidewalks as an efficient way to complete these tasks. One concern is that older grate systems may have been built to load capacity requirements that may not support heavier loads, such as skid-steer loaders, on sidewalks. In addition, older grates may have corroded structural supports that are not visible without performing structural inspections.



Incident: An auto mechanic for a local hospital was fatally injured when the skid-steer loader he was operating to clear snow during a blizzard broke through a ventilation shaft grate located in a sidewalk. The victim and the skid-steer loader fell approximately 20 feet to the bottom of the ventilation shaft. The force of the skid-steer load hitting the bottom of the shaft caused the victim's head to strike the back of the operator's seat. The victim was in the ventilation shaft for approximately two hours before co-workers discovered him. The grate and connecting shaft were originally constructed as part of a ventilation system for a transformer. At the time of the incident, the grate and connecting shaft were no longer being used for their original function, but had been incorporated into the heating, ventilation, and air conditioning system for the hospital. It was determined after the incident that some of the bolts that held the grate's supporting structure were corroded.

Recommendations

To prevent similar incidents, employers, property owners, and municipalities with sidewalk and roadway grates on their property should:

- know the intended load capacities for the grates
- maintain current engineering drawings for the grates that reflect "as built" conditions
- check cities or towns for local regulations and building codes that pertain to grate systems and heavy equipment use on sidewalks
- have registered professional engineers conduct routine structural inspections of the grates
- develop preventive maintenance schedules for the grates
- consider redesigning grate systems that currently lack redundant supporting mechanisms
- explore the possibility of eliminating or reducing the size of older grates when the original function of the system that the grate was part of has been eliminated, changed, or updated
- develop, implement and enforce communication protocols, such as routine personnel checks every 30 minutes via radio or in person, to enhance safety of employees who are assigned to tasks that involve working alone in extreme weather conditions

References:

Code of Federal Regulations, 29 CFR 1910.22 General requirements, Government Printing Office
Code of Federal Regulations, 29 CFR 1910.23 Guarding floor and wall openings and holes, Government Printing Office
United States Department of Labor, Occupational Safety and Health Administration, Safety and Health Information Bulletins, Hazard of Potential Sidewalk Grate System Failure, SHIB 12-30-2004. <http://www.osha.gov/dts/shib/shib123004.html>



August 2004 Vol. 7, No. 2

Multi-Piece Rim Wheels



A safety cage/tire inflation cage is one method of containing rim components in the event of an explosive separation.

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Occupational Health Surveillance Program
Massachusetts Department of Public Health
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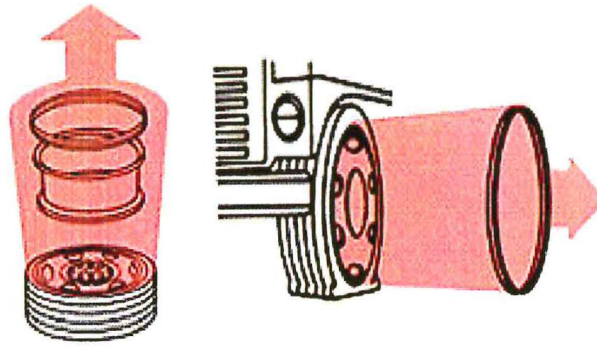
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If you have comments or questions, please call the FACE Project at 1-800-338-5223.



Worker Killed While Inflating a Tire Mounted on a Multi-Piece Rim - Massachusetts

Incident: A 42-year-old male laborer was fatally injured while using an air line with a faulty pressure gauge to inflate a tire mounted on a multi-piece rim on a front end loader. The victim sat in a chair positioned directly in front of the flat tire's sidewall and in the trajectory of the multi-piece rim parts. While he was inflating the tire, the increased air pressure caused the tire's tube to explode. The explosion knocked the victim backward with the chair, fatally injuring him.



Recommendations

All employees should be cautioned about the potential hazards of multi-piece rim wheels. Only employees who are assigned to service multi-piece rim wheels and have been trained on the proper methods of working with these wheels should be allowed to service them, including inflating tires.

To prevent similar incidents, employers should:

- **Ensure that tires mounted on multi-piece rims that are flat or underinflated (the tire has less than 80% of recommended pressure) are never re-inflated while the wheel is on the vehicle. Once the wheel is off of the vehicle, the rim should be disassembled, inspected, reassembled, re-inflated and placed back on the vehicle.**

Completely deflate the tire by removing the valve core. Then, remove the wheel from the vehicle, demount and inspect the tire, and disassemble and inspect the rim. If no problems are found, reassemble the rim, remount the tire on the rim, and reinflate the tire prior to placing the wheel back onto the vehicle. When reinflating the tire, employees should use a restraining device for the tire, such as a safety cage or cable restraints.¹

- **Ensure that employees never position themselves in front of or over tires mounted on multi-piece rims during inflation.**

A tire mounted on a multi-piece rim that is underinflated but has more than 80% of the recommended pressure can be inflated without demounting and disassembling the wheel (the wheel can remain on the vehicle). Employees should inflate tires from a distance, standing behind the tire tread, out of the trajectory of the rim parts, using a long air line with a clip-on chuck and in-line valve with a pressure gauge.¹ If the same underinflated tire is not mounted on a vehicle, the tire can still be inflated without disassembling and inspecting the wheel, but a restraining device must be used on the tire.^{1,2}

- **Implement safe operating procedures for servicing multi-piece rim wheels and provide training on these procedures.**

OSHA has outlined safe operating procedures in their 29 CFR 1910.177 standard, *Servicing multi-piece and single piece rim wheels*. In addition to the above two recommendations, other required procedures for servicing multi-piece rim wheels are listed below. The full text of this standard can be found at: www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9825

After inflation, the tire and rim components should be inspected while still within the restraining device to ensure that all components are properly seated and locked. If further adjustments to the tire or rim components are needed, the tire shall be deflated before these adjustments are made.

- Never attempt to correct the seating of side and lock rings by hammering, striking, or forcing the components while the tire is pressurized.
- Cracked, broken, bent, or damaged rim components should not be reworked, welded, brazed, or otherwise heated.
- No heat shall be applied to any multi-piece rim components.

- **Develop, implement and enforce equipment maintenance programs.**

Equipment maintenance programs should include both scheduled preventive and emergency maintenance. The victim was inflating a tire that routinely lost air using an air compressor that had a faulty pressure gauge. The air compressor should have been taken out of service until the pressure gauge was replaced. In addition, when the tire on the front end loader first started losing air, a trained worker should have addressed the problem.

References:

1. Code of Federal Regulations, 29 CFR 1910.177, Servicing multi-piece and single piece rim wheels, Motor vehicles, U.S. Government Printing Office
2. Equipment Manufacturers Institute, 1991, Wheel loader / tractor, Form # WLT70-1



June 2004 Vol. 7, No. 1

Vehicle Mounted Work Platforms

Please Post

Occupational Health Surveillance Program
Massachusetts Department of Public Health
250 Washington Street, 6th Floor
Boston, MA 02108

The Massachusetts Department of Public Health, in cooperation with the National Institute for Occupational Safety and Health, conducts investigations of fatal work related injuries and occasionally serious non fatal injuries. The project, known as FACE (Fatality Assessment and Control Evaluation), seeks to identify the factors that contribute to these occupational injuries. The Face Project will help in the development and use of improved safety measures for preventing occupational injuries in the future.

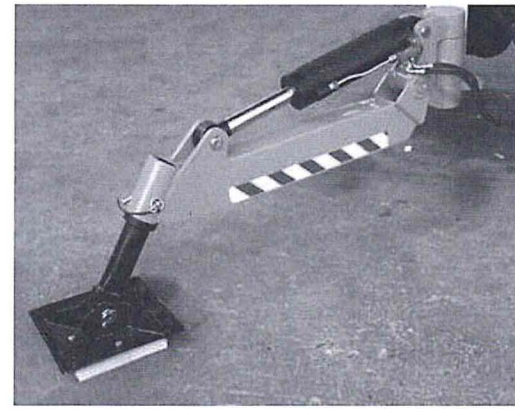
We hope you find the "FACE Facts" informative and that you will share it with others. This document is in the public domain and may be copied freely.

If you have comments or questions, please call the FACE Project at 1-800-338-5223.



Two Vehicle Mounted Work Platforms Overturn Killing the Operators- Massachusetts

Background: Vehicle mounted work platforms, also called aerial lifts, are used daily by workers to complete many tasks. Within a twelve-month period during 2001 - 2002, two Massachusetts workers were fatally injured in separate incidents when the rented vehicle mounted work platforms they were working from overturned. In both cases the outriggers had not been fully deployed during the use of the work platforms.



Fully deploy outriggers onto pads or solid surfaces

Incident 1: A structural engineer was fatally injured during an interstate viaduct inspection. The victim was conducting the inspection from a vehicle mounted work platform that had four out of the five outriggers fully deployed. The passenger side outrigger was deployed but **only partially extended due to an obstruction** on the ground. The work platform had been elevated approximately 50 feet up and over the passenger side direction. The ground below the elevated work platform sloped downwards approximately 30 feet from the area on which the vehicle was positioned. The vehicle tipped toward the passenger side, and the victim fell with the platform approximately 80 feet to the ground below.

Incident 2: An electrician was fatally injured while using a vehicle mounted work platform to install holiday lights at a city common. The vehicle's outriggers had been lowered onto pieces of plywood but **not extended outward**. At the time of the incident, the work platform had been elevated approximately 50 feet up and over the driver side. The truck tipped in that same direction and the victim fell with the platform approximately 50 feet to the ground below.

Recommendations

To prevent similar incidents, employers should:

- ensure that outriggers are fully deployed and are set on pads or solid surfaces

Employers should also:

- provide employee training by a qualified person on the safe use of vehicle mounted work platforms as outlined in the manufacturer's operator's manual
- ensure that work site hazard analyses are performed prior to positioning the vehicle mounted work platform for use (this should include but not be limited to):
 - locating level ground (when possible) to position the vehicle
 - looking for holes, drop-offs, bumps and other ground obstructions
 - evaluating area above the work site for overhead power lines and other obstructions
- provide and ensure that employees are using the OSHA required fall protection equipment when in an elevated aerial lift

Vehicle mounted work platform rental companies should:

- provide copies of the operator's and maintenance manuals stored in a weather-resistant location on the aerial device
- perform a pre-rental inspection of both the vehicle and work platform
- ensure that the lessors have been trained on the proper use and operation of the specific aerial device being rented as outlined in the manufacturer's operator's manual

Vehicle mounted work platform manufacturers should:

- explore the possibility of incorporating interlocks that would prohibit operation of an aerial lift if the outriggers were not fully extended

References:

Occupational Safety and Health Administration (OSHA) Standard: 29 CFR 1910.67 Vehicle-mounted elevating and rotating work platforms.
Occupational Safety and Health Administration (OSHA) Standard: 29 CFR 1910.132 Personal Protective Equipment.
The Center to Protect Workers' Rights, Aerial Lift Safety, Hazard Alert www.cpwr.com/Hazardalert.htm

INJURY INVESTIGATION REPORT

FACE Facts

August 2003 Vol. 6, No. 2



Please
Post

Occupational Health Surveillance Program
Massachusetts Department of Public Health
2 Boylston Street, 6th Floor
Boston, MA 02116

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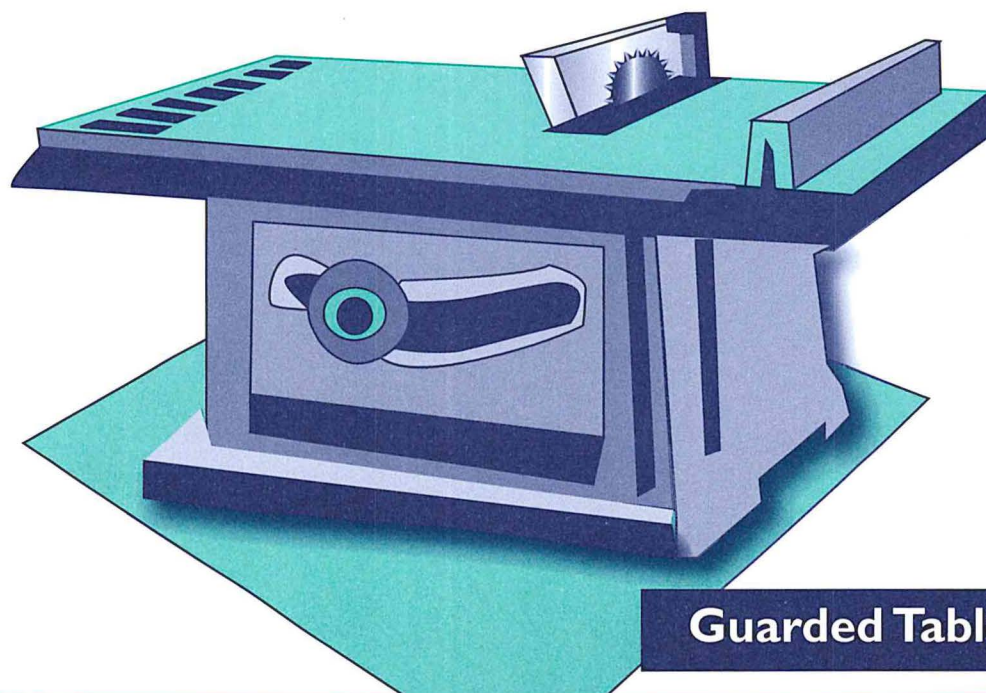
If you have comments or questions, please call the FACE Project at 617-988-3341.



A 15-Year-Old Student Amputates Fingers While Operating an Unguarded Table Saw in Woodworking Class - Massachusetts

Industrial arts provides students with important opportunities to learn technical skills and introduces them to the work environment. Occupational safety and health is a crucial component of this work preparation, both for safety in the school shop and to develop safe work skills for the future.

Incident: In 2003, a 15-year-old student amputated one left finger (both joints) and a portion of another left finger and thumb while operating an unguarded table saw in a woodworking class at a school. The saw, manufactured in 1991 and equipped with a 10-inch woodworking blade, was located in the woodworking shop, near the shop door. The student was making a lengthwise cut (ripping) and reached around to the back side of the **unguarded** saw blade to grab the cut piece of wood. The student's two fingers and thumb came in contact with the rotating saw blade, resulting in the serious injuries to the left hand.



To prevent similar incidents, schools that have woodworking shops should:

- Ensure that the manufacturers' supplied guards are installed on all table saws, and that the guards function properly and are used at all times.
- Position tables at the backside of saws to prevent the work pieces from falling off the saws and onto the floor.
- Design the woodworking shop layout to reduce distractions to equipment operators.
- Provide woodworking class conditions that at a minimum meet safety and health standards set by the Occupational Health and Safety Administration (OSHA) and train students about these standards.

REFERENCES

- Code of Federal Regulations, 29 CFR 1910.213, Machinery and Machine Guarding, *Woodworking machinery requirements*.
U.S. Department of Labor, Occupational Safety and Health Administration, Small Business Safety Management Services, *A Guide for Protecting Workers from Woodworking Hazards*. OSHA 3157 1000.
Delta International Machinery Corporation, *Instruction Manual, Ten-inch Contractor's Saw*. Model. 34-444, 10-15-91.
National Safety Council, *Safeguarding Concepts Illustrated* 6th Edition. 1995.





From the Occupational Health Surveillance Program, Massachusetts Department of Public Health

Laborer from Brazil died on the job when he became caught in a rock crushing machine

In February 2002, tragedy struck when a 37-year-old man from Brazil died at a Massachusetts workplace. The man, employed by a local construction contractor, worked at a rock crushing facility as a laborer. He kept the site clean by shoveling and sweeping debris from around the rock crushing machine. A co-worker found the man caught in the rock crushing machine. He had only been working for this employer for one week prior to his death.

Tips to keep yourself safe on the job:

- If you think some part of your job is not safe, talk to your co-workers. You can talk to your boss together.
- Ask your boss for safety training for any machine you use, even if you have used that kind of machine before.
- If you can not understand warning and safety signs at your job, ask your boss to post signs in your language.
- If you are in a union, talk to a union representative.

You have a right to ask for health and safety information and protection. It is illegal for your employer to fire you if you do so!

You have health and safety rights on the job!

All workers have health and safety rights in the workplace: citizens and non-citizens, documented and undocumented workers. Employers have to follow occupational health and safety regulations.

Your employer has to:

- Provide you with a safe workplace that is free of serious recognized hazards.
- Train you how to work safely around dangerous chemicals (that you work with or work near).
- Make sure you have and use safe and properly maintained tools and equipment.
- Make sure all employees are covered under "Workers' Compensation" insurance. (Workers' Compensation is a state system that provides medical benefits and money for workers who get hurt on the job.)

For more information

Brazilian Immigrant Center Tel: 617-783-8001
www.braziliancenter.org

Massachusetts Coalition for Occupational Safety & Health (MassCOSH) helps workers with health and safety problems on the job Tel: 617-825-7233 ext. 10
www.masscosh.org

Occupational Safety and Health Administration (OSHA) handles complaints of serious hazards. Tel: 617-565-9860
www.osha.gov

Massachusetts Department of Industrial Accidents (DIA) administers Workers' Compensation Tel: 617-727-4900 x470
www.state.ma.us/dia

ALWAYS: *If you need an interpreter, ask for one as soon as you make the call!*



Do Programa de Saúde Ocupacional, Deptº. de Saúde Pública de Massachusetts

Trabalhador do Brasil morre no trabalho, ao ficar preso em máquina para triturar pedras

Em Fevereiro 2002, ocorreu uma chocante tragédia, quando um trabalhador do Brasil, de 37 anos morreu no local de trabalho em Massachusetts. O trabalhador, empregado de uma companhia local de construção, trabalhava na área de trituração de pedras como operário. Ele mantia o local limpo, removendo com a pá e varrendo os fragmentos que caíam em volta da máquina de triturar pedras. Um colega de trabalho encontrou o operário preso na máquina. Ele trabalhou para esse empregador somente por uma semana, antes de sua morte.

Como manter-se seguro em seu trabalho:

- Se você acha que alguma parte em seu trabalho não é segura, converse com seus colegas. Vocês podem conversar juntos, com o seu chefe.
- Peça ao seu chefe um treinamento de segurança nas máquinas que você usa, mesmo que você já tenha usado aquele tipo de máquina antes.
- Se você não compreende os avisos de segurança colocados em seu trabalho, peça ao seu chefe que coloque avisos em seu idioma.
- Se você pertence a uma união de trabalhadores converse com um representante da união.

Você tem o direito de pedir informação sobre saúde, segurança e proteção. É ilegal para seu empregador demiti-lo por esse motivo.

Você tem direito à saúde e à segurança no trabalho!

Todo trabalhador tem o direito à saúde e segurança no local de trabalho: cidadãos e não cidadãos, documentados e não documentados. Empregadores têm que seguir os regulamentos de saúde e segurança ocupacionais.

Seu empregador tem que:

- Fornecer-lhe um local de trabalho isento de riscos sérios e reconhecidos.
- Treinar-lhe como trabalhar com segurança, em volta de produtos químicos (com os que você trabalha ou com os que estão próximos).
- Assegurar-se que você tenha e use ferramentas e equipamentos seguros e mantidos apropriadamente.
- Assegurar-se que todos os empregados estejam cobertos sob o seguro de "Compensação dos Trabalhadores". (Este é um sistema estadual que fornece benefícios médicos e financeiros para trabalhadores que se ferem no trabalho).

Para mais informação

Centro do Imigrante Brasileiro *Tel: 617-783-8001*
www.braziliancenter.org

Massachusetts Coalition for Occupational Safety & Health (MassCOSH) ajuda trabalhadores com problemas de saúde e segurança no trabalho *Tel: 617-825-7233 ext. 10*
www.masscosh.org

Occupational Safety and Health Administration (OSHA) tratam das queixas de riscos graves. *Tel: 617-565-9860*
www.osha.gov

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www.state.ma.us/dia

SEMPRE: Se você precisar de intérprete peça por um, logo que fizer a chamada!



From the Occupational Health Surveillance Program, Massachusetts Department of Public Health

18-year-old Brazilian died on the job when a shoplifter stabbed him

In February 2004, tragedy struck when a Brazilian worker was assaulted during a shoplifting incident. The victim, an 18-year-old male, was fatally stabbed during an assault outside of the store. The victim was employed by a local pharmacy where he provided general help. The shoplifter exited the store with stolen items and the store manager went after him. The 18-year-old worker noticed that the shoplifter had stabbed the store manager and went outside to help his boss. While trying to help his boss, the 18-year-old was fatally stabbed by the shoplifter.

Tips to keep yourself safe on the job:

- If you think some part of your job is not safe, talk to your co-workers. You can talk to your boss together.
- Ask your boss for safety training for any machine you use, even if you have used that kind of machine before.
- If you can not understand warning and safety signs at your job, ask your boss to post signs in your language.
- If you are in a union, talk to a union representative.

You have a right to ask for health and safety information and protection. It is illegal for your employer to fire you if you do so!

You have health and safety rights on the job!

All workers have health and safety rights in the workplace: citizens and non-citizens, documented and undocumented workers. Employers have to follow occupational health and safety regulations.

Your employer has to:

- Provide you with a safe workplace that is free of serious recognized hazards.
- Train you how to work safely around dangerous chemicals (that you work with or work near).
- Make sure you have and use safe and properly maintained tools and equipment.
- Make sure all employees are covered under "Workers' Compensation" insurance (Workers' Compensation is a state system that provides medical benefits and money for workers who get hurt on the job).

For more information

Coalition for a better work environment for Brazilians (COBWEB) Tel: (617) 783-8001 ext. 6
Tel: (978) 934-3147

Massachusetts Coalition for Occupational Safety & Health (MassCOSH) helps workers with health and safety problems on the job Tel: 617-825-7233 ext. 10
www.masscosh.org

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www.mass.gov/dia

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Do Programa de Saúde Ocupacional, Depto. de Saúde Pública de Massachusetts

Brasileiro de 18 anos morreu no trabalho ao ser esfaqueado por um ladrão

Em fevereiro de 2004, a tragédia aconteceu quando um trabalhador brasileiro foi atacado durante um roubo na loja em que trabalhava. Um homem de 18 anos foi fatalmente esfaqueado do lado de fora da loja, durante um assalto. A vítima era empregado de uma farmácia local onde trabalhava atendendo os consumidores. O ladrão saiu da loja com itens roubados e o gerente da loja o perseguiu. O trabalhador percebeu que o ladrão havia esfaqueado o gerente e saiu da loja para ajudar o seu patrão. Ao tentar ajudar o gerente, o jovem trabalhador foi mortalmente esfaqueado pelo ladrão.

Como manter-se seguro em seu trabalho:

- Se você acha que alguma parte em seu trabalho não é segura, converse com seus colegas. Vocês podem conversar juntos, com o seu chefe.
- Peça ao seu chefe um treinamento de segurança nas máquinas que você usa, mesmo que você já tenha usado aquele tipo de máquina antes.
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- Assegurar-se que você tenha e use ferramentas e equipamentos seguros e mantidos apropriadamente.
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Para mais informação

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Tel: (978) 934-3147

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SEMPRE: Se você precisar de intérprete peça por um, logo que fizer a chamada!

Departamento de Saúde Pública de Massachusetts, Programa de Saúde Ocupacional
250 Washington St., 6º andar, Boston, MA 02108-4619, Tel: 617-624-5632 Fax: 617-624-5696

SAFETY ALERT



From the Occupational Health Surveillance Program, Massachusetts Department of Public Health

Two Brazilian restaurant cleaners were injured on the job, one fatally, when assaulted by a robber

In May 2004, tragedy struck when two Brazilian workers were assaulted during a robbery attempt at the restaurant where they worked. One of these workers, a 35-year-old male, was fatally stabbed and the other worker, a 27-year-old male, was injured during the assault. The men, employed by a local restaurant, cleaned the restaurant after hours. The 35-year-old victim noticed his co-worker being assaulted and attempted to help him. During this attempt, robber fatally stabbed him.

Tips to keep yourself safe on the job:

- If you think some part of your job is not safe, talk to your co-workers. You can talk to your boss together.
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For more information

Coalition for a better work environment for Brazilians (COBWEB) Tel: (617) 783-8001 ext. 6
Tel: (978) 934-3147

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Do Programa de Saúde Ocupacional, Depto. de Saúde Pública de Massachusetts

Dois brasileiros, faxineiros de de um restaurante, foram feridos no trabalho, um deles mortalmente, ao serem atacados por um ladrão que portava arma branca

Em maio de 2004, a tragédia aconteceu quando dois trabalhadores brasileiros foram atacados durante uma tentativa de assalto no restaurante em que trabalhavam. Um dos trabalhadores, um homem de 35 anos, foi fatalmente esfaqueado e o outro trabalhador, um homem de 27 anos, foi ferido durante o ataque. Este empregado de um restaurante local limpava o restaurante após seu fechamento. A vítima de 35 anos de idade percebeu que seu colega de trabalho estava sendo atacado e tentou socorrê-lo, quando o assaltante o esfaqueou mortalmente.

Como manter-se seguro em seu trabalho:

- Se você acha que alguma parte em seu trabalho não é segura, converse com seus colegas. Vocês podem conversar juntos, com o seu chefe.
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From the Occupational Health Surveillance Program, Massachusetts Department of Public Health

42-year-old Brazilian roofer died on the job when electrocuted

In October 2004, tragedy struck when two workers were electrocuted. One of these workers, a 42-year-old Brazilian male, was killed and the other worker, a 21-year-old Guatemalan male, was severely injured. A local roofing contractor employed both men as roofers. The men were unloading a 32-foot aluminum extension ladder from a pickup truck when the ladder struck an overhead electrical power line and electrocuted them.

Tips to keep yourself safe on the job:

- If you think some part of your job is not safe, talk to your co-workers. You can talk to your boss together.
- Ask your boss for safety training for any machine you use, even if you have used that kind of machine before.
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For more information

Collaboration for a Better Workplace Environment for Brazilians (COBWEB) Tel: (617) 783-8001 ext. 6
Tel: (978) 934-3147

Massachusetts Coalition for Occupational Safety & Health (MassCOSH) helps workers with health and safety problems on the job Tel: 617-825-7233 ext. 10
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Do Programa de Saúde Ocupacional, Depto. de Saúde Pública de Massachusetts

Instalador de telhado brasileiro de 42 anos morre ao ser eletrocutado

Em outubro de 2004, a tragédia ocorreu quando dois trabalhadores foram eletrocutados. Um destes trabalhadores, um homem brasileiro de 42 anos, faleceu, e o outro trabalhador, um homem guatemalteco de 21 anos, foi seriamente ferido. Os dois homens eram empregados de uma empresa local de instalação de telhados. Os trabalhadores estavam descarregando uma escada de alumínio de 10 metros de uma pickup quando a escada bateu em uma linha de alta tensão e os eletrocutou. O brasileiro faleceu e o guatemalteco sobreviveu.

Como manter-se seguro em seu trabalho:

- Se você acha que alguma parte em seu trabalho não é segura, converse com seus colegas. Vocês podem conversar juntos, com o seu chefe.
- Peça ao seu chefe um treinamento de segurança nas máquinas que você usa, mesmo que você já tenha usado aquele tipo de máquina antes.
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Seu empregador tem que:

- Fornecer-lhe um local de trabalho isento de riscos sérios e reconhecidos.
- Treinar-lhe como trabalhar com segurança, em volta de produtos químicos (com os que você trabalha ou com os que estão próximos).
- Assegurar-se que você tenha e use ferramentas e equipamentos seguros e mantidos apropriadamente.
- Assegurar-se que todos os empregados estejam cobertos sob o seguro de "Compensação dos Trabalhadores". (Este é um sistema estadual que fornece benefícios médicos e financeiros para trabalhadores que se ferem no trabalho).

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www.masscosh.org

Occupational Safety and Health Administration (OSHA) tratam das queixas de riscos graves Tel: 617-565-9860
www.osha.gov

Massachusetts Department of Industrial Accidents (DIA) administra a Compensação dos Trabalhadores Tel: 617-727-4900 x470
www.mass.gov/dia

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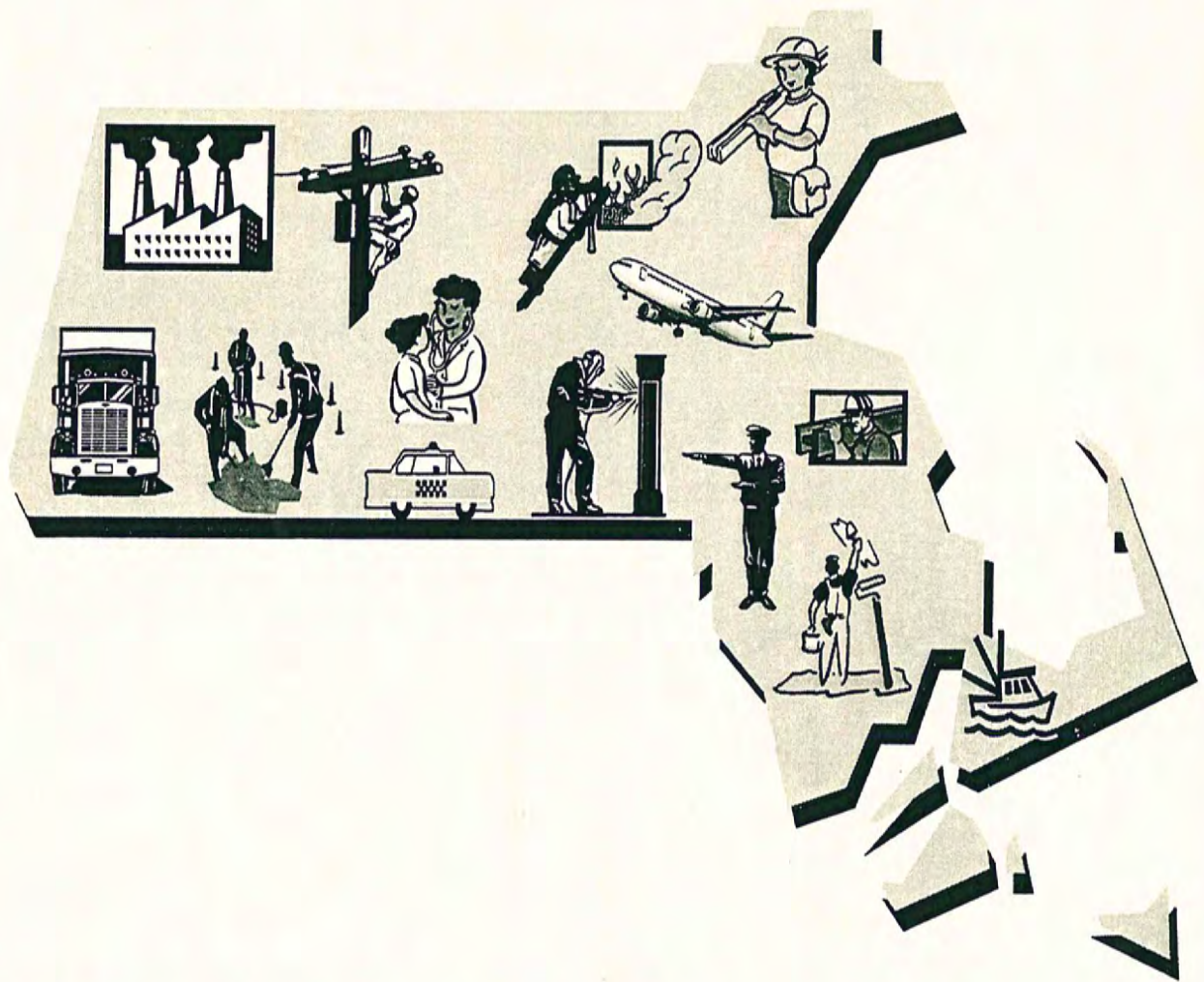
Appendix 5

Fatal Occupational Injuries in Massachusetts, 1991-1999

Annual Massachusetts Fatality Update Data Reports

Fatal Occupational Injuries in Massachusetts

1991-1999



Massachusetts Department of Public Health
Bureau of Health Statistics, Research and Evaluation
Occupational Health Surveillance Program

September 2002

Fatal Occupational Injuries in Massachusetts

1991 - 1999

Jane Swift, Governor
Robert P. Gittens, Secretary of Health and Human Services
Howard K. Koh, MD, MPH, Commissioner of Public Health

Daniel J. Friedman, Ph.D, Assistant Commissioner, Bureau of Health Statistics,
Research and Evaluation
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Massachusetts Department of Public Health
Bureau of Health Statistics, Research and Evaluation
Occupational Health Surveillance Program

September 2002

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617-624-5632

**This report is also available on line at MDPH's web site
<http://www.state.ma.us/dph/bhsre/ohsp/ohsp.htm>**

Preface

It is not possible to issue a report on work-related fatalities at this time without acknowledging the overwhelming number of people who died at work in the recent terrorists attacks. The events of September 11th have brought a heightened and painful awareness of the tragedy wrought when loved ones leave for work never to return home. These and the subsequent fatalities of media and postal workers due to anthrax exposures in the workplace have fostered new appreciation for the contribution of workers in all walks of life.

This report tells the less dramatic but likewise painful story of individuals who have been fatally injured on the job – not in a single event but in events that occur day in and day out. It is the story of workers who have died trying to get their jobs done – of fishers who provide us with the food we eat, of carpenters who build the homes we live in, of convenience store workers who work through the night, of firefighters, police, and other first responders who routinely put their lives on the line for the greater public good. The hazards faced by these workers should not simply be accepted as part of the job. The more we know about the circumstances under which workers have been fatally injured, the better able we are to prevent similar fatalities in the future.

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Executive Summary

Work-related fatalities are a significant public health problem in Massachusetts, as they are in the United States. Information about the occupations, industries and circumstances in which these fatalities occur is essential to guide efforts to prevent future fatalities. Since 1991, the Massachusetts Department of Public Health has collected information on all fatal occupational injuries in the Commonwealth as part of the national Census of Fatal Occupational Injuries, conducted in cooperation with the Bureau of Labor Statistics in the U.S. Department of Labor. This report provides a comprehensive overview of fatal occupational injuries in Massachusetts during 1991-1999. It includes a comparison of the occupational fatality experience in Massachusetts with that of the nation as a whole. It also includes more detailed findings on three specific topics: falls to lower levels, work-related homicides, and fishing-related fatalities. Findings are intended to guide the many players – government agencies, employers, unions, safety professionals, advocacy organizations, researchers, job trainers, and equipment design engineers - who have important roles to play in preventing fatal injuries at work.

Key findings:

Overview

- A total of 633 workers died as a result of fatal occupational injuries sustained in Massachusetts during 1991-1999 – an average of between one and two workers each week.
- The annual average fatality rate was 2.3 fatalities per 100,000 workers. There was no clear-cut trend in fatality rates over the nine-year period (Chart 1).

Gender, Age, Race, and Hispanic Origin

- The great majority of victims (93%) were male, and male workers had a much higher rate of fatal occupational injury than female workers (Chart 2).
- The rate of fatal occupational injury increased markedly with the age of the workers (Chart 3).
- Workers of Hispanic origin (regardless of race) had a high rate of fatal occupational injury compared to black and white workers (Chart 4).
- Foreign-born workers accounted for a high proportion of fatal injuries among workers of color and made up a disproportionate share of the victims of workplace homicide.

Industries, Occupations, and Fatal Events

- Agriculture (excluding Fishing and Forestry) had the highest fatal occupational injury rate, more than five times the average rate for all industry divisions (Chart 5). Two thirds of the 35 fatalities in this industry division involved workers employed in landscaping and horticultural services.
- The Construction industry division had both a high number of fatal injuries (136) and the second highest fatal occupational injury rate. More than half of the construction workers fatally injured on the job died as a result of falls.
- The Farming, Forestry and Fishing occupation group had the highest fatality rate, more than thirteen times the average rate for all occupations. Most of the workers in this group (57 of 95) were fishers. Commercial fishing claimed more lives than any other single occupation (Chart 6).

- Fatal occupational injuries due to transportation-related incidents - including land, water, and air transport incidents - lead all event categories. Within this category, highway motor vehicle incidents and water vehicle incidents were the most frequent events resulting in 84 and 51 fatalities respectively.
- Falls to lower levels was the leading single fatal event in Massachusetts, accounting for 118 fatalities (Table1).

Sector, Establishment Size and Investigations by the Occupational Safety and Health Administration

- A total of 69 government employees died on the job.
- Self-employed workers had a higher occupational fatality rate (more than twice) than wage and salary workers.
- Small establishments (with 19 or fewer employees) had a high fatal occupational injury rate, more than one and a half times the average rate for establishments of all sizes (Chart 7).
- More than 60% of the occupational fatalities were not inspected by OSHA because; a) they did not fall under OSHA's jurisdiction; or b) they resulted from events that are not routinely investigated by the agency; or c) death occurred more than 30 days after the injury (Chart 8).

Falls to Lower Levels

- Most fatal falls to lower levels (61%, 72 fatalities) occurred in the construction industry division and two-thirds of these occurred in small establishments with 10 or fewer employees (Chart 11).
- The fatal fall rate in construction was as high as sixteen times the average fatal fall rate for all industries (Table 6).
- Older workers had a six-fold increased risk of fatal falls to lower levels compared to workers of all age groups (Chart 13).

Work-related Homicides

- Work-related homicide was the third leading fatal event, accounting for 82 fatalities.
- Work-related homicides were concentrated in a small number of industries and occupations (Chart 14).
- Male workers had a higher rate of workplace homicide than female workers.
- Homicide was the leading fatal event among black and Hispanic workers.
- Robbery was the leading precipitating circumstance, where motive was known, of work-related homicides (Chart 15).
- Workplace homicides are more likely to result from shooting than non-workplace homicide.

Fishing

- Most work-related fishing fatalities occurred as a result of sinking or capsizing of fishing vessels (Chart 16).
- Most (61%) fishing fatalities occurred during fall and winter seasons (Chart 17).

Comparison with national occupational fatality experience

- Massachusetts had lower annual fatal occupational injury rates than the nation for each year of the period under consideration (Chart 9). The rate difference was in part explained by the difference in the occupation composition and industry mix of the labor force between Massachusetts and the nation. Low homicide and motor vehicle related death rates in Massachusetts have also contributed to the low fatal injury rate of the state.
- Falls accounted for a much higher proportion (21%) of work-related fatal injuries in Massachusetts than in the nation (11%) (Appendix 2).

Introduction

Although the risk of dying on the job in the United States has declined since 1980¹, fatal occupational injuries continue to be a significant public health problem in Massachusetts as they are in the country as a whole. From 1991 through 1999, 633 workers died as a result of injuries sustained while at work in the Commonwealth. These fatalities were all the more tragic because they were largely preventable. Information about the circumstances in which workers were fatally injured on the job is essential to design and target efforts to prevent future fatalities.

This report provides a comprehensive overview of fatal occupational injuries in Massachusetts from 1991 to 1999. Although the Massachusetts Department of Public Health published an annual report on fatal injuries at work each year during this period, the numbers from these individual years were too small for meaningful analysis of categories of interest. Nine years of data, however, allow for a more detailed understanding of the factors associated with workplace fatalities in Massachusetts.

This report is based on data collected under two separate but complementary federal programs. The comprehensive surveillance of all fatal occupational injuries sustained in Massachusetts is conducted as part of the national Census of Fatal Occupational Injuries (CFOI), supported by the U.S. Department of Labor, Bureau of Labor Statistics. On-site investigations of selected fatalities are carried out as part of the Fatality Assessment and Control Evaluation (FACE) program sponsored by the National Institute for Occupational Safety and Health. Both of these programs are carried out in Massachusetts by the Occupational Health Surveillance Program of the Massachusetts Department of Public Health.

Section I of this report provides an overview of work-related fatalities in Massachusetts during the nine-year period. Section II compares the occupational fatality experience in Massachusetts with that of the nation. Section III includes more detailed findings on three special topics: falls to lower levels, homicides, and fishing-related fatalities. Case examples based on FACE investigations are included throughout the report. This resource document is intended to guide the many parties - government agencies, employers, unions, safety professionals and advocacy organizations, researchers, job trainers, product design engineers, and architects - who have a role to play in preventing fatal injuries at work.

¹Fatal Injuries to Civilian Workers in the United States, 1980-1995: National and State Profiles, Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, July 2001.

Methods

Definition of Fatal Occupational Injuries

A fatal occupational injury is defined as a death resulting from traumatic injury or other external cause that occurred while the person was at work. This definition includes fatalities due to acute exposure to toxic chemicals or physical agents as well as lack of such essentials as heat or oxygen. Examples include those events traditionally linked with factors in the work environment such as falls, electrocutions, and crushings, as well as homicides and suicides at work and motor vehicle fatalities that occur while travelling on the job. The CFOI and FACE programs do not include injuries that occur while commuting to or from work. Deaths caused by occupational illness and most fatal heart attacks are also excluded.

Included in this report are all fatal occupational injuries that occurred in Massachusetts while the victims were working or traveling for work in the state regardless of their state of residence, state of death, or state of origin of travel. The count does not include, however, fatal injuries that occurred in other states but death occurred in Massachusetts.

Fatal occupational injuries that occurred in the ocean are included in the count if (according to the CFOI criteria), either the injury occurred within the 200-miles offshore economic zone of the United States and is more proximal to Massachusetts than other states or a death certificate was issued by the state of Massachusetts. Fatal injuries that occurred beyond the 200-mile offshore economic zone of the U.S. are excluded.

Definition of Work-relatedness

For an injury to be considered work-related, the victim must have been working at the time of the event (or traveling as part of his employment) and engaged in a legal activity. Victims may have been either employed by others or self-employed, and they may have been employed for wage and salary compensation or have been volunteers working without pay or other compensation.

Sources of Data

Data on fatal occupational injuries in Massachusetts are from the Census of Fatal Occupational Injuries (CFOI) carried out by the Occupational Health Surveillance Program (OHSP) in the Massachusetts Department of Public Health. The Department has collected occupational fatality data under the CFOI program since 1991. Data on occupational fatalities throughout the United States are from the national CFOI reports published by the U.S. Bureau of Labor Statistics (BLS).

CFOI uses multiple data sources to identify and document work-related fatalities. The main sources are death certificates, Workers' Compensation records, newspapers, FARS (Fatality Accident Reporting System) reports, OSHA records, and Coast Guard reports. Other available federal and state administrative records are also used. In some cases, employers are contacted through follow-up questionnaires to obtain additional information. These records are used to compile a complete and accurate count of fatal injuries at work in a given year. For assurance of an accurate count of fatal occupational injuries, CFOI requires that the work relationship be substantiated by two or more independent sources.

Coding

Information on each fatal occupational injury is coded for different variables using different coding systems. Categorical analyses of fatal injuries by industry, occupation and event are based on the classifications of these coding systems.

Industry: Industry is the type of establishment or business in which a fatally-injured worker was employed at the time of the injury. Information is obtained from different source documents and is coded according to the *Standard Industrial Classification Manual*, Office of Management and Budget 1987 (Appendix 8).

Occupation: Occupation is the type of occupation that a fatally-injured worker assumed at the time of his/her injury. It is coded according to the *Occupational Injuries and Illnesses Occupation Coding Manual* (Adopted from the Bureau of Census 1990 *Alphabetical Index of Industries and Occupations*), 1993, Bureau of Labor Statistics, U.S. Department of Labor (Appendix 9).

Event/Exposure, Nature of Injury, Body Part Affected and Source of Injury: were coded according to *Occupational Injury and Illness Classification Manual*, 1992, BLS (Appendix 10).

Other variables: Other variables such as age, race, gender, establishment size, and ownership are coded according to the BLS, *Census of Fatal Occupational Injuries State Operating Manual*, March 1996.

Fatality Rates

Fatality rates are defined as the number of fatalities due to traumatic occupational injuries per 100,000 Massachusetts workers. Unless otherwise noted in this document, the average annual fatality rates for the nine-year period are reported. These were computed as: (a) the sum of the number of fatalities over the nine-year period, divided by (b) the sum of the number of workers employed in Massachusetts each year over the nine-year period, multiplied by (c) 100,000. For some rates, employment data from 1995 (the midyear of the study period) were used as the denominator. Information about the number of workers was obtained from the Current Population Survey (CPS) conducted by the Bureau of Labor Statistics, except where noted. Fatalities involving youth less than 16 years old were excluded from all rate calculations because employment data from the CPS are limited to workers 16 years and older. Due to lack of industry-specific data for self-employed workers, fatalities among self-employed workers (except for Agriculture) were excluded from industry-specific rate computations. Some of the rates presented in this report are based on small numbers of fatalities and should be interpreted with caution.

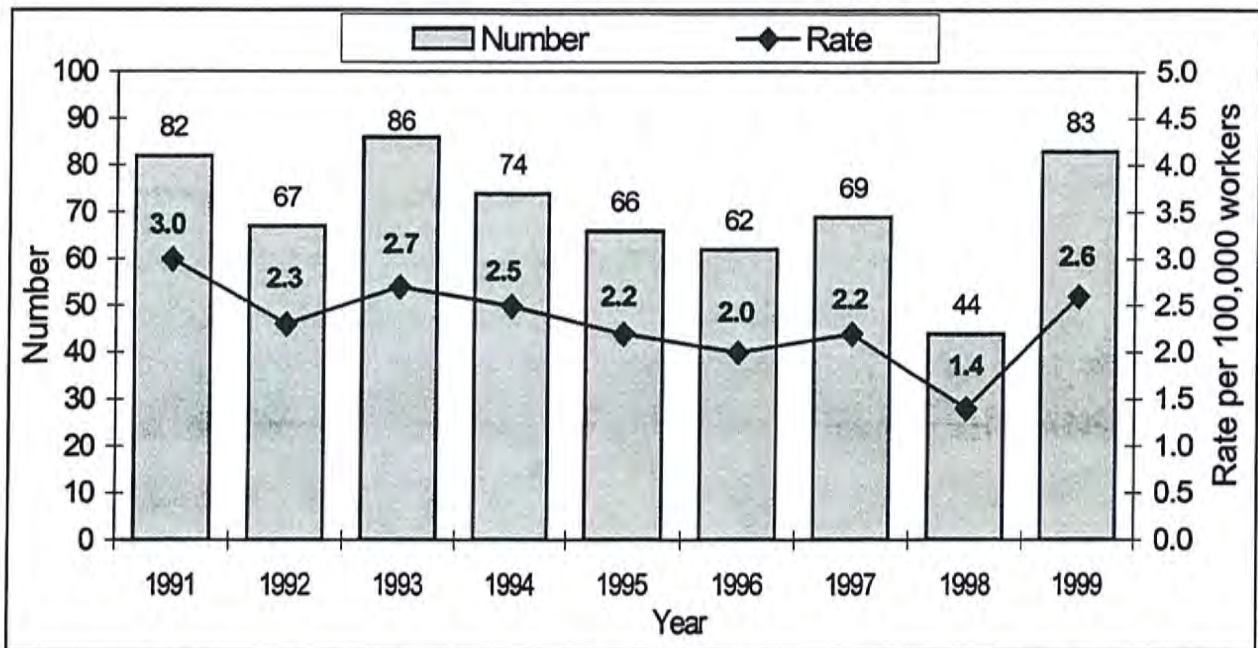
Rates indicate the probability or risk of a worker being fatally injured on the job within a year. Numbers are the count of workers who die from work-related injuries. In a large industry, many workers may be fatally injured but the rate may be low. Conversely, in a small but high-risk industry, the number of workers fatally injured may be small but the rate or risk may be high. Both rates and numbers should be taken into account when targeting prevention efforts.

1. Fatal Occupational Injuries in Massachusetts

1.1 Overview

- A total of 633 workers suffered fatal injuries at work from 1991 through 1999, an average of 70 fatalities a year, more than one worker death each week (1.3 fatalities per week).
- The average annual occupational fatality rate for the nine-year period was 2.3 fatalities per 100,000 civilian workers.
- The average age² at death was 42.4 years. These fatalities resulted in an average 33 years of potential life lost for each death (number of years before the victim reached age 75) and for a total of 20,724 years of potential life lost over the nine-year period.
- The number of work-related fatalities and fatality rates in Massachusetts fluctuated over time (Chart 1). Except for 1998, the annual number of fatalities ranged between 62 and 86 and the annual fatality rate between 2.0 and 3.0 fatalities per 100,000 workers. The lowest number of fatalities was observed in 1998 and the highest in 1993.

Chart 1. **Number and Rate of Fatal Occupational Injuries by Year, Massachusetts, 1991-1999 (N=633)**



A 16-year-old male part-time cleaning helper was fatally injured at a seafood processing/retail facility when the forklift he was operating overturned. The victim was operating the forklift to move a wooden pallet loaded with trash. The load was raised approximately 4 ½ feet when the victim made a right-hand turn causing the forklift to overturn. When the forklift overturned, the Falling Object Protective Structure (FOPS) of the forklift struck him in the chest. He was transported to a hospital where he died the next day from his injuries.

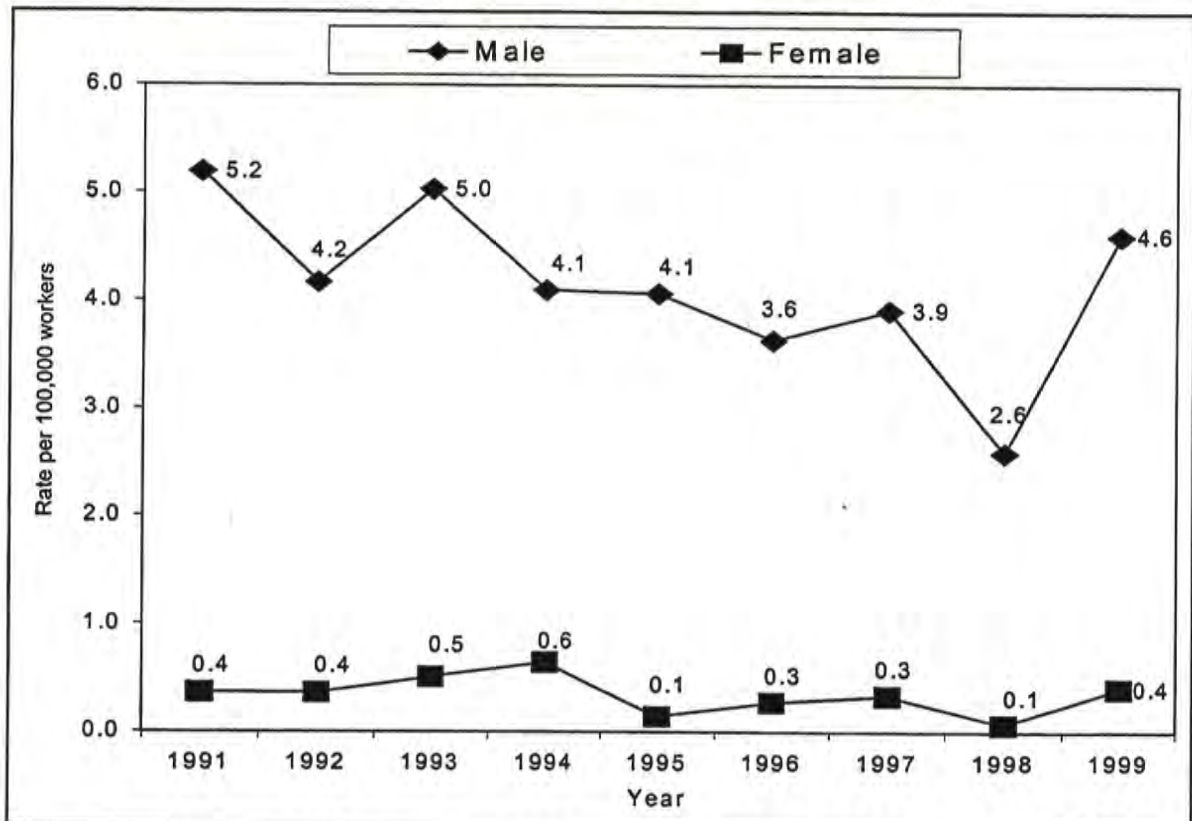
In order to prevent similar incidents, the Massachusetts FACE program recommended that employers should: 1) comply with federal and state child labor laws that prohibit youth less than 18-years-old from operating forklifts; 2) train all forklift operators in safe operating procedures; 3) provide adequate supervision for young workers, new employees, and any inexperienced workers; and 4) develop, implement, and enforce a written comprehensive health and safety program (Massachusetts FACE report, 00MA058).

²Age Information was not available for 5 fatalities.

1.2 Gender

- The great majority (589 workers, 93%) of workers who died due to work-related injuries were men. Female workers accounted for the remaining 44 fatalities (7%).
- The fatal occupational injury rates for male workers were much higher than the rates for female workers for all the years under consideration (Chart 2). The average annual fatal occupational injury rate for the nine-year study period for men was 4.1 fatalities per 100,000 workers, more than thirteen times the rate for women (0.3 per 100,000). These findings are consistent with findings at the national level.
- The difference in fatality rates for men and women is likely in large part due to the fact that more men are employed in high-risk occupations. For example, in 1999, proportionately more men (18%) than women (3%) were employed in two occupation groups with high fatality rates: Farming, Forestry & Fishing occupations and Operators, Fabricators and Laborers. Conversely, 75% of female workers compared to 52% of male workers were employed in two occupation groups with low fatality rates: Managerial & Professional Specialty occupations and Technical, Sales and Administrative Support occupations.
- Fatal events varied by gender. Highway transportation incidents (16 fatalities, 36%) and homicide (12 fatalities, 27%) were the two leading events for female workers, accounting for 63% of all female fatalities. In contrast, fall to a lower level was the leading event among men (114 fatalities, 20%) followed by homicide (70 fatalities, 12%), and highway transportation incidents (68 fatalities, 12%).

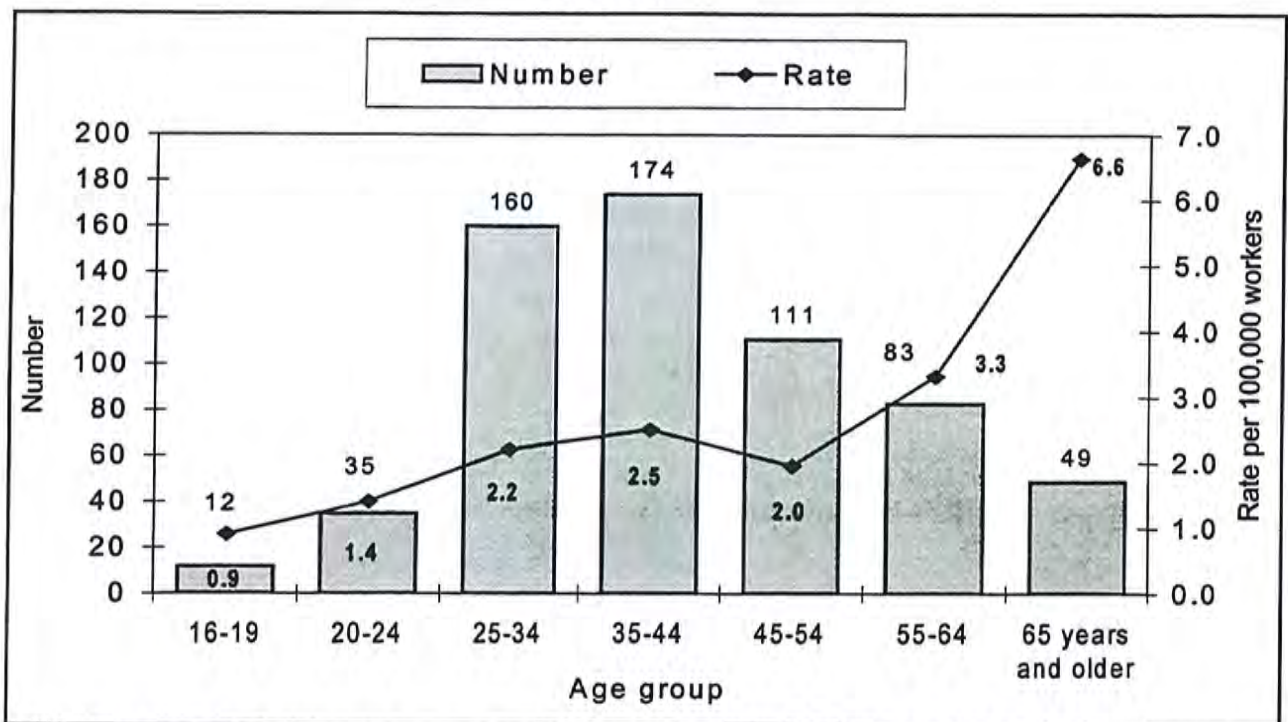
Chart 2. **Rate of Fatal Occupational Injuries by Gender, Massachusetts, 1991-1999**



1.3 Age

- The average age at death for the nine-year period was 42.4 years, with a range of 9 to 85 years. Most workers (398 fatalities, 63%) who were fatally injured on the job were 45 years old or younger.
- Six workers (1%) were less than 18 years of age. These included: 3 newspaper carriers who were struck by vehicles while delivering papers; a teen worker who was fatally injured when a trench collapsed on him; a teen worker who was crushed by a street sweeper; and another teen worker who committed suicide while at work.
- Forty-nine victims (8%) were 65 years of age or older, and the risk of being fatally injured on the job increased markedly with age (Chart 3). A similar age trend is seen in the national data.³
- Fatality rates calculated using number of workers employed underestimate the risks faced by both older (greater than 64 years) and younger (less than 18 years) workers. Workers in both these age groups are more likely to be employed part-time; therefore their rates are higher when actual total work hours are taken into account.⁴
- Fatal events varied by age. Forty-nine percent of the workers 65 years or older (24 fatalities) died as a result of falls compared to 19% (109 fatalities) of workers less than 65 years old (Appendix 8).

Chart 3. **Number and Rates of Fatal Occupational Injuries by Age Group, Massachusetts, 1991-1999**
(N=624)



NOTE: Employment data for 1995 from the Current Population Survey was used for rate computation. Four fatal injuries were excluded because victims were younger than 16 years. Another 5 fatalities were excluded due to lack of age information.

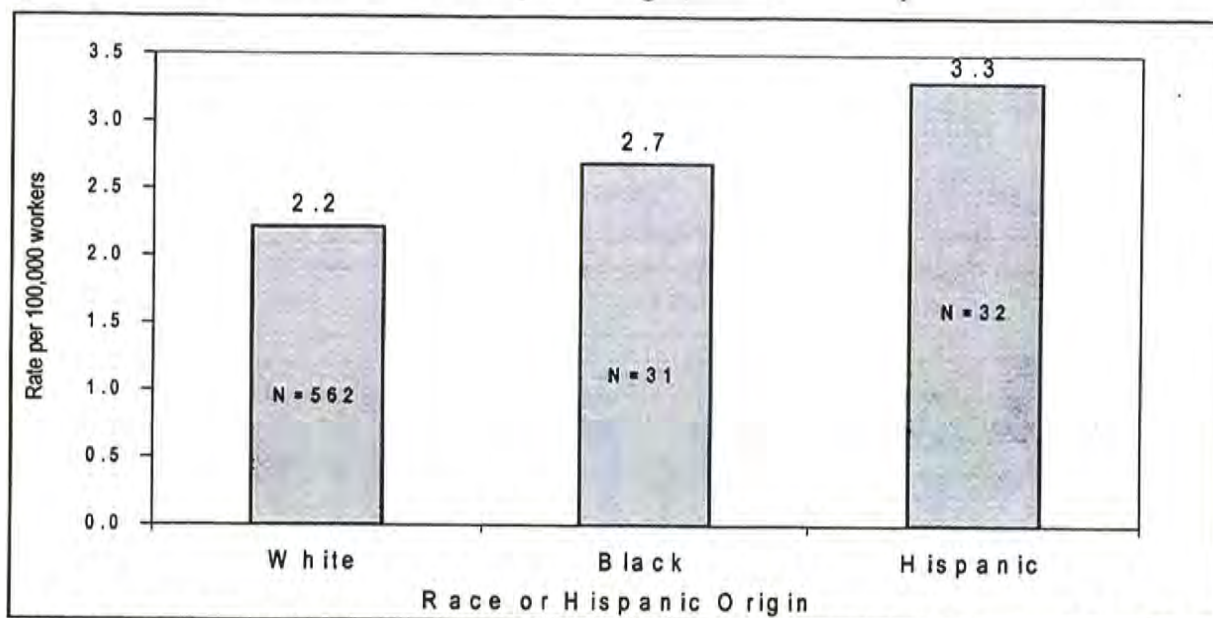
³ U.S. Department of Labor, Bureau of Labor Statistics, Census of Fatal Occupational Injuries, 1991-1999.

⁴ Ruser, J. Denominator Choice in the Calculation of Workplace Fatality Rates, Fatal Workplace Injuries in 1996: A Collection of Data and Analysis, U.S. Department of Labor, Bureau of Labor Statistics, June 1998.

1.4 Race and Hispanic Origin

- Based on data obtained from death certificates for fatally injured workers, 562 workers (89%) were white while 31 (5%) were black and 24 (4%) were of Asian or Pacific Islanders descent. Thirty-two workers (5%) were of Hispanic origin.⁵
- White workers had lower fatal occupational injury rates than other workers. The rate for black workers was 2.7 fatalities per 100,000 workers compared to a rate of 2.2 fatalities per 100,000 for white workers. Workers of Hispanic Origin had the highest rate of fatal injury (3.3 fatalities per 100,000 workers) (Chart 4). Findings are consistent with previous reports that minority workers are disproportionately employed in high-risk jobs.⁶
- Industry divisions in which high numbers of fatal injuries occurred varied by race. A high number of fatal occupational injuries among non-white workers occurred in the Trade industry whereas a high number of white workers lost their lives in the Construction industry.
- Leading fatal events also varied by race and ethnicity of victims. Falls were the leading event among white workers, while homicide was the leading event among black, Asian, Hispanic workers (Appendix 1).

Chart 4. **Average Annual Rate of Fatal Occupational Injuries by Race and Hispanic Origin, Massachusetts, 1991-1999**



NOTE: The Hispanic employed workforce is reportedly underestimated by 10 %⁷. The fatality rate for Hispanic workers is adjusted for this underestimation. The unadjusted rate was 3.7 fatalities per 100,000 workers.

A 40-year old Hispanic male laborer died when he was caught in a ribbon blender at a fish processing plant. The victim and a co-worker had stepped into the empty tank, normally used in the processing of fish gurry, carrying a hose to clean out the tank. When the victim pulled on the hose, it caught on the switch that turned on the machine. The co-worker escaped because he had not completely entered the tank, but the victim was caught in the slowly rotating blades. The machine was shut down immediately and emergency medical services were called to the scene. The victim died in the machine. The victim and the majority of his co-workers spoke Spanish or Portuguese as their only language. The victim had worked for the same company for two months at the time of his death.

In order to prevent similar incidents, Massachusetts FACE recommended that employers should: 1) develop and enforce a comprehensive lockout/tag-out program; and 2) develop and enforce a safety program that includes training for all workers in their commonly spoken language in recognizing and avoiding machinery hazards (Massachusetts FACE report, 98MA035).

⁵ Workers of Hispanic Origin may be of any race.

⁶ Frumkin H, Walker D, Friedman-Jimenez G, *Minority Workers and Communities, Occupational Medicine: State of the Art Review*, 14(3), 1999.

⁷ McKay, R. Cultural Factors Affecting Within Household Coverage and proxy Reporting in Hispanic Households. A Pilot study. *Proceedings of the Section on Survey Research Methods, American Statistical Association*. 614-618. 1992.

1.5 Events/Exposures

- Transportation related incidents (including land, water and air transport incidents) led all event categories. During the nine-year period, 221 workers (35% of fatalities) died from work-related transportation incidents. Within this category, highway motor vehicle incidents and water vehicle incidents were the most frequent, resulting in 84 and 51 fatalities respectively. Forty workers were struck by vehicles and 24 died in aircraft crashes (Table 4).
- Falls, the second leading event category, accounted for one-fifth (133 fatalities, 21%) of all fatal occupational injuries. Within this category, fall to lower levels was the single leading event; sixty percent (71 fatalities) of the falls to lower levels occurred in the construction industry division (See Special Topic: Falls to Lower Levels, page 27).
- Assaults and Violent Acts was the third leading event category, accounting for 115 fatalities (18%). Homicide, which is the major single event within this category and the third leading event overall, claimed a total of 82 workers' lives, while suicides and animal attacks accounted for 33 fatalities. In more than two-thirds (68%) of the homicides, firearms were used as a means of assault. Robbery was the primary circumstance in workplace homicides for which information about circumstance was available; 25 out of 51 (49%) of the cases occurred during robbery. (See Special Topic: Work-related Homicide, page 32).
- Contact with objects accounted for the fatalities of 88 workers (14%). Twenty-four victims died after being struck by falling objects such as trees and electrical poles. Another 21 workers died when they were caught in running equipment or machinery. About 61% (54 fatalities) of the 88 fatalities due to contact with objects occurred in the Construction, Manufacturing and Agriculture industries, whereas only 35% of all fatalities occurred in these industries.
- Fifty workers (8%) died from Exposure to Harmful Substances and Environments at their workplaces. Half (25) of them were electrocuted, 15 died from inhaling harmful substances, and 8 died from oxygen deficiency.
- Fires and Explosion events fatally injured 25 workers (4%) during the nine-year period. Fire incidents claimed the lives of 17 workers while 7 workers died from explosions. Ten victims of fire incidents were fire fighters who died in the line of duty due to an injury;⁸six of them died in a single incident.

A 22-year old male warehouse worker was fatally injured when the forklift truck he was driving tipped over. The victim was driving the truck around the parking lot at the end of a shift after having filled the battery with water. He took a very sharp turn and the three-wheeled forklift truck tipped over. He was not wearing the available seat belt at the time of the incident. He fell from the vehicle and the truck fell on top of him. He had been driving a forklift truck in the warehouse for four years. His training had been completely on-the-job.

In order to prevent similar incidents, FACE recommended that employers: 1) assure that forklift operators are trained in the safe operation of their vehicles; 2) require that operator restraints be used; and 3) develop and implement a comprehensive safety program that includes worker training in recognizing and controlling the hazards of warehouse work (Massachusetts FACE report, 98MA033).

⁸ Firefighters who died in the line of duty from illnesses such as heart attack are not included.

Table 1. **Number and Rate of Fatal Occupational Injuries by Event/Exposure, Massachusetts, 1991-1999**

Event/Exposure	Number of fatalities	Percent	Rate Per 100,000 Workers
Transportation Incidents	221	35	0.8
<i>Highway motor vehicle incidents</i>	84	13	0.3
<i>Water vehicle incidents</i>	51	8	0.2
<i>Worker struck by vehicle</i>	40	6	0.2
<i>Aircraft crashes</i>	24	4	0.1
Falls	133	21	0.5
<i>Falls to lower levels</i>	118	19	0.4
Assaults and Violent Acts	115	18	0.4
<i>Homicide</i>	82	13	0.3
<i>Suicide</i>	30	5	0.1
Contact with objects	88	14	0.3
<i>Struck by falling object</i>	24	4	0.1
<i>Caught in running equipment or machinery</i>	21	3	0.1
Exposure to Harmful Substances or Environments	50	8	0.2
<i>Electrocution</i>	25	4	0.1
Fires and Explosions	25	4	0.1
Total	633	100	2.3

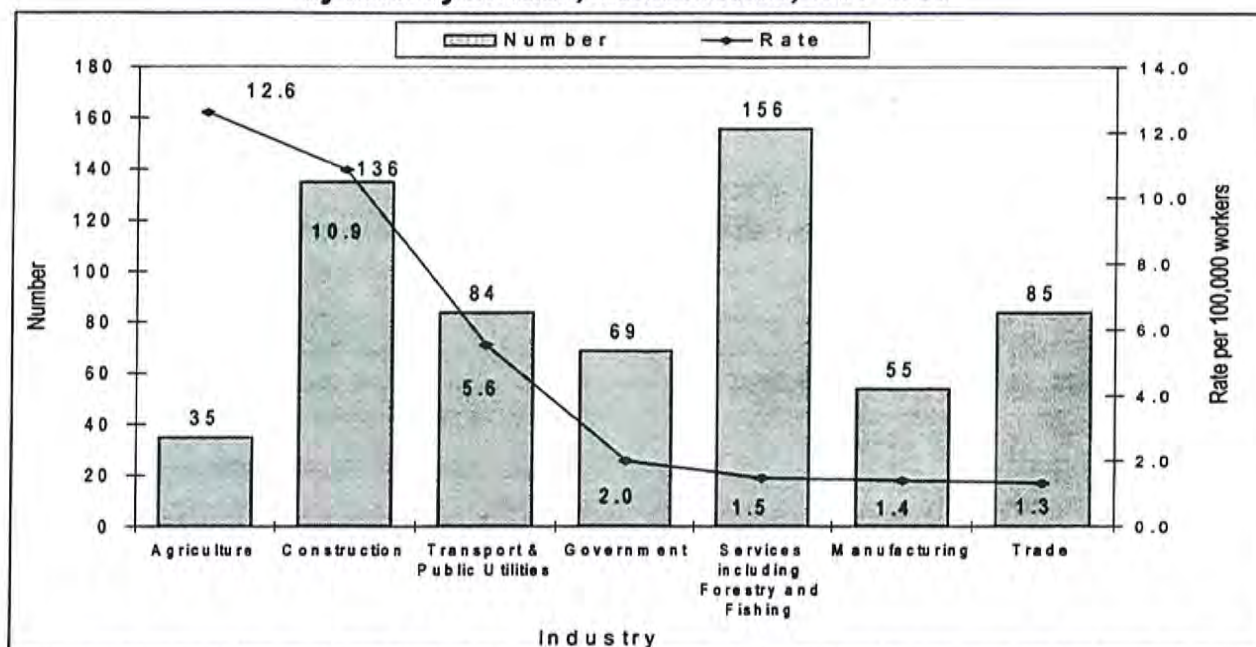
Table 2. **Major Events/Exposures Categories and Events/Exposures with Three or More Occupational Fatalities, Massachusetts, 1991-999**

Event/Exposure Category	Events/Exposures with Three or More Occupational Fatalities
Contact with Object or Equipment (88)	Struck by falling objects (24)- [<i>trees (10) and other objects (14)</i>]; Struck by dislodged flying object (3); Struck by rolling vehicles that were not in normal operation (7); Caught in running machinery or equipment (21); Compressed or pinched by rolling or sliding objects (3); Excavation or trenching cave-in (5); and caught in or crushed in collapsing structure (3)
Falls (133)	Fall down stairs or steps (8); Fall from floor, dock, or ground level (6); Fall from ladder (21); Fall from roof (26); Fall from scaffold, staging (18); Fall from building girders or other structural steel (6); Fall from non-moving vehicle (9); and Fall to floor, walkway, or other surface (8); and Fall onto or against objects (93)
Exposure to Harmful Substances And Environments (50)	Electrocution (25); Inhalation of substance (12); Drowning, submersion (7)
Transportation Accidents (221)	Highway motor-vehicle related incidents (84) [<i>Collision between vehicles or collision between a moving vehicle and stationary objects or vehicles (70) and Non-collision incidents (11)</i>]; Non-highway motor vehicle related incidents (19); Worker struck by motor vehicle (40); Railway incidents (3); Water vehicle incidents (51)- [<i>Sinking , capsizing water vehicle (34) and Fall from ship or boat (14)</i>]; and Aircraft crashes (24)
Fires and Explosions (25)	Unintended fires (17); and Explosions (8)
Assaults and Violent Acts (115)	Homicides (82); Suicides (30); and Attacks by Non-venomous Animals (3)

1.6 Industry

- The Service industry division, which includes Forestry and Fishing, lost the greatest number of workers (156 fatalities, 25%) to fatal occupational injuries (Chart 5). Within this division, Commercial Fishing had by far the largest number of fatalities (57), followed by Business Services and Health Services industries with 18 and 17 fatalities, respectively.
- The Agriculture industry division had the highest fatality rate during the nine-year period and had the second smallest number of fatalities. About two-thirds of these fatal injuries (23 fatalities) occurred in Landscaping and Horticultural Services and more than half (52%, 12 fatalities) of these 23 victims in the Landscaping and Horticultural services industry were either struck by falling trees or fell from trees.
- The Construction industry division had the second highest number of fatalities and the second highest fatal occupational injury rate. During the nine-year period, the construction industry division lost 136 workers (21%) to occupational injuries and the average annual fatality rate was 10.9 fatalities per 100,000 workers- more than four times the overall state rate. Nearly three-in-four construction workers fatally injured on the job (100 fatalities) were employed in the Special Trade Contractors sector which includes, among others, carpentry, roofing, masonry, and steel erection. More than one-half of the fatalities (53%, 71 fatalities) in this major industry group resulted from fatal falls.
- The Trade industry division, which employs about one-fifth of Massachusetts' labor force, had 85 fatalities (13%) during the nine-year period. More than half (49) of the fatalities in this industry division were the result of workplace homicides and transportation incidents.
- Sixty-nine workers employed in the Government sector suffered fatal injuries. Approximately two-thirds (67%, 46 fatalities) of those fatally injured were in Public Administration jobs such as fire protection, public safety, and security. The two leading events among government workers were highway motor vehicle incidents and homicide (Appendix 6).
- Leading fatal events varied by industry division (Table 3).

Chart 5. **Number and Rate of Fatal Occupational Injuries by Industry Division, Massachusetts, 1991–1999**



NOTE: Employment data from the Current Population Survey were used to calculate rates. Except for agriculture, fatalities among self-employed workers were excluded from rate computations. The Finance, Insurance and Real Estate industry division was excluded due to small number of fatalities (9 fatalities). Information about industry/ownership was unavailable for two fatalities.

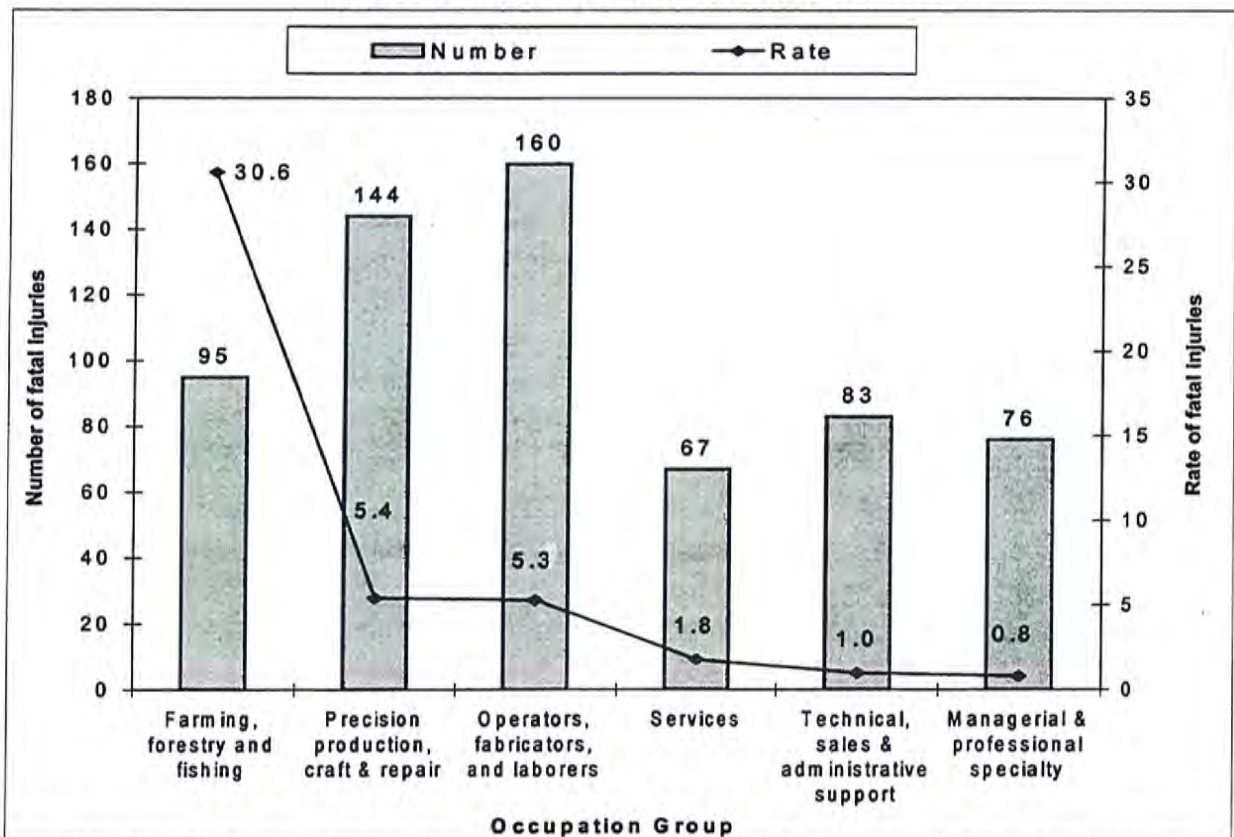
Table 3. Industry Divisions, Leading Fatal Events and Industries with Three or More Work-related Fatalities, Massachusetts, 1991-1999

Industry Division	Leading fatal events	Industries with three or more work-related fatalities
Agriculture, Forestry and Fishing (94)	<ul style="list-style-type: none"> - Water vehicle incidents (57) - Struck by falling objects (9) - Falls to lower levels (8) 	Fruits and tree nut farms (7); landscape and horticultural services (23); and commercial fishing (57)
Construction (136)	<ul style="list-style-type: none"> - Falls to lower levels (71) - Electrocution (13) - Struck by object (12) 	General building contractors –residential buildings (13); general building contractors-non-residential buildings (5); highway and street construction (5); heavy construction-except highway and street construction (11); and special construction trades (100)- [e.g. carpentry, masonry, roofing,...etc]
Manufacturing (55)	<ul style="list-style-type: none"> - Caught in running equipment/machinery (7) - Falls to lower levels (5) - Suicides (4) 	Iron and steel foundries (5) and fabricated structural metal products (4)
Transportation/ Communication/ Public Utilities (84)	<ul style="list-style-type: none"> - Highway motor vehicle incidents (24) - Homicides (15) - Aircraft crashes (14) 	Taxicabs (13); trucking and courier services, except air (25); public warehousing and storage (3); marine towing and tugboat services (3); air transportation, nonscheduled (8); telephone communications (6); electric services (5); and sanitary services (5)
Wholesale and Retail Trade (85)	<ul style="list-style-type: none"> - Homicide (29) - Highway motor vehicle incidents (12) - Falls to lower levels (11) 	Electrical goods wholesale (3); hardware, and plumbing & heating equipment and supplies wholesale (3); miscellaneous durable goods wholesale (5); groceries and related products wholesale (5); lumber and building material retail (4); grocery stores (9); gasoline service stations (3); eating and drinking places (18); liquor stores (3); used merchandise stores (3); and miscellaneous shopping good stores (3)
Finance, Insurance and Real Estate (9)	<ul style="list-style-type: none"> - Falls to lower levels (5) 	Real estate agents and managers (5)
Services (97)	<ul style="list-style-type: none"> - Highway motor vehicle incidents (22) - Homicides (20) - Falls to lower levels (12) 	Hotels and motels (4); laundry, cleaning, and garment services (3); building cleaning and maintenance (8); personnel supply services (6); miscellaneous business services (10); automotive repair shops (7); miscellaneous repair shops and related services (3); miscellaneous amusement and recreation services (4); hospitals (5); home health care services (4); miscellaneous health and allied services (3); colleges, universities, professional schools and junior colleges (6); religious organizations (3); engineering, architectural, and surveying services (3); and research, development, and testing services (6)
Government Sector (69)	<ul style="list-style-type: none"> - Highway motor vehicle incidents (14) - Homicides (14) - Suicides (6) 	Highway and street construction (3); local and suburban passenger transportation (4); sanitary services (3); elementary and secondary schools (4); public order and safety (32); administration of environmental quality program (3); and national security (4)

1.7 Occupation

- Farming, Forestry & Fishing occupation group had the highest fatal occupational injury rate with 30.6 fatalities per 100,000 workers, more than thirteen times the overall state rate for all occupations (2.3 fatalities per 100,000 workers) (Chart 6). Most of the workers in this group (57 of 95) were fishers; fishing claimed more lives than any other single occupation (Table 4) (See Special Topic: Commercial Fishing, page 36).
- Operators, Fabricators, and Laborers had the highest number of occupational fatalities and the third highest fatality rate over the nine-year period (Chart 6). One-fourth (160 fatalities) of all workers fatally injured on the job were employed in this occupation group, which had a fatality rate of 5.3 fatalities per 100,000 workers.
- The Precision, Production, Craft, and Repair occupation group had the second highest fatality rate (5.4 per 100,000 workers) and more fatal falls and electrocution injuries than any other occupation group. About two-thirds (68%) of all fatal falls to lower levels and 60% (15 of 25) of all fatal electrocutions involved workers in this occupation group.
- Leading events varied by occupation group (Table 4). Water Vehicle incidents were the leading event in the Farming, Forestry and Fishing occupation group. Homicide was the leading event in three occupation groups: Service, Managerial & Professional Specialty, and Technical, Sales & Administrative Support occupation groups. Falls to Lower Levels was the leading event in Precision Production, Craft & Repair occupation group.

Chart 6. **Number and Rate of Fatal Occupational Injuries by Occupation Groups, Massachusetts, 1991-1999**



NOTE: Employment data from the Current Population Survey (1991-1999) were used to calculate rates. The data included fatalities to both self-employed and wage and salary workers. Four fatalities were excluded because victims were younger than 16 years. Four other fatalities were excluded due to lack of information about occupation.

Table 4. Occupation Groups, Leading Fatal Events and Occupations with Three or More Work-related Fatalities, Massachusetts, 1991-1999

Occupation Groups	Three Leading Fatal Events	Occupations with Three or More Fatalities
Managerial and Professional Specialty (76)	<ul style="list-style-type: none"> - Homicide (17) - Highway motor vehicle incidents (15) - Falls to lower levels (8) 	Administrators, education and related fields (3); managers, food serving and lodging establishments (7); managers, property and real estate (3); other managers and administrators (14); civil engineers (3); agricultural engineers (5); physicians (3); lawyers (3); and athletes (3)
Technical, Sales and Administrative Support (86)	<ul style="list-style-type: none"> - Homicide (26) - Aircraft crashes (16) - Highway motor vehicle incidents (14) 	Electrical and electronic technicians (6); airplane pilots and navigators (12); supervisors and proprietors-sales occupations (19); sales workers (6); cashiers (5); news vendors (4); messengers (3); traffic, shipping and receiving clerks (4); and stock and inventory clerks (5)
Service (67)	<ul style="list-style-type: none"> - Homicide (19) - Highway motor vehicle incidents (15) - Falls to lower levels (8) 	Fire fighting occupations (10); police and detective-public service (16); guards and police- except public service (8); cooks (4); miscellaneous food preparation occupations (3); nursing aides, orderlies and attendants (4); and janitors and cleaners (8)
Farming, Forestry and Fishing (95)	<ul style="list-style-type: none"> - Water vehicle incidents (47) - Falls to lower levels (10) - Struck by falling objects (8) 	Farmers-except horticultural (3); horticultural specialty farmers (3); groundskeepers and gardeners-except farm (14); captains and other officers-fishing vessels (12); and fishers (45)
Precision Production, Craft and Repair (144)	<ul style="list-style-type: none"> - Falls to lower levels (67) - Electrocutation (15) - Inhalation of substance (9) 	Supervisors, mechanics, and repairers (3); automobile mechanics (5); bus, truck, and stationary engine mechanics (3); industrial machine repairers (3); heating, air conditioning, and refrigeration mechanics (3); elevator installers and repairers (3); specified mechanics and repairers (3); supervisors, carpenters and related workers (4); supervisors, n.e.c. (11); brickmasons and stonemasons (6); carpenters (16); electricians (15); painters, construction and maintenance (9); plumbers, pipefitters and steamfitters (6); roofers (16); structural metal workers (7); construction trades, n.e.c. (9); and supervisors, production occupations (8)
Operators, Fabricators, and Laborers (161)	<ul style="list-style-type: none"> - Highway motor vehicle incidents (33) - Homicide (17) - Struck by vehicle (17) - Falls to lower levels (15) 	Molding and casting machine operators (3); welders and cutters (4); truck drivers (43); bus drivers (3); taxicab drivers and chauffeurs (14); sailors and deckhand operators (3); operating engineers (3); excavating and loading machine operators (6); industrial truck and tractor equipment operators (5); miscellaneous material moving equipment operators (3); construction laborers (21); garbage collectors (3); machine feeders and offbearers (3); freight, stock and material handlers, n.e.c. (4); and laborers-except construction (24)

n.e.c. – not elsewhere classified

- As shown in Table 5, seven occupations with the highest number of fatalities accounted for nearly one-third (30%) of all occupational fatalities in Massachusetts during the nine-year period.

Table 5. **Selected Occupations with High Number of Fatal Occupational Injuries, Massachusetts, 1991-1999**

Occupation	Number	% of total fatalities
Fishers	57	9.0
Truck drivers	43	6.8
Construction laborers	21	3.3
Supervisors and proprietors, sales occupations	19	3.0
Police and detectives	16	2.5
Carpenters	16	2.5
Roofers	16	2.5
Total	188	30.0

1.8 Government Employed Workers

- A total of 69 (11% of total work-related fatalities) government employees died on the job. Public sector workers raise special concerns because they are not protected under the federal Occupational Safety and Health Act in Massachusetts.
- The two leading events in the sector were highway motor vehicular incidents (14 fatalities, 20% of public sector total) and homicide (14 fatalities, 20%) (Appendix 6). Nine workers were fatally injured after being struck by vehicles at their workplaces. Suicide, electrocution, fire, and other events accounted for the remaining fatalities.
- The age of victims at time of death ranged from 16 to 70 years. Nearly two-thirds (64%) of these workers were between the ages of 35 and 54 years and 99% (68 victims) were younger than 65 years. Government workers fatally injured on the job in Massachusetts were, on average, younger than all workers who suffered fatal occupational injuries in the state.
- Government workers who died from work-related injuries were employed in a wide range of industries. The majority (32 victims, 46%) of these workers were employed in the Justice, Public Order and Safety industry. Twelve (17%) fatalities occurred in the Transportation and Public Utilities division and 7 (10%) occurred in the Service industry division. Four victims were federal government employees involved in National Security and Internal Affairs Activities.
- Almost half (48%, 33 workers) of the workers were employed in service occupations which include detectives, police officers, supervisors, and firefighters. Fifteen victims were law enforcement workers and 10 were firefighters. Six of the 10 firefighters were fatally injured in a single fire.

A police officer was fatally injured when a motorist intruded into a roadway construction work zone striking him. The victim was standing at a four-way intersection directing traffic through a detour. The main flow of traffic followed the detour making a right-hand turn at the four-way intersection. The motorist failed to turn right at the construction site detour and struck the victim. The victim was transported to a local hospital where he was pronounced dead.

In order to prevent similar incidents, FACE recommended that employers/highway construction contractors should: 1) ensure that the work zone is setup, at a minimum, in accordance with the Manual on Uniform Traffic Control Devices (MUTCD), Part 6 developed by the U.S. Department of Transportation Federal Highway Administration; 2) consider portable rumble strips to alert motorist to the changed roadway conditions; and 3) consider area objects and the work site background when choosing colors for worker apparel. In addition, FACE also recommended that local and state government agencies should: 1) consider training and certifying all municipal officers who are performing traffic details on work zone construction sites; and 2) consider developing state work zone laws to include increased fines for motorists speeding within work zones (Massachusetts FACE report, 00MA054).

1.9 Self-employed Workers

- Of the 633 workers who were fatally injured from 1991 to 1999, 111(18%) were self-employed.
- The average annual fatality rate for self-employed workers (4.4 fatalities per 100,000 workers) was more than twice the average annual fatality rate for wage and salary workers (2.0 fatalities per 100,000 workers).
- Most fatal injuries to self-employed workers occurred in high-risk industries and occupations. For example, 57% of fatalities (63 fatalities) among self-employed workers occurred in two industry divisions: Construction and Agriculture, Forestry & Fishing. Similarly, 59% (65 fatalities) of the fatalities among self-employed workers were to fishers, construction workers, sales workers, cabdrivers, and truck drivers.

1.10 Foreign-Born Workers

- One out of every 6 workers (110 fatalities) who died due to occupational injuries in Massachusetts was foreign-born (Table 6). An equal proportion (17%) of Massachusetts's labor force is comprised of immigrant workers.⁹
- Of the 99 foreign-born workers for whom race information was available, two-thirds (66) were white, 17 were black and 16 were Asian. Fifteen (15 %) of the foreign-born workers were of Hispanic origin.
- Foreign-born workers accounted for high proportion of work-related fatal injuries among Asian, black and Hispanic workers. About 89% (16 out of 18) of the fatalities among Asian workers, 55% (17 out of 31) of fatalities among black workers, and 53% (17 out of 32) of fatalities among Hispanic workers involved workers born outside the United States. In contrast, only 12% of fatalities among white workers occurred to workers born in other countries.
- Foreign-born workers who died on the job were somewhat more likely than native born to be self-employed (23% vs 18%). Nearly half of the fatalities among foreign-born workers occurred among fishers, taxi drivers, construction trade occupations, and sales occupations.
- The leading event categories among foreign-born and native workers were the same: Transportation Incidents (including water vehicle incidents), Assaults and Violent Acts, and Falls. However, these three event categories accounted for 72% of the fatalities among the foreign-born compared to 44% of the victims born in the U.S.

A 33-year old carpenter was fatally injured when he fell through the open side of the third floor of a structure being renovated from a factory into an office building. The victim was working with two co-workers to place a 300 lb. wooden box beam onto the roof 8 ½ feet above the floor using a manual hoist. The hoist mechanism let go allowing the beam to fall and strike the victim, pushing him out the opening. He fell approximately 22 ½ feet to the ground below and died from severe head injuries.

In order to prevent similar incidents, FACE recommended that the employers: 1) ensure that alternative fall protection is used when guardrails are removed to gain access for construction tasks; 2) ensure that all lifting equipment is in good working order and follow all recommended maintenance procedures; 3) develop, implement and enforce a comprehensive safety program that includes, but is not limited to, worker training in recognizing fall hazards and the hazards of the equipment used on the job; and 4) coordinate safety planning among contractors on multi-employer sites (Massachusetts FACE report 96MA023).

⁹ Rodriguez, C. Foreign-born Fuel Economic Growth: Massachusetts Immigrants Filling Labor Needs. The Boston Globe, 2001 December 30.

- Foreign-born workers also accounted for a disproportionate share of the victims of workplace homicide. About one-third (28 workers) of workplace homicide victims were foreign-born whereas only 10% of the fatalities among native-born workers were due to workplace homicides.

Table 6. **Number and percent of Fatal Occupational Injuries Among Foreign-born Workers, Massachusetts, 1991-1999**

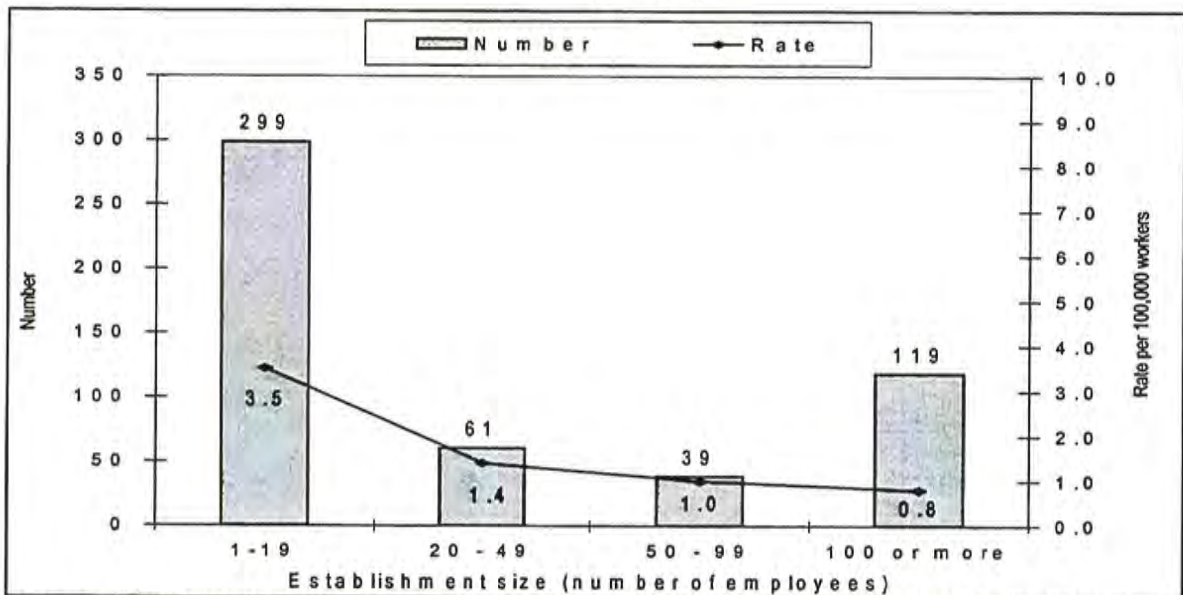
Year	Number of fatalities to foreign-born workers *	Number of total occupational fatalities	Percent
1991	13	82	16
1992	19	67	28
1993	16	86	19
1994	11	74	15
1995	12	66	18
1996	9	62	15
1997	8	69	12
1998	6	44	14
1999	16	83	19
Total	110	633	17

* Information on country of birth was obtained from death certificates.

1.11 Establishment size

- Out of 518 fatal injuries for which employers' establishment size information was available, more than one-half (299 fatalities) occurred in small establishments with 19 or fewer employees (Chart 7). One-third (102 fatalities) of these occurred in the Construction industry division, followed by the Agriculture, Forestry, and Fishing (69 fatalities) and the Service (43 fatalities) industry divisions.
- Small establishments also suffered the highest fatality rate (3.5 fatalities per 100,000 workers), more than one and half times the average rate for all establishments (2.3 fatalities per 100,000 workers).
- Forty-nine percent (256 fatalities) of fatalities for which establishment size information was available occurred in establishments with 10 or fewer employees. About one-third (35%, 89 fatalities) of these occurred in the Construction industry division while 25% (64 fatalities) occurred in the Agriculture, Fishing & Forestry industry division, and 14% (37 fatalities) occurred in the Services industry division.
- Self-employed workers accounted for 32% (81 fatalities) of fatal injuries in small establishments (with 10 or fewer employees) while they accounted for 17% of all fatal occupational injuries.
- Occupational fatalities in establishments with more than 50 employees were concentrated in two industry divisions: Manufacturing and Service industry divisions. These two industry divisions accounted for more than half (54%, 56 fatalities) of fatalities in these establishments while they only accounted for about 24% of all fatal occupational injuries.

Chart 7. Number and Rate of Fatal Occupational Injuries by Establishment Size, Massachusetts, 1991-1999 (N = 518)



NOTE: Rates calculated using year 2000 employment data from the Massachusetts Division of Employment and Training. To maintain consistency with the denominator data, fatalities among self-employed workers are excluded from rate computation. Establishment size information was not available for 115 fatalities.

1.12 Distribution of Occupational Fatalities by County

- Number of fatal occupational injuries varied by county ranging from 3 fatalities in Nantucket County to 100 in Middlesex County (Table 7).
- Four counties, namely, Middlesex, Suffolk, Worcester, and Bristol accounted for over half (55%, 337 fatalities) of the total occupational fatalities (for which county was determined) in the state during the 9-year period.

Table 7. Fatal Occupational Injuries by County Massachusetts, 1991-1999 (N = 611)

County	Number of fatal injuries	Percent
Barnstable	30	4.9
Berkshire	29	4.8
Bristol	70	11.5
Dukes	7	1.2
Essex	57	9.3
Franklin	14	2.3
Hampden	38	6.2
Hampshire	13	2.1
Middlesex	100	16.4
Nantucket	3	0.5
Norfolk	47	7.7
Plymouth	36	5.9
Suffolk	91	14.9
Worcester	76	12.4
Total	611	100

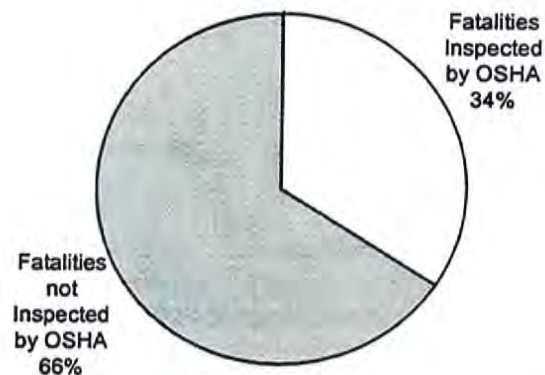
NOTE: County was undetermined for 22 fatalities.

1.13 Fatal Occupational Injuries Inspected by OSHA

The Occupational Safety and Health Administration conducts inspections of workplace fatalities to determine if safety standards have been violated. However, fatalities in some industries and circumstances fall outside OSHA jurisdiction. These include fatalities among fishing workers at sea, public sector workers in many states, including Massachusetts, and the self-employed. Also, certain other types of fatalities (such as homicides and highway motor vehicle incidents) are not routinely inspected by OSHA. In addition, since 1994, OSHA did not conduct fatality investigations when the fatalities occur more than 30 days after the injury events.

Out of the total 633 fatal occupational injuries, OSHA inspected 215 (34%) fatalities (Chart 8). The remaining 418 fatalities were not inspected because; a) they did not fall under OSHA's jurisdiction; b) they resulted from events that are not routinely inspected by the agency; or c) the fatalities occurred more than 30 days after the injury. These included 203 occupational fatalities that occurred among self-employed workers, commercial fishers and among government workers. They also included 193 occupational fatalities due to homicide, suicide, motor vehicle related incidents, and air transportation incidents. Twenty-two fatalities were not inspected by OSHA because fatalities occurred more than 30 days after the occurrence of the injuries. Eleven of these 22 fatalities occurred within the same year (but more than thirty days after the injury) while the other 11 fatalities occurred more than a year after the workers were injured.

Chart 8. **Fatal Occupational Injuries Inspected by OSHA
Massachusetts, 1991-1999
(N=633)**



SOURCE: U.S. Department of Labor, OSHA, Region I Office

In addition to OSHA's enforcement inspections, the Massachusetts Department of Public Health conducted research-oriented investigations of 145 occupational fatalities between 1990 and 2001 as part of the national Fatality Assessment and Control Evaluation (FACE) program. The events covered in these investigations include, but are not limited to, falls to lower level, machine-related incidents, fatalities to teen workers, electrocutions, explosions, and highway work-zone incidents.

2. Comparison of Massachusetts and the U.S.

Each year in the United States more than 6,000 workers are fatally injured on the job. In this section, data on fatal occupational injuries in Massachusetts from 1991-1999 are compared with the CFOI findings for the country as a whole. National data from 1992 - 1999 were used for this comparison where indicated. National employment estimates from the Current Population Survey were used to calculate the national rates.

2.1 Rates of Fatal Occupational Injuries

Massachusetts compares favorably to the nation in terms of many different health outcomes¹⁰ and our occupational fatality experience is no exception. The annual occupational fatality rate for Massachusetts was lower than the national rate for each year of the period under consideration (Chart 9). In most years, the state rate was approximately half that of the nation.

This difference in fatality rates is likely explained in part by differences in the industrial composition of Massachusetts' workforce as compared to that of the nation. For example, 32% of the Massachusetts workforce was employed in the service sector between 1991 and 1999 as compared to 27% of the U.S. workforce. Nationally, proportionately more workers were employed in higher risk industry divisions such as Agriculture, Construction, and Transportation and Public Utilities (Table 8).

However, industry-specific fatality rates, except in the Agriculture industry division, were also lower in Massachusetts than in the nation as a whole. Massachusetts's rates for the Manufacturing, Trade, and Transportation and Public Utilities divisions were less than half the national rates for these industry divisions.

An overall standardized fatality rate¹¹ for Massachusetts (standardized by the direct method to the 1992-1999 industrial composition of the nation) was calculated to determine how much of the difference in rates could be attributed to the difference in industry mix. The overall standardized fatality rate for Massachusetts was 2.6 fatalities per 100,000, still substantially lower than the national rate of 4.8 fatalities per 100,000 workers. State and national differences in workforce composition *within* industry sectors were not accounted for and could also contribute to the differences in state and national rates. These findings, however, do suggest that the difference in industrial composition of the workforce between Massachusetts and the nation alone cannot explain the observed rate differences.

A review of fatalities by occupation yielded similar findings. Massachusetts had lower fatal occupational injury rates than the nation for all occupation groups (Table 9). As with industry, some but not all of this difference was explained by differences in the workforce composition of the state compared to that of the nation. Proportionately more of the nation's workforce was employed in high-risk occupation groups such as Farming, Forestry and Fishing and Operators, Fabricators and Laborers. An overall occupation-standardized fatality rate for Massachusetts was also calculated taking into consideration these differences in the occupation composition of the state and national workforce; this standardized rate was 3.0 fatalities per 100,000 workers, still much lower than the national rate of 4.8 fatalities per 100,000 workers.

Another important factor contributing to lower occupational fatality rates in Massachusetts is that homicide and highway motor vehicle related fatalities, two events that contribute substantially to the occupational fatality burden, are low in the Massachusetts general population compared to the nation. The average crude homicide rate in the general Massachusetts population for the

¹⁰ The Henry J. Kaiser Family Foundation, State Health Facts online, www.statehealthfacts.kff.org, July 17, 2002.

¹¹ The Mining and Finance, Insurance & Real Estate industry divisions were excluded from rate computation.

eight-year period between 1991 and 1998 was 3.4 fatalities per 100,000 population while the comparable rate for the nation was 8.7 fatalities per 100,000 population.¹² Massachusetts also had a lower traffic fatality rate of 0.8 fatalities per 100 million vehicle miles traveled as compared to a national rate of 1.5 fatalities per 100 million vehicle miles traveled.¹³

This general experience is reflected in low fatal occupational injury rates due to homicide and transportation incidents for Massachusetts. The annual average work-related homicide rate in Massachusetts was 0.3 fatalities per 100,000 workers between 1992 and 1999; while the national rate was 0.8 fatalities per 100,000 workers. Similarly, the rate of fatal work-related highway transportation incidents in Massachusetts was lower at 0.3 fatalities per 100,000 as compared to a national rate of 1.0 fatalities per 100,000 workers.

The low overall homicide and traffic fatality rates in Massachusetts, however, provide only a partial explanation for the difference in the occupational fatality rates between Massachusetts and the nation. Occupational fatality rates computed excluding homicide and highway traffic fatalities reduced, but did not eliminate, the gap between the state and national rates (Chart 10).

Likely, numerous additional factors such as the comparatively high levels of education and socioeconomic status in Massachusetts, the higher proportion of unionized workers in the state (15%), and greater access to emergency medical services also contribute to the low occupational fatality rates in Massachusetts. Further research is needed to examine factors accounting for the difference between the national and state rates.

2.2 Fatal Events

As discussed above, the contribution of homicide and highway motor vehicle incidents to the occupational fatality burden is low in Massachusetts as compared to the nation. As a consequence, falls accounted for a much higher proportion of the work-related fatalities in Massachusetts during the study period (21%) than they did in the country as a whole (11%) (Appendix 2). Falls to a lower level stood out as the single leading event in Massachusetts.

2.3 Age, Gender, Race and Hispanic Origin

The distribution of fatal occupational injuries in Massachusetts was similar to national findings with respect to gender, age, and employment status. However, Massachusetts' victims were more likely to be white and less likely to be Hispanic than victims in the country as a whole, which likely reflects differences in the underlying racial and ethnic composition between the nation and Massachusetts workforce (Appendix 2). As mentioned previously, the high fatal occupational injury rates for Hispanic workers and older workers observed in Massachusetts have also been reported for Hispanic and older workers nationwide.¹⁴

¹² U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Injury Mortality reports, <http://www.cdc.gov>, July 18, 2002.

¹³ National Highway Traffic Safety Administration (NHTSA), Traffic Safety Facts 1999, U.S. Department of Transportation.

¹⁴ Rates calculated from CFOI annual reports indicate that fatality rates for older workers and Hispanic workers are higher compared to younger workers and workers of other races and ethnicity.

Chart 9. Fatal Occupational Injury Rates by Year, Massachusetts and U.S., 1992-1999

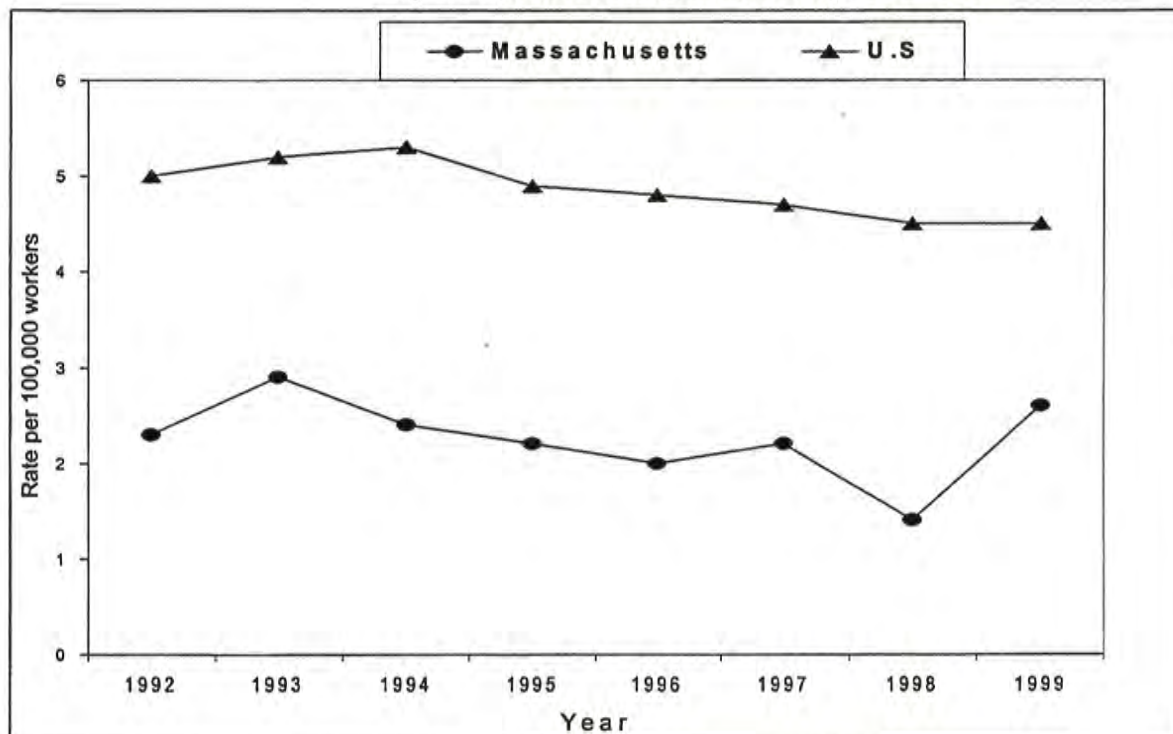


Table 8. Percent of Labor Force and Percent & Rate of Fatal Occupational Injuries by Industry Division, Massachusetts and U.S.

Industry Division	Massachusetts			U.S.		
	% of Labor Force (1991-1999) Average	% of Fatalities (1991-1999) Average	Fatality Rate	% of Labor Force (1992-1999) Average	% of Fatalities (1992-1999) Average	Fatality Rate
Agriculture *	1.1	5.5	12.6	2.7	5.6	8.2
Mining	-	-	-	0.5	2.9	23.3
Construction	4.1	21.5	10.9	5.8	18.1	16.0
Manufacturing	17.2	8.9	1.3	15.9	13.2	3.3
Transportation and Public Utilities	5.1	13.3	5.6	5.7	16.8	12.5
Trade	20.1	13.4	1.3	20.5	13.9	2.9
Finance, Insurance, and Real Estate	7.6	1.3	**	6.3	1.8	1.3
Services including Forestry and Fishing	31.7	24.6	1.5	27.1	13.1	2.1
Government	13.2	10.9	2.1	15.5	14.7	3.7
Overall Average	100	100	2.3	100	100	4.8

* Includes the self-employed and family workers. Excludes Forestry & Fishing.

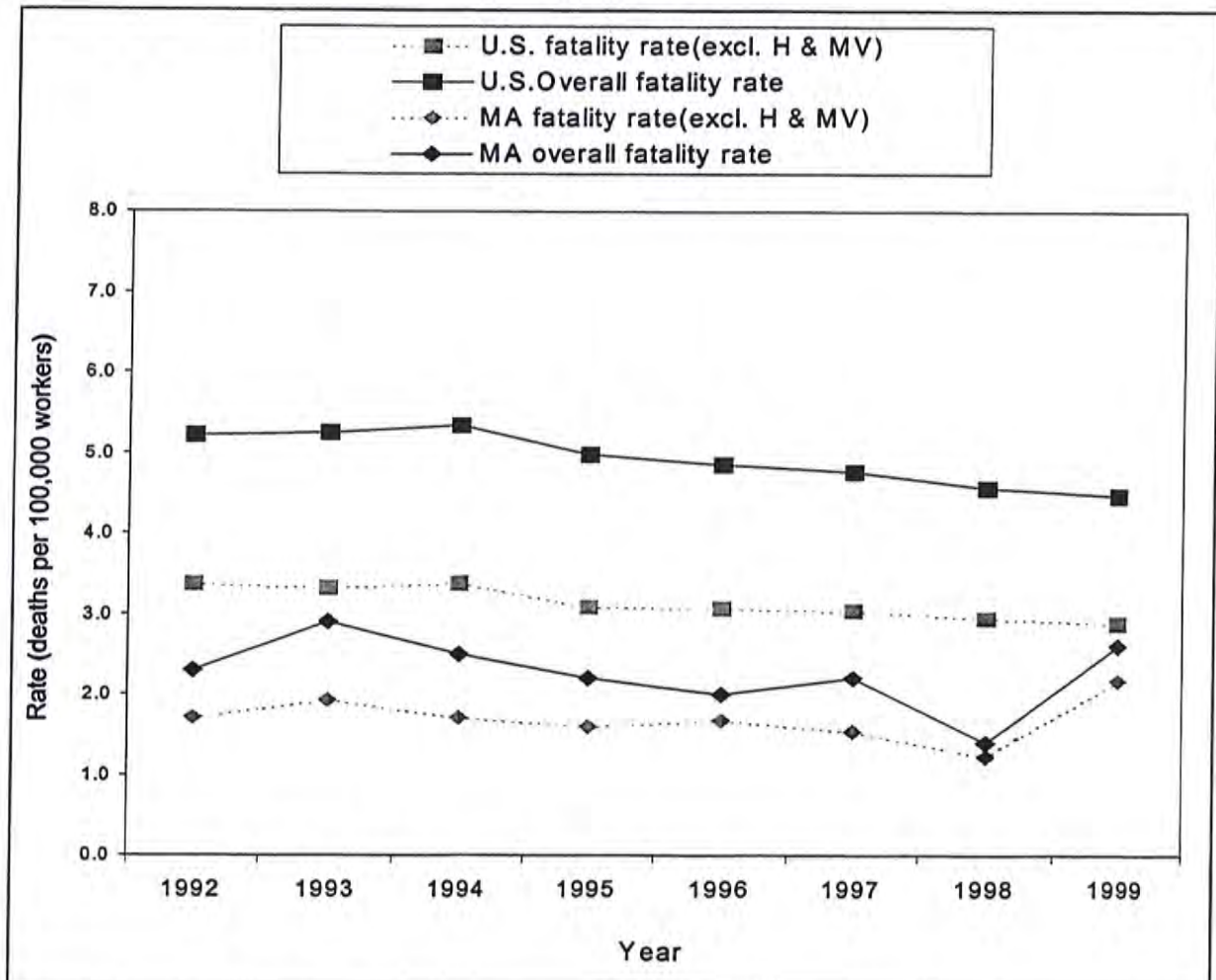
** Rate not presented due to small number of fatal injuries (fewer than 10).

NOTE: Dashes indicate that there were no fatalities during the period. Employment estimates from Current Population Survey were used to compute percent of labor force and fatality rates.

Table 9. Rates of Fatal Occupational Injuries by Occupation Groups
Massachusetts, 1991-1999 and U.S., 1992-1999

Occupation Groups	Massachusetts, 1991-1999			United States, 1992-1999		
	% of Fatality (1991-99) Average	% of Labor Force (1991-1999) Average	Fatality Rate 1991-1999	% of Fatality (1992-99) Average	% of Labor Force (1992-1999) Average	Fatality Rate 1992-1999
Managerial and Professional	12	34.9	0.8	11	28.4	1.9
Technical, Sales and Administrative Support	14	30.0	1.0	12.5	30.0	2.1
Service	11	13.7	1.8	8.3	13.6	3.0
Farming, Forestry and Fishing	15	1	30.6	14.7	2.8	31.1
Precision Production, Craft and Repair	23	9.9	5.4	17.5	11.0	6.7
Operators, Fabricators and Laborers	25	10.5	5.3	33.1	14.2	11.6
All occupations	-	-	2.3	-	-	4.8

Chart 10. Rates of Fatal Occupational Injuries Including and Excluding Homicide and Highway Traffic Fatalities, Massachusetts and U.S., 1992-1999



3. Special Topics

3.1 Fatal Falls to Lower Levels

Workplace falls claimed the lives of 133 Massachusetts workers between 1991-1999 accounting for 21% of all fatal occupational injuries during this period. The average annual fall fatality rate was 0.5 per 100,000 workers, similar to the 1999 fall fatality rate of 0.5 per 100,000 workers for the nation. Fatal workplace falls in Massachusetts occurred in a wide range of circumstances. The great majority (118 fatalities, 89%) were falls to lower levels. Falls from roofs (26), ladders (21), and scaffolds and staging (18) were the most common. This special topic section focuses on fatal falls to lower levels.

Most fatal falls to lower levels occurred in the construction industry division.

- Most fatal falls to lower levels (71 fatalities, 60%) occurred in the Construction industry division, an average of 8 fatalities per year (Table 10). The Service industry division had the second highest number of fatal falls to lower levels (13 fatalities).
- Within the Construction industry division, the Special Trade Contractors major industry group accounted for 81% (58 fatalities) of fatal fall injuries. Contractors engaged in roofing and sheet metal work, carpentry and floor work, structural steel erection, and masonry work led all other groups in the number of fatalities.
- The construction industry division also had a high annual average rate of fatal falls to lower levels (6.6 fatalities per 100,000 workers), more than sixteen times the overall rate for all industry divisions (0.4 fatalities per 100,000 workers).

Table 10. Number and Average Annual Rate of Fatal Falls to Lower Levels in the Construction Industry Division, Massachusetts, 1991-1999

Industry Division	Number of Falls to Lower Levels (1991-99)	Percent	Average Annual Fall Fatality Rate
Construction	71	60	6.6
Special trade contractors	58	49	
- Roofing, siding and sheet metal work	14	12	
- Carpentry work	11	9	
- Structural steel erection	9	8	
- Masonry, stone setting, tile setting and plastering	7	6	
All industry divisions	118	100.0	0.4

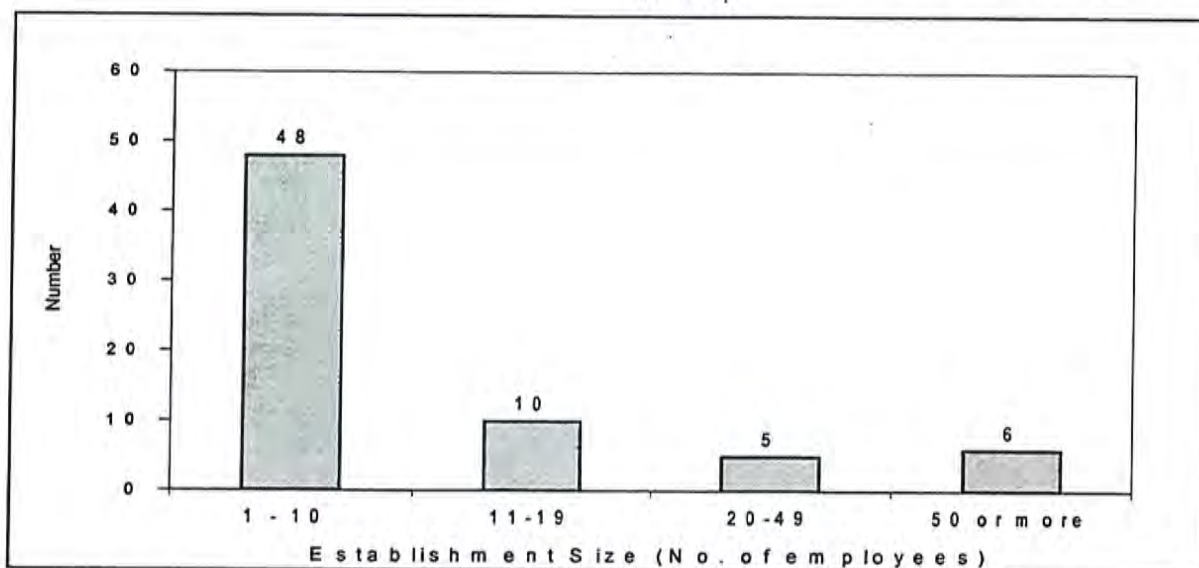
A pest control technician died when he fell from the roof of an apartment building. The technician was spraying for spiders in the vents and other parts of the roof when the incident occurred. While spraying along a gutter of a rooftop penthouse, the technician walked off the edge of the roof and fell nine stories to the parking lot below. Emergency medical services were called immediately. The victim was given CPR and transported to a local hospital emergency room where he died.

In order to prevent similar incidents in the future, FACE recommended that employers: 1) should develop and implement a site specific health and safety plan for each site under contract; and 2) employ alternative controls for fall hazards when personal fall arrest systems are not required or appropriate. Building owners should consider installation of guardrails at the perimeter of flat roofs wherever possible (Massachusetts FACE report 97MA038).

Fatal falls in the construction industry division were concentrated in small establishments.

- About two-thirds of the fatal falls to lower levels in the construction industry division occurred in small establishments with 10 or fewer employees (Chart 11).
- Establishments with fewer than 11 employees are not regularly inspected by OSHA unless a fatality occurs. Therefore, they are likely to have less contact with safety inspectors than large establishments and less knowledge about safety precautions should be taken to prevent fall injuries.

Chart 11. Number of Fatal Falls to Lower Levels in Construction Industry Division by Establishment Size, Massachusetts, 1991-1999 (N = 69)



Roofers and Carpenters had the highest number of fatal falls to lower levels.

- Construction occupations accounted for 60% of all falls to lower levels. Roofers and carpenters had the highest number of fatal falls followed by construction laborers, and structural metal workers (Table 11).
- Falls to lower levels accounted for a high proportion of fatalities (52%, 71 fatalities) among construction workers, whereas only 19% of total fatal injuries in the state were due to falls to lower levels. All of the occupational fatalities among the brick and stone masons and structural metal workers were due to falls.

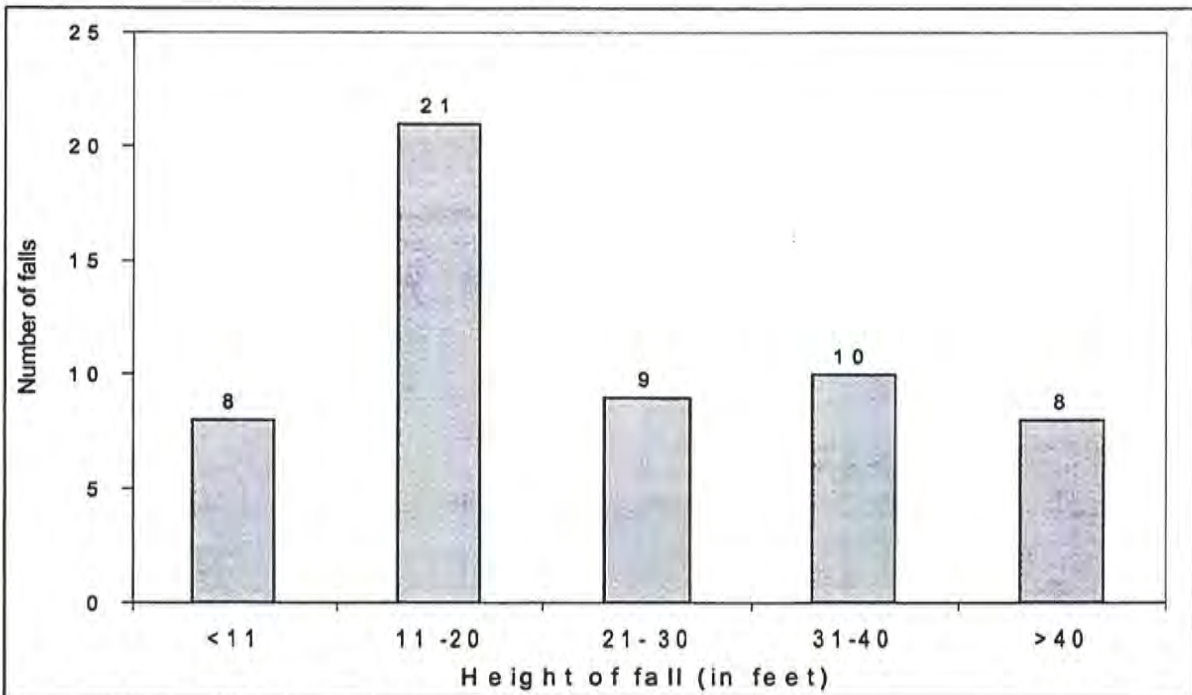
Table 11. Number and Percent of Fatal Falls to Lower Levels by Selected Occupations, Massachusetts, 1991-1999

Occupation	No. of Fatal Falls	Total Fatal Injuries	% of Fatal Injuries Due to Falls
Roofers	14	16	88
Carpenters	11	16	59
Construction laborers	7	21	33
Structural metal workers	7	7	100
Brick and stone masons	6	6	100
Painters	6	9	75
All occupations	118	633	19

Majority of fatal falls to lower levels in construction occurred from heights of less than 20 feet.

- Height information was available for 56 out of 71 fatal falls to lower levels in the construction industry division. Of these 56 fatal falls, 52% (29 fatalities) occurred from heights of 20 feet or less (Chart 12). Eight fatal falls (14%) occurred from heights of 10 feet or lower and another 8 falls occurred from heights of over 30 feet. The heights ranged from 3 feet to 130 feet.

Chart 12. Fatal Falls to Lower Levels in the Construction Industry Division by Height of Fall, Massachusetts, 1991-1999 (N = 56)



NOTE: Height information was not available for 15 fatal falls to lower levels.

Falls to lower levels were the leading event among older workers.

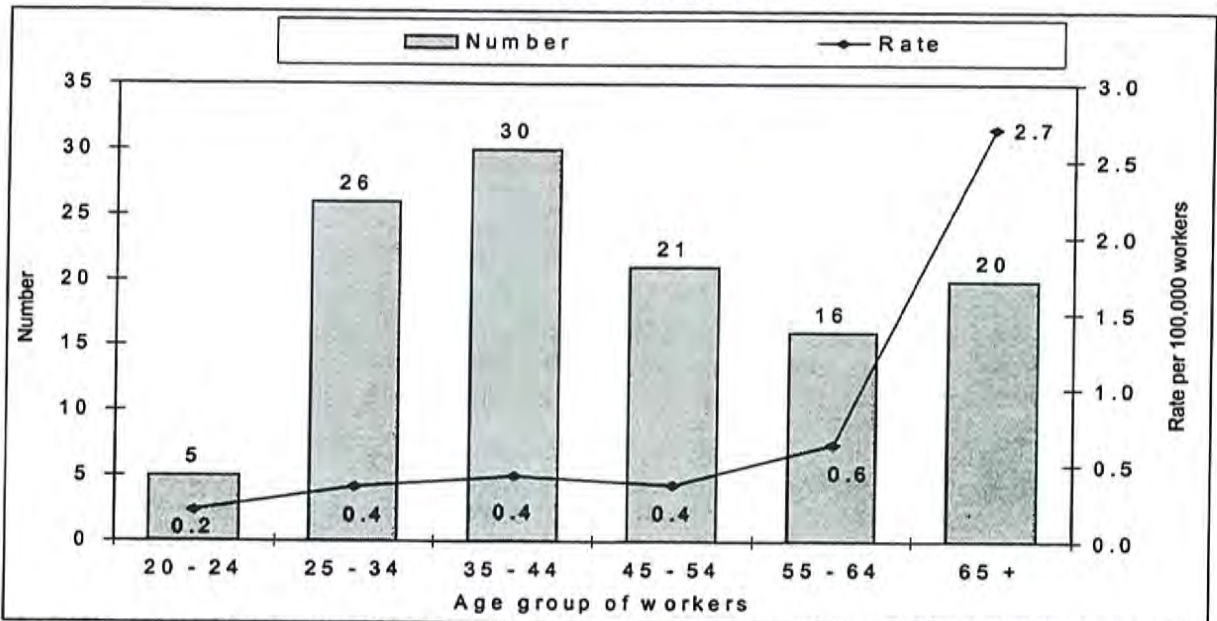
- Falls to lower levels accounted for 41% (20 fatalities) of all work-related fatal injuries among workers age 65 years and older. The annual average fatal fall rate for these workers was 2.7 per 100,000, more than six times higher than the average rate for all age groups (Chart 13). This rate would be even higher if hours of work were used as a denominator instead of number of workers employed because older workers are more likely to work part time.¹⁵

A 23-year old ironworker was fatally injured when he fell approximately 20 feet through a roof opening to ice-covered ground. The victim was part of a crew that was building the flat roof on a new building, and he fell through an uncovered opening while he was capping the roof's expansion joists with its center plate. The victim was not wearing any fall protection.

In order to prevent future similar incidents, FACE recommended that employers: 1) require floor openings to be adequately protected; 2) provide and require use of fall protection equipment; and 3) design, develop and implement a comprehensive safety program that includes, but is not limited to, fall protection (Massachusetts FACE report, 94MA011).

¹⁵Ruser, J. Denominator Choice in the Calculation of Workplace Fatality Rates. Fatal Workplace Injuries in 1996: A Collection of Data and Analysis, U.S. Department of Labor, Bureau of Labor Statistics, June 1998.

Chart 13. Number and Rate of Fatal Falls to Lower Levels by Age of Workers, Massachusetts, 1991-1999



NOTE: Rates are not presented for age groups with fewer than 5 fatalities. Employment data from the Current Population Survey for 1995 is used to calculate rates.

Preventing Falls to Lower Levels in the Workplace

Surveillance findings underscore falls in construction as a priority for prevention in Massachusetts. Falls in this industry division should not simply be accepted as part of the job. Comprehensive work-site fall prevention programs, including the use of fall protection systems, can reduce the risk of fall injuries in construction. The Occupational Safety and Health Administration has established standards for fall protection in construction workplaces (Subpart M, Fall Protection, 29 CFR 126.500-1926.503). Employers should develop and implement comprehensive fall protection programs that, at a minimum, meet these OSHA requirements. The National Institute of Occupational Safety and Health (NIOSH) recommends the following elements as a guide for employers and workers in developing fall-protection programs:¹⁶

- Address all aspects of safety and hazards in the planning phase of projects
- Train employees in the recognition and avoidance of unsafe conditions and the OSHA regulations applicable to their work environment
- Provide appropriate fall protection equipment
- Train workers on the proper use of fall protection equipment, enforce its use, and inspect equipment daily
- Conduct scheduled and unscheduled safety inspections of the work-site
- Address environmental conditions, language differences, alternative methods/equipment to perform assigned tasks, and establish medical and rescue programs
- Encourage workers to participate actively in workplace safety

In addition to these general recommendations, NIOSH also recommends specific strategies to prevent falls from ladders, scaffolds, and roofs, common fall hazards both in Massachusetts and across the nation.

¹⁶ U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Worker Deaths by Falls: A Summary of Surveillance Findings and Investigative Case Reports, November 2000.

To prevent falls from ladders:

- Select and use the proper type of ladder (get the right size and check the duty rating)
- Inspect ladder, prior to using, for structural damage, missing or damaged safety devices, substances that could cause slips or falls, and paint or stickers that could hide defects
- Tag and remove defective ladders from the work-site
- Wear approved fall protection equipment, if applicable
- Use ladders only on solid, stable and level surfaces unless secured to prevent accidental displacement
- Use ladders only as recommended by manufacturer (do not use ladder in a horizontal position as a scaffold, do not have more than one person on the ladder at a time, do not overload, do not work from the top rungs of an extension ladder or the top of a step ladder)
- Maintain ladders regularly (change shoes and lubricate metal bearings, locks and pulleys)
- Train workers on safe use and make sure that they understand and follow safe use of ladders

To prevent falls from scaffolds:

- Select and use the proper type of scaffold for the job
- Provide access ladder to scaffolds
- Use scaffold grade lumber for all platforms
- Install guardrails and toe-boards on all open sides and ends of platforms more than 10 feet above the ground
- Make sure that the footing or anchorage for scaffolds is sound, rigid, and capable of carrying four times the maximum intended load, including its own weight
- Inspect the scaffolding after erection and before first use
- Inspect the scaffolds routinely for consideration of footing (anchorage), parts of the scaffolds, and slippery conditions
- Train workers on the safe way to use scaffoldings

To prevent falls from roofs and buildings:

- Install guarding and/or fall protection on all roof openings
- Put warning signs on all roof openings
- Make cutting the roof openings a last action on the roof
- Provide fall protection measures along unguarded roof perimeters and balconies
- Install a cover (for roof and floor openings) capable of supporting the maximum intended load

Innovative efforts are needed to reach employers and workers in small construction businesses. The Massachusetts Department of Public Health has developed a series of educational brochures on prevention of falls in residential construction, and distributes these through building permit offices in cities and towns throughout the Commonwealth. These materials are available in English, Spanish, Portuguese and Haitian Creole from the Occupational Health Surveillance Program upon request.

A 49-year-old male inventory control clerk died when he fell approximately 12 feet from a high-lift order-picker truck while applying barcode labels in a warehouse freezer. The order picker truck was not positioned next to the desired location due to boxes in the aisle. He fell as he stepped from the raised order picker truck onto a stacked box of product in an attempt to reach the next higher shelf. He was wearing a body harness and lanyard that was not secured to an anchor point on the order picker truck.

In order to prevent future similar incidents, FACE recommended that employers should: 1) adopt a mandatory tie-off/no unhook policy for employees using order picker trucks; 2) ensure that aisle ways are maintained free from obstructions that would interfere with lift truck access to storage shelves; 3) strictly enforce the safety precautions outlined in comprehensive safety programs; and 4) regularly review and update the programs and training. In addition, high lift order picker truck manufacturers should consider equipping trucks with devices that will activate audible or visible alarms if the operator unhooks fall protection while the lift is raised (Massachusetts FACE Report, 99MA058).

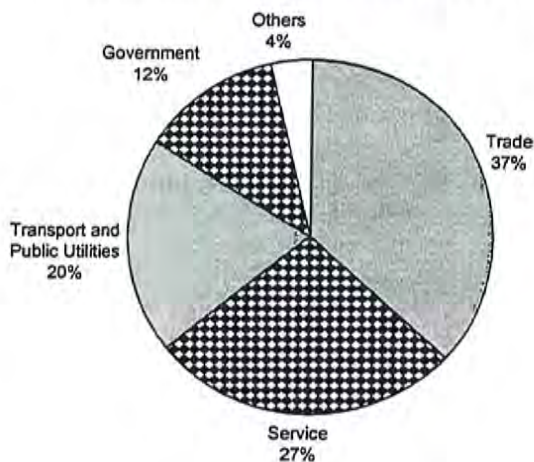
3.2 Work-related Homicide

Homicide was the third leading fatal occupational event in Massachusetts between 1991-1999. During this period, 82 workers (13%) died as a result of homicides at work. The average annual occupational homicide rate was 0.3 per 100,000 workers.

Work-related homicides were concentrated in a small number of industries and occupations.

- As shown in Chart 14, more than one-third (37%) of the victims of work-related homicide in Massachusetts were employed in the Wholesale and Retail Trade industry division. The Service and Transportation and Public Utilities divisions followed, accounting for 27% and 20% of work-related homicides, respectively. These three industry divisions combined accounted for 84% (68 homicides) of all work-related homicides.
- Occupations with high number of homicides were sales supervisors and proprietors (13 homicides), police and detectives (12 homicides), and taxi drivers and chauffeurs (11 homicides). These three occupations, combined, accounted for 44% of all homicides at work.
- Exchange of money and direct customer service are risk factors for workplace homicide. For example, national data indicate that taxi and livery drivers were 60 times more likely than other workers to be victims of work-related homicide.¹⁷

Chart 14. **Workplace Homicide by Industry Division, Massachusetts, 1991-1999**



The risk of workplace homicide was higher for men than women; however, homicide accounted for a higher proportion of work-related fatalities among women than men.

- The average annual occupational homicide rate for male workers (0.5 per 100,000 workers) was five times the female homicide rate of 0.1 per 100,000 workers. This difference was much greater than the difference between the overall homicide rates for men and women in the community (2.8 per 100,000 for males vs 1.2 per 100,000 for females).¹⁸
- Although men were more likely to die as a result of homicide on the job than women, homicides accounted for 27% of all fatal occupational injuries among female workers and only 12% of all occupational fatalities among men.

A 68-year old merchant was shot to death in a late-morning hold-up attempt at his neighborhood grocery store. According to newspaper reports, a gunman ordered several customers to the floor but was stopped by the proprietor after walking around the store counter. The grocer, who was working alone, was shot in the ensuing struggle. He had reportedly been trying to sell the store after several earlier robberies (Massachusetts CFOI report, 1994).

¹⁷ U.S. Department of Labor, Occupational Safety and Health Administration, Risk Factors and Protective Measures for Taxi and Livery Drivers. May 2000.

¹⁸ Massachusetts Department of Public Health, Bureau of Health Statistics, Research and Evaluation, Research & Epidemiology, Massachusetts Deaths, 2000.

A disproportionate number of black, Hispanic, and foreign-born workers were victims of workplace homicide.

- Homicide was the leading fatal event among black and Hispanic workers, accounting for 45% (14 fatalities) and 31% (10 fatalities) of all fatal occupational injuries among black and Hispanic workers, respectively. In contrast, only 11% of the occupational fatalities among white workers were the result of homicide. This finding is consistent with national data.
- Between 1991 and 1999, black and Hispanic workers were victims of 17% and 12% of all workplace homicides respectively, while they constituted only 4% and 3% of the state's labor force. In contrast, white workers, who constituted 93% of the labor force, were victims of 76% of workplace homicides.
- Twenty-five percent (28 fatalities) of the work-related fatalities among foreign-born workers in Massachusetts were due to homicides, whereas homicides accounted for only 10% of the occupational fatalities among workers born in the U.S.
- A high risk of workplace homicide among black, Hispanic and foreign-born workers at the national level was explained in large part by their concentration in occupations with high homicide rates such as taxicab drivers and managers and proprietors of small business establishments.¹⁹
- Self-employed workers, including those working for a family business, accounted for 23% of the homicides at work, whereas they comprised only 7% of all employed workers during 1999.

Patterns of workplace homicide differ from patterns of homicide in general

- Homicide in the workplace is characterized by unique patterns that set it apart from homicide in general. For instance, robbery was the precipitating circumstance in 49% of work-related homicides where motives were known in Massachusetts over the nine-year period. In contrast, a 1995 report by the Massachusetts Department of Public Health (MDPH) identifies robbery or other felony as responsible for less than one-fifth of all homicides in Massachusetts between 1978 and 1993.
- The MDPH report also points out that 45% of homicide victims in general were related to or acquainted with their assailants, a higher percentage than the 26% of workers who were fatally injured by someone they knew (Chart 15).
- Homicide in the workplace is also more likely to result from shooting than homicide in general. In Massachusetts, 68 percent of workers who died as a result of homicide between 1991 and 1999 were fatally injured by shooting, while shootings were responsible for approximately 54 percent of Massachusetts homicides overall in 2000.²⁰ Such differences between workplace and community homicides have been found to exist to an even greater degree at the national level.

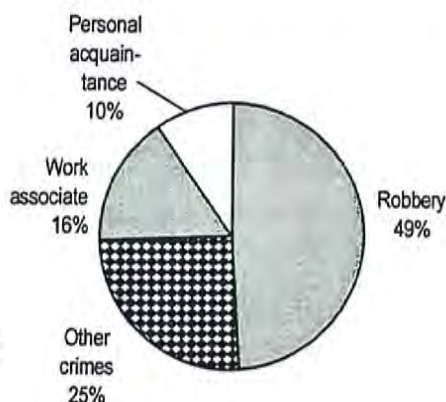
A lawyer was shot and fatally injured by his client's husband. He had gone to the residence of the client. While the lawyer was in her house, the client's husband shot and killed the victim, his wife, and himself (Massachusetts CFOI report, 1995).

An off-duty police officer was killed when a perpetrator who was accused of child molestation stabbed him. The officer was consoling the family of the molested child when the assailant showed up with a knife and mace to attack the child's family. The officer tried to fend off the assailant and was stabbed in the ensuing struggle. He died later from the stab wound he suffered (Massachusetts CFOI report, 1997).

¹⁹Castillo, D. and Jenkins, L. Industries and Occupations at High Risk for Work-Related Homicide, *Journal of Medicine*, Volume 36(4), February 1994.

²⁰MDPH, Bureau of Health Statistics, Research and Evaluation, Research and Epidemiology, Massachusetts Deaths, 2000.

Chart 15. **Workplace Homicide by Circumstance
Massachusetts, 1991-1999 (N = 51)**



Preventing Violence in the Workplace

Workplace violence cannot be considered independently from violence in the community at large. Efforts to prevent violence in the community should contribute to reduction of injuries due to violence at work. At the same time, it is important to recognize that specific efforts can and should be made to address violence in the workplace. As discussed, patterns of workplace homicides are distinct from patterns of homicide in the community in general and point to unique opportunities for violence prevention. While specific approaches will vary depending by the type of workplace, there are steps that most workplaces can take to address risk factors that have been identified. These risk factors include:²¹

- Contact with the public
- Exchange of money
- Delivery of passengers, goods, or services
- Having a mobile workplace (i.e. taxicab, police cruiser)
- Working with unstable persons in health care, social services, or criminal justice settings
- Working alone or in small numbers
- Working late at night or during early morning hours
- Guarding valuable property or possessions
- Working in high-crime areas
- Working in community-based settings

The National Institute for Occupational Safety and Health has recommended that workplace violence prevention programs should include:

1) Management commitment

Management should develop and publicize a written "zero tolerance for violence" policy. A written program should include a policy statement, a system of record keeping, and a program of responsibilities and actions in the event of violence. Implementation of the program should entail mechanisms for reporting threats or violent acts, identification of procedures for dealing with violence, and enforcement of the non-violence policy.

Three immigrant taxi drivers were killed during robberies in separate incidents. One incident occurred during daytime while the other two occurred during evening and early morning hours. The cab of one of the victims did not have a safety partition. Another victim was using his own car as a cab to drive shoppers from a neighborhood supermarket to their residences (Massachusetts CFOI report, 1997).

²¹ U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, *Violence in the Workplace*, 1996.

2) Work-site analysis

Identification and analysis of potential problem areas is a necessary prelude to implementing effective control measures. Part of this process involves studying the history of violence in the community and workplace to better understand the scope and nature of potential violence. A comprehensive physical inspection of the work-site to document areas where controls are in order is also necessary.

3) Environmental controls

Controls will vary with the work setting. Measures may include: enhanced lighting at strategic outside locations and enhanced street visibility; installation of security devices such as alarms, mirrors and video cameras; and design of entrances and exits to deter access by unauthorized persons and eliminate hiding places. In retail and other establishments where money is exchanged, the installation of bulletproof glass can provide workers with physical protection, while using drop safes and posting signs about limited cash availability may also serve as deterrents. In other settings where the public or clients may pose a threat, additional controls may include the provision of separate and locked bathroom facilities for staff, the installation of panic buttons and alarms, and the use of card key access systems.

4) Administrative controls

Staffing patterns are among the foremost violence prevention administrative measures. Increasing the number of staff on site is only one possible control. Particular activities may carry increased risk, such as transporting patients or storing money. Increased staffing policies should be implemented for such activities. Using trained security guards is another way of improving workplace security. Employee training and education on hazard recognition, safe work practices, and conflict resolution is another form of administrative control. Instructing employees in restaurants or bars on how to deal with customers who leave without paying or cause problems and making clear that employees should not physically engage customers are examples of such practices.

Preventing violence against taxi drivers

Taxi and livery drivers face an increased risk of workplace violence both in Massachusetts and nationally. The Occupational Safety and Health Administration recommends the following protective measures to prevent violence-related injury to taxi drivers and speed response time to those who need help. They include:²²

- Automatic vehicle location or global positioning system (GPS) to locate drivers in distress
- Caller ID to help trace location of fares
- First-aid kits in every car for use in emergencies
- In-car surveillance cameras
- Partitions or shields between the driver and passenger
- Protocol with police—owners and police to track high-crime locations
- Radios to communicate in emergencies (e.g., with an “open mike switch”)
- Safety training for drivers
- Silent alarms
- Use of credit/debit cards (“cash-less” fare systems) to discourage robberies

A plain-clothes police officer was shot and killed by an assailant. The officer was responding to a domestic disturbance call from residents and saw one of the men involved in the disturbance leaving the scene. As he followed the assailant, the assailant shot and wounded him several times. He later died of gun shot injuries (Massachusetts CFOI report, 1999).

²² U.S. Department of Labor, Occupational Safety and Health Administration, Risk Factors and Protective Measures for Taxi and Livery Drivers. May 2000.

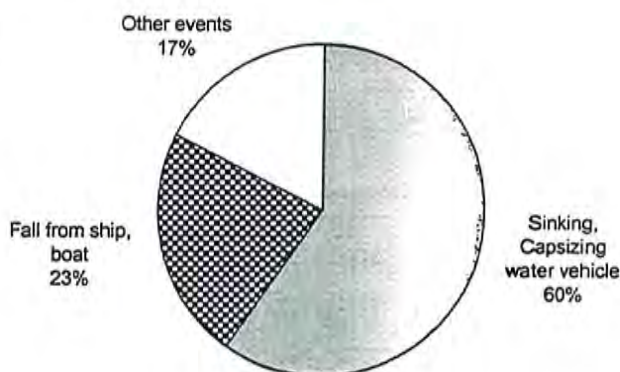
3.3 Commercial Fishing

Fishing claimed the lives of more workers in Massachusetts during 1991-1999 than any other single occupation. During this period, 57 Massachusetts fishers were fatally injured on the job. All victims were men, 24 were self-employed, 43 were white, and 15 were foreign-born. It was not possible to compute a state-specific fatality rate for the fishing industry because adequate data on the number of workers in this industry in Massachusetts were not available. However, commercial fishing has been found to be the most dangerous industry in the country. Nationally, between 1992-1996, an average of 76 fishers were fatally injured on the job each year, and the fatal occupational injury rate was 140 fatalities per 100,000 fishers, more than 28 times the average rate for all industries.²³ During the same period, Massachusetts was second only to Alaska in the number of fishers fatally injured at work.

Most Massachusetts fishers died as a result of sinking or capsizing of water vehicles.

- Sinking or capsizing of water vehicles were the leading events accounting for 60% (34 fatalities) of fishing fatalities (Chart 16). Thirteen workers fell overboard from fishing vessels and 10 died from other injuries such as being struck by a tow-line, inhalation of substance in enclosed, restricted or confined space, being caught in a rotating fishing vessel engine, and falling on boats.
- Out of the 34 fatalities due to sinking or capsized fishing vessels, 88% (30 fatalities) were due to ten multiple-fatality incidents with 2 to 6 lives lost at one time. Vessel size information was available for 5 fishing vessels that sunk or capsized, and their size ranged from 40 feet to 112 feet.

Chart 16. **Fishing Fatalities by Event/Exposure Massachusetts, 1991-99**
(N = 57)



Sinking or capsizing of water vehicles claimed more lives of shellfisher than finfisher.

- Of the total 57 fatalities, 27 victims were shellfishers and 26 were finfishers. Information on specific industry was not available for 4 fatalities. Nationally, more shellfishers (188 fatalities) than finfishers (138 fatalities) died between 1992 and 1997.²⁴

Two fishers were fatally injured when their fishing vessel sank. They were part of a five-man crew on a quahog clam boat. The other three members were rescued by another fishing vessel. The weather condition was rainy with strong wind, high seas, low visibility, and cold water temperature. The bodies of the victims were found washed up on shore two days later (Massachusetts CFOI report, 1999).

²³ Drudi, D. Fishing for a Living is Dangerous Work, Fatal Workplace Injuries in 1996: A Collection of Data and Analysis, BLS, June 1998.

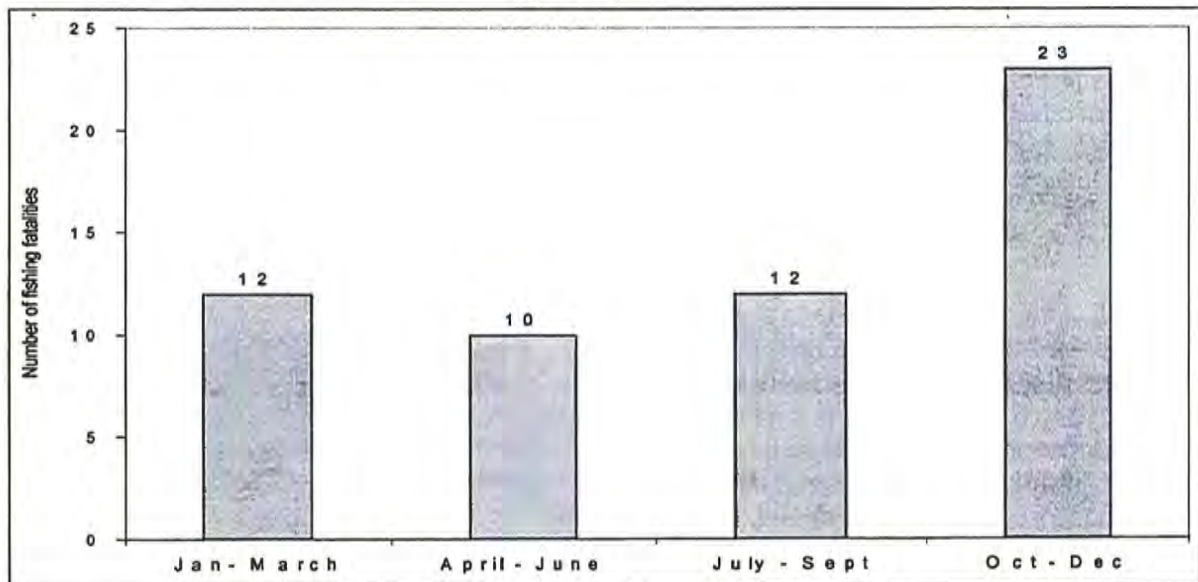
²⁴ Drudi, D. Persons Overboard/Sunk Vessels: Fishing Jobs Continue to Take Deadly Toll, BLS, Issues in Labor Statistics, June 1998.

- Events involving sinking or capsizing water vehicles claimed more lives of finfishers than shellfishers in Massachusetts. Two-thirds (77%, 20 fatalities) of finfishers who were fatally injured on the job died when their fishing boats sank or capsized, whereas less than half (48%, 13 fatalities) of the fatalities among shellfishers were the result of similar events.
- Fall overboard events were more common among shellfishers than finfishers. One-third (33%, 9 fatalities) of the fatalities among shellfishers and about one-tenth (3 fatalities, 12%) of the fatalities among finfishers were the results of a fall overboard.

Most fishing fatalities occurred during fall and winter seasons.

- In Massachusetts, most fishing fatalities occurred during fall and winter seasons (Chart 17). Six in 10 of all fishing fatalities and two-thirds (68%) of the fatalities due to capsized fishing boats occurred in the months between October and March.

Chart 17. Work-related Fishing Fatalities by Time of the Year, Massachusetts, 1991-1999 (N = 57)



Preventing work-related fatalities among commercial fishers

- Capsizing or sinking vessels accounted for the majority of fatalities among commercial fishers in Massachusetts. A NIOSH working group on Commercial Fishing in Alaska identified vessel stability and hull integrity, licensing and training of operators and crew, management regimes, and avoidance of most harsh sea and weather conditions as critical issues to be addressed to prevent fatalities due to capsizing and sinking fishing vessels. The working group recommended the following measures²⁵:

Two fishers were fatally injured when their fishing trawler sank. One of them died of hypothermia and drowning and the other could not be found and was presumed dead. According to reports from the Coast Guard, the vessel did not meet several of the voluntary standards set for small commercial fishing vessels. The life raft was found to have been stowed improperly in the wheelhouse. The Emergency Positioning Indicating Radio Beacon (EPIRB), an electronic device meant to float to the surface and give off a signal during an emergency, had also been improperly stowed. In addition, the vessel did not carry immersion suits that protect workers from exposure to cold water (Massachusetts CFOI report, 1991).

²⁵ NIOSH, Current Intelligence Bulletin 58, Commercial Fishing Fatalities in Alaska: Risk Factors and Prevention Strategies, September 1997.

- **A requirement for periodic stability reassessment and inspection of all vessels**
- **Minimum specifications for watertight components and bulkheads sufficient to keep vessels afloat**
- **Assessing thoroughly the current licensing and training requirements for skippers and crew and correcting deficiencies**
- **Establishing adequate watchkeeping and staffing requirements for all vessels**
- **Examining all existing and proposed management regimes from a health and safety perspective**

A considerable number of fishers also die from falling overboard. Personal Flotation Devices (PFD) can increase the chance of survival. A study by NIOSH indicates that 63% of fishers who fell overboard while wearing PFDs have survived, while only 12% of those who did not wear PFDs survived.²⁶

The availability of PFDs in a readily accessible area to all crewmembers is necessary. The choice and proper use of PFDs during routine work on deck can save the lives of fishers who fall overboard and risk drowning or hypothermia.

NIOSH recommends the following to prevent overboard falling and related fatalities:

- Use safety lines when possible
- Install or extend guardrails where possible
- Keep decks as clean and clear as possible to prevent slipping or tripping
- Ensure that vessels are equipped with at least one Personal Flotation Device (PFD) or immersion suit for each person on board
- Have a rescue system in place for a quick retrieval from the water
- Always wear a PFD while on the deck of a commercial fishing vessel.

A lobsterman died after falling off his boat. He was alone in his boat when he went to check his traps. Hours later, another fisherman found him beneath his boat. He died later from the injuries he suffered (Massachusetts CFOI report, 1996).

Two fishers were fatally injured in two separate incidents when their clothes became entangled in the rotating propulsion shafts of the fishing vessels they were working aboard.

Victim # 1 was attempting to gain access to the bilge pump. He removed the deck cover, which exposed approximately 2 feet of the 2½-inch diameter rotating propulsion shaft and flanged coupling. While reaching underneath the propulsion shaft to clear away debris from the bilge pump the victim's shirt became entangled in the rotating shaft, pulling him into the bilge.

Victim # 2 was owner of a fishing vessel and was assisting his son in solving a problem with the vessel's propulsion system. Prior to checking the transmission and propulsion shaft, the victim had removed the wooden deck cover exposing approximately 1½ feet of the 1½ inch diameter rotating propulsion shaft and flanged coupling. The engine shut down after a clanging sound was heard. The son turned around and found his father entangled in the propulsion shaft.

In order to prevent similar future incidents, the FACE program recommended that fishers should: 1) disengage the transmission before attempting to work on or near the transmission and propulsion shaft; and 2) guard moving machine parts, such as propulsion shafts, to avoid contact (Massachusetts FACE reports, 99MA068 and 99MA072).

²⁶ Center for Diseases Control and Prevention, NIOSH, Preventing Drownings of Commercial Fishermen, Alert, April 1994.

4. Appendices

Appendix 1. **Top Three Fatal Occupational Events/Exposures
by Race and Hispanic Origin, Massachusetts, 1991-1999**

Race of workers			Hispanic Origin	
White (n = 562)	Black (n = 31)	Asian/Native Hawaiian/Pacific (n = 24)	Hispanic (n = 32)	Non-Hispanic (n = 578)
Fall to lower level (20%)	Homicide (52%)	Homicide (18%)	Homicide (35%)	Fall to lower level (19%)
Motor vehicle incident (14%)	Motor vehicle incident (16%)	Caught in/or between equipment (18%)	Fall to lower level (12%)	Motor vehicle incident (14%)
Homicide (12%)	Fall to lower level (16%)	Suicide (14%)	Contact with objects (15%)	Homicide (13%)

SOURCE: Massachusetts Department of Public Health, Occupational Health Surveillance Program, Census of Fatal Occupational Injuries.

NOTE: Information about race and Hispanic origin was obtained from death certificates. Race data was not available for 16 workers and information on Hispanic Origin was not available for 23 workers.

Appendix 2. **Fatal Occupational Injuries by Selected Characteristics**
Massachusetts, 1991-1999 and U.S., 1992-1999 Annual Average

Characteristics	Massachusetts 1991-1999		U. S. 1992-99 annual average		Characteristics	Massachusetts 1991-1999		U. S. 1992-99 annual average	
	N	%	N	%		N	%	N	%
Total	633	100	6,247	100	Total	633	100	6,247	100
Employer					Industry				
Private	562	89	5,598	90	Ag/For/Fishing	94	15	826	13
Government	69	11	649	10	Comm. Fishing	57	9	71	1
Employee Status					Construction	136	22	1,057	17
Wage & Salary	522	82	4,971	80	Sp. Trade. Contractors	100	16	610	10
Self-employed*	111	18	1,224	20	Manufacturing	55	9	739	12
Gender					Transp/Public Utilities	84	13	941	15
Men	589	93	5,711	91	Trade	85	13	932	15
Women	44	7	84	9	Services	97	15	766	12
Race					Government	69	11	656	11
White	562	89	5,104	82	Occupation				
Black	31	5	647	10	Manag/ Professional	76	12	687	11
Asian/Pacific Islander	24	4	188	3	Tech/Sale/Adm. Supp.	86	14	782	13
Not reported	16	2	308	5	Service	67	11	516	8
Hispanic Origin					Farm/Forestry/ Fishing	95	15	919	15
Hispanic**	32	5	31	10	Prec/prod/Craft/Repair Op/Fabr/ Laborers	144	23	1,091	18
Age					161	25	2,069	34	
Under 20 years	16	3	250	4	Event				
20 - 24 years	35	3	484	8	Contact with objects	88	14	1,000	16
25 - 34 years	160	25	1,381	22	Fall	133	21	671	11
35 - 44 years	174	28	1,545	25	Fall to lower level	120	19	590	9
45 - 54 years	111	18	1,251	20	Exposure to harmful sub.	50	8	590	9
55 - 64 years	83	13	824	13	Contact with electric	25	4	318	5
65 years and older	49	8	5	8	Transportation Incidents	221	35	2,600	42
Unknown	5	1	-	-	Highway incidents	84	13	1,345	22
					Non-highway accident	19	3	390	6
					Pedestrian	40	6	375	6
					Water vehicle accident	51	8	120	2
					Aircraft accident	24	4	298	
					Assaults and violent acts	115	18	1,168	19
					Homicide	82	13	923	15
					Suicide	30	5	214	3

* Includes paid and unpaid family workers and may include owners of incorporated businesses, or members of partnerships.

** Persons identified as Hispanic may be of any race.

NOTE: Totals may include data for subcategories not shown separately. Percentages may not add to totals due to rounding. Dashes indicate data that are not available or do not meet publication criteria.

SOURCE: Census of Fatal Occupational Injuries (CFOI), Massachusetts Department of Public Health, 1991-1999.
 Census of Fatal Occupational Injuries (CFOI), Bureau of Labor Statistics, 1992-1999.

Appendix 3. **Workplace Fall Fatalities by Selected Characteristics, Massachusetts 1991-1999 and U.S., 1997**

Characteristics	Massachusetts (1991-1999)		U.S. (1997)		Characteristics	Massachusetts (1991-1999)		U.S. (1997)	
	N	%	N	%		N	%	N	%
Total	133	100	715	100	Technical , sales, and administrative support	12	9	28	4
Employee status					Farming, forestry, and fishing	11	8	64	9
Wage and salary workers	112	84	595	83	Precision production, craft and repair	68	51	293	41
Self-employed	21	16	120	17	Mechanic and repairers	5	4	42	6
Gender					Construction trades	62	47	236	33
Men	127	95	695	97	Brickmasons and stonemasons, apprentices	6	5	12	1
Women	6	5	20	3	Carpenters and apprentices	11	8	43	6
Race					Electricians and apprentices	4	3	14	2
black	5	4	56	8	Painters, construction and maintenance	6	5	21	3
white	125	94	606	85	Roofers	14	11	36	5
Other	3	2	53	7	Structural metal workers	7	5	35	5
Hispanic Origin					Operators, fabricators, and laborers	19	14	207	29
Hispanic	7	5	88	12	Transportation and material moving Occupations	4	3	-	-
Age					Handlers, equipment cleaners, helpers and laborers	13	10	-	-
Under 15 years	-	-	-	-	Construction laborers	7	5	107	15
15-24 years	6	5	67	9	Laborers, except construction	4	3	-	-
25-34 years	27	20	121	19	Other	-	-	-	-
35-44 years	36	27	157	24	Industry				
45-54 years	24	18	151	23	Agriculture, Forestry, and Fishing	9	7	65	9
55-64 years	16	12	96	15	Construction	72	54	380	53
65 years and older	24	18	66	10	General building contractors	11	8	-	-
Unknown	-	-	5	1	Heavy contractors	3	2	-	-
Event					Special trade contractors	58	44	-	-
Fall to lower level	118	89	652	91	Masonry, stonework, and plastering	7	5	-	-
Fall down stairs or steps	4	3	13	2	Carpentry and floor work	11	8	-	-
Fall from floor, dock, ground	-	-	40	6	Roofing, siding, and sheet metal work	14	11	-	-
Fall from ladder	10	8	116	16	Miscellaneous special trade Contractors	13	10	-	-
Fall from roof	12	9	154	22	Manufacturing	3	4	55	8
Fall through existing roof opening	-	-	20	3	Transportation and Public Utilities	4	6	37	5
Fall through roof surface	4	3	19	3	Wholesale/Retail trades	7	10	49	7
Fall through skylight	-	-	17	2	Services	11	16	68	10
Fall from roof edge	4	3	56	8	Government			30	4
Fall from scaffold, staging	10	8	87	12	Establishment sizes (no. of employees)				
Fall from building girders or other structural steel	3	2	48	7	1-10	73	59	-	-
Fall from nonmoving vehicle	-	-	53	7	11-19	12	10	-	-
Fall on same level	15	11	44	6	20-49	13	11	-	-
Fall to floor, walkway, or other	4	3	33	5	50-99	4	3	-	-
Occupation					100+	21	17	-	-
Managerial and professional specialty	5	4	64	9					

SOURCE: Massachusetts Department of Public Health, Census of Fatal Occupational Injury (CFOI) Program, 1991-1999, and U.S. Department of Labor, Bureau of Labor Statistics, CFOI, 1997.

NOTE: Totals for major categories may include subcategories not shown separately. Percentages may not add to totals due to rounding. Major categories that do not meet publication criteria are not shown. Dashes indicate unpublshable data.

Appendix 4. **Workplace Homicides by Selected Characteristics, Massachusetts, 1991-1999 and U.S., 1992-1999 Annual Average**

Characteristics	Massachusetts 1991-1999		U.S. 1992-1999 annual average		Characteristics	Massachusetts 1991-1999		U.S. 1992-1999 annual average	
	N	%	N	%		N	%	N	%
Total	82	100	920	100	Occupation				
Gender					Managerial and professional specialty occupations	17	21	160	17
Men	70	85	743	81	Executive, administrative and managerial occupations	7	9	127	14
Women	12	15	147	19	Professional specialty	10	12	33	4
Race					Technical, sales, and administrative support jobs	26	32	328	36
white	61	74	606	66	Sales occupations	20	24	287	31
black	14	17	170	18	Supervisors and proprietors, sales occupations	13	16	146	16
Other or unknown	7	9	144	16	Cashiers	3	4	80	9
Hispanic Origin					Administrative support occupations, including, clerical	5	6	36	4
Hispanic	10	12	126	14	Service occupations	19	23	197	21
Age					Protective service occupations	12	15	116	13
Under 20 years	1	1	30	3	Operators, Fabricators, Laborers	14	17	110	12
20-24 years	7	9	60	8	Motor vehicle operators	14	17	106	12
25-34 years	18	22	233	25	Truck drivers	2	2	23	3
35-44 years	25	30	240	26	Taxicab drivers and chauffeurs	11	13	70	8
45-54 years	20	24	181	20	Industry				
55-64 years	6	7	106	12	Transportation and public utilities	15	18	98	11
65 years and older	5	6	56	6	Local and interurban passenger transit	12	15	74	8
Event					Taxicabs	10	12	70	8
Shooting	56	68	705	82	Wholesale/Retail trade	29	35	442	48
Stabbing	12	15	73	9	Food stores	9	11	154	17
Hitting, kicking, beating	4	5	47	5	Eating and drinking places	6	7	119	13
Other, including, bombing	10	12	31	4	Services	20	24	156	17
Motive					Business services	4	5	43	5
Robbery and other crimes	64	78	775	84	Manufacturing	-	-	38	4
Personal acquaintance	11	13	44	5	Government/Public Administration	15	18	112	12
Work associates	7	9	101	11					

SOURCE: Massachusetts Department of Public Health, Census of Fatal Occupational Injury (CFOI) Program, 1991- 1999, and U.S. Department of Labor Bureau of Labor Statistics, CFOI, 1997.

NOTE: Totals for major categories may include subcategories not shown separately. Percentages may not add to totals due to rounding. Major categories that do not meet publication criteria are not shown. Dashes indicate no data reported or data that do not meet publication criteria.

Appendix 5. **Work-related Fishing Fatalities by Selected Characteristics, Massachusetts, 1991 – 1999**

Characteristics	Massachusetts 1991-1999		Characteristics	Massachusetts 1991-1999	
	N	%		N	%
Total	57	100	Occupation		
Employee status			Fishers, hunters and trappers	57	100
Wage and salary workers	33	58	Captains and other officers, fishing vessels	12	21
Self-employed	24	42	Fishers	45	79
Gender			Industry		
Men	57	100	Fishing, hunting and trapping	57	100
Race			Finfish	26	49
white	43	75	Shellfish	27	43
Not classified	14	25	Unknown	4	7
Foreign-born	15	26	Event		
Portugal	5	9	Oxygen deficiency, n.e.c.	3	5
Ireland	4	7	Drowning	3	5
Cape Verde	3	5	Water vehicle accident	47	82
Poland	1	2	Fall from ship, boat	12	21
Honduras	1	2	Sinking, capsized water vehicle	26	46
England	1	2	Water vehicle accident, n.e.c.	9	16
Age			Contact with objects	4	7
20-24 years	1	2	Other events	3	5
25-34 years	20	35	Establishment Size		
35-44 years	20	35	1 to 10	35	61
45-54 years	5	9	11 to 19	2	4
55-64 years	6	11	Not reported	20	35
Unknown	5	9			

n.e.c.- not elsewhere classified

SOURCE: Massachusetts Department of Public Health, Occupational Health Surveillance Program, Census of Fatal Occupational Injuries (CFOI).

NOTE: Totals for major categories may include subcategories not shown separately. Percentages may not add to totals due to rounding. Major categories that do not meet publication criteria are not shown. Dashes indicate no data reported or data that does not meet publication criteria.

Appendix 6. **Fatal Occupational Injuries of Government Workers
by Selected Characteristics, Massachusetts, 1991-1999 and U.S., 1995**

Characteristics	Massachusetts 1991-1999		U.S. 1995		Characteristics	Massachusetts 1991-1999		U.S. 1995	
	N	%	N	%		N	%	N	%
Total fatalities	69	100	772	100	Type of Government				
Gender					Federal	6	9	299	39
Men	64	93	657	85	State	16	23	124	16
Women	5	7	115	15	Local	47	68	338	44
Race					Foreign	-	-	7	1
white	63	91	620	80	Other	-	-	4	1
black	6	9	110	14	Occupation				
Hispanic Origin					Managerial and professional specialty occupations	11	16	124	16
Hispanic	4	6	40	5	Executive, administrative and managerial occupations	4	6	64	8
Employee status					Professional specialty	7	10	60	8
Active duty armed forces (resident)	2	3	143	19	Technical, sales, and administrative support jobs	5	7	91	12
Wage and salary	66	96	602	78	Service occupations	32	46	241	31
Volunteers	1	1	27	3	Protective service occupations	31	45	221	29
Age					Police and detectives, including, supervisors	18	26	168	22
16-19 years	1	1	20	3	Firefighting and fire prevention	10	15	35	5
20-24 years	2	3	73	9	Precision, production, craft and repair occupations	10	15	62	8
25-34 years	12	17	204	26	Electricians	4	6		
35-44 years	25	36	188	24	Operators, fabricators, and laborers	8	12	92	12
45-54 years	19	28	150	19	Laborers, except, construction	5	7	-	-
55-64 years	9	13	104	13	Industry				
65 years and older	1	1	29	4	Transportation and public utilities	12	17	65	8
Event					Local and interurban passenger transit	4	6	10	1
Highway incidents	14	20	194	25	U.S. Postal service	-	-	16	2
Homicide	14	20	211	27	Electric, gas and sanitary services	6	9	30	4
Struck by vehicle	9	13	67	9	Construction	3	4	43	6
Exposure to harmful substances or objects	7	10	51	7	Heavy Construction, except building	3	4	41	5
Fires	8	12	32	4	Services	7	10	72	9
Suicides	6	9	37	5	Government/Public Administration	46	67	576	75
Other events	11	16	-	-					

SOURCE: Massachusetts Department of Public Health, Census of Fatal Occupational Injuries, 1991-1999.
U.S. Department of Labor, Bureau of Labor Statistics, Fatal Workplace Injuries in 1995: A collection of Data and Analysis.

NOTE: Number of Government Workers Include workers employed by Local, State and Federal Governments in Massachusetts regardless of industry.

Appendix 7. **Fatal Occupational Injuries of Older Workers (65 and over) and Younger Workers (< 65 years) by Selected Characteristics, Massachusetts, 1991-1999**

Worker Characteristics	Age Groups			
	65 years and older		< 65 years	
	N	%	N	%
Total fatalities	49	100	579	100
Gender				
Men	45	92	539	93
Women	4	8	40	7
Race				
white	48	98	514	89
black	-	-	31	5
Others	-	-	23	4
Employment				
Wage and Salary	36	73	479	83
Self-employed	13	27	96	17
Event				
Contact with Object	4	8	84	15
Falls	24	49	109	19
Exposure to Harmful Substances and Environments	-	-	50	9
Transportation related incidents	15	31	201	35
Highway incidents	8	16	76	13
Assaults and Violent Acts	5	10	110	19
Homicide	5	10	77	13
Industry				
Agriculture, Forestry and Fishing	3	6	86	15
Construction	10	20	126	22
Manufacturing	4	8	51	9
Transport and Public Utilities	4	8	80	14
Trade	8	16	77	13
Finance, Insurance and Real Estate	-	-	7	1
Services	16	33	83	14
Government	-	-	69	12
Occupation				
Managerial and Professional Occupations	6	12	70	9
Technical, Sales, and Administrative Support Occupations	13	27	73	13
Service Occupations	4	8	63	11
Farming, Forestry and Fishing Occupations	4	8	86	15
Precision Production, Craft and Repair Occupations	13	27	131	23
Operators, Fabricators and Laborers	9	18	152	26

SOURCE: Massachusetts Department of Public Health, Occupational Health Surveillance Program, Census of Fatal Occupational Injuries, and Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

NOTE: Totals for major categories may include subcategories not shown separately. Percentages may not add to totals due to rounding. Major categories that do not meet publication criteria are not shown. Dashes indicate no data reported or data that does not meet publication criteria. Five fatalities were excluded due to lack of age information.

Appendix 8. Detailed Standard Industrial Classification (SIC) Industry Groupings

SIC Industry Division	Major Industry Group	Included Industries
AGRICULTURE, FORESTRY AND FISHING (00 - 09)	AGRICULTURAL PRODUCTION- CROPS (01)	Cash grains; Non-cash Field Crops; Vegetable and Melons; Fruits and Tree Nuts; Horticultural Specialties; General Farms, Primarily Crop
	AGRICULTURAL PRODUCTION LIVESTOCK (02)	Livestock, Except Dairy and Poultry); Dairy Farms; Poultry and Eggs; Animal Specialties; General Farms, Primarily Animal
	AGRICULTURAL SERVICES (07)	Soil Preparation Services; Crop Services; Veterinary Services; Animal Services (except veterinary); Farm Labor and Management Services; Landscape and Horticultural Services
	FORESTRY (08)	Timber Tracts; Forest Products; Forestry Services
	FISHING, HUNTING, and TRAPPING (09)	Commercial Fishing; Fish Hatcheries and Preserves; Hunting, Trapping, Game Propagation
CONSTRUCTION (15 - 17)	GENERAL BUILDING CONTRACTORS (15)	Residential Building Construction; Operative Builders; Non-residential Building Construction
	HEAVY CONSTRUCTION, EXCEPT BUILDING (16)	Highway and Street Construction; Heavy Construction (except highway)
	SPECIAL TRADE CONTRACTORS (17)	Plumbing, Heating and Air-conditioning; Painting and Paper Hanging; Electrical Work; Masonry, Stonework, and Plastering; Carpentry and Floor work; Roofing, Siding, and Sheet Metal work
MANUFACTURING (20 - 39)	FOOD and KINDRED PRODUCTS (20)	Meat Products; Dairy Products; Preserved Fruits and Vegetables; Grain Mill Products; Bakery Products; Sugar and Confectionery Products; Fats and Oils; Beverages; Miscellaneous Food and Kindred Products
	TOBACCO PRODUCTS (21)	Cigarettes; Cigars; Chewing and Smoking Tobacco; Tobacco Stemming and Redrying
	TEXTILE MILL PRODUCTS (22)	Broadwoven Fabric Mills, Cotton; Broadwoven Fabric Mills, Manmade; Broadwoven Fabric Mills, Wool; Narrow Fabric Mills; Knitting Mills; Textile Finishing, Except Wool; Yam and Thread Mills; Miscellaneous Textile Goods
	APPAREL and OTHER TEXTILE PRODUCTS (23)	Men's and Boys' Suits and Coats; Men's and Boys' Furnishings; Women's and Misses' Outerwear; Women's and Children's Undergarments; Hats, Caps, and Millinery; Girls' and Children's Outerwear; Fur Goods; Miscellaneous Apparel and Accessories; Miscellaneous Fabricated Textile Products
	LUMBER and WOOD PRODUCTS (24)	Logging; Sawmills and Planing Mills; Millwork, Plywood and Structural Members; Wood Containers; Wood Buildings and Mobile Homes; Miscellaneous Wood Products
	FURNITURE and FIXTURES (25)	House Hold Furniture; Office Furniture; Public Building and Related Furniture; Partitions and Fixtures; Miscellaneous Furniture and Fixtures
	PAPER and ALLIED PRODUCTS (26)	Pulp Mills; Paper Mills; Paperboard Mills; Paperboard Containers and Boxes; Miscellaneous Converted Paper Products
	PRINTING and PUBLISHING (27)	Newspapers; Periodicals; Books; Miscellaneous Publishing
	CHEMICALS and ALLIED PRODUCTS (28)	Industrial Inorganic Chemicals; Plastics Materials and Synthetics; Drugs; Soap, Cleaners, and Toilet Goods; Paints and Allied Products; Industrial Organic Chemicals; Agricultural Chemicals; Miscellaneous Chemical Products
	PETROLEUM and COAL PRODUCTS (29)	PETROLEUM Refining; Asphalt Paving and Roofing Materials; Miscellaneous Petroleum and Coal products
		Tires and Inner Tubes; Rubber and Plastic Footwear; Hose and Belting and Gaskets and Packing; Fabricated Rubber Products

Appendix 8. **Detailed Standard Industrial Classification (SIC) Industry Grouping - Continued**

SIC Industry Division	Major Industry Group	Included Industries
MANUFACTURING Continued	LEATHER and LEATHER PRODUCTS (31)	Leather Tanning and Finishing; Footwear Cut Stock; Footwear, Except Rubber; Luggage; Handbags and Personal Leather Goods; Leather Goods, n.e.c.
	STONE, CLAY, and GLASS PRODUCTS (32)	Flat Glass; Glass and Glassware, Pressed or Blown; Products of Purchased Glass; Structural Clay Products; Pottery and Related products; Concrete, Gypsum, and Plaster products; Cut Stone and Stone Products; Miscellaneous Nonmetallic Mineral Products
	PRIMARY METAL INDUSTRIES (33)	Blast Furnace and Basic Steel Products; Iron and Steel Foundries; Primary Nonferrous Metals; Secondary Nonferrous Metals; Nonferrous Rolling and Drawing; Nonferrous Foundries (Castings); Miscellaneous Primary Metal products
	INSTRUMENTS and RELATED PRODUCTS (38)	Search and Navigation Equipment; Measuring and Controlling Devices; Medical Instruments and Supplies; Ophthalmic Goods; Photographic Equipment and Supplies; Watches, Clocks, Watchcases and Parts
	MISCELLANEOUS MANUFACTURING INDUSTRIES (39)	Jewelry, Silverware, and Plated Ware; Musical Instruments; Toys and Sporting Goods; Pens, Pencils, Office, and Art Supplies; Costume Jewelry and Notions; Miscellaneous Manufactures.
TRANSPORTATION and PUBLIC UTILITIES (40-49)	RAILROAD TRANSPORTATION (40)	Railroads
	LOCAL and INTERURBAN PASSENGER TRANSIT (41)	Local and Suburban Transportation; Taxicabs; Inter-city and Rural Bus Transportation; Bus Charter Service; School Buses; Bus Terminal and Service Facilities
	TRUCKING and WAREHOUSING (42)	Trucking and Courier Services, except Air; Public Warehousing and Storage; Trucking Terminal Facilities
	U.S. POSTAL SERVICE (43)	U.S. Postal Service
	WATER TRANSPORTATION (44)	Deep Sea Foreign Transportation of Freight; Deep Sea Domestic Transportation of Freight; Freight Transportation on the Great Lakes; Water Transportation of Freight, n.e.c.; Water Transportation of Passengers; Water Transportation Services
	TRANSPORTATION BY AIR (45)	Air Transportation, Scheduled; Air Transportation, Nonscheduled; Airports, Flying Fields, and Services
	PIPELINES, EXCEPT NATURAL GAS (46)	Pipelines, Except Natural Gas
	TRANSPORTATION SERVICES (47)	Passenger Transportation Arrangement; Freight Transportation Arrangement; Rental of Railroad Cars; Miscellaneous Transportation Services
	COMMUNICATIONS (48)	Telephone Communications; Telegraph and Other Communications; Radio and Television Broadcasting; Cable and Other Pay TV Services
	ELECTRIC, GAS, and SANITARY SERVICES (49)	Electric Services; Gas Production and Distribution; Combination Utility Services; Water Supply; Sanitary Services; Steam and Air-conditioning Supply; Irrigation Systems
WHOLESALE TRADE (50 - 51)	WHOLESALE TRADE -DURABLE GOODS (50)	Motor Vehicles, Parts, and Supplies; Furniture and Home Furnishings; Lumber and Construction Materials; Professional and Commercial Equipment; Metals and Minerals, Except Petroleum; Electrical Goods; Hardware, Plumbing, and Heating Equipment; Machinery, Equipment, and Supplies; Miscellaneous Durable Goods
	WHOLESALE TRADE -NONDURABLE GOODS (51)	Paper and Paper Products; Drugs, Proprietarys, and Sundries; Apparel, Piece Goods, and Notions; Groceries and Related Products; Farm-Product Raw materials; Chemicals and Allied Products; Petroleum and Petroleum Products; Beer, Wine, and Distilled Beverages; Miscellaneous Non-durable Goods

Appendix 8. **Detailed Standard Industrial Classification (SIC) Industry Grouping - Continued**

SIC Industry Division	Major Industry Group	Included Industries
RETAIL TRADE (52 - 59)	BUILDING MATERIALS and GARDEN SUPPLIES (52)	Lumber and Other Building Materials; Paint, Glass, and Wallpaper Stores; Hardware Stores; Retail Nurseries and Garden Stores; Mobile Home Dealers;
	GENERAL MERCHANDISE STORES (53)	Department Stores; Variety Stores; Miscellaneous General Merchandise Stores
	FOOD STORES (54)	Grocery Stores; Meat and Fish Markets; Fruit and Vegetable Markets; Candy, Nut, and Confectionery Stores; Dairy Products Stores; Retail Bakeries; Miscellaneous Food Stores
	AUTOMOTIVE DEALERS and SERVICE STATIONS (55)	New and Used Car Dealers; Used Car Dealers; Auto and Home Supply Stores; Gasoline Service Stations; Boat Dealers; Recreational Vehicle Dealers; Motorcycle Dealers; Automotive Dealers, n.e.c.
	APPAREL and ACCESSORY STORES (56)	Men's and Boys' Clothing Stores; Women's Clothing Stores; Women's Accessory and Specialty Stores; Children's and Infants' Wear Stores; Family Clothing Stores; Shoe Stores; Miscellaneous Apparel and Accessory Stores
	FURNITURE and HOME FURNISHING STORES (57)	Furniture and Home Furnishings Stores; Household Appliance Stores; Radio, Television, and Computer Stores
	EATING and DRINKING PLACES (58)	Eating and Drinking Places
	MISCELLANEOUS RETAIL (59)	Drug Stores and Proprietary stores; Used Merchandise Stores; Liquor Stores; Miscellaneous Shopping Goods Stores; Non-store Retailers; Fuel Dealers; Retail Stores, n.e.c.
FINANCE, INSURANCE and REAL ESTATE (60 - 69)	DEPOSITORY INSTITUTIONS (60)	Central Reserve Depositories; Commercial Banks; Savings Institutions; Credit Unions; Foreign Bank and Branches & Agencies; Functions Closely Related to Banking;
	NONDEPOSITORY INSTITUTIONS (61)	Federal and Fed-Sponsored Credit; Personal Credit Institutions; Business Credit Institutions; Mortgage Bankers and Brokers
	SECURITY and COMMODITY BROKERS (62)	Security Brokers and Dealers; Commodity Contracts Brokers, Dealers; Security and Commodity Exchanges; Security and Commodity Services
	INSURANCE CARRIERS (63)	Life Insurance; Medical Service and Health Insurance; Fire, Marine, and Casualty Insurance; Surety Insurance; Title Insurance; Pension, Health, and welfare Funds; Insurance Carriers, n.e.c.
	INSURANCE AGENTS, BROKERS, and SERVICE (64)	Insurance Agents, Brokers, and Service
	REAL ESTATE (65)	Real Estate Operators and Lessors; Real Estate Agents and Managers; Subdividers and Developers
SERVICES (70 - 89)	HOTELS and OTHER LODGING PLACES (70)	Hotels and Motels; Rooming and Boarding Houses; Camps and Recreational Vehicle Parks; Membership-Basis Organization Hotels
	PERSONAL SERVICES (72)	Laundry, Cleaning, and Garment Services; Photographic Studios, Portrait; Beauty Shops; Barber Shops; Shoe Repair and Shoeshine Parlors; Funeral Service and Crematories; Miscellaneous Personal Services
	BUSINESS SERVICES (73)	Advertising; Credit Reporting and Collection; Mailing, Reproduction, Stenographic; Services to Buildings (including disinfecting and pest control and building maintenance); Miscellaneous Equipment Rental and Leasing; Personnel Supply Services; Computer and Data Processing Services; Miscellaneous Business Services (including Detective and Armored Car Services).
	AUTO REPAIR, SERVICES, AND PARKING (75)	Automotive Rentals, No Drivers; Automobile Parking; Automotive Repair Shops; Automotive Services, Except Repair

Appendix 8. **Detailed Standard Industrial Classification (SIC) Industry Grouping - Continued**

SIC Industry Division	Major Industry Group	Included Industries	
SERVICES Continued	MISCELLANEOUS REPAIR SERVICES (77)	Electrical Repair Shops; Watch, Clock, and Jewelry Repair; Reupholstry and Furniture Repair; Miscellaneous Repair Shops	
	MOTION PICTURES (78)	Motion Picture Production and Services; Motion Picture Distribution and Services; Motion Picture Theatres; Video Tape Rental;	
	AMUSEMENT and RECREATION SERVICES (79)	Dance Studios, Schools, and Halls; Producers, Orchestras, Entertainers; Bowling Centers; Commercial Sports; Miscellaneous Amusement, Recreation Services	
	HEALTH SERVICES (80)	Offices and Clinics of Medical Doctors; Offices and Clinics of Dentists; Offices and Clinics of Physicians; Offices of Other Health Practitioners; Nursing and Personal Care Facilities; Hospitals; Medical and Dental Laboratories; Home Health Care Services; Health and Allied Services, n.e.c.	
	LEGAL SERVICES (81)	Legal Services	
	EDUCATIONAL SERVICES (82)	Elementary and Secondary Schools; Colleges and Universities; Libraries; Vocational Schools; Schools and Educational Services, n.e.c.	
	SOCIAL SERVICES (83)	Individual and Family Services; Job Training and Related Services; Child Day Care Services; Residential Care; Social Services, n.e.c.	
	MUSEUMS, BOTANICAL, ZOOLOGICAL GARDENS (84)	Museums and Art Galleries; Botanical and Zoological Gardens	
	MEMBERSHIP ORGANIZATIONS (86)	Business Associations; Professional Organizations; Labor Organizations; Civic and Social Associations; Political Organizations; Religious Organizations; Membership Organizations, n.e.c.	
	ENGINEERING and MANAGEMENT SERVICES (87)	Engineering and Architectural Services; Accounting, Auditing, and Bookkeeping; Research and Testing Services; Management and Public Relations	
	PRIVATE HOUSEHOLDS (88)	Private Households	
	SERVICES, n.e.c. (89)	Services, n.e.c.	
	PUBLIC ADMINISTRATION (91 - 97)	EXECUTIVE, LEGISLATIVE, AND GENERAL (91)	Executive Offices; Legislative Bodies; Executive and Legislative Combined; General Government, n.e.c.
		JUSTICE, PUBLIC ORDER, and SAFETY (92)	Courts; Public Order and Safety
FINANCE, TAXATION, and MONETARY POLICY (93)		Finance, Taxation, and Monetary Policy	
ADMINISTRATION OF HUMAN RESOURCES (94)		Administration of Educational Programs; Administration of Public Health Programs; Administration of Social and Manpower Programs; Administration of Veterans' Affairs	
ENVIRONMENTAL QUALITY and HOUSING (95)		Environmental Quality; Housing and Urban Development	
ADMINISTRATION OF ECONOMIC PROGRAMS (96)		Administration of General Economic Programs; Regulation, Administration of Transportation; Regulation, Administration of Utilities; Regulation of Agricultural Marketing; Regulation Miscellaneous Commercial Sectors; Space and Research and Technology	
NATIONAL SECURITY and INTERNATIONAL AFFAIRS (97)		National Security; International Affairs	

n.e.c. -- not elsewhere classified

SOURCE: Standard Industrial Classification Manual, Office of Management and Budget, 1987.

Appendix 9. Detailed Bureau of Census Occupation Groupings

Occupation Category	Major Occupation Groups	Occupation Sub-Groups Included
MANAGERIAL and PROFESSIONAL SPECIALTY OCCUPATIONS (003-199)	EXECUTIVE, ADMINISTRATIVE, and MANAGERIAL OCCUPATIONS (003 – 037)	Executive, Administrative, and Managerial Occupations; Management Related Occupations
	PROFESSIONAL SPECIALTY OCCUPATIONS (043 – 199)	Engineers, Architects, and Surveyors; Mathematical and Computer Scientists; Natural Scientists; Health Diagnosing Occupations; Health Assessment and Treating Occupations; Teachers, Post-Secondary; Teachers, Except Post-Secondary; Social Scientists and Urban Planners; Librarians, Archivists, and Curators; Social, Recreation, and Religious Workers; Lawyers and Judges; Writers, Artists, Entertainers, and Athletes
TECHNICAL, SALES, and ADMINISTRATIVE SUPPORT OCCUPATIONS (203-389)	TECHNICIANS and RELATED SUPPORT OCCUPATIONS (203 – 235)	Health Technologists and Technicians; Technologists and Technicians, Except Health; Science Technicians; Technicians, Except Health, Engineering, and Science
	SALES OCCUPATIONS (243 – 285)	Supervisors and Proprietors, Sales Occupations; Sales Representatives, Finance and Business Services; Sales Representatives, Commodities Except Retail; Sales Workers, Retail and Personal Services; Sales Related Occupations
	ADMINISTRATIVE SUPPORT OCCUPATIONS, INCLUDING CLERICAL (303 – 389)	Supervisors, Administrative Support; Computer Equipment Operators; Secretaries, Stenographers, and Typists; Information Clerks; Records Processing Occupations, Except Financial; Financial Records Processing Occupations; Duplicating, Mail and Other Office Machine Operators; Communications Equipment Operators; Mail and Message Distributing Occupations; Material Recording, Scheduling, and Distributing Clerks; Adjusters and Investigators; Miscellaneous Administrative Support Occupations
SERVICE OCCUPATIONS (403-469)	PRIVATE HOUSEHOLD OCCUPATIONS (403 – 407)	Launderers and Ironers; Cooks, Private Household; Housekeepers and Butlers; Child Care Workers, Private Household; Private Household Cleaners and Servants
	PROTECTIVE SERVICE OCCUPATIONS (413 – 427)	Supervisors, Protecting Service Occupations; Firefighting and Fire Prevention Occupations; Police and Detectives; Guards
	SERVICE OCCUPATIONS, EXCEPT PROTECTIVE and HOUSEHOLD (433 – 469)	Food Preparation and Service Occupations; Health Service Occupations; Cleaning and Building Service Occupations, except Household; Personal Service Occupations
FARMING, FORESTRY, and FISHING OCCUPATIONS (473-499)	FARMING, FORESTRY, and FISHING OCCUPATIONS (473 – 499)	Farm Operators and Managers; Other Agricultural and Related Occupations; Forestry and Logging Occupations; Fishers, Hunters, and Trappers
PRECISION PRODUCTION, CRAFT, and REPAIR OCCUPATIONS (503-699)	MECHANICS and REPAIRERS (503 – 549)	Vehicle and Mobile Equipment Mechanics and Repairers; Electrical and Electronic Equipment Repairers; Miscellaneous Mechanics and Repairers
	CONSTRUCTION TRADES (553 – 599)	Supervisors, Construction Occupations; Construction Trades, Except Supervisors
	EXTRACTIVE OCCUPATIONS (613 – 617)	Supervisors, Extractive Occupations; Drillers, Oil Well; Explosives Workers; Mining Machine Operators; Mining Occupations, n.e.c.
	PRECISION PRODUCTION OCCUPATIONS (628 – 699)	Precision Metal working Occupations; Precision Woodworking Occupations; Precision Textile, Apparel, and Furnishings Machine Workers; Precision Workers, Assorted Materials; Precision Food Production Occupations; Precision Inspectors, Testers, and Related Workers; Plant and System Operators
	OPERATORS, FABRICATORS, and LABORERS (703-889)	MACHINE OPERATORS, ASSEMBLERS, and INSPECTORS (703 – 799)
TRANSPORTATION and MATERIAL MOVING OCCUPATIONS (803 – 859)		Motor Vehicle Operators; Transportation Occupations, Except Motor Vehicles; Material Moving Equipment Operators
HANDLERS, EQUIPMENT CLEANERS, HELPERS, and LABORERS (864 – 889)		Supervisors, Handlers, Equipment Cleaner, and Laborers, n.e.c.; Helpers, Mechanics and Repairers; Helpers, Construction and Extractive Occupations; Freight, Stock, and Material Handlers

SOURCE: Occupational Injuries and Illnesses, Occupational Coding Manual, U.S. Department Labor, Bureau of Labor Statistics, May 2000.

Appendix 10. Occupational Injuries and Illnesses Classification Manual (Event/Exposure Structure)

0. Contact with Objects and Equipment

- ◆ Contact with objects and equipment, unspecified
- ◆ Struck against object
 - Struck against object, unspecified
 - Stepped on object
 - Struck against stationary object
 - Struck against moving object
 - Struck against object, n.e.c.
- ◆ Struck by object
 - Struck by object, unspecified
 - struck by falling object
 - struck by flying object
 - Struck by flying object, unspecified
 - Struck by dislodged flying object, particle
 - Struck by discharged object or substance
 - struck by flying object, n.e.c.
- ◆ Struck by swinging or slipping object
 - Struck by swinging or slipping object, unspecified
 - Struck by or slammed in swinging door or gate
 - Struck by slipping handheld object
 - Struck by swinging or slipping object, n.e.c.
- ◆ Caught in or compressed by equipment or objects
 - Caught in or compressed by equipment or objects, unspecified
 - Caught in running equipment or machinery
 - Compressed or pinched by rolling, sliding, or shifting objects
 - Caught in or compressed by equipment or objects, n.e.c.
- ◆ Caught in or crushed in collapsing materials
 - Caught in or crushed in collapsing materials, unspecified
 - Excavation or trenching cave-in
 - Other cave-in
 - Caught in or crushed in collapsing structure
 - Caught in or crushed in collapsing materials, n.e.c.
- ◆ Rubbed or abraded by friction or pressure
 - Rubbed or abraded by friction or pressure, unspecified
 - Rubbed or abraded by kneeling on surface
 - Rubbed or abraded by objects being handled
 - Rubbed or abraded by foreign matter in eye
 - Rubbed or abraded by friction or pressure, n.e.c.
- ◆ Rubbed, abraded, or jarred by vibration
 - Rubbed, abraded, or jarred by vibration, unspecified
 - Rubbed, abraded, or jarred by vehicle or mobile equipment vibration
 - Rubbed, abraded, or jarred by other machine or equipment vibration
 - Rubbed, abraded, or jarred by vibration, n.e.c.
- ◆ Contact with objects and equipment, n.e.c.

1. Falls

- ◆ Fall, unspecified
- ◆ Fall to lower level
 - Fall to lower level, unspecified
 - Fall down stairs or steps
 - Fall from roof, dock, or ground level
 - Fall from floor, dock, or ground level, unspecified
 - Fall through existing floor opening
 - Fall through floor surface
 - Fall from loading dock
 - Fall from ground level to lower level
 - Fall from floor, dock, or ground level, n.e.c.
 - Fall from ladder
 - Fall from piled or stacked material
 - Fall from roof
 - Fall from roof, unspecified
 - Fall through existing roof opening
 - Fall through roof surface
 - Fall through skylight
 - Fall from roof edge
 - Fall from roof, n.e.c.
 - Fall from scaffold, staging
 - Fall from building girders or other structural steel
 - Fall from nonmoving vehicle
 - Fall to lower level, n.e.c.
- ◆ Jump to lower level
 - Jump to lower level, unspecified
 - Jump from scaffold, platform, loading dock
 - Jump from structure, structure element, n.e.c.
 - Jump from nonmoving vehicle
 - Jump to lower level, n.e.c.
- ◆ Fall on same level
 - Fall on same level, unspecified
 - Fall to floor, walkway, or other surface
 - Fall onto or against objects
 - Fall on same level, n.e.c.
- ◆ Fall, n.e.c.

2. Bodily Reaction and Exertion

- ◆ Bodily reaction and exertion, unspecified
- ◆ Bodily reaction
 - Bodily reaction, unspecified
 - Bending, climbing, crawling, reaching, twisting
 - Sudden reaction when surprised, frightened, startled
 - Running—without other incident
 - Sitting
 - Slip, trip, loss of balance—without fall
 - Standing
 - Walking—without other incident
 - Bodily reaction, n.e.c.

Appendix 10. Occupational Injuries and Illnesses Classification Manual- Continued

- ◆ Overexertion
 - Overexertion, unspecified
 - Overexertion in lifting
 - Overexertion in pulling or pushing objects
 - Overexertion in holding, carrying, turning, or wielding objects
 - Overexertion in throwing objects
 - Overexertion, n.e.c.
- ◆ Repetitive motion
 - Repetitive motion, unspecified
 - Typing or key entry
 - Repetitive use of tools
 - Repetitive placing, grasping, or moving objects, except tools
 - Repetitive motion, n.e.c.
 - Bodily conditions, n.e.c.
- ◆ Bodily reaction and exertion, n.e.c.
- 3. Exposure to Harmful Substances or Environments**
- ◆ Exposure to harmful substances or environments, unspecified
- ◆ Contact with electric current
 - Contact with electric current, unspecified
 - Contact with electric current of machine tool, appliance, or light fixture
 - Contact with wiring, transformers, or other electrical components
 - Contact with overhead power lines
 - Contact with underground, buried power lines
 - Struck by lightning
 - Contact with electric current, n.e.c.
- ◆ Contact with temperature extremes
 - Contact with temperature extremes, unspecified
 - Exposure to environmental heat
 - Exposure to environmental cold
 - Contact with hot objects or substances
 - Contact with cold objects or substances
- ◆ Exposure to air pressure changes
 - Exposure to air pressure change, unspecified
 - Pressure changes underwater
 - Pressure changes in airplane, other aircraft
 - Exposure to air pressure change, n.e.c.
- ◆ Exposure to caustic, noxious, or allergenic substances
 - Inhalation of substance
 - Inhalation of substance, unspecified
 - Inhalation in enclosed, restricted, or confined space
 - Inhalation in open or non-confined space
 - Contact with skin or other exposed tissue
 - Injections, stings, venomous bites
 - Injections, stings, venomous bites, unspecified
 - Needle sticks
 - Bee, wasp, hornet sting
 - Other stings or venomous bites
 - Injections, stings, venomous bites, n.e.c.
 - Ingestion of substance
 - Exposure to caustic, noxious, or allergenic substances, n.e.c.
- ◆ Exposure to noise
 - Exposure to noise, unspecified
 - Exposure to noise overtime
 - Exposure to noise in single incident
- ◆ Exposure to radiation
 - Exposure to radiation, n.e.c.
 - Exposure to traumatic or stressful event, n.e.c.
 - Oxygen deficiency, n.e.c.
 - Drowning, submersion
 - Choking on object or substance
 - Depletion of oxygen from cave-in or collapsed materials
 - Depletion of oxygen in other enclosed, restricted, or confined space
 - Other oxygen deficiency, n.e.c.
 - Exposure to harmful substances or environments, n.e.c.
- 4. Transportation Accidents**
- ◆ Transportation accident, unspecified
- ◆ Highway accident
 - Highway accident, unspecified
 - Collision between vehicles, mobile equipment
 - Collision between vehicles, mobile equipment, unspecified
 - Re-entrant collision
 - Moving in same direction
 - Moving in opposite directions, oncoming
 - Moving in intersection
 - Moving in intersection
 - Moving and standing vehicle, mobile equipment—in roadway
 - Moving and standing vehicle, mobile equipment—side of road
 - Collision between vehicles, mobile equipment, n.e.c.
 - Vehicle struck stationary object or equipment in roadway
 - Vehicle struck stationary object, equipment on side of road
 - Non-collision accident
 - Non-collision, accident, unspecified
 - Jack-knifed or overturned—no collision
 - Ran off highway—no collision
 - Struck by shifting load
 - Sudden start or stop, n.e.c.
 - Non-collision accident, n.e.c.
 - Highway accident, n.e.c.
- ◆ Non-highway accident, except rail, air, water
 - Non-highway accident, unspecified
 - Collision between vehicles or mobile equipment
 - Vehicle, mobile equipment struck stationary object

Appendix 10. Occupational Injuries and Illnesses Classification Manual- Continued

- Non-collision accident
 - Non-collision accident, unspecified
 - Fall from moving vehicle, mobile equipment
 - Fell from and struck by vehicle, mobile equipment
 - Overturned
 - Loss of control
 - Struck by shifting load
 - Sudden start or stop, n.e.c.
 - Non-collision accident, n.e.c.
- Non-highway accident, n.e.c.
- ♦ Pedestrian, non-passenger struck by vehicle, mobile equipment
 - Pedestrian struck by vehicle, mobile equipment, unspecified
 - Pedestrian struck by vehicle, mobile equipment in roadway
 - Pedestrian by vehicle, mobile equipment on side of road
 - Pedestrian struck by vehicle, mobile equipment in parking lot or non-roadway area
- ♦ Railway accident
 - Railway accident, unspecified
 - Collision between railway vehicles
 - Collision between railway vehicle and other vehicle
 - Collision between railway and other object
 - Fell from and struck by railway vehicle
 - Derailment
 - Explosions, fire, n.e.c.
 - Fall in, on, or from railway vehicle in motion, n.e.c.
 - Railway accident, n.e.c.
- ♦ Water vehicle accident
 - Water vehicle accident, unspecified
 - Collision
 - Explosion, fire, n.e.c.
 - Fall from ship, boat, n.e.c.
 - Fall on ship, boat
 - Sinking, capsized water vehicle
 - Water vehicle accident, n.e.c.
- ♦ Aircraft accident
 - Aircraft accident, unspecified
 - During takeoff or landing
 - Aircraft accident, n.e.c.
- ♦ Transportation accident, n.e.c.

5. Fires and Explosions

- ♦ Fire or explosions, unspecified
- ♦ Fire—unintended or uncontrolled
 - Fire, unspecified
 - Fire in residence, building, or other structure
 - Forest, brush, or other outdoor fire
 - Ignition of clothing from controlled heat source
 - Fire, n.e.c.
- ♦ Explosion
 - Explosion, unspecified
 - Explosion of battery
 - Explosion of pressure vessel or piping
 - Explosion, n.e.c.

6. Assaults and Violent Acts

- ♦ Assaults and violent acts, unspecified
- ♦ Assaults and violent acts by person(s)
 - Assaults and violent acts by person(s), unspecified
 - Biting
 - Hitting, kicking, beating
 - Shooting
 - Squeezing, pinching, scratching, twisting
 - Stabbing
 - Rape
 - Threats or verbal assaults
 - Assaults and violent acts by person(s), n.e.c.
- ♦ Self-inflicted injury
 - Self-inflicted injury, unspecified
 - Suicide, attempted-suicide
 - Self-inflicted injury or fatality—intent unknown
- ♦ Assaults by animals
 - Assaults by animals, unspecified
 - Non-venomous bites
 - Assaults by animals, n.e.c.

9. Other Events or Exposures

9999. Non-Classifiable

Source: Occupational Injuries and Illnesses Classification Manual, Bureau of Labor Statistics, U.S. Department of Labor, 1992.

MASSACHUSETTS

FATAL INJURIES AT WORK

1999 UPDATE

Occupational Health Surveillance Program • Massachusetts Department of Public Health

August 2001

Every year, men and women in a wide variety of jobs and industries throughout Massachusetts die as a result of injuries suffered at work. These deaths are all the more tragic because they are largely preventable. Information about when and how they occur is essential in order to target effective prevention programs. In Massachusetts, the Occupational Health Surveillance Program (OHSP) in the Massachusetts Department of Public Health (MDPH) collects information on all fatal occupational injuries in the Commonwealth as part of the national Census of Fatal Occupational Injuries (CFOI), conducted in cooperation with the Bureau of Labor Statistics (BLS), U.S. Department of Labor.

OHSP also conducts in-depth work site investigations of targeted fatal occupational injuries as part of the national Fatality Assessment Control and Evaluation project (FACE), sponsored by the National Institute for Occupational Safety and Health (NIOSH). The purpose of the FACE project is to develop a detailed understanding of how fatal injuries occur and to identify effective countermeasures to prevent similar incidents in the future. Excerpts from selected FACE investigations are highlighted within this report.

This update provides an overview of fatal injuries at work that occurred in Massachusetts during 1999. These include fatalities traditionally linked with factors in the work environment such as falls, electrocutions, and exposure to toxic substances. They also include homicides and suicides at work, as well as motor vehicle-related fatalities that occurred during travel on the job. Deaths caused by occupational illnesses and most fatal heart attacks at work are not included in this fatality census.

OVERVIEW OF FATAL INJURIES AT WORK IN 1999

- ⌘ In 1999, 77 men and 6 women in Massachusetts suffered fatal injuries at work, the highest number of fatalities since 1993. This translates into an average of 1.6 deaths per week and an annual occupational fatality rate of 2.6 per 100,000 workers.
- ⌘ There were 8 deaths of workers from racial groups other than white and 6 workers were of Hispanic origin.*
- ⌘ The average age at death was 44 years. Forty-eight victims were 44 years of age or younger and 8 were 65 years old or older. The 83 fatalities resulted in an average of 31 years of potential life lost for each death (number of years before the victim reached age 75), for a total of 2,573 years of potential life lost.
- ⌘ Of the 83 workers fatally injured, 70 were wage and salary workers and 12 were self-employed. One worker died while volunteering.

A 49-year-old male inventory control clerk died when he fell approximately 12 feet from a high lift order picker truck while applying barcode labels in a warehouse freezer. The order picker truck was not positioned next to the desired location due to boxes in the aisle. He fell as he stepped from the raised order picker truck onto a stacked box of product in an attempt to reach the next higher shelf. He was wearing a body harness and lanyard that was not secured to an anchor point on the order picker truck. The victim had been employed by the company for 21 years.

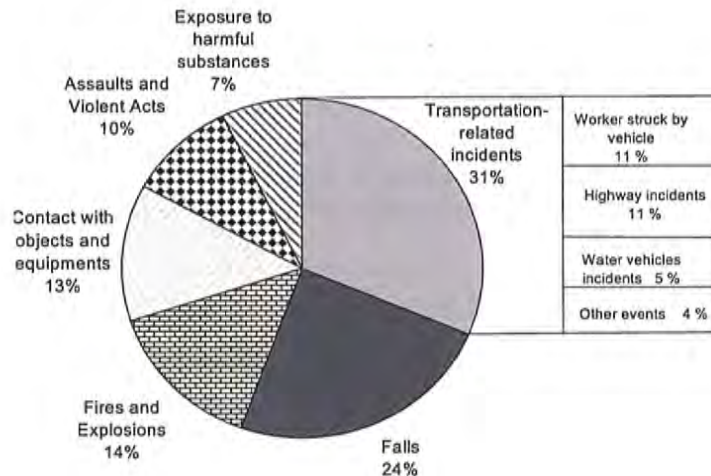
In order to prevent similar incidents, Massachusetts FACE recommended that employers should: 1) adopt a mandatory tie-off/no unhook policy for employees using order picker trucks; 2) ensure that aisle ways are maintained free from obstructions that would interfere with lift truck access to storage shelves; 3) strictly enforce the safety precautions outlined in comprehensive safety programs, and; 4) regularly review and update the programs and training. In addition, high lift order picker truck manufacturers should consider equipping trucks with devices that will activate audible or visible alarms if the operator unhooks fall protection while the lift is raised. (Massachusetts FACE Report, 99MA058)

* Race/ethnicity information is obtained from death certificates. Fatality victims of Hispanic origin may be in any racial group.

EVENTS RESULTING IN FATAL INJURIES

- Twenty-six Massachusetts workers (31%) died in transportation-related incidents distributed among several categories (as shown below). Nine workers (11 %) were vehicle occupants killed as a result of highway incidents. Nine others were pedestrians struck by vehicles or mobile equipment on roadways, parking lots, and on sides of road. Three workers died as a result of capsized water vehicles. Ten out of the 26 workers who died in transportation-related incidents were employed in the transportation industry.

Fatal Injuries at Work by Event * Massachusetts, 1999



Total Number of deaths = 83

*Based on the 1992 Bureau of Labor Statistics (BLS) Occupational Injury & Illness Classification Structures.

- Falls to lower levels (18 deaths, 22%) was the leading fatal event at work in Massachusetts in 1999 for a fifth consecutive year. Two-thirds (12) of these fatalities occurred in the construction industry. Seven of these fatalities were among plumbers, carpenters, electricians, painters, and roofers. Four of the fatal falls were from scaffolds and three were from ladders. Of the falls for which height information is available (16), 10 falls were from less than 20 feet.
- Twelve workers died from fires and explosions and 11 of these fatalities were due to fire incidents. The number of workers who died as a result of fires and explosions in 1999 is almost equal to the number of workers who lost their lives to similar events in the previous eight years combined.
- Contact with objects and equipment led to the death of 11 Massachusetts workers in 1999. Six workers were caught in running equipment or machinery. More than half (6) of these fatalities occurred in the manufacturing and construction industries. Three more occurred in the agriculture, forestry and fishing industry.
- Exposure to harmful substances and environments led to the death of six workers in Massachusetts during the year. Three workers died from inhalation of substances in enclosed spaces and two died of electrocution.
- There were five homicides at work in Massachusetts in 1999 and robbery was a motive for three of these fatal assaults. There were also three self-inflicted fatal injuries.

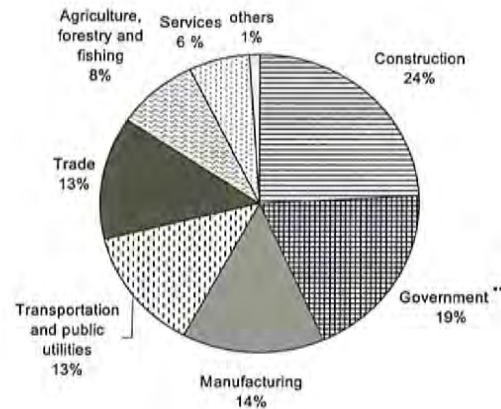
A 39-year-old male self-employed residential contractor died when he stepped backwards into an unguarded floor opening. He was using a level to true up the gable end wall of the second floor of a single family home under construction when he stepped backwards into the floor opening intended for a chimney and fell 10 feet striking his head on the concrete chimney footing below.

In order to prevent similar incidents, Massachusetts FACE recommended that residential contractors, including self-employed contractors should: 1) keep all holes in walking/working surfaces covered or otherwise protected throughout all phases of construction; and 2) develop a safety program that includes, but is not limited to, evaluating and preventing hazards before beginning tasks. (Massachusetts FACE Report, 99MA022)

FINDINGS BY INDUSTRY

- ^ The highest number of fatal injuries at work occurred in the **construction** industry (20 deaths, 24% of total). Falls to lower levels was the leading event in the industry, accounting for 12 of the 20 deaths. Seventeen of the 20 victims were employed in establishments with 10 or fewer employees. Three workers were self-employed. The number of fatalities in construction was higher in 1999 than in any of the eight previous years.

Fatal Injuries at Work by Industry* Massachusetts, 1999



Total Number of Deaths = 83

* Standard Industrial Classification Manual, 1987

** Includes fatalities to workers employed by government organizations regardless of industry.

- ^ **Government** had the second highest number of occupational fatalities in 1999 (16 deaths, 19%). More government workers died in 1999 than in any single previous year. Six of these government employees were fire fighters fatally injured by fire in a single incident. Five were killed in transportation-related incidents.
- ^ **Manufacturing** workers suffered 12 fatalities. Out of these twelve fatalities, four were caused by fires, three by contact with objects, and three by falls on-the-job. Three workers died from a single fire incident that was caused by a dust explosion.
- ^ The **Transportation and Public Utilities** Industry had 11 occupational fatalities. The leading fatal event in the industry was transportation related incidents (9). Five of the workers were employed in the freight transport industry while three others were working in the passenger transportation sector. Eight of the 11 workers were employed as motor vehicle operators.
- ^ The **Trade** industry had 11 occupational fatalities during the year. There were three transportation incidents, three homicides, and three falls in this sector.
- ^ Seven workers died of occupational injuries in the **Agriculture, Forestry and Fishing** industry during the year. Five of these workers were employed in the commercial fishing sector, and three of these five died due to capsized water vehicles.

A 36-year-old male second shift foundry manager was killed while cleaning the die of a cold chamber die cast machine. The company had purchased the machine used and recently modified it requiring the installation of an additional safety device. The victim had been notified that the die cast machine was producing castings with a blemish. He subsequently leaned in between the two sections of the die to clean them and the machine cycled closing the die and crushing him. The investigation revealed that the lockout/tag-out procedure had not been followed and the new safety device had been bypassed.

In order to prevent similar incidents, Massachusetts FACE recommended that employers should: 1) enforce a comprehensive lockout/tag out program; 2) regularly review and update the program and training; 3) ensure that new safety devices are installed properly and are effective before implementing them; and 4) obtain information from the machine manufacturers on the proper way to controlling hazardous energy when purchasing used or remanufactured equipment. (Massachusetts FACE Report, 9MA070)

OSHA COVERAGE, INVESTIGATIONS AND PENALTIES

Of the 83 fatal injuries at work in 1999, 51 deaths occurred in industries or circumstances that are outside the jurisdiction of the Occupational Safety and Health Administration (OSHA). These included 28 fatalities that occurred among commercial fishers, public sector employees including fire fighters, and self-employed individuals for whom there is no employer/employee relationship. The remaining 23 fatalities involved circumstances not routinely addressed by OSHA, such as homicides, suicides, airplane crashes and motor vehicle-related deaths.

OSHA investigated 32 occupational fatalities that occurred during the year. Fines for violations of OSHA standards related to these fatalities were issued against 25 employers in separate incidents. The agency assessed a total of \$594,825 in penalties as a result of its fatality investigations, with the lowest fine assessed at \$1,000 and the highest at \$189,500. Employers are required to report work related fatalities to OSHA within 8 hours of any fatality that occurs within 30 days of an incident. OSHA fined one employer a total of \$2,500 for failure to report such fatalities within this required time frame.

COMMENTS

It is important in reporting summary information about fatal occupational injuries to acknowledge the victims that these numbers represent. These deaths were tragic incidents which were in large part preventable. Surveillance findings are intended to guide government, industry, and labor organizations in developing strategies to prevent similar tragedies in the future.

Nationally, 6,053 workers died as a result of work-related injuries in 1999¹ and the fatality rate was 4.5 fatalities per 100,000 workers. Massachusetts had 83 work related fatal injuries during the same year. This translates to a fatality rate of 2.6 per 100,000 workers, while substantially lower than the national rate, the highest rate in Massachusetts since 1994.

Industry specific findings for Massachusetts highlight those industries where injury prevention efforts are most needed. The construction industry continues to stand out as having the highest number of workers killed on the job. In Massachusetts as well as the nation, falls were the leading cause of fatal injuries among construction workers. OSHA continues to publicize and emphasize enforcement of the new fall protection standard in the construction industry (OSHA 3146). The standard identifies areas where fall protection is needed and clarifies what employers must do to provide fall protection for employees (such as identifying and evaluating fall hazards and providing specific training and equipment). In Massachusetts, the FACE Project is continuing educational outreach to residential contractors by disseminating fall prevention brochures. These brochures are available on our web site at www.state.ma.us/dph/ohsp/scaffold.htm.

Government, which is outside OSHA's jurisdiction in Massachusetts, also stands out with 16 deaths, more this year than in any single year since 1991. Six of these victims were Massachusetts fire fighters who died in a single incident. In 1998, the National Institute for Occupational Safety and Health (NIOSH) started conducting the Fire Fighter Fatality Investigation and Prevention Program to investigate on-duty fire fighter fatalities throughout the country. These investigations are intended to determine factors causing or contributing to fire fighter deaths in the line of duty and to develop strategies for prevention of future similar incidents. Copies of these investigation reports are available on NIOSH's web site at <http://www.cdc.gov/niosh/firehome.html>.

For more detailed tables of fatal occupational injuries in 1999 and copies of full-length FACE fatality reports, in Massachusetts, please contact Massachusetts Department of Public Health, Occupational Health Surveillance Program, 250 Washington St., 6th Fl., Boston, MA 02108. (617) 624-5627 e-mail: Tsegaye.Bekele@state.ma.us.

ACKNOWLEDGMENTS

This project is a joint effort of several state and federal agencies. For their assistance in providing data for the study and for their advice, we thank: *Ruth McCully*, Regional Administrator, OSHA Region I; *Jim Hayes*, Office of Safety, MA Department of Industrial Accidents; *Elaine Trudeau*, Registrar of Vital Records and Statistics, MA Department of Public Health; *Anthony Conti*, Director, MA Fatal Accident Reporting System (FARS). We also appreciate the contributions of the MA Department of Labor and Workforce Development, the U.S. Coast Guard, the U.S. Bureau of Labor Statistics, the National Transportation Safety Board (NTSB), the National Institute for Occupational Safety and Health (NIOSH), police departments, and clerks of cities and towns.

¹ Bureau of Labor Statistics, National Census of Fatal Occupational Injuries, 2000. August 2001

MASSACHUSETTS

FATAL INJURIES AT WORK

2000 UPDATE

Occupational Health Surveillance Program ◦ Massachusetts Department of Public Health ◦ September 2002

Every year, men and women in a wide variety of jobs and industries throughout Massachusetts die as a result of injuries suffered at work. These deaths are all the more tragic because they are largely preventable. Information about when and how they occur is essential in order to target effective prevention programs. In Massachusetts, the Occupational Health Surveillance Program (OHSP) in the Massachusetts Department of Public Health (MDPH) collects information on fatal occupational injuries as part of the national Census of Fatal Occupational Injuries (CFOI), conducted in cooperation with the Bureau of Labor Statistics (BLS), U.S. Department of Labor.

OHSP also conducts in-depth work site investigations of targeted fatal occupational injuries as part of the national Fatality Assessment Control and Evaluation project (FACE), sponsored by the National Institute for Occupational Safety and Health (NIOSH). The purpose of the FACE project is to develop a detailed understanding of how fatal injuries occur and to identify effective countermeasures to prevent similar incidents in the future. Excerpts from selected FACE investigations are highlighted in this report.

This update provides an overview of fatal injuries at work that occurred in Massachusetts during 2000. These include fatalities traditionally linked with factors in the work environment such as falls, electrocutions, and exposure to toxic substances. They also include homicides and suicides at work, as well as motor vehicle-related fatalities that occurred during travel on the job. Deaths caused by occupational illnesses and most fatal heart attacks at work are not included in this fatality census.

OVERVIEW OF FATAL INJURIES AT WORK IN 2000

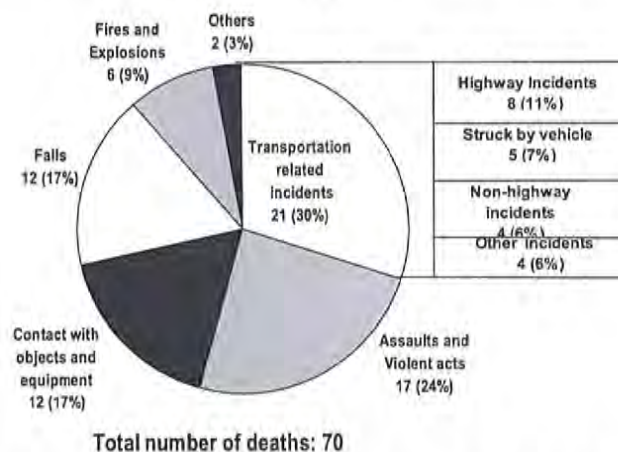
- In 2000, 60 men and 10 women in Massachusetts suffered fatal injuries at work. The overall rate of fatal occupational injury was 2.2 per 100,000 workers. The rate for men was 3.6 deaths per 100,000 workers, more than five times higher than the rate for women (0.7 deaths per 100,000 workers).
- The average age at death was 42.4 years. Thirty-nine (56%) victims were younger than 45 years of age and 5 victims were older than 65 years. The 70 fatalities resulted in an average of 32.6 years of potential life lost for each death (years before the victim reached age 75), for a total of 2,282 years of potential life lost.
- Two victims were younger than 18 years. One of them was killed when the golf cart he was operating crashed into a deck, and the second young worker was killed when the forklift he was operating overturned.
- Sixty-one (87%) victims were White, 3 were Black, and 2 were of other races.
- Four victims were Hispanic.¹
- Of the 70 workers fatally injured, 57 (81%) were wage and salary workers and 13 were self-employed.

¹ Victims of Hispanic origin are counted only as "Hispanic" and are excluded from counts in any of the race categories.

EVENTS RESULTING IN FATAL INJURIES

- Twenty-one (30%) Massachusetts workers died in *Transportation-related incidents* distributed among different categories (Figure 1). Eight workers were vehicle occupants who were killed due to motor vehicle crashes, overturns and collisions on highways and other roads. Four victims were vehicle occupants that were killed when the vehicles they were operating overturned in construction sites. Five workers were struck by vehicles in construction sites, roadways or parking lots. These included two police officers who were fatally struck by vehicles while directing traffic.
- *Assaults and violent acts* accounted for 17 (24%) of the work-related deaths, the highest number since 1991. Eleven were homicides and 6 were suicides. Nine of the 11 homicides involved the use of firearms, and 7 of these victims were killed in a single incident.

Figure 1. **Fatal Injuries at Work by Event/Exposure²**
Massachusetts, 2000



- *Contact with objects and equipment* claimed the lives of 12 workers. Five of them were struck by falling objects. Three workers were killed when they were run over by unoccupied vehicles that moved.
- *Falls* accounted for 12 deaths. Of these, 11 were due to falls to lower levels. *Falls to lower levels* remained one of the most common fatal events for the sixth consecutive year. Nearly two-thirds (7 deaths) of these fatal falls occurred in the construction industry. Three of the 8 fatal falls for which height information was available occurred from heights less than 20 feet.
- Six workers died from *Fires and explosions*, and 5 of them died in a single fire.

A municipal police officer was fatally injured when a motorist intruded into a roadway construction work zone. The victim had been standing inside the work zone at a four-way intersection directing traffic through a detour. The motorist who failed to turn right at the detour, skidded sideways through traffic barrels and signs, striking the victim. The victim had been employed by the municipality for approximately three years. In Massachusetts, municipal police officers do not receive specific roadway construction work zone safety training.

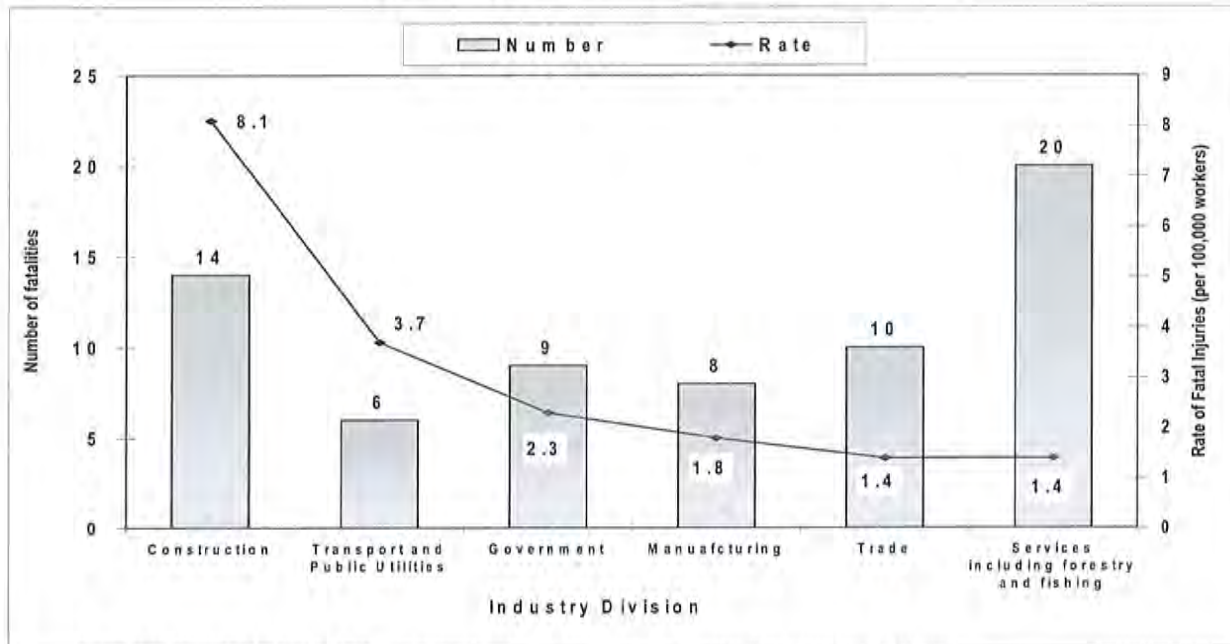
In order to prevent similar incidents, Massachusetts FACE recommended that employers should: 1) ensure that work zones are setup, at a minimum, in accordance with the Manual on Uniform Traffic Control Devices (MUTCD), Part 6 developed by the U.S. Department of Transportation Federal Highway Administration; 2) consider portable rumble strips to alert motorists to the changed roadway conditions; and 3) consider area objects and the work site background when choosing colors for worker apparel. FACE also recommended that: 1) Local and state government agencies should consider providing work zone safety training for all municipal officers who perform traffic details on roadway construction sites; and 2) State government agencies should consider developing state laws that impose increased fines for motorists speeding within roadway work zones (Massachusetts FACE Report, 00MA054).

² Occupational Injury and Illness Classification Manual, U.S. Department of Labor, Bureau of Labor Statistics, 1992.

FINDINGS BY INDUSTRY

- The *Services* industry division (including Forestry and Fishing) had the highest number of fatal injuries at work (19 deaths) and the lowest rate of fatal injury (Figure 2). More workers died in this industry division in 2000 than in any of the previous 9 years. Homicide was the leading single event in this industry division (7 fatalities). All 7 homicides were the result of a single incident in the computer programming, data processing, and other computer-related services industry. Fire was the second leading event with 5 fatalities, all the result of a single fire.

Figure 2. **Number and Rate³ of Fatal Injuries at Work by Industry Division^{4,5}, Massachusetts, 2000**



NOTE: Government includes all fatalities to workers employed by government organizations regardless of industry. Data for the Agriculture Industry division are not presented due to few fatal injuries (less than three)

- Construction* had 14 (20%) occupational fatalities and the highest fatal injury rate (8.1 deaths per 100,000 workers), nearly four times higher than the overall rate for all industry divisions. Eight of the 14 fatal injuries occurred on residential construction sites. Falls to lower levels was the leading event in the industry division, accounting for 7 of the 14 deaths. Eight (57%) of the 14 victims were employed in establishments with 10 or fewer employees.
- Ten fatal occupational injuries occurred in the *Trade* industry division. Most of the fatal injuries (6 deaths) occurred in retail trade establishments. Three of these were homicides and 3 were motor vehicle incidents. Of the 3 homicides, one occurred in a convenience store and two occurred in eating & drinking places.
- Nine *Government* workers were killed on-the-job in 2000, and the fatal injury rate for government workers was the third highest (2.3 deaths per 100,000 workers). Three victims were law enforcement officers, 2 of whom were killed when they were struck by vehicles while directing traffic.
- Eight workers in the *Manufacturing* industry division sustained fatal injuries. Three of these deaths were due to contact with objects and equipment.
- Transport and Public Utilities* industry division had 6 fatalities, and the second highest fatal injury rate (3.7 deaths per 100,000 workers). Three of the 6 fatalities involved truck drivers who died due to motor vehicle collisions on highways.

³ To maintain consistency with the denominator data, fatalities among self-employed workers were excluded in calculating rates.

⁴ Standard Industrial Classification Manual, 1987 edition, Office of Management and Budget.

⁵ To maintain consistency with the denominator data, fatalities in Forestry and Fishing industries were included in the Services industry Division.

FINDINGS BY OCCUPATION

- The *Operators, Fabricators and Laborers* occupation group had the highest number of fatalities (23 deaths). These included truck drivers, machine operators, construction laborers, welders, and non-construction laborers. Eight of the 23 victims were employed in the construction industry division, which had the highest rate of fatal injury. Five were employed in the Transport and Utilities industry division that had the second highest fatal injury rate.
- The *Managerial and Professional Specialty* occupation group had the second highest number of fatal injuries (19 deaths). Thirteen of these 19 victims were employed in the Services Industry division. Homicide, the most common fatal event in the Services industry division, was also the leading fatal event in the Managerial and Professional Specialty occupation group accounting for 7 deaths. A single fire fatally injured 5 workers, while 4 workers committed suicide at work.

OSHA COVERAGE, INVESTIGATIONS AND PENALTIES

Of the 70 fatal injuries at work in 2000, 24 deaths occurred in industries or circumstances that are outside Occupational Safety and Health Administration (OSHA) jurisdiction. These included fatalities among commercial fishers, public sector employees including fire fighters, and self-employed individuals for whom there is no employer/employee relationship. An additional 26 fatalities involved circumstances not routinely addressed by OSHA, such as homicides, suicides, airplane crashes and motor vehicle-related deaths. In total, 50 (71%) of the fatal injuries at work in Massachusetts during 2000 occurred in industries, circumstances or causes that are not addressed by OSHA.

OSHA investigated 20 occupational fatalities that occurred during the year. Fines for violations of OSHA standards related to these fatalities were issued against 19 employers in separate incidents. The agency assessed a total of \$344,392.51 in penalties as a result of its fatality investigations, with the lowest fine assessed at \$3,000 and the highest at \$59,200. Employers are required to report work related fatalities to OSHA within 8 hours of any fatality that occurs within 30 days of an incident. OSHA fined one employer a total of \$2,500 for failure to report a fatality within this required time frame.

COMMENTS

It is important in reporting summary information about fatal occupational injuries to acknowledge the victims that these numbers represent. These deaths were tragic incidents that were in large part preventable. Surveillance findings are intended to guide government, industry and labor and community organizations in developing strategies to prevent similar, tragic deaths in the future.

Nationwide, 5,915 workers died as a result of work-related injuries in 2000, and the national fatal occupational injury rate was 4.3 deaths per 100,000 workers⁶, substantially higher than the rate of 2.2 deaths per 100,000 workers for Massachusetts. The lower fatal occupational injury rate in Massachusetts is, in part, explained by the industrial make-up of the Commonwealth compared to that of the nation. Massachusetts also has lower rates of fatal motor vehicle crashes and homicides in general. Massachusetts' findings highlight the types of fatal occupational events and industries for which prevention efforts are most needed in the Commonwealth.

A 16-year-old part-time cleaning helper was fatally injured when the forklift he was operating at a seafood processing/retail facility overturned, crushing his chest. The victim was using the forklift to move a wooden pallet that had been loaded with trash and raised approximately 4½ feet. He had been employed with the company for approximately 18 days and his training was on-the-job and conducted by other teen employees.

In order to prevent similar incidents, Massachusetts FACE recommended that employers should: 1) comply with federal and state child labor laws which prohibit youth less than 18 years old from operating forklifts; 2) train all forklift operators in safe operating procedures; 3) provide adequate supervision for young workers, new employees and any inexperienced worker; 4) develop, implement and enforce a comprehensive health and safety program; and 5) government and insurance agencies should increase their efforts to inform businesses about child labor laws (Massachusetts FACE Report, 00MA058).

⁶ U.S. Department of Labor, Bureau of Labor Statistics, Census of Fatal Occupational Injuries, 2000. August 2001.

The *Services* industry division had the highest (19 deaths) number of fatal occupational injuries during 2000, more than the number of fatalities in any of the previous 9 years. Workplace homicide accounted for 7 of these 19 deaths and remained the leading fatal event in the industry since 1991. The major circumstances of workplace homicide include robbery-related violence and violence by co-workers. Workplace violence, therefore, needs to be considered as an occupational safety and health issue, and prevention efforts by employers are required to minimize risks. Prevention strategies and guidelines for specific industries are available on the Occupational Safety and Health Administration (OSHA) web site at <http://www.osha.gov> and on the National Institute for Occupational Safety and Health (NIOSH) web site at <http://www.niosh.gov>.

Transportation-related incidents was the leading event category, accounting for 30% the total fatal injuries that occurred in 2000. These included motor vehicle, air transport, and water transport incidents. While motor vehicle incidents on highways and local roads accounted for the majority of these fatal injuries, a considerable number of workers also were struck and killed by vehicles in non-roadway areas such as construction sites. These included two police officers who were struck and killed by vehicles while performing roadway construction traffic details. Prompted by these incidents, the Massachusetts FACE program is exploring ways to promote roadway construction safety training for municipal police officers.

Fall to lower levels was one of the leading fatal events at work in Massachusetts in 2000 for the sixth consecutive year. Nearly one-fifth (19%) of all fatal injuries that occurred in Massachusetts between 1991 and 1999 were falls to lower levels, and 53% of these occurred in the construction industry division. This industry division also had an average fatal occupational injury rate of 10.9 deaths per 100,000 workers during the same period. OSHA has established and is enforcing the new fall protection standard in construction industry (Subpart M, Fall Protection, 29CFR 126.500-1926.503). The standard identifies areas where fall protection is needed and clarifies what employers must do to provide fall protection for employees (such as identifying and evaluating fall hazards and providing specific training and equipment). In Massachusetts, the FACE Project is continuing educational outreach to residential contractors by disseminating fall prevention brochures. These brochures are available on our web site at www.state.ma.us/dph/ohsp/scaffold.htm.

The Occupational Health Surveillance Program is preparing an in-depth report on fatal occupational injuries in Massachusetts from 1991 to 1999. For copies of this report, more detailed tables of fatal occupational injuries in 2000, and copies of full-length FACE reports in Massachusetts, please contact Massachusetts Department of Public Health, Occupational Health Surveillance Program, 250 Washington Street, 6th Floor, Boston, MA 02108-4616. These reports may also be obtained by calling (617) 624-5632 or e-mailing: Tsegaye.Bekele@state.ma.us.

A 22-year-old immigrant laborer was fatally injured when he was crushed while inside a horizontal paper baler. The victim entered the baler's hopper to manually clear a jammed paper bale because the baler's jam clearing mechanism had not been working. While crouched between the ram and the jammed paper bale, the ram cycled in the forward direction crushing him. He had been employed with the company for four years and his training was primarily on-the-job, which did not include training on the hazards associated with his death.

In order to prevent similar incidents, Massachusetts FACE recommended that employers should: 1) ensure that machines are operating properly to eliminate potential hazards to employees; 2) develop and enforce a hazardous energy control program for all employees including specific lockout/tagout procedures for each machine; 3) develop a training program that includes a protocol on how to clear jams and ensure that all workers are trained in the safe operation and the potential hazards of each machine; and 4) develop, implement, and enforce a comprehensive health and safety program (Massachusetts FACE Report, 00MA035).

ACKNOWLEDGEMENTS

This project is a joint effort of several state and federal agencies. For their assistance in providing data for the study and for their advice, we thank: Frank Gravit, Acting Regional Administrator, OSHA Region I; Stanley Nyberg, Registrar of Vital Records and Statistics, MA Department of Public Health; and Anthony Conti, Director, MA Fatal Accident Reporting System (FARS). We also appreciate the contributions of the MA Department of Labor and Workforce Development, MA Department of Industrial Accidents, the U.S. Coast Guard, the National Transportation Safety Board (NTSB), the U.S. Bureau of Labor Statistics, the National Institute for Occupational Safety and Health (NIOSH), police departments, and clerks of cities and towns. This year we particularly acknowledge the contribution of Jim Hayes of the Department of Industrial Accidents with whom we worked over the years in our efforts to prevent work related injuries and illnesses in Massachusetts. Mr. Hayes died on July 30, 2002.

Please report Work-related fatalities immediately to:

Our toll-free Occupational Fatality Hotline Number:

1 - 800 - 338 - 5223

or

Fax **(617) - 624 - 5696**

When reporting a fatality, include the following information:

- Reporter's name, address, and phone number
- Victim's name, occupation and employer
- Brief description of the incident, including date and time

The Occupational Health Surveillance Program would like to thank all agencies and people that contributed to our effort of preventing work-related deaths by reporting fatalities and providing information during our fatality investigations.

**Occupational Health Surveillance Program
Massachusetts Department of Public Health
250 Washington Street, 6th Floor
Boston, MA 02108-4619**

(617)-624-5632



MASSACHUSETTS

FATAL INJURIES AT WORK

2001 UPDATE

Occupational Health Surveillance Program ◦ Massachusetts Department of Public Health ◦ January 2004

Every year, men and women in a wide variety of jobs and industries throughout Massachusetts die as a result of injuries at work. These deaths are all the more tragic because they are largely preventable. Information about when and how they occur is essential in order to target effective prevention programs. In Massachusetts, the Occupational Health Surveillance Program (OHSP) in the Massachusetts Department of Public Health (MDPH) collects information on fatal occupational injuries as part of the national Census of Fatal Occupational Injuries (CFOI), conducted in cooperation with the Bureau of Labor Statistics (BLS), U.S. Department of Labor.

OHSP also conducts in-depth work site investigations of targeted fatal occupational injuries as part of the national Fatality Assessment Control and Evaluation (FACE) project, sponsored by the National Institute for Occupational Safety and Health (NIOSH). The purpose of the FACE project is to develop a detailed understanding of how fatal injuries occur and to identify effective countermeasures to prevent similar incidents in the future. Excerpts from selected FACE investigations are highlighted in this report.

This update provides an overview of fatal injuries at work that occurred in Massachusetts during 2001. These include not only fatalities traditionally linked with physical or chemical factors in the work environment but also homicides and suicides at work and motor vehicle-related fatalities that occurred during travel on the job. Deaths caused by occupational illnesses are not included in this fatality update. The deaths of Massachusetts workers related to the events of September 11, 2001 are counted in the states where the plane crashes occurred and are not included in this report.

OVERVIEW OF FATAL INJURIES AT WORK IN 2001

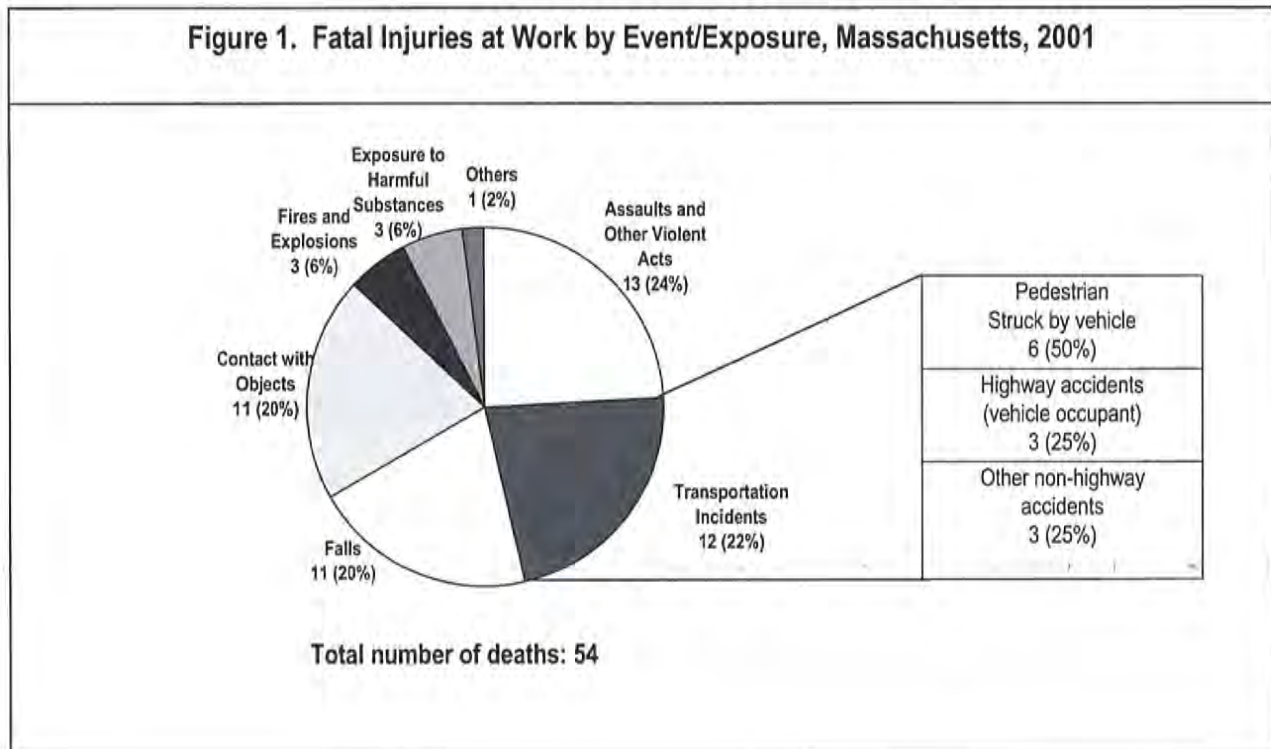
- In 2001, 54 men suffered fatal injuries at work in Massachusetts. There were no women who died as a result of injuries at work that year. The overall rate of fatal occupational injury for *all* workers was 1.6 per 100,000 workers. The rate for *male* workers was 3.1 deaths per 100,000 male workers.¹
- The average age at death was 44.3 years. Twenty-seven (50%) victims were younger than 45 years of age and five (9%) victims were older than 65 years. The 54 fatalities resulted in an average of 32.1 years of potential life lost (years before the victim reached age 75) for each death, for a total of 1,668 years of potential life lost.
- Two victims were younger than 18 years of age. A 15 year-old was killed when he was struck by several heavy granite slabs while shoveling snow at a marble and granite supplier. A 17 year-old student died from medical complications of an injury he sustained while working in a cooperative placement program.²
- Forty-seven (87%) victims were white, five (9%) were black, and two (4%) were of other races. The overall rate of fatal occupational injury for white workers was 1.6 per 100,000 workers and for black workers was 2.3 per 100,000 workers.
- Six victims (11%) were Hispanic workers, who were employed in a variety of industries, including construction, agriculture, fishing, transportation, and retail. The overall rate of fatal occupational injury for all Hispanic workers was 3.1 per 100,000 workers. The rate for Hispanic men was 6.1 deaths per 100,000 male workers.
- Of the 54 workers fatally injured, 41 (76%) were wage and salary workers and 11 (20%) were self-employed and two (4%) were working in family businesses.

¹ Rate calculations exclude cases 15 years of age and younger.

² Data provided by the Massachusetts FACE Program.

EVENTS RESULTING IN FATAL INJURIES

- **Assaults and other violent acts** accounted for 13 (24%) deaths (Figure 1); seven were suicides, and six were homicides. Robbery was the motive for three of the four homicides for which information about motive was available. Four of the six homicides involved the use of firearms.
- Twelve (22%) Massachusetts workers died in **transportation-related incidents**. Six workers were pedestrians struck by vehicles or other mobile equipment -- three on streets or highways and three in non-roadway areas including parking lots. Three victims were killed in motor vehicle collisions on highways while driving for their jobs. The transportation incidents occurred in a wide variety of industries including agriculture, government, services and construction. Two of the 12 workers who died in transportation-related incidents were employed in the transportation industry.²



- **Falls** to lower levels was the single leading fatal event, accounting for 10 of the 11 fall-related deaths. Nearly two-thirds (seven deaths) of these fatal falls occurred in the construction industry, including two falls each from scaffoldings, ladders and through floor openings.
- **Contact with objects or equipment** claimed the lives of 11 workers. Five of the victims were struck by falling objects including a tree, granite slabs, concrete blocks, a car, and a boat. Three workers were killed when unoccupied vehicles moved, striking them. Two workers died when caught in running equipment or machinery. One worker died when caught in or crushed in collapsing materials.

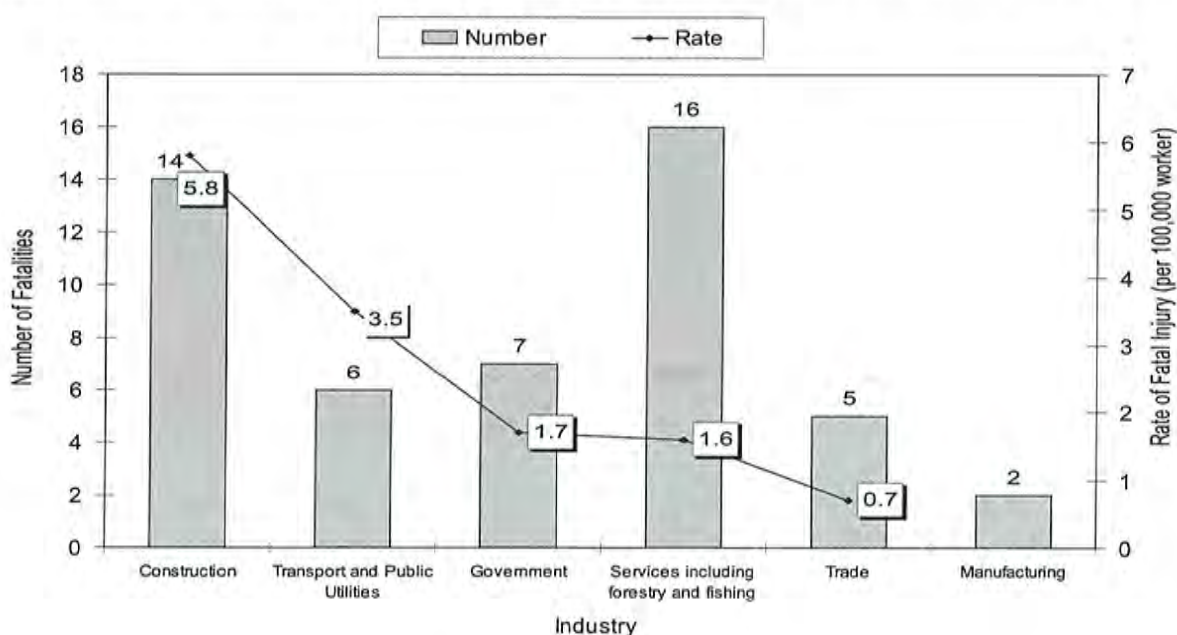
Massachusetts Tractor Operator Killed while Wheel Harrowing a Tobacco Field

A 64-year-old Hispanic male seasonal tractor operator was decapitated while wheel harrowing a tobacco field. The tobacco plants were covered with a shade tent consisting of wood poles, a wire grid, and netting. The employer had modified the tractor that the victim was operating with a homemade wire guard designed to push any low hanging grid wires out of the operator's way. When the tractor exited the field, the victim's neck came in contact with a grid wire forcing him back against the rear of the tractor wire guard decapitating him. He had been employed seasonally with the company for over 8 years and the employer did not provide training on the safe use and operation of tractors. In order to prevent similar incidents Massachusetts FACE recommended that employers should: 1) ensure manufacturers review tractor modifications and make sure that the modifications do not create additional hazards; 2) select appropriate sized tractors that fit underneath shade tents; 3) conduct routine shade tent inspections ensuring there are no low hanging wires; and 4) ensure that tractor operators are trained on the safe use and operation of tractors (Massachusetts FACE Report, 01MA016).

FINDINGS BY INDUSTRY

- The **construction** industry division had 14 (26%) deaths and the highest fatal occupational injury rate (5.8 deaths per 100,000 workers), which was more than three times higher than the overall rate for the state. Falls to lower levels were the leading event in the construction industry, accounting for seven of the 14 deaths. Eight of the 14 construction workers killed were employed in establishments with 10 or fewer employees.
- **Transport and Public Utilities** industry division had six fatalities and the second highest fatal injury rate (3.6 deaths per 100,000 workers). Five workers were killed when pinned or struck by vehicles.
- Seven **government workers** died from work-related injuries; four were employed by local government, two at the state level, and one at the federal level. Three of these victims were municipal law enforcement officers.²

Figure 2. Number and Rate³ of Fatal Injuries at Work by Industry Division^{4,5}, Massachusetts, 2001



NOTE: "Government" includes all fatalities to workers employed by government organizations regardless of industry.
Data for the agriculture Industry division are not presented because denominator data are not available.

- The **Services** industry division, which includes the fishing industry, had more fatal injuries than any other industry division, with a total of 16 deaths (20%) (1.6 deaths per 100,000 workers). Deaths in this division were due to a variety of events, including three suicides, and three homicides by gunshots, two of which occurred at barbershops. There were two deaths in the fishing industry. One fisherman was exposed to toxic concentrations of hydrogen sulfide when he was loading the catch, and the other was tangled in his boat's winch.²
- The **Trade** industry division had five fatal occupational injuries (0.7 deaths per 100,000 workers). Three of the five deaths were homicides committed during robberies in retail trade establishments, including a convenience store, a gas station, and a nightclub.²
- The **Agricultural** industry division claimed four deaths. Three farmers were killed while operating tractors, and a landscaper was killed by a falling tree he was cutting. Two workers sustained fatal injuries in the **Manufacturing** industry division, which

³To maintain consistency with the denominator data, fatalities among self-employed workers were excluded in calculating rates.

⁴ Standard Industrial Classification Manual, 1987 edition, Office of Management and Budget.

⁵ To maintain consistency with the denominator data, fatalities in Forestry and Fishing industries were included in the Services industry Division.

had the lowest fatality rate.²

OSHA COVERAGE, INVESTIGATIONS AND PENALTIES

Of the 54 fatal injuries at work in 2001, 17 deaths occurred in industries or circumstances that are outside Occupational Safety and Health Administration (OSHA) jurisdiction. These included fatalities among commercial fishers, public sector employees (including fire fighters) and self-employed individuals. An additional 14 fatalities involved circumstances not routinely addressed by OSHA such as homicides, suicides, airplane crashes and motor vehicle-related deaths. In total, 31 (58%) of the fatal injuries at work in Massachusetts during 2001 occurred in industries, or from circumstances or causes that are not addressed by OSHA.

OSHA investigated 23 fatal occupational injuries that occurred during the same year.⁶ Fines for violations of OSHA standards related to these fatalities were issued against 22 employers in separate incidents. The agency assessed a total of \$360,750 in penalties as a result of its fatality investigations, with the lowest fine assessed at \$1,500 and the highest at \$71,250.

Massachusetts Boat Handler Fatally Crushed under a Partially Supported Boat

A 35-year-old male boat handler was fatally injured when he was crushed underneath a 33-foot boat at a marina after pulling the boat out of the water. The boat had been positioned incorrectly onto a hydraulic trailer, which led to subsequent problems during offloading. The boat's position on the trailer prohibited the use of wooden blocks that usually support the boat's weight, when offloaded. The offloaded boat was supported only by boat stands which are designed to stabilize but not support a boat's weight. The victim crawled under the boat to add wooden blocks. The boat fell off the boat stands and crushed him. He had been employed with the company for approximately 9 months and his training was primarily on-the-job. In order to prevent similar incidents, Massachusetts FACE recommended that employers should: 1) ensure employees inspect trailer-loaded boats before completely hauling them out of the water; 2) establish and enforce standard operating procedures (SOP) for hauling boats and storing them out of the water; 3) ensure boats are stored on stable ground; 4) establish and enforce a comprehensive health and safety program, including but not limited to providing training for boat handlers on hazard recognition and safe work practices for assigned tasks; and 5) develop a health and safety committee that includes worker participation and meets regularly (Massachusetts FACE Report, 01MA 037).

SUMMARY

It is important in reporting summary information about fatal occupational injuries to acknowledge the individuals that these numbers represent. These deaths were tragic incidents that were in large part preventable. Surveillance findings are intended to guide government, industry, labor and community organizations in developing strategies to prevent similar tragedies in the future.

The year 2001 marks the eleventh year that the Massachusetts Department of Public Health has been tracking fatal occupational injuries in Massachusetts. During this period, the numbers of fatal occupational injuries have fluctuated from a high of 86 deaths in 1994 and a low of 44 deaths in 1998 with no clear cut downward trend. Nationwide, a total of 5,900 workers died as a result of fatal occupational injuries in 2001, excluding 2,887 fatalities related to the September 11th terrorist attacks.⁷ The national fatal occupational injury rate was 4.3 deaths per 100,000 workers⁸. This rate is substantially higher than the rate of 1.6 deaths per 100,000 workers for Massachusetts. The lower fatal occupational injury rate in Massachusetts is, in part, explained by the low rates of fatal motor vehicle crashes and homicides in the Commonwealth compared to that of the nation. Where these two events contributed substantially to the occupational fatality burden. While the fatality rate is lower in Massachusetts, continued efforts are needed to reduce the human and economic toll of preventable deaths at work in the Commonwealth. Findings in this update highlight a number of specific issues to be addressed.

The high occupational fatality rate for Hispanic workers should be interpreted with caution because it is based on small numbers. However, the rate is consistent with previous findings for Massachusetts and with findings for the nation as a whole. Potential contributing factors include the disproportionate concentration of Hispanic workers in high risk jobs, language and communication barriers at work, inexperience and lack of information about health, safety and legal rights on the job among Hispanic workers, and limited job options that may make individuals hesitant to speak up. There is growing recognition of the need to identify and address the factors that place Hispanic workers at high risk. For example, both the Occupational Safety and Health Administration (<http://www.osha.gov/as/opa/spanish/index.html>) and the National Institute for Occupational Safety and Health (<http://www.cdc.gov/spanish/niosh>) now have Spanish language websites. The Occupational Health Surveillance Program at Massachusetts Department of Public Health is working to document the occupational health experience of immigrant workers and to collaborate with community organizations to disseminate educational materials on health and safety in multiple languages.

⁶ OSHA also conducted an investigation of an occupational death due to Legionnaire's disease in 2001.

⁷ <http://stats.bls.gov/news.release/cfoi.nr0.htm>

⁸ U.S. Department of Labor, Bureau of Labor Statistics, Census of Fatal Occupational Injuries, 2001. REF

For the 10th consecutive year, the construction industry in Massachusetts has both high numbers and high rates of fatal occupational injuries, and half of the deaths in this industry continue to be due to falls. Comprehensive work site fall prevention programs, including the use of fall protection systems CAN reduce the risk of fall injuries in construction. The Occupational Safety and Health Administration has established standards for fall prevention in construction workplaces (Subpart M, Fall Protection, 29 CFR 126.500 1926.503). Employers should develop and implement fall protection programs that meet these OSHA requirements. Innovative efforts are needed to reach both employers and workers in small construction businesses. In Massachusetts, the FACE Project is continuing educational outreach to residential contractors by disseminating fall prevention brochures in multiple languages. These brochures are available on our web site at <http://www.state.ma.us/dph/bhsre/ohsp/scaffold.htm>. Also, the regional OSHA office currently has a local emphasis program on fall protection. For information about OSHA Region 1 Fall Protection Local Emphasis Program, contact Robert Hooper or Geoffrey McKinstry at 617-565-9860

The two deaths of high school-aged workers in 2001 draw attention to a population of workers whose health and safety needs can be often overlooked. Each year in the US approximately 70 workers under age 18 are killed on the job. The occupational fatality rate for this age group is similar to that for adult workers, despite of the fact that child labor laws prohibit youth from employment in the most hazardous jobs. National data also indicate that the rate of non-fatal injuries among workers less than 18 years of age is 1.7 times the rate for adult workers. A number of activities are underway in Massachusetts and throughout the nation to improve the health and safety of young workers. Educational materials on health and safety and child labor laws for teens, parents, employers and health care providers can be obtained from the *Teens at Work* Program at the Massachusetts Department of Public Health (<http://www.state.ma.us/dph/bhsre/ohsp/teens/teeninj.htm>) OSHA also has a new Teen Workers web site (<http://www.osha.gov>).

Massachusetts Police Officer Killed after Being Backed Over by a Dump Truck

A 66-year-old male municipal police officer was fatally injured when he was backed over by an asphalt-loaded dump truck, with an operating backup alarm, inside a highway construction work zone. The victim, with his back to the dump truck and facing oncoming traffic, was walking in a closed northbound right-hand travel lane of a four lane divided highway. He was struck while the dump truck backed to an area to be paved. The municipality had employed him for approximately 16 years. In Massachusetts, municipal police officers typically do not receive specific highway / street construction work zone safety training. In order to prevent similar incidents, Massachusetts FACE recommended that employers should: 1) develop, implement, and enforce an internal traffic control plan (ITCP) specific to each construction site to reduce backing of construction vehicles; 2) ensure backing protocols are in place and that designated individuals are assigned as signalers to direct backing construction vehicles on construction sites; 3) ensure that communication exists among equipment operators and workers on foot. FACE also recommended that: local and state government agencies should consider offering work zone safety training for municipal officers who perform traffic details on highway / street construction sites; and manufacturers of heavy construction equipment, such as dump trucks, should explore the possibility of incorporating collision avoidance technology on their equipment to assist the operator while backing (Massachusetts FACE Report, 01MA039).

In September 2002, the Occupational Health Surveillance Program completed a study of fatal occupational injuries in Massachusetts from 1991 to 1999. For copies of this 9-year fatality report, more detailed tables of fatal occupational injuries in 2001, and copies of full-length FACE reports in Massachusetts, please contact the Massachusetts Department of Public Health, Occupational Health Surveillance Program, 2 Boylston Street, 6th Floor, Boston, MA 02116. These reports may also be obtained by calling (617) 988-3341.

ACKNOWLEDGEMENTS

This project is a joint effort of several state and federal agencies. For their assistance in providing data for the study and for their advice, we thank: Marthe Kent, Regional Administrator, OSHA Region I; Stanley Nyberg, Registrar of Vital Records and Statistics, MA Department of Public Health; and Anthony Conti, Director, MA Fatal Accident Reporting System (FARS). We also appreciate the contributions of the MA Department of Labor and Workforce Development, the MA Department of Industrial Accidents, the U.S. Coast Guard, the National Transportation Safety Board (NTSB), the U.S. Bureau of Labor Statistics, the National Institute for Occupational Safety and Health (NIOSH), police departments, and clerks of cities and towns.

Please report work-related fatalities immediately to:

Toll-Free Occupational Fatality Hotline:

1-800-338-5223

or

Fax **(617) 624-5696**

When reporting a fatality, include the following information:

- Reporter's name, address, and phone number
- Victim's name, occupation and employer
- Brief description of the incident, including date and time

The Occupational Health Surveillance Program would like to thank all agencies and people that contributed to our effort of preventing work-related deaths by reporting fatalities and providing information during our fatality investigations.

PLEASE NOTE OUR NEW ADDRESS INFORMATION

**Occupational Health Surveillance Program
Massachusetts Department of Public Health
2 Boylston Street, 6th Floor
Boston, MA 02116**

FATAL INJURIES AT WORK

MASSACHUSETTS FATALITY UPDATE, 2002

Occupational Health Surveillance Program Massachusetts Department of Public Health March, 2005

Every year, men and women in a wide variety of jobs and industries throughout Massachusetts die as a result of traumatic injuries at work. These deaths are all the more tragic because they are largely preventable. Information about where and how they occur is essential in order to develop effective prevention programs. In Massachusetts, the Occupational Health Surveillance Program (OHSP) in the Massachusetts Department of Public Health (MDPH) collects information on fatal occupational injuries as part of the national Census of Fatal Occupational Injuries (CFOI), conducted in cooperation with the Bureau of Labor Statistics (BLS), U.S. Department of Labor.

OHSP also conducts in-depth work site investigations of targeted fatal occupational injuries as part of the national Fatality Assessment Control and Evaluation (FACE) project, sponsored by the National Institute for Occupational Safety and Health (NIOSH). The purpose of the FACE project is to develop a detailed understanding of how fatal injuries occur and to identify effective countermeasures to prevent similar incidents in the future. Excerpts from selected FACE investigations are highlighted in this report.

This update provides an overview of fatal injuries at work that occurred in Massachusetts during 2002. These include fatalities traditionally linked to the work environment such as falls, electrocutions and exposure to toxic chemicals. They also include homicides and suicides at work and motor vehicle-related fatalities that occurred during travel on the job. Deaths caused by occupational illnesses are not included in this fatality update.

OVERVIEW OF FATAL INJURIES AT WORK IN 2002

- In 2002, 42 men and four women suffered fatal injuries at work in Massachusetts. The overall rate of fatal occupational injury for *all* workers was 1.4 per 100,000 workers.¹
- The average age at death was 43.2 years. Twenty-three (50%) victims were younger than 39 years of age. The 46 fatalities resulted in an average of 31.7 years of potential life lost (years before the victim reached age 75) for each death, for a total of 1,461 years of potential life lost.
- Thirty-six (78%) victims were white non-Hispanic. The overall rate of fatal occupational injury for white non-Hispanic workers was 1.2 per 100,000 workers.
- Five victims (11%) were Hispanic workers, four of whom were foreign born. The victims were employed in a variety of industries, including construction, manufacturing, transportation, and retail. The overall rate of fatal occupational injury for Hispanic workers was 2.5 per 100,000 workers.
- Fourteen victims were foreign-born. In addition to the four foreign-born Hispanic workers fatally injured, five victims were born in Brazil. Four of the fatally injured Brazilians were employed in the construction industry.
- Of the 46 workers fatally injured, 38 (83%) were wage and salary workers, and seven (15%) were self-employed.² Over half of the victims (26) were employed in establishments with ten or fewer workers.

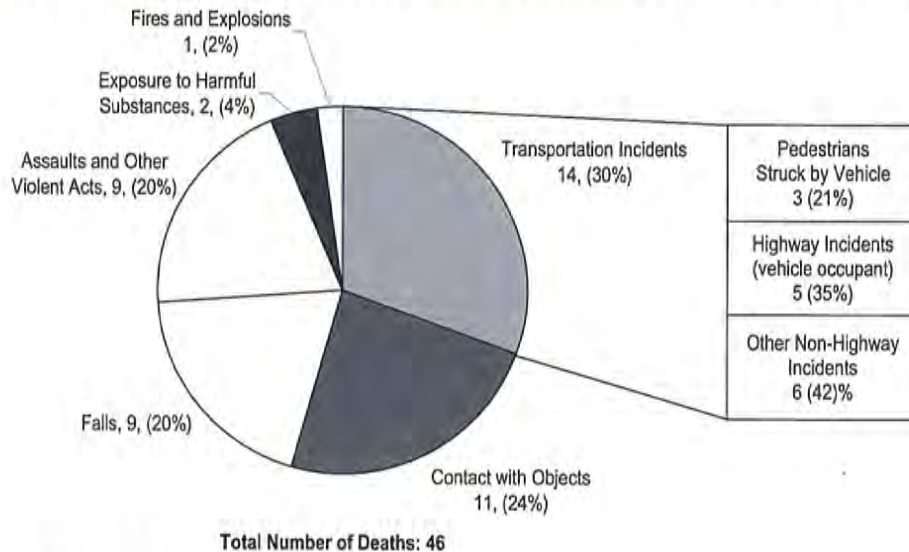
¹ Rate calculations exclude cases 15 years of age and younger.

² Information about employment status was not available for one case.



EVENTS RESULTING IN FATAL INJURIES

Figure 1. Fatal Injuries at Work by Event/Exposure, Massachusetts 2002



Source: Massachusetts Census of Fatal Occupational Injuries

Transportation-related incidents accounted for 14 (30%) deaths. These incidents involved workers in a wide variety of industries including construction, agriculture, services, and retail as well as the transportation industry. Five workers were vehicle occupants who were fatally injured in motor vehicle crashes, overturns, and collisions on highways and other roads. Three victims were pedestrians struck by vehicles in off-road locations including a construction site, a driveway, and a parking garage.³ Six workers were fatally injured in other non-highway incidents, three involving fishing vessels, and one a helicopter crash. In two incidents, both on residential housing sites, workers were killed when the machines that they were operating overturned, pinning them to the ground.³

Contact with objects or equipment claimed the lives of 11 (24%) workers. Five of the victims were struck by falling objects. Five workers were caught in or compressed by equipment or objects.

Massachusetts Machine Operator Dies After Becoming Caught in Shirt Pressing Machine Massachusetts FACE Report 02MA002

A 44-year-old female machine operator was fatally injured when she became caught in the shirt pressing machine she was operating. While a shirt was in the machine's pressing area, the victim reached down into an opening in the loading table and became stuck. The machine cycled, releasing the shirt from the pressing area, striking and crushing the victim's right arm, neck and chest. Personnel from the local fire department used Jaws of Life to free the victim. The victim had been employed with the company for 19 years. The only training session provided by the equipment manufacturer had been held when the machine was delivered to the employer, eight years prior to the incident.

In order to prevent similar incidents, Massachusetts FACE recommended that employers should: 1) ensure that accessible and exposed mechanical hazards of a shirt pressing machine are guarded; 2) ensure that shirt pressing machines are equipped with emergency stops; 3) periodically perform equipment hazard analyses to ensure equipment is safe to operate; 4) train equipment operators and employees on all aspects of the equipment, including functions that don't pertain to daily operation; and 5) develop, implement, and enforce a comprehensive safety and health program that includes, but is not limited to, hazard recognition, safety training, and protocols to safely complete tasks. FACE also recommended that shirt pressing machine manufacturers should: 1) design machines so moving parts are not exposed and accessible and emergency stops are linked to the pneumatic system; and 2) explore the possibility of reducing the force used to transfer the shirt (buck) to and from the loading table and pressing area.

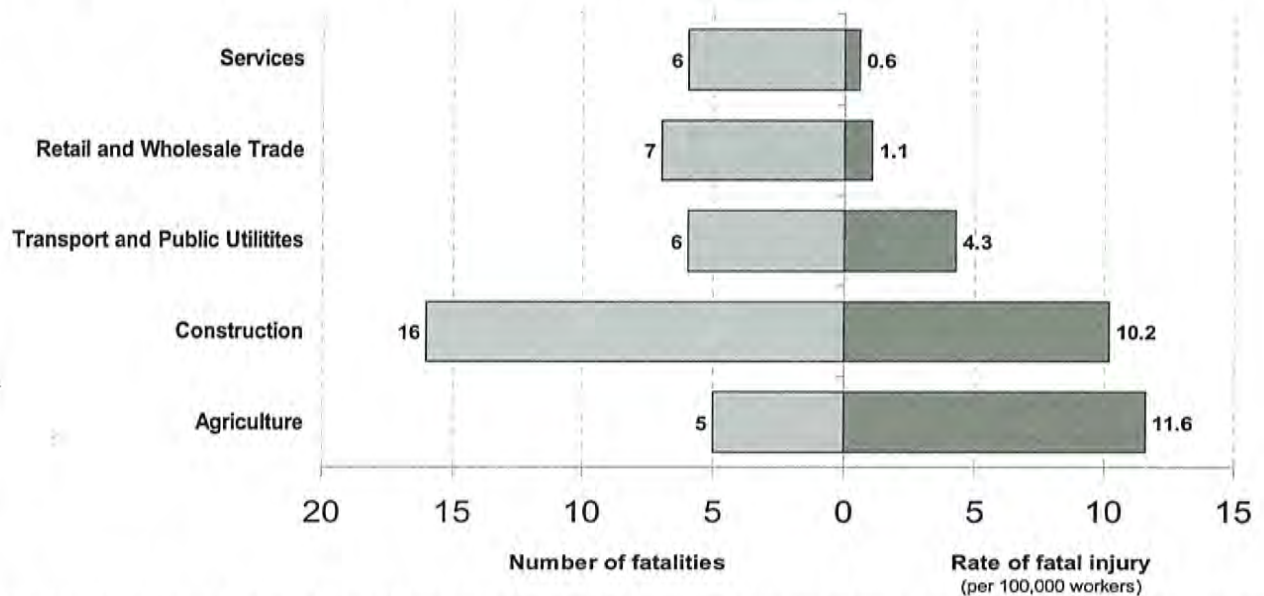
³ Data provided by the Massachusetts FACE program.

The broad category of **falls** includes both falls on the same level and falls to lower levels. In 2002, all of the fatal falls were falls to lower levels, which was the single leading fatal event. Seven of the nine fatal falls occurred in the construction industry, including two falls each from ladders, scaffolds, and roofs. The heights of the fatal falls ranged from 15 to 30 feet.⁴

Assaults and other violent acts accounted for nine (20%) of the work-related deaths; five were homicides and four were suicides. The five homicides included a police officer killed in the line of duty and two workers killed during the course of robberies.³ Four of the five homicides involved the use of sharp objects.

FINDINGS BY INDUSTRY

Figure 2. Number and Rate⁵ of Fatal Injuries at Work by Industry Division^{6,7}, Massachusetts 2002



Source: Massachusetts Census of Fatal Occupational Injuries

Note: Data not presented for Industry Divisions with fewer than five fatalities.

The **Agriculture** industry had five (11%) fatalities and the highest occupational fatality rate (11.6 deaths per 100,000 workers) for 2002. The rate was seven times higher than that of the overall fatality rate for the state. Three of the five fatally injured workers were landscapers, one of whom fell, one was hit by a branch and one was killed when the equipment he was operating overturned.³

The **Construction** industry had the highest fatality count with 16 (35%) deaths and the second highest occupational fatality rate (10.2 deaths per 100,000 workers). Seven construction workers died as a result of falls to lower levels and three as a result of being struck by falling objects.³

The **Transportation and Public Utilities** industry had six (13%) deaths with a fatality rate of 4.3 deaths per 100,000 workers. Four of the six workers were fatally injured in transportation related incidents.

The **Trade** industry had seven (15%) deaths and a rate of 1.1 deaths per 100,000 workers.⁸ Three workers died as a result of assaults with sharp objects and two as a result of motor vehicle crashes.³

⁴ Height information was not available for one fatal fall.

⁵ To maintain consistency with denominator data, fatalities among self employed workers were excluded in calculating rates, except in Agriculture.

⁶ Standard Industrial Classification Manual, 1987 edition, Office of Management and Budget.

⁷ To maintain consistency with the denominator data, fatalities in the Forestry and Fishing industries were included in the Service industry division.

⁸ Excludes the self-employed, family workers and private household workers.

The **Manufacturing** industry claimed the lives of four workers and two **Government** employees sustained fatal injuries in 2002— a police officer and a firefighter both killed in the line of duty.

OSHA COVERAGE, INVESTIGATIONS AND PENALTIES

Of the 46 fatal injuries at work in 2002, ten deaths occurred in industries or circumstances that are outside Occupational Safety and Health Administration (OSHA) jurisdiction; these included fatalities among commercial fishers, public sector employees, and self-employed individuals. An additional 15 fatalities involved circumstances not routinely addressed by OSHA such as homicides, suicides, airplane crashes, and motor vehicle-related deaths. In total, 25 (54%) of the fatal injuries at work in Massachusetts during 2002 occurred in industries or from circumstances or causes that are not addressed by OSHA.

OSHA investigated 21 fatal occupational injuries that occurred in 2002.⁹ Fines for violations of OSHA standards related to these fatalities were issued against 20 employers in separate incidents. The agency assessed a total of \$211,032 in penalties as a result of its fatality investigations, with the lowest fine assessed at \$1,400 and the highest at \$33,000.

COMMENTS

It is important when reporting summary information about fatal occupational injuries to acknowledge the individuals that these numbers represent. These deaths were tragic incidents that were in large part preventable. Surveillance findings are intended to guide government, industry, labor, and community organizations in developing strategies to prevent similar tragedies in the future.

Nationwide, a total of 5,524 workers died as a result of fatal occupational injuries in 2002. The national fatal occupational injury rate was 4.0 deaths per 100,000 workers¹⁰. This rate is substantially higher than the rate of 1.4 deaths per 100,000 workers for Massachusetts. The lower fatal occupational injury rate in Massachusetts is, in part, explained by the industrial make-up of Massachusetts compared to that of the nation. Massachusetts also has comparatively low rates of fatal motor vehicle crashes and homicides in general. These two types of fatal injuries contributed substantially to the national occupational fatality burden. While the fatality rate is lower in Massachusetts, continued efforts are needed to reduce the human and economic toll of preventable deaths at work in the Commonwealth. Findings in this update highlight several specific issues to be addressed.

Massachusetts Temporary Laborer Dies After Being Struck by a Turning Device at a Concrete Product Manufacturing Facility, Massachusetts FACE Report 02MA016

A 30-year-old Hispanic male employed as a temporary worker was fatally injured at a concrete casting facility. The victim had been hired as a laborer to help with the manufacturing of concrete products. While assisting with the removal of a 1,000-gallon concrete septic system tank from its form, the boom section of the turning device used for this task slipped off of the forklift lines that had been supporting the turning device. The boom struck the victim in the head and back, causing fatal injuries. The victim was one of four temporary workers assigned to the concrete manufacturing facility and had been working there for a year. The victim's first language was Spanish and the first language of the person he typically worked with, a fulltime permanent employee of the concrete manufacturing facility, was English. The company did not have a written safety and health program, and the only training provided was on-the-job.

In order to prevent similar incidents, Massachusetts FACE recommended that employers should: 1) develop a locking mechanism to ensure that concrete casting turning devices used with forklifts are securely attached to the tines; 2) provide barrier guards to ensure that all employees are safe from possible hazards while completing tasks; 3) establish written procedures for rotating concrete castings; 4) consider using an overhead crane system for rotating concrete castings; 5) ensure that workers employed through temporary agencies are provided site and task specific safety and health training; and 6) ensure that workers who are part of a multilingual workforce comprehend safety training for their assigned tasks.

⁹ OSHA also conducted three investigations of occupational deaths due to apparent cardiovascular disease which initially appeared to be work related in 2002.

For the 11th consecutive year, the **construction industry** in Massachusetts has both high numbers and high rates of fatal occupational injuries, and close to half of the deaths in this industry continue to be due to falls. Comprehensive work-site fall prevention programs, including the use of fall protection systems, can reduce the risk of fall injuries in construction. The Occupational Safety and Health Administration has established standards for fall prevention in construction workplaces (Subpart M, Fall Protection, 29 CFR 126.500 1926.503). Employers should develop and implement fall protection programs that meet these OSHA requirements. Innovative efforts are needed to reach both employers and workers in small construction businesses. In Massachusetts, the FACE Project is continuing educational outreach to residential contractors by disseminating fall prevention brochures in multiple languages. These brochures are available on our web site at <http://www.mass.gov/dph/bhsre/ohsp/scaffold.htm>. Also, the regional OSHA office currently has a local emphasis program on fall protection. For information about OSHA Region 1 Fall Protection Local Emphasis Program, contact Robert Hooper or Geoffrey McKinstry at 617-565-9860.

The high occupational fatality rate for **Hispanic workers** should be interpreted with caution because it is based on small numbers. However, the rate is consistent with previous findings for Massachusetts and with findings for the nation as a whole. Potential contributing factors include: the disproportionate concentration of Hispanic workers in high risk jobs; language and communication barriers at work; inexperience and lack of information about health; safety and legal rights on the job among Hispanic workers; and limited job options that may make individuals hesitant to speak up. There is growing recognition of the need to identify and address the factors that place Hispanic workers at high risk. Both the Occupational Safety and Health Administration (<http://www.osha.gov/as/opa/spanish/index.html>) and the National Institute for Occupational Safety and Health (<http://www.cdc.gov/spanish/niosh>) now have Spanish language websites. The Occupational Health Surveillance Program is working to document the occupational health experience of immigrant workers and to collaborate with community organizations to disseminate educational materials on health and safety in multiple languages. OHSP has also recently released a guide describing workers rights and benefits under the workers' compensation system in Massachusetts available in English, Portuguese, and Spanish at <http://www.mass.gov/dph/bhsre/ohsp/ohsp.htm>.

For more detailed tables of fatal occupational injuries in 2002 or copies of full-length FACE reports in Massachusetts, please contact the Massachusetts Department of Public Health, Occupational Health Surveillance Program, 250 Washington Street, 6th Floor, Boston, MA 02108-4619. These reports may also be obtained by calling 1-800-338-5223.

ACKNOWLEDGEMENTS

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¹⁰ U.S. Department of Labor, Bureau of Labor Statistics, Census of Fatal Occupational Injuries, 2002.

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- Brief description of the incident, including date and time

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PLEASE NOTE OUR NEW ADDRESS INFORMATION
Occupational Health Surveillance Program
Massachusetts Department of Public Health
250 Washington Street, 6th Floor
Boston, MA 02108-4619

FATAL INJURIES AT WORK

MASSACHUSETTS FATALITY UPDATE, 2003 – 2004

Occupational Health Surveillance Program Massachusetts Department of Public Health September, 2006

Every year, men and women in a wide variety of jobs and industries throughout Massachusetts die as a result of traumatic injuries at work. These deaths are all the more tragic because they are largely preventable. Information about where and how they occur is essential in order to develop effective prevention programs. In Massachusetts, the Occupational Health Surveillance Program (OHSP) in the Massachusetts Department of Public Health (MDPH) collects information on fatal occupational injuries as part of the national Census of Fatal Occupational Injuries (CFOI), conducted in cooperation with the Bureau of Labor Statistics (BLS), U.S. Department of Labor.

OHSP also conducts in-depth investigations of fatal occupational injuries as part of the national Fatality Assessment and Control Evaluation (FACE) project, sponsored by the National Institute for Occupational Safety and Health (NIOSH). The purpose of the FACE project is to develop a detailed understanding of how fatal injuries occur and to identify effective countermeasures to prevent similar incidents in the future. Excerpts from selected FACE investigations are highlighted in this report.

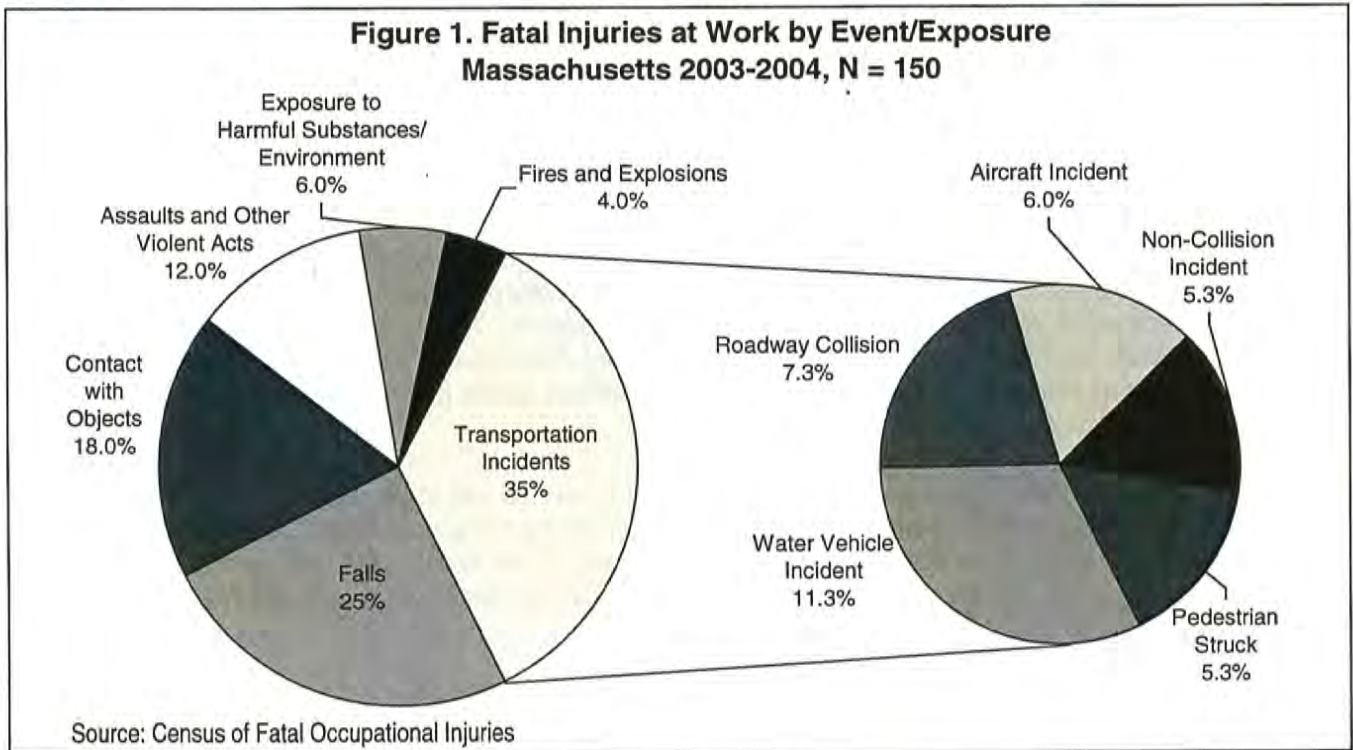
This update provides an overview of fatal injuries at work that occurred in Massachusetts during 2003 and 2004. These include fatalities traditionally linked to the work environment such as falls, electrocutions, and exposure to toxic chemicals. They also include workplace homicides and suicides as well as motor vehicle-related fatalities that occurred during travel on the job. Deaths resulting from occupational illnesses and heart attacks at work are excluded from this fatality update.

OVERVIEW OF FATAL INJURIES AT WORK IN 2003 - 2004

- In Massachusetts, a total of 150 men and women were fatally injured at work during 2003 and 2004. Ninety-five percent of these workers were men. In 2003, 73 men and five women suffered fatal injuries at work in Massachusetts; in 2004, 69 men and three women died as a result of occupational injuries. The average annual rate of fatal occupational injury for all workers in Massachusetts was 2.3 per 100,000 workers over the two year period 2003-2004.¹
- The average age at death was 41.6 years. More than one-quarter (27.3%) of victims were younger than 35 years of age. The highest fatal injury rates were among the 35-44 age group and those individuals 65 years and older. The 150 fatalities resulted in a total of 5,000 potential life years lost, an average of 33 potential life years lost per death. Potential life lost is the difference between the victim's age and 75 years.
- One hundred and sixteen (77%) victims were white non-Hispanic. Fifteen victims (10%) were Hispanic, twelve of whom were foreign born. The average, annual rate of fatal injuries among Hispanics was 3.6 deaths per 100,000 workers over the two year period, 2003 – 2004.
- Thirty-five victims were foreign-born, ten of whom were employed in the construction industry. Foreign-born workers had a higher rate of fatal injuries compared with workers born in the United States (3.4 verses 2.0).
- Of the 150 workers fatally injured, 25 (17%) were self-employed and died at 1.8 times the rate of wage/salary earners.

¹ One hundred and fifty work-related fatality cases identified as of 1/1/06. Rate calculations exclude cases under 16 years of age.

EVENTS RESULTING IN FATAL INJURIES



Transportation-related incidents accounted for 53 (35%) deaths. These incidents involved workers in a wide variety of industries including fishing, professional & technical services, warehousing, and transportation. Eleven workers were vehicle occupants who were fatally injured in roadway collisions. An additional eight vehicle occupants died in overturns and other non-collision crashes. Eight victims were pedestrians struck by vehicles in the roadway, the breakdown lane, a parking lot, and other off-road areas. The remaining 26 transportation-related fatalities occurred in non-highway incidents: 17 involving fishing vessels, and nine involving aircraft. Five fishing vessel incidents and two aircraft incidents resulted in more than one fatality per incident.

Falls to a lower level accounted for 89% of all fatal falls, claiming 33 workers' lives and resulting in more fatalities than any other single event during 2003-2004. Half of these fatal falls were from a height of 25 feet or less (Range: 5 to 200 feet)² and included 12 falls from a ladder, scaffold, girder, or stairs, nine from a roof, four through an opening in the floor, and three from a stationary vehicle. Sixty-nine percent (23/33) of the fatal falls to a lower level occurred in the construction industry.

Contact with objects or equipment claimed the lives of 27 (18%) workers. Seventeen of the victims were struck by or against objects such as felled trees, un-manned vehicles, structural beams, and other building materials. Ten workers were caught in or compressed by equipment, objects, or collapsing materials. Among these, cranes killed three persons, and production machinery claimed three lives.

Assaults and other violent acts accounted for 18 (12%) of the work-related deaths; nine were workplace homicides and nine were suicides. More than one-half (five) of homicide victims were killed while working in convenience stores or gas stations. Six workers were slain during robbery attempts. Five of the nine homicides involved the use of knives and the remaining four resulted from gunshots. Seven of the nine homicide victims were foreign-born workers.

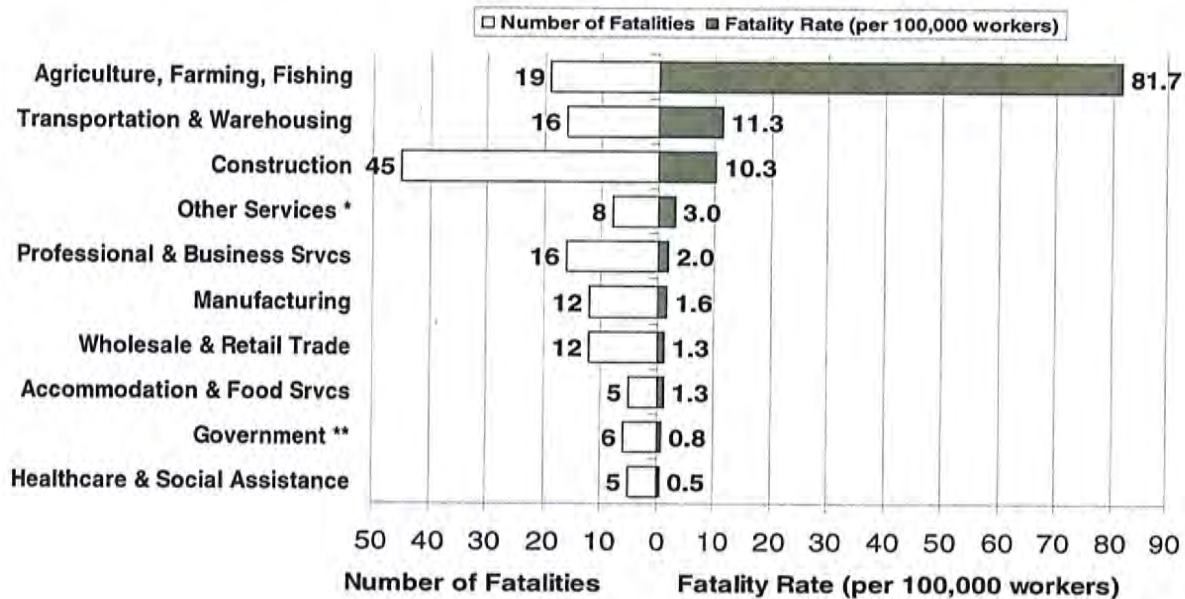
Exposure to harmful substances or environments resulted in the deaths of nine (six percent) workers. Seven of these workers were electrocuted, four of whom came in contact with energized power lines.

An additional six (four percent) workers perished in fires or explosions.

² Height information was not available for four fatal falls to a lower level.

FINDINGS BY INDUSTRY

**Figure 2. Number and Rate³ of Fatal Injuries at Work by Industry Division⁴
Massachusetts 2003-2004**



Note: Data not presented for four Industry Divisions with fewer than five fatalities.
 * Other Services includes automotive as well as other maintenance/repair services.
 ** The Government category includes fatalities sustained by public sector workers regardless of industry.

Source: Census of Fatal Occupational Injuries

The **Agriculture, Farming, and Fishing** industry had 19 (13%) fatalities and the highest occupational fatality rate (approximately 82 deaths per 100,000 workers) during 2003 and 2004. Seventeen of the 19 victims in this industry sector were commercial fishers. Of the 17 commercial fishers who lost their lives in 2003-2004, five drowned in one incident when their scalloping boat capsized and sank in frigid waters.

The **Transportation and Warehousing** industry had 16 (11%) deaths with the second highest fatality rate of 11.3 deaths per 100,000 workers. Seven workers were fatally injured in transportation incidents involving trucks and another nine victims were involved in five plane crashes.

The **Construction** industry had the highest fatality count with 45 (30%) deaths and the third highest occupational fatality rate (10.3 deaths per 100,000 workers). Twenty-three construction workers died as a result of falling from a height. Six died after contacting electric current, five were struck by or against an object, and four were killed after being caught in or compressed by a machine or other equipment.

The **Professional and Business Services** industry accounted for 16 (11%) deaths with a rate of 2.0 fatalities per 100,000 workers.

The **Trade** industry had 12 (8%) deaths with a rate of 1.3 deaths per 100,000 workers. More than half (56%) of all homicides occurred in the retail trade sector.

The **Manufacturing** industry claimed the lives of 12 workers and six **Government** employees sustained fatal injuries in 2003-2004. Three of the six government workers were employed by local municipalities. An excerpt from FACE Report 03MA041 on the next page describes an incident which resulted in the death of a public sector grounds keeper.

³ To maintain consistency with denominator data, fatalities among military personnel and workers under 16 years of age were excluded from the numerator in rate calculation.

⁴ Industry definitions based on the 2002 North American Industry Classification Structure (NAICS), The Office of Management and Budget.

OSHA COVERAGE, INVESTIGATIONS AND PENALTIES

The Occupational Safety and Health Administration (OSHA) investigated 38% (57/150) of the fatal work-related injuries that occurred in Massachusetts between 2003 and 2004.⁵ About half of the remaining fatalities were in sectors that fall outside of OSHA jurisdiction such as commercial fishers, public sector employees, sole proprietors, or the self-employed. The remaining fatalities involved events not routinely addressed by OSHA such as homicides, suicides, airplane/railway incidents, or roadway motor vehicle-related crashes.

OSHA levied fines for violations of health and safety standards against 47 of the 54 employer establishments they investigated.⁶ In the period 2003-2004, the agency assessed a total of \$823,025 in initial penalties, with the lowest fine assessed at \$1,500 and the highest at \$70,000.

Public Sector Equipment Operator Killed when Run Over by a Rotary Riding Mower - Massachusetts Massachusetts FACE Report 03MA041

A public sector equipment operator was fatally injured when he was run over by a sit-down rough rotary mower. The victim, who was mowing a section of a city park, had stopped the mower on an edge of a hill and turned off the engine. After exiting the mower, he noticed that the mower had started to roll down the hill. The victim attempted to stop the rolling mower by stepping in front of it, but became trapped underneath the mower and was dragged approximately 75 feet. The victim had worked for the city parks department for approximately eight years. The employer did not have a designated person in charge of safety and health, nor a written safety and health program. On-the-job training had been provided by the city on the mower involved in the incident.

In order to prevent similar incidents, Massachusetts FACE recommended that employers should:

1) develop, implement, and enforce standard operating procedures (SOPs) for operating and shutting down mowers, including requirements to park mowers on level ground; 2) develop, implement, and enforce a comprehensive written safety program, which includes training on hazard recognition and the avoidance of unsafe work practices and conditions.

In addition, employers of state and municipal workers should provide work environments that, at a minimum, meet all relevant Occupational Safety and Health Administration (OSHA) and American National Standards Institute (ANSI) requirements and standards.

The full report can be found at www.cdc.gov/niosh/face/MAFACE.html

COMMENTS

It is important when reporting summary information about fatal occupational injuries to acknowledge the individuals that these numbers represent. These deaths were tragic incidents that were largely preventable. In addition to the human and emotional losses suffered, these deaths resulted in financial hardships for victims' families as well as societal losses. Surveillance findings guide government, industry, labor, and community organizations in developing and implementing strategies to prevent similar tragedies in the future.

Nationwide, an average of 5,631 workers died annually as a result of traumatic work-related injuries in 2003-2004, and the average annual occupational fatality rate was 4.0 deaths per 100,000 workers.⁷ This rate is substantially higher than the average annual rate of 2.3 deaths per 100,000 workers for Massachusetts for the same time period. Massachusetts' lower

⁵ OSHA also conducted five initial investigations of occupational deaths that either resulted from heart attacks or were among self-employed individuals in 2003 and 2004.

⁶ Three establishments that OSHA fined each had two fatalities in this time period.

⁷ U.S. Department of Labor, Bureau of Labor Statistics, Census of Fatal Occupational Injuries, 2003-04.

fatality rate is possibly explained in part by differences in the industrial make-up of the Commonwealth's workforce as compared with that of the nation. Between 2003 and 2004, 43% of Massachusetts' workforce was employed in relatively lower risk, service-oriented jobs in education, business, administration, leisure, hospitality, and healthcare as compared with 36% of the U.S. workforce. Nationally, proportionately more workers were employed in higher risk industry sectors such as heavy manufacturing, agriculture, mining, and utilities management.⁸ Massachusetts also has lower rates of fatal motor vehicle crashes and homicides in general. These two types of fatal injuries contributed substantially to the national occupational fatality burden. While the fatality rate is lower in Massachusetts, continued efforts are needed to reduce the human and economic toll of preventable deaths at work in the Commonwealth. Findings in this update highlight several specific issues to be addressed.

The **construction** industry in Massachusetts continues to have both high numbers and high rates of fatal occupational injuries. One-half (51%) of the deaths in this industry were due to falls. OSHA has established standards for fall prevention at construction sites (29 CFR 1926, Subpart M, Fall Protection). Comprehensive work-site fall prevention programs that adhere to these OSHA standards and promote use of engineering controls that safeguard against falls can reduce the risk of fall-related injuries in construction. To spread the fall prevention message, innovative efforts are needed to reach employers and workers in small construction companies, as well as the homeowners who hire them. In Massachusetts, the Fatality Assessment and Control Evaluation (FACE) project is facilitating discussions among a diverse group of stakeholders representing labor, occupational health surveillance/research, risk management, enforcement, and the community for the purpose of sharing strategies for fall prevention in the construction industry and identifying opportunities for collaboration. FACE continues its educational outreach to residential contractors by disseminating fall prevention brochures in multiple languages. These brochures are available on our web site at www.mass.gov/dph/ohsp. Also, the regional OSHA office implements a local emphasis program (LEP) on fall protection, and currently, a residential construction LEP in Southeast Massachusetts is underway. For information about OSHA Region 1 Local Emphasis Programs, contact Robert Hooper at 617-565-9860.

The high occupational fatality rates among **Hispanic and immigrant workers** should be interpreted with caution because they are calculated using small numbers of deaths as well as imprecise and, often, underestimated workforce counts for Massachusetts. However, these rates are consistent with previous findings for Massachusetts and with findings for the nation as a whole. Increasingly, immigrants are making up a greater percentage of the Commonwealth's workforce; however, 23% of all the 2003-04 fatal injuries involved foreign-born workers, which is higher than their representation in the workforce (16-17%).⁹ Higher than average fatality rates for foreign-born and Hispanic workers may be explained by their disproportionate representation in higher risk jobs and other factors such as literacy, language, and cultural barriers at work, inexperience, lack of information about occupational hazards, health and safety rights and resources, fear of discrimination and socioeconomic pressure that renders workers hesitant to speak up.^{10 11}

There is growing recognition of the need to identify and address the factors that place immigrant, Hispanic, and other minority workers at high risk. In response to the incident in which two Vietnamese floor finishers were fatally burned and another two sustained serious burn injuries (see excerpt from FACE Report #04MA032 on the next page), Boston-based community organizations solicited input from the FACE project as well as other state, local, and federal agencies to identify hazards associated with hardwood floor finishing. These community organizations have successfully used this information to work with local employers and product manufacturers/distributors in developing strategies to reduce these hazards. The Occupational Health Surveillance Program continues to document the occupational health experience of immigrant workers and to collaborate with community organizations to disseminate educational materials on health and safety in multiple languages. OHSP distributes a guide describing worker rights and benefits under the workers' compensation system in Massachusetts available in English, Portuguese, and Spanish at www.mass.gov/dph/ohsp. In the last few years, the FACE project has highlighted some of the work hazards that put immigrant workers at risk for injury by issuing one page Safety Alerts and FACE Facts that describe fatal incidents, inform workers of their health and safety rights on the job, and propose recommendations to prevent similar events from occurring again. Locally, OSHA regional and area offices have outreached to Hispanic workers and their employers by providing educational activities and consultation services. Information, resources, and publications in Spanish can be found on the OSHA website at <http://www.osha.gov/as/opa/spanish/index.html>.

⁸ U.S. and Massachusetts workforce estimates calculated using Current Population Survey data; U.S. Department of Labor, Bureau of Labor Statistics, 2003-2004.

⁹ MassINC (The Massachusetts Institute for a New Commonwealth). (2005). *The Changing Face of Massachusetts*.

¹⁰ Frumkin H. Pransky G. (1999). *Special Populations in Occupational Health*. *Occup Med: State of the Art Reviews*, 4(3):479-84.

¹¹ Azaroff L. Levenstein C. Wegman D. (2002). *Occupational Injury and Illness Surveillance: Conceptual Filters Explain Underreporting*. *Am. J. Pub Health*, 92(9): 1421-29.

**Two Vietnamese Floor Sanders Die When Wood Floor Finish Product Ignites - Massachusetts
Massachusetts FACE Report 04MA032**

Two hardwood floor sanders were fatally injured when the three-family house they were working in caught fire. The victims were refinishing the wood floors in the third floor unit and the stairs leading up to this unit. The incident occurred when the flammable lacquer floor sealer they were applying was ignited by a pilot light in a gas stove, causing the house to catch fire. At the time of the incident, the windows were closed and no other means of ventilation were being used. The company did not have a written hazard communication program. The victims received on-the-job training, but it did not address the hazards associated with this incident. Both of the fatally injured workers were Vietnamese immigrants. The company owner was also Vietnamese.

In order to prevent similar incidents, Massachusetts FACE recommended that employers should:

1) use wood floor finishing products that are less flammable (products with flash points greater than 100°F) for indoor applications; 2) ensure that ignition sources, including gas pilot lights, are extinguished prior to beginning work; 3) ensure that work areas are adequately ventilated during indoor application of wood floor finishing products; 4) conduct job hazard analyses and implement and enforce a safety checklist to be completed prior to beginning work; 5) develop, implement, and enforce a written hazard communication program that includes training employees about the chemicals they work with and the associated hazards and controls of these chemicals. Additional recommendations for the wood floor finishing industry, homeowners, policymakers, and other stakeholders can be found in FACE Report #04MA032 at www.cdc.gov/niosh/face/MAFACE.html.

The FACE Program, in conjunction with the Office of the State Fire Marshall, also released a Fire Safety Alert in response to this incident that is available in English as well as Vietnamese. A black and white English version of this alert is located on the next page. See the contact / material request information section below on how to obtain full size color copies of the alert in English and Vietnamese.

CONTACT / MATERIAL REQUEST INFORMATION

For detailed tables of fatal occupational injuries in 2003 and 2004, previous fatality update reports as well as FACE Facts and Safety Alerts, please contact the Massachusetts Department of Public Health, Occupational Health Surveillance Program, 250 Washington Street, 6th Floor, Boston, MA 02108-4619. These reports may also be obtained by calling 1-800-338-5223. Some can be accessed online at www.mass.gov/dph/ohsp, under the 'Educational Materials' or 'Data Reports and Publications' section of 'Fatal Work-related Injuries.'

ACKNOWLEDGEMENTS

This project is a joint effort of several state and federal agencies. For their assistance in providing data and advice, we thank: Marthe Kent, Regional Administrator, OSHA Region I; Robert Hooper, Assistant Regional Administrator, OSHA Region 1 and his staff; Stanley Nyberg, Registrar of Vital Records and Statistics, MA Department of Public Health and his staff; and Anthony Conti, Director, MA Fatal Accident Reporting System (FARS). We also appreciate the contributions of the MA Department of Labor and Workforce Development, the MA Office of the Chief Medical Examiner (CME), the MA Department of Industrial Accidents, the U.S. Coast Guard, the National Transportation Safety Board (NTSB), the Boston Regional Office of the U.S. Bureau of Labor Statistics, the National Institute for Occupational Safety and Health (NIOSH), local and state police departments, health departments, and clerks of cities and towns.

Fire Safety Alert

Occupational Health Surveillance Program- Massachusetts Department of Public Health
Office of the State Fire Marshal Department of Fire Services



March 2006

Wood Floor Sanders Killed When Floor Finishing Product Catches Fire-Massachusetts

Wood floor finishing can expose workers, building occupants, and homeowners to fire hazards. In Massachusetts, three wood floor sanders died within a 10 month period (September 2004 – July 2005) in two separate fires when the flammable lacquer floor sealer they were using caught fire. The sealer used in these incidents was highly flammable (flash point 9°F/-13°C). All three of the fatally injured workers were Vietnamese immigrants.

Incident 1: Two floor sanders died from burns and two were seriously burned while they were refinishing wood floors in a three-family house. The house caught fire while the workers were applying a lacquer sealer that was ignited by a pilot light in a gas stove. At the time of the fire, windows were closed and no other means of ventilation were being used.

Incident 2: One floor sander died from burns and another received minor burns while finishing wood floors that they installed in a single family house. The house caught fire while the workers were applying a lacquer sealer that was ignited by a pilot light on a gas hot water heater. The heater was located in a closet on the same level of the house where the floors were being finished. At the time of the fire, the front door was open, but windows were closed and no other means of ventilation were being used.



FLAMMABLE

What is the flash point of a liquid?

The flash point is the lowest temperature at which a liquid produces enough vapor to catch fire in the presence of a flame or other ignition source. The lower the flash point, the more flammable the liquid. A product's flash point can be found on the *Material Safety Data Sheet* (MSDS), or product label or by calling the product manufacturer.

HOW CAN YOU HELP PREVENT FIRE DURING FLOOR FINISHING?

Use less flammable wood floor finishing products (products with flash points greater than 100°F/38°C) for indoor applications.

Extinguish all open flames and other ignition sources before beginning work.

- Extinguish gas appliance pilots (on stoves, hot water heaters, heating units, clothes dryers, and other appliances).
- Turn off and unplug cycling electrical appliances (such as refrigerators, air conditioners, heating units, hot water heaters) and other electrical devices.
- Do not light or smoke cigarettes while you are working.
- Do not turn light switches on or off during the floor finishing process; turn off power to work area, if possible.

Adequately ventilate work areas during wood floor finishing.

- Open windows; keep open during product application until product is dry.
- If electric fans are used for ventilation, they must be classified as *explosion proof* and be plugged in outside of the work area.

In addition, employers should:

Provide safety training to employees, as required by law,* about the hazards of the chemicals they work with and safe work practices. Training should be provided in the languages spoken by employees.

*The Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 CFR 1910.1200).

Conduct a job hazard analysis before each job. Also require employees to complete a safety checklist before beginning each job.

Before starting floor finishing jobs, employers should get information on manufacturer's safety recommendations for all products being used, ignition sources in the house and how to keep the work area ventilated. This information should be part of the safety checklist given to the work crew before going to the work site. Employers should make sure that the safety checklist has been completed before anyone starts work.

Please report work-related fatalities immediately to the
Toll-Free Occupational Fatality Hotline

1-800-338-5223

or

Fax 617-624-5696

When reporting a fatality, include the following information:

- Your name, organization, address, and phone number
- Victim's name, occupation, and employer
- Brief description of the incident, including date and time

The Occupational Health Surveillance Program would like to thank all agencies and people that contribute to our efforts in preventing work-related deaths by reporting fatalities and providing information during our fatality investigations.

Appendix 6

Articles Printed in Trade Publications



Nitco Materials Handling Solutions Newsletter

Forklift Operator Training Pays Dividends

February 2003

in this issue

Frequently Asked Questions--

OSHA steps up enforcement in New England

Under 18 Not Allowed!

Don't have time for Operator Training? Think again...

Greetings!

Providing formal training for your lift-truck operators pays surprising dividends, in addition to satisfying your federal OSHA obligations.

Trained and certified operators behave more professionally and take more pride in their work. This often translates into fewer accidents and incidents; potentially reducing your insurance premiums. Trained operators also take better care of their equipment, resulting in lower maintenance expense. The bottom line - trained operators are more productive.

Frequently Asked Questions--



Here are some of the most common questions that our customers ask us about complying with OSHA's Powered Industrial Truck (forklift) operator training regulations:

1. How often do I have to certify my operators?
2. I have only motorized pallet jacks in my warehouse. I don't have to train my operators, right?
3. I have a high turnover of

• OSHA steps up enforcement in New England



OSHA has stepped up enforcement in New England of its forklift regulations. Under a current OSHA "local emphasis" program (directive # CPL 2-1.22), OSHA will:

Read on...

• Under 18 Not Allowed!



According to both state and federal law, teens less than 18 years of age are not allowed to operate forklifts at work!

Do you employ teenagers? It's important that you're aware of the special safety needs of young workers.

Full Story

• Don't have time for Operator Training? Think again...

employees. Can I learn to give this training myself?

[Find out more....](#)



Through training, operators learn to watch for, anticipate and react to hazards before an accident or incident occurs.

[Full Story](#)

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NITCO MATERIALS HANDLING SOLUTIONS NEWSLETTER

DO-IT-YOURSELF FORKLIFT TRAINING - 'PENNY WISE AND POUND FOOLISH'?

Summer
2003

in this issue

FREQUENTLY ASKED QUESTIONS--

DO-IT-YOURSELF FORKLIFT TRAINING - continued from above:

THE LOWDOWN ON 'MAN LIFTS'

Your opinion counts!

From Previous Issues

More...

Greetings!

Designating one of your existing employees as your forklift trainer without the benefit of a train-the-trainer course can appear to be a way to cut costs while still meeting your training obligations because you do not have to bring in outside professional instructors. But is your in-house training program really effective?

• DO-IT-YOURSELF FORKLIFT TRAINING - continued from above:



Effective training benefits your business in many more ways than ensuring compliance with OSHA or your insurance company's requirements.

Full Story

FREQUENTLY ASKED QUESTIONS--

Here are some of the most common questions that our customers ask us about complying with OSHA's Powered Industrial Truck (forklift) operator training regulations:

1. How often do I have to certify my operators?
2. I have only motorized pallet jacks in my warehouse. I don't have to train my operators, right?
3. I have a high turnover of

• THE LOWDOWN ON 'MAN LIFTS'

Answers to Frequently Asked Questions about Aerial Lift Operator Safety Training

We are asked a number of questions on a regular basis with regard to Aerial Lift Operator Safety Training. For answers to some of the most frequently asked questions..

Read on...

• Your opinion counts!

In an effort to provide you with relevant information, I need your feedback--so, please click on the link below and spent 15 seconds completing our very brief survey

Go to Survey

employees. Can I learn to give this training myself?

[Find out more....](#)



[OSHA Steps up Enforcement in New England](#)

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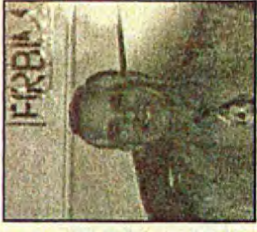
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Perc Fee Stalls In California, 8

Hercules Machinery Earns Award, 14

CLA Holds Annual Convention, 28



Carlucci, pg. 14

DRYCLEANERS NEWS®

VOLUME 53 NUMBER 7 JULY 2004

YOUR NEWS AND MANAGEMENT MAGAZINE

IFI Moving To New Location

Borrowing a phrase from legendary TV drycleaner George Jefferson, the International Fabricare Institute (IFI) is "movin' on up!" Following one-and-a-half years of negotiations with two suitors, IFI recently sold its existing facility and property and has purchased a new headquarters facility.

"It's taken a long time and a lot of negotiations to get us here," IFI Chief Executive Officer Bill Fisher says, "but IFI's leadership saw an opportunity to relocate IFI and simultaneously reinforce IFI's financial well-being, improve instructional facilities and upgrade training equipment."

See story on page 8

ONtheINSIDE

Distributor Directory

This month, *Drycleaners News* presents its annual Distributor Directory, an informative guide to companies that can provide the equipment you need to run an economically- and environmentally-sound operation. An alphabetical listing of distributors begins on page 16, along with the categories of products and services they provide on page 18 Page 16

FIRST-YEAR OWNERS GROWING THE BUSINESS

BY PATRICK CONWAY

When Surendra and Malini Jadav took over as the owners of

fruits of their labors.

"When we decided to buy the business, we knew it was struggling, but we saw a lot of potential in it," Surendra said

willing to learn it from top to bottom."

When a business broker discovered the business for sale, one of Surendra's



Malini and Jurendra Jadav, new owners of *Town and Country Cleaners* in Watertown, Conn.

Town & Country Cleaners in Watertown, Conn., on May 7, as he greeted customers with a big smile. "My wife and I are not afraid of hard work, and I am a great time looking over

cousins, who operates a dry-cleaning store in Pennsylvania spent time looking over

products and services they provide on page 18 Page 16

New Introductions Add To Options

The handling and use of perchloroethylene has never been safer, and it is still the solvent of choice for over 75% of the country's drycleaners. But for those drycleaners interested in moving away from perc as a solvent, there are now even more options to choose from with the introduction of two new products to the market among the news on the alternatives' front.....Page 32

Departments

14 Trade Names 30 Products
31 Classified 32 Directory

Focus On Image At Fabricare Cleaners

"I don't think there is a more difficult business than drycleaning, yet it's a fact that our pricing has not kept up with the other service industries," says Michael Astorino of Fabricare Cleaners in Darien, Conn., who is profiled in this month's Coming Clean column on page 4. Astorino and partner Tim Driver have utilized their business backgrounds and a focus on quality service and image to build the business. "We now have 35 employees, and we're still growing," says Astorino, who believes "people are very concerned with getting quality work and good service, but they are also very concerned about pricing. That's why it's so important to work hard to keep customers, and we constantly try to communicate with them and educate them."

Town & Country Cleaners in Watertown, Conn., on May 7, 2003, they knew it would take a lot of time and hard work in order to turn the business into a success.

And now, a little more than a year later, the husband and wife team are enjoying the

as he greeted customers with a big smile. "My wife and I are not afraid of hard work, and we were willing to put in the time to turn the business around. Although drycleaning is new to us, we have family members and friends who are in the business and we were

cousins, who operates a dry-cleaning store in Pennsylvania, spent time looking over the Watertown operation.

"He thought it was a good investment with a lot of potential, and we made the decision
continued on page 10

Pressing Equipment

Mass. Dept. of Public Health Releases Safety Report

Resulting from a project investigating the death of a pressing machine operator in a drycleaning shop two years ago, the Massachusetts Department of Public Health recently outlined a number of safety recommendations for the state's employers operating similar equipment.

The department's Fatality Assessment and Control Evaluation (FACE) Program conducted an investigation into this incident and released a report containing recommendations that employers can use to improve workplace safety and help prevent similar incidents from recurring. The department has already distributed their report to nearly 200 drycleaners in Massachusetts.

The report includes a description of the incident and recommendations for employers and shirt pressing machine manufacturers, as well as a reference to an OSHA Safety and Health Information Bulletin describing the same incident.

Massachusetts is among 15 states that have a FACE program, funded by NIOSH, which are responsible for identifying and studying work-related fatalities and producing educational safety materials in an effort to prevent recurrences of preventable fatalities.

To arrive at the recommendations resulting from the 2002 fatality case mentioned above,

continued on page 12

Massachusetts Health Dept. Releases Safety Report

always use the best materials, including detergents, that are needed.

"In this business, quality and service are most important," he continues. "Customers are willing to pay for what they get. And I've noticed that people are dressing up more and more these days. Shirts and ties, as well as jackets and suits, are coming back. We thought about many businesses when we were looking, and we are very happy we chose drycleaning. It was definitely a good choice." **DCN**

continued from page 1

investigators took into account interviews with the drycleaner/employer, the police report, death certificate and corporate information, as well as OSHA's fatality/catastrophe report.

Tragic incident

On February 26, 2002, a 44-year-old female machine operator was fatally injured when she became caught in the shirt

pressing machine she was operating. The victim had reached down into an opening in the loading table, became stuck, and called to a co-employee for help. While the co-employee was attempting to help the victim, the shirt pressing machine cycled, releasing the shirt from the pressing area and crushing the victim's right arm, right shoulder, neck and chest.

Additional co-workers were also unable to free the

victim from the machine and a call was then placed for emergency assistance. Personnel from the local and state police and the fire department were notified and responded to the scene within minutes.

The Jaws of Life apparatus was used to free the victim from the shirt pressing machine, and she was rushed to a local hospital where she was pronounced dead. The medical examiner listed the immediate cause of death as

acute respiratory arrest due to mechanical asphyxia.

The owner/employer had been in business for approximately 44 years at the time of the incident. The company employed five people, all of whom had worked at the drycleaner for at least eight years. The victim had been employed with the drycleaner for 19 years, and one employee had worked for the drycleaner for the entire 44 years the company had been in business.

Employee training at the shop was primarily "on-the-job," except when new equipment was purchased. It was reported by the employer that in 1993, upon delivery of the shirt pressing machine involved in the incident, the manufacturer provided training to the owner and employees on how to operate the machine. The company did not have a safety and health committee, but it has been an active member in a local dry cleaners association where safety was an underlying priority.

Program recommendations

The full FACE report lists seven recommendations for employers and equipment manufacturers of similar shirt pressing equipment, followed by discussions by investigators on each guideline in relation to the fatality that led to the FACE investigation.

Recommendation #1: Employers should ensure that accessible and exposed mechanical hazards of a shirt pressing machine are controlled.

During normal operation of the shirt pressing machine, an opening (10" wide by 48" long) in the loading table became accessible to employees when the buck was in the pressing head area. This opening in the loading table became a pinch point hazard to employees when the buck returned to its loading table start position covering the opening.

In this case, a guard that eliminated employee access to the opening in the loading table when the buck was in the pressing head area would have eliminated the pinch point hazard and prevented the victim from becoming caught in the opening.

Recommendation #2: Employers should ensure that shirt pressing machines are equipped with emergency stops.

In this case, if the machine were equipped with an emergency stop that immediately

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opped all of the machine functions, including releasing pneumatic pressure, it could have reduced the victim's injuries. When considering altering a piece of equipment, such as adding a guard id/or an emergency stop, the equipment manufacturer id/or an engineer should be consulted.

Recommendation #3: Employers should periodically perform equipment hazard analyses to ensure equipment is safe to operate.

The shirt pressing machine involved in the incident was manufactured and purchased in 1993 by the company involved in the incident and as operated for many years without incident. Employers might assume equipment that has been functioning without incident for a number of years is "safe" as designed by the manufacturer. Performing machine-specific hazard analysis might reveal potential hazards that have previously gone unnoticed.

It is the employer's responsibility to ensure a safe work

place for their employees. A hazard analysis is a way of focusing on job tasks to identify hazards to which employees might be exposed. Machine-specific hazard analyses should be performed on all equipment, both new and old, to identify potential and known hazards.

Once uncontrolled hazards are identified, the employer should take steps to eliminate or control these hazards. In this case, a hazard analysis of the shirt pressing machine involved in the incident might have revealed the hazard of the exposed and accessible opening in the loading table, prompting the employer to take extra steps to control the hazard.

Recommendation #4: Employers should train equipment operators and employees on all aspects of the equipment, including functions that don't pertain to daily operation.

In this case, training provided to employees had been on-the-job and by equipment manufacturers upon delivery of purchased equipment.

Training on the shirt pressing machine involved in the incident was last conducted nine years prior to the incident, in 1993, when the machine was delivered.

Employers should provide training, with annual refreshers, to all equipment operators and employees that work in close proximity to the equipment.

Training on shirt pressing machines should include proper operation, all safety features and safety hazards of the machine, including the hazard of jewelry or loose fitting clothing potentially becoming caught while operating the machine.

The training should also include functions that don't pertain to daily operations, such as operation of air valves. In this incident, an air valve that was located behind the machine would have released the machine's pneumatic pressure, allowing the buck to be moved manually. If the co-workers had the knowledge of the air valve's location and function, the victim's injuries might have been reduced.

Recommendation #5: Employers should develop, implement and enforce a comprehensive safety and health program that includes, but is not limited to, hazard recognition, safety training and protocols to safely complete tasks.

A comprehensive safety and health program should be routinely updated with employees' input when safety concerns arise and when new equipment and new tasks are introduced into the workplace. When updating a comprehensive health and safety program, employees should participate by evaluating possible hazards associated with equipment and techniques involved in completing their tasks. Employees will know the most about the effectiveness, limitations, and inconveniences of the equipment and procedures to complete tasks.

In this case, if the employer had a comprehensive health and safety program, the pinch point hazard of the accessible and exposed opening in the loading table might have been

identified and controlled prior to the incident. In addition, to ensure employees are following the protocols that they were trained in, employers should perform periodic scheduled and unscheduled observations of employee performance and work with employees to eliminate any observed unsafe work practices immediately.

Recommendation #6: Shirt pressing machine manufacturers should design machines so moving parts are not exposed and accessible and ensure emergency stops are linked to the pneumatic system.

The shirt pressing machine involved in the incident had been designed with multiple safety features to prevent workers from becoming caught between the buck and the machine's pressing head area. To fully protect workers, a safety feature should have been designed to prevent workers from becoming stuck between the buck and the loading table. A guard designed to cover the exposed

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and accessible opening in the loading table would have eliminated the pinch point hazard. At the time of the investigation, the employer had been in contact with the machine manufacturer, working on developing additional guarding for the machine.

Shirt pressing machines and similar style equipment should be designed with emergency stops, which override all other switches on the machine. Emergency stops should be located close to the operator. An emergency stop for this machine could be designed to automatically release the pneumatic pressure when the emergency stop switch is engaged by an employee or if a pressure sensor detects resistance during

the buck transfer, such as the buck striking an object. Releasing the pneumatic pressure would end the cycle, allowing the buck to be moved manually. This type of emergency stop might have reduced the victim's injuries.

Recommendation #7: Shirt pressing machine manufacturers should explore the possibility of reducing the force used to transfer the buck to and from the loading head and pressing head area.

The force needed to transfer the buck into and out of the pressing area should be relatively constant for all shirts being pressed. Therefore, the manufacturer should explore the possibility of alter-

ing the transfer cycle to reduce the force used in transferring the buck. Combining a reduction of force used to transfer the buck with an emergency stop that would engage when the buck detects resistance (as described in recommendation #6), could have reduced injuries in this case.

References

The Massachusetts Department of Public Health lists the following as references for the FACE project and its recommendations:

- United States Department of Labor, Occupational Safety and Health Administration, Safety and Health Information Bulletins, Cabinet Press Pinch Point Hazard, SHIB 03-07-16 www.osha.gov/dts/shib/sub071603.html
- Unipress, Instruction and Parts Manual, CSBV, January 1993
- United States Department of Labor, Occupational Safety and Health Administration, Job Hazard Analysis, Publication Number 3071, Government Printing Office.
- Code of Federal Regula-

tions, 29 CFR 1910.212 Machinery and Machine Guarding, General requirements for all machines, Government Printing Office.

DCN

The entire FACE report can be viewed at www.cdc.gov/niosh/face/stateface/ma/02m002.html, or a copy can be obtained from the Massachusetts Department of Public Health by calling (617) 988-3341. Additional safety materials from MDPH are available at www.mass.gov/dph/ohsr/ohsp/ohsp.htm.

TRADEnames

TCATA Officers Announced At Conference

Bill Odorizzi, vice president of sales for the F. H. Bonn Co. in Springfield, Ohio, assumed the presidency of the Textile Care Allied Trades Association (TCATA) during the association's annual conference in May at Hilton Head, S.C. His term runs through the 2006 conference.

Odorizzi has been an active member and contributor to TCATA since he became involved in the industry 10 years ago. He just completed a two-year term as TCATA's secretary-treasurer, was program chair for the 1998 conference and general conference chair for the 2000 conference, and has served as a member of the ACME Committee, Directors Nominating Committee, Officers Nominating Committee, Executive Committee and has been on the TCATA board since 1999.

In remarks delivered at the closing dinner during the conference, Odorizzi noted that the primary focus during his term will be the implementation of TCATA's core mission. Odorizzi has been with F. H. Bonn Co. for 10 years. Previously, he was vice president of the Dayton Development Council.

Alex Atwater of A-1 Products, Birmingham, Ala., assumed the position of secretary-treasurer, having been elected to that position last year. His term runs for two years.

Also elected at the TCATA

Conference were three vice presidents: Janet Hickman, Dow Chemical Co., representing the Supply Manufacturers Group; Rick Kelly, Pellerin-Milnor Corporation, representing the Machinery Manufacturers Group, and Lawton Jones, Phenix Supply Co., representing the Distributors Group.

industrial laundry chemical market, Guy Seguin has joined Gurtler as the regional manager for Canada. In his most recent position with a laundry chemicals company, Seguin managed the sales force for Eastern Canada and was responsible for training and development. In addition, Seguin is a certified trainer for the Quebec Hospital Laundry Association and is responsible for their laundry manager training program.

For more information on Gurtler Industries and its Canadian operation, call (800) 638-7300 or visit www.gurtler.com.

Changes Web Address

MidAtlantic Association of Cleaners has changed its Web site URL to www.midatlanticassociation.org to better reflect its name, the association says. In addition, MidAtlantic's new e-mail address is midatlanticassociation@direcway.com.

The former e-mail address is no longer active, and e-mails sent to the association's old address will be returned as undeliverable, MidAtlantic says.

MidAtlantic Association of Cleaners is an IFI affiliate, representing members in Virginia, Maryland, West Virginia and the District of Columbia. For more information on becoming an IFI/MidAtlantic member and accessing exclusive business improvement programs and benefits, contact MidAtlantic at (800) 235-8360 or visit its new Web address. **DCN**



Joe Carlucci (center) of Hercules Machinery, Island Park, N.Y., was recently honored with the 2004 Five Star Distinguished Distributor award from Fibrimatic. On hand for the presentation were Vincent Minarelli (left), export manager for Fibrimatic, Italy, and Bob Halges of Fibrimatic USA.

New Venture In Canada

Gurtler Industries Inc., based in South Holland, Ill., has opened a new sales and service operation in Montreal, offering a line of laundry chemical products and services in the provinces of Quebec and Ontario. Alan Gordon, vice president, corporate accounts, will lead the business development program for Canada.

With over 35 years' experience in the institutional and

FROM McALLISTER

John's Cleaners recently purchased two McAllister pressing machines - models MRS-7204P and MRS-111A - from McAllister Retail Services of Alpharetta, Ga., for their operation based in Lafayette, Colo.

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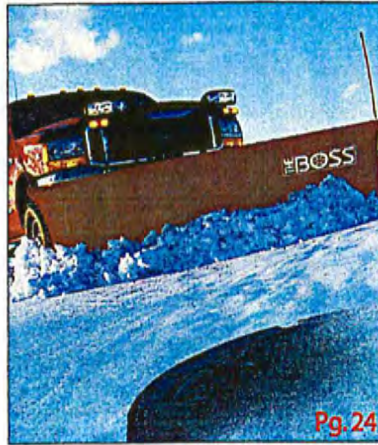
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Trencher Chains and More



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Skid Steer Safety on Pedestrian Surfaces

Work Securely on Grates and Sidewalks by Understanding Your Jobsite Load Capacities

By Michael A. Fiore

Skid steer loaders provide great maneuverability and power within a compact frame, making them useful in urban settings. Many urban property owners, property management companies, contractors and municipalities use skid steer loaders to clear snow and sweep sidewalks, as well as to complete other landscaping and construction tasks with a variety of attachments.



Before using a skid steer on any public or private pedestrian way that has hollow sidewalks or sidewalk grates, it is essential to make sure that the systems in place were designed to support these loads.

In urban areas where space is limited, many property owners try to use all available space — even the areas below sidewalks. Access grates within sidewalks and or hollow sidewalks (also called vaults) are sometimes created when these areas are utilized.

Before using a vehicle on any public or private pedestrian way that has hollow sidewalks or sidewalk grates, it is

essential to make sure that the systems in place were designed to support these loads. Older grate and hollow sidewalk systems could be of concern because they might have been built to load capacity requirements that did not take into consideration certain loads, such as skid steers and other heavy compact equipment. In addition, older grates may have corroded structural supports that are not visible without performing structural inspections.

The Massachusetts Department of Public Health, in cooperation with the National Institute for Occupational Safety and Health (NIOSH), conducts investigations of work-related fatal injuries through the Massachusetts FACE (Fatality Assessment and Control Evaluation) project. The goal of the FACE project is to prevent fatal occupational injuries across the state and nation by conducting investigations to identify the contributing factors of the incident. Then FACE will help in the development and use of improved safety measures for preventing occupational injuries in the future.

Massachusetts FACE conducted an investigation into the work-related fatality of an auto mechanic for a local hospital who was fatally injured while using a skid steer loader to clear snow during a blizzard. The victim was clearing snow from a sidewalk, owned by the hospital, when the skid steer broke through a ventilation shaft sidewalk grate. The victim and the skid steer fell approximately 20 ft to the bottom of the ventilation shaft. The force of the skid steer loader hitting the bottom of the shaft caused the victim's head to strike the back of the operator's seat. The victim was in the ventilation shaft for approximately two hours before co-workers discovered him.

The sidewalk grate and connecting shaft were originally constructed as part of a ventilation system for a transformer. At the time of the accident, the sidewalk grate and shaft were no longer being used for their original function, but had been incorporated into the heating, ventilation and air conditioning system for the hospital. It was determined after the accident that some of the bolts that held the grate's supporting structure were corroded.

Recommendations

To prevent similar accidents, employers, property owners and municipalities with sidewalk and roadway grates on their property should:

- Know the intended load capacities for the grates
- Maintain current engineering drawings for the grates that reflect as-built conditions
- Check cities or towns for local regulations and building codes that pertain to grate systems and heavy equipment use on sidewalks
- Have registered professional engineers conduct routine structural inspections of the grates
- Develop preventive maintenance schedules for the grates
- Consider redesigning grate systems that currently lack redundant supporting mechanisms
- And explore the possibility of eliminating or reducing the size of older grates when the original function of the system that the grate was part of has been eliminated, changed or updated.

In addition, in this accident the victim was working alone in extreme weather conditions. Employers should develop, imple-

ment and enforce communication protocols, such as routine personnel checks every 30 minutes via radio or in person to enhance safety of employees who are assigned to tasks that involve working alone in extreme weather conditions.



Keep a look out for safety signs.

This article was based on a FACE Facts sheet that can be found along with other materials on the Massachusetts Department of Public Health's Web site at www.mass.gov/dph/bhsre/ohsp/ohsp.htm.

References:

1. Code of Federal Regulations, 29 CFR 1910.22, General requirements, Government Printing Office
2. Code of Federal Regulations, 29 CFR 1910.23, Guarding floor and wall openings and holes, Government Printing Office
3. United States, Department of Labor, Occupational Safety and Health Administration, Safety and Health Information Bulletins, Hazard of Potential Sidewalk Grate System Failure, SHIB 12-30-2004. Web: www.osha.gov/dts/shib/shib123004.html

Michael A. Fiore is the Massachusetts FACE project director, Occupational Health Surveillance Program, Massachusetts Department of Public Health, Boston.



Know the intended load capacities for grates and have registered professional engineers conduct routine structural inspections of the grates.