Occupational Exposure Limits — What if one hasn't been established?

By: Josh Staniscia

Occupational Exposure Limits

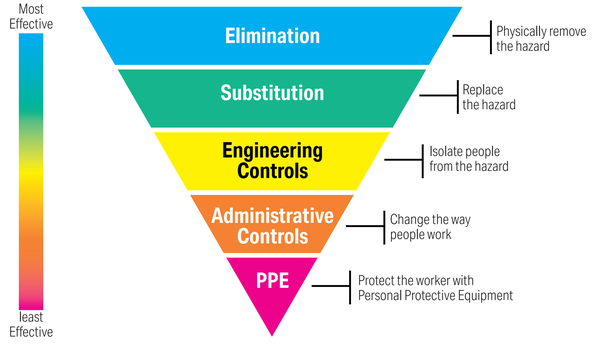
Occupational exposure limits (OELs) have a significant role in helping health and safety professionals determine if workers are being properly protected from exposure to hazardous materials in the workplace. OELs have been established throughout the world for thousands of substances, however what do you do whenever an OEL is not publically available for a material?

Why use Exposure Banding?

When an occupational exposure limit is not publically available and has not been formally established for a substance, a great first resource for health and safety professionals is to utilize exposure banding. Exposure banding helps categorize the occupational exposure range a substance may fall into. The occupational exposure band (OEB) a substance fits into can help characterize the level of concern of exposure to a substance in the workplace and initiate risk management discussions regarding next steps or actions that need to take place.

Process for Using Occupational Exposure Banding

1. Assessment of Hazard potential with the help of occupational exposure banding
2. Use an exposure banding tool to determine the appropriate band a substance would fall into
3. Based on outcome, begin risk management discussions to ensure workers are operating in a safe environment



NIOSH Occupational Exposure Banding Process

Tier 1- Qualitative:

User: EH&S professional

Tier 1 grouping is based on GHS hazard codes associated with the GHS classification of a substance

Tier 2- Semi-Quantitative:

User: EH&S professional with help of a Toxicologist

Tier 2 involves assigning exposure bands using point of departure data from reputable sources for all 9 endpoints

Tier 3- Expert Judgement:

User: Toxicologist

Tier 3 uses expert judgement of a toxicologist to determine the proper band by assessing all available data

Exposure Banding Ranges

Occupational Exposure Band	Airborne Target Range for Particulate Concentration (mg/m³)	Airborne Target Range for Gas or Vapro Concentration (ppm)
A	>10 mg/m³	>100 ppm
B	>1 to 10 mg/m³	>10 to 100 ppm
C	>0.1 to 1 mg/m³	>1 to 10 ppm
D	>0.01 to 0.1 mg/m³	>0.1 to 1 ppm
E	≤0.01 mg/m³	≤0.1 ppm

Tier 1 Overview

Preliminary NIOSH Tier 1 criteria		C	D	E
OEL ranges	Particle	> 0.1 to ≤ 1 milligrams per cubic meter of air (mg/m³)	> 0.01 to ≤ 0.1 mg/m³	≤ 0.01 mg/m³
	Vapor	> 1 to ≤ 10 parts per million (ppm)	> 0.1 to ≤ 1 ppm	≤ 0.1 ppm
Acute toxicity		H301 Category 3 H302 Category 4 H331 Category 3 H332 Category 4 H311 Category 3 H312 Category 4	H300 Category 2 H330 Category 2 H310 Category 2	H300 Category 1 H330 Category 1 H310 Category 1
Skin corrosion/ irritation		H315 Category 2	—	H314 Category 1, 1A, 1B, or 1C
Serious eye damage/ eye irritation		H319 Category 2, 2A or 2B	—	H318 Category 1
Respiratory and skin sensitization		H317 Category 1B (skin) —	H317 Category 1 or 1A H334 Category1B	— H334 Category 1 or 1A
Genotoxicity		—	H341 Category 2	H340 Category 1, 1A or 1B
Carcinogenicity		—	—	H350 Category 1, 1A, or 1B H351 Category 2
Reproductive Toxicity		H361 *(including H361f, H361d, and H361fd)* Category 2	H360 *(including H360f, H360d, and H360fd)* Category 1B	H360 *(including H360f, H360d, and H360fd)* Category 1 or 1A
Specific target organ toxicity		H371 Category 2 H373 Category 2	—	H370 Category 1 H372 Category 1

Tier 2 Overview

1. Search recommended databases for toxicity information
2. Compare qualitative and quantitative data to NIOSH Tier 2 banding criteria
3. Assign band for each health endpoint based on NIOSH Tier 2 banding criteria
4. Assign a Tier 2 OEB for the chemical based on most protective endpoint band

Tier 3 Overview

1. Toxicologist searches all literature and databases for data available on the target substance
2. Select studies as applicable to the nine toxicological endpoints under evaluation
3. Evaluate the selected studies and determine appropriate benchmarks for each endpoint
4. Using the derived benchmarks, the data for each toxicological endpoint can be compared against the Tier 2 technical criteria and the most protective exposure band is selected

Toxicological Endpoints evaluated using NIOSH Occupational Exposure Banding

- Acute Toxicity
- Skin Irritation
- Eye Irritation
- Skin Sensitization
- Respiratory Sensitization
- Genotoxicity
- Carcinogenicity
- Reproductive Toxicity
- Specific Target Organ Toxicity- From Repeated Exposure