



CRAFTON HILLS COLLEGE

SAN BERNARDINO COMMUNITY COLLEGE DISTRICT

FORMALDEHYDE AND PHENOL PROGRAM

EFFECTIVE: AUGUST 2012

REVISED: JULY 30, 2012



EMERGENCY TELEPHONE NUMBERS

Local Emergency Dispatch for Fire, Personal Injury or Local Police
911

District Police Department
909-389-3275

Chemical Spill or Accident
Dean of Arts and Sciences
909-389-3205

SITE SAFETY OFFICER
Vice President of Administrative Services
909-389-3210

HAZARDOUS WASTE DISPOSAL COORDINATOR
Custodial Supervisor
909-389-3238

DISTRICT ENVIRONMENTAL HEALTH AND SAFETY OFFICER
909-382-4070



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APPENDIX A: Regulatory Requirements and Guidelines

APPENDIX B: Standard Operating Procedure – Formaldehyde

APPENDIX C: Standard Operating Procedure – Phenol

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1.0 INTRODUCTION

The purpose of this program is to protect Crafton Hills College (CHC) employees and students from the hazards associated with the use of formaldehyde and phenol, and to maintain formaldehyde and phenol exposures below the regulatory limits.

2.0 SCOPE

This program applies to all CHC employees and students who use formaldehyde, formalin, other formaldehyde-containing solutions, phenol, and other phenol-containing solutions.

3.0 RESPONSIBILITIES

3.1 CHEMICAL HYGIENE OFFICER

- develop and implement the CHC Formaldehyde and Phenol program;
- monitor compliance with the Occupational Health & Safety Administration (OSHA) Standard for Formaldehyde, 29 CFR 1910.1048;
- provide general formaldehyde and phenol safety training;
- coordinate exposure assessments and evaluation of exposure control measures in collaboration with the Site Safety Officer, as necessary;
- coordinate emergency response for chemical spills;
- investigate accidents; and
- maintain employee and student exposure records.
- ensure compliance with site-specific Standard Operating Procedures (SOP) that address the specific safety measures to be implemented when using formaldehyde and/or phenol and revise as necessary (see Appendix B);
- coordinate the provision of medical examinations, exposure monitoring and record keeping in collaboration with the Site Safety Officer and Laboratory Technicians, as required

3.2 DEANS, DIRECTORS AND DEPARTMENT HEADS

- Ensure departmental compliance with all the procedures outlined in this program.

3.3 INSTRUCTORS

- ensure compliance with this program in their work area(s);
- review site-specific Standard Operating Procedures (SOP) that address the specific safety measures to be implemented when using formaldehyde and/or phenol (see Appendix B);
- ensure employees with potential exposure to formaldehyde or phenol receive the appropriate training before working with it;
- arrange for immediate emergency response, if necessary, for chemical spills, injuries and overexposures;



- notify the Chemical Hygiene Officer when there is a change in equipment, processes or controls which may result in additional exposure to formaldehyde or phenol.

3.4 LAB TECHNICIANS/EMPLOYEES

- know the provisions of the CHC Formaldehyde and Phenol Program;
- maintain their work area(s) daily;
- maintain an MSDS for the formaldehyde and phenol products used, and all other hazardous chemicals in the work area;
- report accidents, possible overexposures or unsafe conditions to the instructors; and
- wear/utilize personal protective equipment (PPE) and engineering controls when recommended and provided.
- schedule medical examinations and exposure monitoring in collaboration with the Chemical Hygiene Officer and Site Safety Officer, as required.

3.5 STUDENTS

- know the provisions of the CHC Formaldehyde and Phenol Program;
- report accidents, possible overexposures or unsafe conditions to the instructors; and
- wear/utilize personal protective equipment (PPE) and engineering controls when recommended and provided.

4.0 FORMALDEHYDE HAZARD DATA

Formaldehyde exposure has been associated with irritation to the human respiratory tract, cancers of the nose and lung, and loss of vision. Formaldehyde may affect the body through inhalation, skin/eye contact or accidental ingestion. One's sense of smell and eye irritation become less sensitive with time as one adapts to formaldehyde exposure; therefore, one cannot rely on formaldehyde's warning properties to alert oneself to the potential for overexposure. The dose, or amount of exposure, determines the type and degree of beneficial or adverse health effects.

4.1 ACUTE HEALTH EFFECTS

Acute Health Effects are symptoms that occur at very high concentrations of exposure. Table 1.0 below describes of the health effects correlated to the various routes of formaldehyde exposure.



Table 1.0 – Acute Health Effects, Formaldehyde

Routes of Exposure	Health Effects
Inhalation	<ul style="list-style-type: none">❖ Formaldehyde is highly irritating to the eyes, nose and throat.❖ Affects the nasal cavity.❖ Severity of the symptoms depends upon the concentration in air coupled with the length of the exposure.❖ Wheezing, nausea, bronchitis, teary eyes, watery nose, headache, sinus fullness, sore throat, throat hoarseness, severe coughing, chest pains, chest tightness, swelling of the throat, and spasms in the throat.❖ Concentrations of 100 ppm are immediately dangerous to life and health (IDLH).
Skin Absorption	<ul style="list-style-type: none">❖ Formaldehyde is a severe skin irritant and sensitizer.❖ Contact with formaldehyde causes white discoloration, drying, cracking and scaling of the skin.❖ Skin discoloration, cracking, drying, scaling.❖ Prolonged or repeated contact can cause numbness or hardening/tanning of the skin.
Eye Contact	<ul style="list-style-type: none">❖ Formaldehyde solutions splashed in the eyes can cause injuries ranging from mild discomfort (such as watery eyes, itchy eyes) to severe, permanent corneal clouding and loss of vision.❖ The eyes can become itchy, tear, and can eventually close.❖ The severity of the effects depends on the concentration of formaldehyde, length of contact, and whether or not the eyes were flushed with water immediately after the accident.
Ingestion	<ul style="list-style-type: none">❖ Severe irritation of the mouth, throat, and stomach.❖ Nausea, vomiting, abdominal pain, diarrhea, hypertension, hypothermia, lethargy, dizziness, convulsions, coma, acidosis, kidney inflammation, liver toxicity.❖ Corrosion of the gastrointestinal tract.❖ Inflammation and ulceration of the mouth, esophagus, and stomach.❖ Severe stomach pains will follow ingestion with possible loss of consciousness and death.

4.2 CHRONIC HEALTH EFFECTS

Formaldehyde has the potential to cause various respiratory impairments, such as bronchitis and nasal cancer that may appear over a relatively long period of time after repeated and prolonged exposures above the OSHA permissible exposure limits (PEL). In humans, formaldehyde exposure has been associated with cancers of the lung, nasopharynx and oropharynx, and nasal passages.

4.3 PHYSICAL HAZARDS

Formaldehyde poses a moderate fire and explosion hazard when exposed to heat or flame. The flash point for 37% formaldehyde is 185°F with an explosion range of 7 to 73% by volume in air. Avoid contact with strong oxidizing agents, caustics, strong alkalis, isocyanates, anhydrides, oxides, and inorganic acids. Formaldehyde reacts with nitrogen dioxide, nitromethane, peroxyformic acid, perchloric acid and



aniline to yield explosive compounds. Formaldehyde reacts with hydrochloric acid to form the potent carcinogen, bischloromethyl ether. A violent reaction occurs when formaldehyde is mixed with strong oxidizers. Oxygen from the air can oxidize formaldehyde to formic acid, especially when heated; formic acid is corrosive.

4.4 PERMISSIBLE EXPOSURE LIMITS (PELs)

CAL-OSHA has issued several types of limits for employee exposures to trigger various regulated requirements.

Table 2.0 – CAL-OSHA Formaldehyde Exposure Limits and CAL-OSHA Required Actions

Limit Types	Limits	Required Actions
Exposure Threshold	0.1 part formaldehyde per million parts of air (0.1 ppm)	❖ Annual formaldehyde training
Action Level (AL)	0.5 ppm (calculated as an 8-hour time-weighted average)	❖ If at or above the AL, CAL-OSHA mandates that employers initiate certain required activities such as exposure monitoring and medical surveillance for employees.
Permissible Exposure Limit (PEL)	0.75 ppm (calculated as an 8-hour time-weighted average)	❖ If at or above the PEL, CAL-OSHA requires employers to do the following: <ul style="list-style-type: none"> ○ Provide personal protective equipment (PPE) such as respirators; ○ Establish administrative controls, to study and install engineering controls (if feasible); and ○ Establish regulated areas, and perform other OSHA-required procedures and duties.
Short Term Exposure Limit (STEL)	2 ppm (averaged over any one 15-minute period)	❖ If at or above the STEL, CAL-OSHA requires employers to do the following: <ul style="list-style-type: none"> ○ Provide personal protective equipment (PPE) such as respirators; ○ Establish administrative controls, to study and install engineering controls (if feasible); and ○ Establish regulated areas, and perform other OSHA-required procedures and duties.



5.0 PHENOL HAZARD DATA

Phenol exposure has been associated with irritation to the skin, eyes, and mucous membranes. The skin is the primary route of entry into the human body. Phenol may affect the body through inhalation, skin/eye contact or accidental ingestion. Acute exposure in humans can result in irregular breathing, muscle weakness, muscle tremors, loss of coordination, convulsions, coma, respiratory arrest, and death. The dose, or amount of exposure, determines the type and degree of beneficial or adverse health effects.

5.1 ACUTE HEALTH EFFECTS

Acute Health Effects are symptoms that occur at very high concentrations of exposure and short term exposures. Table 3.0 below describes the health effects correlated to the various routes of phenol exposure.

Table 3.0 – Acute Health Effects, Phenol

Routes of Exposure	Health Effects
Inhalation	❖ Phenol is extremely irritating to the skin, eyes, and mucous membrane.
Skin Absorption	❖ Phenol is extremely irritating to the skin, eyes, and mucous membrane. ❖ Chemical burns, redness, edema, tissue necrosis, and gangrene.
Eye Contact	❖ Irritation ❖ Conjunctival swelling where the cornea becomes white and loses sensation. ❖ Loss of vision, blindness.
Ingestion	❖ Shock, collapsing, coma, convulsions, cyanosis, muscular weakness, and death ❖ Severe burns in the mouth and throat, abdominal pain, cyanosis, muscular weakness

5.2 CHRONIC HEALTH EFFECTS

Phenol has the potential to cause anorexia, progressive weight loss, diarrhea, vertigo, salivation and dark coloration of the urine in those after repeated and prolonged exposures above the OSHA permissible exposure limits (PEL). In humans, phenol exposure has been associated with gastrointestinal irritation and respiratory, eyes, skin, blood, liver, and kidney effects, and systemic disorders such as digestive disturbances and nervous system effects. The Agency for Toxic Substances and Disease Registry (ATSDR)¹ indicated that application of phenol to the skin resulted in dermal inflammation and necrosis, and exposure in high phenol concentration resulted in cardiac arrhythmias in humans.

5.3 PHYSICAL HAZARDS

Formaldehyde poses a moderate fire and explosion hazard when exposed to heat, flames, or sparks. The flash point for 30-60% phenol is 175°F. Avoid phenol contact with strong oxidizing agents (especially calcium hypochlorite), acids, and

¹ Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Phenol (Update)*. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 1998.



halogens as they yield explosive compounds. Liquid phenol attacks rubber, coatings, and some forms of plastic. Hot liquid phenol attacks aluminum, magnesium, lead, and zinc metals.

5.4 PERSONAL EXPOSURE LIMITS (PELs)

CAL-OSHA and NIOSH have issued several types of limits for employee exposures to trigger various regulated requirements.

Table 4.0 – Phenol Exposure Limits and Recommended Actions

Limit Types	Limits	Recommended Actions
Cal-OSHA Permissible Exposure Limit (PEL)	5 ppm [skin] ² (calculated as an 8-hour time-weighted average)	❖ If at or above the limit, OSHA requires employers to do the following: <ul style="list-style-type: none">o Annual phenol training;o Provide personal protective equipment (PPE) such as respirators;o Establish administrative controls, to study and install engineering controls (if feasible); ando Establish regulated areas, and perform other OSHA-required procedures and duties.
NIOSH Short Term Exposure Limit (STEL)	15.6 ppm [skin] ² (averaged over any one 15-minute period)	

6.0 EXPOSURE ASSESSMENTS

Whenever formaldehyde or phenol is used in a work area, the College will coordinate with an industrial hygienist to conduct air monitoring to determine employee exposures. Measurements of employee exposures will be representative of a full shift or STEL and will be taken for each job classification in each work area.

The industrial hygienist will utilize special sampling equipment to collect representative air samples for laboratory analysis of the formaldehyde or phenol. Exposure records and determinations shall be kept for at least 30 years.

6.1 EMPLOYEE EXPOSURE ASSESSMENTS

If employee exposures are found to be at or above the action level or STEL for formaldehyde, or at or above the PEL for Phenol, the college will repeat air monitoring every six (6) months. If exposures are above the STEL, air monitoring will be conducted at least once per year. Monitoring will continue until exposures can be reduced below these levels by engineering or administrative controls.

² "Skin" notation, indicates that the cutaneous route of exposure (including mucous membranes and eyes) contributes to overall exposure.



Air monitoring will be conducted promptly in a work area if employees are experiencing signs or symptoms of formaldehyde or phenol exposure. Air monitoring will be repeated in an area each time there is a change in equipment, processes or controls which may result in additional exposure to formaldehyde.

Periodic monitoring of the employees may be discontinued if the results from two (2) consecutive sampling periods taken at least seven (7) days apart show that employee exposure is below the AL and the STEL for formaldehyde, and below the PEL for Phenol.

Affected employees shall be notified of the monitoring results within fifteen (15) days of receiving the results.

Exposure records shall be kept for 30 years. Access to exposure records must be allowed to current and former employees or their designated representatives upon request.

6.2 STUDENT EXPOSURE ASSESSMENTS

Student exposure assessments are currently not conducted by CHC. Students are to report to the health center and their instructors if students are experiencing signs or symptoms of formaldehyde or phenol exposure.

7.0 METHODS OF REDUCING EMPLOYEE/STUDENT EXPOSURE TO FORMALDEHYDE & PHENOL

7.1 SUBSTITUTION

When possible, substitution of a less hazardous chemical or process will be used to reduce or eliminate formaldehyde and/or phenol use and exposures.

7.2 ENGINEERING CONTROLS

When possible, chemical fume hoods and/or local exhaust ventilation will be used to reduce exposures to formaldehyde and phenol. Local exhaust is used to capture and exhaust formaldehyde and phenol vapors, preventing the accumulation of high exposures in a person's breathing zone. General dilution ventilation will also be used, which involves continuous introduction of fresh air into the laboratory/workroom to mix with the contaminated air and lower the breathing zone concentration of formaldehyde and phenol. Effectiveness of general dilution ventilation will depend on the number of air changes per hour and where devices emitting formaldehyde and phenol are located in the area.

7.3 ADMINISTRATIVE CONTROLS

If engineering controls cannot be implemented, alteration of work practices will be used to reduce exposures to formaldehyde and phenol. This could include limiting the amount of time employees spend working in high exposure areas, such as by reassigning or rotating personnel among various job duties. Reassignment may continue for up to six (6) months until the employee is determined to be able to return to the original job or to be unable to return to work – whichever comes first.



7.4 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Prevent direct contact with the eyes or skin with liquids containing formaldehyde and/or phenol, by the use of protective garments and equipment which are resistant to formaldehyde and phenol. The type of PPE necessary will vary on the concentration, amount used and the potential for splashing. The CHEMICAL HYGIENE OFFICER can provide you with guidance regarding the appropriate PPE for your area.

7.4.1 HAND PROTECTION

Butyl or polyethylene gloves are recommended when handling phenol. Butyl gloves are recommended when handling 37% or greater concentrations of formaldehyde. Nitrile gloves (8-mil) may be used when solely handling formaldehyde/formalin solutions.

7.4.2 EYE PROTECTION

Goggles must be worn during formaldehyde or phenol use, when there is potential for splashing/disturbance. Face shields may be used to supplement the protection provided by goggles, but must never be used without other eye protection.

7.4.3 RESPIRATORY PROTECTION

If employee/student exposures are found to exceed the PEL or STEL, respirators will be provided until feasible engineering or administrative controls can be implemented.

Respirator use and type will be based on air monitoring results in accordance with CHC's Respiratory Protection Plan.

If respirator use is necessary, employees/students must comply with the *CHC's Respiratory Protection Program*.

7.4.4 PROTECTIVE CLOTHING

Protective (impervious) gowns, lab coats, aprons and arm sleeves are provided for use.

In areas where the formaldehyde or phenol concentrations are unknown or greater than 100 ppm, full body protective clothing and Self-Contained Breathing Apparatus (SCBA) are required. This concentration may be encountered during a large quantity spill of formaldehyde or phenol in a confined or small enclosed area. Contact the CHEMICAL HYGIENE, SITE SAFETY OFFICER or District Police (after hours) in these situations.

7.5 HYGIENE

To prevent the accidental ingestion of formaldehyde or phenol, eating, drinking and smoking are prohibited in areas where formaldehyde or phenol are used. In addition, employees/students must wash their hands after formaldehyde and/or phenol use.

Protective clothing contaminated with formaldehyde or phenol must be decontaminated prior to reuse and no contaminated clothing may be taken home. Disposable clothing may not be reused.



Containers for contaminated clothing and equipment shall have the following labels and signage:

**DANGER: FORMALDEHYDE CONTAMINATED CLOTHING AND EQUIPMENT
AVOID INHALATION AND SKIN CONTACT**

OR

**DANGER: PHENOL CONTAMINATED CLOTHING AND EQUIPMENT
AVOID INHALATION AND SKIN CONTACT**

7.6 EMERGENCY EYEWASH AND SHOWER

If there is a possibility that employee's/students' skin may be splashed by formaldehyde or phenol-containing solutions, an emergency shower will be provided in the work area. If there is a possibility that employee's/students' eyes may be splashed by formaldehyde or phenol-containing solutions, a plumbed eyewash station will be provided in the work area. Both emergency showers and eyewash stations have to be within ten (10) seconds of unobstructed travel.

Employee/students must be instructed on the proper use of the eyewash and emergency showers. If an employee's/students' eyes or skin are splashed by formaldehyde or phenol-containing solutions, the employee/student must flush them immediately and continue for 15 minutes. The employee/student should then seek medical attention.

8.0 SIGNAGE AND LABELING

8.1 Regulated Areas

Areas where the airborne levels of formaldehyde or phenol are found to exceed the PEL and/or STEL will be designated as regulated areas. Access to these areas will be limited to persons trained to recognize the hazards of formaldehyde or phenol. All entrances and access ways will be posted with signs bearing the following information:

DANGER
Formaldehyde Exposure Area
Irritant and Potential Cancer Hazard
Authorized Personnel Only

OR

DANGER
Phenol Exposure Area
Avoid any contact with skin or eyes
Avoid breathing vapor or aerosol

8.2 Container Labels

The OSHA Hazard Communication Standard (HCS) and Global Harmonized System of Classification and Labeling of Chemicals (GHS) require that all containers must be labeled with the name of the product and the most significant hazards(s) associated with the contents. Label all mixtures or solutions composed of greater than 0.1% formaldehyde and materials capable of releasing formaldehyde into the air at concentrations reaching or exceeding 0.1 ppm with the following information:



DANGER
Contains Formaldehyde
Toxic if swallowed/in contact with skin
Fatal if inhaled
Causes severe skin burns and serious eye damage
May cause allergy or asthma symptoms or breathing difficulties if inhaled
May cause genetic defects and cancer
Flammable liquid and vapor

Label all containers of phenol at concentration of 1% phenol or greater with the following information:



DANGER

Contains Phenol

Harmful if swallowed

Toxic in contact with skin

Fatal if inhaled

May cause allergy or asthma symptoms or breathing difficulties if inhaled

Causes damage to organs

*CHEMICAL HYGIENE OFFICER will provide these labels upon request.

9.0 STANDARD OPERATING PROCEDURES

Work with formaldehyde or phenol requires a written Standard Operating Procedure (SOP) that addresses the following:

- the hazards of formaldehyde and phenol;
- what containment devices (i.e., chemical fume hoods, glove boxes) will be used when working with formaldehyde or phenol;
- what PPE is required;
- designated storage and use areas;
- how to dispose of waste formaldehyde or phenol solutions; and
- decontamination and spill clean-up procedures.

The *CHC Chemical Hygiene Plan* serves as a general guideline. A CHC Formaldehyde and Phenol template is provided in Appendix B and C respectively of this program. Certain applications may require the development of additional, site-specific formaldehyde and phenol SOPs.

10.0 INFORMATION AND TRAINING

10.1 Employee and Student Information and Training

Every employee/student working with formaldehyde and phenol must receive training regarding the hazards. A training module will be provided to instructors with lab technicians and students working with formaldehyde and/or phenol.

The CHEMICAL HYGIENE OFFICER should ensure this information is reviewed with lab technicians annually and with students at the start of each semester. The training shall cover the following:

- ❖ requirements of the Cal-OSHA formaldehyde and phenol regulations;
- ❖ explanation of the formaldehyde and phenol Material Safety Data Sheets (MSDSs);
- ❖ explanation of the *CHC Formaldehyde & Phenol Program* in its entirety;



- ❖ description of the medical surveillance program (applicable to employees and students);
- ❖ description of the health hazards associated with exposure;
- ❖ instructions to report any signs or symptoms that may be attributable to formaldehyde or phenol exposure;
- ❖ description of the operations in the work area where formaldehyde or phenol is present;
- ❖ explanation of the work practices to reduce exposure, including engineering and administrative controls and PPE required; and
- ❖ Instructions for handling spills and emergency procedures.

This training must be conducted whenever a new hazard is introduced into the work area, when the employee transfers to another job, at the beginning of each semester, and whenever the employee/student demonstrates behavior that indicates a lack of understanding of the basic rules for the safe handling of chemicals.

Instructors are responsible for ensuring that employees and students with potential exposure to formaldehyde or phenol receive the appropriate training before working with it. All training must be documented by the individual presenting the training session and a copy of the training records will be submitted to the CHEMICAL HYGIENE OFFICER.

11.0 MEDICAL SURVEILLANCE (EMPLOYEES ONLY)

Employees exposed to formaldehyde or phenol will be provided with the opportunity to receive medical attention under the following circumstances:

- whenever an employee has developed disease signs or symptoms associated with exposure to formaldehyde or phenol; and/or
- When an employee is involved in a spill, leak or other occurrence resulting in a possible overexposure to formaldehyde or phenol.

It is the intent of CHC to provide a work environment which does not compromise the reproductive health of any employee or student, regardless of gender, or the health of a fetus.

CHC employees may obtain free medical consultation or counseling regarding concerns about formaldehyde and/or exposures by contacting District Human Resources at 909-382-4040.

If respirator use is necessary, employees/students will consult and comply with the CHC Respiratory Protection Program.

11.1 FORMALDEHYDE

Employees found to have exposures that exceed the action level or the STEL of formaldehyde will be included in a medical surveillance program. These employees will fill out a medical questionnaire form annually and receive a physical examination if CHC's designated medical personnel determine it is necessary based on a review of the employee's responses on the questionnaire. Required medical surveillance should be provided at the time of initial assignment and once a year afterward for as long as the exposure continues.



Medical records shall be kept for the duration of employment plus 30 years. Access to medical records must be allowed to current and former employees or their designated representatives upon request.

11.2 PHENOL

OSHA is developing requirements for phenol medical surveillance. When these requirements are promulgated, it should be referred to for additional information and to determine whether employers whose employees are exposed to phenol are required to implement medical surveillance procedures.

Medical records shall be kept for the duration of employment plus 30 years. Access to medical records must be allowed to current and former employees or their designated representatives upon request.

11.2.1 MEDICAL SCREENING

Workers who may be exposed to phenol should be monitored in a systematic program of medical surveillance that is intended to prevent occupational injury and disease. To detect and control work-related health effects, medical evaluations should be performed (1) before job placement, (2) periodically during the term of employment, and (3) at the time of job transfer or termination.

11.2.2 PREPLACEMENT MEDICAL EVALUATION

A preplacement medical evaluation is recommended to assess medical conditions that may be aggravated or may result in increased risk when a worker is exposed to phenol at or below the prescribed exposure limit. The health care professional should consider the probable frequency, intensity, and duration of exposure as well as the nature and degree of any applicable medical condition. Before a worker is placed in a job with a potential for exposure to phenol, a licensed health care professional should evaluate and document the worker's baseline health status with thorough medical, environmental, and occupational histories, a physical examination, and physiologic and laboratory tests appropriate for the anticipated occupational risks. These should concentrate on the function and integrity of the skin, central nervous system, respiratory system, liver, and kidneys. Medical surveillance for respiratory disease should be conducted using the principles and methods recommended by the American Thoracic Society.

11.2.3 PERIODIC MEDICAL EVALUATIONS

Occupational health interviews and physical examinations should be performed at regular intervals during the employment period. Evaluations should be conducted every 3 to 5 years or as frequently as recommended by an experienced occupational health physician if hazard is minimal. Current health status should be compared with the baseline health status of the individual worker or with expected values for a suitable reference population.

Additional examinations may be necessary if a worker develops symptoms attributable to phenol exposure. The interviews, examinations, and medical screening tests should focus on identifying the adverse effects of phenol on the skin, central nervous system, respiratory system, liver, or kidneys.



The medical, environmental, and occupational history interviews, the physical examination, and selected physiologic or laboratory tests that were conducted at the time of placement should be repeated at the time of job transfer or termination to determine the worker's medical status at the end of his or her employment. Any changes in the worker's health status should be compared with those expected for a suitable reference population.

11.2.4 BIOLOGICAL MONITORING

Biological monitoring involves sampling and analyzing body tissues or fluids to provide an index of exposure to a toxic substance or metabolite. A worker's exposure to phenol can be determined by analyzing a urine sample taken at the end of the shift for total phenol. A 250 mg total phenol per gram creatinine level corresponds to an airborne phenol exposure at the TLV (5 ppm). It should be noted that dermal absorption of phenol may also contribute to the urinary levels found.

11.3 MEDICAL REMOVAL

Employees experiencing significant irritation of the eyes, central nervous system, respiratory system, liver, kidneys or skin, respiratory sensitization or dermal sensitization attributed to formaldehyde or phenol exposure will be seen by CHC's designated medical provider. If CHC's designated medical provider determines that the symptoms may be the result of a possible overexposure, the CHEMICAL HYGIENE OFFICER will evaluate the work area to determine if the symptoms are the result of an over-exposure. If exposures are at or above the OSHA PEL or STEL, the CHEMICAL HYGIENE OFFICER or designated industrial hygienist will determine which further administration and/or engineering control measures are necessary. If the employee's symptoms have not subsided within a two-week period and CHC's designated medical personnel has determined that the employee was sensitized, restrictions or transfer from the work area may be recommended.

12.0 SPILLS

Laboratory personnel can clean up the vast majority of chemical spills that occur in the lab. **The individual(s) who caused the spill is (are) responsible for prompt and proper clean-up.** It is the responsibility of the instructor and/or lab technician to have spill control clean-up materials and PPE, which are appropriate for the chemicals being handled, readily available. Instructors are also responsible for ensuring that spills are cleaned up as soon as possible. Notify the CHEMICAL HYGIENE OFFICER, SITE SAFETY OFFICER OR District Police (after hours) of a spill.

The types and quantities of hazardous chemical substances used on the CHC campus require preplanning in order for accidental chemical releases to be handled in a safe manner. Additionally, formaldehyde- and phenol-contaminated waste and debris from a spill must be disposed of as hazardous waste. Two categories of chemical spills and response procedures are identified for this purpose.



12.1 SMALL SPILLS

Small spills (<100 milliliters) can be cleaned up with absorbent material. The appropriate PPE, such as safety glasses and chemical-resistant gloves, must be used to prevent skin contact with the formaldehyde or phenol material. The spill clean-up materials must be double-bagged, tightly closed, labeled and picked up by CHC's designated hazardous waste contractor for disposal. If an employee experiences any eye or upper respiratory irritation while cleaning up the spill, stop immediately and call CHEMICAL HYGIENE OFFICER, SITE SAFETY OFFICER or District Police (after hours) for assistance.

12.2 LARGE SPILLS

Employees should not attempt to clean up large quantity (≥ 100 milliliters) spills of formaldehyde or phenol, particularly in confined or restricted spaces, unless training has been received, appropriate spill clean-up materials, and PPE are readily available. In the event of a large spill for which you are not properly trained or prepared:

- ❖ do not touch the spilled material; stop the leak if it is possible to do so without risk;
- ❖ evacuate the area;
- ❖ close doors;
- ❖ alert others not to enter the area;
- ❖ remove all sources of heat and ignition;
- ❖ contact the CHEMICAL HYGIENE OFFICER, SITE SAFETY OFFICER or District Police (after hours) to coordinate clean-up of the spill. If a spill is larger than 1 liter, the Campus Police must be notified.
- ❖ do not reenter the area until the area has been monitored.
- ❖ read the Standard Operating Procedures for formaldehyde or phenol in that area.

13.0 DISPOSAL

All chemical waste must be disposed of according to *CHC's Chemical Hygiene Plan*. Formaldehyde or phenol-containing wastes should be placed in a labeled waste container in a flammable storage cabinet. Call CHC's designated hazardous waste contractor for pickup of waste materials and surplus chemicals.

14.0 STORAGE

Ideally, formaldehyde and phenol should be stored in a cool, dry, well-ventilated cabinet in an unbreakable, chemically resistant secondary container to contain spills. Containers of formaldehyde and phenol should be protected from physical damage and ignition sources. Phenol should be stored separately from strong oxidizers, acids, and halogens; and Formaldehyde should not be stored with inorganic acids, caustics, strong alkalis, isocyanates, anhydrides or oxidizing agents. The storage area should exhibit a sign warning of the presence and hazards of formaldehyde and/or phenol. Refer to *CHC's Chemical Hygiene Plan*.



15.0 REGULATORY REQUIREMENTS AND GUIDELINES (REFER TO APPENDIX A)

California Code of Regulations, Title 8, Section 5217 Formaldehyde

Occupational Health & Safety Administration, 29 CFR, Part 1910, Subpart Z, Standard 1910.1048
Formaldehyde

Occupational Safety & Health Guideline for Phenol



CITADEL
ENVIRONMENTAL SERVICES, INC.

Appendix A

Regulatory Requirements and Guidelines

This information is provided free of charge by the Department of Industrial Relations from its web site at www.dir.ca.gov. These regulations are for the convenience of the user and no representation or warranty is made that the information is current or accurate. See full disclaimer at http://www.dir.ca.gov/od_pub/disclaimer.html.

Subchapter 7. General Industry Safety Orders Group 16. Control of Hazardous Substances Article 110. Regulated Carcinogens

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§5217. Formaldehyde.

(a) Scope and application. This standard applies to all occupational exposures to formaldehyde, i.e. from formaldehyde gas, its solutions, and materials that release formaldehyde.

(b) Definitions. For purposes of this standard, the following definitions shall apply:

Action level. Action level means a concentration of 0.5 part formaldehyde per million parts of air (0.5 ppm) calculated as an eight (8)-hour time-weighted average (TWA) concentration.

Authorized Person. Authorized person means any person required by work duties to be present in regulated areas, or authorized to do so by the employer, by this section, or by the California Occupational Safety and Health Act of 1973.

Chief. The Chief of the Division of Occupational Safety and Health, or designee.

Director. Director means the Director of the National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, or designee.

Emergency. An emergency is any occurrence, such as but not limited to equipment failure, rupture of containers, or failure of control equipment that results in an uncontrolled release of a significant amount of formaldehyde.

Employee exposure. Employee exposure means the exposure to airborne formaldehyde which would occur without corrections for protection provided by any respirator that is in use.

Formaldehyde. Formaldehyde means the chemical substance, HCHO, Chemical Abstracts Service Registry No. 50-00-0.

(c) Permissible Exposure Limit (PEL)

(1) Time Weighted Average (TWA): The employer shall assure that no employee is exposed to a concentration

of airborne formaldehyde which exceeds 0.75 parts formaldehyde per million parts of air (0.75 ppm) as an 8-hour TWA.

(2) Short Term Exposure Limit (STEL): The employer shall assure that no employee is exposed to a concentration of airborne formaldehyde which exceeds two parts formaldehyde per million parts of air (2 ppm) as a 15 minute STEL.

(d) Exposure monitoring

(1) General.

(A) Each employer who has a workplace covered by this standard shall monitor employees to determine their exposure to formaldehyde.

(B) Exceptions.

Where the employer documents, using objective data, that the presence of formaldehyde or formaldehyde-releasing products in the workplace cannot result in concentrations of airborne formaldehyde that would cause any employee to be exposed at or above the action level or at or above the STEL under foreseeable conditions of use, the employer will not be required to measure employee exposure to formaldehyde.

(C) When an employee's exposure is determined from representative sampling, the measurements used shall be representative of the employee's full shift or short-term exposure to formaldehyde, as appropriate.

(D) Representative samples for each job classification in each work area shall be taken for each shift unless the employer can document with objective data that exposure levels for a given job classification are equivalent for different work shifts.

(2) Initial monitoring. The employer shall identify all employees who may be exposed at or above the action level or at or above the STEL and accurately determine the exposure of each employee so identified.

(A) Unless the employer chooses to measure the exposure of each employee potentially exposed to formaldehyde, the employer shall develop a representative sampling strategy and measure sufficient exposures within each job classification for each workshift to correctly characterize and not underestimate the exposure of any employee within each exposure group.

(B) The initial monitoring process shall be repeated each time there is a change in production, equipment, process, personnel, or control measures which may result in new or additional exposure to formaldehyde.

(C) If the employer receives reports of signs or symptoms of respiratory or dermal conditions associated with formaldehyde exposure, the employer shall promptly monitor the affected employee's exposure.

(3) Periodic monitoring.

(A) The employer shall periodically measure and accurately determine exposure to formaldehyde for employees shown by the initial monitoring to be exposed at or above the action level or at or above the STEL.

(B) If the last monitoring results reveal employee exposure at or above the action level, the employer shall repeat

monitoring of the employees at least every 6 months.

(C) If the last monitoring results reveal employee exposure at or above the STEL, the employer shall repeat monitoring of the employees at least once a year under worst conditions.

(4) Termination of monitoring. The employer may discontinue periodic monitoring of employees if results from two consecutive sampling periods taken at least 7 days apart show that employee exposure is below the action level and the STEL. The results must be statistically representative and consistent with the employer's knowledge of the job and work operation.

(5) Accuracy of monitoring. Monitoring shall be accurate, at the 95 percent confident level, to within plus or minus 25 percent for concentrations of airborne formaldehyde at the TWA and the STEL, and to within plus or minus 35 percent for concentrations of airborne formaldehyde at the action level.

(6) Employee notification of monitoring results. Within 15 days of receiving the results of exposure monitoring conducted under this standard, the employer shall notify the affected employees of these results. Notification shall be in writing, either by distributing copies of the results to the employees or by posting the results. If the employee exposure is over either PEL, the employer shall develop and implement a written plan to reduce employee exposure to or below both PELs, and give written notice to employees. The written notice shall contain a description of the corrective action being taken by the employer to decrease exposure.

(7) Observation of monitoring.

(A) The employer shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to formaldehyde required by this standard.

(B) When observation of the monitoring of employee exposure to formaldehyde requires entry into an area where the use of protective clothing or equipment is required, the employer shall provide the clothing and equipment to the observer, require the observer to use such clothing and equipment, and assure that the observer complies with all other applicable safety and health procedures.

(e) Regulated areas

(1) The employer shall establish regulated areas where the concentration of airborne formaldehyde exceeds either the TWA or the STEL, and post all entrances and accessways with signs bearing the following information:

DANGER FORMALDEHYDE IRRITANT AND POTENTIAL CANCER HAZARD AUTHORIZED PERSONNEL ONLY

(2) The employer shall limit access to regulated areas to authorized persons who have been trained to recognize the hazards of formaldehyde.

(3) An employer at a multi-employer worksite who establishes a regulated area shall communicate the access restrictions and locations of these areas to other employers with work operations at that worksite.

(f) Methods of compliance

(1) Engineering controls and work practices. The employer shall institute engineering and work practice controls

to reduce and maintain employee exposures to formaldehyde at or below the TWA and the STEL.

(2) Exception. Whenever the employer has established that feasible engineering and work practice controls cannot reduce employee exposure to or below either of the PELs, the employer shall apply these controls to reduce employee exposures to the extent feasible and shall supplement them with respirators which satisfy this standard.

(g) Respiratory protection

(1) General. For employees who are required to use respirators by this section, the employer must provide respirators that comply with the requirements of this subsection. Respirators must be used during:

(A) Periods necessary to install or implement feasible engineering and work practice controls;

(B) Work operations, such as maintenance and repair activities or vessel cleaning, for which the employer establishes that engineering and work practice controls are not feasible;

(C) Work operations for which feasible engineering and work practice controls are not yet sufficient to reduce exposure to or below the PELs; and

(D) Emergencies.

(2) Respirator program.

(A) The employer must implement a respiratory protection program in accordance with section 5144 (b) through (d) (except (d)(1)(C)), and (f) through (m).

(B) When employees use air-purifying respirators with chemical-cartridges or canisters that do not contain end-of-service-life indicators approved by the National Institute for Occupational Safety and Health, employers shall replace these cartridges or canisters as specified by subsection (d)(3)(C)(2)(b) of Section 5144, or at the end of the workshift, whichever condition occurs first.

(3) Respirator selection.

(A) The employer must select, and provide to employees, the appropriate respirators specified in Section 5144(d)(3)(A)1.

(B) The employer shall make available a powered air purifying respirator, adequate to protect against formaldehyde exposure to any employee who experiences difficulty wearing a negative pressure respirator to reduce exposure to formaldehyde.

(C) The employer shall equip each air-purifying, full facepiece respirator with a canister or cartridge approved for protection against formaldehyde.

(D) For escape, the employer shall provide employees with one of the following respirator options: A self-contained breathing apparatus operated in the demand or pressure-demand mode; or a full facepiece respirator having a chin-style, or a front- or back-mounted industrial-size, canister or cartridge approved for protection against formaldehyde.

(E) Employers may substitute an air-purifying, half mask respirator for an air-purifying, full facepiece respirator when they equip the half mask respirator with a cartridge approved for protection against formaldehyde and provide the affected employee with effective gas-proof goggles.

(h) Protective equipment and clothing. Employers shall comply with the provisions of Sections 3380, 3382, 3383 and 3384. When protective equipment or clothing is provided under these provisions, the employer shall provide these protective devices at no cost to the employee and assure that the employee wears them.

(1) Selection. The employer shall select protective clothing and equipment based upon the form of formaldehyde to be encountered, the conditions of use, and the hazard to be prevented.

(A) All contact of the eyes and skin with liquids containing 1 percent or more formaldehyde shall be prevented by the use of chemical protective clothing made of material impervious to formaldehyde and the use of other personal protective equipment, such as goggles and face shields, as appropriate to the operation.

(B) Contact with irritating or sensitizing materials shall be prevented to the extent necessary to eliminate the hazard.

(C) Where a face shield is worn, chemical safety goggles are also required if there is a danger of formaldehyde reaching the area of the eye.

(D) Full body protection shall be worn for entry into areas where concentrations exceed 100 ppm and for emergency reentry into areas of unknown concentration.

(2) Maintenance of protective equipment and clothing.

(A) The employer shall assure that protective equipment and clothing that has become contaminated with formaldehyde is cleaned or laundered before its reuse.

(B) When ventilating formaldehyde contaminated clothing and equipment, the employer shall establish a storage area so that employee exposure is minimized. Containers for contaminated clothing, equipment, and storage areas shall have labels and signs containing the following information:

DANGER

FORMALDEHYDE-CONTAMINATED

(CLOTHING) EQUIPMENT

AVOID INHALATION AND SKIN CONTACT

(C) The employer shall assure that only persons trained to recognize the hazards of formaldehyde remove the contaminated material from the storage area for purposes of cleaning, laundering, or disposal.

(D) The employer shall assure that no employee takes home equipment or clothing that is contaminated with formaldehyde.

(E) The employer shall repair or replace all required protective clothing and equipment for each affected employee as necessary to assure its effectiveness.

(F) The employer shall inform any person who launders, cleans, or repairs such clothing or equipment of formaldehyde's potentially harmful effects and of procedures to safely handle the clothing and equipment.

(i) Hygiene protection.

(1) The employer shall provide change rooms, as described in Section 3367 for employees who are required to change from work clothing into protective clothing to prevent skin contact with formaldehyde.

(2) If employee's skin may become splashed with solutions containing 1 percent or greater formaldehyde, for example because of equipment failure or improper work practices, the employer shall provide conveniently located quick drench showers and assure that affected employees use these facilities immediately.

(3) If there is any possibility that an employee's eyes may be splashed with solutions containing 0.1 percent or greater formaldehyde, the employer shall provide acceptable eyewash facilities within the immediate work area for emergency use.

(j) Housekeeping. For operations involving formaldehyde liquids or gas, the employer shall conduct a program to detect leaks and spills, including regular visual inspections.

(1) Preventative maintenance of equipment, including surveys for leaks, shall be undertaken at regular intervals.

(2) In work areas where spillage may occur, the employer shall make provisions to contain the spill, to decontaminate the work area, and to dispose of the waste.

(3) The employer shall assure that all leaks are repaired and spills are cleaned promptly by employees wearing suitable protective equipment and trained in proper methods for cleanup and decontamination.

(4) Formaldehyde contaminated waste and debris resulting from leaks or spills shall be placed for disposal in sealed containers bearing a label warning of formaldehyde's presence and of the hazards associated with formaldehyde.

(k) Emergencies. For each workplace where there is the possibility of an emergency involving formaldehyde, the employer shall assure appropriate procedures are adopted to minimize injury and loss of life. Appropriate procedures shall be implemented in the event of an emergency.

(l) Medical surveillance

(1) Employees covered.

(A) The employer shall institute medical surveillance programs for all employees exposed to formaldehyde at concentrations at or exceeding the action level or exceeding the STEL.

(B) The employer shall make medical surveillance available for employees who develop signs and symptoms of overexposure to formaldehyde and for all employees exposed to formaldehyde in emergencies. When determining whether an employee may be experiencing signs and symptoms of possible overexposure to formaldehyde, the employer may rely on the evidence that signs and symptoms associated with formaldehyde exposure will occur only in exceptional circumstances when airborne exposure is less than 0.1 ppm and when formaldehyde is present in materials in concentrations less than 0.1 percent.

(2) Examination by a physician. All medical procedures, including administration of medical disease questionnaires, shall be performed by or under the supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

(3) Medical disease questionnaire. The employer shall make the following medical surveillance available to employees prior to assignment to a job where formaldehyde exposure is at or above the action level or above the STEL, and annually thereafter. The employer shall also make the following medical surveillance available promptly upon determining that an employee is experiencing signs and symptoms indicative of possible overexposure to formaldehyde.

(A) Administration of a medical disease questionnaire, such as in Appendix D, which is designed to elicit information on work history, smoking history, any evidence of eye, nose, or throat irritation; chronic airway problems or hyperactive airway disease; allergic skin conditions or dermatitis; and upper or lower respiratory problems.

(B) A determination by the physician based on evaluation of the medical disease questionnaire, of whether a medical examination is necessary for employees not required to wear respirators to reduce exposure to formaldehyde.

(4) Medical examinations. Medical examinations shall be given to any employee who the physician feels, based on information in the medical disease questionnaire, may be of increased risk from exposure to formaldehyde and at the time of initial assignment and at least annually thereafter to all employees required to wear a respirator to reduce exposure to formaldehyde. The medical examination shall include:

(A) A physical examination with emphasis on evidence of irritation or sensitization of the skin and respiratory system, shortness of breath, or irritation of the eyes.

(B) Laboratory examinations for respirator wearers consisting of baseline and annual pulmonary function tests. As a minimum, these tests shall consist of forced vital capacity (FVC), forced expiratory volume in one second (FEV1), and forced expiratory flow (FEF).

(C) Any other test which the examining physician deems necessary to complete the written opinion.

(D) Counseling of employees having medical conditions that would be directly or indirectly aggravated by exposure to formaldehyde on the increased risk of impairment of their health.

(5) Examinations for employees exposed in an emergency. The employer shall make medical examinations available as soon as possible to all employees who have been exposed to formaldehyde in an emergency.

(A) The examination shall include a medical and work history with emphasis on any evidence of upper or lower respiratory problems, allergic conditions, skin reaction or hypersensitivity, and any evidence of eye, nose, or throat irritation.

(B) Other examinations shall consist of those elements considered appropriate by the examining physician.

(6) Information provided to the physician. The employer shall provide the following information to the examining physician:

- (A) A copy of this standard and Appendices A, C, D, and E;
- (B) A description of the affected employee's job duties as they relate to the employee's exposure to formaldehyde;
- (C) The representative exposure level for the employee's job assignment;
- (D) Information concerning any personal protective equipment and respiratory protection used or to be used by the employee;
- (E) Information from previous medical examinations of the affected employee within the control of the employer; and
- (F) In the event of a non-routine examination because of an emergency, the employer shall provide to the physician as soon as possible a description of how the emergency occurred and the exposure the victim may have received.

(7) Physician's written opinion.

(A) For each examination required under this standard, the employer shall obtain a written opinion from the examining physician. This written opinion shall contain the results of the medical examination except that it shall not reveal specific findings or diagnoses unrelated to occupational exposure to formaldehyde. The written opinion shall include:

1. The physician's opinion as to whether the employee has any medical condition that would place the employee at an increased risk of material impairment of health from exposure to formaldehyde;
2. Any recommended limitations on the employee's exposure or changes in the use of personal protective equipment, including respirators; and
3. A statement that the employee has been informed by the physician of any medical conditions which would be aggravated by exposure to formaldehyde, whether these conditions may have resulted from past formaldehyde exposure or from exposure in an emergency, and whether there is a need for further examination or treatment.

(B) The employer shall provide for retention of the results of the medical examination and tests conducted by the physician.

(C) The employer shall provide a copy of the physician's written opinion to the affected employee within 15 days of its receipt.

(8) Medical removal.

(A) The provisions of subsection (I)(8) apply when an employee reports significant irritation of the mucosa of the eyes or of the upper airways, respiratory sensitization, dermal irritation, or dermal sensitization attributed to workplace formaldehyde exposure. Medical removal provisions do not apply in the case of dermal irritation or dermal sensitization when the product suspected of causing the dermal condition contains less than 0.05% formaldehyde.

(B) An employee's report of signs or symptoms of possible overexposure to formaldehyde shall be evaluated by a physician, selected by the employer pursuant to subsection (I)(3). If the physician determines that a medical examination is not necessary under subsection (I)(3)(B), there shall be a two-week evaluation and remediation period to permit the employer to ascertain whether the signs or symptoms subside untreated or with the use of creams, gloves, first aid treatment or personal protective equipment. Industrial hygiene measures that limit the employee's exposure to formaldehyde may also be implemented during this period. The employee shall be referred immediately to a physician prior to expiration of the two-week period if the signs or symptoms worsen. Earnings, seniority and benefits may not be altered during the two-week period by virtue of the report.

(C) If the signs or symptoms have not subsided or been remedied by the end of the two-week period, or earlier if signs or symptoms warrant, the employee shall be examined by a physician selected by the employer. The physician shall presume, absent contrary evidence, that observed dermal irritation or dermal sensitization are not attributable to formaldehyde when products to which the affected employee is exposed contain less than 0.1% formaldehyde.

(D) Medical examinations shall be conducted in compliance with the requirements of subsection (I)(5)(A) and (B). Additional guidelines for conducting medical exams are contained in Appendix C.

(E) If the physician finds that significant irritation of the mucosa of the eyes or of the upper airways, respiratory sensitization, dermal irritation, or dermal sensitization result from workplace formaldehyde exposure and recommends restrictions or removal, the employer shall promptly comply with the restrictions or recommendation of removal. In the event of a recommendation of removal, the employer shall remove the affected employee from the current formaldehyde exposure and if possible, transfer the employee to work having no or significantly less exposure to formaldehyde.

(F) When an employee is removed pursuant to subsection (I)(8)(E), the employer shall transfer the employee to comparable work for which the employee is qualified or can be trained in a short period (up to 6 months), where the formaldehyde exposures are as low as possible, but not higher than the action level. The employer shall maintain the employee's current earnings, seniority, and other benefits. If there is no such work available, the employer shall maintain the employee's current earnings, seniority and other benefits until such work becomes available, until the employee is determined to be unable to return to workplace formaldehyde exposure, until the employee is determined to be able to return to the original job status, or for six months, whichever comes first.

(G) The employer shall arrange for a follow-up medical examination to take place within six months after the employee is removed pursuant to this subsection. This examination shall determine if the employee can return to the original job status, or if the removal is to be permanent. The physician shall make a decision within six months of the date the employee was removed as to whether the employee can be returned to the original job status, or if the removal is to be permanent.

(H) An employer's obligation to provide earnings, seniority and other benefits to a removed employee may be reduced to the extent that the employee receives compensation for earnings lost during the period of removal either from a publicly or employer-funded compensation program or from employment with another employer made possible by virtue of the employee's removal.

(I) In making determinations of the formaldehyde content of materials under this subsection the employer may rely on objective data.

(9) Multiple physician review.

(A) After the employer selects the initial physician who conducts any medical examination or consultation to determine whether medical removal or restriction is appropriate, the employee may designate a second physician to review any findings, determinations or recommendations of the initial physician and to conduct such examinations, consultations, and laboratory tests as the second physician deems necessary and appropriate to evaluate the effects of formaldehyde exposure and to facilitate this review.

(B) The employer shall promptly notify an employee of the right to seek a second medical opinion after each occasion that an initial physician conducts a medical examination or consultation for the purpose of medical removal or restriction.

(C) The employer may condition its participation in, and payment for, the multiple physician review mechanism upon the employee doing the following within fifteen (15) days after receipt of the notification of the right to seek a second medical opinion, or receipt of the initial physician's written opinion, whichever is later;

1. The employee informs the employer of the intention to seek a second medical opinion, and
2. The employee initiates steps to make an appointment with a second physician.

(D) If the findings, determinations or recommendations of the second physician differ from those of the initial physician, then the employer and the employee shall assure that efforts are made for the two physicians to resolve the disagreement. If the two physicians are unable to quickly resolve their disagreement, then the employer and the employee through their respective physicians shall designate a third physician who shall be a specialist in the field at issue:

1. To review the findings, determinations or recommendations of the prior physicians; and
2. To conduct such examinations, consultations, laboratory tests and discussions with the prior physicians as the third physician deems necessary to resolve the disagreement of the prior physicians.

(E) In the alternative, the employer and the employee or authorized employee representative may jointly designate such third physician.

(F) The employer shall act consistent with the findings, determinations and recommendations of the third physician, unless the employer and the employee reach an agreement which is otherwise consistent with the recommendations of at least one of the three physicians.

(m) Hazard communication

(1) General. Communication of the hazards associated with formaldehyde in the workplace shall be governed by the requirements of this subsection. The definitions of Section 5194(c) shall apply under this subsection.

(A) The following shall be subject to the hazard communication requirements of this subsection: formaldehyde gas, all mixtures or solutions composed of greater than 0.1 percent formaldehyde, and materials capable of releasing formaldehyde into the air, under reasonably foreseeable conditions of use, at concentrations reaching or exceeding 0.1 ppm.

(B) As a minimum, specific health hazards that the employer shall address are: cancer, irritation and sensitization of the skin and respiratory system, eye and throat irritation, and acute toxicity.

(2) Manufacturers and importers who produce or import formaldehyde or formaldehyde-containing products shall provide downstream employers using or handling these products with an objective determination through the required labels and MSDSs if these items may constitute a health hazard within the meaning of Section 5194(d) under normal conditions of use.

(3) Labels.

(A) The employer shall assure that hazard warning labels complying with the requirements of Section 5194(f) are affixed to all containers of materials listed in subsection (m)(1)(A), except to the extent that Section 5194(f) is inconsistent with this subsection.

(B) Information on labels. As a minimum, for all materials listed in subsection (m)(1)(A) capable of releasing formaldehyde at levels of 0.1 ppm to 0.5 ppm, labels shall identify that the product contains formaldehyde; list the name and address of the responsible party; and state that physical and health hazard information is readily available from the employer and from material safety data sheets.

(C) For materials listed in subsection (m)(1)(A) capable of releasing formaldehyde at levels above 0.5 ppm, labels shall appropriately address all hazards as defined in Section 5194(d) and Section 5194 Appendices A and B, including respiratory sensitization, and shall contain the words "Potential Cancer Hazard."

(D) In making the determinations of anticipated levels of formaldehyde release, the employer may rely on objective data indicating the extent of potential formaldehyde release under reasonably foreseeable conditions of use.

(E) Substitute warning labels. The employer may use warning labels required by other statutes, regulations, or ordinances which impart the same information as the warning statements required by this subsection.

(4) Material safety data sheets.

(A) Any employer who uses formaldehyde-containing materials listed in subsection (m)(1)(A) shall comply with the requirements in Section 5194(g) with regard to the development and updating of material safety data sheets

(B) Manufacturers, importers, and distributors of formaldehyde-containing materials listed in subsection (m)(1)(A) shall assure that material safety data sheets and updated information are provided to all employers purchasing such materials at the time of the initial shipment and at the time of the first shipment after a material safety data sheet is updated.

(5) Written hazard communication program. The employer shall develop, implement, and maintain at the workplace, a written hazard communication program for formaldehyde exposures in the workplace, which at a minimum describes how the requirements specified in this subsection for labels and other forms of warning and material safety data sheets, and subsection (n) for employee information and training, will be met. Employers in multi-employer workplaces shall comply with the requirements of Section 5194(e)(2).

(n) Employee information and training

(1) Participation. The employer shall assure that all employees who are assigned to workplaces where there is exposure to formaldehyde participate in a training program, except that where the employer can show, using objective data, that employees are not exposed to formaldehyde at or above 0.1 ppm, the employer is not required to provide training.

(2) Frequency.

Employers shall provide such information and training to employees at the time of initial assignment and whenever a new exposure to formaldehyde is introduced into their work area. The training shall be repeated at least annually.

(3) Training program. The training program shall be conducted in a manner which the employee is able to understand and shall include:

(A) A discussion of the contents of this regulation and the contents of the Material Safety Data Sheet;

(B) The purpose for and a description of the medical surveillance program required by this standard, including:

1. A description of the potential health hazards associated with exposure to formaldehyde and a description of the signs and symptoms of exposure to formaldehyde.

2. Instructions to immediately report to the employer the development of any adverse signs or symptoms that the employee suspects is attributable to formaldehyde exposure.

(C) Description of operations in the work area where formaldehyde is present and an explanation of the safe work practices appropriate for limiting exposure to formaldehyde to each job;

(D) The purpose for, proper use of, and limitations of personal protective clothing and equipment;

(E) Instructions for the handling of spills, emergencies, and clean-up procedures;

(F) An explanation of the importance of engineering and work practice controls for employee protection and any necessary instruction in the use of these controls; and

(G) A review of emergency procedures including the specific duties or assignments of each employee in the event of an emergency.

(4) Access to training materials.

(A) The employer shall inform all affected employees of the location of written training materials and shall make these materials readily available, without cost, to the affected employees.

(B) The employer shall provide, upon request, all training materials relating to the employee training program to the Chief and the Director.

(o) Recordkeeping

(1) Exposure measurements. The employer shall establish and maintain an accurate record of all measurements taken to monitor employee exposure to formaldehyde. This record shall include:

- (A) The date of measurement;
 - (B) The operation being monitored;
 - (C) The methods of sampling and analysis and evidence of their accuracy and precision;
 - (D) The number, durations, time, and results of samples taken;
 - (E) The types of protective devices worn; and
 - (F) The names, job classifications, social security numbers, and exposure estimates of the employees whose exposures are represented by the actual monitoring results.
- (2) Exposure determinations. Where the employer has determined that no monitoring is required under this standard, the employer shall maintain a record of the objective data relied upon to support the determination that no employee is exposed to formaldehyde at or above the action level.
- (3) Medical surveillance. The employer shall establish and maintain an accurate record for each employee subject to medical surveillance under this standard. This record shall include:
- (A) The name and social security number of the employee;
 - (B) The physician's written opinion;
 - (C) A list of any employee health complaints that may be related to exposure to formaldehyde; and
 - (D) A copy of the medical examination results, including medical disease questionnaires and results of any medical tests required by the standard or mandated by the examining physician.
- (4) Respirator fit testing.
- (A) The employer shall establish and maintain accurate records for employees subject to negative pressure respirator fit testing required by this standard.
- (B) This record shall include:
1. A copy of the protocol selected for respirator fit testing.
 2. A copy of the results of any fit testing performed.
 3. The size and manufacturer of the types of respirator available for selection.
 4. The date of the most recent fit testing, the name and social security number of each tested employee, and the respirator type and facepiece selected.
- (5) Record retention. The employer shall retain records required by this standard for at least the following periods:
- (A) Exposure records and determinations shall be kept for at least 30 years.

(B) Medical records shall be kept for the duration of employment plus 30 years.

(C) Respirator fit testing records shall be kept until replaced by a more recent record.

(6) Availability of records.

(A) Upon request, the employer shall make all records maintained as a requirement of this standard available for examination and copying to the Chief and the Director.

(B) The employer shall make employee exposure records, including estimates made from representative monitoring and available upon request for examination, and copying to the subject employee, or former employee, and employee representative in accordance with section 3204.

(C) Employee medical records required by this standard shall be provided upon request for examination and copying, to the subject employee or former employee or to anyone having the specific written consent of the subject employee or former employee in accordance with Section 3204(a)-(e) and (g)-(i).

(p) Reporting requirements See section 5203.

(q) Delayed Effective Dates. The amendments to the following subsections have a delayed effective date:

(1) Respiratory protection. Respiratory protection required to meet the amended PEL of 0.75 ppm TWA shall be provided as soon as possible but no later than March 24, 1993.

(2) Engineering and work practice controls. Engineering and work practice controls required to meet the amended PEL of 0.75 ppm TWA shall be implemented as soon as possible, but no later than December 26, 1993.

(3) Medical removal protection. The medical removal protection provisions including the multiple physician review mechanism shall be implemented no later than June 28, 1993.

(4) Hazard communication. The labeling provisions contained in amended subsection (m) of this standard shall be implemented no later than June 28, 1993. Labeling of containers of formaldehyde products shall continue to comply with the provisions of Section 5194(e)-(j) until that time.

(5) Training. The periodic training mandated for all employees exposed to formaldehyde between 0.1 ppm and 0.5 ppm shall begin no later than February 25, 1993.

(r) Appendices. The information contained in Appendices A, B, C, and D is not intended, by itself, to create any additional obligations not otherwise imposed or to detract from any existing obligations. The protocols on respiratory fit testing in Appendix E are mandatory.

Note: Authority cited: Sections 142.3, 9020, 9030 and 9040, Labor Code. Reference: Sections 142.3, 9004(d), 9009, 9020, 9030, 9031 and 9040, Labor Code.

HISTORY 1. New section and Appendices A-E filed 3-5-90; operative 4-4-90 (Register 90, No. 11). For history of former section 5217, see Registers 87, No. 51 and 86, No. 47.

2. Change without regulatory effect amending section filed 11-21-90 pursuant to section 100, title 1, California

Code of Regulations (Register 91, No. 2).

3. Amendment of subsection (c)(1), table 1, subsections (g)(3)(D), (n)(1)-(2) and Appendix 1, repeal of subsections (d)(1)(B)1., (m)(1) and (n)(2)(B) and new subsections (d)(2)(C), (l)(8)(A)-(m)(5) and (q)-(q)(5) and relettering filed 12-9-92; operative 1-8-93 (Register 92, No. 50).
4. Change without regulatory effect amending subsection (o)(6)(C) filed 3-30-93 pursuant to section 100, title 1, California Code of Regulations (Register 93, No. 14).
5. Editorial corrections (Register 95, No. 24).
6. Amendment of former subsections (g)(1)-(g)(3)(E) including subsection renumbering and relettering resulting in newly designated subsections (g)(1)- (g)(3)(B), and amendment repealing appendix E and adding editorial reference filed 8-25-98; operative 11-23-98 (Register 98, No. 35).
7. Editorial correction moving Noteand Histories1-6 from following Appendix E to preceding Appendix A (Register 99, No. 28).
8. Amendment of subsection (p) and repealer of subsections (p)(1)-(3) filed 7- 6-99; operative 8-5-99 (Register 99, No. 28).
9. Editorial correction of subsections (o)(2) and (o)(3) (Register 2007, No. 6).
10. Amendment of subsections (g)(2)(A)-(B), repealer of subsections (g)(2)(B)1.-2., amendment of subsections (h)(3)(A)-(B) and new subsections (h)(3)(C)-(h)(3)(E) filed 3-6-2007; operative 3-6-2007. Submitted to OAL for printing only pursuant to Labor Code section 142.3(a)(3) (Register 2007, No. 10).

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• Part Number:	1910
• Part Title:	Occupational Safety and Health Standards
• Subpart:	Z
• Subpart Title:	Toxic and Hazardous Substances
• Standard Number:	<u>1910.1048</u>
• Title:	Formaldehyde.
• Appendix:	A , B , C , D , E

1910.1048(a)

Scope and application. This standard applies to all occupational exposures to formaldehyde, i.e. from formaldehyde gas, its solutions, and materials that release formaldehyde.

1910.1048(b)

Definitions. For purposes of this standard, the following definitions shall apply:

- "Action level" means a concentration of 0.5 part formaldehyde per million parts of air (0.5 ppm) calculated as an eight (8)-hour time-weighted average (TWA) concentration.
- "Assistant Secretary" means the Assistant Secretary of Labor for the Occupational Safety and Health Administration, U.S. Department of Labor, or designee.
- "Authorized Person" means any person required by work duties to be present in regulated areas, or authorized to do so by the employer, by this section, or by the OSH Act of 1970.
- "Director" means the Director of the National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, or designee.
- "Emergency" is any occurrence, such as but not limited to equipment failure, rupture of containers, or failure of control equipment that results in an uncontrolled release of a significant amount of formaldehyde.
- "Employee exposure" means the exposure to airborne formaldehyde which would occur without corrections for protection provided by any respirator that is in use.
- "Formaldehyde" means the chemical substance, HCHO, Chemical Abstracts Service Registry No. 50-00-0.

1910.1048(c)

Permissible Exposure Limit (PEL) -

1910.1048(c)(1)

TWA: The employer shall assure that no employee is exposed to an airborne concentration of formaldehyde which exceeds 0.75 parts formaldehyde per million parts of air (0.75 ppm) as an 8-hour TWA.

1910.1048(c)(2)

Short Term Exposure Limit (STEL): The employer shall assure that no employee is exposed to an airborne concentration of formaldehyde which exceeds two parts formaldehyde per million parts of air (2 ppm) as a 15-minute STEL.

1910.1048(d)

Exposure monitoring -

1910.1048(d)(1)

General.

1910.1048(d)(1)(i)

Each employer who has a workplace covered by this standard shall monitor employees to determine their exposure to formaldehyde.

1910.1048(d)(1)(ii)

Exception. Where the employer documents, using objective data, that the presence of formaldehyde or formaldehyde-releasing products in the workplace cannot result in airborne concentrations of formaldehyde that would cause any employee to be exposed at or above the action level or the STEL under foreseeable conditions of use, the employer will not be required to measure employee exposure to formaldehyde.

1910.1048(d)(1)(iii)

When an employee's exposure is determined from representative sampling, the measurements used shall be representative

of the employee's full shift or short-term exposure to formaldehyde, as appropriate.

1910.1048(d)(1)(iv)

Representative samples for each job classification in each work area shall be taken for each shift unless the employer can document with objective data that exposure levels for a given job classification are equivalent for different work shifts.

1910.1048(d)(2)

Initial monitoring. The employer shall identify all employees who may be exposed at or above the action level or at or above the STEL and accurately determine the exposure of each employee so identified.

1910.1048(d)(2)(i)

Unless the employer chooses to measure the exposure of each employee potentially exposed to formaldehyde, the employer shall develop a representative sampling strategy and measure sufficient exposures within each job classification for each workshift to correctly characterize and not underestimate the exposure of any employee within each exposure group.

1910.1048(d)(2)(ii)

The initial monitoring process shall be repeated each time there is a change in production, equipment, process, personnel, or control measures which may result in new or additional exposure to formaldehyde.

1910.1048(d)(2)(iii)

If the employer receives reports of signs or symptoms of respiratory or dermal conditions associated with formaldehyde exposure, the employer shall promptly monitor the affected employee's exposure.

1910.1048(d)(3)

Periodic monitoring.

1910.1048(d)(3)(i)

The employer shall periodically measure and accurately determine exposure to formaldehyde for employees shown by the initial monitoring to be exposed at or above the action level or at or above the STEL.

1910.1048(d)(3)(ii)

If the last monitoring results reveal employee exposure at or above the action level, the employer shall repeat monitoring of the employees at least every 6 months.

1910.1048(d)(3)(iii)

If the last monitoring results reveal employee exposure at or above the STEL, the employer shall repeat monitoring of the employees at least once a year under worst conditions.

1910.1048(d)(4)

Termination of monitoring. The employer may discontinue periodic monitoring for employees if results from two consecutive sampling periods taken at least 7 days apart show that employee exposure is below the action level and the STEL. The results must be statistically representative and consistent with the employer's knowledge of the job and work operation.

1910.1048(d)(5)

Accuracy of monitoring. Monitoring shall be accurate, at the 95 percent confidence level, to within plus or minus 25 percent for airborne concentrations of formaldehyde at the TWA and the STEL and to within plus or minus 35 percent for airborne concentrations of formaldehyde at the action level.

1910.1048(d)(6)

Employee notification of monitoring results. The employer must, within 15 working days after the receipt of the results of any monitoring performed under this section, notify each affected employee of these results either individually in writing or by posting the results in an appropriate location that is accessible to employees. If employee exposure is above the PEL, affected employees shall be provided with a description of the corrective actions being taken by the employer to decrease exposure.

1910.1048(d)(7)

Observation of monitoring.

1910.1048(d)(7)(i)

The employer shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to formaldehyde required by this standard.

1910.1048(d)(7)(ii)

When observation of the monitoring of employee exposure to formaldehyde requires entry into an area where the use of protective clothing or equipment is required, the employer shall provide the clothing and equipment to the observer, require the observer to use such clothing and equipment, and assure that the observer complies with all other applicable safety and health procedures.

1910.1048(e)

Regulated areas.

1910.1048(e)(1)

The employer shall establish regulated areas where the concentration of airborne formaldehyde exceeds either the TWA or the STEL and post all entrances and accessways with signs bearing the following information:

DANGER
FORMALDEHYDE
IRRITANT AND POTENTIAL CANCER HAZARD
AUTHORIZED PERSONNEL ONLY

1910.1048(e)(2)

The employer shall limit access to regulated areas to authorized persons who have been trained to recognize the hazards of formaldehyde.

1910.1048(e)(3)

An employer at a multiemployer worksite who establishes a regulated area shall communicate the access restrictions and locations of these areas to other employers with work operations at that worksite.

1910.1048(f)

Methods of compliance -

1910.1048(f)(1)

Engineering controls and work practices. The employer shall institute engineering and work practice controls to reduce and maintain employee exposures to formaldehyde at or below the TWA and the STEL.

1910.1048(f)(2)

Exception. Whenever the employer has established that feasible engineering and work practice controls cannot reduce employee exposure to or below either of the PELs, the employer shall apply these controls to reduce employee exposures to the extent feasible and shall supplement them with respirators which satisfy this standard.

1910.1048(g)

Respiratory protection.

1910.1048(g)(1)

General For employees who use respirators required by this section, the employer must provide each employee an appropriate respirator that complies with the requirements of this paragraph. Respirators must be used during:

1910.1048(g)(1)(i)

Periods necessary to install or implement feasible engineering and work-practice controls.

1910.1048(g)(1)(ii)

Work operations, such as maintenance and repair activities or vessel cleaning, for which the employer establishes that engineering and work-practice controls are not feasible.

1910.1048(g)(1)(iii)

Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the PELs.

1910.1048(g)(1)(iv)

Emergencies.

1910.1048(g)(2)

Respirator program.

1910.1048(g)(2)(i)

The employer must implement a respiratory protection program in accordance with § 1910.134(b) through (d) (except (d)(1)(iii), (d)(3)(iii)(b)(1), and (2)), and (f) through (m), which covers each employee required by this section to use a respirator.

1910.1048(g)(2)(ii)

When employees use air-purifying respirators with chemical cartridges or canisters that do not contain end-of-service-life indicators approved by the National Institute for Occupational Safety and Health, employers must replace these cartridges or canisters as specified by paragraphs (d)(3)(iii)(B)(1) and (B)(2) of 29 CFR 1910.134, or at the end of the workshift, whichever condition occurs first.

1910.1048(g)(2)(ii)(A)

Replace the cartridge after three (3) hours of use or at the end of the workshift, whichever occurs first, unless the cartridge contains a NIOSH-approved end-of-service-life indicator (ESLI) to show when breakthrough occurs.

1910.1048(g)(2)(ii)(B)

Unless the canister contains a NIOSH-approved ESLI to show when breakthrough occurs, replace canisters used in atmospheres up to 7.5 ppm (10xPEL) every four (4) hours and industrial-sized canisters used in atmospheres up to 75 ppm (100xPEL) every two (2) hours, or at the end of the workshift, whichever occurs first.

1910.1048(g)(3)

Respirator selection.

1910.1048(g)(3)(i)

Employers must:

1910.1048(g)(3)(i)(A)

Select, and provide to employees, the appropriate respirators specified in paragraph (d)(3)(i)(A) of 29 CFR 1910.134.

1910.1048(g)(3)(i)(B)

Equip each air-purifying, full facepiece respirator with a canister or cartridge approved for protection against formaldehyde.

1910.1048(g)(3)(i)(C)

For escape, provide employees with one of the following respirator options: A self-contained breathing apparatus operated in the demand or pressure-demand mode; or a full facepiece respirator having a chin-style, or a front-or back-mounted industrial-size, canister or cartridge approved for protection against formaldehyde.

1910.1048(g)(3)(ii)

Employers may substitute an air-purifying, half mask respirator for an air-purifying, full facepiece respirator when they equip the half mask respirator with a cartridge approved for protection against formaldehyde and provide the affected employee with effective gas-proof goggles.

1910.1048(g)(3)(iii)

Employers must provide employees who have difficulty using negative pressure respirators with powered air-purifying respirators permitted for use under paragraph (g)(3)(i)(A) of this standard and that affords adequate protection against formaldehyde exposures.

1910.1048(h)

Protective equipment and clothing. Employers shall comply with the provisions of 29 CFR 1910.132 and 29 CFR 1910.133. When protective equipment or clothing is provided under these provisions, the employer shall provide these protective devices at no cost to the employee and assure that the employee wears them.

1910.1048(h)(1)

Selection. The employer shall select protective clothing and equipment based upon the form of formaldehyde to be encountered, the conditions of use, and the hazard to be prevented.

1910.1048(h)(1)(i)

All contact of the eyes and skin with liquids containing 1 percent or more formaldehyde shall be prevented by the use of chemical protective clothing made of material impervious to formaldehyde and the use of other personal protective equipment, such as goggles and face shields, as appropriate to the operation.

1910.1048(h)(1)(ii)

Contact with irritating or sensitizing materials shall be prevented to the extent necessary to eliminate the hazard.

1910.1048(h)(1)(iii)

Where a face shield is worn, chemical safety goggles are also required if there is a danger of formaldehyde reaching the area of the eye.

1910.1048(h)(1)(iv)

Full body protection shall be worn for entry into areas where concentrations exceed 100 ppm and for emergency reentry into areas of unknown concentration.

1910.1048(h)(2)

Maintenance of protective equipment and clothing.

1910.1048(h)(2)(i)

The employer shall assure that protective equipment and clothing that has become contaminated with formaldehyde is cleaned or laundered before its reuse.

1910.1048(h)(2)(ii)

When ventilating formaldehyde-contaminated clothing and equipment, the employer shall establish a storage area so that employee exposure is minimized. Containers for contaminated clothing and equipment and storage areas shall have labels and signs containing the following information:

DANGER
FORMALDEHYDE-CONTAMINATED [CLOTHING] EQUIPMENT
AVOID INHALATION AND SKIN CONTACT

1910.1048(h)(2)(iii)

The employer shall assure that only persons trained to recognize the hazards of formaldehyde remove the contaminated material from the storage area for purposes of cleaning, laundering, or disposal.

1910.1048(h)(2)(iv)

The employer shall assure that no employee takes home equipment or clothing that is contaminated with formaldehyde.

1910.1048(h)(2)(v)

The employer shall repair or replace all required protective clothing and equipment for each affected employee as necessary to assure its effectiveness.

1910.1048(h)(2)(vi)

The employer shall inform any person who launders, cleans, or repairs such clothing or equipment of formaldehyde's potentially harmful effects and of procedures to safely handle the clothing and equipment.

1910.1048(i)

Hygiene protection.

1910.1048(i)(1)

The employer shall provide change rooms, as described in 29 CFR 1910.141 for employees who are required to change from work clothing into protective clothing to prevent skin contact with formaldehyde.

1910.1048(i)(2)

If employees' skin may become contacted with solutions containing 1 percent or greater formaldehyde, for example, because

if employees' skin may become splashed with solutions containing 1 percent or greater formaldehyde, for example, because of equipment failure or improper work practices, the employer shall provide conveniently located quick drench showers and assure that affected employees use these facilities immediately.

1910.1048(i)(3)

If there is any possibility that an employee's eyes may be splashed with solutions containing 0.1 percent or greater formaldehyde, the employer shall provide acceptable eyewash facilities within the immediate work area for emergency use.

1910.1048(j)

Housekeeping. For operations involving formaldehyde liquids or gas, the employer shall conduct a program to detect leaks and spills, including regular visual inspections.

1910.1048(j)(1)

Preventative maintenance of equipment, including surveys for leaks, shall be undertaken at regular intervals.

1910.1048(j)(2)

In work areas where spillage may occur, the employer shall make provisions to contain the spill, to decontaminate the work area, and to dispose of the waste.

1910.1048(j)(3)

The employer shall assure that all leaks are repaired and spills are cleaned promptly by employees wearing suitable protective equipment and trained in proper methods for cleanup and decontamination.

1910.1048(j)(4)

Formaldehyde-contaminated waste and debris resulting from leaks or spills shall be placed for disposal in sealed containers bearing a label warning of formaldehyde's presence and of the hazards associated with formaldehyde.

1910.1048(k)

Emergencies. For each workplace where there is the possibility of an emergency involving formaldehyde, the employer shall assure appropriate procedures are adopted to minimize injury and loss of life. Appropriate procedures shall be implemented in the event of an emergency.

[1910.1048\(l\)](#)

Medical surveillance -

1910.1048(l)(1)

Employees covered.

1910.1048(l)(1)(i)

The employer shall institute medical surveillance programs for all employees exposed to formaldehyde at concentrations at or exceeding the action level or exceeding the STEL.

1910.1048(l)(1)(ii)

The employer shall make medical surveillance available for employees who develop signs and symptoms of overexposure to formaldehyde and for all employees exposed to formaldehyde in emergencies. When determining whether an employee may be experiencing signs and symptoms of possible overexposure to formaldehyde, the employer may rely on the evidence that signs and symptoms associated with formaldehyde exposure will occur only in exceptional circumstances when airborne exposure is less than 0.1 ppm and when formaldehyde is present in material in concentrations less than 0.1 percent.

1910.1048(l)(2)

Examination by a physician. All medical procedures, including administration of medical disease questionnaires, shall be performed by or under the supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

1910.1048(l)(3)

Medical disease questionnaire. The employer shall make the following medical surveillance available to employees prior to assignment to a job where formaldehyde exposure is at or above the action level or above the STEL and annually thereafter. The employer shall also make the following medical surveillance available promptly upon determining that an employee is experiencing signs and symptoms indicative of possible overexposure to formaldehyde.

1910.1048(l)(3)(i)

Administration of a medical disease questionnaire, such as in Appendix D, which is designed to elicit information on work history, smoking history, any evidence of eye, nose, or throat irritation; chronic airway problems or hyperreactive airway disease; allergic skin conditions or dermatitis; and upper or lower respiratory problems.

1910.1048(l)(3)(ii)

A determination by the physician, based on evaluation of the medical disease questionnaire, of whether a medical examination is necessary for employees not required to wear respirators to reduce exposure to formaldehyde.

1910.1048(l)(4)

Medical examinations. Medical examinations shall be given to any employee who the physician feels, based on information in the medical disease questionnaire, may be at increased risk from exposure to formaldehyde and at the time of initial assignment and at least annually thereafter to all employees required to wear a respirator to reduce exposure to formaldehyde. The medical examination shall include:

1910.1048(l)(4)(i)

A physical examination with emphasis on evidence of irritation or sensitization of the skin and respiratory system, shortness of breath, or irritation of the eyes.

1910.1048(l)(4)(ii)

Laboratory examinations for respirator wearers consisting of baseline and annual pulmonary function tests. As a minimum, these tests shall consist of forced vital capacity (FVC), forced expiratory volume in one second (FEV(1)), and forced expiratory flow (FEF).

1910.1048(l)(4)(iii)

Any other test which the examining physician deems necessary to complete the written opinion.

1910.1048(l)(4)(iv)

Counseling of employees having medical conditions that would be directly or indirectly aggravated by exposure to formaldehyde on the increased risk of impairment of their health.

1910.1048(l)(5)

Examinations for employees exposed in an emergency. The employer shall make medical examinations available as soon as possible to all employees who have been exposed to formaldehyde in an emergency.

1910.1048(l)(5)(i)

The examination shall include a medical and work history with emphasis on any evidence of upper or lower respiratory problems, allergic conditions, skin reaction or hypersensitivity, and any evidence of eye, nose, or throat irritation.

1910.1048(l)(5)(ii)

Other examinations shall consist of those elements considered appropriate by the examining physician.

1910.1048(l)(6)

Information provided to the physician. The employer shall provide the following information to the examining physician:

1910.1048(l)(6)(i)

A copy of this standard and Appendix A, C, D, and E;

1910.1048(l)(6)(ii)

A description of the affected employee's job duties as they relate to the employee's exposure to formaldehyde;

1910.1048(l)(6)(iii)

The representative exposure level for the employee's job assignment;

1910.1048(l)(6)(iv)

Information concerning any personal protective equipment and respiratory protection used or to be used by the employee; and

1910.1048(l)(6)(v)

Information from previous medical examinations of the affected employee within the control of the employer.

1910.1048(l)(6)(vi)

In the event of a nonroutine examination because of an emergency, the employer shall provide to the physician as soon as possible: a description of how the emergency occurred and the exposure the victim may have received.

1910.1048(l)(7)

Physician's written opinion.

1910.1048(l)(7)(i)

For each examination required under this standard, the employer shall obtain a written opinion from the examining physician. This written opinion shall contain the results of the medical examination except that it shall not reveal specific findings or diagnoses unrelated to occupational exposure to formaldehyde. The written opinion shall include:

1910.1048(l)(7)(i)(A)

The physician's opinion as to whether the employee has any medical condition that would place the employee at an increased risk of material impairment of health from exposure to formaldehyde;

1910.1048(l)(7)(i)(B)

Any recommended limitations on the employee's exposure or changes in the use of personal protective equipment, including respirators;

1910.1048(l)(7)(i)(C)

A statement that the employee has been informed by the physician of any medical conditions which would be aggravated by exposure to formaldehyde, whether these conditions may have resulted from past formaldehyde exposure or from exposure in an emergency, and whether there is a need for further examination or treatment.

1910.1048(l)(7)(ii)

The employer shall provide for retention of the results of the medical examination and tests conducted by the physician.

1910.1048(l)(7)(iii)

The employer shall provide a copy of the physician's written opinion to the affected employee within 15 days of its receipt.

1910.1048(l)(8)

Medical removal.

1910.1048(l)(8)(i)

The provisions of paragraph (I)(8) apply when an employee reports significant irritation of the mucosa of the eyes or of the upper airways, respiratory sensitization, dermal irritation, or dermal sensitization attributed to workplace formaldehyde exposure. Medical removal provisions do not apply in the case of dermal irritation or dermal sensitization when the product suspected of causing the dermal condition contains less than 0.05 percent formaldehyde.

1910.1048(I)(8)(ii)

An employee's report of signs or symptoms of possible overexposure to formaldehyde shall be evaluated by a physician selected by the employer pursuant to paragraph (I)(3). If the physician determines that a medical examination is not necessary under paragraph (I)(3)(ii), there shall be a two-week evaluation and remediation period to permit the employer to ascertain whether the signs or symptoms subside untreated or with the use of creams, gloves, first aid treatment or personal protective equipment. Industrial hygiene measures that limit the employee's exposure to formaldehyde may also be implemented during this period. The employee shall be referred immediately to a physician prior to expiration of the two-week period if the signs or symptoms worsen. Earnings, seniority and benefits may not be altered during the two-week period by virtue of the report.

1910.1048(I)(8)(iii)

If the signs or symptoms have not subsided or been remedied by the end of the two-week period, or earlier if signs or symptoms warrant, the employee shall be examined by a physician selected by the employer. The physician shall presume, absent contrary evidence, that observed dermal irritation or dermal sensitization are not attributable to formaldehyde when products to which the affected employee is exposed contain less than 0.1 percent formaldehyde.

1910.1048(I)(8)(iv)

Medical examinations shall be conducted in compliance with the requirements of paragraph (I)(5)(i) and (ii). Additional guidelines for conducting medical exams are contained in Appendix C.

1910.1048(I)(8)(v)

If the physician finds that significant irritation of the mucosa of the eyes or of the upper airways, respiratory sensitization, dermal irritation, or dermal sensitization result from workplace formaldehyde exposure and recommends restrictions or removal, the employer shall promptly comply with the restrictions or recommendation of removal. In the event of a recommendation of removal, the employer shall remove the affected employee from the current formaldehyde exposure and if possible, transfer the employee to work having no or significantly less exposure to formaldehyde.

1910.1048(I)(8)(vi)

When an employee is removed pursuant to paragraph (I)(8)(v), the employer shall transfer the employee to comparable work for which the employee is qualified or can be trained in a short period (up to 6 months), where the formaldehyde exposures are as low as possible, but not higher than the action level. The employer shall maintain the employee's current earnings, seniority, and other benefits. If there is no such work available, the employer shall maintain the employee's current earnings, seniority and other benefits until such work becomes available, until the employee is determined to be unable to return to workplace formaldehyde exposure, until the employee is determined to be able to return to the original job status, or for six months, whichever comes first.

1910.1048(I)(8)(vii)

The employer shall arrange for a follow-up medical examination to take place within six months after the employee is removed pursuant to this paragraph. This examination shall determine if the employee can return to the original job status, or if the removal is to be permanent. The physician shall make a decision within six months of the date the employee was removed as to whether the employee can be returned to the original job status, or if the removal is to be permanent.

1910.1048(I)(8)(viii)

An employer's obligation to provide earnings, seniority and other benefits to a removed employee may be reduced to the extent that the employee receives compensation for earnings lost during the period of removal either from a publicly or employer-funded compensation program or from employment with another employer made possible by virtue of the employee's removal.

1910.1048(I)(8)(ix)

In making determinations of the formaldehyde content of materials under this paragraph the employer may rely on objective data.

1910.1048(I)(9)

Multiple physician review.

1910.1048(I)(9)(i)

After the employer selects the initial physician who conducts any medical examination or consultation to determine whether medical removal or restriction is appropriate, the employee may designate a second physician to review any findings, determinations or recommendations of the initial physician and to conduct such examinations, consultations, and laboratory tests as the second physician deems necessary and appropriate to evaluate the effects of formaldehyde exposure and to facilitate this review.

1910.1048(I)(9)(ii)

The employer shall promptly notify an employee of the right to seek a second medical opinion after each occasion that an initial physician conducts a medical examination or consultation for the purpose of medical removal or restriction.

1910.1048(I)(9)(iii)

The employer may condition its participation in, and payment for, the multiple physician review mechanism upon the employee doing the following within fifteen (15) days after receipt of the notification of the right to seek a second medical opinion, or receipt of the initial physician's written opinion, whichever is later;

1910.1048(I)(9)(iii)(A)

The employee informs the employer of the intention to seek a second medical opinion, and

1910.1048(l)(9)(iii)(B)

The employee initiates steps to make an appointment with a second physician.

1910.1048(l)(9)(iv)

If the findings, determinations or recommendations of the second physician differ from those of the initial physician, then the employer and the employee shall assure that efforts are made for the two physicians to resolve the disagreement. If the two physicians are unable to quickly resolve their disagreement, then the employer and the employee through their respective physicians shall designate a third physician who shall be a specialist in the field at issue:

1910.1048(l)(9)(iv)(A)

To review the findings, determinations or recommendations of the prior physicians; and

1910.1048(l)(9)(iv)(B)

To conduct such examinations, consultations, laboratory tests and discussions with the prior physicians as the third physician deems necessary to resolve the disagreement of the prior physicians.

1910.1048(l)(9)(v)

In the alternative, the employer and the employee or authorized employee representative may jointly designate such third physician.

1910.1048(l)(9)(vi)

The employer shall act consistent with the findings, determinations and recommendations of the third physician, unless the employer and the employee reach an agreement which is otherwise consistent with the recommendations of at least one of the three physicians.

1910.1048(m)

Hazard communication -

1910.1048(m)(1)

General. Communication of the hazards associated with formaldehyde in the workplace shall be governed by the requirements of paragraph (m). The definitions of 29 CFR 1910.1200 (c) shall apply under this paragraph.

1910.1048(m)(1)(i)

The following shall be subject to the hazard communication requirements of this paragraph: formaldehyde gas, all mixtures or solutions composed of greater than 0.1 percent formaldehyde, and materials capable of releasing formaldehyde into the air, under reasonably foreseeable conditions of use, at concentrations reaching or exceeding 0.1 ppm.

1910.1048(m)(1)(ii)

As a minimum, specific health hazards that the employer shall address are: cancer, irritation and sensitization of the skin and respiratory system, eye and throat irritation, and acute toxicity.

1910.1048(m)(2)

Manufacturers and importers who produce or import formaldehyde or formaldehyde-containing products shall provide downstream employers using or handling these products with an objective determination through the required labels and MSDSs if these items may constitute a health hazard within the meaning of 29 CFR 1910.1200(d) under normal conditions of use.

1910.1048(m)(3)

Labels.

1910.1048(m)(3)(i)

The employer shall assure that hazard warning labels complying with the requirements of 29 CFR 1910.1200(f) are affixed to all containers of materials listed in paragraph (m)(1)(i), except to the extent that 29 CFR 1910.1200(f) is inconsistent with this paragraph.

1910.1048(m)(3)(ii)

Information on labels. As a minimum, for all materials listed in paragraph (m)(1)(i) capable of releasing formaldehyde at levels of 0.1 ppm to 0.5 ppm, labels shall identify that the product contains formaldehyde; list the name and address of the responsible party; and state that physical and health hazard information is readily available from the employer and from material safety data sheets.

1910.1048(m)(3)(iii)

For materials listed in paragraph (m)(1)(i) capable of releasing formaldehyde at levels above 0.5 ppm, labels shall appropriately address all hazards as defined in 29 CFR 1910.1200 (d) and 29 CFR 1910.1200 Appendices A and B, including respiratory sensitization, and shall contain the words "Potential Cancer Hazard."

1910.1048(m)(3)(iv)

In making the determinations of anticipated levels of formaldehyde release, the employer may rely on objective data indicating the extent of potential formaldehyde release under reasonably foreseeable conditions of use.

1910.1048(m)(3)(v)

Substitute warning labels. The employer may use warning labels required by other statutes, regulations, or ordinances which impart the same information as the warning statements required by this paragraph.

1910.1048(m)(4)

Material safety data sheets.

1910.1048(m)(4)(i)

Any employer who uses formaldehyde-containing materials listed in paragraph (m)(1)(i) shall comply with the requirements of 29 CFR 1910.1200(g) with regard to the development and updating of material safety data sheets.

1910.1048(m)(4)(ii)

Manufacturers, importers, and distributors of formaldehyde-containing materials listed in paragraph (m)(1)(i) shall assure that material safety data sheets and updated information are provided to all employers purchasing such materials at the time of the initial shipment and at the time of the first shipment after a material safety data sheet is updated.

1910.1048(m)(5)

Written hazard communication program. The employer shall develop, implement, and maintain at the workplace, a written hazard communication program for formaldehyde exposures in the workplace, which at a minimum describes how the requirements specified in this paragraph for labels and other forms of warning and material safety data sheets, and paragraph (n) for employee information and training, will be met. Employers in multi-employer workplaces shall comply with the requirements of 29 CFR 1910.1200(e)(2).

1910.1048(n)

Employee information and training -

1910.1048(n)(1)

Participation. The employer shall assure that all employees who are assigned to workplaces where there is exposure to formaldehyde participate in a training program, except that where the employer can show, using objective data, that employees are not exposed to formaldehyde at or above 0.1 ppm, the employer is not required to provide training.

1910.1048(n)(2)

Frequency. Employers shall provide such information and training to employees at the time of initial assignment, and whenever a new exposure to formaldehyde is introduced into the work area. The training shall be repeated at least annually.

1910.1048(n)(3)

Training program. The training program shall be conducted in a manner which the employee is able to understand and shall include:

1910.1048(n)(3)(i)

A discussion of the contents of this regulation and the contents of the Material Safety Data Sheet.

1910.1048(n)(3)(ii)

The purpose for and a description of the medical surveillance program required by this standard, including:

1910.1048(n)(3)(ii)(A)

A description of the potential health hazards associated with exposure to formaldehyde and a description of the signs and symptoms of exposure to formaldehyde.

1910.1048(n)(3)(ii)(B)

Instructions to immediately report to the employer the development of any adverse signs or symptoms that the employee suspects is attributable to formaldehyde exposure.

1910.1048(n)(3)(iii)

Description of operations in the work area where formaldehyde is present and an explanation of the safe work practices appropriate for limiting exposure to formaldehyde in each job;

1910.1048(n)(3)(iv)

The purpose for, proper use of, and limitations of personal protective clothing and equipment;

1910.1048(n)(3)(v)

Instructions for the handling of spills, emergencies, and clean-up procedures;

1910.1048(n)(3)(vi)

An explanation of the importance of engineering and work practice controls for employee protection and any necessary instruction in the use of these controls; and

1910.1048(n)(3)(vii)

A review of emergency procedures including the specific duties or assignments of each employee in the event of an emergency.

1910.1048(n)(4)

Access to training materials.

1910.1048(n)(4)(i)

The employer shall inform all affected employees of the location of written training materials and shall make these materials readily available, without cost, to the affected employees.

1910.1048(n)(4)(ii)

The employer shall provide, upon request, all training materials relating to the employee training program to the Assistant Secretary and the Director.

1910.1048(o)

Recordkeeping -

1910.1048(o)(1)

Exposure measurements. The employer shall establish and maintain an accurate record of all measurements taken to monitor employee exposure to formaldehyde. This record shall include:

1910.1048(o)(1)(i)

The date of measurement;

1910.1048(o)(1)(ii)

The operation being monitored;

1910.1048(o)(1)(iii)

The methods of sampling and analysis and evidence of their accuracy and precision;

1910.1048(o)(1)(iv)

The number, durations, time, and results of samples taken;

1910.1048(o)(1)(v)

The types of protective devices worn; and

1910.1048(o)(1)(vi)

The names, job classifications, social security numbers, and exposure estimates of the employees whose exposures are represented by the actual monitoring results.

1910.1048(o)(2)

Exposure determinations. Where the employer has determined that no monitoring is required under this standard, the employer shall maintain a record of the objective data relied upon to support the determination that no employee is exposed to formaldehyde at or above the action level.

1910.1048(o)(3)

Medical surveillance. The employer shall establish and maintain an accurate record for each employee subject to medical surveillance under this standard. This record shall include:

1910.1048(o)(3)(i)

The name and social security number of the employee;

1910.1048(o)(3)(ii)

The physician's written opinion;

1910.1048(o)(3)(iii)

A list of any employee health complaints that may be related to exposure to formaldehyde; and

1910.1048(o)(3)(iv)

A copy of the medical examination results, including medical disease questionnaires and results of any medical tests required by the standard or mandated by the examining physician.

1910.1048(o)(4)

Respirator fit testing.

1910.1048(o)(4)(i)

The employer shall establish and maintain accurate records for employees subject to negative pressure respirator fit testing required by this standard.

1910.1048(o)(4)(ii)

This record shall include:

1910.1048(o)(4)(ii)(A)

A copy of the protocol selected for respirator fit testing.

1910.1048(o)(4)(ii)(B)

A copy of the results of any fit testing performed.

1910.1048(o)(4)(ii)(C)

The size and manufacturer of the types of respirators available for selection.

1910.1048(o)(4)(ii)(D)

The date of the most recent fit testing, the name and social security number of each tested employee, and the respirator type and facepiece selected.

1910.1048(o)(5)

Record retention. The employer shall retain records required by this standard for at least the following periods:

1910.1048(o)(5)(i)

Exposure records and determinations shall be kept for at least 30 years.

1910.1048(o)(5)(ii)

Medical records shall be kept for the duration of employment plus 30 years.

1910.1048(o)(5)(iii)

Respirator fit testing records shall be kept until replaced by a more recent record.

1910.1048(o)(6)

Availability of records.

1910.1048(o)(6)(i)

Upon request, the employer shall make all records maintained as a requirement of this standard available for examination and copying to the Assistant Secretary and the Director.


1910.1048(o)(6)(ii)


The employer shall make employee exposure records, including estimates made from representative monitoring and available upon request for examination, and copying to the subject employee, or former employee, and employee representatives in accordance with 29 CFR 1910.1020 (a)-(e) and (g)-(i).

1910.1048(o)(6)(iii)

Employee medical records required by this standard shall be provided upon request for examination and copying, to the subject employee or former employee or to anyone having the specific written consent of the subject employee or former employee in accordance with 29 CFR 1910.1020 (a)-(e) and (g)-(i).

[56 FR 10378, Mar. 12, 1991; 56 FR 26909, June 12, 1991; 56 FR 37651, Aug. 8, 1991; 56 FR 57593, Nov. 13, 1991; 57 FR 2682, Jan. 23, 1992; 57 FR 19262, May 5, 1992; 57 FR 22290, May 27, 1992; 61 FR 5507, Feb. 13, 1996; 63 FR 1152, Jan. 8, 1998; 63 FR 20098, April 23, 1998; 70 FR 1143, Jan. 5, 2005; 71 FR 16672 and 16673, April 3, 2006; 71 FR 50190, August 24, 2006; 73 FR 75586, Dec. 12, 2008]

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U.S. Department of Labor | Occupational Safety & Health Administration | 200 Constitution Ave., NW, Washington, DC 20210
Telephone: 800-321-OSHA (6742) | TTY: 877-889-5627

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Occupational Safety and Health Guideline for Phenol

DISCLAIMER:

These guidelines were developed under contract using generally accepted secondary sources. The protocol used by the contractor for surveying these data sources was developed by the National Institute for Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA), and the Department of Energy (DOE). The information contained in these guidelines is intended for reference purposes only. None of the agencies have conducted a comprehensive check of the information and data contained in these sources. It provides a summary of information about chemicals that workers may be exposed to in their workplaces. The secondary sources used for supplements III and IV were published before 1992 and 1993, respectively, and for the remainder of the guidelines the secondary sources used were published before September 1996. This information may be superseded by new developments in the field of industrial hygiene. Therefore readers are advised to determine whether new information is available.

[Introduction](#) | [Recognition](#) | [Evaluation](#) | [Controls](#) | [References](#)

Introduction

This guideline summarizes pertinent information about phenol for workers and employers as well as for physicians, industrial hygienists, and other occupational safety and health professionals who may need such information to conduct effective occupational safety and health programs. Recommendations may be superseded by new developments in these fields; readers are therefore advised to regard these recommendations as general guidelines and to determine whether new information is available.

Recognition

SUBSTANCE IDENTIFICATION

* Formula

C(=C1C=CC(=C(C=C1)O

* Structure

(For Structure, see paper copy)

* Synonyms

Carbolic acid, monohydroxybenzene, hydroxybenzene, benzenol, phenylic acid, phenyl hydroxide, benzophenol, phenyl hydrate, phenylic alcohol, monophenol, phenic acid, oxybenzene

* Identifiers

1. CAS No.: 108-95-2
2. RTECS No.: SJ3325000
3. DOT UN: 1671 55 (phenol, solid); 2821 55 (phenol solutions); 2312 55 (phenol, molten); 2821 55 (phenol solutions)
4. DOT label: Poison

* Appearance and odor

Pure phenol consists of white or clear acicular crystals. At 41degreesC (105degreesF), phenol congeals into a solid that can be liquefied by mixing a very small amount of water (2 parts water: 23 parts phenol). On exposure to air and light, phenol assumes a pinkish or reddish discoloration; this discoloration is accelerated by the presence of alkalinity or impurities. Phenol has a characteristic sweet, medicinal, or tar-like odor. It is shipped in the molten state at elevated temperatures or in the solid or crystalline form; it is also available as an aqueous solution. The air odor threshold concentration for phenol is 0.04 part per million (ppm) parts of air.

CHEMICAL AND PHYSICAL PROPERTIES

* Physical data

1. Molecular weight: 94.11
2. Boiling point (at 760 mm Hg): 181.7 degrees C (359.1 degrees F)
3. Specific gravity (water = 1): 1.07 at 20 degrees C (68 degrees F)
4. Vapor density: 3.24
5. Melting point: 43 degrees C (109.4 degrees F)
6. Vapor pressure at 25 degrees C (77 degrees F): 0.35 mm Hg
7. Solubility: Soluble in water and benzene; very soluble in alcohol, chloroform, ether, glycerol, carbon disulfide, petrolatum, volatile and fixed oils, and aqueous alkali hydroxides; almost insoluble in petroleum ether.
8. Evaporation rate: Data not available.

* Reactivity

1. Conditions contributing to instability: Heat, flames, or sparks.
2. Incompatibilities: Contact between phenol and strong oxidizers (especially calcium hypochlorite), acids, and halogens should be avoided.
3. Hazardous decomposition products: Toxic gases (such as carbon monoxide) may be released in a fire involving phenol.

4. Special precautions: Liquid phenol attacks rubber, coatings, and some forms of plastic. Hot liquid phenol attacks aluminum, magnesium, lead, and zinc metals.

* Flammability

The National Fire Protection Association has assigned a flammability rating of 2 (moderate fire hazard) to phenol.

1. Flash point: 79 degrees C (175 degrees F) (closed cup)
2. Autoignition temperature: 715 degrees C (1319 degrees F)
3. Flammable limits in air (percent by volume): Lower, 1.7; upper, 8.6
4. Extinguishant: For small fires use dry chemical, water spray, or regular foam. Use water spray, fog, or regular foam to fight large fires involving phenol. Fires involving phenol should be fought upwind from the maximum distance possible. Keep unnecessary people away; isolate the hazard area and deny entry. Emergency personnel should stay out of low areas and ventilate closed spaces before entering. Containers of phenol may explode in the heat of the fire and should be moved from the fire area if it is possible to do so safely. If this is not possible, cool fire exposed containers from the sides with water until well after the fire is out. Dike fire control water for later disposal; do not scatter this material. Stay away from the ends of containers. Firefighters should wear a full set of protective clothing and self-contained breathing apparatus when fighting fires involving phenol.

EXPOSURE LIMITS

* OSHA PEL

The current Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for phenol is 5 ppm (19 milligrams per cubic meter (mg/m³)) as an 8-hour time-weighted average (TWA) concentration. The OSHA PEL also bears a "Skin" notation, which indicates that the cutaneous route of exposure (including mucous membranes and eyes) contributes to overall exposure [29 CFR 1910.1000, Table Z-1].

* NIOSH REL

The National Institute for Occupational Safety and Health (NIOSH) has established a recommended exposure limit (REL) for phenol of 5 ppm (19 mg/m³) as a TWA for up to a 10-hour workday and a 40-hour workweek and a short-term exposure limit (STEL) of 15.6 ppm (60 mg/m³) for periods not to exceed 15 minutes. NIOSH also assigns a "Skin" notation to phenol [NIOSH 1992].

* ACGIH TLV

The American Conference of Governmental Industrial Hygienists (ACGIH) has assigned phenol a threshold limit value (TLV) of 5 ppm (19 mg/m³) as a TWA for a normal 8-hour workday and a 40-hour workweek. The ACGIH also assigns a "Skin" notation to phenol [ACGIH 1994, p. 29].

* Rationale for Limits

The NIOSH limits are based on the risk of skin, eyes, central nervous system, liver, kidneys [NIOSH 1992]. The ACGIH limit is based on the risk of irritation and systemic effects [ACGIH 1991, p. 1206].

Evaluation

HEALTH HAZARD INFORMATION

* Routes of Exposure

Exposure to phenol can occur through inhalation, ingestion, eye or skin contact, and absorption through the skin [Sittig 1991, p. 1284].

* Summary of toxicology

1. Effects on Animals: Phenol is an irritant of the eyes, mucous membranes, and skin; absorption causes convulsions as well as liver, kidney, and other systemic damage [Hathaway et al. 1991]. In animals, the predominant effects of acute toxicity are exerted on motor centers in the spinal cord, which induces marked twitching and severe convulsions. Following absorption of a toxic dose, the heart rate first increases and then becomes slow and irregular; the blood pressure initially rises slightly and then falls markedly. There may be salivation and marked dyspnea, and the body temperature usually decreases [Clayton and Clayton 1982]. The mean lethal concentration for rats inhaling phenol vapors is 316 mg/m³, and for mice it is 177 mg/m³. The oral LD₅₀ values are 317 mg/kg and 270 mg/kg for rats and mice, respectively. In rabbits, the dermal LD₅₀ is 850 mg/kg [NIOSH 1991]. Prolonged oral or subcutaneous administration of phenol to animals can cause damage to the lungs, liver, kidneys, heart, and genitourinary tract. Prolonged inhalation of vapor concentrations in the range of 30 to 60 ppm causes respiratory difficulties, lung damage, loss of weight, and paralysis [Clayton and Clayton 1982]. In contact with rabbit eyes, crystalline or concentrated aqueous phenol causes almost instantaneous white opacification of the corneal epithelium; 8 hours after application, the cornea is anesthetic, the surface ulcerated, and the stroma opaque. Five weeks later, scarring of the conjunctiva and opacity of the cornea occur. In addition, glaucoma has been induced experimentally in rabbits by injected 5-percent phenol subconjunctivally [Grant 1986]. Phenol administered by gavage has produced fetotoxic effects in rats and mice. An increased incidence of leukemia and lymphomas has been reported in rats receiving 2,500 ppm of phenol in drinking water for 103 weeks, although phenol was not considered to be carcinogenic. In mice treated twice weekly for 41 weeks by application of one drop of a 10-percent solution of phenol in benzene to the shaved dorsal skin, papillomas occurred in five of 14 animals after 52 weeks, and a single fibrosarcoma appeared at 72 weeks. Phenol may act as a nonspecific irritant to promote the development of tumors when it is repeatedly applied in large amounts to the skin [Hathaway et al. 1991].

2. Effects on Humans: The effects of phenol exposure in humans are similar to those produced in animals: systemic absorption causes central nervous system impairment and liver and kidney damage; local effects include irritation of the eyes, skin and mucous membranes [Hathaway et al. 1991]. Because of its low volatility, phenol does not pose a serious inhalation hazard in the occupational setting; the skin is a primary route of entry [Hathaway et al. 1991; Parmeggiani 1983]. A 32-year-old man died 10 minutes after spilling a strong solution of phenol over his scalp, face, neck, shoulders, and back. There was coagulation necrosis of the skin and left eye, acute dermatitis, and acute passive congestion of the lungs, liver, spleen, and kidneys [NLM 1992]. An oral dose of 1 gram of phenol may be lethal to humans; however, in exceptional cases, patients have survived the ingestion of 65 grams of pure phenol or 120 grams of the crude product. Roughly 50 percent of all reported cases have been fatal. Death may be rapid and usually results from respiratory failure [Clayton and Clayton 1982]. Chronic phenol poisoning is characterized by systemic disorders such as digestive disturbances, nervous system effects, and possibly by skin discoloration and eruptions; the prognosis is grave when there is extensive damage to the liver and kidneys [Parmeggiani 1983]. Concentrated phenol solutions are severely irritating to the human eye and cause conjunctival swelling; the cornea becomes white and loses sensation. Loss of vision has occurred in some cases. In addition to systemic effects, contact with the solid or liquid can produce chemical burns. Erythema, edema, tissue necrosis, and gangrene have been reported [Hathaway et al. 1991].

* Signs and symptoms of exposure

1. Acute exposure: Acute phenol intoxication causes shock, collapse, coma, convulsions, cyanosis, and death. Ingestion of lethal amounts causes severe burns of the mouth and throat, marked abdominal pain, cyanosis, muscular weakness, collapse, coma, and death. Tremors, convulsions, and muscle twitching have also occurred. Contact of the skin with the solid or liquid can produce chemical burns: redness, edema, tissue necrosis, and gangrene; contact with the eye

also occurred. Contact of the skin with the solid or liquid can produce chemical burns, redness, edema, tissue necrosis, and gangrene; contact with the eye may result in irritation, conjunctival swelling, whitened cornea, and blindness.

2. Chronic exposure: Chronic phenol poisoning is characterized by vomiting, difficult swallowing, excessive salivation, diarrhea, anorexia, headache, fainting, vertigo, mental disturbances, and possibly skin eruptions. Prolonged cutaneous exposure may result in deposition of dark pigment in the skin.

EMERGENCY MEDICAL PROCEDURES

* Emergency medical procedures: [NIOSH to supply]

1. Rescue: Remove an incapacitated worker from further exposure and implement appropriate emergency procedures (e.g., those listed on the Material Safety Data Sheet required by OSHA's Hazard Communication Standard [29 CFR 1910.1200]). All workers should be familiar with emergency procedures, the location and proper use of emergency equipment, and methods of protecting themselves during rescue operations.

EXPOSURE SOURCES AND CONTROL METHODS

The following operations may involve phenol and lead to worker exposures to this substance:

- The manufacture and transportation of phenol
- Use as bonding resin in plywood manufacture and of molding resins in manufacture of molded articles, such as electrical appliances, automotive parts, foundry sand molds, and utensil handles; and during manufacture of friction materials, bonded adhesives, coated abrasives, wood particle board, and insulation materials
- Use as a peptizing agent in glue, as a blocking agent for blocked isocyanate monomers, and in the synthesis of stabilizers and preservatives for dyes, perfumes, and fungicides
- Use in synthesis of thermosetting phenolic resins, epoxy, polycarbonate, phenoxy, and polysulfone; and in synthesis of caprolactam for use in nylon 6 fibers, plastics, and films
- Use in synthesis of bisphenol-a, adipic acid, alkylphenols, agricultural chemicals, and intermediates; in synthesis of pharmaceuticals, rubber and plastic plasticizers and antioxidants, and curing agents
- Use during solvent refining of lubrication oil and wax and in synthesis of additives for gasoline and lubricating fluids and intermediates
- Use in medicine as a preservative for pneumococcal polysaccharide vaccine, as an agent for relieving itching, as a disinfectant for septic wounds, as a cauterizing agent, and for the treatment of severe disability (muscle spasms, paralysis, and related disorders) resulting from multiple sclerosis
- Use in synthesis of intermediates in polyester production; in synthesis of corrosion-resistant polyester and polyester polyols; and in synthesis of dye intermediates
- Use in synthesis of disinfectants, surface-active agents, detergent intermediates, explosives, and synthetic cresols and xylenols
- Use in the production or manufacture of fertilizer, coke, illuminating gas, lampblack, paints, paint removers, and asbestos goods
- Use in veterinary medicine as an internal antiseptic and gastric anesthetic

Methods that are effective in controlling worker exposures to phenol, depending on the feasibility of implementation, are as follows:

- Process enclosure
- Local exhaust ventilation
- General dilution ventilation
- Personal protective equipment

Workers responding to a release or potential release of a hazardous substance must be protected as required by paragraph (q) of OSHA's Hazardous Waste Operations and Emergency Response Standard [29 CFR 1910.120].

Good sources of information about control methods are as follows:

1. ACGIH [1992]. Industrial ventilation--a manual of recommended practice. 21st ed. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.
2. Burton DJ [1986]. Industrial ventilation--a self study companion. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.
3. Alden JL, Kane JM [1982]. Design of industrial ventilation systems. New York, NY: Industrial Press, Inc.
4. Wadden RA, Scheff PA [1987]. Engineering design for control of workplace hazards. New York, NY: McGraw-Hill.
5. Plog BA [1988]. Fundamentals of industrial hygiene. Chicago, IL: National Safety Council.

MEDICAL SURVEILLANCE

OSHA is currently developing requirements for medical surveillance. When these requirements are promulgated, readers should refer to them for additional information and to determine whether employers whose employees are exposed to phenol are required to implement medical surveillance procedures.

* Medical Screening

Workers who may be exposed to chemical hazards should be monitored in a systematic program of medical surveillance that is intended to prevent occupational injury and disease. The program should include education of employers and workers about work-related hazards, early detection of adverse health effects, and referral of workers for diagnosis and treatment. The occurrence of disease or other work-related adverse health effects should prompt immediate evaluation of primary preventive measures (e.g., industrial hygiene monitoring, engineering controls, and personal protective equipment). A medical surveillance program is intended to supplement, not replace, such measures. To detect and control work-related health effects, medical evaluations should be performed (1) before job

placement, (2) periodically during the term of employment, and (3) at the time of job transfer or termination.

* Preplacement medical evaluation

Before a worker is placed in a job with a potential for exposure to phenol, a licensed health care professional should evaluate and document the worker's baseline health status with thorough medical, environmental, and occupational histories, a physical examination, and physiologic and laboratory tests appropriate for the anticipated occupational risks. These should concentrate on the function and integrity of the skin, central nervous system, respiratory system, liver, and kidneys. Medical surveillance for respiratory disease should be conducted using the principles and methods recommended by the American Thoracic Society. A preplacement medical evaluation is recommended to assess medical conditions that may be aggravated or may result in increased risk when a worker is exposed to phenol at or below the prescribed exposure limit. The health care professional should consider the probable frequency, intensity, and duration of exposure as well as the nature and degree of any applicable medical condition. Such conditions (which should not be regarded as absolute contraindications to job placement) include a history and other findings consistent with diseases of the skin, central nervous system, respiratory system, liver, and kidneys.

* Periodic medical evaluations

Occupational health interviews and physical examinations should be performed at regular intervals during the employment period, as mandated by any applicable Federal, State, or local standard. Where no standard exists and the hazard is minimal, evaluations should be conducted every 3 to 5 years or as frequently as recommended by an experienced occupational health physician. Additional examinations may be necessary if a worker develops symptoms attributable to phenol exposure. The interviews, examinations, and medical screening tests should focus on identifying the adverse effects of phenol on the skin, central nervous system,

respiratory system, liver, or kidneys. Current health status should be compared with the baseline health status of the individual worker or with expected values for a suitable reference population.

* Termination medical evaluations

The medical, environmental, and occupational history interviews, the physical examination, and selected physiologic or laboratory tests that were conducted at the time of placement should be repeated at the time of job transfer or termination to determine the worker's medical status at the end of his or her employment. Any changes in the worker's health status should be compared with those expected for a suitable reference population.

* Biological monitoring

Biological monitoring involves sampling and analyzing body tissues or fluids to provide an index of exposure to a toxic substance or metabolite. A worker's exposure to phenol can be determined by analyzing a urine sample taken at the end of the shift for total phenol. A 250 mg total phenol per gram creatinine level corresponds to an airborne phenol exposure at the TLV (5 ppm). It should be noted that dermal absorption of phenol may also contribute to the urinary levels found.

WORKPLACE MONITORING AND MEASUREMENT

Determination of a worker's exposure to airborne phenol is made using an XAD-7 tube (100/50 mg sections, 15/50 mesh). Samples are collected at a maximum flow rate of 0.1 liter/minute until a maximum collection volume of 24 liters is reached. The sample is then treated with methanol. Analysis is conducted by gas chromatography using a flame ionization detector (GC/FID). This method is fully validated and is described in the OSHA Computerized Information System [OSHA 1994] and in NIOSH Method No. 2546 [NIOSH 1994b].

Controls

PERSONAL HYGIENE PROCEDURES

If phenol contacts the skin, workers should immediately wash the affected areas with soap and water.

Clothing contaminated with phenol should be removed immediately, and provisions should be made for the safe removal of the chemical from the clothing. Persons laundering the clothes should be informed of the hazardous properties of phenol, particularly its potential for causing irritation and tissue corrosion.

A worker who handles phenol should thoroughly wash hands, forearms, and face with soap and water before eating, using tobacco products, using toilet facilities, applying cosmetics, or taking medication.

Workers should not eat, drink, use tobacco products, apply cosmetics, or take medication in areas where phenol or a solution containing phenol is handled, processed, or stored.

STORAGE

Phenol should be stored in a cool, dry, well-ventilated area in tightly sealed containers that are labeled in accordance with OSHA's Hazard Communication Standard [29 CFR 1910.1200]. Containers of phenol should be protected from physical damage and ignition sources, and should be stored separately from strong oxidizers (especially calcium hypochlorite), acids, and halogens.

SPILLS AND LEAKS

In the event of a spill or leak involving phenol, persons not wearing protective equipment and clothing should be restricted from contaminated areas until cleanup has been completed. The following steps should be undertaken following a spill or leak:

1. Do not touch the spilled material; stop the leak if it is possible to do so without risk.
2. Notify safety personnel.
3. Remove all sources of heat and ignition.
4. Use non-sparking tools.
5. Water spray may be used to reduce vapors.
6. For small dry spills, use a clean shovel and place the material into a clean, dry container; cover and remove the container from the spill area.
7. For small liquid spills, take up with sand or other noncombustible absorbent material and place into closed containers for later disposal.
8. For large liquid spills, build dikes far ahead of the spill to contain the phenol for later reclamation or disposal.

SPECIAL REQUIREMENTS

U.S. Environmental Protection Agency (EPA) requirements for emergency planning, reportable quantities of hazardous releases, community right-to-know, and hazardous waste management may change over time. Users are therefore advised to determine periodically whether new information is available.

* Emergency planning requirements

Employers owning or operating a facility at which there are 10,000 pounds or more of phenol must comply with EPA's emergency planning requirements [40 CFR Part 355.30]. (If phenol is in the form of a finely divided powder or is handled in solution or in molten form, the employer must comply with these requirements if 500 pounds or more of phenol are present at the facility.)

* Reportable quantity requirements for hazardous releases

A hazardous substance release is defined by EPA as any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of contaminated containers) of hazardous substances. In the event of a release that is above the reportable quantity for that chemical, employers are required to notify the proper Federal, State, and local authorities [40 CFR 355.40].

The reportable quantity of phenol is 1,000 pounds. If an amount equal to or greater than this quantity is released within a 24-hour period in a manner that will expose persons outside the facility, employers are required to do the following:

- Notify the National Response Center **immediately** at (800) 424-8802 or at (202) 426-2675 in Washington, D.C. [40 CFR 302.6].
- Notify the emergency response commission of the State likely to be affected by the release [40 CFR 355.40].
- Notify the community emergency coordinator to the local emergency planning committee (or relevant local emergency response personnel) of any area likely to be affected by the release [40 CFR 355.40].

* Community right-to-know requirements

Community right-to-know requirements

Employers who own or operate facilities in SIC codes 20 to 39 that employ 10 or more workers and that manufacture 25,000 pounds or more of phenol per calendar year or otherwise use 10,000 pounds or more of phenol per calendar year are required by EPA [40 CFR Part 372.30] to submit a Toxic Chemical Release Inventory form (Form R) to EPA reporting the amount of phenol emitted or released from their facility annually.

* Hazardous waste management requirements

EPA considers a waste to be hazardous if it exhibits any of the following characteristics: ignitability, corrosivity, reactivity, or toxicity as defined in 40 CFR 261.21-261.24. Under the Resource Conservation and Recovery Act (RCRA) [40 USC 6901 et seq.], EPA has specifically listed many chemical wastes as hazardous. Phenol is listed as a hazardous waste under RCRA and has been assigned EPA Hazardous Waste No. U188. It is approved for land disposal after treatment and only if the concentration of phenol in the waste or treatment residual does not exceed 6.2 mg/kg.

Providing detailed information about the removal and disposal of specific chemicals is beyond the scope of this guideline. The U.S. Department of Transportation, EPA, and State and local regulations should be followed to ensure that removal, transport, and disposal of this substance are conducted in accordance with existing regulations. To be certain that chemical waste disposal meets EPA regulatory requirements, employers should address any questions to the RCRA hotline at (703) 412-9810 (in the Washington, D.C. area) or toll-free at (800) 424-9346 (outside Washington, D.C.). In addition, relevant State and local authorities should be contacted for information on any requirements they may have for the waste removal and disposal of this substance.

RESPIRATORY PROTECTION

* Conditions for respirator use

Good industrial hygiene practice requires that engineering controls be used where feasible to reduce workplace concentrations of hazardous materials to the prescribed exposure limit. However, some situations may require the use of respirators to control exposure. Respirators must be worn if the ambient concentration of phenol exceeds prescribed exposure limits. Respirators may be used (1) before engineering controls have been installed, (2) during work operations such as maintenance or repair activities that involve unknown exposures, (3) during operations that require entry into tanks or closed vessels, and (4) during emergencies. Workers should only use respirators that have been approved by NIOSH and the Mine Safety and Health Administration (MSHA).

* Respiratory protection program

Employers should institute a complete respiratory protection program that, at a minimum, complies with the requirements of OSHA's Respiratory Protection Standard [29 CFR 1910.134]. Such a program must include respirator selection, an evaluation of the worker's ability to perform the work while wearing a respirator, the regular training of personnel, respirator fit testing, periodic workplace monitoring, and regular respirator maintenance, inspection, and cleaning. The implementation of an adequate respiratory protection program (including selection of the correct respirator) requires that a knowledgeable person be in charge of the program and that the program be evaluated regularly. For additional information on the selection and use of respirators and on the medical screening of respirator users, consult the latest edition of the NIOSH Respirator Decision Logic [NIOSH 1987b] and the NIOSH Guide to Industrial Respiratory Protection [NIOSH 1987a].

PERSONAL PROTECTIVE EQUIPMENT

Workers should use appropriate personal protective clothing and equipment that must be carefully selected, used, and maintained to be effective in preventing skin contact with phenol. The selection of the appropriate personal protective equipment (PPE) (e.g., gloves, sleeves, encapsulating suits) should be based on the extent of the worker's potential exposure to phenol. The resistance of various materials to permeation by phenol (>70 percent) is shown below:

Material	Breakthrough time (hr)
Viton	>8
Saranex	>8
Barricade	>8
Chemrel	>8
Responder	>8
Neoprene	>4
Teflon	>4
4H (PE/EVAL)	>4
Butyl Rubber	Caution 1 to 4
Natural Rubber	<1(*)
Nitrile Rubber	<1(*)
Polyethylene	<1(*)
Polyvinyl Alcohol	<1(*)
Polyvinyl Chloride	<1(*)

(*) Not recommended, degradation may occur

To evaluate the use of these PPE materials with phenol, users should consult the best available performance data and manufacturers' recommendations. Significant differences have been demonstrated in the chemical resistance of generically similar PPE materials (e.g., butyl) produced by different manufacturers. In addition, the chemical resistance of a mixture may be significantly different from that of any of its neat components.

Any chemical-resistant clothing that is used should be periodically evaluated to determine its effectiveness in preventing dermal contact. Safety showers and eye wash stations should be located close to operations that involve phenol.

Splash-proof chemical safety goggles or face shields (20 to 30 cm long, minimum) should be worn during any operation in which a solvent, caustic, or other toxic substance may be splashed into the eyes.

In addition to the possible need for wearing protective outer apparel (e.g., aprons, encapsulating suits), workers should wear work uniforms, coveralls, or similar full-body coverings that are laundered each day. Employers should provide lockers or other closed areas to store work and street clothing separately. Employers should collect work clothing at the end of each work shift and provide for its laundering. Laundry personnel should be informed about the potential hazards of handling contaminated clothing and instructed about measures to minimize their health risk.

Protective clothing should be kept free of oil and grease and should be inspected and maintained regularly to preserve its effectiveness.

Protective clothing may interfere with the body's heat dissipation, especially during hot weather or during work in hot or poorly ventilated work environments.

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Telephone: 800-321-OSHA (6742) | TTY: 877-889-5627

www.OSHA.gov



CITADEL
ENVIRONMENTAL SERVICES, INC.

Appendix B

Standard Operating Procedure – Formaldehyde



Formaldehyde

1. Process

- a. General handling of Formaldehyde (37%) or Formalin

2. Describe process, hazardous chemical, or hazard class

- a. Toxic
- b. Carcinogen
- c. Flammable

3. Personal Protective Equipment

- a. If airborne exposures are suspected contact the CHEMICAL HYGIENE OFFICER for consultation. Formaldehyde Exposure Assessments are required by law.
- b. Eye: Eye protection should be selected on potential for splash and exposure. *Minimum potential:* safety glasses with side shields when only low splash hazard exists (e.g. placing a tissue sample in a container). Chemical splash goggles should be worn if using or transferring larger quantities.
- c. Skin: Disposable or lightweight nitrile (8-mil) gloves provide protection from incidental contact. Heavier (Butyl) gloves should be used when extended handling of contaminated or preserved materials or immersion is likely. A chemically resistant apron should be used when transferring or using large quantities and splash is likely.

4. Engineering Controls

- a. Work with formaldehyde only in a fume hood or with local exhaust ventilation.
- b. Use only in an area equipped with an emergency shower and eyewash.

5. Special Handling Procedures and Storage Requirements

- a. Read Material Safety Data Sheet (MSDS) prior to first use.
- b. Keep in a tightly closed container.
- c. Separate from oxidizing agents.
- d. Keep away from heat and flame.

6. Spill and Accident Procedures

- a. Small spills: Do not attempt cleanup if you feel unsure of your ability to do so or if you perceive the risk to be greater than normal laboratory operations. Absorb incidental spills. Collect and submit for waste disposal by CHC's designated hazardous waste contractor (EMT).
- b. Notify others in area. Evacuate room/immediate area. If splashed on an individual or in eyes flush for 15 minutes with copious quantities of water. Call CHEMICAL HYGIENE OFFICER, SITE SAFETY OFFICER (VP OF ADMINISTRATIVE SERVICES), OR DISTRICT POLICE (after hours) for emergency response. Prevent unnecessary entry until CHC emergency response team arrives. Provide assistance to CHEMICAL HYGIENE OFFICER/emergency response team as requested.
- c. Inhalation: Remove to fresh air. If breathing has stopped give artificial respiration immediately.
- d. Ingestion: If swallowed and the victim is conscious, dilute, inactivate, or absorb the ingested formaldehyde by giving 1 to 2 cups of milk, and induce vomiting. After vomiting, give mixture of 2 Tbs. of activated charcoal mixed with 1 cup of water. Any organic material will inactivate formaldehyde. Get medical attention immediately.



- e. Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
- f. Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

7. Decontamination Procedures

- a. Wash surfaces thoroughly with soap and water.
- b. Contain decontamination materials for proper waste disposal by CHC's designated hazardous waste contractor (EMT).

8. Waste Disposal Procedures

- a. Formaldehyde is a listed RCRA hazardous waste. Dispose of waste through CHC's designated hazardous waste contractor (EMT).

9. MSDS Location

- a. Available in lab
- b. Available through Chemical Hygiene Officer
- c. Available through manufacturer's website



CITADEL
ENVIRONMENTAL SERVICES, INC.

Appendix C

Standard Operating Procedure – Phenol



Formaldehyde

1. Process

- a. General handling of Formaldehyde (37%) or Formalin

2. Describe process, hazardous chemical, or hazard class

- a. Toxic
- b. Carcinogen
- c. Flammable

3. Personal Protective Equipment

- a. If airborne exposures are suspected contact the CHEMICAL HYGIENE OFFICER for consultation. Formaldehyde Exposure Assessments are required by law.
- b. Eye: Eye protection should be selected on potential for splash and exposure. *Minimum potential:* safety glasses with side shields when only low splash hazard exists (e.g. placing a tissue sample in a container). Chemical splash goggles should be worn if using or transferring larger quantities.
- c. Skin: Disposable or lightweight nitrile (8-mil) gloves provide protection from incidental contact. Heavier (Butyl) gloves should be used when extended handling of contaminated or preserved materials or immersion is likely. A chemically resistant apron should be used when transferring or using large quantities and splash is likely.

4. Engineering Controls

- a. Work with formaldehyde only in a fume hood or with local exhaust ventilation.
- b. Use only in an area equipped with an emergency shower and eyewash.

5. Special Handling Procedures and Storage Requirements

- a. Read Material Safety Data Sheet (MSDS) prior to first use.
- b. Keep in a tightly closed container.
- c. Separate from oxidizing agents.
- d. Keep away from heat and flame.

6. Spill and Accident Procedures

- a. Small spills: Do not attempt cleanup if you feel unsure of your ability to do so or if you perceive the risk to be greater than normal laboratory operations. Absorb incidental spills. Collect and submit for waste disposal by CHC's designated hazardous waste contractor (EMT).
- b. Notify others in area. Evacuate room/immediate area. If splashed on an individual or in eyes flush for 15 minutes with copious quantities of water. Call CHEMICAL HYGIENE OFFICER, SITE SAFETY OFFICER (VP OF ADMINISTRATIVE SERVICES), OR DISTRICT POLICE (after hours) for emergency response. Prevent unnecessary entry until CHC emergency response team arrives. Provide assistance to CHEMICAL HYGIENE OFFICER/emergency response team as requested.
- c. Inhalation: Remove to fresh air. If breathing has stopped give artificial respiration immediately.
- d. Ingestion: If swallowed and the victim is conscious, dilute, inactivate, or absorb the ingested formaldehyde by giving 1 to 2 cups of milk, and induce vomiting. After vomiting, give mixture of 2 Tbs. of activated charcoal mixed with 1 cup of water. Any organic material will inactivate formaldehyde. Get medical attention immediately.



- e. Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
- f. Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

7. Decontamination Procedures

- a. Wash surfaces thoroughly with soap and water.
- b. Contain decontamination materials for proper waste disposal by CHC's designated hazardous waste contractor (EMT).

8. Waste Disposal Procedures

- a. Formaldehyde is a listed RCRA hazardous waste. Dispose of waste through CHC's designated hazardous waste contractor (EMT).

9. MSDS Location

- a. Available in lab
- b. Available through Chemical Hygiene Officer
- c. Available through manufacturer's website



Phenol

1. Process

- a. General handling of Phenol (5%)

2. Describe process, hazardous chemical, or hazard class

- a. Toxic
- b. Severe body tissue irritant
- c. Combustible solid

3. Personal Protective Equipment

- a. If airborne exposures are suspected contact the CHEMICAL HYGIENE OFFICER for consultation. Phenol Exposure Assessments are recommended.
- b. Eye: Eye protection should be selected on potential for splash and exposure. *Minimum potential:* safety glasses with side shields when only low splash hazard exists (e.g. placing a tissue sample in a container). Chemical splash goggles should be worn if using or transferring larger quantities.
- c. Skin: Butyl or polyethylene gloves provide protection from incidental contact. Heavier gloves should be used when extended handling of contaminated or preserved materials or immersion is likely. A chemically resistant apron should be used when transferring or using large quantities and splash is likely.

4. Engineering Controls

- a. Work with phenol only in a fume hood or with local exhaust ventilation.
- b. Use only in an area equipped with an emergency shower and eyewash.

5. Special Handling Procedures and Storage Requirements

- a. Read Material Safety Data Sheet (MSDS) prior to first use.
- b. Keep in a tightly closed container.
- c. Separate from strong oxidizers, acids, and halogens.
- d. Keep away from heat and flame.

6. Spill and Accident Procedures

- a. Small spills: Do not attempt cleanup if you feel unsure of your ability to do so or if you perceive the risk to be greater than normal laboratory operations. Absorb incidental spills. Collect and submit for waste disposal by CHC's designated hazardous waste contractor (EMT).
- b. Notify others in area. Evacuate room/immediate area. If splashed on an individual or in eyes flush for 15 minutes with copious quantities of water. Call CHEMICAL HYGIENE OFFICER, SITE SAFETY OFFICER (VP OF ADMINISTRATIVE SERVICES), OR DISTRICT POLICE (after hours) for emergency response. Prevent unnecessary entry until CHC emergency response team arrives. Provide assistance to CHEMICAL HYGIENE OFFICER/emergency response team as requested.
- c. Inhalation: Remove to fresh air. If breathing has stopped give artificial respiration immediately.
- d. Ingestion: If swallowed and the victim is conscious, give no more than 1 to 2 cups of water for dilution. Do not induce vomiting. Get medical attention immediately.
- e. Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.



- f. Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

7. Decontamination Procedures

- a. Wash surfaces thoroughly with soap and water.
- b. Contain decontamination materials for proper waste disposal by CHC's designated hazardous waste contractor (EMT).

8. Waste Disposal Procedures

- a. Phenol is a listed RCRA hazardous waste. Dispose of waste through CHC's designated hazardous waste contractor (EMT).

9. MSDS Location

- a. Available in lab
- b. Available through Chemical Hygiene Officer
- c. Available through manufacturer's website

Appendix D

Material Safety Data Sheets

FLINN SCIENTIFIC, INC.

Material Safety Data Sheet (MSDS)

MSDS #: 353.00

Revision Date: December 7, 2011

SECTION 1 — CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Formalin

Flinn Scientific, Inc. P.O. Box 219 Batavia, IL 60510 (800) 452-1261

CHEMTREC Emergency Phone Number: (800) 424-9300

SECTION 2 — COMPOSITION, INFORMATION ON INGREDIENTS

Formaldehyde (50-00-0) 3.7%, Methyl alcohol (67-56-1) 1.5%, Sodium phosphate monobasic (10049-21-5) <0.5%, Sodium phosphate dibasic anhydrous (7558-79-4) <1%, & water (7732-18-5) >93.3%.

CAS#: None established

SECTION 3 — HAZARDS IDENTIFICATION

Clear, colorless solution. Pungent formaldehyde odor.

Formaldehyde is a known human carcinogen (IARC-1). Contains methyl alcohol.

Irritant to body tissues. Moderately toxic by ingestion, inhalation, and skin absorption. Avoid contact with skin, eyes, and mucous membranes.

FLINN AT-A-GLANCE

Health-3

Flammability-0

Reactivity-1

Exposure-3

Storage-0

0 is low hazard, 3 is high hazard

SECTION 4 — FIRST AID MEASURES

Call a physician and seek medical attention for further treatment, observation, and support after first aid.

Inhalation: Remove to fresh air at once. If breathing has stopped, give artificial respiration immediately.

Eye or External: Immediately flush with fresh water for at least 15 minutes.

Internal: Rinse mouth. Give large quantities of water for dilution. Call a physician or poison control at once.

SECTION 5 — FIRE FIGHTING MEASURES

Nonflammable liquid. Contains methyl alcohol which may produce flammable vapors when heated.

NFPA CODE

None

established

SECTION 6 — ACCIDENTAL RELEASE MEASURES

Restrict unprotected personnel from the area and ventilate area. Contain the spill with sand or absorbent material and deposit in a sealed bag or container. See Sections 8 and 13 for further information.

SECTION 7 — HANDLING AND STORAGE

Flinn Suggested Chemical Storage Pattern: Organic #3. Store with hydrocarbons, esters, and aldehydes.

Use and dispense in a hood.

SECTION 8 — EXPOSURE CONTROLS, PERSONAL PROTECTION

Avoid contact with eyes, skin, and clothing. Wear chemical splash goggles, chemical-resistant gloves, and apron. Use ventilation to keep airborne concentrations below exposure limits. Always wear a NIOSH-approved respirator with proper cartridges or a PAPR when handling this material in emergency situations (spill or fire). **Odor threshold** formaldehyde 0.05 - 1 ppm. If the odor of formaldehyde is detected more ventilation is needed. Exposure guidelines: TWA 0.016 ppm (NIOSH)

SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES

Clear, colorless liquid.
Neutral and buffered.

Biological use: tissue fixative.

SECTION 10 — STABILITY AND REACTIVITY

Avoid contact with strong acids, strong bases, and strong oxidizers.
Shelf life: Indefinite, if stored properly.

SECTION 11 — TOXICOLOGICAL INFORMATION

Acute effects: Highly toxic, severe eye irritant, sensitizer.
Chronic effects: Pulmonary edema, possible carcinogen mutagen.
Target organs: Eyes, kidneys.

ORL-RAT LD₅₀: 100 mg/kg as formaldehyde
IHL-RAT LC₅₀: 203 mg/m³ as formaldehyde
SKN-RBT LD₅₀: 270 mg/kg as formaldehyde

N.A. = Not available, not all health aspects of this substance have been fully investigated.

SECTION 12 — ECOLOGICAL INFORMATION

Data not yet available.

SECTION 13 — DISPOSAL CONSIDERATIONS

Please review all federal, state and local regulations that may apply, before proceeding.
Flinn Suggested Disposal Method #2 is one option.

SECTION 14 — TRANSPORT INFORMATION

Shipping name: N/A
Hazard class: N/A
UN number: N/A
N/A = Not applicable

SECTION 15 — REGULATORY INFORMATION

Not listed.

SECTION 16 — OTHER INFORMATION

This Material Safety Data Sheet (MSDS) is for guidance and is based upon information and tests believed to be reliable. Flinn Scientific, Inc. makes no guarantee of the accuracy or completeness of the data and shall not be liable for any damages relating thereto. The data is offered solely for your consideration, investigation, and verification. The data should not be confused with local, state, federal or insurance mandates, regulations, or requirements and CONSTITUTE NO WARRANTY. Any use of this data and information must be determined by the science instructor to be in accordance with applicable local, state or federal laws and regulations. The conditions or methods of handling, storage, use and disposal of the product(s) described are beyond the control of Flinn Scientific, Inc. and may be beyond our knowledge. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH THE HANDLING, STORAGE, USE OR DISPOSAL OF THIS PRODUCT(S).

**Consult your copy of the *Flinn Science Catalog/Reference Manual*
for additional information about laboratory chemicals.**

Cadaver solution from Loma Linda

5% Propylene Glycol

5% Formalin (of 37% formaldehyde) or (1.85% formaldehyde)

5% Phenol

10% Isopropanol Alcohol

75% Water

Wetting solution used at CHC

0.5% Propionic Acid

1% Glycerin

98.5% Deionized Water

FLINN SCIENTIFIC INC.

"Your Safer Source for Science Supplies"

Material Safety Data Sheet (MSDS)

MSDS #: 659.00

Revision Date: March 10, 2001

Section 1 — Chemical Product and Company Identification

1,2-Propanediol

Flinn Scientific, Inc. P.O. Box 219 Batavia, IL 60510 (800) 452-1261

CHEMTREC Emergency Phone Number: (800) 424-9300

Section 2 — Composition, Information on Ingredients

1,2-Propanediol

Synonym: propylene glycol

CAS#: 57-55-6

Section 3 — Hazards Identification

Colorless, odorless, viscous liquid.

Irritating to body tissues. Avoid all body tissue contact.

Combustible liquid.

FLINN AT-A-GLANCE

Health-0

Flammability-1

Reactivity-0

Exposure-1

Storage-1

0 is low hazard, 3 is high hazard

Section 4 — First Aid Measures

Call a physician, seek medical attention for further treatment, observation and support after first aid.

Inhalation: Remove to fresh air at once. If breathing has stopped give artificial respiration immediately.

Eye: Immediately flush with fresh water for 15 minutes.

External: Wash continuously with fresh water for 15 minutes.

Internal: Induce vomiting. Call a physician or poison control at once.

Section 5 — Fire Fighting Measures

Class IIIB Combustible liquid.

Flash Point: 225 F UEL: 12.5% LEL: 2.6% Autoignition Temperature: 779 F

Fire Fighting Instructions: Use triclass, dry chemical fire extinguisher. Firefighters should wear PPE and SCBA with full facepiece operated in positive pressure mode.

NFPA CODE

H-0

F-1

R-0

Section 6 — Accidental Release Measures

Restrict unprotected personnel from area and ventilate area. Contain spill with sand or absorbent material; deposit in sealed bag or container. See Sections 8 and 13 for further information.

Section 7 — Handling and Storage

Flinn Suggested Chemical Storage Pattern: Organic #2. Store with alcohols, glycols, amines and amides.

Keep container tightly closed. Store in a cool dry place. Deliquescent, store in Flinn Chem-Saf Bag.

Section 8 — Exposure Controls, Personal Protection

Avoid contact with eyes, skin and clothing. Wear chemical splash goggles, chemical-resistant gloves and chemical-resistant apron.

Use exhaust ventilation to keep airborne concentrations low.

Section 9 — Physical and Chemical Properties

Colorless, odorless, viscous liquid.
Solubility: Miscible with water and many organic solvents.
Formula: CH₃CHOHCH₂OH
Formula Weight: 76.11

Specific Gravity: 1.0381
Melting Point: -60 C
Boiling Point: 187 C
Vapor Pressure: 0.08mm (20 C)

Section 10 — Stability and Reactivity

Avoid contact with acid chlorides, acid anhydrides, oxidizers, chloroformates, reducers, and any source of ignition.
Shelf life: Hygroscopic.

Section 11 — Toxicological Information

Acute effects: G.I. disturbances, nausea, headache, vomiting, irritant
Chronic effects: CNS depression
Target organs: N.A.

ORL-RAT LD50: 20 gm/kg
IHL-RAT LC50: N.A.
SKN-RBT LD50: 20800 mg/kg

N.A. = Not available, not all health aspects of this substance have been fully investigated.

Section 12 — Ecological Information

Data not yet available.

Section 13 — Disposal Considerations

Please consult with state and local regulations.
Flinn Suggested Disposal Method 18b is one option.

Section 14 — Transport Information

Shipping Name: Not regulated
Hazard Class: N/A
UN Number: N/A

N/A = Not applicable

Section 15 — Regulatory Information

TSCA-listed, EINECS-listed (200-338-0).

Section 16 — Other Information

Consult your copy of the Flinn Scientific Catalog/Reference Manual for additional information about laboratory chemicals. This Material Safety Data Sheet (MSDS) is for guidance and is based upon information and tests believed to be reliable. Flinn Scientific Inc. makes no guarantee of the accuracy or completeness of the data and shall not be liable for any damages relating thereto. The data is offered solely for your consideration, investigation, and verification. Flinn Scientific Inc. assumes no legal responsibility for use or reliance upon this data.

FLINN SCIENTIFIC INC.**"Your Safer Source for Science Supplies"**

*Questions on Chemical Disposal
or Storage?--Call Flinn*

flinn@flinnsci.com www.flinnsci.com
P.O. Box 219 Batavia IL 60510
(800) 452-1261 Fax (866) 452-1436

FLINN SCIENTIFIC, INC.

Material Safety Data Sheet (MSDS)

MSDS #: 352.00

Revision Date: May 20, 2008

SECTION 1 — CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Formaldehyde

Flinn Scientific, Inc. P.O. Box 219 Batavia, IL 60510 (800) 452-1261

CHEMTREC Emergency Phone Number: (800) 424-9300

SECTION 2 — COMPOSITION, INFORMATION ON INGREDIENTS

Formaldehyde (50-00-0) 37%, Methyl Alcohol (67-56-1) 6-15%, Water (7732-18-5) 48-57%.

Synonym: Formalin

CAS#: 50-00-0

SECTION 3 — HAZARDS IDENTIFICATION

Colorless liquid; pungent odor.

Highly toxic by ingestion, inhalation, and skin absorption; severe body tissue irritant. Avoid all body contact. Formaldehyde vapor is a known carcinogen to humans.

FLINN AT-A-GLANCE

Health-3

Flammability-1

Reactivity-2

Exposure-3

Storage-0

0 is low hazard, 3 is high hazard

SECTION 4 — FIRST AID MEASURES

Call a physician, seek medical attention for further treatment, observation and support after first aid.

Inhalation: Remove to fresh air at once. If breathing has stopped give artificial respiration immediately.

Eye: Immediately flush with fresh water for 15 minutes.

External: Wash continuously with fresh water for 15 minutes.

Internal: Rinse out mouth, give 1 to 2 cups of water or milk, induce vomiting. After vomiting, give mixture of 2 Tbs. of activated charcoal mixed with one cup of water. Call a physician or poison control at once.

SECTION 5 — FIRE FIGHTING MEASURES

Class IIIA combustible liquid.

When heated to decomposition, emits smoke and fumes. Suspected carcinogen.

Flash Point: 133 F Upper: 73% Lower: 7% Autoignition Temperature: 572 F

Fire Fighting Instructions: Use triclass, dry chemical fire extinguisher. Firefighters should wear PPE and SCBA with full facepiece operated in positive pressure mode.

NFPA CODE

H-3

F-2

R-0

SECTION 6 — ACCIDENTAL RELEASE MEASURES

Restrict unprotected personnel from area and ventilate area. Contain spill with sand or absorbent material; deposit in sealed bag or container. See Sections 8 and 13 for further information.

SECTION 7 — HANDLING AND STORAGE

Flinn Suggested Chemical Storage Pattern: Organic #3. Store with hydrocarbons, esters and aldehydes.

Use and dispense in a hood.

SECTION 8 — EXPOSURE CONTROLS, PERSONAL PROTECTION

Avoid contact with eyes, skin and clothing. Wear chemical splash goggles, chemical-resistant gloves and chemical-resistant apron. Use ventilation to keep airborne concentrations below exposure limits. Always wear a NIOSH-approved respirator with proper cartridges or a positive pressure, air-supplied respirator when handling this material in emergency situations (spill or fire).

Exposure guidelines: TWA 0.016 ppm (NIOSH)

SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES

Colorless liquid; pungent odor.
Solubility: Soluble: water and alcohol.
37% Formaldehyde gas in water.
Formula: HCHO
Formula Weight: 30.03

Specific Gravity: 1.1
Flash Point: 50 C (122 F)

SECTION 10 — STABILITY AND REACTIVITY

Avoid contact with strong acids, strong bases, strong oxidizers.
Shelf Life: Fair. Slowly polymerizes to polyformaldehyde.

SECTION 11 — TOXICOLOGICAL INFORMATION

Acute effects: Highly toxic, severe eye irritant, sensitizer
Chronic effects: Pulmonary edema, carcinogen, mutagen
Target organs: Eyes, kidneys. Effects may be delayed.

ORL-RAT LD50: 100 mg/kg
IHL-RAT LC50: 203 mg/m3
SKN-RBT LD50: 270 mg/kg

N.A. = Not available, not all health aspects of this substance have been fully investigated.

SECTION 12 — ECOLOGICAL INFORMATION

Data not yet available.

SECTION 13 — DISPOSAL CONSIDERATIONS

Please consult with state and local regulations before disposal.
Flinn Suggested Disposal Method #2 is one option.

SECTION 14 — TRANSPORT INFORMATION

Shipping Name: Formaldehyde, solutions
Hazard Class: 8, Corrosive
UN Number: UN2209
N/A = Not applicable

SECTION 15 — REGULATORY INFORMATION

TSCA-listed, EINECS-listed (200-001-8), RCRA code U122.

SECTION 16 — OTHER INFORMATION

This Material Safety Data Sheet (MSDS) is for guidance and is based upon information and tests believed to be reliable. Flinn Scientific, Inc. makes no guarantee of the accuracy or completeness of the data and shall not be liable for any damages relating thereto. The data is offered solely for your consideration, investigation, and verification. The data should not be confused with local, state, federal or insurance mandates, regulations, or requirements and CONSTITUTE NO WARRANTY. Any use of this data and information must be determined by the science instructor to be in accordance with applicable local, state or federal laws and regulations. The conditions or methods of handling, storage, use and disposal of the product(s) described are beyond the control of Flinn Scientific, Inc. and may be beyond our knowledge. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH THE HANDLING, STORAGE, USE OR DISPOSAL OF THIS PRODUCT(S).

**Consult your copy of the Flinn Chemical Catalog/Reference Manual
for additional information about laboratory chemicals**

FLINN SCIENTIFIC INC.

"Your Safer Source for Science Supplies"

Material Safety Data Sheet (MSDS)

MSDS #: 586.00

Revision Date: March 14, 2001

Section 1 — Chemical Product and Company Identification

Phenol

Flinn Scientific, Inc. P.O. Box 219 Batavia, IL 60510 (800) 452-1261

CHEMTREC Emergency Phone Number: (800) 424-9300

Section 2 — Composition, Information on Ingredients

Phenol

Synonyms: carbolic acid, hydroxybenzene

CAS#: 108-95-2

Section 3 — Hazards Identification

White crystalline mass or loose crystals or liquefied. Disinfectant-like odor.
Highly toxic by ingestion, inhalation, or skin contact. Severe body tissue irritant.
Contact with phenol may cause a severe blistering skin effect. Phenol in contact with more than 100 sq. in. of skin is absorbed so quickly that it may be fatal in 90 seconds.
Avoid all body tissue contact.
Combustible solid.

FLINN AT-A-GLANCE

Health-3
Flammability-1
Reactivity-1
Exposure-3
Storage-3

0 is low hazard, 3 is high hazard

Section 4 — First Aid Measures

Call a physician, seek medical attention for further treatment, observation and support after first aid.
Inhalation: Remove to fresh air at once. If breathing has stopped give artificial respiration immediately.
Eye: Immediately flush with fresh water for 15 minutes.
External: Wash continuously with fresh water for 15 minutes.
Internal: Give no more than 1-2 cups of water for dilution. Do not induce vomiting. Call a physician or poison control at once.

Section 5 — Fire Fighting Measures

Combustible solid.
Phenol, when heated, forms explosive mixtures with air.
Flash Point: 175 F Upper: 8.6% Lower: 1.7% Autoignition Temperature: 1319 F
Fire Fighting Instructions: Use triclass, dry chemical fire extinguisher. Firefighters should wear PPE and SCBA with full facepiece operated in positive pressure mode.

NFPA CODE

H-3
F-2
R-0

Section 6 — Accidental Release Measures

Restrict unprotected personnel from area. Remove all ignition sources and ventilate area. Sweep up (if liquid, contain spill with sand and absorbent material), place in sealed bag or container and dispose. Ventilate area and wash spill site after material pickup is complete. See Sections 8 and 13 for further information.

Section 7 — Handling and Storage

Flinn Suggested Chemical Storage Pattern: Organic #8. Store with phenols and cresols. Store in a poisons cabinet.
Store in a Flinn Chem-Saf bag. Use and dispense in a hood.

Section 8 — Exposure Controls, Personal Protection

Avoid contact with eyes, skin and clothing. Wear chemical splash goggles, chemical-resistant gloves and chemical-resistant apron.
Use ventilation to keep airborne concentrations below exposure limits. Always wear a NIOSH-approved respirator with proper cartridges or a positive pressure, air-supplied respirator when handling this material in emergency situations (spill or fire).
Exposure guidelines: TWA 5 ppm (OSHA)

Material Safety Data Sheet (MSDS)

Phenol

MSDS #: 586.00

Revision Date: March 14, 2001

Section 9 — Physical and Chemical Properties

White crystalline mass or loose crystals or liquefied.
Disinfectant-like odor.
Soluble in water and several organic solvents including alcohol.
Formula: C₆H₅OH
Formula Weight: 94.11

Specific Gravity: 1.07
Melting Point: 42.5-43 C
Boiling Point: 182 C
Vapor Pressure: 0.36mm (20 C)
Vapor Density: 3.24

Section 10 — Stability and Reactivity

Avoid contact with strong oxidizing agents, strong bases, strong acids.
Shelf Life: Fair to poor. Changes color on exposure to light; absorbs water from air and liquifies.

Section 11 — Toxicological Information

Acute effects: Highly toxic, vesicant
Chronic effects: Dermatitis
Target organs: Liver, kidneys, nervous system, spleen

ORL-RAT LD50: 317 mg/kg
IHL-RAT LC50: 316 mg/m³
SKN-RBT LD50: 669 mg/kg

N.A. = Not available, not all health aspects of this substance have been fully investigated.

Section 12 — Ecological Information

Data not yet available.

Section 13 — Disposal Considerations

Please consult with state and local regulations.
Flinn Suggested Disposal Method #24a is one option.

Section 14 — Transport Information

Shipping Name: Phenol, solid
Hazard Class: 6.1, Poison
UN Number: UN1671

N/A = Not applicable

Section 15 — Regulatory Information

TSCA-listed, EINECS-listed (203-632-7), RCRA code U188.

Section 16 — Other Information

Consult your copy of the Flinn Scientific Catalog/Reference Manual for additional information about laboratory chemicals. This Material Safety Data Sheet (MSDS) is for guidance and is based upon information and tests believed to be reliable. Flinn Scientific Inc. makes no guarantee of the accuracy or completeness of the data and shall not be liable for any damages relating thereto. The data is offered solely for your consideration, investigation, and verification. Flinn Scientific Inc. assumes no legal responsibility for use or reliance upon this data.

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FLINN SCIENTIFIC INC.

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Material Safety Data Sheet (MSDS)

MSDS #: 420.00

Revision Date: March 14, 2001

Section 1 — Chemical Product and Company Identification

Isopropyl Alcohol

Flinn Scientific, Inc. P.O. Box 219 Batavia, IL 60510 (800) 452-1261

CHEMTREC Emergency Phone Number: (800) 424-9300

Section 2 — Composition, Information on Ingredients

Isopropyl Alcohol

Synonym: 2-propanol, rubbing alcohol

CAS#: 67-63-0

Section 3 — Hazards Identification

Clear colorless liquid; distinctive odor; like rubbing alcohol.

Irritant to body tissues. Slightly toxic by ingestion, inhalation, and skin absorption.

The single lethal dose for a human adult is about 250 mL, although as little as 100 mL can be fatal.

Class 1B flammable liquid.

FLINN AT-A-GLANCE

Health-1

Flammability-3

Reactivity-1

Exposure-1

Storage-3

0 is low hazard, 3 is high hazard

Section 4 — First Aid Measures

Call a physician, seek medical attention for further treatment, observation and support after first aid.

Inhalation: Remove to fresh air at once. If breathing has stopped give artificial respiration immediately.

Eye: Immediately flush with fresh water for 15 minutes.

External: Wash continuously with fresh water for 15 minutes.

Internal: Induce vomiting. Call a physician or poison control at once.

Section 5 — Fire Fighting Measures

Class 1B flammable liquid.

Flash Point: 60 F Upper: 12% Lower: 2.5% Autoignition Temperature: 860 F

When heated to decomposition, emits acrid smoke and fumes.

Fire Fighting Instructions: Use triclass, dry chemical fire extinguisher. Firefighters should wear PPE and SCBA with full facepiece operated in positive pressure mode.

NFPA CODE

H-1

F-3

R-0

Section 6 — Accidental Release Measures

Restrict unprotected personnel from area. Remove all ignition sources and ventilate area. Contain spill with sand and absorbent material; deposit in sealed bag or container. See Sections 8 and 13 for further information.

Section 7 — Handling and Storage

Flinn Suggested Chemical Storage Pattern: Organic #2. Store with alcohols, glycols, amines and amides.

Store in a dedicated flammables cabinet. If a flammables cabinet is not available, store in Flinn Saf-Stor can.

Store in a cool dry place. Use and dispense in a hood. Avoid prolonged storage (see section 10).

Section 8 — Exposure Controls, Personal Protection

Avoid contact with eyes, skin and clothing. Wear chemical splash goggles, chemical-resistant gloves and chemical-resistant apron.

Use ventilation to keep airborne concentrations below exposure limits. Always wear a NIOSH-approved respirator with proper cartridges or a positive pressure, air-supplied respirator when handling this material in emergency situations (spill or fire).

Exposure guidelines: TWA 400 ppm, STEL 500 ppm (OSHA, ACGIH)

FLINN SCIENTIFIC INC.

"Your Safer Source for Science Supplies"

Material Safety Data Sheet (MSDS)

Isopropyl Alcohol

MSDS #: 420.00

Revision Date: March 14, 2001

Section 9 — Physical and Chemical Properties

Clear colorless liquid.
Solubility: Water soluble, soluble in alcohol and ether.
Formula: C₃H₈O
Formula Weight: 60.11

Specific Gravity: 0.7863
Melting Point: -89 C
Boiling Point: 82.4 C
Vapor Pressure: 33 mm (20C)
Vapor Density: 2

Section 10 — Stability and Reactivity

Avoid contact with strong oxidizers, acetaldehyde, chlorine, ethylene oxide, acids, isocyanates.
Shelf life: Poor, organic peroxide development is possible when exposed to light and air. Organic peroxides can result in explosions, especially when distilled. Avoid prolonged storage.

Section 11 — Toxicological Information

Acute effects: Severe eye irritant, nausea, headache, vomiting
Chronic effects: N.A.
Target organs: Nerves, kidneys

ORL-RAT LD50: 5045 mg/kg
IHL-RAT LC50: N.A.
SKN-RBT LD50: 12800 mg/kg

N.A. = Not available, not all health aspects of this substance have been fully investigated.

Section 12 — Ecological Information

Data not yet available.

Section 13 — Disposal Considerations

Please consult with state and local regulations.
Flinn Suggested Disposal Method #18a is one option.

Section 14 — Transport Information

Shipping Name: Isopropyl alcohol
Hazard Class: 3, Flammable liquid
UN Number: UN1219

N/A = Not applicable

Section 15 — Regulatory Information

TSCA-listed, EINECS-listed (200-661-7), RCRA code D001.

Section 16 — Other Information

Consult your copy of the Flinn Scientific Catalog/Reference Manual for additional information about laboratory chemicals. This Material Safety Data Sheet (MSDS) is for guidance and is based upon information and tests believed to be reliable. Flinn Scientific Inc. makes no guarantee of the accuracy or completeness of the data and shall not be liable for any damages relating thereto. The data is offered solely for your consideration, investigation, and verification. Flinn Scientific Inc. assumes no legal responsibility for use or reliance upon this data.

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flinn@flinnsci.com www.flinnsci.com
P.O. Box 219 Batavia IL 60510
(800) 452-1261 Fax (866) 452-1436

FLINN SCIENTIFIC, INC.

Material Safety Data Sheet (MSDS)

MSDS #: 660.00

Revision Date: December 5, 2007

SECTION 1 — CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Propionic Acid

Flinn Scientific, Inc. P.O. Box 219 Batavia, IL 60510 (800) 452-1261

CHEMTREC Emergency Phone Number: (800) 424-9300

SECTION 2 — COMPOSITION, INFORMATION ON INGREDIENTS

Propionic Acid

Synonym: propanoic acid

CAS#: 79-09-4

SECTION 3 — HAZARDS IDENTIFICATION

Colorless, oily liquid; rancid odor.

Moderately toxic by ingestion, inhalation, and skin absorption. Corrosive to body tissues. Avoid all body tissue contact.

Combustible liquid.

FLINN AT-A-GLANCE

Health-2

Flammability-1

Reactivity-1

Exposure-2

Storage-0

0 is low hazard, 3 is high hazard

SECTION 4 — FIRST AID MEASURES

Call a physician, seek medical attention for further treatment, observation and support after first aid.

Inhalation: Remove to fresh air at once. If breathing has stopped give artificial respiration immediately.

Eye: Immediately flush with fresh water for 15 minutes.

External: Wash continuously with fresh water for 15 minutes.

Internal: Give 1 to 2 cups of water or milk, followed by a gastric antacid, such as milk of magnesia. Do not induce vomiting. Call a physician or poison control at once.

SECTION 5 — FIRE FIGHTING MEASURES

Class II combustible liquid.

Flash Point: 125 F UEL: 12.1% LEL: 2.9% Autoignition Temperature: 955 F

Fire Fighting Instructions: Use triclass, dry chemical fire extinguisher. Firefighters should wear PPE and SCBA with full facepiece operated in positive pressure mode.

NFPA CODE

H-2

F-2

R-0

SECTION 6 — ACCIDENTAL RELEASE MEASURES

Restrict unprotected personnel from area. Remove all ignition sources and ventilate area. Contain spill with sand and absorbent material, neutralize with sodium bicarbonate or calcium hydroxide and deposit in sealed bag or container. See Sections 8 and 13 for further information.

SECTION 7 — HANDLING AND STORAGE

Flinn Suggested Chemical Storage Pattern: Organic #1. Store with acids, anhydrides and peracids.

Store in a cool dry place. Use and dispense in a hood.

SECTION 8 — EXPOSURE CONTROLS, PERSONAL PROTECTION

Avoid contact with eyes, skin and clothing. Wear chemical splash goggles, chemical-resistant gloves and chemical-resistant apron.

Use ventilation to keep airborne concentrations below exposure limits. Always wear a NIOSH-approved respirator with proper cartridges or a positive pressure, air-supplied respirator when handling this material in emergency situations (spill or fire).

Exposure guidelines: TWA 10 ppm, STEL 15 ppm (NIOSH, NIOSH)

SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES

Colorless, oily liquid, rancid odor.	Specific Gravity: 0.9942
Solubility: Soluble in water, alcohol and other organic solvents.	Melting Point: -23 C
Formula: CH ₃ CH ₂ COOH	Boiling Point: 141 C
Formula Weight: 74.09	Vapor Pressure: 2.4 mm (20 C)
	Vapor Density: 2.55

SECTION 10 — STABILITY AND REACTIVITY

Avoid contact with bases, strong oxidizing agents and reducing agents.
Shelf life: Indefinite.

SECTION 11 — TOXICOLOGICAL INFORMATION

Acute effects: Toxic, corrosive	ORL-RAT LD50: 2600 mg/kg
Chronic effects: N.A.	IHL-RAT LC50: N.A.
Target organs: N.A.	SKN-RBT LD50: 500 mg/kg

N.A. = Not available, not all health aspects of this substance have been fully investigated.

SECTION 12 — ECOLOGICAL INFORMATION

Data not yet available.

SECTION 13 — DISPOSAL CONSIDERATIONS

Please consult with state and local regulations.
Flinn Suggested Disposal Method #24a is one option.

SECTION 14 — TRANSPORT INFORMATION

Shipping Name: Propionic Acid
Hazard Class: 8, Corrosive
UN Number: UN3463
N/A = Not applicable

SECTION 15 — REGULATORY INFORMATION

TSCA-listed, EINECS-listed (201-176-3), RCRA code D001, D002.

SECTION 16 — OTHER INFORMATION

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**Consult your copy of the Flinn Chemical Catalog/Reference Manual
for additional information about laboratory chemicals**

FLINN SCIENTIFIC INC.

"Your Safer Source for Science Supplies"

Material Safety Data Sheet (MSDS)

MSDS #: 373.00

Revision Date: March 8, 2001

Section 1 — Chemical Product and Company Identification

Glycerin

Flinn Scientific, Inc. P.O. Box 219 Batavia, IL 60510 (800) 452-1261

CHEMTREC Emergency Phone Number: (800) 424-9300

Section 2 — Composition, Information on Ingredients

Glycerin

Synonym: glycerol

CAS#: 56-81-5

Section 3 — Hazards Identification

Clear, colorless, odorless, viscous liquid.

May cause slight eye irritation. Avoid all body tissue contact, possible allergen.

Combustible liquid.

FLINN AT-A-GLANCE

Health-0

Flammability-1

Reactivity-2

Exposure-1

Storage-0

0 is low hazard, 3 is high hazard

Section 4 — First Aid Measures

Call a physician, seek medical attention for further treatment, observation and support after first aid.

Inhalation: Remove to fresh air at once. If breathing has stopped give artificial respiration immediately.

Eye: Immediately flush with fresh water for 15 minutes.

External: Wash continuously with fresh water for 15 minutes.

Internal: Induce vomiting. Call a physician or poison control at once.

Section 5 — Fire Fighting Measures

Class IIIB combustible liquid.

Flash point: 390 F Autoignition Temperature: 698 F

When heated to decomposition, it emits toxic fumes of acrolein.

Fire Fighting Instructions: Use triclass, dry chemical fire extinguisher. Firefighters should wear PPE and SCBA with full facepiece operated in positive pressure mode.

NFPA CODE

H-1

F-1

R-0

Section 6 — Accidental Release Measures

Restrict unprotected personnel from area and ventilate area. Contain spill with sand or absorbent material; deposit in sealed bag or container. See Sections 8 and 13 for further information.

Section 7 — Handling and Storage

Flinn Suggested Chemical Storage Pattern: Organic #2. Store with alcohols, glycols, amines and amides.

Store in a cool dry place.

Section 8 — Exposure Controls, Personal Protection

Avoid contact with eyes, skin and clothing. Wear chemical splash goggles, chemical-resistant gloves and chemical-resistant apron.

Use ventilation to keep airborne concentrations below exposure limits. Always wear a NIOSH-approved respirator with proper cartridges or a positive pressure, air-supplied respirator when handling this material in emergency situations (spill or fire).

Exposure guidelines: TWA 10 mg/m³ (ACGIH)

FLINN SCIENTIFIC INC.

"Your Safer Source for Science Supplies"

Material Safety Data Sheet (MSDS)

Glycerin

MSDS #: 373.00

Revision Date: March 8, 2001

Section 9 — Physical and Chemical Properties

Clear, colorless, odorless, viscous liquid.
Solubility: Soluble in water and alcohol.
Formula: $C_3H_5(OH)_3$
Formula Weight: 92.10

Specific Gravity: 1.23-1.26
Melting Point: 18 C
Boiling Point: 290 C

Section 10 — Stability and Reactivity

Avoid contact with strong oxidizing agents such as chromium trioxide, potassium chlorate, or potassium permanganate may produce an explosion.
Shelf Life: Indefinite.

Section 11 — Toxicological Information

Acute effects: Eye irritant, nausea, headache, vomiting
Chronic effects: N.A.
Target organs: N.A.

ORL-RAT LD50: 12600 mg/kg
IHL-RAT LC50: N.A.
SKN-RBT LD50: N.A.

N.A. = Not available, not all health aspects of this substance have been fully investigated.

Section 12 — Ecological Information

Data not yet available.

Section 13 — Disposal Considerations

Please consult with state and local regulations.
Flinn Suggested Disposal Method #26b is one option.

Section 14 — Transport Information

Shipping Name: Not regulated
Hazard Class: N/A
UN Number: N/A

N/A = Not applicable

Section 15 — Regulatory Information

TSCA-listed, EINECS-listed (200-289-5).

Section 16 — Other Information

Consult your copy of the Flinn Scientific Catalog/Reference Manual for additional information about laboratory chemicals. This Material Safety Data Sheet (MSDS) is for guidance and is based upon information and tests believed to be reliable. Flinn Scientific Inc. makes no guarantee of the accuracy or completeness of the data and shall not be liable for any damages relating thereto. The data is offered solely for your consideration, investigation, and verification. Flinn Scientific Inc. assumes no legal responsibility for use or reliance upon this data.

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FLINN SCIENTIFIC, INC.

Material Safety Data Sheet (MSDS)

MSDS #: 586.00

Revision Date: November 16, 2010

SECTION 1 — CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Phenol

Flinn Scientific, Inc. P.O. Box 219 Batavia, IL 60510 (800) 452-1261

CHEMTREC Emergency Phone Number: (800) 424-9300

SECTION 2 — COMPOSITION, INFORMATION ON INGREDIENTS

Phenol

Synonyms: carbolic acid, hydroxybenzene

CAS#: 108-95-2

SECTION 3 — HAZARDS IDENTIFICATION

White crystalline mass or loose crystals may be liquefied with a small amount of water. Disinfectant-like odor.

Highly toxic by ingestion, inhalation, or skin contact. Severe body tissue irritant.

Contact with phenol may cause a severe blistering skin effect. Phenol in contact with more than 100 sq. in. of skin is absorbed so quickly that it may be fatal in 90 seconds.

Avoid all body tissue contact.

FLINN AT-A-GLANCE

Health-3

Flammability-1

Reactivity-1

Exposure-3

Storage-3

0 is low hazard, 3 is high hazard

SECTION 4 — FIRST AID MEASURES

Call a physician and seek medical attention for further treatment, observation and support after first aid.

Inhalation: Remove to fresh air at once. If breathing has stopped give artificial respiration immediately.

Eye: Immediately flush with fresh water for 15 minutes.

External: Remove phenol with isopropyl alcohol or undiluted polyethylene glycol (300-400 MW), if available, then wash continuously with SOAPY water for 15 minutes. Water alone may be harmful.

Internal: Do NOT give water. Do not induce vomiting. Call a physician or poison control at once. Water may enhance absorption.

SECTION 5 — FIRE FIGHTING MEASURES

Combustible solid.

Flash Point: 79 °C Flammable limits: Lower: 1.7% Upper: 8.6% Autoignition Temperature: 715 °C

Phenol, when heated, forms explosive mixtures with air.

Fire Fighting Instructions: Use triclass, dry chemical fire extinguisher. Firefighters should wear PPE and SCBA with full facepiece operated in positive pressure mode.

NFPA CODE

H-3

F-2

R-0

SECTION 6 — ACCIDENTAL RELEASE MEASURES

Restrict unprotected personnel from area. Remove all ignition sources and ventilate area. Sweep up (if liquid, contain spill with sand and absorbent material), place in sealed bag or container and dispose. Ventilate area and wash spill site after material pickup is complete. See Sections 8 and 13 for further information.

SECTION 7 — HANDLING AND STORAGE

Flinn Suggested Chemical Storage Pattern: Organic #8. Store with phenols and cresols. Store in a poisons cabinet.

Store in a Flinn Chem-Saf bag. Use and dispense in a hood.

SECTION 8 — EXPOSURE CONTROLS, PERSONAL PROTECTION

Avoid contact with eyes, skin, and clothing. Wear chemical splash goggles, Neoprene gloves, and chemical-resistant apron. Use ventilation to keep airborne concentrations below exposure limits. Always wear a NIOSH-approved respirator with proper cartridges or a positive pressure, air-supplied respirator when handling this material in emergency situations (spill or fire).

Exposure guidelines: PEL 5 ppm (OSHA) Readily absorbed through the skin.

SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES

White crystalline mass, loose crystals or liquefied.
Disinfectant-like odor.
Soluble in water and organic solvents, including alcohol.
Formula: C_6H_5OH
Formula Weight: 94.11

Boiling Point: 182 °C
Melting Point: 42.5-43 °C
Specific Gravity: 1.07
Vapor Density: 3.24 (Air=1)
Vapor Pressure: 0.35 mmHg @ 25 °C

SECTION 10 — STABILITY AND REACTIVITY

Avoid contact with strong oxidizing agents, strong bases, strong acids.
Shelf Life: Fair to poor. Changes color on exposure to light; absorbs water from air and liquifies.

SECTION 11 — TOXICOLOGICAL INFORMATION

Acute effects: Highly toxic, blistering agent, absorbed through skin	ORL-RAT LD ₅₀ : 317 mg/kg
Chronic effects: Dermatitis	IHL-RAT LC ₅₀ : 316 mg/m ³
Target organs: Liver, kidneys, nervous system, spleen	SKN-RBT LD ₅₀ : 850 mg/kg

N.A. = Not available, not all health aspects of this substance have been fully investigated.

SECTION 12 — ECOLOGICAL INFORMATION

Data not yet available.

SECTION 13 — DISPOSAL CONSIDERATIONS

Please consult with state and local regulations.
Flinn Suggested Disposal Method #24a is one option.

SECTION 14 — TRANSPORT INFORMATION

Shipping Name: Phenol, solid
Hazard Class: 6.1, Poison
UN Number: UN1671
N/A = Not applicable

SECTION 15 — REGULATORY INFORMATION

TSCA-listed, EINECS-listed (203-632-7), RCRA code U188.

SECTION 16 — OTHER INFORMATION

This Material Safety Data Sheet (MSDS) is for guidance and is based upon information and tests believed to be reliable. Flinn Scientific, Inc. makes no guarantee of the accuracy or completeness of the data and shall not be liable for any damages relating thereto. The data is offered solely for your consideration, investigation, and verification. The data should not be confused with local, state, federal or insurance mandates, regulations, or requirements and CONSTITUTE NO WARRANTY. Any use of this data and information must be determined by the science instructor to be in accordance with applicable local, state or federal laws and regulations. The conditions or methods of handling, storage, use and disposal of the product(s) described are beyond the control of Flinn Scientific, Inc. and may be beyond our knowledge. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH THE HANDLING, STORAGE, USE OR DISPOSAL OF THIS PRODUCT(S).

**Consult your copy of the *Flinn Science Catalog/Reference Manual*
for additional information about laboratory chemicals.**

S A S C O C H E M I C A L G R O U P
M A T E R I A L S A F E T Y D A T A S H E E T
I N F U T R A C E

Date Printed: May 19, 2009

MSDS Effective Date : 19 MAY 09

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SECTION 1 - COMPANY IDENTIFICATION

PRODUCED BY : Sasco chemical Group, Inc.
827 Pine Ave. / P.O. Box 45
Albany, GA 31702-0045

SOLD BY:

24 Hour Emergency Telephone Number: Sasco Chemical Group, Inc. (229) 435-8394

This MSDS sheet is provided to you pursuant to 29 CFR, 1910.1200, the
"OSHA Hazard Communication Standard".

This Data Sheet contains confidential product information as well as
information regarding personal safety, emergency response for spills
of this product, and other environmental information.

This information is for use in your facility for the intended purpose
only, and is not for release to individuals outside of your facility,
or to other suppliers for product comparison with out our express
written consent.

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SECTION 2 - PRODUCT IDENTIFICATION

Product Name : INFUTRACE

CAS # : MIXTURE

NFPA ----- : H-1 /F-0 /R-0 /OTHER-N/A

Chemical Name: N/A

Chemical Family: N/A

Formula ----- : PROPRIETARY

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SECTION 3 - TRANSPORTATION

D.O.T. Shipping Name : N/A

Hazard Classification: N/A

U.N. Number: N/A

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SECTION 4 - PHYSICAL DATA

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PHYSICAL DATA :

Boiling Point @ 760mm Hg: 200 'F

Freezing Point ----- : < 8 'F

Specific Gravity (H2O=1): 1.116

Water Solubility ----- : 100%

Vapor Pressure @ 20 C. : >1

Vapor Density, (Air=1) : N/D

V O C ----- % by Volume : 0%

Evaporation Rate : <1

pH : 3.11

(Butyl Acetate =1)

Appearance / Odor : Clear Liquid / Odorless

=====

SECTION 5 - ENVIRONMENTAL / REGULATORY DATA

SARA Reportability : NO

Report as cas # : N/A

Reportable % : N/A

Sect. 313 Reportability : NO

Report as cas # : N/A

Reportable % : N/A

RCRA Waste # : N/A

HAPS : N

TSCA - Components are Either Listed or Exempt ----- : Y

| DSL Listed or Exempt :

WHMIS Information: N/A

Subpart Z Status : No

Clean Air Act : No

Carcinogenicity : OSHA : No

NTP : No , IARC : No

RCRA Reportable Qty. : N/A

EINECS # : N/A

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SECTION 6 - HAZARDOUS INGREDIENTS

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TRADE SECRET AS PER 1910.1200

** ACTIVE PERCENT IN FORMULA: **

"NONYM: Information On This Ingredient Will Be Provided To Doctor

LD50 = N/A

ACGIH = N/A

TLV = N/A

PEL = N/A

STEL = N/A

NIOSH = N/A

IDLH = N/A

RTECS = N/A

CAS# = N/A

TSCA = N

Hazard: = N/A

HAPS % = N/A

VOC % = N/A

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SECTION 7 - FIRE & EXPLOSION HAZARDS

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** Flashpoint: NON FLAMM

** Flammable Limits by Air: N/A

** FIRE EXTINGUISHING METHOD:

Water Spray

Material Itself Is Not Combustible. If Involved In A Fire,
Choose Extinguishing Agent Most Suitable For Type Of
Surrounding Fire.Water: Be Careful Not To Spread Fire By Use Of Direct
Streams.

** FIRE FIGHTING PROTECTION:

Run-Off May Contain Hazardous Materials And Should Be
Controlled If Necessary.

Wear SCBA (Self Contained Breathing Apparatus)

** FIRE AND EXPLOSION HAZARDS:

Toxic Smoke And Fumes May Be Produced.

Violent Rupture Of Containers Due To Heat Is Possible.

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SECTION 8 - REACTIVITY DATA

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** Conditions To Avoid:

Contamination From Outside Sources May Affect The
Performance Of This Product.Mixing With Agents Listed Here May Cause An Unsafe
Reaction Or Give Off Toxic Gasses.

Keep Away From Fire, Open Flame, Or Any Heat Source.

Do Not Mix With Strong Oxidizers, Nitrites, Or Peroxides

** BYPRODUCTS OF DECOMPOSITION:

Oxides Of Nitrogen Formed.

** HAZARDOUS POLYMERIZATION: Will Not Occur.

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SECTION 9 - SPILL OR LEAK PROCEDURES:

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CONSULT SECTION XI FOR PROPER SAFETY EQUIPMENT

PERSONAL PROTECTION LEVELS MAY HAVE TO BE INCREASED ACCORDING
TO THE SIZE OF THE SPILL AND THE HAZARDS INVOLVED.DIKE SPILL AND PROTECT SEWER AND WATER INTAKES UNTIL YOU ARE SURE
OF THE HAZARDS AND SIZE OF THE SPILL AS PER 40 CFR

VENTILATE AREA, MONITOR AIR FOR ACCUMULATION OF HAZARDOUS VAPORS

NOTIFY PROPER AUTHORITIES IF REQUIRED / FOLLOW ENVIRONMENTAL REGULATIONS
Carefully Neutralize With Weak Alkali Solution.

"SASCO Acid Handler" Will Safely Solidify And Neutralize

Small Spills And Residue Of This Product And Will Aid In
The Cleanup Of The Spill.

Rinse Residue Down The Drain With Plenty Of Water.

Use Large Amounts Of Water To Dilute Product Prior To
Discharge.

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SECTION 10 - WASTE DISPOSAL

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Follow Local, State, And Federal Disposal Regulations.
Consult SASCO For Further Information
Can Be Neutralized, As Noted, And Disposed Of In Accordance
With Local, State, And Federal Regulations.

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SECTION 11 - SPECIAL PROTECTION INFORMATION:

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PROTECTION LEVELS SHOULD BE INCREASED ACCORDING TO USE CONDITIONS
UNCOATED TYVEK SHOULD NEVER BE USED FOR CHEMICALS.

** RESPIRATORY:

If Use Conditions Generate A Mist, Spray, Or Dust, An
Appropriate NIOSH-Approved Respirator May Be Required
None Needed For Normal Use.

** SKIN CONTACT:

Neoprene Gloves

** EYE CONTACT:

Chemical Splash Goggles

** VENTILATION:

Adequate For Work Area To Maintain Vapors At A Safe Level
Maintain Levels Below Any Listed TLV'S.

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SECTION 12 - SPECIAL PRECAUTIONS (HANDLING AND STORAGE)

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** SPECIAL PRECAUTIONS:

Do Not Transfer To Containers Not Properly Labeled For
This Product. Triple Rinse Empty Container Before
Disposal To Prevent Possible Chemical Reaction On Reuse
Do Not Contaminate With Dirty Equipment.

** Use This Product At Room Temperature. Do Not Heat.

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SECTION 13 - OTHER PRECAUTIONS:

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KEEP OUT OF REACH OF CHILDREN. FOR INDUSTRIAL AND COMMERCIAL USE ONLY

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SECTION 14 - HEALTH HAZARD DATA/ROUTES OF ENTRY:

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** TLV AND SOURCE: N/D

** ACUTE EFFECTS OF OVEREXPOSURE

** INGESTION SYMPTOMS:

May Cause Diarrhea/Intestinal Distention/Cramps.

May Cause Irritation And Burning Of Membranes In Mouth
& Throat

May Cause Stomach Pain And Possible Ulceration.

** SKIN ABSORPTION And/Or SKIN CONTACT:

Skin Contact May Aggravate Pre-Existing Skin Conditions.

** RESPIRATORY:

Breathing Product Dust Or Mist May Irritate Respiratory
Tract.

** EYE CONTACT:

May Cause Inflammation Of The Conjunctives.

May Cause Redness/Blurred Vision/Tearing/Burning.

** CHRONIC EFFECTS OF OVEREXPOSURE:

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SECTION 15 - EMERGENCY AND FIRST AID PROCEDURES

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** INGESTION:

If Vomiting Occurs Spontaneously, Hold Head Lower Than
Hips To Prevent Aspiration.

Rinse Mouth Out And Spit. Do Not Swallow!

Do Not Induce Vomiting. Drink Water Or Milk. Continue

Sipping Fluids Until Medical Help Is Obtained.
Keep Quiet And Treat For Shock. Do Not Speak Except To
Assist In First Aid.
Never Attempt To Give Anything By Mouth To An
Unconscious Person.

* SKIN CONTACT:

Remove Contaminated Clothing At Once. Blot Wet Chemical
With Compatible Wipe, Or Brush Off Dry Chemical.
Flush With Cold Water For At Least 15 Minutes.
Monitor Victim For Recurring Symptoms.
Use Diluted Bicarbonate Of Soda To Neutralize Acids.
Clean Contaminated Clothing Before Reuse.
Discard Shoes By Approved Methods. Do Not Reuse.
Wash With Soap And Water. Flush With Cool Clean Water
Until All Chemical Is Removed.

** RESPIRATORY:

Remove To Fresh Air. Loosen Tight Clothing. Treat For
Shock. Give CPR If Necessary. Keep Warm And Quiet.
If Symptoms Persist Or Worsen, Get Medical Attention
At Once.
If Short Of Breath, Give Oxygen If Qualified Personnel
Are Available. If Symptoms Persist, Get Medical Care At
Once.

** EYE CONTACT:

Get Water Into Eyes Immediately. Holding Eyelids Apart,
Continue Flushing Until Medical Help Is Found.
Chemical Antidote Should Only Be Given By A Physician.

** NOTES TO PHYSICIAN:

None Known

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SECTION 16 - OTHER PERTINENT PRODUCT INFORMATION:

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NOTE: WHILE SASCO BELIEVES THAT THE DATA CONTAINED HEREIN
IS FACTUAL AND THE OPINIONS EXPRESSED ARE THE RESULTS OF
THE TESTS CONDUCTED, THE DATA IS NOT INTENDED TO BE
TAKEN AS A WARRANTY OR REPRESENTATION FOR WHICH S & S COMPANY
ASSUMES LEGAL RESPONSIBILITY. THEY ARE OFFERED SOLELY FOR
YOUR CONSIDERATION, INVESTIGATION AND VERIFICATION. ANY
USE OF THESE DATA AND INFORMATION MUST BE DETERMINED BY
THE USER TO BE IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE
AND LOCAL REGULATIONS.

ABBREVIATIONS : N/D - Not Determined
N/A - Not Applicable

San Bernardino Community College District

Safety Program Approval

Safety Program Formaldehyde and Phenol Program, dated 7/30/12, Revision 0

Reviewed by:  Date 08/08/12
Environmental Health & Safety Administrator

Approved by:  Date 8/8/12
Dean of Arts and Sciences

Approved by:  Date 8/8/12
Vice President Administrative Services/Business Services

Approved by:  Date 8-8-12
President/Vice Chancellor Fiscal Services

Note: Upon revisions to plans, the Vice President of Administrative Services shall:

1. Distribute the plan for posting on the District EH&S website and notify the appropriate managers, faculty, staff, and/or students; provide appropriate training.
2. When revisions are made, the campus Safety Committee shall recommend re-training on the plan when the changes are deemed a substantial change to the plan. Upon distribution of the new plan, the Vice President of Administrative Services shall notify HR whether or not retraining was recommended by the Safety Committee.