

Chemical Profiles

Formaldehyde Solutions

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What are other names or identifying information for formaldehyde solutions?

CAS Registry No.: 50-00-0

Other Names: Formalin

Main Uses: Manufacture of resins and other chemicals, preservative; many other uses.

Appearance: Milky colourless liquid.

Odour: Pungent. May contain methanol as a stabilizer.

Canadian TDG: UN1198, UN2209

What is the WHMIS classification?

According to the Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST), [formaldehyde](#) can be classified as:

Flammable gases - Category 1



Acute toxicity - inhalation - Category 2



Serious eye damage/eye irritation - Category 2



Germ cell mutagenicity - Category 2



Carcinogenicity - Category 1A



Specific target organ toxicity - single exposure (respiratory tract irritation) - Category 3 -
Respiratory tract irritation



The signal word is danger.

The hazard statements are:

- Extremely flammable gas
- Fatal if inhaled

- Causes serious eye irritation
- Suspected of causing genetic defects
- May cause cancer
- May cause respiratory irritation

Please note that this classification was retrieved from the CNESST site on February 21, 2023 and was established by CNESST personnel to the best of their knowledge based on data obtained from scientific literature and it incorporates the criteria contained in the Hazardous Products Regulations (SOR/2015-17). It does not replace the supplier's classification which can be found on its Safety Data Sheet.

What are the most important things to know about formaldehyde solutions in an emergency?

Emergency Overview: Milky colourless liquid. Pungent odour. COMBUSTIBLE LIQUID. May polymerize under certain conditions. VERY TOXIC. Fatal if inhaled. TOXIC following skin contact and/or if ingested. CORROSIVE. Causes severe skin burns and eye damage. Corrosive to the respiratory tract. SKIN SENSITIZER. May cause an allergic skin reaction. CANCER HAZARD. May cause cancer. MUTAGEN. May cause genetic defects.

What are the potential health effects of formaldehyde solutions?

Main Routes of Exposure: Inhalation; skin contact; skin absorption; eye contact.

- **Inhalation:** VERY TOXIC, can cause death. Can cause severe irritation of the nose and throat. Can cause life-threatening accumulation of fluid in the lungs (pulmonary edema). Symptoms may include coughing, shortness of breath, difficult breathing and tightness in the chest. Symptoms may develop hours after exposure and are made worse by physical effort.
- **Skin Contact:** CORROSIVE. Contact can cause pain, redness, burns, and blistering. Permanent scarring can result. Can be absorbed through the skin.
- **Eye Contact:** CORROSIVE. May cause serious eye damage. May irritate or burn the eyes. Permanent damage including blindness may result. The gas irritates the eyes.
- **Ingestion:** TOXIC. Can cause death. Can burn the lips, tongue, throat and stomach. Symptoms may include nausea, vomiting, stomach cramps and diarrhea. Can harm the kidneys. Can harm the liver.

- **Effects of Long-Term (Chronic) Exposure:** Can cause dry, red, cracked skin (dermatitis) following skin contact. SKIN SENSITIZER. May cause an allergic skin reaction in some people. In sensitized people, contact with a very small amount of product can cause an allergic reaction. Symptoms include redness, rash, itching and swelling. This reaction can spread from the hands or arms to the face and body. Repeated exposure will make the reaction worse. May harm the lungs. May harm the nervous system. Conclusions cannot be drawn from the limited studies available.
 - **Carcinogenicity:** CARCINOGEN. Has been associated with: nasal cancer, cancer of the blood or blood system.
 - International Agency for Research on Cancer (IARC): Group 1 - Carcinogenic to humans
 - American Conference for Governmental Industrial Hygienists (ACGIH): A1 - Confirmed human carcinogen
 - **Teratogenicity / Embryotoxicity:** Not known to harm the unborn child.
 - **Reproductive Toxicity:** Not known to be a reproductive hazard.
 - **Mutagenicity:** MUTAGEN. May cause genetic damage based on animal information.
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What are first aid measures for formaldehyde solutions?

Inhalation: Take precautions to ensure your own safety before attempting rescue (e.g., wear appropriate protective equipment). Move victim to fresh air. Keep at rest in a position comfortable for breathing. If breathing is difficult, trained personnel should administer emergency oxygen. DO NOT allow victim to move about unnecessarily. Symptoms of pulmonary edema may be delayed. Get medical attention immediately. Treatment is urgently required. Transport to a hospital.

Skin Contact: Avoid direct contact. Wear chemical protective clothing if necessary. Quickly take off contaminated clothing, shoes and leather goods (e.g. watchbands, belts). Immediately flush with gently flowing water. DO NOT INTERRUPT FLUSHING. If it can be done safely, continue flushing during transport to hospital. Get medical attention immediately. Treatment is urgently required. Transport to a hospital. Double bag, seal, label and leave contaminated clothing, shoes and leather goods at the scene for safe disposal.

Eye Contact: Avoid direct contact. Wear chemical protective gloves if necessary. Immediately flush the contaminated eye(s) with large amounts of gently flowing water while occasionally lifting the upper and lower eyelids. If a contact lens is present, DO NOT delay flushing or attempt to remove the lens. Neutral saline solution may be used as soon as it is available. DO NOT INTERRUPT FLUSHING. If necessary, continue flushing during transport to hospital. Take care not to rinse contaminated water into the unaffected eye or onto the face. Get medical attention immediately. Treatment is urgently required. Transport to a hospital.

Ingestion: Have victim rinse mouth with water. Get medical attention immediately. Treatment is urgently required. Transport to a hospital.

First Aid Comments: If exposed or concerned, see a medical professional for advice. Some of the first-aid procedures recommended here require advanced first-aid training. All first aid procedures should be periodically reviewed by a medical professional familiar with the chemical and its conditions of use in the workplace.

What are fire hazards and extinguishing media for formaldehyde solutions?

Flammable Properties: COMBUSTIBLE LIQUID. Can ignite if heated. Releases vapour that can form an explosive mixture with air at or above the flash point.

Suitable Extinguishing Media: Carbon dioxide, dry chemical powder, appropriate foam, water spray or fog. Special "alcohol-resistant fire-fighting foams". Foam manufacturers should be consulted for recommendations regarding types of foams and application rates.

Specific Hazards Arising from the Chemical: Closed containers may rupture violently when heated, releasing contents. In a fire, the following hazardous materials may be generated: flammable hydrogen; toxic chemicals; irritating chemicals.

What are the stability and reactivity hazards of formaldehyde solutions?

- **Chemical Stability:** Stable if inhibited. Polymerization reactions are not hazardous.
 - **Conditions to Avoid:** Open flames, sparks, static discharge, heat and other ignition sources.
 - **Incompatible Materials:** Increased risk of fire and explosion on contact with: oxidizing agents (e.g., peroxides), strong bases (e.g. sodium hydroxide), strong acids (e.g., hydrochloric acid). Corrosive to: carbon steel. Not corrosive to: stainless steel, aluminum alloys.
 - **Hazardous Decomposition Products:** Formic acid, methanol.
 - **Possibility of Hazardous Reactions:** Polymerizes in the presence of inhibitor depletion.
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What are unintentional release measures for formaldehyde solutions?

Personal Precautions: Evacuate the area immediately. Isolate the hazard area. Keep out unnecessary and unprotected personnel. Use personal protective equipment as required. Ventilate area. Eliminate ignition sources.

Methods for Containment and Clean-up: Do not touch spilled material. Dike spilled product to prevent runoff. Stop or reduce leak if safe to do so. Contain and soak up spill with absorbent that does not react with spilled product. Place used absorbent into suitable, covered, labelled containers for disposal. Flush spill area. Contaminated absorbent poses the same hazard as the spilled product. Large spills or leaks: contact emergency services and manufacturer or supplier for advice.

Other Information: Report spills to local health, safety and environmental authorities, as required.

What handling and storage practices should be used when working with formaldehyde solutions?

Handling: Before handling, it is important that all engineering controls are operating and that protective equipment requirements and personal hygiene measures are being followed. Avoid ALL unprotected contact with this product or with contaminated equipment/surfaces. In event of a spill or leak, immediately put on an escape-type respirator and exit the area. Get medical attention for all exposures. Symptoms can be delayed. Immediately report leaks, spills or failures of the safety equipment (e.g., ventilation system). Avoid generating vapours or mists. Properly vent drums to prevent pressure buildup. Do not handle swollen drums. Contact supervisor for advice. Eliminate heat and ignition sources such as sparks, open flames, hot surfaces and static discharge. Post "No Smoking" signs. Use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems. Prevent unintentional contact with incompatible chemicals. Do not weld, cut or perform hot work on an empty container until all traces of the product have been removed.

Storage: Store in an area that is: dry, well-ventilated, temperature-controlled, out of direct sunlight and away from heat and ignition sources, clear of combustible and flammable materials (e.g. old rags, cardboard), separate from incompatible materials, on the ground floor or preferably, in an isolated, detached building. Avoid bulk storage indoors. Keep the amount in storage to a minimum. Store in the original, labelled, shipping container. Comply with all applicable health and safety regulations, fire and building codes.

What is the American Conference of Governmental Industrial Hygienists (ACGIH®) recommended exposure limit for formaldehyde solutions?

ACGIH® TLV® - TWA: 0.1 ppm DSEN RSEN A1

ACGIH® TLV® - STEL: 0.3 ppm DSEN RSEN A1

Exposure Guideline Comments: TLV® = Threshold Limit Value. TWA = Time-Weighted Average. STEL = Short-term Exposure Limit. A1 = Confirmed human carcinogen. DSEN = Dermal (skin) sensitization. RSEN = Respiratory sensitization.

Adapted from: 2022 TLVs® and BEIs® - Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati: American Conference of Governmental Industrial Hygienists (ACGIH)

NOTE: In many (but not all) Canadian jurisdictions, the exposure limits are similar to the ACGIH® TLVs®. Since legislation varies by jurisdiction, contact your local jurisdiction for exact details. A list is available in the OSH Answers on [Canadian Governmental Occupational Health and Safety Departments](#).

A list of which acts and regulations that cover [exposure limits](#) to chemical and biological agents is available on our website. Please note that while you can see the list of legislation for free, you will need a subscription to view the actual documentation.

What are the engineering controls for formaldehyde solutions?

Engineering Controls: Use local exhaust ventilation, if general ventilation is not adequate to control the amount in the air. It may be necessary to use stringent control measures such as process enclosure to prevent product release into the workplace. Use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems in areas where this product is used and stored. Provide eyewash and safety shower if contact or splash hazard exists.

What Personal Protective Equipment (PPE) is needed when working with formaldehyde solutions?

Eye/Face Protection: Wear chemical safety goggles. A face shield (with safety goggles) may also be necessary.

Skin Protection: Wear chemical protective clothing e.g. gloves, aprons, boots. [Suitable materials](#) include for formaldehyde, 30-70%: butyl rubber, nitrile rubber, Viton®, Viton®/butyl rubber, AlphaTec® (02-100, 4000, EVO, VPS), Kemblok®, Silver Shield® - PE/EVAL/PE, Saranex®™, Chemprotex® 300, ChemMax® 3, Tychem® 6000. Recommendations are NOT valid for very thin nitrile rubber gloves (0.3 mm or less).

Not recommended: natural rubber.

Respiratory Protection:

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus.

The NIOSH Recommended Exposure Limit (REL) is 0.016 ppm (time-weighted average concentration) and 0.1 ppm (15 minute ceiling limit).

APF = Assigned Protection Factor

Recommendations apply only to National Institute for Occupational Safety and Health (NIOSH) approved respirators. Refer to the [NIOSH Pocket Guide to Chemical Hazards](#) for more information.

NOTE: NIOSH has classified this substance as a potential occupational carcinogen, according to specific NIOSH criteria. This classification is reflected in these recommendations for respiratory protection, which specify that only the most reliable and protective respirators be worn at any detectable concentration. The requirements in Canadian jurisdictions may vary.

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