

Hazard & Risk Evaluation Matrix

EH&S

Step 1 of 3: Hazard Score

Hazard ¹	Indicators	Less Hazardous Less Risky					More Hazardous More Risky	Score
Score		1	2	3	4	5		
Flammability	OSHA Flammability Category	Not Flammable	4	3	2	1		
	Flash Point (°F/°C)	>199/>93	140-199/60-93	73-140/23-60	<73/23; BP >95/35	<73/23; BP <95/35		
	NFPA (Red)	0	1	2	3	4		
Corrosivity	OSHA Skin/Eye Corrosion Category	Not Corrosive	2			1		
	pH	>6-8	>5-6 or >8-9	>3-5 or 9-10	2-3 or >10-11.5	<2 or >11.5		
Reactivity	NFPA (Yellow)	0	1	2	3	4		
	OSHA Category Water Reactive, Polymerizes, Self- Reactive or forms Peroxides, Oxidizer	Not Reactive, Oxidizer, etc.		3	2	1		
Toxicity	OSHA Acute Toxicity Category	Not Acutely Toxic	4	3	2	1		
	LD ₅₀ oral, rat (mg/kg) or LC ₅₀ inhalation gas, rat (ppm)	>2000 or >20,000	>300-2000 or >2,500-20,000	>50-300 or >500-2,500	5-50 or 100-500	<5 or <100		
	Chronic Health Hazard	Carcinogen (pick 1)	OSHA	Not carcinogen		2	1B	1A
IARC			4	3	2B	2A	1	
ACGIH			A5	A4	A3	A2	A1	
	Reproductive Hazard (Teratogen or Mutagen)	No Evidence		Animal Evidence, but no Human Evidence (suspected)		Yes – Human Evidence		
	OSHA Category	Not Reproductive Hazard		2		1A or 1B		
Health Effects	Exposure Limits (PEL, OEL)	>1000 ppm	101 – 1000 ppm	11 – 100 ppm	1 – 10 ppm	<1 ppm		
	NFPA (Blue)	0	1	2	3	4		
Add all above scores							Hazard Score	

¹ These are not the only hazards associated with chemicals. These are the ones used for this risk evaluation. Always refer to the Safety Data Sheet.

NOTE: If a chemical has not been tested or information on hazards is not available, the indicator must be scored as a “4” or “5”. The term “No Evidence” means that a study was conducted and there is no evidence the chemical is a carcinogen or reproductive hazard. This is different than “no data or information” which implies the health effects of the chemical have not been studied.

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Step 2 of 3: Exposure Score

Exposure Indicator	Less Hazardous Less Risky				More Hazardous More Risky	Score
	1	2	3	4	5	
Quantity	Small quantity		Intermediate quantity		Large quantity	
Concentration	Low concentration		Intermediate concentration		High concentration	
Physical Form	Solid; pellets	Liquids; granules	Mists	Vapors/fumes; Fine powders	Gas; Nanoparticles	
Vapor Pressure (mmHg@20°C)	<1	1 – 10	>10 – 100	>100 – 760	>760	
Boiling Point (°F/°C)	>302/>150		122 – 302/50 – 150		<122/<50	
Route of Exposure	Ingestion		Skin contact and ingestion		Inhalation, skin contact and ingestion	
Detection	Appearance	Established odor/irritation levels	Odor/irritation threshold	Odor/irritation levels not established	Analytical methods	
Warning Properties	Odor/irritation threshold is below PEL/TLV			Odor/irritation threshold is above PEL/TLV		
<i>Add all above scores</i>					Exposure Score	

Step 3 of 3: Risk = Hazard Score x Exposure Score

	Hazard	x	Exposure =	Risk	Safety
Low	13		8	104	Acceptable – use standard lab practices
Medium	39		24	936	Take Action – reduce exposure
High	65		40	2600	Unacceptable – reduce hazard and exposure
Your Score:					

How to Use the Hazard & Risk Evaluation Matrix

This matrix will help you determine if the chemical that you are working with poses an acceptable or unacceptable risk to you, your laboratory and/or the university. This matrix gives you a tool to evaluate the hazards and the exposure potential for the chemical you are using. Once you have rated the hazards and exposures, you can determine the risk. The risk score will then let you know if you need to reduce your exposure or re-evaluate and reduce the hazard.

NOTE: This matrix is only one tool to help assess the relative hazard of a chemical. It does not replace the general safety practices that must be in place in the laboratory. If the chemical hazards have not been evaluated by the manufacturer or other available scientific studies, you must consider the material to be hazardous and implement precautionary measures. Everyone working with chemicals must receive chemical safety training.

Procedure:

Prepare: Obtain the Safety Data Sheet (SDS) for the chemical you will be working with.

Step 1: Locate the *Indicators* listed on the Hazard matrix on the SDS. Determine the score (1-5).

If an *Indicator* is not listed on the SDS:

1. "No Evidence" is not the same as "No Information"; Score 4 or 5 for "No Information"
2. The NFPA rating is not always provided on the SDS; No Score
3. Attempt to locate any missing basic information using additional resources:
 - Review another manufacturer's SDS
 - NIOSH (<http://cdc.gov/niosh/ipcs/icstart.html>)
 - TOXNET (<http://toxnet.nlm.nih.gov/>)
 - IARC: <http://monographs.iarc.fr/ENG/Classification/index.php>
 - NTP: <http://ntp.niehs.nih.gov/?objectid=72016262-BDB7-CEBA-FA60E922B18C2540>
 - ACGIH: <http://www.acgih.org>

Step 2: Rate the *Exposure*. Some of these indicators are inherent to the material you are using and some indicators depend on how you are using it.

Step 3: Multiply the Hazard score and the Exposure score to determine the Risk.

Action:

- If the Risk is "Low", standard laboratory practices are acceptable.
- If the Risk is "Medium", re-evaluate how you are using the material.
 - Can you use a smaller quantity?
 - Can it be purchased and used in a lower concentration?
 - Can it be used in another form (e.g., liquid vs. gas)?
 - Ensure fume hoods and other engineering controls are working and used correctly.
- If the Risk is "High", you must reduce the hazard and exposure.
 - Consider using a different chemical with lower hazards (e.g. *Substitution*).
 - Institute high hazard safety protocols.

Review the Stony Brook University Chemical Hygiene Plan, EH&S Policy 4-2, for work practices for Low, Medium and High Hazard chemicals. ([http://www.asa.stonybrook.edu/asa/asafoms/EHSD0221/\\$FILE/EHSD0221.pdf](http://www.asa.stonybrook.edu/asa/asafoms/EHSD0221/$FILE/EHSD0221.pdf))

For additional work practices and safety procedures, review information on the EH&S Lab Safety website: <http://www.stonybrook.edu/ehs/lab/>