



Explosion and Asphyxiation Deaths Among Contract Employees in Industrial Plants

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Explosions and asphyxiations often cause deaths and injuries in chemical- producing and -using industries. A desire to prevent these incidents led to the formation of the U.S. Chemical Safety and Hazard Investigation Board (CSB), which went into full operation in 1998. The CSB works to help prevent chemical injuries and deaths by investigating chemical accidents and hazards and recommending actions to prevent further incidents.

In its first annual report, the CSB (2001) reported on investigations of 11 incidents for

such as age, race, and ethnicity, is obtained from death certificates, workers' compensation and medical examiner reports, and federal and state agency administrative records. Confirmation from at least two of these sources, or one source verified by a survey of the employer, is required before a death is considered work-related. Data compiled by the CFOI program are issued annually, with a lag from data collection to public release of one to two years.

Methods

Construction industry data for the 2-digit Standardized Industrial Classification (SIC) Codes 15, 16, and 17

1. Types of explosions involved in deaths among contract employees in industrial plants, United States, 1992-2001

<u>Type of explosion</u>	<u>Incidents</u>		<u>Deaths</u>	
	<u>No.</u>	<u>%</u>	<u>No.</u>	<u>%</u>
Chemical explosion	37	71%	51	77%
Pressure vessel explosion	11	21%	11	17%
Arc flash/arc blasts	–	–	–	–
Total	52		66	

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4. Causes of asphyxiation deaths of contract employees in industrial plants, United States, 1992-2001

Cause	Incidents		Deaths	
	No.	%	No.	%
Chemical inhalation	12	55%	14	56%
Oxygen deficiency	8	36%	9	36%
Other	–	–	–	–
Total	22		25	

– = No data reported or data do not meet BLS publication criteria.

Source: U.S. Bureau of Labor Statistics data.

Contract employees had been doing repairs or maintenance in 9 of the incidents (41%) and 11 of the deaths (44%). Four incidents involving 5 deaths happened while installing equipment.

The asphyxiation incidents included 9 instances of contract employees' entering chemical tanks or pipelines (41%), 6 instances involving working on or near chemical tanks or pipelines (27%), and 5 instances involving working inside manholes or similar confined spaces (23%).

Supervisors suffered 5 of the asphyxiation deaths (25%). Trades suffering asphyxiation deaths included plumbers, pipefitters, and steamfitters; welders and cutters; construction laborers; structural metal workers; electricians; and insulation workers.

Discussion and Conclusions

This study is based on a small number of deaths, so the data should be interpreted cautiously.

Clearly, contract employees in industrial plants are being killed by explosions and asphyxiation. Most of the deaths have involved specialized plant equipment or environmental conditions.

The use of outside contractors working in industrial plants should be reviewed to determine the unique safety risks and needs for this group. The first step would be **a more-comprehensive review of Chemical Safety Board investigations of past incidents** to determine the circumstances involving contract employee deaths and injuries in explosions and chemical releases in chemical plants. The CFOI records do not have enough detail to determine root causes of these deaths.

OSHA has two standards that apply, at least in some cases; both standards describe contractor responsibilities. OSHA's confined space standard requires that a host employer inform contractors about the hazards and permit requirements associated with confined space entry (29 CFR 1910.146(c)(8)). A second standard requires that the host employer inform contractors of process safety hazards and safe work practices (29 CFR 1910.119(h)). And Appendix C to the process safety management standard recommends that host employers train contract employees. However, the process safety management standard does not apply to all chemical-producing or -using industries.

In addition, the hazard communication standards (29 CFR 1910.1200 (e)(2) and 29 CFR 1926.59 (e) (2)) require employers to have procedures and follow those procedures to ensure that

the other employers have on-site access to material safety data sheets for each hazardous chemical the other employers' employees may be exposed to while working.

A second step would be **more stringent requirements for chemical plant safety procedures when outside contractors and vendors are present**. Such issues as training, contractual relationships, and multi-employer allocation of responsibilities can affect the safety of contract employees in chemical plants. One issue requiring attention is whether existing OSHA regulations are adequate and are enforced.

Third, **new procedures for welding on or near chemical or fuel tanks or equipment**, in particular, could help make sure a worker knows what materials might be inside and whether they are flammable. An adequate hot-permit system – as is required by OSHA in general industry – could ascertain in advance the nature of past or present contents of the tanks and determine whether welding can be done safely or if special precautions are needed.

Fourth, two **safety bulletins** could prove valuable. One would be a CSB bulletin on welding in industrial plants that provides general background information for contract employees and plant supervisors, with information on the types of hazards to look for and recommendations for working safely. This safety bulletin could be used in orientation training for contract employees. Similarly, a bulletin for contractors on the hazards they face and management systems that do or do not work could help.

References