

OSHA: Safety and Health Regulations for Employees in the Chemical Industry

The workplace today is typically considered to provide a safe and healthy environment. There are rules and regulations that employers must follow to ensure the well being of their employees at the worksite, no matter what is the nature of the job. However, this was not always the case for working men and women 40 years ago. Until about 1975, workers were often at high risk for illness and injury due to a variety of hazards, including lead poisoning and asbestos. To improve employee health, the Occupational Safety and Health Administration (OSHA) was established in 1970 through the Occupation Safety and Health Act to assure safety at the worksite, and to enforce safety guidelines. Consequently, working environments today must conform to specific safety principles set by law. OSHA depends on progress in the chemical sciences because discoveries made by chemical research are later used in to set standards and laws governing worksite conditions.

In the 18th century, during the Industrial Revolution, factory work did not conform to the standards that exist today. The Industrial Revolution began around 1760 and provided advances in manufacturing and machinery. The rapid creation of more and more factories spurred growths of urban populations that subsequently attracted a new influx of workers. But the safety conditions of these factories were very poor, leaving workers highly subject to hazard, injury, and death. Employees, both men and women, had to endure twelve-hour workdays, in workshops that lacked proper lighting and ventilation. Dangerous machinery was also often exposed, increasing the possibility of injuries.

Poor working conditions in the 18th and 19th centuries stirred motivation for the creation of safety and health legislation. Occupational health is characterized by a history of fraud and deception. There is evidence that “industry has often concealed the extent of workplace exposures and medical evidence on adverse health effects in individual workers”⁴. Employees and researchers were also blocked from obtaining access to these records. In many cases, dangerous health conditions, caused by exposure to toxins at the worksite, were not brought into the open until chemical researchers published their findings in scientific journals.

The first legislation concerning safety and health in the workplace was established in Massachusetts in 1877. The law required protection on elevators, guarding of shafts and gears, and accessible fire exits. These newly created standards consequently became the foundation for similar laws in other states. Decades later, in 1913, the Department of Labor was formed, followed by the creation of the Bureau of Labor Standards in 1934⁶. The purpose of the Bureau was to promote safety and health for working Americans. OSHA was finally established on April 28, 1971, when the Occupation Safety and Health Act (OSH Act) was put into effect.

Since its establishment in the early 1970s, OSHA’s focus has changed. It has shifted from emphasizing on specific hazards and dangerous worksites to helping employees with general safety and health. Through its standards and regulations, OSHA aims to provide a balance of enforcement, education and training at the job. Statistics over the years have shown that the extent of illness and injury has decreased with the enforcement of OSHA standards, as shown in Table 1.

Table 1. Changes in the total number of work-related injuries and illnesses for private industry before and after the enforcement of OSHA programs and standards³

Changes in State Total Recordable Rates for Private Industry Five Years After Adoption of Mandatory Safety and Health Program Requirements

Characteristic	States Identified by OSHA							States Identified by Others	
	CA	HI	MN	OR	AK	LA	WA	NE	NC
Year state health program adopted	1991	1982	1991	1991	1985	1983	1973	1993	1993
Total recordable rate in next year	9.3	10.6	8.6	9.1	10.2	7.9	12.3 ^a	10.2	7.5
Total recordable rate 4 years later	6.6	9.8	8.3	7.8	11.1	7.4	10.5	8.5	6.1
% change	-29	-8	-3	-14	9	-6	-14	-17	-13
% change in U.S. rate for same period	-17	9	-17	-17	11	8	-5	-20	-20

NOTE: Total recordable rate is total number of injuries and illnesses per 100 full-time-equivalent workers. The total recordable injury and illness rates for states and the United States are reported by the Bureau of Labor Statistics annual Survey of Occupational Injuries and Illnesses (BLS, 2007). As an example of the injury rate change calculations, for California, the table compares the rate in 1992 with the rate in 1996.

^a State-level injury rate data were not available prior to 1976. Therefore, the rate of 12.3 in Washington is the rate for 1976, not 1974, and 10.5 is the rate for 1980.

Women also played a significant role in promoting safety in the workforce. Alice Hamilton was a prominent figure in the struggle to overcome workplace hazards in the early 1900s. A physician and toxicologist, Hamilton worked as a special investigator for the Bureau of Labor, inspecting different workplaces and evaluating safety⁶. Hamilton held the view that “society had an interest in protecting women from [work-related] hazards”².

Working women provided an important stimulus for the formation of new standards because poor conditions at work were believed to be detrimental to reproductive issues. The controversy concerning working women’s health and safety was most prominent during World War II. During wartime, a large number of women were hired to work in factories, taking positions that would normally be assigned to men. Using the image of Rosie the Riveter, women

were called into the labor force as a form of patriotic duty, while the men served in the military overseas.

Nonetheless, despite the improvements accredited to OSHA, officials and policy makers have criticized the agency. Critics argued that the implementation of state safety plans was too costly, and that OSHA's methods were ineffective. As a result, labor unions, employers, and politicians have had to choose sides on the issue of occupational health. In 1981, at the end of the Carter administration, OSHA issued the Hazard Identification Standard--a requirement that chemical manufacturers and suppliers provide safety evaluation files on each of their products. Very soon after its implementation, newly inaugurated President Ronald Reagan withdrew the Hazard Identification Standard as one of his first acts as president⁴. Prior to the Hazard Identification Standard, OSHA's regulations concerning the employee's right to know what type of hazards he or she is exposed to were quite weak. Consequently, Reagan's Regulatory Relief Plan encouraged unions and strong advocates of occupational health to push for more rights to access of chemical hazard information. They eventually succeeded with the establishment of OSHA's Hazard Communication Standard; however, this regulation did not stand without attack. Since then, OSHA has continued to counter opposition, but has ultimately progressed in increasing the occupational-health rights of employees.

The standards created by OSHA largely depend on findings made by chemical research. OSHA works together with the National Institute for Occupational Safety and Health (NIOSH) to obtain recommendations for standards. NIOSH conducts research on a variety of safety and health problems, examining the effects of different chemicals and contaminants on health. Substances that are hazardous are then submitted to OSHA so that standards can be adopted to protect the safety and health of employees. These standards can then be used to ensure that

worksites operate under safe conditions. For example, one of OSHA's duties is to create Permissible Exposure Limits (PELs). PELs indicate the maximum allowable safe concentration of toxic chemicals that an individual can be exposed to over a specified period of time, as shown in Table 2. The time-weighted average (TWA) limit is the average exposure to a chemical expected from an 8-hour workday. The short term exposure limit (STEL) is the concentration of a chemical substance that workers can be exposed to over a short period of time without suffering from negative effects. This information contributes to ensuring the occupational health of employees.

Table 2. Permissible Exposure Limits for selected hazards¹

Compound	Time-Weighted Average (TWA) Limit	Short Term Exposure Limit (STEL)
Asbestos	0.1 fiber/cm ³ air	-
Lead	50 µg/cm ³ air	-
Ethylene oxide	1 ppm	-
Formaldehyde	0.75 ppm	2 ppm
1,3-Butadiene	1 ppm	5 ppm

OSHA's programs and legislation are not limited to regulating work environments in factories. OSHA's research and standards enforcement also ensures safety in industrial laboratories and academic chemistry departments. The Laboratory Standard requires that laboratories produce a Chemical Hygiene Plan (CHP). A CHP addresses the specific hazards found in the laboratory and outlines a method for preventing each problem. OSHA also has set guidelines pertaining to proper storage and handling of chemicals.

At Wright State University, a new safety program was undertaken to ensure that the university's laboratory facilities are consistent with OSHA standards⁵. Therefore, OSHA is effective not only in promoting the occupational safety of employees, but also for professional and student researchers.

Table 3. Recordable injury and illness case rates from 2003 to 2007

Injury and Illness Rates	2003	2004	2005	2006	2007	% Reduction 2003-2007
Total Recordable Case Rate	5.0	4.8	4.6	4.4	4.2	- 16.0%
Days Away/Restricted Case Rate	2.6	2.5	2.4	2.3	2.1	- 19.2%

Source: U.S. Department of Labor

The Occupational Safety and Health Administration has come a long way since its establishment in the 1970s. Although it has been subjected to criticism and setbacks over the years, OSHA has provided undeniable improvement in the safety and occupational health of worksites today. Coupled with the findings of chemical research, hundreds of standards and regulations have been formulated. OSHA enforces these standards and regulations by maintaining routine workplace inspections, meant to identify any potential hazards at the site. In recent years, the enforcement of these standards has proved to be effective, as the total recordable injury and illness case rates have decreased over 15 percent (Table 3). With ever-increasing chemical research, OSHA can be expected to progress in the future.

References

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