



MATERIAL SAFETY DATA SHEET



1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT IDENTIFIER: Phenol
SYNONYMS: Carboic acid, hydroxybenzene, benzenol, monophenol, phenyl hydroxide, phenyl alcohol, phenic acid, phenylic acid, and phenylic alcohol.
GENERAL USE: The largest end use is in phenol-formaldehyde resin used in wood adhesives as well as molding and laminating resins, paints, varnishes and enamels. Phenol may also be used in manufacturing of nylon, herbicides, pharmaceuticals and preservatives.
PRODUCT DESCRIPTION: Colorless to pink solid crystal like appearance with a characteristic, sweet, tarry odor.

MANUFACTURER:
 Dakota Gasification Company
 420 County Road 26
 Beulah, North Dakota 58523-9400
 (701) 873-6677

EMERGENCY TELEPHONE NUMBERS:
 Dakota Gasification (701) 873-6600
 CHEMTREC (800) 424-9300

2. COMPOSITION / INFORMATION ON INGREDIENTS

INGREDIENTS	WT. %	CAS Registry #
Phenol	99.9	108-95-2
Ortho-cresol	0.01	95-48-7

OSHA HAZARDOUS COMPONENTS (29 CFR 1910.1200):

EXPOSURE LIMITS 8 hrs. TWA (ppm)

	OSHA PEL	ACGIH TLV
Phenol	5 ppm	5 ppm
Ortho-cresol	5 ppm	5 ppm

3. HAZARDS IDENTIFICATION / EMERGENCY OVERVIEW:

Phenol is a combustible, highly corrosive chemical that can cause serious burns and systemic poisoning by all exposure routes.

Routes of Entry: Absorption, inhalation, ingestion, skin contact, and eye contact.

Effects of Acute Exposure: This material has a strong corrosive effect on the skin and eyes. The material can rapidly absorb through the skin and may cause death. Symptoms of exposure may include nausea, headache, respiratory failure, muscular weakness, vomiting, severe depression, collapse and death. Skin exposure may cause redness, blisters and/or minor to

severe chemical burns. Although the effects are primarily on the central nervous system, excess accumulation of fluid in the lungs and injury of the kidneys, liver, pancreas, and spleen may occur. **DANGER !!!** Rapid DEATH may occur from gross contamination of the body.

Persons exposed only to phenol vapor do not pose substantial risks of secondary contamination.

Persons whose clothing or skin is contaminated with phenol can secondarily contaminate personnel by direct contact or through off-gassing vapor.

Effects of Chronic Exposure: Respiratory System; Central Nervous System; Skin; Eyes; Lungs; Kidneys; Liver. Chronic exposure may cause gastrointestinal disturbances (vomiting, anorexia), nervous disorders (headache, dizziness), dermatitis, or pigmentary disorder. Serious and sometimes fatal systemic injury can result from chronic exposure.

Odor character/threshold: Has a distinctive sweet, somewhat acrid, tarry odor. Phenol has good warning properties due to its characteristic odor and irritation at concentrations below the concentrations at which toxic effects occur.

Odor Threshold: 0.05 ppm in air

POTENTIAL HEALTH EFFECTS:

EYE CONTACT: This material has a strong corrosive effect on the eyes. Eye irritation has been noted following brief exposures to concentrated vapors.

SKIN CONTACT: Death has occurred from 64 sq. in. of skin exposure. Burns will result from skin contact. Even dilute solutions may cause severe burns if contact is prolonged. Systemic toxicity can result from skin or eye exposures.

INHALATION: Phenol causes irritation and is corrosive to tissue of the upper respiratory system. Because of its low volatility, inhalation is limited.

INGESTION: Phenol is very corrosive to the mouth, esophagus and stomach. Systemic toxicity will occur. Will cause gastroenteric disturbances. Ingestion can be fatal.

4. FIRST AID MEASURES

EYES: Remove the victim from the source of contamination and take him to the nearest eye wash, shower, or other source of clean water. Immediately but gently brush, blot or wipe away any liquid or powdered chemical remaining on the face, being careful not to get it on your skin. Gently rinse the affected eye(s) with clean, lukewarm water for at least 15 minutes. Have the victim lie or sit down and tilt his head back. Hold the eyelid(s) open and pour water slowly over the eyeball(s) at the inner corners, letting the water run out of the outer corners. The victim may be in great pain and want to keep his eyes closed, but you must rinse the chemical out of his eye(s) in order to prevent permanent damage. Ask the victim to look up, down and side to side as you rinse in order to better reach all parts of the eye(s). Seek medical attention immediately.

SKIN: Rapid skin decontamination is critical. Skin exposure of 64 sq. in. has caused fatality. Skin contact can be life threatening. The victim may not be aware of initial skin contact because of local anaesthetic effect of phenol. Remove clothing, shoes, socks and jewelry from the affected areas as quickly as possible, cutting them off if necessary. **Be Careful** not to get any of the chemical on your skin or clothing. Blot excess chemical from the skin very gently. In case of extensive splashing, wash the victim down under a shower under cold or luke-warm water while protecting the victim's eyes. Rinse the skin area for at least 15 minutes. Keep victim quiet and maintain normal body temperature. If burns develop such as inflammation or blisters apply a dry sterile dressing or use a clean dry cloth. Elevate the affected area above the level of the victim's heart if possible. If the victim is in pain immerse the painful area in cold water or apply cold wet dressings. **DO NOT**

break open blisters or remove skin. If clothing is stuck to skin after flushing with water, do not remove it. DO NOT use hot water. Seek medical attention immediately.

INHALATION: Move victim to fresh air at once. Initiate artificial respiration and supply oxygen if needed. Keep victim warm and at rest. Seek medical attention. If patient is conscious, the irritation of the throat may be relieved by water in the mouth. Seek medical attention immediately.

INGESTION: A conscious victim should immediately drink 4 to 8 ounces of water, and then a slurry of activated charcoal to reduce the concentration of the chemical. Have him rinse his mouth several times with cold water and spit out. Do not induce vomiting. Do not give sodium bicarbonate or carbonated drinks. Keep victim warm and quiet. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

FLASH POINT: 185°F
AUTO-IGNITION TEMPERATURE: 1319°F
FIRE AND EXPLOSION HAZARDS: Yields combustible vapors when heated.
UPPER EXPLOSIVE / FIRE LIMITS: 8.6%
LOWER EXPLOSIVE / FIRE LIMITS: 1.7%
EXTINGUISHING MEDIA: Water fog, alcohol foam, carbon dioxide, dry chemical.
SPECIAL FIRE FIGHTING PROCEDURES: Firefighters should wear full protective clothing, and a NIOSH approved self-contained breathing apparatus operated in positive pressure mode. Avoid breathing phenol or decomposition products. Avoid the downwind area of the fire. Emits toxic vapors under fire conditions. All emergency personnel must be totally protected from exposure to the vapors. Full encapsulating suits of impervious materials should be worn if personnel must work in or very near the liquid. Use water spray to "knock down" vapors. Fight fire from maximum distance. Contain fire water by diking a perimeter. Only spray water as necessary to limit environmental contamination. Water spray nearby vessels to prevent pressure build-up. Maintain a safe distance. NOTE: A phenol spill will tend to crystallize, providing the following is true: the ambient temperature is below 105°F, the humidity is sufficiently low, water is not applied to it, thus enabling a clean up procedure to be accomplished more easily. Phenol burns hot and dirty, generating a lot of heat and smoke.

6. ACCIDENTAL RELEASE MEASURES

SPILL OR LEAK PROCEDURES: When it is safe, shut off the discharge. Approach the spill from upwind, with all ignition sources eliminated. Since the toxicity is high, release of the vapors and their travel toward populated areas must be avoided. If vapors can't be controlled, evacuation downwind must be considered immediately. Since phenol's volatility is low, large amounts of vapor may not be generated. Released vapors can be swept from the air by an application of water spray or fog, which will dissolve them. The resulting water must be collected and contained. Absorb

liquid spills on vermiculite, sand, sawdust, or other absorbent to prevent from entering waterways or sewers and place in approved metal containers. All phenol containing clean up materials must be handled and treated as a hazardous waste. If crystalline, shovel into steel drums. Avoid creating dust. Workers must wear full protective clothing and positive pressure air supplied respirator.

WASTE DISPOSAL METHOD: See Section 13-Disposal Considerations on page 7 of 9

7. HANDLING AND STORAGE

STORAGE TEMPERATURE: Ambient
SHELF LIFE: Indefinite
SPECIAL SENSITIVITY: None known.
HANDLING / STORAGE PRECAUTIONS: Protect containers from physical damage. Store in cool dry ventilated locations. Do not store in areas where fire hazard may exist. Outside detached storage area is preferred provided the containers are not left to rust. Separate from other storage. Spills must be disposed of immediately by properly protected personnel; no others should remain in the area. Flush area with water.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

RECOMMENDED WORK / HYGIENE PROCEDURES: Prevent exposure - utilize prudent engineering practice, administrative controls, and or personal protective equipment.
EYE PROTECTION REQUIREMENTS: Prevent eye contact. Use goggles and/or face shield as appropriate for the exposure potential.
HAND PROTECTION REQUIREMENTS: Impervious gloves: viton, neoprene, PVC. Select the proper glove that meets your needs based on glove manufactures advice.
PROTECTIVE CLOTHING REQUIREMENTS: Use impervious materials to prevent all exposures to phenol. Butyl rubber(IIR), Neoprene(CR), Teflon.
RESPIRATORY REQUIREMENTS: Chemical cartridge: organic vapor with dust/mist prefilter. Upper Limit 50 ppm
Supplied air or continuous flow powered air purifying with organic vapor cartridge and a dust/mist prefilter. Upper Limit 125 ppm
Self-contained breathing apparatus with full facepiece operated in pressure demand or other positive pressure mode. Supplied air line operated in pressure demand or other positive pressure with an auxiliary self-contained breathing apparatus operated in pressure demand or other positive pressure mode.
WASH REQUIREMENTS: Immediately wash when exposed. Wash before eating or using the restroom.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	Colorless to light pink crystalline material which melts at 105°F. Deliquescent material (absorbs moisture from air and becomes liquid).
ODOR:	Medicinal, sweet, tarry.
PHYSICAL STATE:	Colorless to pink crystalline solid or white powder, or syrupy liquid.
pH:	9.9 in aqueous solutions.
VAPOR PRESSURE:	0.36 at 68°F (mmHg)
VAPOR DENSITY:	3.24 at 359.6°F (air = 1)
MELTING POINT:	105°F
BOILING POINT:	358°F
SPECIFIC GRAVITY:	1.071 (water = 1)
EVAPORATION RATE:	<0.01 (Butyl acetate = 1)
PERCENT VOLATILES:	Virtually 100% (by volume)
BULK DENSITY:	8.92 lbs/gallon
SOLUBILITY IN WATER:	Soluble, 82g/L @ 15°C
SOLVENT SOLUBILITY:	Soluble in alcohol, ether, chloroform, glycerol, carbon disulfide, petroleum, volatile oils and alkalies.
MOLECULAR WEIGHT:	94.12
CHEMICAL FORMULA:	C ₆ H ₅ OH
CHEMICAL FAMILY:	Phenolic

10. STABILITY AND REACTIVITY

INSTABILITY CONDITIONS:	None known.
INCOMPATIBILITIES:	Strong oxidizers, especially calcium hypochlorite, aluminum chloride (contact with these may cause fires and explosions) violent reaction with nitric acid, and acids.
DECOMPOSITION:	Toxic vapors and gases, such as carbon monoxide, may be released in a fire.
HAZARDOUS POLYMERIZATION:	Will not occur.

11. TOXICOLOGICAL INFORMATION

ROUTES OF ENTRY:	Exposure to phenol by any route can cause systemic poisoning.
EFFECTS OF ACUTE EXPOSURE:	Death has occurred from 64 sq. in. of skin exposure. Death has occurred from 1.5 grams of oral exposure. Phenol is very corrosive to all body tissue and is readily absorbed through the skin. Damage to the central nervous system may occur. Burns will result from eye and skin contact. Phenol causes irritation and is corrosive to tissue of the upper respiratory system.
SYMPTOMS:	The clinical toxicity produced by phenol is the same no matter what route of entry. Initial signs and symptoms may include; nausea, excessive sweating, headache, dizziness, and ringing in the ears. Seizures, loss of consciousness, coma, depression of the function of the respiratory center in the brain, and death may ensue. Coma and seizures usually occur within minutes to a few hours after exposure or after a delay of up to 18 hours.
EYE EFFECTS:	Irritation of the eyes. Burns will result from eye contact. Contact with concentrated solutions can cause severe eye damage including clouding of the eye surface, inflammation of the eye

and eyelid burns.

SKIN EFFECTS: Phenol is readily absorbed through the skin. Burns will result from skin contact. When phenol is applied to the skin, a white covering of precipitated protein forms. This soon turns red and eventually sloughs, leaving the surface stained slightly brown. If phenol is left on the skin, it will penetrate rapidly and lead to cell death and gangrene. If more than 60 square inches, are affected, there is risk of imminent death. Phenol has local anesthetic properties and can cause extensive damage before before pain is felt.

ACUTE ORAL EFFECTS: Vomiting and diarrhea are common effects of phenol toxicity by any exposure route. In cases of ingestion, corrosive mucosal injury can involve the entire intestinal tract, sometimes causing ulceration and bleeding. Ingestion may lead to death from respiratory failure. Mild exposure may cause upper respiratory tract irritation. With more serious exposure, swelling of the throat, inflammation of the trachea, tracheal ulceration, and accumulation of fluid in the lungs can occur.

ACUTE INHALATION EFFECTS: Air concentrations of phenol vapors below the PEL of 5 ppm are not associated with health effects, although the odor of phenol is noticeable. Air concentrations above the PEL of 5 ppm have been associated with irritation of mucous membranes.

CHRONIC EFFECTS / CARCINOGENICITY: This agent is not considered a carcinogen by NTP, IARC, or OSHA.

MUTAGENICITY: In humans, no clear association between phenol exposure and risk for birth defects is found.

ORGANS AFFECTED BY LONG-TERM EXPOSURE: Prolonged oral or subcutaneous administration to animals can cause damage to the lungs, liver, kidney, heart, and genital and urinary tract. Prolonged inhalation of vapors (30 to 60 ppm) has induced respiratory difficulties, lung damage, loss of weight, and paralysis. Prolonged administration of phenol may cause abnormal growth and inflammation of the kidney, excess blood in the glomerular and cortical region, cloudy swelling, excess accumulation of fluid in the convoluted tubules, and degenerative changes of the glomeruli. Blood cells become hyalinized, vacuolated, or filled with granules. Muscle fibers show marked striation. The primary site of stimulation to the central nervous system is the spinal cord. Twitching is due to reflex stimulation, where as the chronic convulsions are probably due to an increased excitation of the motor mechanism of the anterior horn cells. Chronic exposure to low concentrations of vapor or mist can cause digestive disturbances. Dermatitis may occur when traces of phenol or phenol containing materials contact the skin for long periods of time. Severe chronic poisoning is characterized by systemic disorders such as digestive disturbances, including vomiting, difficulty of swallowing, excessive flow of saliva, diarrhea, anorexia, nervous disorders, headache, fainting, dizziness and mental disturbance. Chronic exposure to phenol is usually fatal when there is extensive damage to the liver and kidneys. Prolonged cutaneous exposure to phenol may result in ochronosis.

12. ECOLOGICAL INFORMATION

Phenol has a short half-life as a vapor phase in air which is approximately 12-15 hours, but persists in water much longer. The biodegradation of phenol in water can range from 1 day to 9 days. Phenol is also photochemically oxidized, and its photo-oxidation half-life is approximately 19 hours. Phenol in soil generally degrades very quickly. Phenol does not concentrate or bioconcentrate in aquatic organisms to any significant degree. The transport and movement of phenol in the environment is affected by the pH of the environment or the medium in which phenol is present. Since the pKa of phenol is 9.9 and it will, therefore exist in a partially dissociated state in water and in moist soil. Phenol is biodegradable in water sources if the concentration is not high enough to produce significant inhibition of degradation by microorganisms. In fact, phenol may degrade in less than 1 day in surface waters. The degradation of phenol is slower in salt water as compared to fresh water.

13. DISPOSAL CONSIDERATIONS

Recycling or reclamation of all phenol residuals is recommended. Discarded or spill cleanup material may be considered hazardous waste as defined under RCRA 40 CFR 261.33 (Phenol U188).

Please be advised that state and local requirements for waste disposal may be more restrictive or otherwise different from federal regulations. Consult state and local regulations regarding the proper disposal of this material.

14. TRANSPORTATION INFORMATION

D.O.T. SHIPPING NAME: Phenol, molten, or Phenol, solid
D.O.T. HAZARD CLASS: 6.1
U.N. NUMBER: UN 2312, or UN 1671
D.O.T. PLACARD: Poison
D.O.T. LABEL CODE: Poison
PACKAGING CLASSIFICATION: Packing Group II
D.O.T. REPORTABLE QUANTITY: 1000 lbs

15. REGULATORY REQUIREMENTS

EPA DETERMINATIONS

CERCLA, 40 CFR 302

The material contains the following hazardous substances which, when released in quantities equal to or exceeding the Reportable Quantity, triggers National Response Center notification requirements.

Hazardous Substance	Reportable Quantity
Phenol	1000 lbs. (112 gallons)

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986,
TITLE III - SECTIONS 302, 304, 311, 312, 313

SECTION 302/304 - Extremely Hazardous Substances (40 CFR 355)

The material Phenol is an extremely hazardous substance. However, it is possible that this material may contain extremely hazardous substances at a lower concentration so that a large enough spill could warrant an emergency release under Section 304.

SECTION 311/312 - MSDS and Chemical Inventory Reporting Requirements
(40 CFR 370)

The material should be reported under the following EPA Hazard Categories.

4	Immediate (Acute Health Hazard)
4	Delayed (Chronic Health Hazard)
4	Fire
	Sudden Release of Pressure
	Reactive

SECTION 313 - List of Toxic Chemicals (40 CFR 372)

The material contains chemical(s) at a level of 1.0% or greater (0.1% for carcinogens) on the list of toxic chemicals and is subject to toxic chemical release reporting requirements.

Toxic Chemical: Phenol
CAS Registry Number: 108-95-2
Approximate Concentration (Upper Bound): 99.9 wt%

TOXIC SUBSTANCES CONTROL ACT (TSCA) (40 CFR 710)

The chemical ingredients in this material are in Section 8(b) Chemical Substance Inventory

The information contained in this Material Safety Data Sheet (MSDS) is believed to be correct since it was obtained from sources we believe are reliable. However no representation, guarantees or warranties of any kind are made as to its accuracy, suitability for particular applications, hazards connected with the use of the material, or the results to be obtained from the use thereof. User assumes all risks and liability of any use, processing or handling of any material, variations in methods, conditions and equipment used to store, handle, or process the material and hazards connected with the use of the material are solely the responsibility of the user and remain at his sole discretion.