

2002

**Annual Report on
Traumatic Work-Related
Fatalities in Michigan**



2002 Annual Report On Traumatic Work-Related Fatalities in Michigan

A Joint Report
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Summary

In January 2001, the Division of Occupational and Environmental Medicine at Michigan State University (MSU), in cooperation with Wayne State University, began a special program to track work-related fatalities. This is the second annual report on the results of this surveillance. One hundred fifty-one individuals died in 2002 from an acute traumatic injury at work in Michigan, down from 174 in 2001. The largest number of deaths occurred in Construction (40), followed by Manufacturing (24), Agriculture (21), and Retail Trade (20).

The ranking of industries by *risk* of death differed: Agriculture had the highest annual average incidence rate (45.6 deaths per 100,000 workers), followed by Mining (25.0 deaths per 100,000 workers), and Construction (20.0 deaths per 100,000 workers).

Most deaths occurred among men (92%) who were white (90.6%). The average age of death was 42.2 years and ranged from 13 to 85. Illegal drugs, alcohol or side effects of prescribed medication was a potential factor in approximately 20 percent of the deaths. The largest number of work-related traumatic events occurred on a Tuesday (28) followed closely by Friday (27). July was the most common month (20, 13.3%) and 8:00a.m. to 12:00p.m. was the most common time of the day (34, 31.2%) for the occurrence of traumatic incidents.

The most common means of death were from motor vehicles (31), followed by homicides (22), falls (21), and machines (20).

The 151 individuals who died had 147 different employers. Three employers had a fatal incident where more than one person died. Descriptions of each of the deaths is in Appendix I. Copies of the reports of the detailed investigations are at the Michigan State University Department of Occupational & Environmental Medicine (MSU OEM) www.chm.msu.edu/oem.

Michigan Occupational Safety and Health Act (MIOSHA) staff investigated forty-seven of the deaths at forty-seven employers. The police investigated 64 of the deaths (motor vehicle, homicides and suicides). Six of the deaths were investigated only by Federal agencies (aircraft and mining). The other 34 deaths were not investigated by a regulatory agency as to cause of death other than by the police to exclude a homicide or suicide.

Although acute work-related traumatic fatalities represent only a small percentage of the approximately 87,000 deaths that occur annually in Michigan, work-traumatic fatalities are preventable. The descriptions of the acute traumatic work-related deaths in Appendix I highlight these tragedies and the need despite their relatively small number to take action to prevent them. Further efforts to investigate the circumstances leading to these deaths and disseminate information from what we learn are necessary to educate and where applicable, recommend change in regulations to prevent similar deaths from occurring in the future.

Background

The Michigan Fatality Assessment and Control Evaluation (MIFACE) is a joint research project of Michigan State University College of Human Medicine's Occupational and Environmental Medicine Division and Wayne State University Department of Occupational and Environmental Health Sciences. Surveillance and prevention activities of traumatic work-related deaths by MIFACE began January 1, 2001.

The purpose of the MIFACE surveillance project is threefold: 1) identify types of industries and work situations where workers are dying from acute traumatic incidents, 2) identify the underlying causes of the work-related fatality, and 3) formulate and disseminate prevention strategies to reduce work-related fatalities.

MIFACE uses the National Institute for Occupational Safety and Health (NIOSH) Fatality Assessment and Control Evaluation (FACE) program as a model. Since 1982, NIOSH has run a multi-state FACE program. The goal of the FACE program is to "prevent occupational fatalities across the nation by identifying and investigating work situations at high risk for injury and then formulating and disseminating prevention strategies to those who can intervene in the workplace". NIOSH FACE investigations have provided aggregate data to identify high-risk industries and work practices as well as provided the stories or "faces" necessary to make the statistics real and influence change in the workplace. Emphasis on information dissemination and translation of information into user-friendly materials is an important part of both the NIOSH and MIFACE program.

Methods

MIFACE used numerous sources to identify persons who have died from a work-related injury: (1) MIOSHA, (2) Police Departments, including Fatality Analysis Reporting System (FARS) crash reports, (3) County Clerks, (4) Medical Examiners, (5) Michigan State University County Extension Offices, (6) Newspaper articles, and (7) Emergency Service Providers, including Fire Departments.

Any person who dies from a work-related injury that occurs while performing his/her job was included in the MIFACE program. Deaths from natural causes, such as heart attacks, were not included. Suicides were included, following the protocol established by the NIOSH FACE program as well as that of the United States Department of Labor Bureau of Labor Statistics (BLS), which collects the official statistics of work-related deaths in all states.

Once an individual had been identified and confirmed as an eligible work-related death, various sources of information were used to describe the circumstances associated with the fatal event. Basic information we attempted to collect included: the size of the company; the content of the safety program; the victim's age, gender, and occupation; tasks the victim was performing; tools or equipment the victim was using; the working environment; the energy exchange resulting in the fatality; and the role of management in controlling how these factors interact.

The level of information collected for each fatality depended on the type of incident.

For homicides, suicides and most transportation-related fatalities that occur while the individual was at work, MIFACE collected only source documents.

Source documents included reports from agencies that investigated the death or provided emergency services when the event occurred, death certificates, medical examiner reports and, when appropriate, the MIOSHA fatality investigation narrative.

For the remaining work-related fatalities including agricultural fatalities, MIFACE initiated contact with employers or farm family members to request permission for an on-site investigation. Employer participation in the MIFACE program was voluntary and was unrelated to any regulatory or enforcement procedures. It is important to note that MIFACE investigators did not enforce compliance with Michigan Occupational Safety and Health Act (MIOSHA) rules and regulations and did not assign fault or blame. However, to decrease the burden to the employer of multiple investigations, MIFACE with employer agreement, accompanied the MIOSHA compliance officer. Also MIFACE interviewed the compliance officers about their investigation.

When the MIFACE on-site fatality investigation was completed, a report was written based on the facts identified during the investigation and from reviewing the source documents. Neither reports nor educational materials produced by the MIFACE program contained personal identifiers. The MIFACE report contained a summary of the fatal incident, a detailed narrative of the fatal incident, the cause of death and recommendations to minimize the chances of a similar fatality occurring in the future. Before releasing the MIFACE report, the report was reviewed by MIOSHA (if MIOSHA conducted an investigation), and members of the MIFACE advisory board. The MIFACE report was sent to the employer and other groups that could potentially affect work practice changes to eliminate or reduce the chances of a fatality occurring under similar circumstances in the future.

MIFACE has posted completed investigative reports on the MSU OEM website at www.chm.msu.edu/oem/.

Results

There were 151 acute traumatic work-related fatalities in 2002. One hundred forty-six (96.7%) of the 151 work-related traumatic incidents occurred in 2002. In five cases, the traumatic incidents occurred in a prior year, and the individuals died of complications from their injuries in 2002. The traumatic incidents occurred in 1988, 1989 and two in 2001. The year of injury was not identified on the death certificate for the fifth death. Two individuals died from complications of blunt force cranio-cerebral trauma, one individual died due to multisystem organ failure as a result of a vehicle accident, one individual died as a result of sepsis after 60% of his body was burned, and one individual died from a post-traumatic seizure disorder after a fall from a machine.

Demographics

Gender

One hundred thirty nine (92.1%) of the individuals who died were men and 12 (7.9%) were women.

Race/Ethnicity

One hundred thirty one (88.0%) of the individuals who died were Caucasian, eight (5.3%) were African American, seven (4.9%) were Hispanic, one (0.7%) was Alaskan or American Indian, one (0.7%) was Asian/Pacific and one (0.7%) was of Middle East descent. Race was unknown for two individuals.

Age

The age distribution of the individuals who died from a work-related injury is shown in Figure 1. The ages ranged from 13 to 85. The average age was 42.2 years. One hundred forty one (93.4%) of the deaths occurred in individuals between the ages of 18-69. The one death in a youth and the nine deaths in the elderly are described below.

One thirteen year old youth who worked on a farm, was sitting on a horse drawn cart attached to a hay wagon with steel wheels. A loud sound startled the horses, causing them to lurch forward. This movement caused the youth to fall off of the cart. His head was crushed by the steel wheels of the hay wagon.

Nine individuals, with ages ranging from seventy to eighty-five died from acute work-related events. Seven of the nine individuals were self-employed workers; three were farm owner/operators and four were the owner/operator of a business (independent contactor, car dealership, handyman, and pilot). One individual was employed by a home improvement store. The employment status of the other individual could not be identified.

Marital Status

Eighty-two (55.4%) individuals who died from traumatic incidents were married, 44 (29.7%) individuals were single or never married, 19 (12.8%) individuals were divorced, and three (2.0%) individuals were widowed. Marital status was unknown for three individuals.

Educational Level

Twenty-nine individuals (19.9%) had not completed high school, 61 individuals (41.8%) completed high school and received a high school diploma, 51 individuals (34.9%) completed 1-4 years of college, and five individuals (3.4%) had 5+ years of college. Educational level was unknown for five individuals.

Table 1 shows the distribution of education level by industry. Among individuals completing high school but no college, the highest proportion of deaths occurred while working in construction, followed closely by those working in retail trade. Among individuals who did not complete high school, the highest proportion of deaths occurred while working in construction, followed by agriculture and manufacturing. One of the six individuals in agriculture was a youth.

Among individuals with some college education, the highest proportion of deaths occurred while working in the construction industry, followed by manufacturing and services.

Drug/Alcohol/Medication Use

Among the non-suicide cases, 101 of the 151 individuals (66.9%) had an alcohol screen performed after death. Six individuals (5.9%) had measurable alcohol; five individuals had measurable alcohol in their blood and one individual had measurable alcohol in their urine. One additional individual according to the medical examiner report was under the influence of alcohol at the time of the incident but did not have a measurable blood alcohol at the time of testing.

Among the non-suicide cases, 94 individuals had a drug screen performed after death. Ten individuals (10.6%) tested positive for illegal drugs; four individuals tested positive for marijuana, three individuals tested positive for cocaine, one individual tested positive for opiates, one individual tested positive for opiates and marijuana, and one individual tested positive for cocaine and marijuana.

One individual tested positive for difluoroethane in blood from an unknown source.

Seven (7.4%) individuals tested positive for metabolites of medication. Medications potentially may have been a factor in the death of four of these individuals (4.0%).

Among the non-suicide deaths, a total of 20 individuals had measurable levels of alcohol, illegal drug or medication in their system at the time of their death, which may have been a risk factor for the occurrence of the injury. No individual had an overlap of alcohol, illegal drugs or medications in their blood, urine or other tested body fluid, although one individual with cocaine in his urine was the individual noted by the medical examiner to be under the influence of alcohol.

Work-Related Event Details

Day of Injury

The largest number of work-related fatalities occurred on a Tuesday (28 of 145, 19.3%). Friday had the next highest number of work-related fatalities with 27 (18.6%), followed by Monday with 25 (17.2%) and Wednesday with 24 (16.6%). The day of injury is unknown for six individuals. Table 2 shows the distribution of work-related fatalities by day of the week.

Wednesday had the highest number of work-related fatalities (10 of 39; 25.6%) within the construction industry.

Seven of 21 (33.3%) of agricultural deaths occurred on the weekends.

Monday was the day of the week when the most work-related homicides occurred (six of 18; 33%) with a known date of injury. Most work-related fatalities in the manufacturing sector occurred on Friday (seven of 23 with a known date of injury; 30.4%). Tuesday was the day of the week when the most agricultural-related deaths occurred (five of 21; 23.8%).

July had the highest number of injuries resulting in fatalities with 20 (13.3%), followed by October with 15 (10.0%), April, September and November with 14 (9.3%) each.

In the construction sector, June and September were the months that had the highest number of work-related fatalities with six each. In the agricultural sector, the highest number of work-related fatalities occurred in July. July was the month in which most work-related homicides occurred (Table 3). For the manufacturing sector the highest months were March, August and November with three each.

Time of Injury

The time of the injury was known in 109 of the 151 work-related deaths; the time of the fatal injury was unknown for 42 individuals. The 24-hour day has been divided into the following 4-hour time periods: 12:00a.m.-4:00a.m., 4:00a.m.-8:00a.m., 8:00a.m.-12:00p.m., 12:00p.m.-4:00p.m., 4:00p.m.-8:00p.m., and 8:00p.m.-12:00a.m.

Thirty-four (31.2%) fatalities occurred between 8:00a.m. -12:00p.m., 29 (26.6%) fatal incidents occurred between 12:00p.m.-4:00p.m., 19 (17.4%) fatal incidents occurred between 4:00p.m.-8:00p.m., 13 (11.9%) fatal incidents occurred between 4:00a.m.-8:00a.m., 10 (9.2%) fatal incidents occurred between 8:00p.m.-12:00a.m., and four (3.7%) fatal incidents occurred between the hours of 12:00a.m.-4:00a.m.

The construction and agricultural industry had the highest number of work-related fatalities between the hours of 8:00a.m.-12:00p.m. Eleven (34.4%) of the work-related deaths in construction and five (29.4%) fatal incidents in the agricultural industry occurred between 8:00a.m. to 12:00p.m. (Table 4).

Place of Death

For 92 (60.9%) individuals, the place of death was at the scene of the traumatic incident. For 56 (37.1%) individuals, the death occurred in the hospital, and one (0.7%) individual died enroute to the hospital in the care of emergency personnel. One (0.7%) individual died while in a hospice and one individual died in a nursing home.

Geographic Distribution

Table 5 and Figure 2 show the county in which the victim worked where he/she was fatally injured. The most common locations were: Wayne (31 deaths, 20.5%), Oakland (17 deaths, 11.3%), Kent (nine deaths, 6.0%), Macomb (seven deaths, 4.6%), and Washtenaw and Kalamazoo counties (six deaths each, 4.0%).

Type of Industry

Table 6 shows the distribution of work-related fatalities by industry.

The type of Michigan industry was classified using the 1987 Standard Industrial Classification (SIC) manual. The industry sector with the highest number of fatalities was Construction (SIC 15-17) with 40 (26.8%).

Within the construction industry, nine of 40 construction related deaths occurred in the Roofing, Siding, Sheet Metal classification, six of 40 occurred in Highway and Street construction, and six of 40 occurred in Plumbing, Heating and Air Conditioning. Almost half of the individuals (four of nine, 44.4%) in the Roofing, Siding and Sheet Metal classification died as a result of a fall, three individuals were electrocuted, one died from hyperthermia and one individual died as a result of striking a tree while running from a dog. Of the six deaths in Plumbing, Heating and Air Conditioning, two individuals died as a result of a fall from a ladder, two individuals died from a trench collapse, and two individuals were fatally injured in a motor vehicle accident. Two of the six individuals in the Highway and Street Construction died when they were struck by an object (dump truck tailgate, dirt from a trench collapse). One individual was electrocuted and three individuals were standing on the ground in a work zone when they were struck by a moving construction vehicle.

Manufacturing (SIC 20-29) had the next highest number with 24 (16.1%), followed by Agriculture (SIC 01-09) with 21 (14.1%). The Retail Trade sector (SIC 52-59) had 20 (13.4%) work-related fatalities, Services (SIC 70-89) had 18 (12.1%) fatalities, Transportation (SIC 40-49) had ten (6.7%) fatalities, and Public Administration (SIC 91-97) had nine (6.0%) fatalities. Finance, Insurance and Real Estate (SIC 60-67) had three (2.0%) fatalities, and Mining (SIC 10-14) and Wholesale Trade (SIC 50-51) had two (1.3%) fatalities each.

Agriculture had the highest annual average incidence rate of death (45.6/100,000) followed by Mining (25/100,000), Construction (20/100,000), Transportation & Public Utilities (5.6/100,000), Public Administration (3.5/100,000), Manufacturing (2.6/100,000), Retail Trade (2.4/100,000), Finance, Insurance & Real Estate and Services each, (1.4/100,000) and Wholesale Trade (0.9/100,000).

Occupations

The 1990 Census of Population and Housing's Alphabetical Index of Industries and Occupations was used to categorize occupations of the individuals who died. Enough information was available to categorize 150 work-related fatalities; one fatality could not be categorized.

Of the 150 work-related fatalities categorized, there were 71 different occupations.

The occupational category that had the most work-related deaths was Operators, Fabricators and Laborers with 38 deaths. Within this major grouping, Handlers, Equipment Cleaners, Helpers and Laborers accounted for 19 of the 38 (50%) work related deaths. Eight of 19 individuals were construction laborers, two individuals were garbage collectors, and one individual was a freight, stock and material handler. One individual was involved in a garage and service station related occupation. One individual was a stock handler/bagger and one individual was a machine feeder/bearer. The remaining five deaths in the Handlers, Equipment Cleaners and Laborers occupational category occurred in the Laborers, except construction subcategory. Transportation and Material Moving Occupations accounted for 12 of the 38 work-related fatalities. Motor vehicle operators accounted for ten of the 12 transportation-occupation fatalities (truck drivers, taxicab drivers), and material moving equipment operators accounted for two deaths. Machine Operators accounted for seven of the 38 fatalities.

Precision Production, Craft and Repair Occupations had 35 work-related deaths. Within this occupational category, Construction Trades had 24 work-related deaths, Mechanics and Repairers had

six work-related deaths, and four deaths occurred in the Precision Production Occupations. Extractive Occupations had one death.

Another occupational category is Service Occupations; this category had 14 deaths. Protective Service Occupations experienced four (28.6%) of the fatalities in this category of work. Food Service/Preparation had six (42.9%) deaths, Health Service had three (21.4) deaths, and Personal Service one death (7.1%).

The Military Occupations category had one death.

Farming, Forestry, and Fishing occupations had 21 work-related deaths. Eleven of these 21 individuals were farm operators/managers, seven individuals had occupations classified in Other Agricultural and Related, and three individuals were in the Forestry/Logging classification.

Managerial and Professional Specialty Occupations had 25 deaths. Managers and administrators had the highest number of work-related deaths in this category (16, 71.4%). Engineers had next highest with four (16%). One death each occurred in the following occupations: financial manager, manager medicine and health, purchasing agent and buyer, physician and athlete.

Technical, Sales, and Administrative Support Occupations had 16 deaths. Within this major occupational grouping, the Sales occupation category had seven (43.8%) work-related deaths, the Technicians category had five (31.3%) work-related deaths, and the Administrative Support category had four (25%) work-related deaths.

Victim's Activity at the Time of the Fatality

The activity of the victim at the time of the fatality was known for 110 of the 119 non-homicides/non-suicide related deaths. In these 110 deaths, the individual was the operator in 66 fatal incidents (60.0%), a coworker directly involved in the work activity in 37 fatal incidents (33.6%), a bystander pedestrian, or passenger in seven fatal incidents (6.4%). Activity was unknown in nine incidents.

At the time of the fatal injury, the individual who died was working indoors in 43 incidents (30.1%) and outdoors in 100 incidents (69.9%). This includes the homicides and suicides. Location of work was unknown in eight cases.

For all deaths, the victim was working alone in 66 fatal incidents (52.8%) and working with a coworker in 59 fatal incidents (47.2%). Whether the victim was working alone or with a coworker could not be identified in 26 fatal incidents. The victim was working alone in nine of 22 homicide (41.0%) cases, six victims were working with a coworker and in seven instances working status could not be determined.

Means of Work-Related Death

Table 7 presents the 151 work-related fatalities by means of death. Motor vehicles accounted for 31 (20.5%) of all work-related deaths in Michigan in 2002, followed by falls 21 (13.9%). Contact with a

machine accounted for 20 work-related deaths (13.2%). Twenty-two (14.6%) homicides and 11 (7.3%) suicides occurred at work.

An object striking an individual occurred in 17 (11.2%) instances. There were five (3.3%) individuals who were fatally injured in aircraft-related incidents, eight (5.3%) individuals were electrocuted, one (0.6%) individual was fatally injured by asphyxiation, five (3.3%) were fatally injured by explosions, two (1.3%) individuals drowned, two (1.3%) deaths were heat-related (hyperthermia). Four (26%) individuals had a toxic exposures and two (1.3%) individuals died in animal-related incidents.

Aircraft

There were five individuals fatally injured in three aircraft-related fatalities; one individual was doing an animal count, one individual was in passenger charter services, and three individuals were returning from a business meeting when their plane crashed.

Two planes were single engine planes and one was a twin engine. In two incidents, the plane was in flight when the fatal incident occurred. In one incident the plane was attempting to land. One incident involved a charter service, and the other two planes were privately owned.

Animals

Two individuals died as a result of their interaction with an animal. One individual was kicked in the head by a horse, the other was running away from a dog when he hit a tree and later died from a hemopneumothorax.

Asphyxiation

One individual was asphyxiated when food he swallowed became caught in his windpipe.

Drownings

Two individuals died as a result of drowning. One individual was repairing a dock at a marina when he fell into the water. The other individual was a farmer clearing an irrigation pond. Neither individual could swim nor was wearing a life preserver.

Electrocutions

Eight individuals died as a result of coming into contact with electrical current. One individual was working on an energized exterior light pole, one individual was repairing a rotary mower at a farm when he contacted the energized mower, two individuals were holding aluminum ladders that contacted energized overhead wires, one individual was stuck by lightning while tarping a roof, one individual was operating a guard rail post pounder, one individual was moving a grain auger that contacted an overhead line, one individual was involved in moving a building under an energized line when an antenna contacted the line. The voltages contacted ranged from 240 volts to 14,400 volts.

Two individuals had direct contact with electrical current; one individual directly contacted an energized wire and the other individual was struck by lightning. Five of eight (62.5) electrocutions

involved indirect contact with an energized overhead powerline; two individuals were holding a ladder, two individuals were operating a boomed vehicle that contacted the energized line, and one individual was moving a house that contacted the energized line. The other individual with indirect contact touched a piece of machinery that was electrically energized.

In five (71.4%) cases, the victim's work area was identified as dry and wet in 2 cases (28.6%). Wind was a significant factor in one incident. The wind was strong enough to move a wire allowing contact with a boomed vehicle operating near by. One victim was mounting the electrical system, one victim was working in the vicinity of the electrical system and one individual was maintaining equipment other than the electrical system. Three individuals were conducting roofing activities and two individuals were traveling past the electrical system when they sustained the fatal injury.

Explosions/Burns

Five individuals died as a result of an explosion. One individual was involved in a fireworks display, one was standing near coal dust ductwork when it exploded, one was struck by a mold that exploded while he was welding, one individual who worked out of his home was killed when his home exploded due to a gas leak and one individual was burned by steam that escaped from a gas washer/scrubber he was working on.

Falls

Falls accounted for 21 of the work-related fatalities. The reason for the fall was identified in 15 (71.4%) cases and was unknown in six cases. The individual slipped or tripped in eleven cases. The structure gave way in one case. In two cases the ladder was not secured, and in one case the victim touched an energized electrical wire causing him to fall.

The distance the worker fell was identified in 15 cases, six cases were unknown. The individual's fall was less than 10 feet in five (33.3%) cases, 10-20 feet in four (26.7%) cases, 21- 50 feet in five (33.3%) cases and for one (6.7%) case, the fall was 50+ feet.

The location of the fall was identified for 19 cases, and two were unknown. Individuals fell from a roof edge in six (31.6%) instances, a scaffold or ladder in five (26.3%) instances, a vehicle, machine or equipment in four (21%) instances, vertical steel frame in one (5.3%) instance, and a tree in one (5.3%) instance. One (5.3%) individual fell from a home's wood frame, and one individual fell through an unguarded wall opening while moving on the floor.

In nine (60.0%) instances, the individual fell to a concrete, rock or asphalt surface. The individual fell directly to packed dirt in three (20.0%) instances. Other identified surfaces individuals fell to were wood (one, 6.7%), metal chute (one, 6.7%) and gravel (one, 6.7%). The surface the victim landed on was undetermined in six of the cases.

The working surface condition was known in 12 of 21 cases. The working surface was dry in eight (66.7%) incidents, and wet in one (8.3%) incident. One work surface was slippery. One (8.3%) work area was dark, and one (8.3%) individual was working around an energized wire. The condition of the work surface the victim fell from is unknown in five cases. Other factors that played a role in the

work-related deaths resulting from falls were work surfaces that were cluttered (one case) or not properly secured (five cases).

Eleven of 21 (52.4%) of the falls occurred while individuals were working in commercial or residential construction activities. Falls occurred during commercial construction activities in six (28.6%) instances, and in residential construction activities in five (23.0%) instances.

Heat/Cold

Two individuals died of heat-related complications. One individual was working on a roof and one individual was landscaping.

Homicides

MIFACE identified 22 work-related homicides. Nineteen (86.4%) homicide victims were men and three (15.8%) victims were women.

Thirteen work-related homicide victims worked in Retail Trade, three in Services, three in Public Administration, and one each in Agriculture, Manufacturing & Finance.

Fourteen (66.7%) work-related homicide victims were Caucasian, five (23.8%), were African American, one (4.8%) was Arabic, one (4.8%) was Asian Pacific and one individual's race was unknown. Five of the eight (62.5%) work-related fatalities among African Americans were caused by homicides.

A gun was the cause of death in 17 (87.5%) cases, a knife for three, one individual was beaten to death and one was asphyxiated.

Machine-Related Deaths

There were 20 machine-related fatalities. The leading causes of machine related deaths were being run over in six (30.7%) instances, entangled in the machine in four (20.0%) instances, and pinned by the machine because of an overturn in four (20.0%) instances. Two (10.0%) individuals were caught between the machine and another object. Two (10.0%) individuals were crushed by a machine. One (5%) individual sustained mechanical asphyxiation and another individual (5%) was struck by a machine.

Machine-related fatal injuries were the cause of eight of 21 (38.1%) fatal agricultural (SIC 01-09) deaths. Tractors were the machines involved in five of the eight deaths; for the other three deaths the machines were manure handling equipment, a mowing machine and a farm wagon.

Motor Vehicle Related Deaths

There were 31 motor vehicle related fatalities. In two cases crash information about the fatal event could not be obtained. One individual's injury occurred in 1989. Limited information was obtained from the medical examiner report and death certificate.

Work-related deaths involving motor vehicles usually were single unit incidents (13, 41.9%) occurring during the daylight hours (25, 86.2%) and occurred primarily on 2-lane roads (19, 65.5%). The weather was clear in 17 (58.6%) incidents and the pavement was dry in 22 (75.7%) of the cases. The speed limit was 55 miles per hour in 14 (48.3%) incidents; the speed limit was 70 miles per hour in six (20.7%) cases. Speed limit signs were posted on 20 (69.0%) of the roads where a death occurred.

The crash type was identified as single motor vehicle in 13 incidents, head-on in eight incidents, rear-ended in two incidents, other in three incidents (pedestrian, load shift and race car) and one each of head-on, left turn, angle, and sideswipe.

Restraint use could be identified for 30 individuals. Ten individuals who were driving (33.0%) were wearing a shoulder and lap belt at the time of the fatal injury. Restraints were not available for four (13.3%) drivers; three motorcycle drivers and one vehicle driver. Seven (23.3%) individuals who were driving were not wearing a shoulder or lap belt. One (3.3%) passenger was not wearing a shoulder and lap belt. A restraint system was not applicable (victims were pedestrians) in three (10.0%) incidents. Restraint use was unknown for five (16.6%) drivers. The victim was ejected from the vehicle in all cases where a should/lap belt was not worn or not available.

Airbag determination was obtained in 29 instances. Ten (34.5%) vehicles involved in the fatal incidents were not equipped with an airbag; an airbag was present in 13 (44.8%) of the vehicles. The airbag deployed at the time of the crash in six (46.2%) of 13 crashes, in seven (53.8%) instances the airbag did not deploy. Airbag deployment was not applicable in six (20.7%) cases (victims were three pedestrians, three motorcyclists). It was unknown if the airbag was present on the passenger side of one vehicle, or present in the vehicle for the injury in 1989.

The victim was the vehicle driver in 26 cases; in three (11.5%) incidents, the driver appeared normal to the responding enforcement agency. In one (3.8%) incident, the driver fell asleep while driving, and in one (3.8%) incident, the driver was described by responding enforcement agency as distracted. The driver's condition was indicated by the responding enforcement agency as unknown in 21 cases. Three (9.7%) of the individuals fatally injured in a motor vehicle incident were not driving the vehicle; for the 1989 incident it is unknown if victim was the driver.

The type of vehicle involved in the fatal injury could be identified in 30 cases. A passenger car was the vehicle being used at the time of the incident in 12 (40.0%) cases; a truck/bus was involved in eight (26.7%) cases, a pickup truck was involved in three (10.0%) cases, motorcyclists were involved in three (10.0%) cases, and in one case each (3.3%) for a small truck, race car, US military vehicle and van.

Twenty-nine of the thirty-one motor vehicle work-related fatalities were classified into three broad categories: non-collision, collision with a non-fixed object and collision with a fixed object. Eleven (37.9%) non-collisions occurred. Non-collisions included the driver losing control in two cases, crossing the centerline in one case, running off of the road to the left (one case) or to the right (six cases). One driver was killed during cargo shift on the vehicle's trailer. Fourteen (48.3%) collisions with a non-fixed object occurred. Ten of the 14 collisions with a non-fixed object involved a collision with a moving motor vehicle in transport. The victim was a pedestrian in three cases, and one driver collided with a parked motor vehicle. Collisions with a fixed object occurred in four (13.8%)

instances. Two (6.9%) collisions involved a tree, one (3.5%) involved a dumpster and one (3.5%) involved a collision with a median barrier.

Self-Inflicted Injuries

Eleven individuals committed suicide while at their workplace. Eight individuals died from a self-inflicted gunshot wound, two individuals died by hanging, and one individual died from a self-inflicted asphyxiation.

Struck By

Seventeen individuals were fatality injured when they were struck by an object. Two individuals were struck by dumpsters (one that fell on the victim and one that pinned an individual against a loading dock). A falling brick struck one individual wearing a hard hat, a steel frame struck one individual, and one individual was struck by a falling tree. One individual was struck on the head by a wooden board, one individual was struck by a dump truck gate, and one individual was struck by a hay bale. Two individuals were fatality injured when vehicles fell on them (tractor, car). One individual was struck by dirt during a trench cave in, one individual was struck by a concrete sewer pipe, and one individual was struck in the head by an exploding pipe end cap. A piece of conveyor fell on one individual, one individual was struck by a paper bale, and one person was involved in a kickboxing match.

Toxic Exposures

Four individuals died due to a toxic exposure while working. One individual entered an oxygen-limiting silo, one individual leaned into a tank that had nitrogen flowing through it, one individual died from inhalation of engine exhaust and one individual died of carbon monoxide and alcohol intoxication.

MIOSHA Fatality Investigations

The 151 individuals who died worked for 147 employers. At 32 of the “employers” where an individual died, the individual was either self-employed or the owner. Seven individuals were identified as contract/temporary employees. For another 14 individuals we are unsure whether they were employees or self-employed/owners. Companies can be investigated by any of three MIOSHA enforcement divisions: General Industry Safety, Construction Safety or Occupational Health depending upon the activity being performed by the company at the time of the inspection. Forty-seven of the 151 work-related fatality cases (31.1%) at 47 of the 147 (32.0%) companies were within MIOSHA’s jurisdiction and were investigated by MIOSHA.

Three employers had a fatal incident where more than one person died during the incident.

For each company that had a work-related fatality, the Federal OSHA Integrated Management Information System (IMIS) was accessed to determine the previous MIOSHA compliance activity at the company.

The IMIS database identified that five (3.4%) of the 147 employers had a work-related fatality occur prior to 2002. Three of these employers were in construction, one was in manufacturing, and the same public administration employer had two fatalities in 2001. Two of the three construction employers with prior fatalities had an individual fatally injured by machines in 2001. One construction employer had one individual fatally injured by a fall from a height in 1997. The manufacturing employer with a prior fatality had one individual fatally injured by overexposure to carbon monoxide in 1999. The public administration employer had two homicides in 2001.

Of the 147 employers who had a work-related fatality, the IMIS database identified 31 of the 147 (21.1%) employers as having had a previous MIOSHA Occupational Health, General Industry Safety or Construction Safety compliance inspection. Ten (32.3%) of the 31 companies had received an Occupational Health Inspection. Nine of ten (90.0%) companies had previously been inspected one to five times, one of ten (10.0%) companies had been inspected six to ten times. Citations were issued to seven of the ten companies during the previous inspection; if conditions warrant, a company can receive multiple citations as a result of a MIOSHA inspection. For the seven companies receiving an Occupational Health citation, one company received a Serious citation, one company received Serious and Willful citations, and five companies received a citation categorized as "Other".

Sixteen of the 31 (51.6%) companies were identified as having had a previous MIOSHA General Industry Safety compliance inspection. All 16 companies that had previously received a General Industry Safety inspection had been inspected one to five times. Citations were received by 15 of the 16 (93.8%) companies. Of the 15 companies receiving General Industry Safety citations, six companies received "Serious" citations, five companies received "Serious" and "Other" citations, three companies received "Serious" "Repeat" and "Other" citations, and one company received an "Other" citation.

Sixteen companies were identified as receiving a compliance inspection from the MIOSHA Construction Safety division. Nine of 16 had one to five inspections, one company had six to ten inspections, and six companies had more than ten inspections. Fifteen of 16 companies received citations from those inspections. Eleven companies received "Serious" and "Other" citations, two companies received "Serious" only, one company received "Serious", "Repeat" and "Other" citations, and one company received "Serious" and "Willful" citations.

MIFACE requested and received permission to conduct a work-related fatality investigation at 16 facilities. Copies of the MIFACE reports are on the Michigan State University Occupational & Environmental Medicine web site and click on the MIFACE link to view the reports (www.chm.msu.edu/oem).

Hispanic Initiative

The US Department of Labor, Bureau of Labor Statistics (BLS) has analyzed the Census of Fatal Occupational Injury (CFOI) data and reported a higher fatal work injury rate for Hispanic workers than for other racial/ethnic groups. As a result, Federal OSHA is currently collecting additional information during all investigations that includes the primary language and country of origin of the victim. OSHA has also formed the Hispanic work force that includes hazard awareness and workplace rights.

In partnership with Federal OSHA, NIOSH has added Hispanic worker fatalities to the list of the current targets for the Federal in-house FACE program. Information gathered will be made available to the OSHA Hispanic Worker Task Force. The Michigan FACE program supports the concept and rationale of this initiative. As a result, we have utilized a draft Immigrant Workers/Limited English Speakers Workers investigation guide during on-site investigations to gather information when it is appropriate.

There were seven deaths of Hispanic workers in Michigan in 2002. This was a rate of 5.9 per 100,000 for 16-65 year old Hispanics as compared to a rate of 5.0 per 100,000 for 16-65 year old Caucasians and 1.0 per 100,000 for 16-65 year old African-Americans.

Four Hispanics died in construction-related incidents, two in landscape-related incidents and one in mining. One (14.3%) of the seven Hispanic work-related fatalities had a MIFACE on-site investigation; six companies declined to participate in the MIFACE research program. In the one incident, MIFACE asked the employer if the employee could speak and understand English. The employer indicated that another employee who could speak and understand English acted as a translator for the victim.

Case Narratives

Based on the information collected during MIFACE on-site investigations and/or from source documents, a brief narrative summary organized alphabetically by means of death of each of the 151 acute traumatic work-related deaths in 2002 is included in Appendix I.

Discussion

There were 151 acute traumatic work-related fatalities in Michigan in the year 2002. Five of the incidents causing death occurred prior to 2002; 1988, 1989, and two in 2001, one individual's date of injury is unknown. The major sources for identifying acute traumatic work-related deaths were the 24-hour MIOSHA hotline, a newspaper clipping service, the State Police vehicular data reporting system, and death certificates. We coordinated our surveillance with the Census of Fatal Occupational Injuries (CFOI). CFOI is the surveillance system funded in every state by the United States Department of Labor Bureau of Labor Statistics (BLS). CFOI reported 153 deaths in 2002. The reason our total differs by two deaths from CFOI is that CFOI counts death by where the individual died and MIFACE counts deaths by the location of the traumatic event. One individual in the CFOI statistics in 2002 was injured in Minnesota and one in Indiana but died in Michigan. Neither were included in the numbers presented in this report.

There were on the average 2.9 acute traumatic work-related fatalities per week although the deaths were not evenly distributed throughout the year. July was the most common month for an incident causing a fatal traumatic death and October was the second most common month. June was the most common month for construction-related fatalities. Tuesday was the most common day of the week for a fatal traumatic incident and Friday was the second most common day. Wednesday was the most common day for construction. Friday was the most common day for manufacturing. Monday was the most common day for work-related homicides (Table 2). From 8a.m. to 12p.m. was the most common

time of the day for an incident causing a fatal traumatic death, and 12p.m. to 4p.m. was the second most common time.

Eight in the morning to 12p.m. and 4p.m. to 8p.m. were the most common time for agricultural fatalities. From 4p.m. to 8p.m. was the most common time for the construction and service industries (Table 4).

Individuals who died from an acute traumatic work-related fatality were most likely to be men (92%), white (88%), on the average 42 years of age, married (55%) and had at least a high school education (80%).

Although the largest number of deaths occurred in construction (40), agriculture had a much higher risk of acute traumatic work-related fatalities. The rate in agriculture was 45.6 per 100,000 as compared to 20.0 per 100,000 in construction (Table 6). Despite the high fatality rate in agriculture, farms with less than 11 employees are exempted from all workplace regulations.

Illegal drugs and/or alcohol were found to have a minimal role in acute work-related fatalities. Alcohol was found in six individuals and another ten tested positive for illegal drugs. In an additional four individuals, the side effects of prescribed medications may have been a factor in the death.

MIOSHA investigated 47 (33.3%) of the deaths, the local police, county sheriff and state police investigated 64, and federal agencies including the National Safety Transportation Board, and Mine Safety and Health Administration investigated six (4.0%) of the deaths. There were 34 (24.5%) deaths not investigated by a regulatory agency as to cause of death other than by the police to exclude a homicide or suicide. MIFACE is a research effort and relies on the voluntary cooperation of employers and for the self-employed, their family members. MIFACE attempted to investigate 22 of the 34 work-related fatalities not investigated by a regulatory agency. MIFACE was denied the opportunity for a site visit at 14 of the employers, and conducted an on-site investigation at eight.

Copies of 27 MIFACE investigations completed in 2001 and 2002 are on our web site www.chm.msu.edu/oem. Summaries of investigations conducted by the Michigan OSHA program are also on the same web site. For each report there is a dissemination plan to maximize awareness of the report. Reports are sent to appropriate trade associations, unions, trade journals and in some cases other employers doing the same type of work. A special effort in conjunction with the Michigan Farm Bureau to provide educational sessions to farmers is ongoing.

Traumatic occupational fatalities are an important public health issue in Michigan as they are throughout the United States. There were 23 less deaths in 2002 as compared to 2001. This decrease is within the variation seen in recent years (1996-155 deaths, 1997-174 deaths, 1998-179 deaths, 1999-182 deaths, 2000-156 deaths) and there has been no persistent trend in the number of acute traumatic work-related fatalities since accurate tracking of the number of deaths was begun in 1992. Traumatic occupational deaths are not random events. Information about the settings and circumstances in which work-related deaths occur is necessary to prevent their occurrence in the future.

Understanding the root cause of these tragic events and then sharing that information with stakeholders - from individuals to groups, is what makes these efforts worthwhile. If what we learn

from any of these deaths can help prevent another death, then the surveillance program has been successful in its goal. Each of the 151 deaths in this report could have been prevented. An awareness of the hazards of one's job and an attitude of safety-mindedness on the part of labor and management is critical to prevent future fatal events.

We are extremely appreciative of the support of the MDCIS Safety and Health officers, the employers, the families and the experts who have worked with us. In conjunction with MDCIS, we have received funds from the National Institute for Occupational Safety and Health to continue this program through 2006 and look forward to identifying ways to prevent work-related traumatic deaths and sharing what we have learned with those who may benefit from this knowledge.

Table 1. Number and Percent of Acute Traumatic Work-Related Fatalities by Education Level of the Deceased, Michigan 2002

Industry (SIC)*	Did Not Complete High School		Completed High School No College		Some College	
	Number	Percent	Number	Percent	Number	Percent
Agricultural Production (01-09)	6	(20.7)	8	(13.1)	6	(8.9)
Mining (13-14)	1	(3.4)	1	(1.6)	0	--
Construction (15-17)	10	(34.5)	16	(26.2)	13	(16.1)
Manufacturing (20-39)	5	(17.2)	10	(16.4)	9	(26.8)
Transportation/Public Utility (40-49)	1	(3.4)	6	(9.8)	3	--
Wholesale Trade (50-51)	0	--	0	--	2	(3.6)
Retail Trade (52-59)	3	(10.3)	12	(19.7)	4	(7.1)
Finance (60-67)	0	--	1	(1.6)	2	(3.6)
Services (70-89)	3	(10.3)	5	(8.2)	9	(30.4)
Public Administration (91-97)	0	--	2	(3.3)	7	(3.6)
Total**	29		61		55	

*Standard Industrial Classification

**Education level was unknown for one individual in agriculture, construction, retail trade and services. For one individual, both SIC and education is unknown, and for one individual, education level known, SIC unknown.

**Table 2. Number and Percent of Acute Traumatic Work-Related Fatalities,
for all Deaths; by Industry*; and for Homicides Separately
by Day of the Week, Michigan 2002**

Day of Injury	All Deaths		Agricultural Deaths (01-09)**		Construction Deaths (15-17)		Manufacturing Deaths (20-39)		Retail Trade Deaths (52-59)		Homicides	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Sunday	9	(6.2)	4	(19.0)	0	--	1	(4.3)	0	--	1	(5.6)
Monday	25	(17.2)	1	(4.8)	6	(15.4)	3	(13.0)	5	(29.4)	6	(33.3)
Tuesday	28	(19.3)	5	(23.8)	7	(17.9)	3	(13.0)	6	(35.3)	5	(27.8)
Wednesday	24	(16.6)	2	(9.5)	10	(25.6)	3	(13.0)	1	(5.9)	1	(5.6)
Thursday	19	(13.1)	4	(19.0)	7	(17.9)	3	(13.0)	1	(5.9)	1	(11.1)
Friday	27	(18.6)	2	(9.5)	8	(20.5)	7	(30.4)	2	(11.8)	2	(11.1)
Saturday	13	(9.0)	3	(14.3)	1	(2.6)	3	(13.0)	2	(11.8)	2	(11.1)
Total	145***		21		39 ⁺		23 ⁺		17 ⁺⁺		18 ⁺⁺⁺	

*Only industries with 20 or more deaths are included in the table.

**Standard Industrial Classification (SIC).

***Day of week of injury was unknown for six deaths. Day of injury known for 2 individuals but SIC not identified

⁺Injury day unknown for one individual

⁺⁺Injury day unknown for three individuals

⁺⁺⁺Injury day unknown for four individuals

**Table 3. Number and Percent of Acute Traumatic Work-Related Fatalities,
for All Deaths; by Industry*; and for Homicides
Separately, by Month, Michigan 2002**

Month of Injury	All Deaths		Agricultural Deaths (01-09)**		Construction Deaths (15-17)		Manufacturing Deaths (20-39)		Retail Trade Deaths (52-59)		Homicides	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
January	10	(6.7)	1	(4.8)	4	(10.0)	1	(4.3)	0	--	0	--
February	7	(4.7)	0	--	0	--	2	(8.7)	0	--	2	(4.2)
March	9	(6.0)	2	(9.5)	1	(2.5)	3	(13.0)	0	--	0	--
April	14	(9.3)	2	(9.5)	2	(5.0)	2	(8.7)	4	(20.0)	1	(8.3)
May	11	(7.3)	1	(4.8)	3	(7.5)	2	(8.7)	2	(10.0)	1	(8.3)
June	12	(8.0)	0	--	6	(15.0)	2	(8.7)	0	--	1	(8.3)
July	20	(13.3)	5	(23.8)	4	(10.0)	1	(4.3)	5	(25.0)	4	(16.7)
August	12	(8.0)	2	(9.5)	2	(5.0)	3	(13.0)	2	(10.0)	3	(8.3)
September	14	(9.3)	1	(4.8)	6	(15.0)	1	(4.3)	2	(10.0)	0	--
October	15	(10.0)	2	(9.5)	4	(10.0)	2	(8.7)	4	(20.0)	3	(12.5)
November	14	(9.3)	4	(19.0)	5	(12.5)	3	(13.0)	0	--	1	(8.3)
December	12	(8.0)	1	(4.8)	3	(7.5)	1	(4.3)	1	(5.0)	2	(25.0)
Total	150+		21		40		23 ⁺		20		24	

*Only industries with 20 or more deaths are included in the table.

**Standard Industrial Classification (SIC).

⁺One Unknown month of injury.

**Table 4. Number and Percent of Acute Traumatic Work-Related Fatalities
for all Death; by Industry*; and for Homicides Separately,
by 4 Hour Time Periods, Michigan 2002**

Time	All		Agricultural Deaths (01-09)**		Construction Deaths (15-17)		Manufacturing Deaths (20-39)		Retail Trade Deaths (52-59)		Homicides	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
12am-4am	4	(3.7)	1	(5.9)	0	--	1	(5.9)	1	(9.1)	2	(25.0)
4am-8am	13	(11.9)	2	(11.8)	2	(6.3)	4	(23.5)	0	--	0	--
8am-12pm	34	(31.2)	5	(29.4)	11	(34.4)	4	(23.5)	4	(36.4)	2	(25.0)
12pm-4pm	29	(26.6)	3	(17.6)	10	(31.3)	3	(17.6)	4	(36.4)	0	--
4pm-8pm	19	(17.4)	5	(29.4)	7	(21.9)	3	(17.6)	2	(18.2)	3	(37.5)
8pm-12am	10	(9.2)	1	(5.9)	2	(6.3)	2	(11.8)	0	--	1	(12.5)
Total	109***		17 ⁺		32 ⁺⁺		17 ⁺⁺⁺		11 ⁺⁺⁺⁺		8 ⁺⁺⁺⁺	

*Only industries with 20 or more deaths are included in the table.

**Standard Industrial Classification (SIC).

***Time of injury was unknown for 42 deaths

⁺Unknown time in 4 deaths

⁺⁺Unknown time in 8 deaths

⁺⁺⁺Unknown time in 9 deaths

⁺⁺⁺⁺Unknown time in 14 deaths

**Table 5. Number and Percent of Acute Traumatic Work-Related Fatalities
By County of Injury, Michigan 2002**

County	Number	Percent	County	Number	Percent	County	Number	Percent	County	Number	Percent
Alcona	1	(0.7)	Dickinson	1	(0.7)	Lake	0	--	Oceana	0	--
Alger	0	--	Eaton	2	(1.3)	Lapeer	3	(2.0)	Ogemaw	1	--
Allegan	1	(0.7)	Emmet	1	(0.7)	Leelanau	1	(0.7)	Ontonagon	0	--
Alpena	0	--	Genesee	4	(2.6)	Lenawee	1	(0.7)	Osceola	0	--
Antrim	0	--	Gladwin	1	(0.7)	Livingston	4	(2.6)	Oscoda	0	--
Arenac	0	--	Gogebic	1	(0.7)	Luce	0	--	Otsego	0	--
Baraga	0	--	Grand Traverse	1	(0.7)	Mackinac	0	--	Ottawa	2	(1.3)
Barry	0	--	Gratiot	1	(0.7)	Macomb	7	(4.6)	Presque Isle	0	--
Bay	3	(2.0)	Hillsdale	1	(0.7)	Manistee	2	(1.3)	Roscommon	1	(0.7)
Benzie	0	--	Houghton	1	(0.7)	Marquette	2	(1.3)	Saginaw	1	(0.7)
Berrien	2	(1.3)	Huron	2	(1.3)	Mason	0	--	St. Clair	2	(1.3)
Branch	1	(0.7)	Ingham	4	(2.6)	Mecosta	1	(0.7)	St. Joseph	2	(1.3)
Calhoun	2	(1.3)	Ionia	0	(1.2)	Menominee	2	(1.3)	Sanilac	0	--
Cass	0	--	Iosco	1	(0.7)	Midland	1	(0.7)	Schoolcraft	0	--
Charlevoix	0	--	Iron	0	--	Missaukee	1	(0.7)	Shiawassee	1	(0.7)
Cheboygan	0	--	Isabella	1	(0.7)	Monroe	4	(2.6)	Tuscola	0	--
Chippewa	1	(0.7)	Jackson	2	(1.3)	Montcalm	1	(0.7)	Van Buren	3	(2.0)
Clare	0	--	Kalamazoo	6	(4.0)	Montmorency	0	--	Washtenaw	6	(4.0)
Clinton	0	--	Kalkaska	0	--	Muskegon	0	--	Wayne	31	(20.5)
Crawford	1	(0.7)	Kent	9	(6.0)	Newaygo	3	(2.0)	Wexford	0	--
Delta	0	--	Keweenaw	0	--	Oakland	17	(11.3)			

**Table 6. Industry of Acute Traumatic
Work-Related Fatalities, Michigan 2002**

Industry (Standard Industrial Classification)	Number of Deaths	Percent	Number of Employees*	Annual Average Incidence Rate per 100,000
Agriculture (01-09)	21	(14.1)	46,027	45.6
Mining (10-14)	2	(1.3)	8,000	25.0
Construction (15-17)	40	(26.8)	200,000	20.0
General Building & Heavy Construction (15-16)	10	(6.7)	64,000	15.6
Special Trade Contractors (17)	30	(20.1)	135,000	22.2
Manufacturing (20-39)	24	(16.1)	908,000	2.6
Lumber and Wood Products (24)	3	(2.0)	17,000	17.6
Paper and Allied Products (26)	1	(0.7)	18,000	5.6
Printing and Publishing (27)	3	(2.0)	39,000	7.7
Chemicals and Allied Products (28)	2	(1.3)	46,000	4.3
Rubber and Misc. Plastics Products (30)	1	(0.7)	62,000	1.6
Primary Metal Industries (33)	2	(1.3)	35,000	5.7
Fabricated Metal Products (34)	2	(1.3)	119,000	1.7
Industrial Machinery and Equipment (35)	5	(3.4)	117,000	4.3
Transportation Equipment (37)	5	(3.4)	280,000	1.8
Transportation and Public Utilities (40-49)	10	(6.7)	179,000	5.6
Miscellaneous Transportation (42, 44, 45, 47)	9	(6.0)	112,000	8.0
Electric, Gas and Sanitary Services (49)	1	(0.7)	33,000	3.0
Wholesale Trade (50-51)	2	(1.3)	217,000	0.9
Wholesale Trade – Durable Goods	1	(0.7)	141,000	0.7
Wholesale Trade – Nondurable Goods	1	(0.7)	76,000	1.3
Retail Trade (52-59)	20	(13.4)	836,000	2.4
Building Materials and Garden Supplies (52)	1	(0.7)	41,000	2.4
General Merchandise Stores (53)	1	(0.7)	136,000	0.7
Food Stores (54)	2	(1.3)	99,000	2.0
Automotive Dealers & Service Stations (55)	3	(2.0)	85,000	3.5
Furniture and Home Furnishings Stores (57)	1	(0.7)	35,000	2.9
Eating and Drinking Places (58)	7	(4.7)	293,000	2.4
Miscellaneous Retail (59)	5	(3.4)	114,000	4.4
Finance, Insurance, and Real Estate (60-67)	3	(2.0)	211,000	1.4
Services (70-89)	18	(12.1)	1,294,000	1.4
Miscellaneous Services (70, 76, 78, 79)	8	(5.4)	186,000	4.3
Business Services (73)	3	(2.0)	305,000	1.0
Auto Repair, Services and Parking (75)	3	(2.0)	40,000	7.5
Health Services & Public Health (80)	3	(2.0)	399,000	0.8
Educational Services (82)	1	(0.7)	430,000	0.2
Public Administration (91-97)	9	(6.0)	254,000	3.5
Total	149**		4,893,027	3.0

*Source: For Agriculture: USDA, National Agricultural Statistics Service. 1997 Census of Agriculture AC97-A-51, March 1999. www.nass.usda.gov/census/. November 19, 2002. For all other Industry Categories: Michigan Department of Career Development, Employment Service Agency Office of Labor Market Information, Trend Services Table-Form 3221, Michigan 2001. www.michlmi.org/lmi/lmadata/trend/trendocs/michi-ol.htm, September 24, 2003.

**SIC unknown for 2 individuals

Table 7. Number and Percent of Acute Traumatic Work-Related Fatalities by Means of Death, Michigan 2002

Means of Death	Number of Deaths	Percent
Aircraft	5 (3)*	3.3
Animal	2	1.3
Asphyxiation	1	0.6
Drowning	2	1.3
Electrocution	8	5.3
Explosion	5	3.3
Fall	21	13.9
Heat/Cold	2	1.3
Homicide	22 (21)	14.6
Machine-Related	20	13.2
Motor Vehicles	31 (30)	20.5
Struck By	17	11.2
Suicide	11	7.3
Toxic Exposure	4	2.6

*Number in parentheses is the number of incidents

Figure 1. Age Distribution of Acute Traumatic Work-Related Fatalities, Michigan 2002

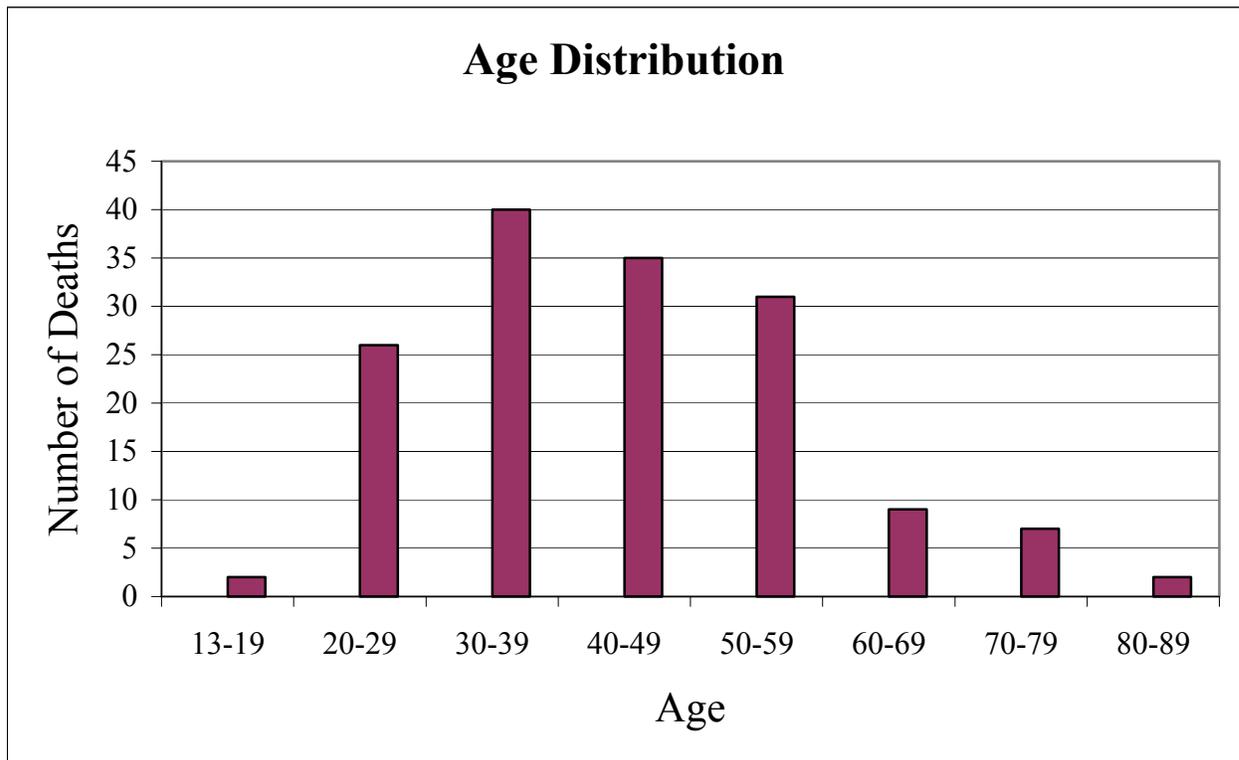
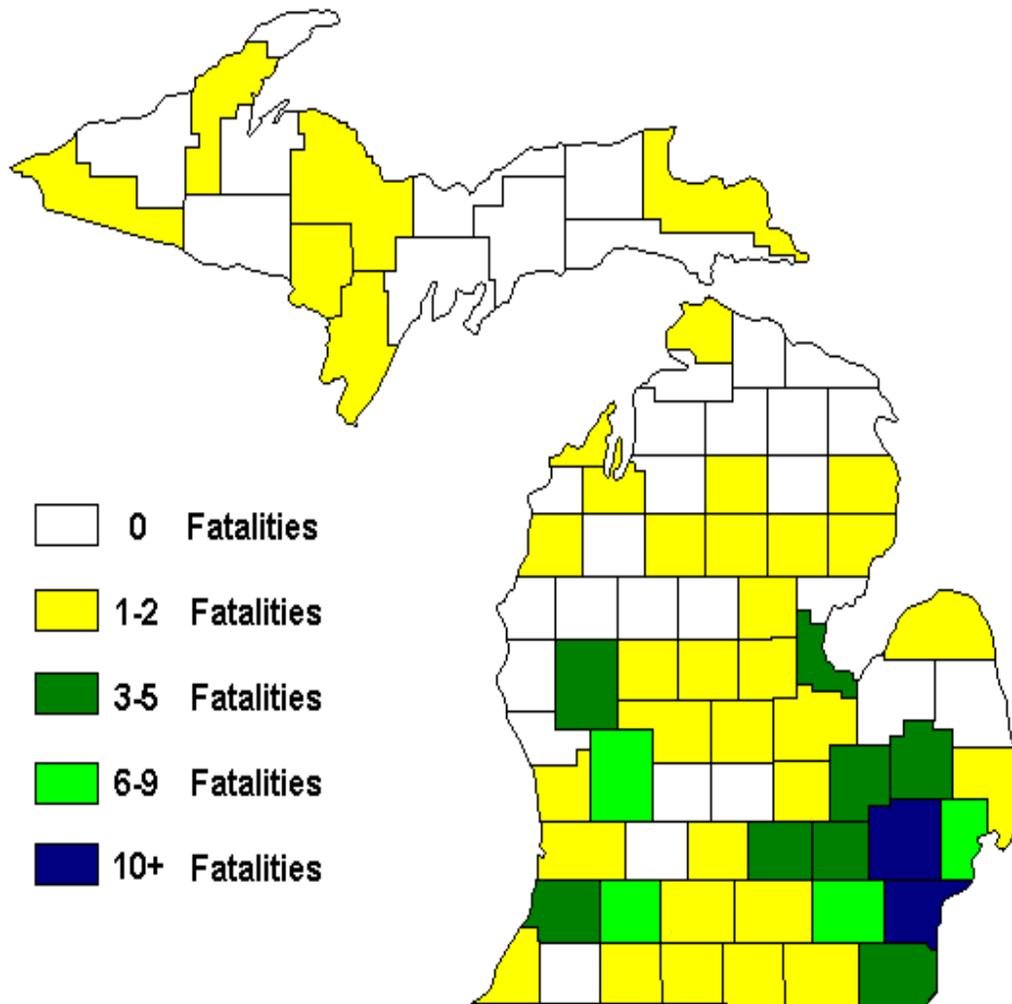


Figure 2. County Distribution of 151 Acute Traumatic Work-Related Fatalities By County of Injury, Michigan 2002



APPENDIX I

2002 CASE NARRATIVES BY CATEGORY

AIRCRAFT	
Case 1	77-year-old male pilot was working under contract to conduct an animal count. His plane went down and the crash site was found three days later.
Case 2	29-year-old female pilot was piloting a twin engine Cessna and was on her way to pick up passengers at another location. The plane was traveling at treetop height and approached the ground as if landing. The plane suddenly gained height, crashed nose first into a bean field, and burst into flames.
Case 3 Case 4 Case 5	55-year-old male engineering manager was the pilot of a single engine plane carrying 2 other company passengers: a 25-year-old male who was the company president and a 34-year old male who was the senior buyer. All were returning from a business trip. While flying low over the path of a river, the rear of the plane hit some power lines running across the river. The plane came apart and crashed into the river, killing all 3 individuals.
ANIMALS	
Case 6	50-year-old male roofer was running away from a dog and struck a tree with his chest. The injury fractured some ribs and he died from a hemopneumothorax the next day.
Case 7	53-year-old male farmer was kicked in the head by a horse. He touched the horse with a battery-operated prod while standing behind the horse.
ASPHYXIATION	
Case 8	53-year-old male assembly worker choked on food at his workplace and died of asphyxiation.
DROWNINGS	
Case 9	58-year-old male part-time maintenance worker performing maintenance on a dock at a marina drowned after falling into 8 feet of water. The victim was retightening a 6x6 foot post attached to the dock that is used to secure the boat at the dock. It appears that the victim was kneeling or laying on the dock removing the post's outside lag screws when he fell into the 51-degree water. The victim could not swim and he was not wearing a flotation device. The dock did not have a ladder or other escape pathway from the water to the dock. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 2.
Case 10	67-year-old male farmer was in the process of treating his irrigation pond. It is postulated that while trying to climb in the boat from the dock he fell into the 15 feet deep pond. He could not swim and was not wearing a life preserver.
ELECTROCUTIONS	
Case 11	41-year-old male journeyman electrician was electrocuted while he was working on an exterior light pole. He and his partner were replacing non-functioning lights on two-light light poles. One of the new lights installed did not work. His partner was at the top of the pole in a bucket checking the ballast. The victim had opened the hand hole near the bottom of the light pole to inspect the wiring and fuse. He was kneeling on damp grass to open the hand hole and access the wires. He was not wearing or using any protective equipment. The wires were energized and carried 277 volts of electricity. He tried to untwist the plastic cover over a fuse on one of the wires that he had pulled out of the hand

	<p>hole. The plastic cover stuck. As he applied force to twist it open, the cover broke apart. He contacted the electricity and a grounding source. When his partner realized what had happened, he descended immediately and severed the victim's contact with a wooden board.</p>
Case 12	<p>43-year-old male farmer/welder was welding to repair a rotary disc mower on his family's farm. The rotary disc mower had a broken disc and stone guard. The portable 240V plug-in-cord connected welder was in disrepair; both welder cables had exposed wiring, and the ground cable wiring was almost completely exposed. The ground cable was attached to a metal piece on the rotary disc mower. The victim had completed the weld on the disc and appeared to be repositioning to repair the stone guard when his face touched the mower. The mower was energized, and the victim was electrocuted. A complete MIFACE investigation report of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click on MIFACE Case ID 02MI121.</p>
Case 13	<p>30-year-old male roofer was re-roofing a building when inclement weather required covering the roof with a tarp. He was struck by lightning while covering the roof with the tarp.</p>
Case 14	<p>53-year-old male roofer was the sole owner of a roofing business. He and coworkers had started to re-roof an A-frame house. The victim and two coworkers returned to the house early the next morning while it was still dark because it was raining and water was getting into the basement of the house. An aluminum ladder was extended while the ladder was lying horizontally on the ground. The victim and a coworkers were raising the ladder up to lean against the roof when the ladder come into contact with an overhead 7200-volt power line that was 26 feet off of the ground. Another coworker saw a "blue streak" at the base of the ladder as the electric current was going to ground. The victim was electrocuted; the other coworker was hospitalized and released. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 12.</p>
Case 15	<p>41-year-old owner/operator of an eaves trough sales and installation company was electrocuted when the aluminum ladder he was holding contacted a 7200-volt bare power line. The victim was part of a 3-person crew at a residential home installing an eaves trough on the north side of the home, which faced the backyard. The crew had walked around the house to look at the eaves but did not notice the bare 7200-volt line. The ladder was a 30 –32 foot aluminum ladder, extended to approximately 23 feet. The power line was 18 feet 6 inches high and located approximately 22 feet from the house. The victim was carrying the ladder while walking backwards. The victim's coworker, according to the police report, warned the victim to be aware of the power lines just before the incident occurred. The ladder contacted the power line and he was electrocuted. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 16.</p>
Case 16	<p>23-year-old male operator of a guardrail post pounder mounted on a stake truck was electrocuted when the boom of the post pounder contacted an energized overhead power line. The company had notified Miss Dig and all underground utility lines were marked. The company did not request an overhead assistance appointment with Miss Dig. The guardrails on the west side of the highway had</p>

	<p>been set and the employees were placing guardrails on the east side. It was very windy on the day of the incident causing the overhead lines to sway in the wind. Work had progressed between 150-200 feet along the highway shoulder when, while pounding the guardrail post, the boom contacted an energized overhead 14,000 volt power line that crossed the highway in an east-west direction. The contact energized the truck and the victim received a fatal shock. He fell, breaking contact. Coworkers heard “crackling” and looked over toward the post pounder truck. They saw the victim lying on the ground, under the truck. They carefully pulled him clear from the energized truck and called for emergency responders. The victim was declared dead at the incident site.</p>
Case 17	<p>32-year-old male farmer was working with a family member moving a grain auger when the auger touched a high voltage wire. The family member, who also received a shock, pushed the farmer from the auger. The farmer died at the hospital and the family member was admitted to the hospital and later released.</p>
Case 18	<p>48-year-old male laborer was electrocuted when the antenna on a county road commission steel pole building contacted an energized 14,400-volt overhead power line while the building was being relocated via a state highway. The building was positioned on three dollies, two steer dollies at the “rear” of the building and one dolly at the “front” of the building that hooked to the front-end loader (tow vehicle). The lineman dropped the neutral wire and left the 14,400-volt electrical lines energized. The lineman was present in an aerial bucket positioned on the road shoulder to observe building clearance while the building was being moved. Approximately 75 feet of the building had proceeded under the lines when the victim and another employee assigned to the “rear” steer dollies went under the building and began to ratchet each dolly chain to steer the rear of the building onto the road. Near the front of the building a “bolt of lightning” was observed. The victim and his coworker at the “rear” steer dollies were electrocuted and fell to the ground. Bystander CPR was initiated and emergency response was called. His coworker was taken to the hospital and survived, the victim was pronounced dead at the scene.</p>
EXPLOSIONS	
Case 19	<p>52-year-old male welder died from burns sustained in an explosion that occurred in ductwork carrying coal dust that occurred in a mill system used to pulverize coal for combustion. A primary air fan that blows pulverized coal into the boiler and out of the mill tripped early during the shut down procedure; the residual coal in the mill may have played a role in the explosion. While the mill was shut down, the victim replaced an oil pump. Prior to the startup of the mill system, the public address system announcement to clear the area was made. The victim did not hear the audible warning to clear the area because the system was not functioning on the plant level above him and a rag was stuffed in the public address speaker on the plant level he was working on. During the mill system start-up, the coal dust ignited and exploded. The victim died approximately 3 weeks after the explosion.</p>
Case 20	<p>49-year-old male restaurant owner was assisting in a fireworks display sponsored by a city. The victim was lighting the firework mortar contained in a metal garbage can when the mortar exploded inside the can. The shrapnel from the explosion struck the victim causing his fatal injury.</p>
Case 21	<p>25-year-old male welder was preheating an aluminum mold to perform TIG welding. The mold had steel backing with thirty-two 5/16-inch bolts. At another location, the mold ran 12 parts and needed some fabrication work so the mold</p>

	<p>was sent to the victim's company. The mold had 4 lines of coolant with quick disconnects. Prior to welding, the victim did not drain/purge the mold of coolant so there was coolant inside cavities within the mold. While welding, the coolant heated to boiling and over pressurized, causing the mold to explode. The explosion blew out the steel backing plates. The victim was struck by a piece of metal and thrown against the wall and a double-stacked tool chest. Employees looked for an emergency first aid kit but could not find one. 911 was called and the victim was transported to the hospital where he died of internal injuries sustained in the explosion. The victim's urine was positive for both cocaine and a marijuana metabolite. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 14.</p>
Case 22	<p>21-year-old male apprentice boilermaker was burned by high-pressure steam that erupted from a Venturi chamber gas washer/scrubber he and his co-worker were attempting to unblock. Four companies were involved in the incident: the owner of the scrubber; an industrial cleaning and vacuuming company; a piping maintenance, cleaning, repair company; and the industrial contracting company that employed the apprentice boilermaker. The chamber had been being purged from above by steam and nitrogen gas under pressure. The vacuuming company thought the chamber was empty because nothing was coming out through their lines. They were mistaken, because a flange from above had fallen and wedged against the pipe they were vacuuming. The victim and his co-worker were told to remove a blank and flange from the scrubber base. They were standing on a small catwalk that they had accessed by climbing a ladder. Large equipment surrounded them. As the victim loosened the bolts on the flange, the waste that had been blocking the pipe broke free forcing the steam onto the two workers. The victim was unable to move out of the way of the steam and was burned. His co-worker was also severely burned. The victim died of his burns in the hospital the next day.</p>
Case 23	<p>30-year-old male farm manager was working at home in his home office when a gas explosion occurred in the basement. The force of the explosion threw the victim from the residence.</p>
FALLS	
Case 24	<p>47-year-old male carpenter died when he fell 14 feet while working with a coworker at a residence to replace siding fascia. The residence had 2 roof elevations; the lower roof elevation was approximately 14 feet high. The upper roof elevation was approximately 2 feet longer than the lower roof, thus it extended past the lower roof edge. The upper roof was snow-covered; the lower roof did not have snow and was not slippery. Both roofs had a slope of 3/12. The victim stood on the lower roof to clear snow from the upper roof because the snow interfered with the fascia installation. The victim, walking on the lower roof and moving from right to left, used his hand to clear the snow from the upper roof edge. He walked off the edge of the lower roof and landed on a concrete patio. He was taken to a local hospital and died 2 days later from his injuries. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 4.</p>
Case 25	<p>31-year-old male carpenter died when he fell 30 feet while descending from a</p>

	<p>roof. The victim was a member of a log home roofing crew. He had just finished decking the northeast valley of the north-south double log ridge using a 2x6 tongue and groove material. To descend from the roof, the workers climbed down the north gable from the west side from the top purlin log to the next purlin log, then onto the cap of an 8-foot stepladder, down to a temporarily decked loft perimeter, then onto the top of another 8-foot stepladder, then down to the first floor. The victim had traveled to the point where the single log ridge and double log intersect with the southwest valley log of the double log ridge. He fell 30 feet from the valley log through the open loft area onto the first floor. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 7.</p>
Case 26	<p>56-year-old millwright died when he fell 30 feet through an unguarded 60-inch air duct in a dust collection plenum. He and another millwright were performing routine maintenance on the dust collection system looking for leaking filter bags. To check for leaks, a fluorescent powder is put into the exhaust system through one of the intake ducts. Using a "black" ultraviolet light, the millwright entered the plenum at night to check for any leaking powder; the leaking powder will glow under the light, indicating the bag must be replaced. The victim locked out the dust collector and climbed a vertical caged ladder to the dust collector access doors and stood on the outside platform. The black light in addition to another light had been tied to a rope and the victim pulled the lights up to himself. While checking for leaks he fell through the unguarded wall opening. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 1.</p>
Case 27	<p>48-year-old male custodian fell 7 ½- feet to the bushes/ground below from a stepladder while he was changing letters on a sign. The ladder was not on a level surface.</p>
Case 28	<p>54-year-old male a millwright installing new copper lines approximately 18 feet in the air was killed when he fell from his extension ladder. No one saw him fall. He had started work at approximately 7:00 a.m. and had been working about an hour when a nearby worker heard a noise. When the worker investigated, he found the victim on the floor next to his ladder. The victim's ladder was supported on the crossbeam of a movable hoist and not on the building I-beam that was nearer to the area where he would have been working. There was evidence that the ladder had been originally leaned against the I-beam and had slipped and fallen to the hoist crossbeam. The victim was lying perpendicular to the ladder on his right side with his back toward the ladder, facing away from the ladder. Emergency personnel indicated that he appeared to have fallen heavily on his right side, because he had multiple rib fractures on his right side as well as head injuries. It is possible that he was standing on his ladder with his back to it working on the copper piping. When the ladder slipped, he fell; he twisted to his right and fell onto his right side. A complete MIFACE investigation report of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click on MIFACE Case ID 02MI060.</p>
Case 29	<p>30-year-old male roofer died as a result of a 30-foot fall from a roof that he was shingling. The victim wore a harness during the morning while performing</p>

	work, but did not place the harness on after lunch. There was no anchor point on the roof to attach the harness line. Working alone, while shingling a roof with a 4/12 slope, he backed off the roof edge and fell approximately 3 stories to hard clay. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 11.
Case 30	42-year-old male painter was killed when the aerial lift platform he was working in fell approximately 130 feet. The worker was painting the trusses in a stadium roof. He was operating a Condor 150 S aerial work platform with an articulating and extensible boom. He was located 122 feet above the ground. The machine became unstable and one outrigger was observed coming up off the ground. The worker was instructed to finish what he was doing and then descend. As he moved the platform to descend, the lift fell toward the east. The basket in which the worker was working landed in the precast concrete seating area of the stadium.
Case 31	13-year-old male youth was helping on a neighbor's farm. He was sitting on a horse-drawn cart attached to a hay wagon with steel wheels. A loud noise startled the horses and they jumped forward causing the victim to fall to the ground. The wagon wheels ran over the victim's head.
Case 32	38-year-old male laborer was killed when he lost his balance and fell from a platform on the rear of a retrofitted van on which he was standing. The company he worked for loads and unloads vehicles from car haulers and train cars. The worker's job was to drive new vehicles to assigned designations on the employer's property. The employer uses cargo vans with the doors removed and benches mounted inside to transport the shuttle drivers around the yard. These vans have a platform added to the rear of the vehicle to aid in entering and exiting the van. On the day of the incident he was standing on the platform waiting to be driven from the drop-off point to pick up another vehicle. When the van started moving, he fell from the platform and hit his head on the asphalt. He died in the hospital 9 days later from his head fracture.
Case 33	41-year-old male electrician was on a building roof when he came into contact with a live electrical wire. He touched the wire and fell 12 feet to the ground. He died from injuries sustained in the fall. He was under the influence of alcohol at the time of the injury.
Case 34	63-year-old school custodian was retrieving an item from a school canopy over an entrance door. He was on an aluminum 5-way ladder with slip resistant pads on the ladder's base. He fell 7 feet from the ladder and struck his head. He died from complications of the head injury approximately one month later.
Case 35	41-year-old male roofer lost his balance while on a roof and fell approximately 20-30 feet to the cement driveway below. He arrived at work with a beer and was wearing sandals while working on the roof. He was hospitalized on the day of the incident; he died 10 days later from his injuries.
Case 36	57-year-old male tree trimmer was killed when he fell approximately 35-40 feet from a tree. He was moving from a vertical branch onto the main part of the tree. At this point, the victim undid his safety harness and stepped over to the main section of the tree. The victim was trying to reattach his safety harness when his spurs slipped from the tree and he started sliding down the tree. The victim hit a tree branch that he had not cut below him and the branch flipped him and he fell to the ground landing on his head and shoulder.
Case 37	37-year-old male machine builder was on a ladder at a restaurant. He was co

	owner of a ventilation company. He had climbed approximately $\frac{3}{4}$ of the way up the ladder when the base slipped on wet, slippery asphalt. The ladder began to slide down the wall, throwing the victim off of the ladder. He died 24 days later from head injuries sustained in the incident.
Case 38	83-year-old male customer service representative fell from one level to another in 2001. He died in 2002 from complications of his head injury sustained at the time of the fall.
Case 39	73-year-old female independent contractor had an unwitnessed fall while working at a bowling alley. She died 3 weeks later from complications of the head injury sustained at the time of the fall.
Case 40	52-year-old male construction laborer was killed when he fell approximately 7 feet to the snow-covered, wet concrete floor from an unsecured fiberglass extension ladder without safety feet. The victim was part of a work crew erecting structural steel. One employee used a forklift to raise the roof support steel to the proper height. The ladders were leaning on a steel beam about 13 feet high and 2 feet wide. The victim and another employee were on opposite sides of an outside column bolting the roof support steel to the column, each standing on fiberglass extension ladders that were not tied off and did not have safety feet. The victim's coworker asked him for some bolts. When the victim leaned to one side to give the coworker the bolts, the ladder shifted with one ladder leg coming off of the ground causing the victim to fall to the concrete floor striking his head. He was taken to the hospital where he died. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 17.
Case 41	23-year-old male carpenter was killed when he fell 27 feet to a cement surface from a 39-foot high steel form. He was climbing the form to unhook the crane that had moved it into place. He was wearing a body harness and a lanyard, but they were not attached, because he was climbing the form using Pelican hooks. Pelican hooks are attached at openings in the formwork designed for that purpose. They are attached and detached one at a time, so that the person climbing is always connected to prevent a fall. Apparently a Pelican hook either malfunctioned or was not in use at the time of the incident, and he fell 27 feet. He died in the hospital the next day of the cranial-cerebral injuries he sustained in the fall.
Case 42	64-year-old male laborer in the construction industry fell from a roof of a vacant building and fractured his neck.
Case 43	73-year-old male maintenance engineer was working on a shed roof. He fell 8 feet to the ground and struck his head.
Case 44	52-year-old male electrician fell to the ground from a machine at an automotive plant.

HEAT/COLD

Case 45	30-year-old male landscape mowing assistant collapsed and died at the end of a day of caring for residential lawns. His co-workers witnessed the collapse and called for medical assistance. The victim's rectal temperature was 107.6 ⁰ F. He was taking a medication that predisposed him to heat related illness. A complete MIFACE investigation report of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click on MIFACE Case ID 02MI075.
Case 46	46-year-old male roofer died of hyperthermia after working on a roof.

HOMICIDES	
Case 47	35-year-old male police officer died from a stab wound while in pursuit of a subject.
Case 48	26-year-old male restaurant cook was shot in the back at work by a relative due to a family dispute.
Case 49	31-year-old male storeowner was shot in the head during a robbery.
Case 50	33-year-old male auto body shop worker was killed when he was caught in the crossfire when a disgruntled customer started shooting. He died from a single gunshot wound to the head.
Case 51 Case 52	32-year-old female restaurant manager and 36-year-old male kitchen manager were shot during a robbery prior to opening a restaurant for the day.
Case 53	41-year-old male food service worker was delivering a pizza and was killed by gunfire.
Case 53	26-year-old female police officer was killed by gunfire during a neighborhood disturbance.
Case 55	45-year-old male cook was delivering pizzas when he was killed by a single gunshot at the delivery location.
Case 56	31-year-old male police officer was shot while making an arrest.
Case 57	22-year-old male gas station attendant died of gunshot wounds during a robbery.
Case 58	30-year-old female store manager was stabbed after arriving to work but before the store opened.
Case 59	30-year-old male fast food restaurant manager was found shot at his place of business.
Case 60	58-year-old male storeowner was killed by gunfire during a robbery.
Case 61	24-year-old male account manager was killed by gunfire by a disgruntled employee.
Case 62	50-year-old male driver for a floral delivery service was found shot at the place of business. He died of a single gunshot wound to the back of the neck.
Case 63	25-year-old male college student was found in the basement of the motel where he was working. He was a victim of a homicide. He died of asphyxia, due to strangulation and blunt force trauma.
Case 64	43-year-old self-employed male was found shot in the head at his place of work.
Case 65	29-year-old male owner of a cellular phone store was shot during a robbery.
Case 66	52-year old male who was self employed in real estate was found beaten to death in a vacant lot.
Case 67	39-year-old retail food store clerk was the victim of a homicide.
Case 68	21-year-old male machine operator was found shot in a locked automobile in the parking lot where he worked.
MACHINE RELATED	
Case 69	32-year-old male died when he was installing decorative cylindrical columns on to existing square red iron columns on the exterior of a new health food store. He was working on a column located near the entrance of the building and located directly under a skylight in the soffit of the exterior overhang of the building. The victim used a Grove Nugget B series self-propelled aerial work platform. The work platform had unguarded moveable controls, that were located at the narrow end of the work platform where the victim was working. He was installing 2x2 steel angle and a wooden 2x4 to the red iron column. It appears he was reaching to attach either the angle or the 2x4 and inadvertently

	<p>activated the lift controls by leaning on them or catching them with his coat. Both the lifting controls and the movement controls were activated, and the lift was propelled into the column, which caught the victim between the aerial platform guardrail system and soffit of the exterior of the building entrance. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 3.</p>
Case 70	<p>61-year-old male farmer was spreading manure in his field. When the victim's wife returned home after being gone all day, she saw the tractor in the field running, but her husband was not around. After looking for him, she called a neighbor to help. The neighbor turned off the PTO and climbed up on the spreader and found the victim.</p>
Case 71	<p>31-year-old male rig hand/welder was fatally injured when he was pulled upward and entangled in the rotating drive shaft between the chain case and the rotary table in the substructure of the oilrig derrick. The victim had previously removed a non-working light from the rig substructure. The replacement light was a 2-foot, 2-bulb fluorescent light with a 6-8 foot long cord. To attach the light to the rig substructure beam, he stood on either the hydraulic winches that lift the drill pipe, or the winch mounting brackets, or both. The winches/mounting brackets were located about 3 ½ feet above the rotary drive box for the chain case drive unit. Standing on the winches/mounting brackets placed him approximately 3 feet below and to the right of the rotating drive shaft. The 2-foot long drive shaft was approximately 8" in diameter, was located approximately 4-6 inches below the rig floor deck and was rotating at least 70 rpm. The rig was not shut down or locked out during the removal of the defective light or during the installation of the replacement light. The event was unwitnessed, so it is unknown how the victim became entangled in the drive shaft. A co-worker heard a thumping sound and observed the victim spinning with the drive shaft. The co-worker shut down the rig and emergency services were called. The victim was pronounced dead at the scene. A complete MIFACE investigation report of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click on MIFACE Case ID 02MI016.</p>
Case 72	<p>44-year-old male machine operator was killed when his head was crushed in a cycling press. The victim had reached into the machine to pull some material through when the machine cycled. The press was cutting fiberglass; a fiberglass sheet in back of the machine had not yet been readied for cycling into the die. The victim was setting up for the next job run. The machine had been locked out for job setup, and then unlocked in preparation to running the job. The press had light curtains and sensor touch to keep hands out of the machine, but the safety devices were not activated.</p>
Case 73	<p>21-year-old male landscaper was killed when the wheel of a skid-steer loader crushed his head. He and three other employees of a landscaping company were driving to the company's nursery on a new LS 180 New Holland skid-steer loader. He was riding on the right fork; another worker was riding on the left fork; a third worker was straddling the forks. As the driver turned onto a dirt path leading into the nursery from the paved road on which they had been traveling, the loader started to bounce. The worker on the left fork and the worker who had been straddling the forks jumped off to the side to safety. The victim slipped and fell into the path of the loader. Before the driver could stop,</p>

	<p>the loader had driven over and crushed the victim's head. He was pronounced dead at the site. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 10.</p>
Case 74	<p>48-year-old male heavy equipment operator was killed when he was run over by a fuel truck backing up after it had finished fueling the equipment used on a road widening construction site. The site supervisor had used his keys to warm up the victim's bulldozer. The victim, wearing a reflective vest, was returning the keys to the supervisor when the fuel truck struck him. The fuel truck was facing west. The truck driver walked around the back of the truck to get to the driver's side door and did not see anyone behind him. The truck had backed up approximately 30-40 feet when it struck the victim. While the truck was backing up, the victim was walking east, with his back to the truck. He was walking away from the fuel truck. The driver could not see the victim in the truck's rear view mirrors. Coworkers were yelling to the victim to get out of the way of the backing fuel truck, but it is thought that the victim could not hear them yell the warnings since he did not get out of the way. After being hit by the truck, the victim tried to crawl away from the truck and he was run over by the passenger-side rear dual tires. The fuel truck back-up indicator was sounding and the back-up lights were working. There were conflicting reports about the hearing status of the individual; some workers thought he was hard of hearing, other workers thought the victim could hear fine. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 18.</p>
Case 75	<p>48-year-old male machinist was operating an automatic CNC horizontal machine. The victim had loaded materials onto a pallet being fed into CNC. The victim walked around to the back of the machine and opened the guard door while the machine was running. It is postulated that he was cleaning out "chips". When the machine cycles, there is a moving part of the machine that moves from the left side of the machine to the right side of the machine. The victim placed himself to the right of the moving part and the side of the machine. The machine cycled and the moving part crushed the victim's head against the side of the machine.</p>
Case 76	<p>53-year-old male laborer was caught between the rear wheels of a semi-tractor and run over. The victim had previously moved another vehicle to another location at the site. During this time, a tractor was being unhitched from a mobile home trailer. The driver and spotter had jacked up the trailer to relieve the weight and pressure from the pin. The pin was removed and the trailer hitch ball was still in the trailer hitch. The spotter was on the driver's side, in front of the truck. The driver placed the tractor in reverse and released the trailer ball from the hitch. The ball dropped and the spotter yelled "all clear". After the "all clear" signal was given, the spotter noticed the victim on the passenger side of the trailer near the toolbox. The driver did not see the victim. The spotter walked back to the end of the truck while the driver pulled forward. The victim appeared to be standing between the tractor's passenger side rear wheels and the fuel tank. As the tractor drove forward, it drove over the victim and he was crushed.</p>
Case 77	<p>A male farm worker of unknown age was clearing brush from a cart. His</p>

	coworker driving a skid steer ran over him after he came down from the cart.
Case 78	49-year-old male tool and die maker was on a company-sponsored hayride. During the hayride, he was climbing all over the wagon. He continued to move about the wagon despite repeated warnings. He climbed out of the wagon, and fell. He was run over by the wagon wheel.
Case 79	60-year-old male farmer was mowing a hay field with a brush hog. He hit a single wire electric fence and the wire became entangled in the mower blades. He turned off mower, was under brush hog to remove wire when the tractor hydraulic lift failed and the brush hog landed on top of him.
Case 80	72-year-old male farmer was traveling to disc along a lane near their home. The tractor overturned into a ditch filled with water, the tractor did not have a cab or rollover protection and the victim was crushed.
Case 81	45-year-old male laborer was killed when a road grader at a road construction site struck him. The victim was part of a crew rebuilding a roadway bed. The victim's job was to advise the grader operator about the height necessary for the blade so each side of the road is of equal height. The roadway bed had a soft gravel surface. The grader had two outside mirrors and a large rear view mirror inside the operator cab. They were adjusted appropriately for the driver's height. The back up alarm was audible and working properly at the time of the incident. The cab glass was dusty, but vision was not obscured. The grader operator and the victim had previously discussed the elevation of the road, and what roadwork work still needed to be done. The grader operator went into the grader and made one forward pass on the road. As the grader operator was backing up, he checked his rear view mirrors and looked out of the rear cab window and did not see anyone. The grader blade was approximately one foot in the air from the top of the gravel. It appears that the victim, wearing an orange vest, was checking the gravel height when he was struck by the rear tires of the grader and then struck by the grader blade. While completing the rear movement, the operator looked out the forward glass and saw the victim in the gravel roadway just to the right of the grader's left front tire. The operator then called for emergency response. When emergency responders found the victim, he was holding a ruler and a small scope in his hands. The victim was declared dead at the scene. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 20.
Case 82	70-year-old male appliance repairman/farmer was traveling on a 2-lane asphalt road on his tractor when he veered to his right. The tractor overturned, and he was pinned beneath the tractor. The tractor was not equipped with a rollover protection structure. His blood alcohol level was 0.29%. A complete MIFACE investigation report of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click on MIFACE Case ID 02MI120.
Case 83	73-year-old male farm hand died of injuries he sustained when he was run over by a tractor. He was starting the tractor while standing on the ground in front of one of the rear wheels. The victim had been operating the tractor earlier in the day using a front-end loader with forks to lift ½ ton fruit tanks onto a flatbed truck. After he was finished, he took the tractor to the shop. The forklift hydraulics were drifting during the loading operation and he may have been attempting to adjust the forklift position when he started the tractor. While

	<p>standing on the ground in front of the rear tire, he pressed down on the clutch and started the tractor. The tractor was left in gear and the tractor's rear wheel ran over the victim, causing crushing injuries to his pelvis. He was found by another employee and taken to the hospital for surgery and stabilization. The next day, a blood clot developed and he died. A complete MIFACE investigation report of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click on MIFACE Case ID 02MI140.</p>
Case 84	<p>24-year-old male debarker operator was working at a debarker machine at a sawmill. His clothing got caught in the feeding rolls and his arm entered the machinery. A coworker, who called for emergency response, found him. His arm was severed at the shoulder. He was declared dead at the scene; he bled to death.</p>
Case 85	<p>45-year-old male farm worker was killed when he became entangled in a tractor's unguarded rotating power take off (PTO) shaft. The mixer had undergone repair and its u-joint and PTO shaft were unguarded. The victim loaded the mixer with supplements and then had driven the tractor/mixer to the bunker silo area to add haylage to the supplements. He drove the tractor into the bunker area from a north to south direction instead of his usual approach, which is in a south to north direction. He had dismounted from the tractor and left the tractor running; it is unknown if the PTO was engaged or disengaged when he dismounted. His left hand/arm became entangled in the rotating PTO. A complete MIFACE investigation report of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click on MIFACE Case ID 02MI151.</p>
Case 86	<p>34-year-old female inmate was part of a work crew doing maintenance at a facility. The victim was operating a tractor with a front-end loader in the front and a tiller on the back. The front-end loader appeared to be 1-2 feet off of the ground. She was returning after tilling an area around a brush pile traveling along a narrow gravel roadway that used to be a rail spur. There was a 70-80 degree drop-off on either side of the gravel roadway. She left the roadway and the tractor rolled down the decline pinning her beneath the tractor. The tractor was not equipped with a rollover protection structure.</p>
Case 87	<p>20-year-old male laborer and his coworker were removing bridge formwork while working from an elevated truck bed. They had previously been patching a road when the foreman instructed them to begin the removal of bridge formwork. The truck used was designed so the truck bed may act as an aerial lift or as a dump truck. The victim and coworker were in a raised position, approximately 10 feet off the ground in the truck bed and had been working for approximately one hour. The control to raise and lower the truck bed is located near the bulkhead of the truck bed. They attempted to lower the raised truck bed, but it wouldn't move. They called down to another coworker, who told them to try to raise the bed a little, and then try to lower the truck bed. The victim and coworker were standing near the bed's bulkhead when one of them tried to raise the truck bed. When they attempted to raise the bed, the truck bed bulkhead was thrust upward and the rear of the truck bed dropped quickly toward the ground. The victim and coworker were crushed between the bulkhead and a bridge beam, and then slid off the angled truck bed to the ground. The coworker survived. A complete MIFACE investigation report of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/</p>

	Click on the MIFACE link, then click on MIFACE Case ID 02MI157.
Case 88	26-year-old male dirt compactor operator was working at a construction site compacting dirt in an area that had 2 different levels. He was working at the higher elevation, 2 feet above the lower elevation. He was moving the compactor back and forth and came too close to the 2-foot drop. The compactor rolled over and the victim was thrown from the compactor. He was not wearing a seat belt. The compactor landed on top of him.
MOTOR VEHICLES	
Case 89	23-year-old male lineman died while driving an escort vehicle. He was following a truck carrying a telephone pole, which protruded out the back of the truck. The truck carrying the pole stopped at a traffic light, but the escort vehicle did not stop in time. The telephone pole entered the escort vehicle on the driver's side, killing the driver.
Case 90	56-year-old male truck driver died when a 60,000-pound front-end loader loaded on a gooseneck trailer broke free from the securing chains and rolled onto the cab. The victim's company was contracted to transport the loader to another site. The victim directed the loader driver onto the trailer and positioned the loader. After the front-end loader was positioned correctly on the trailer, the victim secured the loader with 4 3/8- inch chains. It is unknown if the chains were attached directly to the trailer bed or to the "D" rings on the trailer. During transport, police postulate that the driver stopped suddenly. The momentum from the sudden stop caused the loader to apply strain to the chains and caused them to break. The loader moved over the gooseneck and onto the truck cab. The cab was crushed, and the driver was declared dead at the scene.
Case 91	50-year-old male truck driver for a refuse company was in front of his disabled garbage truck on the shoulder of a road. A semi-truck driver drifted onto the shoulder, striking the rear of the garbage truck. The collision caused the garbage truck to be pushed forward, striking the victim.
Case 92	42-year-old male truck driver was driving a semi truck hauling a load of apples on a highway when a minivan, which had been swerving for approximately 9 miles according to a witness, crossed the centerline and struck the semi. The victim swerved to avoid the van, rolled the truck and was crushed.
Case 93	30-year-old male truck driver was driving a flat-bed stake truck and had been drifting over the fog line on the right side of the road according to witnesses. The driver then made a quick-jerk over the centerline crossed the centerline and struck another truck head-on. The victim was using a lap/shoulder belt. The vehicle was not equipped with an airbag.
Case 94	48-year-old male paint salesman was the driver of an automobile that was broad sided by another vehicle that disregarded a red light. The victim's vehicle ran off of the roadway and struck a light pole. He was wearing a lap and shoulder belt. The airbag did not deploy.
Case 95	25-year-old male landscaping contractor was driving his pick-up truck when he drove off the road, through a ditch and struck a tree. He was wearing a lap / shoulder belt. The airbag did not deploy.
Case 96	62-year-old male truck driver was involved in a motor vehicle accident with two other vehicles. The other vehicles collided, and the victim unable to avoid the collision, hit the wreckage and burst into flames. It is unknown if the victim was wearing a seat/ shoulder belt. The airbag did not deploy.
Case 97	20-year-old male student was a member of an Army National Guard trip. He was the vehicle's driver. He lost control of the vehicle and rolled the vehicle. He

	was ejected from the vehicle; he was not wearing a seat/shoulder belt. He died 5 days later in the hospital from head injuries sustained at the time of the incident.
Case 98	60-year-old male auto body repair shop owner was the driver of an automobile vehicle that was struck head on by a pickup truck. The pickup truck crossed the centerline, made contact with a semi-truck trailer then proceeded down the side of the semi and hit the victim's car. The victim was not wearing a lap/shoulder belt. The airbag did deploy.
Case 99	29-year-old male semi-truck driver was traveling along a road, missed a curve and drove into a grassy field. The semi rolled on its side when it entered the field, pinning the victim. He was wearing a lap/shoulder harness. The vehicle was not equipped with an airbag.
Case 100	26-year-old female technical sales representative employed by a highway traffic management firm was struck and killed by a passenger vehicle while setting up a highway work zone warning device.
Case 101	39-year-old male retail stock distributor was the driver of a van carrying a co-worker. The victim turned left in front of a semi truck. The truck hit the driver's side, pinning the victim. The victim was wearing a lap/shoulder belt and the airbag deployed.
Case 102	20-year-old male college student was working at a car wash and was doing stunts on his motorcycle. He lost control of the motorcycle and he and the cycle struck a dumpster. He died from severe cranial trauma.
Case 103	35-year-old male race driver was driving a racecar doing practice laps. He was accelerating out of turn two and lost control of the car. He left the track and hit a racetrack safety truck parked on the outer edge of the track.
Case 104	38-year-old male truck driver was driving a propane truck. The propane truck was hit on the driver's side by a cement truck that failed to stop at a stop sign. It is unknown if the victim was using a lap/shoulder belt. The vehicle was not equipped with an airbag.
Case 105	69-year old male semi-truck driver was driving a tractor-trailer with a double tank on an interstate highway. Near an exit ramp, the tractor-trailer drove off of the roadway to the right and tried to re-enter. The vehicle's right side tires entered the gravel shoulder; the vehicle began to rotate in a counter clockwise direction and struck a guardrail. Driver restraint use is unknown. The airbag did not deploy
Case 106	85-year-old male car dealership owner was the driver of a vehicle he was repositioning to another area of the dealership lot. While moving the vehicle, the car's rear bumper became caught up on a utility pole guide wire. While attempting to free the car from the guide wire, the victim depressed the accelerator causing significant torque. The vehicle broke free of the guide wire, and accelerated at a high rate of speed. The vehicle crashed into a tree off of the lot. The victim was wearing a seat belt/shoulder harness and the air bag did deploy.
Case 107	20-year-old male newspaper delivery driver crossed the road centerline, went off the road and hit a tree and a brick wall. The driver was not wearing a seat/lap belt. The vehicle was not equipped with an airbag.
Case 108	35-year-old male electrical apprentice was in a motor vehicle accident in 1989. He sustained head injuries in the accident and died from complications in 2002.
Case 109	38-year-old male federal aviation technician crossed the centerline of a highway colliding with an oncoming truck. He may have fallen asleep while driving. The victim was wearing a lap/shoulder harness and the airbag deployed on impact

	with the truck.
Case 110	30-year-old female laboratory technician was on a return trip home from a business trip. She ran the car off the roadway, lost control, rolled and came to rest in oncoming traffic lanes. The victim was not using a seatbelt/shoulder harness and was ejected from the car. The airbag did not deploy.
Case 111 Case 112	30-year-old male welder was driving a pick-up truck with a 44-year-old male pipe fitter passenger. The pickup truck was traveling at a high rate of speed (89mph) the truck left the road right and rolled over several times. The driver was partially ejected; the driver was wearing a lap shoulder belt. The passenger was not wearing restraints and was ejected from the vehicle. The airbag did not deploy.
Case 113	57-year-old female newspaper delivery person was delivering newspapers when she veered to her left, crossed the centerline and rolled her vehicle, which landed on top of her in a ditch. The vehicle was not equipped with a lap/shoulder harness or an airbag.
Case 114	24-year-old female family support services coordinator was traveling between work locations when she did not negotiate a curve and her car hit a tree. Restraint use is unknown. The airbag did deploy.
Case 115	43-year-old male laborer worked for a repossessing service. He was driving a repossessed motorcycle back to the business. He changed lanes and appeared to lose control, leaving the roadway. He hit a concrete barrier and was thrown from the motorcycle and hit a light pole. He was wearing a helmet.
Case 116	33-year-old male auto parts assistant was killed in a head-on collision with a semi-truck. The victim was returning a car that was in for service to the car's owner. The victim crossed the centerline and the victim's vehicle collided with the driver's side of the semi-truck cab. The victim was not wearing a safety lap/shoulder belt, and the vehicle he was driving was not equipped with an airbag.
Case 117	55-year-old female bank employee was in the company parking lot. She bent over or knelt down in a parking space to pick something up from the ground and was struck by a van turning into the parking space.
Case 118	56-year-old female home health care provider was driving to an appointment. She lost control of her vehicle on an icy road and spun out of control. She crossed the centerline and was struck by an oncoming car attempting to avoid the victim's car. She was wearing a lap/shoulder belt. The airbag did not deploy.
Case 119	49-year-old male security supervisor was operating his motorcycle when he was involved in a collision. He died two days later in the hospital from a closed head injury.
STRUCK BY	
Case 120	53-year-old male sales manager was killed when he was assisting in the loading of a 400-pound slag tub (80"x80"x16") onto a truck bed. Overhead crane chains were attached to the 4 corners of the tub holding slag and the crane was used to lift the tub onto the truck. The tub was to be dumped into the truck. The employees unhooked 2 chains so the tub could be tipped. During the tipping process, the crane ran out of crane rail and couldn't complete the tip. The victim placed a 4"x4" board under the tub to try to get the box to tip; the board was above his head. Instead of tipping forward, the tub tipped back, forcing the board he was using to try to tip the tub to come down and strike his head. . A summary of the MIOSHA investigation of this incident can be found on the

	MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 9.
Case 121	43-year-old male temporary worker was killed removing a tire from a loading dock during the unloading of a roll off dumpster. The truck driver delivering the dumpster noticed a tire located in the loading dock area. The loading dock area had a ramp that was lower than the ground. To unload the dumpster, the truck bed must be raised so dumpster may “roll off” the truck bed. Approximately 12 feet from the dock wall, the truck driver got out of the cab, and raised the truck bed approximately $\frac{3}{4}$ of the way up. The driver let the cable out and let some slack build up because it sticks so that the dumpster could be lowered. During this process, the victim noticed the tire and attempted to remove it. He jumped into the ramp area to remove the tire. The victim’s coworker signaled to the driver that the victim was in the ramp area. As the driver walked back to the controls to take the slack out of the cable, the dumpster slid off the truck. The dumpster pinned the victim on the rear passenger side of the dumpster against the loading dock wall. The truck driver winched the dumpster, then drove the truck forward to unpin the victim, 911 was called and the victim was transported to a local hospital where he died of multiple blunt force injuries. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 8.
Case 122	51-year-old male rigger died while he was assisting in the removal of a piece of metal framework weighing 1500-2500 pounds. The framework was located in the middle of an enclosed trailer bed. The metal framework involved in this incident was freestanding, not on a pallet. To remove the framework, a chain was wrapped around the bottom rails and the framework was pulled to the end of the trailer bed by the forklift. While pulling the framework toward the end of the truck, the framework became “cocked” to one side and lodged or caught on something in the trailer and would not continue to move. His coworker had placed forklift tines under the framework. The victim climbed into the trailer, went under the framework and kneeled on the bed floor while under the framework to see what the framework was caught on and to guide the forklift operator. The forklift operator lifted the framework a short distance from the trailer bed floor. As it was being lifted, the framework became dislodged. The sudden movement allowed it to lurch off of the forks landing on the victim's back, pinning him against the trailer bed. A complete MIFACE investigation report of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click on MIFACE Case ID 02MI028.
Case 123	52-year-old farmer was moving a 1500- pound hay bale that was wrapped in plastic from a row of hay bales in a field to inside the barn. The surface he was traveling over was very rutted and snow covered. He placed the hay bale in his front-end loader bucket, and raised the bucket to just over ground level. While transporting the bale of hay to the barn, the rear tires became stuck in some ruts. To free the tractor, he rocked the tractor back and forth and lifted the bucket higher. Still unable to move, he raised the bucket way above the hood of the tractor. While rocking back and forth, the hay bale came out of the bucket striking the farmer while he was sitting in the tractor seat. The bale then rolled off and landed on the ground. Both the tractor seat and steering wheel were bent from the impact of the hay bale. The victim died at the hospital.

Case 124	<p>43-year-old male service manager was killed while working underneath an elevated tractor at a service garage. The tractor had been brought in for service and had been hoisted from the ground by chains for approximately one week while awaiting repair parts. The tractor did not have a secondary support system capable of supporting the weight of the tractor in case of the hoist/chain failure. While working underneath the elevated tractor attaching a part, bolts holding a bracket located at the front of the tractor pulled away from the connectors. The chains and the tractor fell on the victim. The threads of the connection were stripped; the bolts were intact but the bolt threads were filled with threads of the tractor connection area. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 6.</p>
Case 125	<p>45-year-old male grade checker died when he was struck by a dump truck tailgate. The victim was a worker at a road construction site. A tractor-trailer with a dump box was driven to the site with approximately 25 yards of gravel in the box. The truck driver dumped the gravel, and was signaled by the victim, stationed at the back of the truck, to put the dump box down. The driver lowered the box partially down and pulled the truck forward slightly. When the dump box was in a raised position, the rear lower edge of the open dump box was approximately 3'11" off of the ground. As the box is lowered, the edge moves away from the ground; when the box is fully lowered, the rear lower edge of the open dump box is 4'9" from the ground. The victim had in the past cleaned out the back of the dump box lower edge in the tailgate area with his hands after the load was dumped to permit the tailgate to close completely and diminish the amount of free material that may fall out of the truck during subsequent road travel. It appears that the victim was cleaning out this area. It is unknown if the truck was moving forward at the time. The victim was standing between the dumped gravel and the tailgate, which was resting on, and held up by, the dumped gravel pile. Either while the dump box was being lowered and/or when the truck moved forward, the tailgate moved over and off the crown of the gravel pile, swung shut, and struck the victim in the head. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 5.</p>
Case 126	<p>49-year-old male journeyman pipe fitter was struck in the head by a 6-inch diameter grooved cap he was removing from the end of a pipe. The pipe had been pressurized to test its integrity and was still under 100 pounds of air pressure. The force of the blow from the cap striking him in the face knocked him backwards over the rail of the scissors lift that he was standing on to a concrete floor 14 feet below. A complete MIFACE investigation report of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click on MIFACE Case ID 02MI090.</p>
Case 127	<p>35-year-old male laborer was assisting with the re-lining of a limekiln. The cylindrical kiln's outer surface was lined with metal plating. The interior of the kiln was lined with 2 layers of brick. The victim was standing on the ground loading a sling with bricks weighing approximately 18 pounds. Above the ground level was a circular metal ceiling that had a square hatch with a trap door; the door was opened and closed by using a handle located near the hatch. Another worker were responsible to close this trap door when loading the sling. The loaded sling was hoisted to an upper level through the trap door by workers</p>

	<p>located approximately 115 feet above ground on a metal work platform attached to a lift cable. The work platform floor had a trap door to allow the sling to be raised to the platform and the bricks unloaded. After the bricks were hoisted to the work platform, a worker unloaded them from the sling and placed them on the perimeter of the platform. The sling was then lowered and the workers on the ground loaded the sling with another load of bricks. A worker on the upper level was moving a brick when it was knocked from his hand. The trap door was open and the brick fell approximately 115 feet through the open trap door. The victim, who was wearing a hard hat, was struck in the head by the falling brick. The hard hat was cracked from the brick's impact. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 21.</p>
Case 128	<p>30-year-old male temporary worker was killed when a bale of paper weighing approximately 1600 pounds fell on his back. He had loaded several paper 6 x 4 x 3 feet thick bales on an 8-foot wide conveyor with a forklift. The bales were loaded on the flat part of the conveyor. As the conveyor moved the bales to another station, the conveyor had a 45-degree incline. Each paper bale had 5 wires on them. He climbed onto the incline part of the conveyor and standing below the paper bale, had cut several wires. The bale fell on him and he died of asphyxia.</p>
Case 129	<p>54-year-old male truck driver was killed when a precast sewer-manhole cone and its base tipped off the forks of a front-end loader pinning him between the bed of his flat bed semi truck and the 2,500 lb cone. His chest was crushed. He had delivered a load of precast concrete manholes to the construction site and was last seen by the front-end loader operator removing safety chains from the parts. The front-end loader operator slipped the forks of the forklift between the truck bed and the manhole, backed up to lower the parts close to the ground, then adjusted the forks so the load would be tilted slightly toward the front-end loader. He did this to compensate for a slight incline he was going to have to back over as he backed further away from the truck. As he was looking backward to back up, he heard a thud. When he looked forward, he saw that the tapered cone and its base had fallen off the forks of the front-end loader. As he moved forward, he saw that the truck driver was pinned between the manhole cone and his flat bed truck. The victim was pronounced dead at the construction site by the medical examiner. A summary of the MIOSHA investigation of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click MIFACE Summaries of MIOSHA inspections, Case 13.</p>
Case 130	<p>18-year-old male logger was working with a co-worker clearing a piece of property. The victim walked to the location of a second chainsaw to begin limbing felled trees. While the coworker felled another tree, he looked up and saw the victim underneath the falling tree. The tree struck the victim in the back, knocking him to the ground.</p>
Case 131	<p>47-year-old male truck driver was in the process of removing a 12-foot long section of a walkway attached to a portable incline conveyor at a quarry. A section of the walkway collapsed on him as he was cutting a metal attachment with an acetylene torch.</p>
Case 132	<p>50-year-old male refuse hauler driver was loading a 40 cubic yard container onto a truck. As the container was being raised, refuse began to fall out of the</p>

	back of the container. The victim crawled under the container to close the container flap closed. While he was under the container, the hydraulics failed and the container fell to the ground, pinning the victim.
Case 133	43-year-old male pipe fitter was killed when the force of a dirt cave-in propelled his head into a concrete catch basin approximately 6 feet in diameter and 5 feet high; He and another worker were installing the catch basin in the parking lot of their employer's place of business. The hole was approximately 8 feet deep. His partner had excavated the hole with an excavator that the company used in its usual work of installing fiberglass pools and spas. The victim had jumped into the hole to release the chains. The wall collapsed on him forcing his head into the catch basin and burying him to his knees. He was pronounced dead at the site of blunt force trauma to the head.
Case 134	52-year-old male assembler sustained head trauma when an engine fell on his head in 1988. He died from complications of the injury.
Case 135	72-year-old male mechanic was working under an automobile. The car fell on his chest and asphyxiated him.
Case 136	30-year-old male owner/operator of a martial arts studio was competing in a world title kickboxing match during which he was knocked down three times by right crosses. Approximately ninety minutes after the match, he became wobbly and his eyes rolled back in his head. He was rushed to the hospital by which time he was barely conscious. He died three days later.
SUICIDES	
Case 137	46-year-old male physician placed a plastic bag over his head that was connected to nitrous oxide and was asphyxiated.
Case 138	38-year-old male quality engineer committed suicide at work by hanging himself.
Case 139	54-year-old male shipping and receiving clerk was involved in a shooting of coworkers at an out-of-state plant during work hours. He fled from the shooting site into Michigan. While evading police in Michigan, he died of a self-inflicted gunshot.
Case 140	60-year-old male chef committed suicide in his restaurant by a self-inflicted gunshot.
Case 141	28-year-old male salesman committed suicide at his place of business by a self-inflicted gunshot.
Case 142	53-year-old male self-employed sign painter was found at his place of business with a self-inflicted gunshot.
Case 143	35-year-old drywall installer committed suicide by hanging himself in a vacant building.
Case 144	35-year-old male research analyst committed suicide at work by a self-inflicted gunshot.
Case 145	59-year-old male engineer committed suicide at work by a self-inflicted gunshot.
Case 146	36-year-old male mechanic committed suicide at work by a self-inflicted gunshot.
Case 147	41-year-old male owner of recreational vehicle store committed suicide at work by a self-inflicted gunshot.
TOXIC EXPOSURES	
Case 148	46-year-old male dairy farmer entered a 90-foot tall oxygen-limiting silo to adjust some lines for the air bladder system. Three days earlier, he had filled the

	<p>silo with high-moisture shelled corn. Upon filling, he climbed to the top of the silo and discovered that corn covered the lines. He waited for three days to allow the corn to settle before attempting to retrieve the lines. He and a coworker climbed the fixed ladder to the top of the silo and opened the hatch. The victim hung a rope with knots to climb down into the silo, approximately 8-10 feet. The victim entered the silo; the coworker remained outside of the silo. No odor was present upon opening the silo hatch. The blower was not running. The victim entered the silo and cried out for help. The coworker reached for the victim's wrist but could not pull him out. The coworker called the victim's wife for help. The wife sent another family member to assist and also called for emergency assistance. The victim was declared dead at the scene. A complete MIFACE investigation report of this incident can be found on the MSU OEM website: www.chm.msu.edu/oem/ Click on the MIFACE link, then click on MIFACE Case ID 02MI143.</p>
Case 149	<p>35-year-old male production worker was killed when he leaned into a tank through a 14 1/2 inch hatch to take a sample of material that was 6 1/2 feet from the lip of the hatch. He was checking the moisture content of the material. The tank had nitrogen flowing into it. The victim was asphyxiated.</p>
Case 150	<p>44-year-old male entrepreneur died from inhalation of engine exhaust at a machining/storage facility.</p>
Case 151	<p>42-year-old male painter was found unresponsive at the place where he worked. He died of carbon monoxide and alcohol intoxication. He had consumed alcohol and left the van running in the garage at his place of employment. It appears that he attempted to exit the vehicle. A piece of clothing caught on the door, he dangled by his arm and his sweatshirt constricted around his throat. His blood carbon monoxide level was 48%.</p>