



# Industrial Practice Good<sup>^</sup>Hygiene

April 2022

## *Industrial Hygiene - A History and the Changing Face of Exposure Limits*

### What is Industrial Hygiene?

In our articles over the past few years, we have discussed many industrial hygiene topics, but until now we haven't offered a definition of the term. According to the United States Department of Labor Occupational Safety and Health Administration (OSHA), [industrial hygiene](#) is "that science and art devoted to the anticipation, recognition, evaluation, 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 the citizens of the community." To simplify, industrial hygiene seeks to identify and characterize those things in the workplace that are not good for us. While these principles are applicable in other environments, the workplace often presents unique exposure potential that warrants caution and proactive defenses.

### Why worry about Industrial Hygiene?

A wise employer recognizes that their staff is the greatest asset of any company; however, even if the perceived moral imperative to protect people is ignored, the cost resulting from lost time due to injury, training replacement workers, and litigation provides a significant financial rationale to protect the workforce. Unfortunately, this has not always been the case; enter [OSHA](#), the federal agency tasked with ensuring "safe and healthful working conditions for workers by setting and enforcing standards and by providing training, outreach, education and assistance." In April 2021, OSHA celebrated its 50th anniversary. The Occupational Safety and Health Act (OSH Act) was signed into law by President Richard Nixon on December 29, 1970. Up until that time, there had been no federal worker protection regulations in the United States.

### How is Industrial Hygiene implemented?

One of the key provisions of the OSH Act was to establish permissible exposure limits, or PELs. The concept of a PEL is to establish a concentration of a harmful agent, usually airborne, that a worker could be exposed to for up to 40 hours a week during the course of a lifetime of labor and suffer no harmful health effects. The OSHA PEL is also a legal, enforceable threshold.

### Limits of the PEL

One unfortunate aspect of workplace exposures that was not fully understood at the time their limits were established was the difference between acute and chronic exposures of harmful agents. It is easy enough to

comprehend, witness, and in many cases, even experience the harmful effects of a chemical such as ammonia in excess of the PEL. Not fully understood during the early days of industrial hygiene was the relationship between the long-term and insidious latent effects of chronic exposure to agents (such as asbestos and silica) and the associated diseases that don't manifest until decades later.

### Origins and Alternatives to the PEL

The need for an occupational exposure limit (OEL) was not new to industrial hygiene, which has been practiced in this country since the early 20th century. Dr. Alice Hamilton, considered by most as the founder of industrial hygiene in the United States, noticed a correlation between workplace exposures and toxic chemicals in the workplace. By the late 1930s the American Conference of Governmental Industrial Hygienists, or [ACGIH](#)<sup>®</sup>, had begun to develop the concept of the threshold limit value usually expressed as the TLV<sup>®</sup>. TLVs<sup>®</sup> are established by a group of independent and knowledgeable volunteers who are all industry professionals with applicable education, knowledge, and experience. Unlike PELs, these values are not legally enforceable standards, but rather health-based guidelines that are believed to represent levels of exposure that a typical worker can experience without suffering adverse effects.

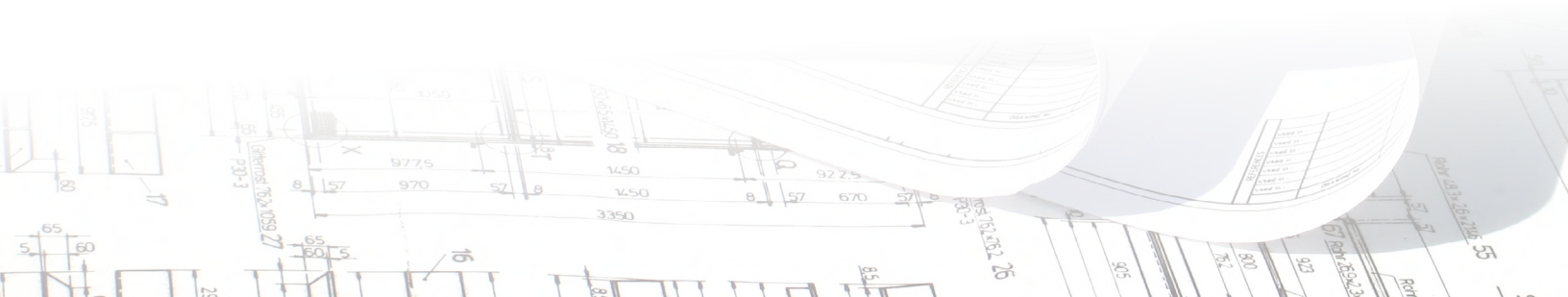
### Merits of the TLV

It is important to understand the difference between the OSHA PELs and the ACGIH TLVs. The ACGIH is an organization that continuously studies workplace exposures, and in most cases, has continuously established and updated more stringent TLVs based on accumulated scientific data to offer better worker protection. The OSHA PELs in existence today are based largely on the ACGIH TLVs<sup>®</sup> that were established in 1969! To put that in some perspective, the OSHA PEL for styrene, a chemical linked to health effects to the nervous system, is set at 100 parts per million (ppm) while the ACGIH TLV<sup>®</sup> is 20 ppm. One can examine some of the differences between PELs, TLVs<sup>®</sup>, and other occupational exposure limits as presented on the [OSHA website](#).

OSHA is well aware of the frequent disparity between the PEL and the TLV<sup>®</sup>. In fact, in 1989 OSHA attempted to change the existing PEL for 212 substances to a lower, more protective concentration and create PELs for an additional 164 substances not previously regulated. However, in 1992 a legal challenge resulted in vacating the attempt. The proposed 1989 PELs were moved back to those established in 1971. You can read more about this in the Centers for Disease Control (CDC) National Institute for Occupational Safety and Health ([NIOSH](#)) online publication [NIOSH Pocket Guide to Chemical Hazards](#).

### Limits of the TLV

One limitation of the TLV<sup>®</sup>, however, is that because these values “are based solely on health factors, there is no consideration given to economic or technical feasibility. ACGIH<sup>®</sup> does not believe that TLVs<sup>®</sup> [...] should be adopted as standards without an analysis of other factors necessary to make appropriate risk management decisions (e.g., control options, technical and economic factors, etc.).” The [Hierarchy of Controls](#) dictates that the best way to handle hazards is to eliminate them; failing that, substitution of a lesser hazard is preferred. Down the hierarchy, less desirable methods to address hazards are outlined. However, it is not reasonable to expect to eliminate all hazards from a workplace. Ultimately the responsibility to be safe is shared by both the employer AND the worker. It is important to acknowledge that since they are established irrespective of economic or technical feasibility, the TLV<sup>®</sup> is not always achievable.



### A Goldilocks Limit?

NIOSH, mentioned above, is a federal research agency established by the OSH Act that develops and periodically revises recommended exposure limits ([RELs](#)) for hazardous substances or conditions in the workplace. NIOSH also provides recommendations to address such hazards. The REL for any given substance is not a legally enforceable regulatory limit, but is a non-mandatory, recommended OEL. According to their own [documentation](#), “because OSHA recognizes that many of its PELs are outdated and inadequate measures of worker safety, both OSHA and NIOSH recommend that employers take actions to keep worker exposures below the NIOSH REL.” RELs are often somewhere between the PEL and the TLV® and are reasonably achievable.

### A Path Forward

To wrap up, employers should realize that while the OSHA PELs are the occupational exposure levels that are legally enforceable by law, they may not necessarily be the most protective of human health. TLVs® are the state of the industry-ideal limit, while RELs are more recently revised limits that can be attained. A best management practice followed by many forward-thinking organizations are the concepts of As Low as Reasonably Achievable, often referred to as ALARA, and As Low as Reasonably Practicable, or ALARP. More about these concepts and other ways to protect employees will be discussed in a future article.

#### **About the Authors**

Glenn Hargrove, CIH, CSP, PG, CHMM, and Jesse Phillips, CIH, CSP, serve as the Practice Leaders for F&R's Industrial Hygiene Group. Both maintain close familiarity with the complex web of federal, state, and local regulations. Glenn, Jesse, and their IH team can assist you in meeting your compliance goals through assessing, managing, and consulting on matters related to the practice of industrial hygiene and safety.

#### ***For Help with All Your Compliance Strategies:***

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