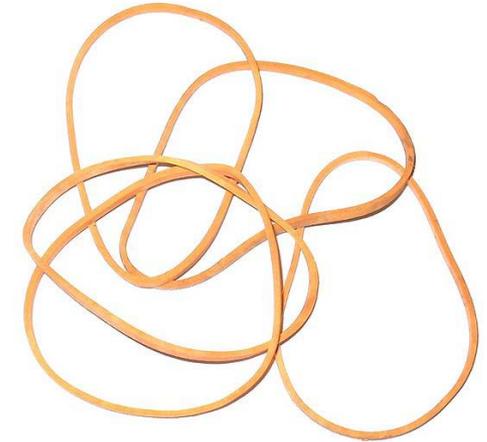


# Hazard & Control Banding



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## Disclaimer

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# Control Banding

- Qualitative risk management process
  - Toxicity factor
  - Exposure factors
- Leads to control “scheme”

***Can be used strategically when  
OEL's & monitoring data are absent***

# Examples

- ANSI Z136.1 Safe Use of Lasers
- OSHA Open Tank Ventilation requirements
- Performance Based Exposure Control Limit (PB-ECL) program in the pharmaceutical industry

# Navy Example

- Maintenance Requirement Cards
  - Used shipboard for all maintenance operations
  - Sailor follows the process steps which includes :
    - Precautions
    - Warnings
    - Work practice controls
    - Necessary PPE, etc.

# Health Effect Rating

## Suggested Rating Rules

The Health Effect Rating Scheme (from DOEHRS):

Rating	Category	Health Effects	Health Effects Codes - Health Hazard
5	Very High	Acute life threatening or disabling injury or illness	<b>Health Hazard</b> HE1 - <i>Regulated carcinogens</i> ; HE2 - <i>Chronic Toxicity</i> : known or suspect human (IARC Group 1, IARC Group 2A; ACGIH A1 & A2 carcinogens); mutagens; HE17 - <i>Chemical Asphyxiants</i> ; HE11 - <i>Respiratory Effects</i> : Acute lung damage, edema;
4	High	Chronic irreversible health effects of concern	<b>Health Hazard</b> HE3 - <i>Chronic Toxicity</i> : long term organ toxicity other than nervous, respiratory, hematologic or reproductive; HE5 - <i>Reproductive Hazards</i> : teratogenesis or other impairment; HE7 - <i>Nervous System Disturbances</i> : other than narcosis; HE10 - <i>Respiratory Effects</i> : cumulative lung damage;
3	Moderate	Severe, reversible health effects of concern	<b>Health Hazard</b> : HE14 - <i>Irritation of eyes, nose and throat</i> : Marked; HE6 - <i>Nervous System Disturbances</i> : Cholinesterase inhibition; HE12 - <i>Long term Hematologic Disturbances</i> : Anemias; HE13 - <i>Hematologic Disturbances</i> : Methemoglobinemia; HE4 - <i>Acute Toxicity</i> : Short term high risk effects (non-IDLH);
2	Low	Reversible health effects of concern	<b>Health Hazard</b> : HE15 - <i>Irritation of eyes, nose and throat</i> : Moderate; HE16 - <i>Irritation of eyes, nose and throat</i> : Mild; HE8 - <i>Nervous System Disturbances</i> : Narcosis;
1	Negligible	Nuisance health effects	<b>Health Hazard</b> : HE19 - <i>Low Risk Health Effects</i> (particulates not otherwise classified, inert gases and vapors); HE20 - <i>Odors</i>

# Control of Substances Hazardous to Health (COSHH) COSHH Essentials

- British Health & Safety Executive (HSE)

Survey of manufacturers to ascertain how they would conduct risk assessments

- Rely on advice from suppliers
- Common sense
- Limited access to IH services

# COSHH Essentials Core Model

- Consideration for accuracy & simplicity
- Conservative

HEALTH + HAZARD: substance allocated to a hazard band, using R-phrases	EXPOSURE => POTENTIAL: substance allocated a dustiness or volatility band and a band for the scale of use	GENERIC RISK => ASSESSMENT: combination of health hazard and exposure potential factors deter- mine desired level of control	CONTROL APPROACH type of approach needed to achieve ade- quate control
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**Figure 24.1 — COSHH Essentials Model<sup>(8)</sup>**

# Hazard Identification- R Phrases

- Readily available information
- Simple
- Risk-Phrase
  - *health effect*
  - Single or repeated exposures

Table 24.1 — R-Phrases Indication of Hazard<sup>(11)</sup>

R20	Harmful by inhalation
R21	Harmful in contact with skin
R22	Harmful if swallowed
R23	Toxic by inhalation
R24	Toxic in contact with skin
R25	Toxic if swallowed
R26	Very toxic by inhalation
R27	Very toxic in contact with skin
R28	Very toxic if swallowed
R34	Causes burns
R35	Causes severe burns
R36	Irritating to the eyes
R37	Irritating to the respiratory system
R38	Irritating to the skin
R39	Danger of very serious irreversible effects
R40	Possible risk of irreversible effects
R41	Risk of serious damage to eyes
R42	May cause sensitization by inhalation
R43	May cause sensitization by skin contact
R45	May cause cancer
R46	May cause heritable genetic damage
R48	Danger of serious damage to health from prolonged exposure
R49	May cause cancer by inhalation
R60	May impair fertility
R61	May cause harm to the unborn child
R62	Possible risk of impaired fertility
R63	Possible risk of harm to the unborn child

# Hazard Classification: Bands

- A-E & S (skin/eye)
- Simple, somewhat arbitrary
- Conservative Approach

**Table 24.2 — Assignment of R-Phrases to Hazard Bands<sup>(11)</sup>**

<i>Hazard band</i>	<i>Target airborne concentration range</i>	<i>R-phrases</i>
A	>1–10mg/m <sup>3</sup> dust; > 50–500ppm vapor	R36, R38 all dusts and vapors not allocated to another band
B	>0.1mg/m <sup>3</sup> dust; >5–50ppm vapor	R20/21/22, R40/20/21/22
C	>0.01–0.1mg/m <sup>3</sup> dust; >0.5–5ppm vapor	R48/20/21/22, R23/24/25, R34, R35, R37, R39/23/24/25, R41, R43
D	<0.01mg/m <sup>3</sup> dust; <0.5ppm vapor	R48/23/24/25, R26/27/28, R39/26/27/28, R40 Carcinogen Category 3, R60, R61, R62, R63
E	Seek specialists advice	R40 mutagens, R42, R45, R46, R49
S*	Prevention or reduction of exposures	R34, R35, R36, R41, R43

\* - Skin and eye contact

# Exposure Assessment Portion

- Simple / Qualitative / Subjective
- Based on:
  - Physical properties (solid or liquid)
    - Powdery?
    - Vapor Pressure and temperature?
  - Quantities used in the workplace
    - Gram quantities?
    - Kilogram?
    - Tons?

# Physical Factor-Solids

High	Fine, light powders. When used, dust clouds can be seen to form and remain airborne for several minutes. For example: cement, titanium dioxide, photocopier toner.
Medium	Crystalline, granular solid. When used, dust is seen, but settles out quickly. Dust is seen on surfaces after use. For example: soap powder, sugar granules.
Low	Pellet like, non friable solids. Little evidence of any dust observed during use. For example: PVC pellets, waxes.

**Figure 24.2** — Physical Factors-Solids<sup>(13)</sup>

# Physical Factor-Liquids

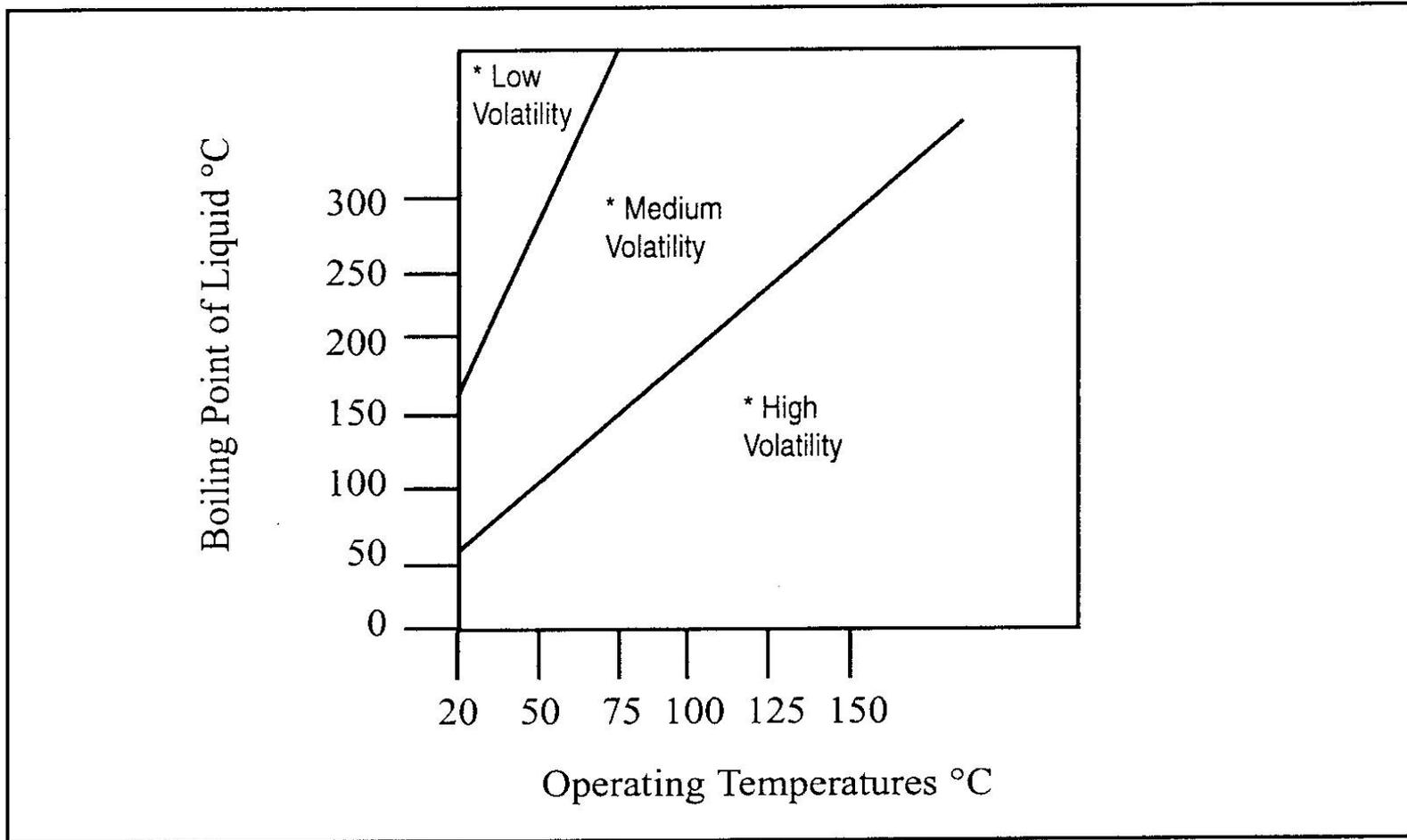


Figure 24.3 — Physical Factors-Liquids<sup>(13)</sup>

# Four Control Strategies

- *Strategy 1:* General vent to control limited exposures to low hazards
- *Strategy 2:* Local exhaust vent or limited engineering to control low or modest exposures to moderately toxic materials
- *Strategy 3:* Engineering controls for containment of modest to high exposures to moderate to highly toxic materials
- *Strategy 4:* Recommend a Specialist

# Hazard Band vs. Exposure Predictor

<i>Hazard Band</i>	<i>Exposure Predictor</i>			
	<i>EPS4</i>	<i>EPS3</i>	<i>EPS2</i>	<i>EPS1</i>
A	Control Strategy 2	Control Strategy 1	Control Strategy 1	Control Strategy 1
B	Control Strategy 3	Control Strategy 2	Control Strategy 1	Control Strategy 1
C	Special*	Control Strategy 3	Control Strategy 2	Control Strategy 1
D	Special	Special	Control Strategy 3	Control Strategy 2
E	Special	Special	Special	Special

\* requires the assessment of a professional Industrial Hygienist.

**Table 24.10 — Liquids – Prediction of Control Strategy from Hazard Bands and Exposure Potential<sup>(13)</sup>**

<i>Hazard Band</i>	<i>Exposure Predictor</i>			
	<i>EPL4</i>	<i>EPL3</i>	<i>EPL2</i>	<i>EPL1</i>
A	Control Strategy 2	Control Strategy 1	Control Strategy 1	Control Strategy 1
B	Control Strategy 2	Control Strategy 2	Control Strategy 1	Control Strategy 1
C	Control Strategy 3	Control Strategy 3	Control Strategy 2	Control Strategy 1
D	Special	Special	Control Strategy 3	Control Strategy 2
E	Special	Special	Special	Special

# Hazard Banding Project

National Institute for Occupational Safety and Health

- Develop/finalize overall hazard banding process, including decision logic
- Finalize health hazard criteria and bands
- Discuss the development of eco-tox and fire/explosion criteria and bands
- Develop an outline of the proposed education module
- Develop requirements for validation of the health hazard criteria, process, and decision logic

# Hazard Banding Project

NIOSH Cont.

- **Goals**

- Development of guidance document
- Development of eco-tox and fire/explosion criteria and bands
- Chemical hazards database
  - Assign chemicals into “categories” or “bands” based on their inherent properties (SAR)
- Finalize criteria, associated signal words, hazards statements, and R and H phrases for:
  - developmental and reproductive toxicity
  - genotoxicity / mutagenicity
  - carcinogenicity
  - Sensitization
- Link to task-based, control-focused solutions

# Hazard Banding Project

NIOSH Cont.

- Control banding to be an effective, comprehensive risk management tool