

## **Guidelines for the Safe Use of Picric Acid**

2,4,6-trinitrophenol, also known as Picric Acid (CAS 88-89-1), is a trinitro-aromatic compound related to trinitrotoluene (TNT) is used as a staining agent and reagent in laboratory procedures. The hazards associated with Picric Acid go beyond its acidic properties; it is unstable and has the ability to react with other materials and create explosive compounds.

Dry and dehydrated Picric Acid is an odourless bright yellow crystal; it is slightly soluble in water. It is highly unstable and highly sensitive to shock, heat or friction – it is a high-powered EXPLOSIVE. Dry Picric Acid can form very shock-sensitive, explosive picrate salts when in contact with concrete, amines, bases, and metals (copper, lead, mercury, and zinc); these unstable picrate salts are often more unstable and explosive than pure Picric Acid. When wet with 10% or more water, it is less hazardous.

Picric Acid that is wet with less than 30% water is an odourless, wet slurry of yellow crystals and has the consistency of wet sand and is DANGEROUSLY REACTIVE.

Picric Acid that with less than 5% water is classified as:

- Skin sensitisation (Category 1)

Picric Acid that is wet with more than 30% water is an odourless, yellow solution or wet slurry of yellow crystals and it is a FLAMMABLE SOLID. Wetted Picric Acid and solutions will lose moisture and become increasingly shock, friction and heat sensitive and may decompose explosively. Picric Acid can decompose at high temperatures and form irritating/toxic gases, such as nitrogen oxides. Explosive decomposition is likely if material is involved in a fire.

Picric Acid that is wet with more than 30% water is classified as:

- Flammable solids (Category 1),
- Acute toxicity, Oral (Category 4),
- Acute toxicity, Inhalation (Category 3),
- Acute toxicity, Dermal (Category 3).

### **Health Hazards & Symptoms of Exposure**

Picric Acid is TOXIC by all routes of entry. Picric Acid is CORROSIVE to the eyes and skin and may cause permanent eye injury and may cause scarring. It is considered an occupational SKIN SENSITIZER. Once sensitized, contact with even a small amount can cause an allergic reaction with symptoms such as skin redness, itching, rash and swelling. This reaction can spread from the hands or arms to other parts of the body. Picric Acid is harmful if swallowed.

Symptoms from Picric Acid exposure may include headache nausea, vomiting, diarrhea, abdominal pain, itching, urinary dysfunction, stupor, convulsions, death (liver and kidney damage may also occur) – the severity of the symptoms depend on the degree of exposure. Dermal exposure may cause irritation and can lead to allergic reactions; skin damage and staining at the contact site. Ingestion and absorption may cause poisoning.

## First Aid Measures

### *Skin contact*

1. Immediately proceed to the nearest eyewash/shower and rinse the affected area thoroughly with water for at least 20-30 minutes. Remove all contaminated clothing while continuing to flush with water. If irritation persists, repeat flushing. DO NOT INTERRUPT FLUSHING.
2. While the victim is rinsing the affected area, someone should call **911** for emergency medical assistance – if the 911 call is placed using a cellular phone, also call McGill Security Services (**3000** Downtown Campus or **7777** Macdonald Campus, **55-555** MNI).
3. Transport victim to an emergency medical facility.

### *Eye contact*

1. Immediately proceed to the nearest eyewash station and flush the contaminated eye(s) with lukewarm, gently flowing water for at least 20-30 minutes. Hold eyelids open and away from the eye during irrigation to allow for thorough flushing.
2. While the victim is rinsing their eyes, someone should call **911** for emergency medical assistance – if the 911 call is placed using a cellular phone, also call McGill Security Services (**3000** Downtown Campus or **7777** Macdonald Campus, **55-555** MNI).
3. Continue to rinse affected area until emergency medical assistance arrives.

### *Inhalation*

1. Immediately move the victim to fresh air.
2. If symptoms persist, obtain medical attention. Call **911** for emergency medical assistance – if the 911 call is placed using a cellular phone, also call McGill Security Services (**3000** Downtown Campus or **7777** Macdonald Campus, **55-555** MNI).

### *Ingestion*

1. Have the victim rinse mouth thoroughly with water.
2. While the victim is rinsing their mouth, someone should call **911** for emergency medical assistance – if the 911 call is placed using a cellular phone, also call McGill Security Services (**3000** Downtown Campus or **7777** Macdonald Campus, **55-555** MNI).
3. Do not induce vomiting. Have victim drink 240 to 300 ml (8 to 10 oz.) of water to dilute material in the stomach. If milk is available it may be administered after the water has been given.
4. Transport victim to an emergency medical facility.

In all cases of accidental exposure, bring a copy of the Safety Data Sheet.

### *Emergency Eyewash & Emergency Shower*

Both emergency eyewash and emergency shower are required within 10 seconds (approximately 55 feet or 16.8 meters) of any work with Picric Acid. They must be unobstructed and the emergency eyewash tested weekly.

## Handling Information

Picric Acid is highly reactive with a wide variety of materials and easily forms picrate salts, which can be more reactive and shock sensitive than the acid. Metal picrates are extremely shock sensitive and will detonate with the slightest motion or vibration, they can be formed with metals such as copper, nickel, lead, iron and zinc. Calcium picrate is formed by the reaction of Picric Acid with concrete.

*Before purchasing Picric Acid, consider the following:*

- Is there a less hazardous material that can substitute Picric Acid?
- Is Picric Acid available in a solution form? Handling solutions decreases the risks considerably.
- How long will it take to use up the quantity ordered? Do not order more than what can be used up in 6 months. Purchase on the smallest quantity that is necessary.

*Before handling Picric Acid:*

- Read the Safety Data Sheet (SDS) for Picric Acid – these guidelines do not substitute for the SDS;
- Identify work practices, engineering controls and protective equipment necessary to do the experiment safely, and include them in written lab procedures;
- Ensure that engineering controls are operating and protective equipment is available;
- Go through a dry run to identify potential hazards before using Picric Acid;
- Be prepared for accidents - know the location of all safety equipment, including eyewash and the first aid kit, emergency contacts and phone numbers, and keep your coworkers informed about your activities with Picric Acid - Do not assume that all lab personnel know the hazards associated with the use of Picric Acid.

*When handling Picric Acid:*

- Avoid direct contact - wear appropriate personal protective equipment (see below);
- Work in a chemical fume hood when dispensing Picric Acid;
- Do not break the seal on the container until the material is needed;
- Visually inspect the container prior to use;
- Do not use metal spatulas to remove the material from the container;
- Before closing a container of Picric Acid, always clean the neck of the bottle, cap and thread with a wet cloth before recapping and seal cap with Parafilm;
- Do not allow Picric Acid to come into contact with metal that is readily oxidized, and do not transfer the material to a container with a metal cap.
- Never work alone when using Picric Acid.

*Eye Protection:* safety glasses

*Protection Clothing:* closed lab coat with sleeves fully extended to the wrist lab coat

*Gloves:* neoprene rubber and nitrile rubber when used for short periods only (resistance to breakthrough within 1 to 4 hours). Verify with manufacturer's glove compatibility charts.

If you have any questions about which protective clothing or gloves to purchase, contact EHS.

## **Safe Storage**

Picric Acid and its derivatives should be stored in small quantities in the original container in a cool, dry, well-ventilated area, out of direct sunlight and away from sources of heat. Protect from freezing temperatures. Store the original Picric Acid container in polyethylene secondary containers and store with other inorganic acids. Storage area should be made of fire-resistant materials. Storage area should be clearly identified, clear of obstruction and accessible only to trained and authorized personnel. Storage area should be away from work process and production areas, building and room exits or main aisles leading to exits. Post warning signs (available from EHS). Picric Acid is considered a flammable solid and is incompatible with oxidizers, reducing agents, inorganic salts, metals, alkaloids and albumin. Improperly managed or stored Picric Acid may become sensitive to shock, friction, and heat. In order to ensure that the quantity stored is as small as possible, keep your chemical inventory updated to reduce the potential for old and overlooked Picric Acid. Only use and store the least amount possible that the work requires.

Picric Acid must be stored with at least 10% moisture content and regular inspections must be made to ensure that the minimum moisture content is maintained. Picric Acid allowed to dry out to less than 10% water by volume becomes unstable and may pose an explosion hazard in your laboratory. Never let Picric Acid dry out. If the material appears dry, do not open or handle the container.

Keep Picric Acid in clearly labelled compatible containers (normally the shipping containers; include the date received). Place the original containers in polyethylene secondary containers, large enough to contain the entire contents of the original container. Label the secondary container with the following cautionary statement: "*Keep Picric Acid immersed in water to maintain in a safe condition*" and include the name and phone number of a contact person. Keep containers closed and do not stack.

### *Monitoring of Picric Acid Container*

Picric Acid containers must be monitored regularly for evidence of crystallization or damage or leaks. Monitoring the containers monthly reduce the chances of explosive or drying out of solutions.

To monitor Picric Acid containers:

- Attach a copy of the **Picric Acid Inspection Log** to the Picric Acid secondary container and write the date of initial receipt (see page 7).
- After initially opening the container, inspect the material **monthly** to ensure that it contains enough water. The material should look like a wet paste. Document this inspection on the **Picric Acid Inspection Log** in the inspection column.
- Rehydrate the contents of the container when necessary with deionised water to maintain a wet paste. Document this rehydration on the **Picric Acid Inspection Log** in the rehydration column.
- Dispose of Picric Acid as a hazardous waste within two years of initial receipt.

### **Accidental Spills**

If spilled **outside a chemical fume hood**, the spill must be cleaned by personnel trained to handle explosives:

- Stop or reduce spill if it is safe to do so;
- Evacuate the area and close the doors - restrict access to area and post a sign to prevent others from entering;
- Call McGill Security Services (**3000** Downtown Campus or **7777** Macdonald Campus, **55-555** MNI).

If spilled **inside a chemical fume hood**, the spill can be cleaned by laboratory staff if they have the correct equipment, understand the hazards, know how to clean up the spill safely and dispose of the waste properly.

- Stop or reduce spill if it is safe to do so;
- DO NOT allow spilled material to dry - dampen spilled solids with water without stirring. DO NOT attempt to sweep up dry material. Picric Acid must remain wetted to reduce the hazard of cleanup;
- Contain spill with material that does not react with spilled chemical - use a spill response pad or pillow damp with water to absorb spilled material;
- Place pads or pillows in a compatible, impervious container with water added. Thoroughly wash the spill site after material pickup is complete;
- Contaminated absorbent material may pose the same hazards as the spilled product;
- Contact Hazardous Waste Management (514-398-5066 or [www.mcgill.ca/hwm](http://www.mcgill.ca/hwm)) and request an immediate pick-up of the containers of spilled product and contaminated absorbent material.

## Disposal of Picric Acid

Picric Acid should be disposed of as a hazardous waste within two years of initial receipt.

If:

- An old container of Picric Acid is found;
- There are crystals in the container;
- The Picric Acid does not appear to be wet; OR
- You cannot be determined what state the Picric Acid;

DO NOT TOUCH THE CONTAINER! Only experienced and knowledgeable personnel should handle Picric Acid in these situations - even a minor disturbance can be dangerous (crystals may have formed between the lid and the container). Attempting to open the container can result in an explosion.

Carefully inspect the container without moving it, looking for identification and an expiration date.

- If there is the slightest indication of crystallization or low water level (it should look like a wet paste), contact McGill Security Services immediately (**3000** Downtown Campus or **7777** Macdonald Campus, **55-555** MNI). Secure the area, restricting access) and lightly mist any crystals on the outside of the bottle with a spray bottle containing water.
- If there is no indication of crystallization or low water level, post a warning sign on the cupboard or area where the Picric Acid was discovered: "*Potentially Explosive Picric Acid – Do Not Touch*" and contact Hazardous Waste Management (514-398-5066 or [www.mcgill.ca/hwm](http://www.mcgill.ca/hwm)) and request a chemical pick-up

Dry Picric Acid or picrate salts should not be touched or moved under any circumstances!

### References:

*Handling of Picric Acid by Laboratory Personnel* (HSE Tool #22). Department of Health, Safety and Environment, University of British Columbia. Version 1/24/2005.

*Safe Use and Management of Picric Acid* (Safety Net #104). Environmental Health & Safety, University of California Davis. Revision 11/06.

CHEMINFO Chemical Profile: *Picric Acid, dry or wetted with less than 30% water*. Canadian Centre for Occupational Health & Safety. Revision 2007-06-19.

CHEMINFO Chemical Profile: *Picric Acid, wetted with not less than 30% water*. Canadian Centre for Occupational Health & Safety. Revision 2007-06-19.

