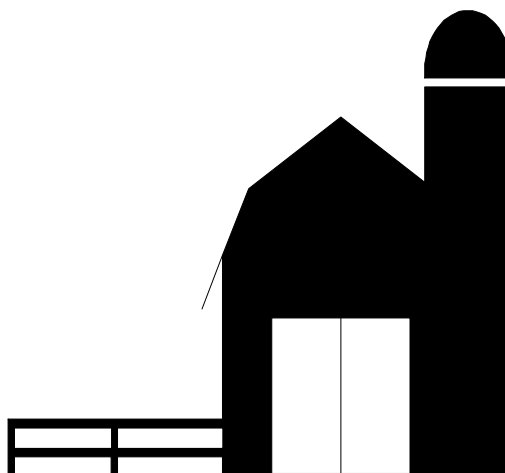

CAUGHT IN OR CRUSHED IN COLLAPSING MATERIALS, CFOI, Illinois, 1992-1995

The Census of Fatal Occupational Injuries (CFOI) monitors, with verification, all fatal work injuries, collecting information on the circumstances of the injury and characteristics of the decedent. Information on the circumstances of the injury includes, among other things, the event or exposure. The event describes the manner in which the injury was inflicted by the source of the injury. Since many farmers are selling grain at this time and the spring weather can bring heavy rains that cause the ground to be unstable as well as high winds, we analyzed the CFOI event category "caught in or crushed in collapsing materials." This category includes engulfment in grain and excavation and trenching fatalities and is defined as an event where a person, or part of a person's body, was squeezed, pinched, compressed or crushed in landslides, cave-ins or collapsing structures. Although this event represented only 3 percent of the total occupational fatalities occurring in Illinois from 1992-1995, these deaths are especially tragic since most of them could have been prevented by taking the extra time necessary to use preventive safety equipment and/or procedures.

From 1992-1995, Illinois workers experienced 31 events in the "caught in or crushed in collapsing materials" category. The most prevalent occurrence was "caught in or crushed in collapsing materials, not elsewhere classified" with 12 fatalities. Of these, nine occurred when workers were

engulfed in grain while trying to break up bridged grain (crust formed on surface of grain) or unclog grain augers in grain bins. Only one grain engulfment fatality involved the use of a safety line. The second most prevalent occurrence was "caught in or crushed in collapsing structure" with nine fatalities. Five of these fatalities involved a building or other structure collapsing while under demolition and four involved a building collapsing while



under construction. Weather was a factor in three of these nine fatalities when high winds caused parts of the structure to fall. Excavation or trenching cave-ins accounted for seven fatalities which only one followed the use of safety measures recommended for excavation and trenching work sites.

The industry experiencing the greatest number of this event type was construction with 15 workers killed. The most common occurrence among these construction fatalities was caught in collapsing structure with eight fatalities,

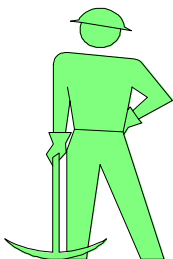
followed by excavation or trenching cave-in with six fatalities. The second highest industry for "caught in collapsing materials" events was agriculture with seven workers killed. Other industries experiencing this type of event were mining, services, wholesale, public administration and transportation.

CFOI data provide information on the socio-demographic characteristics of fatally injured workers. Among the workers killed in this event, the ages varied from 15 to 75 years of age with the greatest number occurring in the 30- to 49-year-old age group. Thirty of the 31 deceased workers were men; 23 percent were self-employed; and 10 percent were local government workers. The peak time for fatalities was between 1 p.m. to 2 p.m., when seven occurred, followed by 11 a.m. to noon and 4 p.m. to 5 p.m. with four each.

The Federal Occupational Safety and Health Administration(OSHA) issued its first excavation and trenching standard in 1971 to protect workers from excavation hazards. Since then, OSHA has amended the standard several times to increase worker protection and to reduce the frequency and severity of excavation accidents and injuries. OSHA's revised rules apply to all open excavations made in the earth's surface, which includes trenches.

It is recommended that contractors develop safety checklists before preparing a bid to make certain there is adequate information about the job site and all needed items are on hand. These checklists should incorporate elements of the relevant OSHA standards as well as other information necessary for safe operations. Detailed checklists also should be used by a designated competent person during excavation to ensure the work site is safe and should include the following general categories.

- ◆ Type of soil determined by soil analysis
- ◆ General inspection of job site (traffic, nearness of structures, hard hats)
- ◆ Overhead and underground utilities located, marked and protected during excavation
- ◆ Means of access and egress provided for workers
- ◆ Protection of workers from wet conditions (surface and ground water)
- ◆ Protection of workers from hazardous atmospheric conditions
- ◆ Appropriate support systems in place



The best way to prevent engulfment fatalities is for workers to stay out of storage bins. It only takes three or four seconds to become helpless in flowing grain and a few seconds more to be submerged in the grain; suffocation soon follows. The following safety measures should be followed to prevent engulfment in grain:

1. If grain bridges, **shut off the unloader and use a pipe or some other long object** (non-conductive) to break the bridge and get the grain flowing again. **Never enter a grain bin while the unloading operation is in progress.** Bridged grain may look perfectly safe from the top but it could hide a cavity that one could fall through and be submerged almost immediately. It only takes a few inches of grain covering an airway to cause suffocation. Conductive poles should not be used since they may contact power lines near the bin.
2. If one must enter a bin, **disconnect the power source and lock it out** making sure no one can turn it on while anyone is inside. Stay near the outer wall while in the bin and if the grain should start flowing for some reason, keep walking until the grain flow stops or the bin is empty.
3. **Install ladders and safety ropes in all bins.** This will provide an exit if one needs to get out, as well as a safe way of getting in. Remember that even if there is a ladder in the bin, one must be able to get to it. If one walks out to the center of the bin and gets caught in flowing grain, he or she may not be able to reach a ladder on the side. Hang a safety rope from the center; however a safety rope will not help if the unloader is running. The force created by the unloading grain is so great that once a person is waist deep in the grain, he or she is unlikely to escape, even with the aid of a safety rope.
4. If one must enter a bin **after shutting off the unloader, tie a rope and harness around the person** so he or she has a way to get out. Properly fasten life lines so anyone inside can remain above the stored material. Have two extra people handy in case something happens--one to hold the rope and one to get extra help if necessary.
5. If someone is buried without a rope, **shut off the auger, and open the emergency dump doors.** If there are no emergency dump doors, **knock a hole in the tank with a tractor.**
7. Another problem is being overcome by carbon dioxide, which is given off by wet grain as it ferments. The CO₂ pushes oxygen out of the bin. **Forced ventilation and breathing equipment** can help.