Industrial Hygiene History and the Occupational Safety and Health Act of 1970

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About the Presenter: 
Tim Rice, CIH

- B.A. Biology - Denison University, 1972
- M.S. Environmental Science - Rutgers University
- Certified Industrial Hygienist (CIH) with 40 years combined governmental, private industry and private consulting experience in the occupational health and safety field.
- 22 years - Principal Consultant with Rice Health & Safety Services, Inc., Flemington, NJ
- Now retired from active IH practice, but retaining CIH
Session Objectives

• Developing an understanding and awareness of key individuals, groups, and events contributing over the centuries to the evolution of the science, art and profession we know today as “Industrial Hygiene.”

• Developing an awareness of events leading to the passage of the Occupational Safety and Health Act of 1970 (Public Law 91-596) and a familiarization with key sections of the Act providing OSHA, NIOSH, and the OSHRC the authority to fulfill their responsibilities under the Act.

• Providing sufficient follow-up references for attendees who wish to learn more about the history of industrial hygiene and/or the OSH Act.
What Is Industrial Hygiene?

• Current definition on AIHA website:

  “Industrial hygiene is a science and art devoted to the anticipation, recognition, evaluation, prevention, and control of those environmental factors or stresses arising in or from the workplace which may cause sickness, impaired health and well-being, or significant discomfort among workers or among citizens of the community.”

• Original version of definition adopted and published by AIHA in 1959
When did the history of industrial hygiene (IH) begin?

One Answer\(^1\) - “It began when one person recognized a work hazard and took steps not only for self protection, but also for protection of fellow workers”

- origin and essence of profession of IH

Key step in development of IH practice

- the recognition of a causal link between workplace hazards and disease

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Industrial Hygiene History

Hippocrates
(c. 460-370 BC)

- Writings include first recorded mention of occupational disease: lead poisoning in miners (slaves) and metallurgists.
- Described ailments of fullers (dye makers), horsemen, tailors, farm hands and fishermen.
Industrial Hygiene History

Pliny the Elder (23-79 AD)

- Pliny - Roman scholar, scientist, and naval/army commander.
- Referred to dangers imminent in dealing with zinc and sulfur.
- Referred to Dioscorides’ observations of animal bladder-derived protective masks used by mining laborers subjected to hot furnace “vapour” and “choaking smells” from minium (red lead) or cinnabar (mercury sulfide) smelting.

Dioscorides (40-90 AD)
Galen (2nd century AD)

- Greek physician residing in Rome.
- Presented theories on anatomy and pathology.
- Recognized the dangers of acid mists to copper miners.
- Was authoritative and assertive in his writings. However, these gave no incentive to problem solution.
Industrial Hygiene History

Middle Ages

- Little improvement made in work standards.
- Feudalism appears.
- One advancement - provision of assistance to ill members and families by feudal guilds.
Industrial Hygiene History

12th and 13th Centuries

- Observation and experimentation flourish in great universities.
- However, study of occupational disease virtually ignored.

Map of Medieval Universities
Industrial Hygiene History

Ulrich Ellenbog • (1473)

German physician - published pamphlet on hazards encountered by metalworkers and occupational disease among gold miners.

- Describes symptoms of industrial poisoning from lead, silver and mercury
- Included notable “hygiene” instruction:
  - Use dry instead of wet coal to avoid production of toxic fumes
  - Work with windows open
  - Bind up the mouth to prevent inhalation of noxious fumes.
Georgius Agricola (1494-1555) (Georg Bauer)

• German physician / scholar who effectively described the hazards associated with the mining industry.

• Greatest work, *De Re Metallica*, published in 1556.
• 12-section comprehensive discourse on all aspects of mining, including:
  – suggestions for mine ventilation
  – protective masks and equipment for miners
  – discussion of mining accidents
  – descriptions of diseases / disorders associated with mining operations (e.g., “trench foot,” “asthma,” and silicosis).
“Some mines are so dry that they are entirely devoid of water and this dryness causes the workmen even greater harm, for the dust, which is stirred and beaten up by digging, penetrates into the windpipe and lungs, and produces difficulty in breathing and the disease the Greeks call asthma.

If the dust has corrosive qualities, it eats away the lungs and implants consumption in the body. In the Carpathian mountains women are found who have married seven husbands, all of whom this terrible consumption has carried off to a premature death.”
treading with his feet. . . . There are two different machines for operating, by means of horses the above described bellows. . . .

In the same way that this last machine can refresh the heavy air of a shaft or tunnel, so also . . .
Paracelsus, Philippus Aureolus (1493 – 1541)

• Pseudonym for Theophrastus Bombastus von Hohenheim, German-Swiss physician and alchemist.

• Published observations based on 10 years working in smelting plant and as a laborer in mines of Tyrol.
Paracelsus, Philippus Aureolus (1493 – 1541)

• Described respiratory diseases among miners with excellent description of mercury poisoning.

• Warnings about toxicity of certain metals and outline of mercury poisoning quite advanced.

• Remembered as “Father of Toxicology,” and having established the dose-response relationship with respect to toxic substances.
Paracelsus, Philippus Aureolus
(1493 – 1541)

“All substances are poisons; there is none which is not a poison. The right dose differentiates a poison and a remedy.”

Von der Besucht
Paracelcus, 1567
Bernardino Ramazzini
(1633 – 1714)

• Italian physician.

• Generally agreed to have authored the first comprehensive treatise on occupational disease, *De Morbis Artificum Diatriba* (Diseases of Workers), published in 1700.
Bernardino Ramazzini (1633 – 1714)

- From his own observations, accurately describes over 50 occupations/trades, their hazards and resulting diseases.
- Recommended some specific and general preventive measures, though most were therapeutic and curative.
- Affected future of industrial hygiene by asserting occupational disease should be studied in work environment rather than in hospital wards.
Bernardino Ramazzini
(1633 – 1714)

• Earned the name, “Father of Occupational (Industrial) Medicine for his cautions to protect workers and his following admonition to doctors:

“When a doctor visits a working-class home he should be content to sit on a three-legged stool, if there isn't a gilded chair, and he should take time for examination; and to the questions recommended by Hippocrates, he should add one more – What is your occupation? (Of what trade are you?)”

*De Morbis Artificum Diatriba, 1700*
“Manifold is the harvest of diseases reaped by certain workers from the crafts and trades that they pursue. All the profit they get is injury to their health that stems mostly, I think, from two causes.

The first and most potent is the harmful character of the materials that they handle, noxious vapors and very fine particles, inimical to human beings, including specific diseases.”
“As a second cause I assign certain violent and irregular motions and unnatural postures of the body, by reason of which the natural structure of the living machine is so impaired that serious diseases gradually develop therefrom.”
Industrial Hygiene History

Percival Pott (1714 - 1788)

- London surgeon.
- 1775: Describes occupational cancer among English chimney sweeps, identifying soot and lack of hygiene measures as a cause of scrotal cancer.
- Major force behind the Chimney Sweeps Act of 1788, one of the first laws intended to protect workers’ health and safety.
- One of first accounts of cause / effect linkage for an occupational carcinogen.
Figure 1.4 — A London chimney sweep (mid-1700s).

Figure 1.5 — A German chimney sweep (mid-1700s). Note the tight-fitting, personal protective clothing. There were no reported problems of scrotal cancer among the German workers.

Illustrations Credit: The Occupational Environment - Its Evaluation and Control, Chapter 1, AIHA Press, 1997
Industrial Hygiene History

Industrial Revolution (1760 - 1830)

- Demand for goods grows to point where only means to meet demand is mass production.
- Production achieved through invention of machines (e.g., spinning jenny). With machines came mills / factories and proportionate increase in textile-producing chemicals used (acids, alkalis, soaps, mordants).
- Advent of steam power first brings general attention to noise as an occupational hazard.
Industrial Hygiene History

**Charles Thackrah (1795 - 1833)**

- English physician. First physician in English-speaking world to establish practice of industrial medicine.
- Interest in diseases seen among poorer classes in City of Leeds. Observations led to development of guidelines for prevention of certain diseases.
- Writings lead to raised public awareness of plight of new working class in mills and factories.
Industrial Hygiene History: English Factory Acts

English Factory Acts of 1833:

- Prompted by public outcry and early Victorian reformers such as Charles Thackrah.
- Considered first effective legislative acts in the field of industry.
- Indicated government interest in worker health and required some concern be shown to working population. Limited child work hours, provided for inspection of certain workplaces.
- In practice, efforts directed more towards providing compensation for accidents rather than controlling causes.
Industrial Hygiene History: English Factory Acts

- **1878 Version**: Specified the use of exhaust ventilation by fans. Centralized the inspection of factories by creating a post for this purpose in London.

- **Factory Act of 1901 (Factories and Workshop Act)**: Major consolidation of previous health and safety measures.
  - Provided for creation of regulations to control dangerous trades.
  - **Watershed event in industrial medicine and hygiene.**
    - Opened possibility of investigating hazards in depth and established requirements to control hazards of particular industrial poisons (e.g., respiratory disease - pottery industry, mercury poisoning - hat manufacturing)
An extraction hood for a grinding wheel. From Heming (1877).

An 1897 downdraft bench used for anthrax control in fleece sorting.

1837 - NY physician, Benjamin McCready, writes monograph, "On the Influence of Trades, Professions and Occupations in the United States, in the Production of Disease."

- Systematic examination dealing with health problems of agricultural workers, laborers, seamen, factory operatives and artisans, among others.
- Generally recognized as first work on occupational medicine published in U.S.
Industrial Hygiene History

- **Post Civil War** - U.S. factory workers confronted with chemicals, dusts, dangerous machines, a confusing jumble of belts, pulleys, and grisly accidents

- **1877**: Massachusetts passes first factory safety and health law in U.S., with factory inspection force established in 1879
  - Borrowed heavily from British factory legislation
  - Prompts flurry of legislation with 14 northern industrial states having similar factory acts by 1897
Industrial Hygiene History

• Of the 14 State Factory Acts:
  – 10 gave inspectors authority to require machine guarding
  – 8 banned cleaning of moving machinery by women or children
  – 8 required regulation of ventilation and sanitation
  – 7 required exhaust fans for dust and fumes
  – 8 required reporting of accidents

• However, this State safety and health legislation had flaws:
  – Numerous hazards left uncontrolled; Inadequate funds for enforcement
  – Inspectors, often political appointees, not always had legal right to enter workplace
  – States with strong laws losing industry to states with less stringent laws, making states competitive and limited in their legislative efforts
Max Gruber (1883)

- German Scientist
- Work at Hygienic Institute of Munich. *Earliest reported effort to establish an air contaminant occupational exposure limit (OEL).*
- Exposes 2 hens, 12 rabbits and himself to known concentrations of **carbon monoxide**.
- Concludes boundary of injurious action lies at concentration on all probability of 500 ppm, and certainly not less than 200 ppm.
Industrial Hygiene History

- Between Civil War and World War I - U.S. develops into leading industrial and manufacturing nation:
  - discovery and utilization of natural resources
  - large supply of labor
  - construction of transportation system
  - growth of foreign / domestic markets
  - capital creation
  - protective tariffs and indirect subsidies
  - application of technology to manufacturing
  - raw materials extraction
Industrial Hygiene History

Progressive Era (1890 - 1920):

- Problems associated with occupational safety and health reach epidemic proportions demanding attention.
- Silicosis, plumbism, phosphorous poisoning, and mercurialism recognized as diseases resulting from occupational exposure.

1909 Glass Factory Workers, Millville, NJ
(Lewis Hine Photo)
Industrial Hygiene History

- **1905**: Following lead of British Factory Acts, Massachusetts Health Department appoints health inspectors to survey industries and evaluate dangers of occupations. Seeds of industrial hygiene as a State public health function sown.

- **1908**: Federal government passes a U.S. Federal Compensation Act for certain civil service employees.
Industrial Hygiene History

1910:
• American Association of Labor Legislation calls first national conference on industrial diseases in Chicago:
  – investigating magnitude of problem
  – proposing method of attack
• Creation of the US Bureau of Mines, in part, in reaction to 1907 mine disaster in Monongah, West Virginia killing 362 coal miners.
Triangle Shirtwaist Company Fire, NYC - March 25, 1911

- Causes death of 146 workers, mostly young immigrant women.
- Lead to transformation of NY State labor code and adoption of fire safety measures serving as model for whole country.
- Crystallized support for efforts to organize workers in garment district, and particularly the ILGWU.

Photos Credit: UNITE Archives, The Kheel Center, Cornell University. Site: http://www.ilr.cornell.edu/trianglefire/
Industrial Hygiene History

- **1910 - 1911**: States, including Washington, New York and Wisconsin, start to pass compulsory workers compensation laws. Most states no longer accept common-law principle that risk is condition of employment.

- **1916**: U.S. Supreme Court declares workers comp laws constitutional. Affirms employer’s inherent responsibility for employee health and safety, regardless of who is at fault.

- **By 1948**: All states pass such legislation.
  - Workers compensation laws significantly influence development of IH in U.S. Management begins to recognize controlling environment less costly than paying large compensation sums.
Industrial Hygiene History

- **1912**: Rudolf Kobert, German pharmacologist and toxicologist, publishes one of earliest tables of acute exposure limits based on animal studies. Concentrations for 20 compounds listed under headings:
  - “rapidly fatal to man and animals”
  - “dangerous in 0.5 to 1 hour”
  - “0.5 to 1 hour without serious disturbances”
  - “only minimal symptoms observed”

Compounds included ammonia, bromine, chlorine, hydrogen cyanide, HCL.
Alice Hamilton  
(1869 – 1970)

• First American physician to devote life to practice of industrial medicine.
• Early 20th Century champion of social responsibility for worker’s health and welfare.
• Presented substantial evidence of relationship between illness and exposure to toxins. Proposed concrete solutions to these problems.
• Findings were scientifically persuasive. Caused sweeping reforms to reduce occupational lead exposure.
Alice Hamilton  
(1869 – 1970)


- “On an individual basis, her work, comprising recognition of occupational disease and evaluation and control of causative agents, should be considered as the initial practice of industrial hygiene, at least in the US.”

Industrial Hygiene History

1912: Prohibitive federal tax levied on white phosphorous used in match manufacturing.

Tax literally eliminated “phossy jaw,” occupational disease of exposed workers.

First major public act (Esch Act) to control occupational disease in U.S.
Industrial Hygiene History

1913:

- New York and Ohio establish first state industrial hygiene agencies staffed by physicians and engineers.
- Congress creates Department of Labor (DOL).
Industrial Hygiene History

1914:

• Office (Division) of Industrial Hygiene and Sanitation founded in US Public Health Service (USPHS).
  – Many subsequent reorganizations before becoming NIOSH in 1971.

• IH section of American Public Health Association organized.

“This may be taken as the beginning of general recognition of industrial hygiene as a specific and distinct activity”


  – Dr. Hamilton serves as vice chair.

• International Ladies Garment Workers Union Health Center established.
Industrial Hygiene History

- **World War I** - Rapid advances in respiratory protection due to use of chemical agents. Research of gas sorbents and high efficiency particulate filters accelerated by introduction of different gases and highly toxic particulate matter on battlefield.

- **1917** - Detector tube for measuring CO developed by Harvard researchers.

- **1922** - Harvard University developed first educational / research program leading to advanced degree in IH.
Industrial Hygiene History

1913 through 1940:

- USPHS and Bureau of Mines conduct series of epidemiologic studies of dangerous/“dusty” trades.

Examples:

- 1924-26 (1937-38 follow-up) USPHS studies of high tuberculosis fatality/silicosis rates in Vermont granite workers. First to measure relationship between the “environment” and worker’s physical condition.

- 1939 study of Utah lead-zinc mines showed 30.5% of workers with more than 20 years in mines had silicosis.
Industrial Hygiene History

- In these studies, degree of dust exposure was an early industrial hygiene concern. Generated need to measure airborne particulate concentrations.

1922 - Greenburg and Smith develop the impinger air sampling instrument.

1937 - Littlefield and Schrenk report on modified design and development of the midget impinger.

- Subsequent development of hand-operated pump gives IHs flexibility in collecting breathing zone samples.
Early Greenburg Smith Impinger “Personal” Sampling

Midget Impinger Sampling Apparatus

Industrial Hygiene History

1929:
• Based on Vermont granite industry studies, USPHS recommend one of earliest upper limits of exposure for an air contaminant:
  – between 9-20 mppcf for quartz-bearing dusts (< 10µm) containing 35% free silica.

1930s:
• IH begins to take on new meaning. Begins to include the nonmedical contributions of the physical sciences and engineering, emphasizing the “environmental” side of IH.
1913 through 1940:

- USPHS/Bureau of Mines studies showed:
  - exposures in workplace could be sufficiently controlled to minimize or prevent worker illness.
  - pointed out need for creditable and reproducible information characterizing worker exposures.

- Development and application of this knowledge in anticipation, recognition, evaluation, control, and prevention of health hazards became foundation for recognizing industrial hygiene as a separate and unique science and profession.

**Slide Reference:** The American Industrial Hygiene Association: Its History and Personalities 1939-1990”, AIHA Press, 1994

**Photo Source:** Control of Silicosis in Vermont Granite Industry - Progress Report. PHS Publication No. 557, USPHS, Washington, D.C., 1957
Industrial Hygiene History

1920s – early 1930s:

- IH activities initiated in only 5 state health departments (CT, MD, MS, OH, RI). In 3 state labor departments (MA, NY, PA). Probably fewer than 50 IHs in U.S. Budget for all five health departments - $30,877.

1930-31 Gauley Bridge Disaster:

- New Kanawha Power Co. drills tunnel through mountain at Gauley Bridge, WV causing massive worker exposures to rock dust with high silica content. Over period of two years, 476 men died and 1,500 eventually disabled from silicosis.
Industrial Hygiene History

1935: Social Security Act and National Labor Relations Act

- **Social Security Act** made federal resources available to states to aid in development of IH programs. Funds earmarked for states by USPHS.
  - **Rationale** - more logical to keep workers healthy and paying into fund, rather than have ill workers drawing from fund.
- By **1936**, 17 IH units established in state/local health departments. By **1938** - 26 IH units.
- **National Labor Relations Act** guarantees workers the right to organize and bargain collectively.
Industrial Hygiene History

1936 - Walsh-Healy Public Contracts Act:

• Precursor to OSH Act.

• Mandatory for industries supplying goods in excess of $10,000 to federal government to maintain safe / healthful workplace.

• Coverage limited to industries with federal contracts, but initiates federal safety / health activity in general industry and authorized federal OHS standards for government contractors.

• World War II give Act real meaning as more goods came under its purview.
Industrial Hygiene History

...It has been suggested “one can date the emergence of the profession of industrial hygiene by the formation of our professional societies.”

Industrial Hygiene History

1938:
- Through efforts of John J. Bloomfield and Royd S. Sayers, group of 76 IHs working under aegis of USPHS forms National Conference of Governmental Industrial Hygienists (NCGIH). Attempt to create some uniformity among the states.
- Membership limited to government agency or educational institution personnel (“National” changed to “American” in 1946).

1941 - outstanding contribution to IH was formation of committee to investigate, recommend, and annually review exposure limits for chemical substances (now the ACGIH Threshold Limit Values for Chemical Substances Committee)
Industrial Hygiene History

- **1939**: American Industrial Hygiene Association (AIHA) founded in Cleveland, Ohio.
  - offshoot of the America Association of Industrial Physicians and Surgeons
- Estimated 300 IHs in U.S.
- **1940**: NJ State IH Program initiated with grant of $64,000 from USPHS. Notable early study - radiation poisoning among workers in radium dial painting industry.

Source: AIHA Website -75 Year History
Industrial Hygiene History

World War II (1941 - 1945):

- War provides significant impetus for development of state / local government IH programs.
  - Need seen to conserve manpower and maintain and accelerate production.
  - By 1946, 52 IH programs operational in 41 states.

- With withdrawal of federal funds after War, steady decline in both number and activity of these programs takes place.
**Industrial Hygiene History**

1946: ACGIH adopts its first list of 148 exposure limits, then known as Maximum Allowable Concentrations (MACs)$^1$, to limit worker exposure to airborne contaminants.

– Relied mainly on data and list of MACs compiled and published by Warren Cook, IH pioneer, in 1945

1948: First edition of *Patty’s Industrial Hygiene* published by John Wiley & Sons. Editor Frank Patty - AIHA’s 8th President.

– Standard text for occupational health and toxicology.

1 – 1956: Term Threshold Limit Values (TLVs) introduced.

*Photo Source: AIHA Website-75 Year History*
Industrial Hygiene History

1951:


1953:

• Application of membrane filter allows particulate exposures to be calculated on mass per volume basis.
Industrial Hygiene History

1960:

- American Board of Industrial Hygiene (ABIH) is formed by AIHA and ACGIH:
  - to develop voluntary professional certification standards.
  - and to implement a certification program.
  - **13 certificates** issued in 1960. First exams - 1963
- ACGIH debuts first edition of *Air Sampling Instruments for Evaluation of Atmospheric Contaminants*.
- In UK, Sherwood and Greenhalgh publish paper, “A personal air sampler.”
The Mk1 and Mk2 personal sampling pumps invented by Sherwood and Greenhalgh (circa 1960)
(minature DC motor - PTFE diaphragm pump - mercury cell battery - bicycle lamp case)

Industrial Hygiene History

1960s:

• State, country, city governments still have primary function of promulgation / enforcement of health standards.
  – Only three states (MI, NY, PA) have full-time OH staffs in excess of 25.
  – Seven states have no identifiable programs.

• Number of staffs involved directly in IH actually diminishes due to increased commitments to radiation and community environmental activities.
Industrial Hygiene History

1960s - Sampling for dusts with impingers, electrostatic precipitators (ESPs) and filtration techniques now reasonably accurate.

1964 ACGIH Annual Meeting: Otterson and Guy describe method for collecting individual organic vapors on activated charcoal, desorption with carbon disulfide, and subsequent compound analysis using gas chromatography.

1970: Major breakthrough in sampling methodology. BOSH (later NIOSH) publishes paper on first comprehensive sorbent tube method for multiple contaminants.

- 1973 - NIOSH places first order for 6,000 charcoal tubes with the Scientific Kit Corporation
- Early 70’s - NIOSH awards contract for development of the low flow, battery-operated pump to the Anatole Sipin Co.
Industrial Hygiene History

1966 - Metal and Nonmetallic Mine Safety Act

• Standards for metal and nonmetallic mines delineated, provided for mandatory reporting of all accidents, injuries, and occupational diseases of mines and expanded employee training programs.

1969 - Coal Mine Health and Safety Act

• Precipitated by 1968 coal mine explosion killing 78 miners in Farmington, WV. Aimed at providing highest degree of health protection for coal miners.

Note: Both mining acts superseded by the comprehensive Mine Safety and Health Act of 1977 which creates the Mine Safety and Health Administration (MSHA) within the DOL.
Industrial Hygiene History

Late 1960s:

- Patchwork of OHS activity exists at federal level.

- Congressional hearings result in documentation of seriousness of workplace deaths, injuries, and illnesses and lack of consistent, comprehensive programs at state / local levels to prevent problems.
1970:
• Congress passes Williams-Steiger Occupational Safety and Health Act, watershed event in history of occupational health in US. Ignites demand for professionals, including industrial hygienists, to carry out mandate of Act.

1970 AIHA Membership: 1,649. Triples within 10 years.
1980 - 5,003; 1997 - 13,326 (all-time high); 2004 - 11,699;
2010 - 10,240; 2018 - 8,500 (source: 2018 AIHA press release)

ABIH Certification:
1960 - 13 CIH certificates issued; 1970 - 673rd; 1980 - 2,007th;
1990 - 5,090th; 2000 - 8,084th; 2010 - 9,898th; 2017 - 11,475th

1987: Formation of International Occupational Hygiene Association (OIHA). Currently 34 member organizations, 31 countries, 20,000 OH’s.

1995: AIHA, ABIH, ACGIH, AAIH jointly develop Code of Professional Ethics for Practice of Industrial Hygiene. Consist of 6 canons with interpretive guidelines to be used to guide practice of profession.
2007: ABIH develops new, enforceable Code of Ethics for CIHs, applicants and examinees. AIHA, AIH, and ACGCIH develop Member Ethical Principles (not enforceable).

2014: NIOSH launches Center for Direct Reading and Sensor Technologies

“The future of direct-reading devices and smartphone applications may help to revolutionize the practice of industrial hygiene and safety evaluations,”

John Howard, NIOSH Director
Fig. 10-14.—Air is sampled to determine the level of solvent vapor in the breathing zone area of printshop craftsman. Workroom air is passed through the midget impinger (shown at left) to collect a sample for subsequent laboratory analysis. The direct-reading method is shown at the right.
## Selected OSHA Standards\(^1\) of Importance for Industrial Hygienists

<table>
<thead>
<tr>
<th>Year</th>
<th>Standard</th>
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<tbody>
<tr>
<td>1971</td>
<td><strong>Air Contaminants, Z-Tables</strong> <em>(adopted 1968 ACGIH TLVs from Walsh-Healy Act and exposure limits from ANSI)</em></td>
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<tr>
<td>1971-72</td>
<td><strong>Asbestos</strong> <em>(with subsequent revisions through 1990’s)</em></td>
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<tr>
<td>1974</td>
<td><strong>Vinyl Chloride</strong></td>
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<tr>
<td>1978</td>
<td><strong>Lead, Cotton Dust</strong></td>
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<tr>
<td>1981</td>
<td><strong>Hearing Conservation</strong></td>
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<tr>
<td>1983</td>
<td><strong>Hazard Communication</strong></td>
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<tr>
<td>1984</td>
<td><strong>Ethylene Oxide</strong></td>
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<tr>
<td>1987</td>
<td><strong>Benzene, Formaldehyde</strong></td>
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<tr>
<td>1989</td>
<td><strong>Hazardous Waste Operations and Emergency Response</strong></td>
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\(^1\) General Industry, 29 CFR 1910
### Selected OSHA Standards\(^1\) of Importance for Industrial Hygienists

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<tr>
<td>1990</td>
<td>Occupational Exposure To Hazardous Chemicals In Laboratories</td>
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<tr>
<td>1991</td>
<td>Bloodborne Pathogens</td>
</tr>
<tr>
<td>1997</td>
<td>Methylene Chloride</td>
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<tr>
<td>1998</td>
<td>Respiratory Protection (Revised); 2006 - Assigned Protection Factors</td>
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<tr>
<td>2006</td>
<td>Hexavalent Chromium (Cr(VI))</td>
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<tr>
<td>2012</td>
<td>Hazard Communication (Revised)</td>
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<tr>
<td>2016</td>
<td>Respirable Crystalline Silica</td>
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<tr>
<td>2017</td>
<td>Beryllium</td>
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</tbody>
</table>

\(^1\) - General Industry, 29 CFR 1910
Industrial Hygiene History
Moving on in the 21st Century

- Nanotechnology
- Opioids Exposure
- Ergonomics and Musculoskeletal Disorders
- Hydraulic Fracturing (Fracking)
- GHS & REACH
- Emergency Response - Natural, Terrorism
- Cannabis Industry - Worker Health & Safety
- Additive Manufacturing/3D Printing

NJAIHA
Industrial Hygiene History
Moving on in the 21st Century (continued)

- Indoor Environmental Quality
- Avian/Pandemic Influenza Planning and Preparedness
- Direct Reading and Sensor Technologies
- Emergency Response - Natural, Terrorism
- Total Worker Health
- In Focus: Ebola

NJAIHA
References: Industrial Hygiene History


References: Industrial Hygiene History


10. American Conference of Governmental Industrial Hygienists (ACGIH): *History* (pamphlet), ACGIH, Cincinnati, Ohio, 4/07.

References:
Industrial Hygiene History


References: Industrial Hygiene History

17. The American Industrial Hygiene Association (AIHA): Synergist Supplement - Celebrating 75 Years of Protecting Worker Health, September 2014


22. Assorted information from AIHA, ABIH, ACGIH and U.S. DOL web sites.
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Need for Legislation

Prior to 1970:

- No uniform / comprehensive provisions to protect workers against workplace safety and health hazards.
- State workers’ compensation statutes not reducing fatalities and traumatic injuries.
Need for Legislation

- **In 1970**, Congress considered *annual* figures:
  - Job-related accidents - more than 14,000 worker deaths.
  - Nearly 2.5 million workers disabled by workplace injuries / illnesses.
  - 10 times as many person days lost from job related disabilities vs. strikes.
  - Estimated new cases of occupational disease - 300,000.
- Staggering burden on nation’s commerce - in terms of lost productivity and wages, medical expenses and disability compensation. Human cost beyond calculation.
Occupational Safety and Health Act (OSH Act) of 1970

• As a result, Williams-Steiger Occupational Safety and Health Act of 1970 (Public Law 91-596) passed by bipartisan Congress.
  - Signed by President Nixon on 12/29/70 and effective 4/28/71.

• Congressional Purpose:
  “To assure as far as possible every man and woman in the nation safe and healthful working conditions and to preserve our human resources.”
Occupational Safety and Health Act (OSH Act) of 1970

Agencies created:

• Occupational Safety and Health Administration (OSHA) - Department of Labor (DOL)
  – to promulgate and enforce workplace safety / health standards.
  – Labor Secretary authorized to appoint Assistant Secretary of Labor for Occupational Safety / Health (filled by presidential appointment with advice and consent of Senate).
Occupational Safety and Health Act (OSH Act) of 1970

Agencies created (continued):

- **National Institute for Occupational Safety and Health (NIOSH)** - Department of Health and Human Services (DHHS), originally Health, Education, and Welfare.
  - to conduct research on occupational safety and health.

- **Occupational Safety and Health Review Commission (OSHRC)** - independent government agency.
  - to adjudicate enforcement actions challenged by employers.
Section 5 - Duties

General Duty Clause - Section 5(a)(1)

• Requires that each employer “shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees.”

• Used where there is no specific OSHA standard applicable to the particular hazard involved.
Section 5 - Duties

- **Employers** shall also comply with OSH standards promulgated under the OSH Act 5(a)(2).

- **Employees** must comply with OSH standards, rules, regulations and orders issued pursuant to the Act which are applicable to his own actions and conduct 5(b).

- Only employers receive OSHA citations and penalties.
### NAICS Code: ALL NAICS Codes

Listed below are standards cited by Federal OSHA for the specified NAICS Code during period October 2016 through September 2017. Penalties shown reflect current rather than initial amounts. For more information, see [definitions](#).

<table>
<thead>
<tr>
<th>Standard</th>
<th>Citations</th>
<th>Inspections</th>
<th>Penalty</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>66,366</td>
<td>22,783</td>
<td>194,096,020</td>
<td><em>All Standards Cited for NAICS Codes</em></td>
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<tr>
<td>19260501</td>
<td>7,271</td>
<td>7,039</td>
<td>34,617,765</td>
<td>Duty to have fall protection.</td>
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<td>19101200</td>
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<td>19260451</td>
<td>3,778</td>
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<td>10,341,457</td>
<td>General requirements. <strong>SCAFFOLDS</strong></td>
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<td>19100134</td>
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<td>1,465</td>
<td>3,499,919</td>
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<tr>
<td>19100147</td>
<td>3,504</td>
<td>1,755</td>
<td>16,178,910</td>
<td>The control of hazardous energy (lockout/tagout).</td>
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<tr>
<td>19261053</td>
<td>2,795</td>
<td>2,279</td>
<td>6,321,620</td>
<td>Ladders.</td>
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<td>19100178</td>
<td>2,434</td>
<td>1,689</td>
<td>5,600,397</td>
<td>Powered industrial trucks.</td>
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<tr>
<td>19100212</td>
<td>2,121</td>
<td>1,906</td>
<td>11,901,346</td>
<td>General requirements for all machines. <strong>MACHINERY &amp; MACHINE GUARDING</strong></td>
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<td>19260503</td>
<td>1,889</td>
<td>1,832</td>
<td>2,899,328</td>
<td>Training requirements. <strong>FALL PROTECTION</strong></td>
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<td>19100305</td>
<td>1,563</td>
<td>1,080</td>
<td>2,332,420</td>
<td>Wiring methods, components, and equipment for general use. <strong>ELECTRICAL</strong></td>
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<td>19260102</td>
<td>1,488</td>
<td>1,482</td>
<td>3,342,570</td>
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<td>19100303</td>
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<td>1,103</td>
<td>2,891,678</td>
<td>General requirements. <strong>ELECTRICAL</strong></td>
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<td>19100132</td>
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<td>3,009,109</td>
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<td>19260100</td>
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<td>961</td>
<td>2,266,470</td>
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<td>5A0001</td>
<td>929</td>
<td>872</td>
<td>5,735,759</td>
<td><strong>OSH ACT GENERAL DUTY PARAGRAPH (Rank - 15th)</strong></td>
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<td>798</td>
<td>556</td>
<td>1,764,282</td>
<td>Fall protection systems criteria and practices.</td>
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<td>Mechanical power-transmission apparatus.</td>
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<td>618</td>
<td>2,235,662</td>
<td>Maintenance, safeguards, and operational features for exit routes.</td>
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<td>19040039</td>
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<td>738</td>
<td>2,198,868</td>
<td>Reporting of work-related fatalities and severe injuries/illnesses.</td>
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<td>19260651</td>
<td>748</td>
<td>459</td>
<td>3,597,926</td>
<td>Specific excavation requirements</td>
</tr>
<tr>
<td>19100157</td>
<td>704</td>
<td>541</td>
<td>705,897</td>
<td>Portable fire extinguishers.</td>
</tr>
</tbody>
</table>
Section 5(a)(1) of the Occupational Safety and Health Act of 1970: The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause serious physical harm to employees in that employees were performing tasks that have caused or were likely to cause musculoskeletal disorders (MSDs): (a) On or about February 4, 2009, and at time prior to, and continuing to the present, employees, including the Certified Nursing Assistants who work at Laurel Hill Health Care nursing home in [redacted], performed repeated lifting/lowering, pushing, pulling, bending, reaching, twisting, and other tasks associated with repositioning and transferring of residents. These actions, performed by employees, to reposition and/or transfer partial and non-weight bearing residents exposed employees to hazards which have caused, are causing, or are likely to cause musculoskeletal disorders (MSDs) involving the back and/or shoulders. Abatement: Although some ergonomic-related risk factors may be reduced or eliminated by implementing a single means of abatement, in most cases a process that includes analysis of the worksite, instituting appropriate controls, providing appropriate response to employee injuries, and training and education (in both recognition of hazard and injury and of avoidance of injury) will provide the most effective method of addressing the risk factors and ensuring ongoing program effectiveness and compliance with this standard.
Section 5(a)(1): The employer did not furnish to each of his employees a place of employment which was free of recognized hazards that were causing or likely to cause death or serious physical harm to employees in that employees were exposed to excessive heat: On or about August 23, 2011 and at times prior thereto, Laborers for performing the tasks of constructing the Building at the job site located at 5015 Highway 7 in Davis, Oklahoma were subjected to the recognized hazard of excessive heat.

Among other methods, one feasible and acceptable abatement method to correct this hazard is to establish a Heat Stress Management Program which incorporates guidelines from the ACGIH’s Threshold Limit Values and Biological Exposure Indices and/or the National Institute for Occupational Safety and Health (NIOSH) document "Working in Hot Environments." Such a program may include, but is not limited to: 1. acclimating employees beginning work in hot environments or those returning from absent periods of three or more days, 2. developing a work/rest regimen, 3. providing cool water and requiring employees to drink 5-7 ounces of fluid every 15-20 minutes rather than relying on thirst, 4. providing cool rest areas, 5. providing training for employees regarding the health effects associated with heat stress, symptoms of heat induced illnesses and the methods of preventing such illnesses and 6. Establish a screening program to identify health conditions aggravated by exposure to heat stress.
Section 6 – Occupational Safety and Health Standards

• Prior to 4/28/73, the Secretary could promulgate existing Federal standard (e.g., Walsh-Healy) or national consensus standard (e.g., ANSI, NFPA) **without** utilizing rulemaking procedures, 6(a).

• Sometimes referred to as “1971 Base Standards.”
Section 6 – Occupational Safety and Health Standards

• Establishes procedural requirements for promulgating, amending, or revoking OSH standards (e.g., publishing of Notice of Proposed Rulemaking in Federal Register (FR), comment period, hearings), 6(b).

Known as “notice-and-comment” rulemaking.

2012 GAO Report: Of the 58 significant OSHA standards issued between 1981 and 2010, average time to develop and issue was 7 years, 9 months.
Section 6 – Occupational Safety and Health Standards

• Provides for establishment of **Emergency Temporary Standards (ETS)** that take affect immediately if Secretary determines workers in grave danger from exposure to toxic substances or agents determined to be toxic or physically harmful or new hazards, **and** an ETS is necessary to protect employee from such danger, **6(c)**. Final ruling should be made in within 6 months.
  – None issued since 1983.

• Individuals adversely affected by a final standard or ETS may file petition (within 60 days of rule’s publication in FR) for judicial review of standard with US Court of Appeals, **6(f)**.
Section 8 – Inspections, Investigations, and Recordkeeping

- Authorizes the Secretary (OSHA compliance officer) to enter places of employment without delay and at reasonable times, to inspect and investigate premises and all pertinent conditions, machines, materials, etc., and to question privately any employer, owner, operator, agent, or employee, 8(a).

- FY 2017 Inspections
  - OSHA: 32,396 inspections
  - State Plans: 43,551 inspections

- FY 2016 Inspections
  - OSHA: 31,948 inspections
  - State Plans: 43,105 inspections

Note: For information on the OSHA metric, the enforcement unit (EU), used to measure enforcement activity in its Enforcement Weighting System (EWS), access this link, EWS.
Section 8 – Inspections, Investigations, and Recordkeeping

• OSHA Inspection Priorities (table source: OSHA Field Operations Manual [FOM], August 2016).

<table>
<thead>
<tr>
<th>Priority</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>Imminent Danger</td>
</tr>
<tr>
<td>Second</td>
<td>Fatality / Catastrophe (NOTE)</td>
</tr>
<tr>
<td>Third</td>
<td>Complaints / Referrals</td>
</tr>
<tr>
<td>Fourth</td>
<td>Programmed Inspections</td>
</tr>
</tbody>
</table>

• Follow-Up Inspections:
  “In general, follow-up inspections shall take priority over all programmed inspections and any unprogrammed inspection in which the hazards are anticipated to be other-than-serious.” (FOM 8/16)

Section 8 – Inspections, Investigations, and Recordkeeping

- Establishes right of employee (or employee representative) who believes a violation of safety / health standard exists that threatens physical harm, or that an imminent danger exists, to request an inspection by giving notice to OSHA of such violation or danger, 8(f). Right to file complaints.

- Requires employers to maintain accurate records of, and to make periodic reports on, work-related deaths and recordable injuries and illnesses, 8(c).
Section 8 – Inspections, Investigations, and Recordkeeping

• Requires employers to maintain accurate records of employee exposures to toxic materials or harmful physical agents, 8(c).

• Provides employees opportunity to observe monitoring processes, and for employees to have access to such records as will indicate their own exposure to toxic materials or harmful physical agents, 8(c).
Section 9 – Citations

• Requires where investigation reveals violation, that employer be issued written citation describing specific nature of violation, 9(a).

• **Citations Issued by Area Director:** After compliance safety and health officer (CSHO) reports findings, area director determines what citations, if any will be issued, and what penalties, if any, will be proposed.

• Citations inform employer / employees of standard, regulation, rule, or order alleged to have been violated and of proposed reasonable length of time set for violation abatement.

Employer will receive citations and notices of proposed penalties by certified mail.
Section 9 – Citations

- Employer must prominently post each citation, or copies of, at or near each place a violation referred to in citation occurred, 9(b).

Citation shall remain posted until the violation has been abated, or for 3 working days, whichever is longer.

- Citation cannot be issued after expiration date of six months following the occurrence of any violation, 9(c).
Section 10 – Procedure for Enforcement

- Employer has **15 working days** after receiving Citation and Notice of Proposed Penalty to notify Secretary of wish to contest citation or proposed assessment of penalty, **10(a)**. Must be in writing, called “Notice of Contest.”

- If failure to notify within 15 working days, **and** no employee/employee representative files contest notice alleging an unreasonable time allotted for abatement, citation and penalty shall be deemed final order, **10(a)**.
Section 10 – Procedure for Enforcement

• If Notice of Contest filed by employer within required 15 working days, Area Director forwards case to Occupational Safety and Health Review Commission (OSHRC) which shall afford an opportunity for hearing, 10(c).

  – Subsequently, OSHRC will issue orders affirming, modifying or vacating citation or proposed penalty, or directing other appropriate relief. Orders final 30 days after issuance, 10(c).

• Percent (%) inspections with citations contested¹:

  **Federal:** FY 2017 - 8.5%; FY 2016 - 8.3%
  **State:** FY 2017 - 15.1%; FY 2016 – 15.9%

“Whistleblower” Protection - Section 11(c)(1) states:

- “No person shall discharge or in any manner discriminate against any employee because such employee has filed any complaint or instituted or caused to be instituted any proceeding under or related to this Act or has testified or is about to testify in any such proceeding or because of the exercise by such employee on behalf of himself or others of any right afforded by this Act”.

Employees believing they have been discharged or otherwise discriminated against in violation of this provision, must within 30 days of such illegal action, file complaint with OSHA, 11(c)(2).

OSHA's Whistleblower Protection Program - enforces whistleblower provisions of 22 whistleblower statutes protecting employees who report violations of various workplace safety and health, airline, commercial motor carrier, consumer product, environmental, financial reform, food safety, health insurance reform, motor vehicle safety, nuclear, pipeline, public transportation agency, railroad, maritime, and securities laws.
Section 12 – Occupational Safety and Health Review Commission (OSHRC)

• Establishes Occupational Safety and Health Review Commission (OSHRC).

• Independent federal agency **not** associated with OSHA or DOL.

• Comprised of 3 members (commissioners), appointed by the President (with approval of Senate) to serve 6-year staggered terms. One member appointed by President to serve as Chair.

• Quasi-judicial body - adjudicates cases when enforcement action taken by OSHA against employer is contested by employer, employees or their representative.
Section 12 – Occupational Safety and Health Review Commission (OSHRC)

• After OSHA notification, OSHRC hears appeals on contested OSHA actions concerning citations, proposed penalties and abatement periods and determines appropriateness of such actions. When necessary, may conduct own investigation and may affirm, modify, or vacate OSHA’s findings. Can issue corrective orders and assess civil penalties.

• Hearings are held by Chair-appointed Administrative Law Judges, whose written decisions are subject to review by Commission members.

• OSHRC rulings may be appealed to appropriate US Court of Appeals, 11(a)&(b).
Section 13 – Procedures to Counteract Imminent Dangers

Imminent Danger:

“Any conditions or practices in any place of employment which are such that a danger exists which could reasonably be expected to cause death or serious physical harm immediately or before the imminence of such danger can be eliminated through the enforcement procedures otherwise provided by this Act” 13(a).
Section 13 – Procedures to Counteract Imminent Dangers

- Procedures in place in the OSHA Field Operations Manual (FOM) on how CSHOs will deal with imminent danger situations during an inspection.

- If employer does or can not voluntarily abate hazard and remove endangered employees from exposure:
  - CSHO will consult with Area Director to obtain permission to post a Notice of Alleged Imminent Danger
  - Employer advised that Section 13 (13a) gives US District Courts authority to restrain any condition/practice posing imminent danger to employees.

Note: OSHA (CSHO) alone has no authority to order an operation/workplace shut down or to direct employees to leave area of imminent danger or the workplace.
Section 13 – Procedures to Counteract Imminent Dangers

- CSHO notifies affected employees of the danger (13c) and that *Notice of an Alleged Imminent Danger* has been posted, advises them of Section 11(c) discrimination protections, and advised them of right to refuse to perform work in area where imminent danger exists.

- Area Director & Regional Administrator, in consultation with Regional Solicitor of Labor, assess situation and, if warranted, make arrangements for expedited initiation of U.S. District Court action (i.e., generally obtainment of temporary restraining order (TRO) which causes immediate shutdown of operation or section of workplace where imminent danger exists), 13(b).
Section 17 – Penalties

Other-Than-Serious Violation:

- Violation having a direct and immediate relationship to the safety and health of employees, but cited in situations where the accident/incident or illness that would most likely result from a hazardous condition would probably not cause death or serious physical harm.

- May propose penalty up to $12,934\(^1\) for each violation. May be adjusted downward depending on employer's good faith (demonstrated efforts to comply with Act), history of previous violations, and size of business.

---

1 – OSHA authorized to set maximum fine at this amount per implementation of the Federal Civil Penalties Inflation Adjustment Act Improvement Act of 2015. Annual increases in maximum penalty amount allowed based on Consumer Price Index for all Urban Consumers (CPI-U).
Section 17 – Penalties

**Serious Violation:**

- Violation where there is substantial probability that death or serious physical harm could result **and** that employer knew, or should have known, of hazard.

- May propose mandatory penalty **up to $12,934\textsuperscript{1}** for each violation. Penalty amount is function of gravity of alleged violation and can then factor in employer's good faith, history of previous violations, and size of business.

**Note:** See OSHA’s *Field Operations Manual (FOM)* (8/2/16) for further information on penalty assessment policy for serious violations and other violation classifications.

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1 - OSHA sets maximum fine at this amount per implementation of the Federal Civil Penalties Inflation Adjustment Act Improvement Act of 2015. Annual increases in penalty amount allowed based on Consumer Price Index for all Urban Consumers (CPI-U).
Section 17 – Penalties

Willful Violation:

- Violation that employer knowingly commits or commits with plain indifference to the law, and either knows that what he/she is doing constitutes a violation, or is aware that a hazardous condition existed and made no reasonable effort to eliminate it.

- Penalties **up to $129,336\(^1\)** for each willful violation may be assessed, but not less than **$9,239\(^1\)**.

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\(^1\) – OSHA sets maximum and minimum fines at this amount per implementation of the Federal Civil Penalties Inflation Adjustment Act Improvement Act of 2015. Annual increases in penalty amount allowed based on Consumer Price Index for all Urban Consumers (CPI-U).
Section 17 – Penalties

Willful Violation (continued):

• U.S. Justice Dept. may bring criminal action against employer whose willful violation results in the death of an employee. Offense punishable by court-imposed fine or by imprisonment for up to six months, or both. A second conviction doubles possible term of imprisonment, (17e).

• A monetary fine of up to $250,000 for an individual, or $500,000 for a corporation, may be imposed for a willful criminal conviction as set by Title 18 of U.S. Code (Crimes and Criminal Procedure), 3571.
Section 17 – Penalties

Repeated Violation:
- Violation of any standard, regulation, rule, or order where, upon reinspection, a substantially similar violation is found.
- Can bring fine of up to $129,336 for each such violation. To be basis of repeated citation, original citation must be final; citation under contest may not serve as basis for subsequent repeated citation.

Failure to Abate Prior Violation:
- Failure to abate a prior violation may bring a civil penalty of up to $12,934 for each day the violation continues beyond the prescribed abatement date. (Normally shall not exceed 30 times the amount of daily proposed penalty [OSHA FOM 8/16]).

1 - OSHA sets maximum fine at this amount per implementation of the Federal Civil Penalties Inflation Adjustment Act Improvement Act of 2015. Annual increases in penalty amount allowed based on Consumer Price Index for all Urban Consumers (CPI-U).
Section 17 – Penalties

Penalties may also be assessed for the following:

• **Civil** - Violation of any posting requirements - fine (*17i*).

• **Criminal** - Providing unauthorized advanced notice of OSHA inspection - fine, imprisonment or both (*17f*).

• **Criminal** - Falsifying records, reports or applications filed or required to be maintained pursuant to the Act - fine, imprisonment, or both (*17g*).

• **Note**: Criminal penalties imposed by courts after trials, not OSHA or OHSRC.
OSHA’s Egregious Case Policy

• Began in 1986 - Instituted to deal with employers flagrantly violating OSHA standards.

• Derived from the willful violation category (See CPL 02-00-080, Handling of Cases to be Proposed for Violation-by-Violation Penalties, 10/21/90).

• Instead of grouping or combining violations for penalty purposes, each instance of non-compliance is considered a separate violation and a penalty applied separately.
OSHA’s Egregious Case Policy

- Known as the “egregious” or violation-by-violation penalty procedure.

- Employer cited on number of instances in which a violation occurs, or on number of employees exposed to a hazard, not simply on number of regulations / standards employer violated.
Section 18 – State Jurisdiction and State Plans

- **Background**: Section 2(11) encourages states to develop and operate their own job safety and health programs.

- **Section 18(b)**: States desiring to assume responsibility for development and enforcement therein of OSH standards relating to any OSH issue with respect to which a Federal standard has been promulgated under Section 6, shall submit a state plan for development of such standards and their enforcement.
Section 18 – State Jurisdiction and State Plans

Approval conditions include:

• Provision of standards (and enforcement thereof) as least as effective as counterpart Federal standards in providing safe and healthful places of employment.

• Plans must, to extent permitted by state law, also provide coverage for state and local government employees.
Section 18 – State Jurisdiction and State Plans

- States have option to promulgate standards covering hazards not addressed by Federal Standards. Must adopt standards comparable to Federal standards within 6 months of Federal standard promulgation.

- Currently, 22 states / jurisdictions operating complete plans (private sector / state / local government).

6 plans cover public employees only: NJ, NY, CT, IL, ME and Virgin Islands.
Section 21 – Training and Employee Education

Examples of training / education activities established / authorized in response to Section 21 requirements:

OSHA:

• Offers short-term training through OSHA Training Institute (Arlington Heights, IL) to Federal/State OSHA and other Federal Agency personnel, State consultants, and private sector personnel.

• Authorizes OSHA Training Institute Educational Centers in which designated nonprofit organizations offer most frequently requested OSHA Training Institute courses for private sector and other Federal agency personnel.
Section 21 – Training and Employee Education

Examples of training / education activities established / authorized in response to Section 21 requirements:

OSHA (continued):

• Extends training reach to workers through various Outreach Training Programs where qualified individuals complete OSHA trainer course and become authorized to teach student courses.

• Administers agency's discretionary grants programs (e.g. Susan Harwood Training Grants Program).

• Administers and provides federal funding for State OSHA On-Site Consultation Projects (codified now at new OSH Act subsection 21 (d):Public Law 105-197, 1998).
Section 21 – Training and Employee Education

Examples of training / education activities established / authorized in response to Section 21 requirements:

NIOSH:

• Supports, through 18 university-based Education and Research Centers (ERCs), academic degree programs and research training opportunities in core areas of OSH, plus specialized areas relevant to OSH field.

• Supports ERC short-term continuing education (CE) programs for OSH professionals, and others with worker safety and health responsibilities.

• Supports Training Project Grants (TPGs) at academic institutions that primarily provide single-discipline graduate training in IH, OH nursing, occupational medicine, occupational safety, and closely related OS&H fields.
Section 22 – National Institute for Occupational Safety and Health

- Establishes National Institute for Occupational Safety and Health (NIOSH) in Department of Health and Human Services (formerly HEW) to carry out policy set forth in Section 2 and perform functions assigned to HHS Secretary under Sections 20 (Research and Related Activities) and 21 (Training and Employee Education).

- Headed by Director, appointed by HHS Secretary, serving six year term unless previously removed by HHS Secretary.
Section 22 – National Institute for Occupational Safety and Health

NIOSH responsibilities / authorizations include:

• Conducting research and experimental programs necessary for developing criteria for new and improved job safety and health standards.

• Developing / establishing recommended OSH Standards. Recommended OHS standards shall immediately be forwarded to Secretary of Labor and HHS.

• Publishing annually list of all known toxic substances and concentrations at which toxicity is known to occur (RTECS). Activity outsourced after 2001.
NIO SH responsibilities / authorizations (continued):

• Conducting Health Hazard Evaluations of workplaces, following appropriate written requests, to determine whether any substance normally found in place of employment has potentially toxic effects in such concentrations as used or found, \textit{20(a)(6)}.  

• Providing training to OHS professionals.
References: Occupational Safety and Health Act of 1970


3. Occupational Safety and Health Administration (OSHA): *All About OSHA* (OSHA Publication 2056-07R), 2003


5. “OSHA’s Field Operations Manual (FOM)”, Directive/Instruction CPL 02-00-160, 8/2/16
References: Occupational Safety and Health Act of 1970


10. Assorted information from current OSHA, NIOSH, OSHRC websites.
Sample Questions
Questions

1. Under Section 10 of the OSH Act, how long does an employer have to notify OSHA (Area Director) in writing of a wish to contest a received Citation and Notice of Proposed Penalty?

   a) two calendar weeks
   b) 10 working days
   c) 15 working days
   d) 30 working days
   e) none of the above
Questions

2. Historical records contain a prevalence of references to working conditions and industrial disease in:
   a) shipbuilding
   b) mining
   c) forge shops
   d) agriculture
Questions

3. De Re Metallica, a comprehensive discourse published in 1556 on all aspects of mining, including descriptions of diseases and disorders associated with mining operations, was written by:

a) Ulrich Ellenbog
b) Bernardino Ramazzini
c) Paracelsus
d) Georgius Agricola
e) Charles Thackrah
Questions

4. Section 5(a)(1) of the OSH Act:
   a) is known as the “Whistleblower” Protection Clause which spells out the rights of an employee to seek safety and health on the job without fear of punishment
   b) is known as the “General Duty Clause”
   c) gives OSHA the ‘right of entry” into workplaces
   d) authorizes OSHA’s use of the Egregious Case Policy
   e) none of the above
Questions

5. The penalty for a willful violation of an OSHA standard (which does not result in the death of an employee):
   a) had a maximum fine amount set at $129,336 in January 2018.
   b) is set at $40,000
   c) can bring a monetary fine of up to $70,000, or up to six months in jail, or both
   d) can range from $100 to $7,000
Questions

6. Many state industrial hygiene programs were established with funds provided by:
   a) the Walsh-Healy Public Contracts Act
   b) OSHA New Directions grants
   c) the War Hazards Rehabilitation Commission
   d) the Social Security Act
   e) Worker Compensation Benefits Funds
Questions

7. Which of the following facts regarding the Occupational Safety and Health Review Commission (OSHRC) is false?
   a) OSHRC is an independent federal agency not associated with OSHA or DOL.
   b) OSHRC is comprised of three members, appointed by President with advice and consent of the Senate, to serve six year staggered terms.
   c) The OSHRC Chair appoints Administrative Law Judges who hear appeals on contested OSHA actions concerning citations, proposed penalties, or abatement periods.
   d) The OSHRC may affirm, modify or vacate OSHA’s findings.
   e) OSHRC rulings are final and may not be appealed to the US Court of Appeals.
Questions

8. A physician, with autobiography entitled *Exploring the Dangerous Trades*, who was a champion of social responsibility for worker health and safety and whose work should be considered the initial practice of IH, at least in the US, is:

a) Dr. Anna Baejter  
b) Dr. Eula Bingham  
c) Dr. Ellen Bog  
d) Dr. Alice Hamilton  
e) Dr. Ada May O. Stewart
9. Which of the following statements is false?
   a) the term “Secretary” in the OSH Act means the Secretary of Labor
   b) an OSHA compliance officer can shut down a plant or operation if an imminent danger is encountered
   c) providing unauthorized advanced notice of an OSHA inspection can result in a criminal penalty of a fine, imprisonment, or both
   d) the OSH Act specifically created and established the National Institute for Occupational Safety and Health (NIOSH) in the Department of Health and Human Services (formerly HEW)
   e) none of the above
Questions

10. A tragic episode in the history of industrial hygiene where over 400 workers deaths were attributed to high concentrations of silica dust was:

a) the Gauley Bridge Tunnel Disaster
b) the Donora, PA Disaster
c) the Dust Bowl
d) the Union Carbide Mine Disaster
e) the Starwood Mine Disaster
Questions

1. Under Section 10 of the OSH Act, how long does an employer have to notify OSHA (Area Director) in writing of a wish to contest a received Citation and Notice of Proposed Penalty?

   a) two calendar weeks
   b) 10 working days
   c) **15 working days**
   d) 30 working days
   e) none of the above
Questions

2. Historical records contain a prevalence of references to working conditions and industrial disease in:
   a) shipbuilding
   b) **mining**
   c) forge shops
   d) agriculture
Questions

3. De Re Metallica, a comprehensive discourse published in 1556 on all aspects of mining, including descriptions of diseases and disorders associated with mining operations, was written by:

a) Ulrich Ellenbog
b) Bernardino Ramazzini
c) Paracelsus
d) **Georgius Agricola**
e) Charles Thackrah
Questions

4. Section 5(a)(1) of the OSH Act:

   a) is known as the “Whistleblower” Protection Clause which spells out the rights of an employee to seek safety and health on the job without fear of punishment

   b) is known as the “General Duty Clause”

   c) gives OSHA the ‘right of entry” into workplaces

   d) authorizes OSHA’s use of the Egregious Case Policy

   e) none of the above
5. The penalty for a willful violation of an OSHA standard (which does not result in the death of an employee):

   a) **had a maximum fine amount set at $129,336 in January 2018**
   
   b) is set at $40,000
   
   c) can bring a monetary fine of up to $70,000, or up to six months in jail, or both
   
   d) can range from $100 to $7,000
Questions

6. Many state industrial hygiene programs were established with funds provided by:
   a) the Walsh-Healy Public Contracts Act
   b) OSHA New Directions grants
   c) the War Hazards Rehabilitation Commission
   d) the Social Security Act
   e) Worker Compensation Benefits Funds
Questions

7. Which of the following facts regarding the Occupational Safety and Health Review Commission (OSHRC) is false?
   a) OSHRC is an independent federal agency not associated with OSHA or DOL.
   b) OSHRC is comprised of three members, appointed by President with advice and consent of the Senate, to serve six year staggered terms.
   c) The OSHRC Chair appoints Administrative Law Judges who hear appeals on contested OSHA actions concerning citations, proposed penalties, or abatement periods.
   d) The OSHRC may affirm, modify or vacate OSHA’s findings.
   e) OSHRC rulings are final and may not be appealed to the US Court of Appeals.
Questions

8. A physician, with autobiography entitled *Exploring the Dangerous Trades*, who was a champion of social responsibility for worker health and safety and whose work should be considered the initial practice of IH, at least in the US, is:
   a) Dr. Anna Baejter
   b) Dr. Eula Bingham
   c) Dr. Ellen Bog
   d) **Dr. Alice Hamilton**
   e) Dr. Ada May O. Stewart
Questions

9. Which of the following statements is false?
   a) the term “Secretary” in the OSH Act means the Secretary of Labor
   b) an OSHA compliance officer can shut down a plant or operation if an imminent danger is encountered
   c) providing unauthorized advanced notice of an OSHA inspection can result in a criminal penalty of a fine, imprisonment, or both
   d) the OSH Act specifically created and established the National Institute for Occupational Safety and Health (NIOSH) in the Department of Health and Human Services (formerly HEW)
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