

**CONDENSED MATERIAL SAFETY INFORMATION FOR
NASCO-GUARD® SPECIMENS
REVISED JANUARY 1993**

THE MILSOLV COMPANIES
Product Code: 6150
ETHYLENE GLYCOL

Manufacturer's Name: Nasco, Fort Atkinson, Wisconsin 53538

Emergency Phone Number: 414-585-2446 Extension 265
The following safety data applies to Nasco-Guard® preservative fluid (or tissue fluids) containing approximately 74% water, 25% ethylene glycol (1, 2-ethanediol) and/or propylene glycol (1, 2-propanediol), 0.5% or less formaldehyde, and 0.5% or less phenol. The Chemical Abstracts Service (CAS) registration number for ethylene glycol is 107-21-1. The CAS number for propylene glycol is 57-55-6. The CAS number for formaldehyde is 50-00-0. The CAS number for phenol is 108-95-2.

GENERAL INFORMATION: Nasco-Guard® specimens are fixed in formaldehyde solutions ranging from 0.8% — 3.7%. The embalming fluid of large mammals (e.g., cats, dogs, fetal pigs) may also contain 1.9% phenol. All specimens are subsequently perfused with an ethylene or propylene glycol-water solution until tissue fluids and ambient fluid contain at least 25% glycol. Residual free formaldehyde is thus reduced to 0.25% or less. Phenol, if present, is reduced commensurately. The ethylene glycol in specimens and ambient fluids presents no hazard by skin absorption or inhalation, but it is toxic if ingested in large quantities. Specimens are intended for observation and dissection only and must not be eaten by humans or pets. Dogs and cats may eat Nasco-Guard® specimens due to the sweet taste of ethylene glycol. The relative safety of ethylene glycol is shown by its worldwide, 50-year acceptance as the primary ingredient of antifreeze solutions for automobiles. Propylene glycol has a very low level of toxicity. **APPEARANCE AND ODOR:** Colorless, sweet tasting liquid with mild odor (slight disinfectant odor if phenol is present). **FIRE AND EXPLOSION HAZARD:** None.

HEALTH HAZARD-NASCO-GUARD® PRESERVATIVE FLUID (OR TISSUE FLUIDS)

Eyes — Direct contact with eyes may cause irritation. Wash eyes with water. Safety glasses may be worn as a precautionary measure.

Skin — Mild irritation possible in hypersensitive individuals. Wash hands with soap and water after handling specimens. Rubber or plastic gloves may be worn as a precautionary measure.

Inhalation — Very small quantities of formaldehyde gas can cause distress (dizziness, nausea, headache, etc.) in hypersensitive individuals. Long-term exposure (8 hours/day, 5 days/week, 2 years) to atmospheric formaldehyde concentrations of 14 ppm have caused nasal carcinomas in rats. Such animal data and limited epidemiological evidence indicates that formaldehyde is a probable human carcinogen. Specimens should be used in a well-ventilated room. Employees and students should not work in the same room where specimens are stored.

Oral — Because Nasco-Guard® specimens are moist packed, little fluid is available for consumption. The main danger lies in eating specimens.

EMERGENCY AND FIRST AID PROCEDURES:

Swallowing — If conscious, give two glasses of water and induce vomiting. Call a physician (or veterinarian in case of cat or dog) immediately.

Skin — Remove contaminated clothing and flush skin with water.

Inhalation — Remove to fresh air. Call a physician if discomfort persists.

Eyes — Flush with water.

SUPPLEMENTAL INFORMATION ON CHEMICALS USED IN THE NASCO-GUARD® PROCESS:

Ethylene glycol is poisonous if ingested (100 cc of 100% ethylene glycol can be fatal in humans). The LD₅₀ for rats is 5840 mg/kg. Severe kidney damage results from ingesting large volumes of ethylene glycol. Specimens must not be consumed by humans or pets. There is no apparent danger, however, from putting fingers in the mouth or chewing fragments of unwashed hands. Hands should be washed, however, after handling any chemical — including Nasco-Guard®. In case of ethylene glycol poisoning, consult a medical doctor or veterinarian immediately (see Notes to Physician). Ethylene glycol has been shown to produce dose-related teratogenic effects in rats and mice when given by forced feeding or in drinking water at high concentrations. There is, however, no currently available information to suggest that ethylene glycol has caused birth defects in humans. Therefore, ethylene glycol is considered an animal teratogen. Two chronic feeding studies, using rats and mice, have not produced any evidence that ethylene glycol causes dose-related increases in tumor incidence, or a different pattern of tumors compared with untreated controls. The absence of carcinogenic potential for ethylene glycol has been supported by numerous *in vitro* genotoxicity studies showing that it does not produce mutagenic or clastogenic effects.

Propylene glycol is practically nontoxic, as evidenced by its wide use in foods, pharmaceuticals, and cosmetics. Ingestion may cause nausea. It may cause minor skin irritation.

Formaldehyde is well known for its toxic and irritant properties; the oral LD₅₀ for a 37% formaldehyde solution in rats is 0.80 g/kg. A large quantity of Nasco-Guard® would have to be ingested, however, to inflict a lethal dose because its residual formaldehyde concentration is 0.5% or less.

Phenol can be toxic; the average fatal dose in humans is 15 g, but death may result from as little as one gram. Ingestion of small amounts may cause a variety of serious disorders. Because phenol has a distinct medicinal smell, however, it is unlikely that specimens containing phenol would be eaten. Phenol's wide use as a disinfectant and deodorant attests to its relative safety when used in highly dilute solutions.

NOTES TO PHYSICIAN:

The principal toxic effect of ethylene glycol, when swallowed in significant amounts, will be kidney damage. Early administration of ethanol may block the formation of nephrotoxic metabolites of ethylene glycol in the liver. Ethanol should be given intravenously, as a 5% solution in sodium bicarbonate, at a rate of about 10 ml of ethanol per hour. Hemodialysis may be required.

DISPOSAL OF SPECIMENS:

Nasco-Guard® specimens are biodegradable. They are suitable for burial in an approved sanitary landfill or for incineration. Ambient fluids may be safely disposed via city sewers.

MSDS: The following material safety data sheets provide additional information on chemicals used in the Nasco-Guard® process.

UNION CARBIDE CHEMICALS AND PLASTICS COMPANY INC.
Industrial Chemicals Division
MATERIAL SAFETY DATA SHEET
EFFECTIVE DATE: 03/21/90

Union Carbide urges each customer or recipient of this MSDS to study it carefully to become aware of and understand the hazards associated with the product. The reader should consider consulting reference works or individuals who are experts in ventilation, toxicology, and fire prevention, as necessary or appropriate to use and understand the data contained in this MSDS.

To promote safe handling, each customer or recipient should: (1) notify its employees, agents, contractors and others whom it knows or believes will use this material of the information in this MSDS and any other information regarding hazards or safety; (2) furnish this same information to each of its customers for the product; and (3) request its customers to notify their employees, customers, and other users of the product of this information.

I. IDENTIFICATION

PRODUCT NAME: ETHYLENE GLYCOL, INDUSTRIAL GRADE

CHEMICAL NAME: Ethylene Glycol

CHEMICAL FAMILY: Glycols

FORMULA: HOCH₂CHOH

MOLECULAR WEIGHT: 62.07

SYNONYMS: EG; Glycol; 1,2-Ethanediol

CAS# and 107-21-1

CAS NAME: 1,2-Ethanediol

IL PHYSICAL DATA (Determined on typical material)

BOILING POINT: 780 mm Hg: &197C (&387F)

FREEZING POINT: -13 C (9 F)

SPECIFIC GRAVITY (H₂O = 1): 1.115 at 20/20 C

VAPOR PRESSURE AT 20°C: 0.08 mm Hg

VAPOR DENSITY (air = 1): 2.1

SOLUBILITY IN WATER by wt: 100

EVAPORATION RATE: 0.01

Buyil Acetate = 1): 0.01

APPEARANCE AND ODOR: Colorless liquid. A slight sweet odor may be detected.

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Union Carbide Chemicals & Plastics Technology Corp.

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EMERGENCY PHONE NUMBER: 1-800-UCC-HELP (Number available at all times)

UNION CARBIDE CHEMICALS AND PLASTICS COMPANY INC.

Industrial Chemicals Division
39 Old Ridgebury Road, Danbury, CT. 06817-4001

PRODUCT NAME: ETHYLENE GLYCOL, INDUSTRIAL GRADE

III. INGREDIENTS

MATERIAL	%	TL V (units)	HAZARD
Ethylene Glycol	100	50ppm C, OSHA & ACGIH	See Section V

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT 241 F, Tag closed Cup, ASTM D 56

(test method): 240 F, Cleveland open cup, ASTM D 92

FLAMMABLE LIMITS IN AIR, % by volume: LOWER: 3.2 Calculated

UPPER: 15.3 (Estimated)

EXTINGUISHING MEDIA: Apply alcohol-type or air-purposetype foams by manufacturer's recommended techniques for large fires. Use CO₂ or dry chemical media for small fires.

SPECIAL FIRE FIGHTING PROCEDURES:

Do not spray pool fires directly; a solid stream of water or foam directed into hot burning liquid can cause frothing. Use self-contained breathing apparatus and protective clothing.

UNUSUAL FIRE AND EXPLOSION HAZARDS None

V. HEALTH HAZARD DATA

NOTES TO PHYSICIAN:

TLV AND SOURCE: See Section III.

EFFECTS OF SINGLE OVEREXPOSURE:
SWALLOWING: May cause abdominal discomfort or pain, nausea, vomiting, dizziness, drowsiness, malaise, blurring of vision, irritability, lumbar pain, oliguria, uremia, and central nervous system effects, including irregular eye movements, convulsions and coma. Cardiac failure and pulmonary edema may develop. Severe kidney damage follows the swallowing of large volumes of ethylene glycol. May be fatal. A few reports have been published describing the development of weakness of the facial muscles, diminished hearing, and difficulty with swallowing, during the late stages of severe poisoning.

SKIN ABSORPTION: No evidence of adverse effects from available information.
INHALATION: May cause irritation of the nose and throat with headache, particularly from mists. High vapor concentrations caused, for example, by heating the material in an enclosed and poorly ventilated workplace, may produce nausea, vomiting, headache, dizziness, and irregular eye movements

SKIN CONTACT: No evidence of adverse effects from available information.
EYE CONTACT: Liquid, vapor, and mist, may cause discomfort in the eye with persistent conjunctivitis, seen as slight excess redness of conjunctiva. Serious corneal injury is not anticipated.

EFFECTS OF REPEATED OVEREXPOSURE:
 Inhalation of mist may produce signs of central nervous system involvement, particularly dizziness and nystagmus.

PRODUCT NAME: ETHYLENE GLYCOL, INDUSTRIAL GRADE
MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:
 May aggravate existing kidney disease.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: Ethylene glycol has been shown to produce dose-related teratogenic effects in rats and mice when given by gavage or in drinking water at high concentrations or doses. The no-effect dose for developmental toxicity for ethylene glycol given by gavage over the period of organogenesis has been shown to be 150 mg/kg/day for the mouse and 500 mg/kg/day for the rat. Also in a preliminary study to assess the effects of exposure of pregnant rats and mice to aerosols at concentrations 150, 1000 and 2500 mg/m³ for 6 hours a day throughout the period of organogenesis, teratogenic effects were produced at the highest concentration, but only in mice. The conditions of these latter experiments did not allow a conclusion as to whether the developmental toxicity was mediated by inhalation of aerosol, percutaneous absorption of ethylene glycol from contaminated skin, or swallowing of ethylene glycol as a result of grooming the wetted coat. In a further study, comparing effects from high aerosol concentration by whole-body or nose-only exposure, it was shown that nose-only exposure resulted in maternal toxicity (1000 and 2500 mg/m³) and developmental toxicity with minimal evidence of teratogenicity (2500 mg/m³). The no-effects concentration (based on maternal toxicity) was 500 mg/m³. In a further study in mice, no teratogenic effects could be produced when ethylene glycol was applied to the skin of pregnant mice over the period of organogenesis. The above observations suggest that ethylene glycol is to be regarded as an animal teratogen; there is currently no available information to suggest that ethylene glycol has caused birth defects in humans. Cutaneous application of ethylene glycol is ineffective in producing developmental toxicity; exposure to high aerosol concentration is only minimally effective in producing developmental toxicity; the major route for producing developmental toxicity is perorally.
 Two chronic feeding studies, using rats and mice, have not produced any evidence that ethylene glycol causes dose-related increases in tumor incidence, or a different pattern of tumors compared with untreated controls. The absence of a carcinogenic potential for ethylene glycol has been supported by numerous in vitro genotoxicity studies showing that it does not produce mutagenic or clastogenic effects.

OTHER EFFECTS OF OVEREXPOSURE:
 Repeated skin contact may, in a very small proportion of cases, cause sensitization with the development of allergic contact dermatitis. The incidence is significantly less than 1% with the undiluted material.

EMERGENCY AND FIRST AID PROCEDURES:

SWALLOWING: If conscious, give two glasses of water and induce vomiting. Call a physician immediately. If medical advice is delayed and the person has swallowed moderate volumes of ethylene glycol (a few ounces), then give three to four ounces of hard liquor such as whiskey.

SKIN: Remove contaminated clothing and flush skin with water.

INHALATION: Remove to fresh air. Call a physician if discomfort persists.

EYES: Immediately flush with water, and continue washing the eyes for several minutes.

The principal toxic effects of ethylene glycol, when swallowed, are kidney damage and metabolic acidosis. Ethanol is antidotal, and its early administration may block the formation of nephrotoxic metabolites of ethylene glycol in the liver. Ethanol should be given intravenously, as a 5% solution in sodium bicarbonate, at a rate of about 10 ml ethanol per hour. A desired therapeutic level of ethanol in blood is 100 mg/dl. Hemodialysis may be required. 4-Methylpyrazole, a potent inhibitor of alcohol dehydrogenase, has been used therapeutically to decrease the metabolic consequences of ethylene glycol poisoning before coma, seizure, and renal failure have occurred (20 mg/kg/day).
 Pulmonary edema with hypoxemia has been described in a number of patients following poisoning with ethylene glycol. The mechanism of production has not been elucidated, but it appears to be noncardiogenic in origin in several cases. Respiratory support with mechanical ventilation and positive end-expiratory pressure may be required.
 There may be cranial nerve involvement in the late stages of toxicity from swallowed ethylene glycol. In particular, effects have been reported involving the seventh, eighth and ninth cranial nerves, presenting with bilateral facial paralysis, diminished hearing and dysphagia.

VI. REACTIVITY DATA

STABILITY: Stable
CONDITIONS TO AVOID: None
INCOMPATIBILITY (materials to avoid): Explosive decomposition may occur if combined with strong acids or strong bases and subjected to elevated temperatures. Therefore, avoid strong acids and strong bases at elevated temperatures. Avoid contamination with strong oxidizing agents and materials reactive with hydroxyl compounds.

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS:
 Burning can produce carbon monoxide and/or carbon dioxide.

HAZARDOUS POLYMERIZATION:
 Will Not Occur
CONDITIONS TO AVOID: None

VII. SPILL OR LEAK PROCEDURES
STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
 Wear suitable protective equipment. Small spills should be flushed with large quantities of water. Larger spills should be collected for disposal.

WASTE DISPOSAL METHOD:
 Incinerate in a furnace where permitted under appropriate Federal, State, or local regulations. At very low concentration in water, ethylene glycol is readily biodegradable in a biological wastewater treatment plant.

VIII. SPECIAL PROTECTION INFORMATION
RESPIRATORY PROTECTION (specify type):
 NIOSH approved breathing air equipment or NIOSH approved face mask with organic vapor cartridge and dust or mist pre-filter (not for use in fire fighting or in atmospheres with reduced oxygen content).

VENTILATION:
 General (mechanical) room ventilation may be adequate if handled at ambient temperatures or in covered equipment. If ambient temperatures are exceeded or operations exist which may produce misting, local exhaust ventilation is needed.

PROTECTIVE GLOVES: Rubber or polyvinyl chloride coated.
EYE PROTECTION: Monogoggles or faceshield.

OTHER PROTECTIVE EQUIPMENT:
 Eye bath and safety shower.

IX. SPECIAL PRECAUTIONS
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:
DANGER!! Harmful or fatal if swallowed.
 Prolonged or repeated breathing of mist or vapor harmful.
 Causes eye irritation
 May cause kidney and nervous system damage.
 Causes birth defects in laboratory animals.
 Do not swallow.
 Do not breathe the mist from spray.
 Avoid prolonged or repeated breathing of vapor.
 Avoid contact with eyes.
 Keep container closed.
 Use with adequate ventilation.
 Wash thoroughly after handling.

FOR INDUSTRY USE ONLY

OTHER PRECAUTIONS:

WARNING: Hot organic chemical vapors or mists are susceptible to sudden spontaneous combustion when mixed with air. Ignition may occur at temperatures below those published in the literature as "autoignition" or "ignition" temperatures. Ignition temperatures decrease with increasing vapor volume and vapor/air contact time, and are influenced by pressure changes.

Ignition may occur at typical elevated — temperature process conditions, especially in processes operating under vacuum if subjected to sudden ingress of air, or outside process equipment operating under elevated pressure if sudden escape of vapors or mists to the atmosphere occurs.

Any proposed use of this product in elevated — temperature processes should be thoroughly evaluated to assure that safe operating conditions are established and maintained.

X. REGULATORY INFORMATION**STATUS ON SUBSTANCE LISTS:**

The concentrations shown are maximum or ceiling levels (weight %) to be used for calculations for regulations. Trade secrets are indicated by "TS".

FEDERAL EPA

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center of release of quantities of Hazardous Substances equal to or greater than the reportable quantities (RQs) in 40 CFR 302.4.

Components present in this product at a level which could require reporting under the statute are:

CHEMICAL	CAS NUMBER	UPPER BOUND CONCENTRATION %
Dioxane	123-91-1	.0026
Ethylene Oxide	75-21-8	.0001

Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III

requires emergency planning based on Threshold Planning Quantities (TPQs) and release reporting based on Reportable Quantities (RQs) in 40 CFR 355 (used for SARA 302, 304, 311 and 312).

Components present in this product at a level which could require reporting under the statute are:

☆☆☆☆ NONE ☆☆☆

Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III

requires submission of annual reports of release of toxic chemicals that appear in 40 CFR 372 (for SARA 313). This information must be included in all MSDSs that are copied and distributed for this material.

Components present in this product at a level which could require reporting under the statute are:

CHEMICAL	CAS NUMBER	UPPER BOUND CONCENTRATION %
Ethylene Glycol	107-21-1	100.0

STATE RIGHT-TO-KNOW**CALIFORNIA Proposition 65**

This product contains trace levels of ACETALDEHYDE AND DIOXANE which the State of California has found to cause cancer, birth defects or other reproductive harm.

MASSACHUSETTS Right-To-Know, Substance List: (MSL) Hazardous Substances and Extraordinarily Hazardous Substances on the MSL must be identified when present in products.

Components present in this product at a level which could require reporting under the statute are:

EXTRAORDINARILY HAZARDOUS SUBSTANCES (= > 0.0001%)

CHEMICAL	CAS NUMBER	UPPER BOUND CONCENTRATION %
Dioxane	123-91-1	.0026
Methanol	67-56-1	.0024

HAZARDOUS SUBSTANCES (= > 1%)

CHEMICAL	CAS NUMBER	UPPER BOUND CONCENTRATION %
Ethylene Glycol	107-21-1	100.0

PENNSYLVANIA Right-To-Know, Hazardous Substance List: Hazardous Substances and Special Hazardous Substances on the List must be identified when present in products.

Components present in this product at a level which could require reporting under the statute are:

HAZARDOUS SUBSTANCES (= > 1%)

CHEMICAL	CAS NUMBER	UPPER BOUND CONCENTRATION %
Ethylene Glycol	107-21-1	100.0

Toxic Substances Control Act (TSCA) Status:

The ingredients of this product are on the TSCA Inventory.

CALIFORNIA SCAQMD RULE 443.1 VOC'S:

Not presently available

NOTE:—

The opinions expressed herein are those of qualified experts within Union Carbide Chemicals and Plastics Company. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and of these opinions and the conditions of the use of the product are not within the control of Union Carbide Chemicals and Plastics Company, it is the user's obligation to determine the conditions of safe use of the product.

REVISED SECTIONS:

Revisions in this MSDS occurred in the following sections:
 Section II: **PHYSICAL DATA** (Subtitle: Appearance and Odor)
 Section V: **HEALTH HAZARD DATA** (Subtitles):
 Medical Conditions Aggravated By Overexposure
 Significant Laboratory Data
 Emergency and First Aid Procedures — "Swallowing"
 Section X: Dioxane level

PC: 35202

F NUMBER: NO1

UNION CARBIDE CORPORATION

Specialty Chemicals Division

MATERIAL SAFETY DATA SHEET

EFFECTIVE DATE: 05/15/89

Union Carbide urges each customer or recipient of this MSDS to study it carefully to become aware of and understand the hazards associated with the product. The reader should consider consulting reference works or individuals who are experts in ventilation, toxicology, and fire prevention, as necessary or appropriate to use and understand the data contained in this MSDS.

To promote safe handling, each customer or recipient should: (1) notify its employees, agents, contractors and others whom it knows or believes will use this material of the information in this MSDS and any other information regarding hazards or safety; (2) furnish this same information to each of its customers for the product; and (3) request its customers to notify their employees, customers, and other users of the product of this information.

I. IDENTIFICATION

PRODUCT NAME: PROPYLENE GLYCOL, ALL GRADES

CHEMICAL NAME: 1,2 Propanediol

CHEMICAL FAMILY: Glycols

FORMULA: CH₃CH(OH)CH₂OH

SYNONYMS: 1,2-Dihydroxypropane

CAS# and 57-55-6

CAS NAME: 1,2-Propanediol

MOLECULAR WEIGHT: 76.1

IL PHYSICAL DATA (Determined on typical material)

BOILING POINT: 780 mm Hg: > 187.3C (> 369.1F)

FREEZING POINT: Sets to glass below -60 C (-76 F)

SPECIFIC GRAVITY (H₂O = 1): 1.038

VAPOR DENSITY (air = 1): 2.6

EVAPORATION RATE (Butyl Acetate = 1): 0.005

APPEARANCE AND ODOR: Water-white liquid; mild odor.

PERCENT VOLATILES (BY VOLUME): 100

EMERGENCY PHONE NUMBER: 1-800-UCC-HELP (Number available at all times)

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UNION CARBIDE CORPORATION

Specialty Chemicals Division

39 Old Ridgebury Road, Danbury, CT, 06817-0001

PRODUCT NAME: PROPYLENE GLYCOL, ALL GRADES

III. INGREDIENTS

MATERIAL %

Propylene Glycol 100

None established

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT 214 F (101 C); Tag closed cup, ASTM D 56

(test method(s)): 225 F (106 C); Cleveland open cup, ASTM D 92

FLAMMABLE LIMITS IN AIR, % by volume: LOWER: 2.6 UPPER: 12.5
EXTINGUISHING MEDIA: Apply alcohol-type or all-purpose-type foam by manufacturer's recommended techniques for large fires. Use CO2 or dry chemical media for small fires.

SPECIAL FIRE FIGHTING PROCEDURES: Use self-contained breathing apparatus and protective clothing.

UNUSUAL FIRE AND EXPLOSION HAZARDS: None

TLV AND SOURCE: None established by OSHA or ACGH.

EFFECTS OF SINGLE OVEREXPOSURE:

SWALLOWING: No evidence of adverse effects from available information.

SKIN ABSORPTION: No evidence of adverse effects from available information.

INHALATION: No evidence of adverse effects from available information.

SKIN CONTACT: May cause minimal irritation seen as mild local redness.

EYE CONTACT: May cause minimal irritation, seen as slight excess redness of the conjunctiva.

EFFECTS OF REPEATED OVEREXPOSURE: Repeated skin contact may result in the development of an allergic skin reaction in a very small proportion of individuals.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: A knowledge of available toxicology information and of the physical and chemical properties of the material suggests that overexposure is unlikely to aggravate existing medical conditions.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: None currently known.

OTHER EFFECTS OF OVEREXPOSURE: None currently known.

EMERGENCY AND FIRST AID PROCEDURES:

SWALLOWING: No emergency care anticipated.

SKIN: Wash with soap and water.

INHALATION: Remove to fresh air.

EYES: Flush with water.

NOTES TO PHYSICIAN: There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.

VI. REACTIVITY DATA

STABILITY: Stable

CONDITIONS TO AVOID: None

INCOMPATIBILITY (materials to avoid): Avoid contamination with strong oxidizing agents.

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS: Burning can produce carbon monoxide and/or carbon dioxide.

HAZARDOUS POLYMERIZATION: Will Not Occur

CONDITIONS TO AVOID: None

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Small spills should be flushed with large amounts of water. Larger spills should be collected for disposal.

WASTE DISPOSAL METHOD: Incinerate in a furnace or otherwise dispose of in accordance with applicable Federal, State, and local requirements. See Section IX.

RESPIRATORY PROTECTION (specify type): None expected to be needed.

VENTILATION: General (mechanical) room ventilation is expected to be satisfactory.

PROTECTIVE GLOVES: Polyvinyl chloride-coated

EYE PROTECTION: Safety glasses

OTHER PROTECTIVE EQUIPMENT: Eye bath and safety shower.

IX. SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: WARNING: MAY CAUSE ALLERGIC SKIN REACTION. Avoid contact with skin and clothing. Wash thoroughly after handling.

OTHER PRECAUTIONS: DISPOSAL: Laboratory studies indicate that propylene glycol is readily biodegradable in a biological wastewater treatment plant.

X. REGULATORY INFORMATION

STATUS ON SUBSTANCE LISTS: The concentrations shown are maximum or ceiling levels (weight %) to be used for calculations for regulations. Trade Secrets are indicated by "TS".

FEDERAL EPA

Comprehensive Environmental Response, Compensation, Liability Act of 1980 (CERCLA) requires notification of the National Response Center of releases of Hazardous Substances equal to or greater than the reportable quantities (ROs) in 40 CFR 302.4.

Components present in this product at a level which could require reporting under the statute are:

☆☆ NONE ☆ ☆ ☆

Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires emergency planning based on Threshold Planning Quantities (TPQs) and release reporting based on Reportable Quantities (ROs) in 40 CFR 355 (used for SARA 302, 304, 311, and 312).

Components present in this product at a level which could require reporting under the statute are:

☆☆ NONE ☆ ☆ ☆

Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires submission of annual reports of release of toxic chemicals that appear in 40 CFR 372 (for SARA 313). This information must be included in all MSDSs that are copied and distributed for this material.

Components present in this product at a level which could require reporting under the statute are:

☆☆ NONE ☆ ☆ ☆

STATE RIGHT-TO-KNOW

California Proposition 65 This product contains no levels of listed substances, which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute.

MASSACHUSETTS Right-To-Know, Substance List (MSL) Hazardous Substances and Extraordinarily Hazardous Substances on the MSL must be identified when present in products.

Components present in this product at a level which could require reporting under the statute are:

☆☆ NONE ☆ ☆ ☆

PENNSYLVANIA Right-To-Know, Hazardous Substance List Hazardous Substances and Special Hazardous Substances on the list must be identified when present in products.

Components present in this product at a level which could require reporting under the statute are:

☆☆ NONE ☆ ☆ ☆

CHEMICAL CAS NUMBER 57-55-6

UPPER BOUND CONCENTRATION % 99.630

Toxic Substances Control Act (TSCA) Status: The ingredients of this product are on the TSCA inventory.

CALIFORNIA SCAQMD RULE 443.1 VOC'S: Volatiles = substances with a vapor pressure of = >5 mmHg at 104 C (210.2 F). This product contains: 1036.16 g/liter VOC 1036.16 g/liter of Material less Exempted Compounds

OTHER REGULATORY INFORMATION: EPA Hazard Categories: Immediate Health, Delayed Health

NOTE--- The opinions expressed herein are those of qualified experts within Union Carbide Corporation. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and of these opinions and the conditions of the use of the product are not within the control of Union Carbide Chemicals and Plastics Company, it is the user's obligation to determine the conditions of safe use of the product.

Date: 05/08/89

Revision Date: 05/17/89

PC: 71012

F NUMBER: B0376

Printed in USA

MATERIAL SAFETY DATA SHEET
FOR INDUSTRIAL USE ONLYDESCRIPTION: FORMALDEHYDE 37% M11%
PRODUCT TYPE: FORMALDEHYDE SOLUTION
APPLICATION: GENERAL PURPOSE

CUR ISS 11-FEB-92

The OSHA hazard communication standard 29 CFR 1910.1200 requires that the information contained on these sheets be made available to your workers. Instruct your workers to handle this product properly. For industrial use only.

SIGNAL WORD

WARNING This material is a "health hazard" and/or a "physical hazard" as determined when reviewed according to the requirements of the Occupational Safety and Health Administration 29 CFR Part 1910.1200 "Hazard Communication" Standard.

CHEMICAL HAZARD RATING

HEALTH = 3 (high)
FIRE = 2 (moderate)
REACTIVITY = 1 (slight)
CHRONIC = *

29CFR 1910.1200 HAZARDOUS INGREDIENTS/REPORTED HEALTH EFFECTS

The ingredients listed below have been associated with one or more of the listed immediate and/or delayed (*) health hazards. Risk of damage and effects depends upon duration and level of exposure. BEFORE USING OR HANDLING, READ AND UNDERSTAND THE MSDS.

CAS/REGISTRY NO. MATERIAL DESCRIPTION % RANGE
50-00-0 FORMALDEHYDE 30-50

POTENTIAL CANCER HAZARD

Rats chronically exposed to 14 ppm formaldehyde contracted nasal cancers. Such animal data and limited epidemiological evidence indicates that formaldehyde is a probable human carcinogen.

May cause allergic skin reaction. Some reports suggest that formaldehyde may cause asthma and that preexisting respiratory and skin disorders may be aggravated by exposure.

OSHA has identified 0.5 ppm as the "Action Level", 29CFR 1910.1048. Please refer to the OSHA Standard for guidance applicable to your specific operations.

OSHA has stated that a concentration of 100 ppm is immediately dangerous to life and health and that the odor threshold for formaldehyde is 0.8-1 ppm, OSHA Occupational Exposure to Formaldehyde, 52 Fed. Reg. 46168, et seq.

ACGIH TLV: 1 PPM (1.2 MG/M3) TWA; 2 PPM (2.5 MG/M3) 15 MIN STEL

OSHA PEL: 1 PPM (1.2 MG/M3) TWA; 2 PPM (2.5 MG/M3) 15 MIN STEL

NIOSH DOCUMENT NUMBER: 77-126

OTHER: OSHA PEL: 29CFR 1910.1048

67-56-1 *METHANOL 10-30

NOTE REVISED OSHA PEL

Possible reproductive disorders from prolonged exposure.

May cause lung damage based on animal data. Preexisting respiratory disorders may be aggravated by exposure.

May cause liver damage based on animal data.

May cause blindness if swallowed.

Can cause central nervous system depression. Signs and symptoms may include headache, dizziness, nausea, vomiting, unconsciousness and asphyxiation. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage.

--See Footnote C.

ACGIH TLV: SKIN 200PPM (262 MG/M3) TWA; 250PPM (328 MG/M3) STEL

OSHA PEL: 200 PPM (260 MG/M3) TWA; 250 PPM (310 MG/M3) STEL

NIOSH DOCUMENT NUMBER: 76-148

Footnote C: As of the date of issuance of this document, this material has not been listed by NTP, IARC or OSHA as a carcinogen.

PHYSICAL DATA

FORM ASSAY, SULFITE

METH IN FORMAL BY PYCNO

STG. LIFE

APPEARANCE

COLOR

ODOR

Dot 49GFR-173.115 COMBUSTIBLE LOD

37.0%

11.0%

30 DAYS @ 60F

CLEAR LIQUID

COLORLESS

PUNGENT RO FORMALDEHYDEMETHANOL

PHYSICAL DATA continued

BOILING POINT

EVAPORATION RATE

FLASH POINT

FREEZING POINT

AUTOIGNITION TEMPERATURE

LOWER EXPLOSION LIMIT

SOLUBILITY IN WATER

SPECIFIC GRAVITY

UPPER EXPLOSION LIMIT

VAPOR DENSITY

VAPOR PRESSURE

100C

SIMILAR TO WATER

130F (54C)

SEE STORAGE SECTION

420C

7%

INFINITE

1.08

70%

1 (AIR = 1)

40MM HG @ 39C

IMMEDIATE HEALTH HAZARD DATA

SKIN ABSORPTION: May be harmful if absorbed through skin.

INGESTION: Not expected to be harmful under normal conditions of use.

If accidentally swallowed, burns or irritation to mucous membranes, esophagus or GI tract can result.

Ingestion may cause blindness.

Can cause central nervous system depression.

INHALATION: May be harmful if inhaled. Liquid or vapor may cause irritation of nose, throat and lungs. Can cause central nervous system depression.

SKIN: Causes irritation.

EYES: Cause burns.

HANDLING PRECAUTIONS

SKIN ABSORPTION: Avoid contact with eyes, skin or clothing.

INHALATION: Avoid breathing vapor. Use with adequate ventilation.

SKIN: Avoid contact with skin.

EYES: Do not put in eyes. Handle in accordance with good industrial hygiene and safety practices. These practices include avoiding unnecessary exposure and removal of the material from eyes, skin, and clothing. Wash thoroughly after handling.

EMERGENCY AND FIRST AID PROCEDURES

SKIN ABSORPTION: In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing and shoes before reuse.

INGESTION: If accidentally swallowed, dilute by drinking large quantities of water. Immediately contact poison control center or hospital emergency room for any other additional treatment directions.

INHALATION: If inhaled, remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Call a physician.

SKIN CONTACT: Flush skin with plenty of water. Remove contaminated clothing. Call a physician if irritation persists.

EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes. Eyelids should be held apart during irrigation to insure water contact with entire surface of eyes and lids. Call a physician.

FIRE AND EXPLOSION HAZARD DATA

COMBUSTIBLE.

Keep away from heat and flame. In case of fire, use water spray, dry chemical, "alcohol" foam or CO2. Use water to keep fire-exposed containers cool.

Normally stable, but may become unstable at high temperatures.

Hazardous polymerization:

Will not occur.

Incompatibilities:

Reacts with many compounds. Reaction with phenol, strong acids or alkalis may be violent.

Reaction with hydrochloric acid may form bis-chloromethyl ether, an OSHA regulated carcinogen.

Decomposition products may include:

CO, CO2.

CONTROL MEASURES

If airborne contaminants are generated when the material is heated or handled, sufficient ventilation in volume and air flow patterns should be provided to keep air contaminant concentration levels below acceptable criteria.

ENGINEERING CONTROLS: The following exposure control techniques may be used to effectively minimize employee exposure: local exhaust ventilation, enclosed system design, process isolation and remote control in combination with appropriate use of personal protective equipment and prudent work practices. These techniques may not necessarily address all issues pertaining to your operations. We, therefore, recommend that you consult with experts of your choice to determine whether or not your programs are adequate.

PERSONAL PROTECTION INFORMATION

Where air contaminants can exceed acceptable criteria, use NIOSH/MSHA approved full facepiece respiratory protection equipment. Respirators should be selected based on the form and concentration of contaminants in air in accordance with OSHA 29CFR 1910.1048(g) Respiratory Protection, OSHA 29CFR 1910.134 or other applicable standards or guidelines. Wear chemical splash goggles or some other type of complete protection for the eye if contact is likely. Wear protective (impervious) gloves as required to prevent skin contact. Where high concentrations of hazardous ingredients may be present, such as in an emergency, full body protection should be worn.

Other protective equipment: Eye wash fountain, safety shower. Reusable protective clothing should be cleaned and ventilated after any formaldehyde contamination.

See OSHA 29CFR 1910.1048(h) Protective Equipment and Clothing and OSHA 29CFR 1910.1048(i) Hygiene Protection for other specific requirements based on the form of formaldehyde, the conditions of use and the hazards to be prevented.

SPILL OR LEAK PROCEDURES

Eliminate all ignition sources.

Large quantities: Enclose with diking material to prevent seepage into natural bodies of water. Small quantities: Soak up with absorbent material and remove to a chemical disposal area.

WASTE DISPOSAL

Recover free liquid. Absorb residue and dispose of according to local, state/provincial, and federal requirements.

STORAGE PRECAUTIONS

Storage temperature depends on methanol content and should be controlled to avoid precipitation or vaporization. See technical bulletin for recommended storage temperatures. Remove plug slowly to relieve pressure.

Formaldehyde solutions will start to precipitate paraformaldehyde if stored below their recommended storage temperatures, making the freezing point difficult to determine.

DOT CLASSIFICATION

FORMALDEHYDE SOLUTION, COMBUSTIBLE LIQUID,
UN 1198, RG.FORMALDEHYDE/METHANOL,
METHAFORM.

PREVIOUS ISSUE: 19-APR-91 CURRENT ISSUE: 11-FEB-92

While Columbus Chemical Industries, Inc. believes that the data contained herein are factual, they are not to be taken as a warranty or representation for which Columbus Chemical Industries, Inc. assumes legal responsibility. They are offered solely for your consideration, investigation. Any use of these data and information must be determined by the user to be in accordance with the applicable Federal, State, and Local laws and regulations.

**SARA TITLE III SECTION 313
AND 40 CFR PART 372
TOXIC CHEMICAL NOTIFICATION SHEET**

FORMALDEHYDE 37% M11%

This product contains the following toxic chemical(s) subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986, and Subpart C-Supplier Notification Requirement of 40 CFR Part 372.

AS Registry

Lumber Chemical Name	Pct. By Weight
30-00-0 FORMALDEHYDE	37.00
37-56-1 METHANOL	11.00

This Toxic Chemical Notification Sheet must not be detached from the Material Safety Data Sheet (MSDS). Any copying and redistribution of the MSDS shall include copying and redistribution of this notification sheet attached to copies of the MSDS subsequently redistributed.

PRINT DATE: 24-JUN-92 05:00 PM

COLUMBUS CHEMICAL INDUSTRIES INC.

MA335 TEMKIN ROAD
COLUMBUS, WISCONSIN 53925
(414) 823-2140
FAX (414) 823-2577

MATERIAL SAFETY DATA SHEET

- Hazards (NFPA)**
- 4 = Extreme
 - 3 = High
 - 2 = Moderate
 - 1 = Slight
 - 0 = Least

Emergency Phones: CHEMTREC: 800-424-9300

June 20, 1991

SECTION 1 — MATERIAL IDENTIFICATION

PRODUCT NAME: Liquefied Phenol — 90% Formula: C₆H₅OH + water
Other Designations: Carboic Acid, Hydroxybenzene, Phenylic acid

SECTION 2 — HAZARDOUS INGREDIENTS

CAS NO.	PERCENT	PELLWA	CARCINOGEN (OSHA, NTP, IARC) NO
Phenol	105-95-2	90%	5 ppm (skin)

SECTION 3 — CHEMICAL AND PHYSICAL PROPERTIES

Appearance: water white liquid
Odor: medicinal
pH: neutral
Water Solubility: n/a
Auto-ignition Temperature: n/a

Boiling Pt: >212°F
Freezing Point: 55°F (12.6°C)
Spec. Gravity (H₂O = 1): 1.055
Vapor Press., mm Hg, 50°C: n/a
Vapor Density (air = 1): 3.24 (phenol)

SECTION 4 — FIRE AND EXPLOSION HAZARDS

Flash Point (Op Cup): 165°F (74°C)
Explosive Limits (Phenol): Lower 1.7% Upper 8.6%
Extinguishing Media: water fog, CO₂, foam (alcohol), halogens, dry chemicals
Special Fire Fighting Procedures and Hazards: Treat as combustible liquid. Vapors can be explosive if liquid is heated above its flash point. Keep unignited containers cool with water. Contaminated fire control waters may be corrosive, and should be diked or collected in ponds if possible, then disposed of properly. Use eye and skin protection and self-contained breathing apparatus.

SECTION 5 — REACTIVITY INFORMATION

Stable: X Unstable: Precautions: n/a
Incompatibility: Alkyl benzene sulfonic acids, calcium hypochlorite.
Hazardous Decomposition Products: CO, CO₂, hydrocarbons (when burned)
Hazardous Polymerization Occurs: Does Not occur: X

SECTION 6 — HEALTH HAZARDS — PROTECTIVE MEASURES — FIRST AID

Inhalation: Excessive or repeated inhalation of concentrations over the PEL can cause irritation, other symptoms, and death (see other medical information below).
Wear NIOSH approved respirator or SCBA appropriate for concentration of phenol vapors or mist.
Remove to fresh air. Use artificial respiration if needed.

Skin: Corrosive. Pain numbness, whitening, and burns occur unless promptly removed. Readily absorbed. See Other Medical Information.
Wear protective phenol-resistant gloves, clothing, boots, and/or head covering as needed to prevent exposure. Have convenient safety showers.

Eyes: Wash affected skin for 15 minutes with soap and water while removing contaminated clothing. Treat any burns. Causes severe eye irritation, with possible damage and blindness.

Ingestion: Flush with water for 15 minutes. Get prompt medical attention.
Avoid swallowing. Wear face shield if face contact is likely.
Rinse mouth immediately. Drink large amounts of water. Do not induce vomiting, but if vomiting occurs drink more water. Do not give liquids to a very drowsy, convulsive, or unconscious person. Get medical attention immediately. See Other Medical Information.

Other Medical Information: Phenol is readily absorbed into body through inhalation, skin contact, and ingestion, particularly when in liquid solutions. When sufficient amounts are absorbed, the effects can be increased and irregular heart rate, low blood pressure, difficult breathing, cough, and skin discoloration. Death can occur in minutes, usually due to respiratory failure. Effects may be aggravated for persons with kidney or hepatic diseases.

IN ALL CASES: GET PROMPT MEDICAL ATTENTION IF EFFECTS OCCUR.

Most likely routes of entry: skin, eyes, inhalation.

SECTION 7 — PRECAUTIONS FOR SAFE HANDLING AND USE

Spills and Leaks: Remove all sources of ignition, and provide ventilation. Small spills: take up with absorbent and put in closed container. Large spills: dike around flow. Stop leak if possible. Do not flush residual liquid to ground if there is potential for surface or ground water pollution (use absorbents or remove soil to proper disposal). Do not flush to sewers. Personnel should wear eye, skin, and respiratory protection. RC Phenol = 1000 lb. (= 1111 lb. of product).

Storage and Handling: Store in closed containers in a cool, well-ventilated area away from heat or ignition sources. Do not heat above 140°F (60°C). Prohibit eating or smoking where phenol is being used or handled. Wear impervious clothing as needed to prevent exposure when transferring material from drum or bulk containers.

Waste Disposal: In selecting the method of disposal, applicable local, state, and federal regulations should be consulted. Empty Containers: Do not cut or weld on empty containers, or expose them to ignition sources before thorough cleaning. Clean before disposal.

SECTION 8 — REGULATORY INFORMATION

DOT (HM-181) (USA and Int'l) — Class & Label: 6.1, Poison

— Shipping Name: Phenol solutions, 6.1, UN2821, PGII, RC

ARA, Title III — This product contains a toxic chemical subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40CFR Part 372: Phenol, CAS No. 108-95-2, 90%.

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