

NIOSH occupational exposure banding: a practical chemical risk assessment and management process

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Division of Science Integration



TECHNICAL REPORT

The NIOSH Occupational Exposure
Banding Process for Chemical Risk
Management



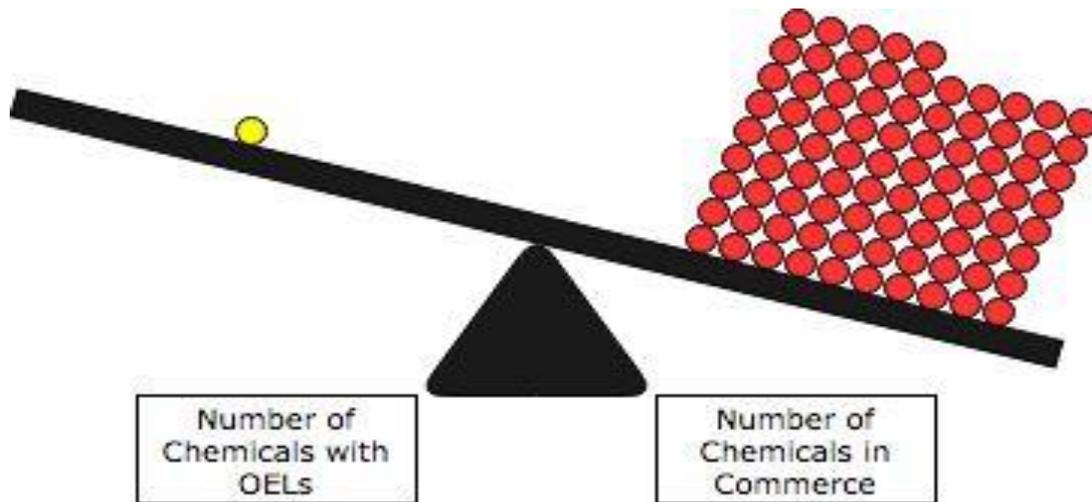
The findings and conclusions in this presentation have not been formally reviewed by the National Institute for Occupational Safety and Health and should not be construed to represent any agency determination or policy.

CHALLENGE



- Workers are exposed to potentially harmful chemicals in their workplace.
- Occupational exposure limits (OELs) guide risk management decisions.
- Most chemicals in use and commerce lack guidance on safe levels of exposure.
- This leaves workers at risk of exposure to chemicals that may be harmful.
- **CDC Strategic Priority: Prevent illness, injury, disability, and premature death.**





- Approximately 1,000 chemicals with authoritative OELs

- Approximately 85,000 chemicals in commerce.

IDEA/SOLUTION

- Innovative approach to provide guidance prescriptive enough to be used by small- and medium-sized establishments
- Occupational Exposure Banding process to provide guidance for chemicals without OELs
- Accompanying electronic tool (e-Tool)

The image shows a screenshot of a Federal Register notice and the NIOSH Occupational Exposure Banding e-Tool interface. The notice is titled "Draft Current Intelligence Bulletin: The Occupational Exposure Banding Process: Guidance for the Evaluation of Chemical Hazards; Notice of Public Meeting; Request for Comments" and is dated 03/15/2017. The e-Tool interface includes a sidebar with navigation options like "Home", "About", "Tier One", "Tier Two", and "Get Email Updates". The main content area displays the "Tier One" section, which includes a "Chemical Information" form with fields for Chemical Name, CAS Number, Physical State, and Chemical Form. Below this is a "Hazard Information" table with columns for "Select", "Hazard Category", and "Hazard Code".

Select	Hazard Category	Hazard Code
<input type="radio"/>	1	214
<input type="radio"/>	1a	214
<input type="radio"/>	1b	214
<input type="radio"/>	1c	214
<input type="radio"/>	2	215

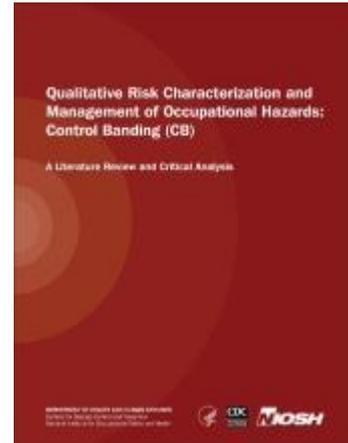
WHAT IS OCCUPATIONAL EXPOSURE BANDING?

A mechanism to quickly and accurately assign chemicals into “categories” or “bands” based on their health outcomes and potency considerations

	A	B	C	D	E
Dust/Particulate Gas/Vapor	>10 mg/m ³ >100 ppm	>1 to 10 mg/m ³ >10 to 100 ppm	>0.1 to 1 mg/m ³ >1 to 10 ppm	>0.01 to 0.1 mg/m ³ >0.1 to 1 ppm	≤0.01 mg/m ³ ≤0.1 ppm

IS THIS THE SAME AS CONTROL BANDING? NO.

- **COSHH Essentials** is a control banding tool that helps small and medium-sized enterprises to do risk assessments for chemicals and mixtures of chemicals
 - identifies the control band (control approach),
 - produces advice on controlling risk from the chemical used in the specified task, and
 - provides written guidance and documentation as a result of the assessment
- NIOSH has reviewed control banding strategies previously



OCCUPATIONAL EXPOSURE BANDING IS DIFFERENT!

- OEBs are derived from **toxicology** and **potency**
- OEBs can be used to identify one of many control strategies



THE PROMISE OF OCCUPATIONAL EXPOSURE BANDING

- Facilitates more rapid evaluation of health risk
- Provides guidance for materials without OELs
- Highlights areas where data are missing
- Provides a screening tool for the development of RELs
- Identifies hazards to be evaluated for elimination or substitution
- Aligned with GHS for hazard communication
- Facilitates the application of Prevention through Design principles

HOW IS THE PROCESS ORGANIZED?

Bands are assigned based on the findings for nine standard toxicological endpoints:

1. Carcinogenicity
2. Reproductive toxicity
3. Specific target organ toxicity resulting from repeated exposure
4. Acute toxicity
5. Genotoxicity
6. Skin corrosion and irritation
7. Respiratory sensitization
8. Skin sensitization
9. Serious eye damage and irritation

IDEA/SOLUTION

- Stakeholders and users have been enthusiastic and supportive of the new of the draft banding guidance and e-Tool technology.
- Innovative banding guidance to address stakeholder needs, including the following enhancements:
 - Automated e-Tool
 - Validated banding criteria and e-Tool for consistency and usability
 - Training materials
 - Detailed plan for broad dissemination

DISSEMINATION

- Occupational safety and health professionals who serve small- and medium-sized businesses
- Stakeholders from multiple organizations, including organized labor, industry safety and health professionals, and government agencies
 - Feedback is overwhelmingly positive
 - Confirmed need for a banding approach and tool
 - Suggestions for improvement – simplicity and training



**NIOSH Occupational
Exposure Banding**

ADDITIONAL GUIDANCE

CDC Centers for Disease Control and Prevention
CDC 24/7 Saving Lives. Protecting People™

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CDC-A-Z INDEX

The National Institute for Occupational Safety and Health (NIOSH)

Workplace Safety and Health Topics

Occupational Exposure Banding

Purpose of Occupational Exposure Banding

Approach to Occupational Exposure Banding

Differences between Control Banding and Occupational Exposure Banding

Resources

References

Related Topics

Control Banding

Occupational Exposure Banding e-Tool

Prevention through Design

Promoting productive workplaces through safety and health research

NIOSH

NIOSH + Workplace Safety and Health Topics

OCCUPATIONAL EXPOSURE BANDING

Overview

Occupational exposure banding, also known as hazard banding, is a process intended to quickly and accurately assign chemicals into specific categories (bands), which correspond to a range of exposure concentrations designed to protect worker health. These bands are assigned based on a chemical's toxicological potency and the adverse health effects associated with exposure to the chemical (Hainesman et al. 2016). The output of this process is an **occupational exposure band (OEB)**. Occupational exposure banding has been used by the pharmaceutical sector and by some major chemical companies over the past several decades to establish exposure control limits or ranges for new or existing chemicals that do not have formal Occupational Exposure Limits (OELs) (Hainesman et al. 2016). The National Institute for Occupational Safety and Health (NIOSH) has proposed a process that could be used to apply occupational exposure banding to a broader spectrum of chemicals used in occupational settings. The proposed NIOSH occupational exposure banding process utilizes available, but often limited, toxicological data to determine a potential range of chemical exposure levels that can be used as targets for exposure controls to reduce risk among workers (Hainesman et al. 2016). Through multiple phases of evaluation of the occupational exposure banding process, NIOSH has ensured the accuracy and reliability of the OEBs.



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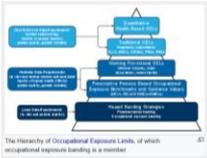
CDC-A-Z INDEX

WIKIPEDIA
The Free Encyclopedia

Occupational exposure banding

From Wikipedia, the free encyclopedia

Occupational exposure banding, also known as **hazard banding**, is a process intended to quickly and accurately assign chemicals into specific categories (bands), each corresponding to a range of exposure concentrations designed to protect worker health. These bands are assigned based on a chemical's toxicological potency and the adverse health effects associated with exposure to the chemical (Hainesman et al. 2016). The output of this process is an **occupational exposure band (OEB)**. Occupational exposure banding has been used by the pharmaceutical sector and by some major chemical companies over the past several decades to establish exposure control limits or ranges for new or existing chemicals that do not have formal OELs (Hainesman et al. 2016). Furthermore, occupational exposure banding has become an important component of the Hierarchy of Occupational Exposure Limits (OELs) (Hainesman et al. 2016). The U.S. National Institute for Occupational Safety and Health (NIOSH) has proposed a process that could be used to apply occupational exposure banding to a broader spectrum of occupational settings. The proposed NIOSH occupational exposure banding process utilizes available, but often limited, toxicological data to determine a potential range of chemical exposure levels that can be used as targets for exposure controls to reduce risk among workers (Hainesman et al. 2016). As an OEB is not meant to replace an OEL, rather it serves as a starting point to inform risk management decisions (Hainesman et al. 2016).



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- 1 Purpose
- 2 Assignment process
- 3 Limitations
- 4 Control banding versus exposure banding
- 5 References
- 6 External links

YouTube

Search

Occupational Exposure Banding
 A conversation with
Lauralynn Taylor McKernan, ScD CIH
 Captain, US Public Health Service
 NIOSH/CDC

Occupational Exposure Banding – A conversation with Lauralynn Taylor McKernan, ScD, CIH

NIOSH

609 views

Published on Mar 30, 2017

Lauralynn Taylor McKernan (CIH), explains the new proposed NIOSH occupational exposure banding methodology and the impact it could have on the occupational safety and health field. Occupational exposure banding is a process of quickly and accurately assigning chemicals into specific categories (bands). These bands are assigned based on a chemical's toxicity and the adverse health effects associated with

FEDERAL REGISTER
The Daily Journal of the United States Government

Notice

Draft Current Intelligence Bulletin: The Occupational Exposure Banding Process; Guidance for the Evaluation of Chemical Hazards; Notice of Public Meeting; Request for Comments

A Notice by the Centers for Disease Control and Prevention on 03/15/2017

This document was corrected by a document published on 03/30/2017. [VIEW CORRECTION](#)

AGENCY:
 National Institute for Occupational Safety and Health (NIOSH) of the Centers for Disease Control and Prevention (CDC), Department of Health and Human Services (HHS).

ACTION:
 Notice of public meeting and availability of draft document for public comment.

SUMMARY:
 The National Institute for Occupational Safety and Health (NIOSH) of the Centers for Disease Control and Prevention (CDC) announces the availability of a Draft Current Intelligence Bulletin entitled *The Occupational Exposure Banding Process: Guidance for the Evaluation of Chemical Hazards* for public comment. NIOSH is seeking comments on the draft document and plans to have a public meeting to discuss the document. The draft document can be found at www.regulations.gov by entering **CDC-2017-0001** in the search field and clicking "Search."

DISCUSSION DETAILS

Printed version: PDF

Publication date: 03/15/2017

Agencies: Centers for Disease Control and Prevention

Details: A public meeting will be held on Tuesday, May 23, 2016, from 9:00 a.m. to 3:00 p.m. Eastern Time, at our 10th floor public presentation hall. Please note that public comments may not be filed for this notice until following the text call for comments. Members of the public who wish to provide public comments should plan to attend the meeting at the start time listed. Electronic or written comments must be received by June 13, 2017.

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NIOSH Occupational Exposure Banding e-Tool (version 1.0)

Promoting productive workplaces through safety and health research

NIOSH

OEB e-Tool Home

About

Tier One +

Tier Two +

Overview

New Entry

View/Edit Entry

Recommended Sources

Additional Resources

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NIOSH Pocket Guide

NIOSH OEB Topic Page

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Chemical Information

Chemical Name

CAS Number

Physical State

Vapor

Particles

Vapor & Particles

[Carcinogenicity](#) [Reproductive Tox](#) [STOT](#) [Genotoxicity](#) [Sensitization \(Irrit\)](#) [Sensitization \(Aller\)](#) [Acute Tox](#) [Skin Irr](#) [Envir](#)

Carcinogenicity

Weight of Evidence (WEO)

Source:

Category:

Quantitative Assessment

BANDING E-TOOL

NIOSH Occupational Exposure Banding e-Tool (version 1.0)

- OEB e-Tool Home
- About
- Tier One +
- Tier Two -**
- Overview
- New Entry
- View/Edit Entry
- Recommended Sources
- Additional Resources
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Promoting productive workplaces through safety and health research 

[CDC](#) > [NIOSH](#) > [OEB e-Tool Home](#) > [Tier Two](#)



Tier Two

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Chemical Information

Chemical Name

CAS Number

Physical State

- Vapor
- Particles
- Vapor & Particles

[Carcinogenicity](#) [Reproductive Tox](#) [STOT](#) [Genotoxicity](#) [Sensitization \(resp\)](#) [Sensitization \(skin\)](#) [Acute Tox](#) [Skin Irr](#) [Eve Ir](#)

Carcinogenicity

Weight of Evidence (WOE)

Source:

Category: 

Quantitative Assessment

Recommendation --- Ranc Test 1(1)

Chemical Name: Ranc Test 1				
CAS Number: 1				
Liquid/Vapor Range: <= 0.1 ppm				
Particle Range: <= 0.01 mg/m ³				
Recommended Band			TDS=15	E
Endpoint	Source	Data	EDS	Endpoint Band
Carcinogenicity Quant	EPA IRIS Slope Factor	1 x 0.00001 (mg/kg-day) ⁻¹	30	C
	California Slope Factor	1 x 0.000001 (mg/kg-day) ⁻¹		C
Carcinogenicity WOE	U.S. EPA IRIS	Group C (possible human carcinogen)	20	D
Reproductive Toxicity				
Target-Organ Toxicity	U.S. EPA: IRIS	Rank 1; NOAEL; 90 hrs; 4.8 ppm	30	E
Genotoxicity Toxicity				
Respiratory Sensitization	WHO: International Programme on Chemical Safety	Rank: 1; Results: Mixed	10	C
Skin Sensitization				
Acute Toxicity	National Library of Medicine ChemID Plus	Rank: 1; Type: Oral LD50; Duration: 4.00 hrs; Input: 661	5	B
Skin Irritation	WHO: International Programme on Chemical Safety	Rank: 1; Results: Skin corrosion/irreversible effects	5	E
	Organization for Economic Co-operation and Development	Rank: 1; Results: Moderate to severe irritation		C
Eye Irritation	WHO: International Programme on Chemical Safety	Rank: 1; Results: Irreversible eye damage	5	E
Notes	Carcinogenicity: Cancer Test Information: https://ntp.niehs.nih.gov/pubhealth/roc/index.html			
	STOT: STOT Test Information: https://ntp.niehs.nih.gov/testing/types/heathandsafety/index.html			
	Acute Tox: Acute Toxicity Information: http://www.inchem.org/			

MORE THAN A BAND

- Identify potential health effects and target organs
- Identify health risks to improve health communication
- Inform implementation of control interventions
- Inform medical surveillance decisions
- Provide critical information in a timely fashion





NEXT STEPS

- Promote broad application of e-Tool and banding guidance
- Address public health challenge of protecting workers from the myriad chemicals lacking guidance
- Partner with AIHA and ASSP for initial dissemination and continuing widespread use in the occupational safety and health community

PROJECT TEAM

- Thomas J. Lentz, Ph.D. – Senior Industrial Hygienist
- Pranav Rane, MPH – Health Communication Specialist
- Lauralynn McKernan, Sc.D. – Senior Industrial Hygienist
- Christine Whittaker, Ph.D. – Senior Toxicologist
- Stephen Gilbert, MS – Statistician
- Jihong Chen, MS – Computer Scientist