Chapter 2
Definitions

This chapter will define some of the terms commonly used in industrial hygiene.

Industrial Hygiene:
According to the American Industrial Hygiene Association (AIHA), 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 and homeplace which may cause sickness, impaired health and well-being, or significant discomfort among workers or among the citizens of the community."

NIOSH Manual of Analytical Methods (NMAM)
NMAM is a collection of methods for sampling and analysis of contaminants in workplace air, and in the blood and urine of workers who are occupationally exposed. These methods have been developed or adapted by NIOSH or its partners and have been evaluated according to established experimental protocols. The NMAM can be found at NIOSH's website at http://www.cdc.gov/niosh/nmam.

NMAM also includes chapters on quality assurance, sampling, portable instrumentation, etc.

Threshold Limit Value (TLV):
The American Conference for Governmental Industrial Hygienists (ACGIH) has established guidelines for exposure to airborne contaminates. These guidelines are widely accepted and updated annually. The TLV of an airborne chemical represents the concentration of that chemical below which there is thought to be no significant adverse effect on most workers. In developing TLV's it should be assumed that workers may be repeatedly exposed, day after day, to the chemical.

Not every chemical will have a TLV. For more information on TLV's, refer to your *ACGIH Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* booklet. (2002 NSC Fundaments of IH workbook)

Permissible Exposure Limit (PEL):
PEL's are promulgated & enforced by OSHA. However, MSHA has used the term PEL in recent rule making, such as Part 62 (noise exposure) and at times refers to PEL's in the DPM regulations.

In most part, the term PEL has the same meaning as TLV, however refers to an enforcing agency (OSHA or MSHA).

Recommended Exposure Limit (REL):
This limit is developed by the National Institute of Occupational Safety & Health. Often the REL is a time-weighted average for a 10-hour work day during a 40-hour work week.

Action Level (AL):
This is a level at which action is required. OSHA & MSHA requires an action level for some specific substances as well as for noise exposure. Many industrial hygiene professionals use the action level to evaluate workplace exposure: It is usually identified as half the PEL or TLV.

Categories of Exposure Limits
There are three important categories of exposure limits that apply to TLVs, PELs, and RELs: time-weighted average, short-term exposure limit, and ceiling.

Time-Weighted Average
This is the average concentration for an 8-hour workday or 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

Short-Term Exposure Limit (STEL)
This is a short-term TWA exposure to which workers can be continuously exposed for up to 15 minutes without suffering from irritation, chronic or irreversible tissue damage, or narcosis of sufficient degree to increase the likelihood of accident or injury.

Ceiling (C)
This is the concentration that should not be exceeded during **any** part of the work day.

Skin Designation
In looking up exposure limits, you may see a skin designation. This alerts you that there is a potential for significant exposure due to skin absorption. This designation is an alert that air sampling alone is insufficient to quantify exposure.

Chemical agents - crystalline silica, coal dust, diesel particulate matter (DPM), welding fumes, solvent vapors, oxides of nitrogen, etc.

Physical agents –noise, heat, and cold.

Shift Weighted Average (SWA):

Shift Weighted Average is a term used solely by MSHA. TLVs & PELs are intended for 8-hour work days, however many miners work more than 8-hours per day. Therefore MSHA uses Shift Weighted Averages to compare full shift sampling on miners working greater than 8-hours per day to the 8-hour TLV or PEL.

For example, if MSHA sampled a miner working a 12-hour shift for mercury exposure, MSHA would sample the entire 12-hour shift, then shift-weight the result to compare to the 8-hour TLV. The formula below shows how to shift weight a result from a Time Weighted Average (TWA).

$$TWA = 0.05\ mg/m^3$$

$$SWA = TWA \times \left(\frac{\text{Sample Time (minutes)}}{\text{480 Minutes}} \right)$$

$$SWA = 0.05\ mg/m3 \times \left(\frac{\text{720 (minutes)}}{\text{480 Minutes}} \right)$$

$$SWA = 0.075\ mg/m3$$