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The Dow Chemical Company  
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Attn: Section 8(e)

Re: 8EHQ-1098-14302  
Response to Third Request for Additional Information

Dear Sir/Madam:

Reference is made to your request dated March 22, 2000 and signed by Joseph S. Carra.

This submission is for the purpose of providing EPA with a copy of the booklet entitled "2,4-Dichlorophenol Safe Handling Guide." The booklet was published by DowAgroSciences as a result of the recent incident involving the chemical 2,4-dichlorophenol which occurred at the Dow Chemical facility in Midland, Michigan and which was the subject of the submission by Dow under TSCA section 8(e). The submission has been assigned a file number of 8EHQ-1098-14302 by EPA. A copy of the booklet was mailed to each current customer buying 2,4-chlorophenol from Dow AgroSciences.

If you have additional questions, please contact me.

Sincerely,

*Paul A. Wright*  
Paul A. Wright  
Counsel  
Legal Department  
517-636-1853

Enclosure

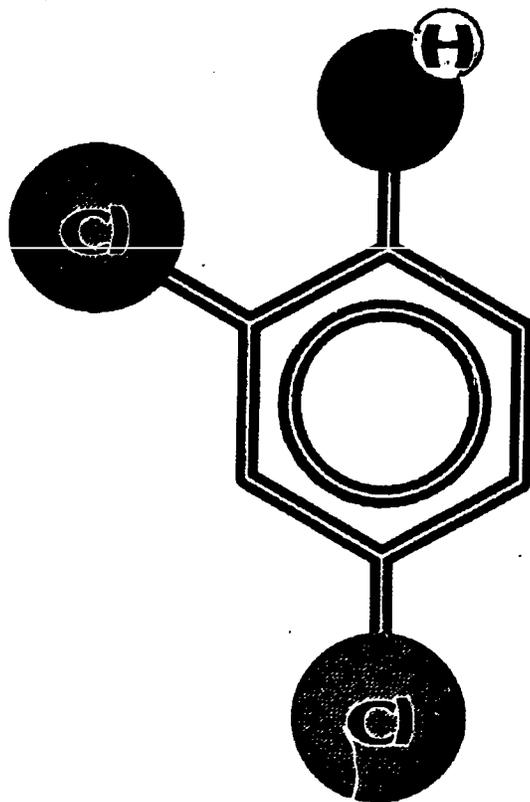


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# 2,4-DICHLOROPHENOL

## SAFE HANDLING GUIDE



# 2,4-Dichlorophenol Safe Handling Guide

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## Introduction

2,4-Dichlorophenol (DCP) is an important intermediate in the manufacture of 2,4-dichlorophenoxyacetic acid (2,4-D), the well-known industrial commodity herbicide. It is also used in the manufacture of other pesticide products and pharmaceuticals.

As an acknowledged leader in the production of DCP, Dow AgroSciences is firmly committed to advancing and maintaining the highest standards of purity, quality, and safety. Because DCP can pose significant health hazards, safe-handling procedures must be observed, and all personnel working with this product must be well trained. For new customer sites, Dow AgroSciences requires and provides a site stewardship assessment prior to the first shipment of product.

## Personnel Training

Personnel handling 2,4-dichlorophenol must understand its hazards, must be trained to avoid those hazards, and must be given specific instructions concerning the personal protective equipment required for particular situations. Safety equipment must be readily available and properly maintained. Workers must be trained in procedures to follow if exposure occurs.

The emphasis should be on preventing exposure, not reacting to an exposure. Safety procedures and material safety data sheets (MSDS) must be reviewed with workers according to OSHA Hazard Communication Standard 29 CFR 1910. The entire training program must be documented in writing, and records must be kept of individual participation.

## Physical Properties

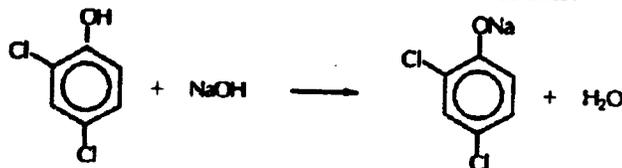
DCP is a white, crystalline solid at room temperature. When molten, it is a colorless liquid. It has a strong phenolic odor, which serves as a good indicator of its presence.

### DCP Physical Properties

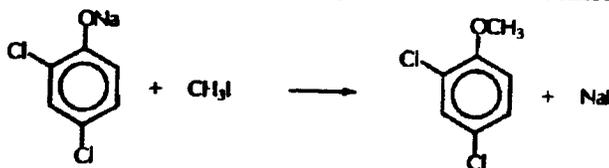
Freezing Point	108°F/42°C
Boiling Point	419°F/215°C
Vapor Pressure @ 20°C	0.10 mm Hg
Vapor Density (Air = 1)	5.6
Water Solubility	0.45 g/100 g
Specific Gravity (60°C/4°C)	1.382
Molecular Weight	163
Flash Point (TCC)	219°F/104°C

## Chemistry and End Uses

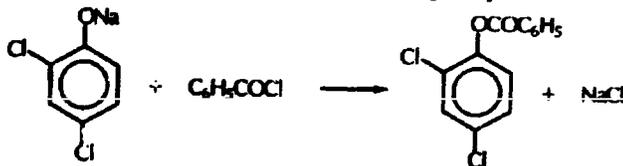
DCP exhibits two major types of reactivity: reactions of the phenolic -OH group and electrophilic substitution in the aromatic ring. The most important type of reactivity is related to the acidity of the -OH group. DCP reacts with bases to form salts. For example, reaction with sodium hydroxide yields the sodium salt of DCP.



The sodium salt of DCP can then react further with alkyl halides or sulfates to form 2,4-dichlorophenyl ethers. For example, reaction with methyl iodide yields 2,4-dichloroanisole.



The sodium salt of DCP also reacts readily with acid chlorides or acid anhydrides to produce esters. For example, reaction with benzoyl chloride yields 2,4-dichlorophenyl benzoate.



An example of electrophilic ring substitution in 2,4-dichlorophenol is the reaction with chlorine, which yields 2,4,6-trichlorophenol.



### End Uses

DCP and its alkali salts are used in the manufacture of a wide variety of chemical products. A common end use for DCP is in the production of phenoxy herbicides. For instance, the sodium salt of DCP is reacted with sodium chloroacetate to produce 2,4-dichlorophenoxyacetic acid, commonly known as 2,4-D. Additional applications for chemicals derived from DCP include pharmaceuticals, fungicides, and insecticides.

## Hazards

In the interest of environmental and personal safety and in compliance with hazard communication policies, Dow AgroSciences supplies an MSDS<sup>1</sup> for DCP. All personnel should read this information carefully and understand the potential hazards associated with DCP before handling it. In addition, all applicable federal, state, and local health and safety laws and regulations should be followed.

### Stability and Reactivity

DCP is stable under normal handling and storage conditions. However, hydrochloric acid and other toxic, irritating products can be produced if DCP is burned. DCP is also extremely corrosive to steel if wet.

### Physical Hazards

**Eye:** Direct contact can cause severe irritation with corneal injury, which could result in permanent impairment of vision, even blindness. Handling DCP at elevated temperatures can generate vapor levels sufficient to cause eye irritation. Contact with heated material can also cause thermal burns.

**Skin:** A brief, single exposure can cause skin burns. DCP is absorbed more readily through the skin when in solution or molten than as a solid. *Molten or hot DCP is immediately absorbed through the skin in amounts that have caused death to humans. Rapid death in humans has been caused by skin exposure without immediate decontamination. Amounts of molten DCP that cover as little as 1% body surface (hand-sized) could result in death.*

**Ingestion:** Small amounts of DCP that might be swallowed incidental to normal handling operations are unlikely to cause injury. However, swallowing large amounts could cause injury. Ingestion can also cause chemical burns of the mouth and throat.

**Inhalation:** Elevated temperatures can generate vapor levels sufficient to cause severe irritation of the upper respiratory tract. Although the formation of DCP dusts is unlikely, such dusts can result in respiratory irritation.

<sup>1</sup>For additional copies of the MSDS contact Dow AgroSciences Customer Service, 1-317-337-7850.

## Handling Precautions

Because of the hazards associated with DCP, constant care must be exercised, and adequate protective measures and equipment fully utilized to avoid harmful effects to personnel or the environment. Written procedures for handling DCP in all applicable operations should also be established. A self-contained system with dry-break connections and sufficient ventilation is recommended in areas where potential exposure can occur. Use extreme caution when handling hot or molten DCP. *Molten or hot DCP is immediately absorbed through the skin in amounts that have caused death to humans. Rapid death in humans has been caused by skin exposure without immediate decontamination. Amounts of molten DCP that cover as little as 1% body surface (hand-sized) could result in death.*

## Protective Measures and Equipment

The sharp, pungent odor and low odor threshold of DCP provide good early warning properties of the presence of DCP. Adequate ventilation should be provided to control airborne concentrations below exposure guidelines when handling DCP.

### Exposure Limits

Dow AgroSciences' Industrial Hygiene Guideline (IHG) for DCP is 1 ppm. The IHG is based upon an 8-hour time-weighted average exposure by vapor inhalation. It should also be noted that inhalation might not be the only route of exposure. Skin contact is another likely exposure route, and DCP can be immediately absorbed through the skin in amounts that have caused rapid death in humans. Absorption through skin accelerates with temperature such that additional measures to minimize exposure to hot or molten DCP should be considered.

### Respiratory Protection

When DCP levels are below the exposure guideline, personnel in areas where the material is stored or used should not need to use respiratory protection. However, if personnel are handling DCP at elevated temperatures (where vapors are likely to be generated) without sufficient ventilation, or if respiratory irritation is experienced, use of a NIOSH-approved full-face air-purifying respirator for organic vapors is recommended. Suitable positive-pressure, self-contained breathing apparatus should be used for longer-term exposure in emergency situations, such as spill clean-ups.

### Face and Eye Protection

For normal operations, chemical goggles should be worn, along with hard hats. For situations in which the potential for exposure is greater, a face shield is also recommended. When handling DCP at elevated temperatures without sufficient ventilation, the use of a NIOSH-approved full-face respirator for organic vapors is recommended.

### Protective Clothing

When the potential for exposure exists, Dow AgroSciences recommends protective clothing impervious to DCP. Protective attire typically consists of neoprene or nitrile gloves, neoprene boots, and Saranex or neoprene full body suit.

### Safety Showers and Eyebaths

Safety showers and eyebaths are essential in any operation involving DCP. They should be located in the immediate work area and readily accessible to personnel. Both should be tested prior to every DCP handling operation.

# First Aid

Because of the toxicity of DCP, prompt action after exposure is necessary to minimize harm to personnel. Emergency first-aid procedures should be covered thoroughly and reviewed frequently in training sessions. If you need help in planning or conducting such training, your Dow AgroSciences representative can assist you with more detailed information.

**Eyes**  
Use an eyebath immediately, and irrigate eyes continuously in flowing water for at least 30 minutes. Remove contact lenses, if present, after 5 minutes, then continue rinsing. Prompt medical attention is essential.

## Skin

Enter the safety shower and immediately flush skin with plenty of water for at least 15 to 20 minutes, while removing all contaminated clothing and shoes. Prompt medical attention is essential. Rapid death in humans has resulted from skin exposure to hot or molten DCP without immediate decontamination. Dispose of contaminated clothing and shoes in a responsible manner.

## Ingestion

Do not induce vomiting unless instructed to do so by a physician. Have individual sip a glass of water if able to swallow. Promptly transport individual to a medical facility.

## Inhalation

Remove to fresh air quickly if any ill effects occur. Consult a physician.

# Shipping information

## Containers

DCP can be supplied in bulk containers such as rail cars, tank trucks, or ISO tanks, or it can be packaged in 55-gallon, galvanized-steel drums. Because DCP freezes at 108°F, it is very likely that the shipment you receive from Dow AgroSciences will require some degree of heating before the container can be completely unloaded into your storage system. Prior to unloading operations, review any written procedures that have been established for handling molten DCP. Make sure all personnel unloading the containers are aware that the containers will need to be safely vented to relieve excess pressure resulting from thawing of DCP. Either low-pressure steam or hot water can be used to melt DCP. Caution must be exercised when opening any container of molten DCP. To minimize the risk of exposure to DCP, the following minimum personal protective equipment is recommended: nitrile or neoprene gloves, neoprene boots, Saranex or neoprene suit, and face shield. In situations involving potential exposure to DCP vapors, a full-face respirator is recommended.

## Bulk Vehicles

All bulk vehicles used for the transportation of DCP must be returned to the Dow AgroSciences DCP production facility for decontamination prior to being released for cleaning. Every effort

will be made to use dedicated equipment to minimize the number of vehicles in this service. This practice can affect the scheduling of product shipments.

## Special Routing

Dow AgroSciences will use two drivers when molten DCP must be shipped by tank truck. Restricted routing might be required for such shipments. Adequate lead-time is necessary to ensure that appropriate equipment, drivers, and routings are available.

## Placarding and Labeling Requirements

Regulations require documentation, labeling, marking, placarding, and package/container approval for materials that meet certain criteria. The shipping description must include the above information and the emergency response telephone number. Any storage tank for DCP must be properly identified and labeled. Other tank labels required by federal, state, or local regulations must also be installed.

*Global Transportation [I.M.D.G.]—Bulk:* DICHLOROPHENOL, SOLID / 6.1 / UN2020 / III / RC (2,4-DICHLOROPHENOL) / MARINE POLLUTANT/PLACARDED: TOXIC 2020 / HAZMAT STCC = 49366545.

*Land [North America]—Non-Bulk:* TOXIC LIQUID, CORROSIVE, INORGANIC, N.O.S.

**Dow AgroSciences** 00011560

**2,4-Dichlorophenol**

**DANGER**

**POISON**

**MARINE POLLUTANT**

**6**

**TOXIC SOLID, CORROSIVE, INORGANIC, N.O.S. (2,4-DICHLOROPHENOL) UN2020 RC (2,4-DICHLOROPHENOL)**

**FOR EXPORT ONLY**

**Net Weight 250 kg / 550 lb**

**Dow AgroSciences LLC, Indianapolis, IN 46206 USA**

**First Aid**

**Prevention**

**Storage**

**Disposal**

**Emergency Response**

**Spill Response**

**Fire Response**

**Transportation**

**Information**

**Other**

Drum Label

(2,4-DICHLOROPHENOL)/6.1/UN3289/II/RQ  
(2,4-DICHLOROPHENOL).

Examples of product and NFPA hazard labels for DCP are provided for reference.

nel who will provide advice and arrange for professional help, as needed, to assist with an emergency.

Dow AgroSciences Emergency Response

1-800-992-5994

Transportation Emergencies

Contact Dow AgroSciences Emergency Response at 1-800-992-5994 to speak with person-

**Dow AgroSciences** 0011933

## 2,4-Dichlorophenol

**DANGER**

**POISON**

**Causes Severe Eye Burns • Causes Severe Skin Burns • May Be Fatal If Absorbed Through The Skin • Causes Severe Burns Of The Mouth And Throat • Dust And Vapor Extremely Irritating If Inhaled • May Cause Liver And Kidney Effects • May Cause Blood Effects**

Material 2,4-Dichlorophenol is immediately absorbed through skin in amounts which have caused death in humans. Rapid death in humans has been caused by skin exposure without immediate decontamination. Amounts of material 2,4-dichlorophenol that may cover as little as 1% body surface area (hand-to-hand) may cause death.

Do not get in eyes or on skin or on clothing. Do not take internally. Avoid breathing dust or vapor. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling.

**POSSIBLE CANCER HAZARD**  
This chemical contains an impurity which may cause cancer based on laboratory animal testing.

**First Aid**  
In case of eye contact, immediate and continuous irrigation with flowing water for at least 30 minutes is imperative. Get medical attention immediately. Wash clothing before reuse. Destroy and dispose of items that cannot be decontaminated, such as shoes. If swallowed, do not induce vomiting. Give large amounts of water or milk, if available. Get medical attention immediately. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

**Container Disposal:** When disposing of unused contents, comply with applicable federal, state and local requirements. Consult Dow AgroSciences for further procedures.

**Container Disposal:** Do not offer empty container for reuse or reconditioning. Dispose of container in compliance with applicable federal state and local requirements.

**For Additional Information, read the Material Safety Data Sheet for this product.**

In case of emergency endangering health or the environment involving this product, call 1-800-992-5994.

900-006316 / 00014377

Dow AgroSciences LLC • Indianapolis, IN 46288 USA

Tank Truck Label

**Dow AgroSciences** 00004398

## 2,4-Dichlorophenol

**DANGER**

**POISON**

**Causes Severe Eye Burns • Causes Severe Skin Burns • May Be Fatal If Absorbed Through The Skin • Causes Severe Burns Of The Mouth And Throat • Dust And Vapor Extremely Irritating If Inhaled • May Cause Liver And Kidney Effects • May Cause Blood Effects**

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**Container Disposal:** When disposing of unused contents, comply with applicable federal, state and local requirements. Consult Dow AgroSciences for further procedures.

**Container Disposal:** Do not offer empty container for reuse or reconditioning. Dispose of container in compliance with applicable federal state and local requirements.

**For Additional Information, read the Material Safety Data Sheet for this product.**

In case of emergency endangering health or the environment involving this product, call 1-800-992-5994.

900-006337 / 00132159

Dow AgroSciences LLC • Indianapolis, IN 46288 USA

Net Weight \_\_\_\_\_ lb

Rail Car Label

## Sampling, Unloading, and Spill Clean-Up

### Sampling

The proper approach for sampling solid DCP depends on the working conditions and type of container or system from which the sample will be obtained. Good judgement should be used to determine the method for obtaining a representative solid sample that minimizes the potential for exposure. Chemical goggles and impervious gloves must be worn to obtain the sample.

Sampling hot or molten DCP should be done using a properly designed sampling system. Sampling devices should be placed in enclosures designed to isolate the product from personnel and the environment. Whenever samples are taken using such an enclosure, goggles and neoprene or nitrile gloves must be worn. If an enclosure is not used, full protective clothing (impervious gloves, boots, and suit) and a full-face respirator must be worn. *Direct sampling of hot or molten DCP should be avoided.*

In any case, operating personnel should review all sampling procedures with supervision in advance to determine the best sampling method and proper protective equipment required for the task.

### Unloading

Because DCP is a solid at ambient temperatures, rail cars containing DCP will need to be thawed prior to unloading. Medium-pressure steam is recommended for melting DCP. The rail car should be equipped with steam coils to aid in the thawing process. When unloading molten DCP, use an unloading checklist (see sample). Review all written procedures established for your facility for unloading DCP from a rail-car.

Wear appropriate protective equipment, barricade the immediate area, and restrict access. Ensure that safety showers and eyebaths are located nearby and are immediately accessible and operational. Use extreme caution when connecting any unloading lines and steam lines to the rail car. Monitor the transfer with another person in attendance and, after transfer, blow out the unloading line with either nitrogen or dry air.

### Unloading System Design

DCP is primarily shipped in top-unload, insulated rail cars equipped with dry-disconnect fittings and external steam coils for melting the solid DCP. The use of a pump to unload molten DCP is recom-

mended. A nitrogen pad can be used to help prime the transfer pump. A typical rail car unloading design is shown in Figure 1.

The storage tank should be vented back either to the bulk container or to a scrubber to avoid emissions of DCP. If the tank is vented to a scrubber, the bulk container should be padded with nitrogen. Consideration should be made for purging product from the unloading line to allow for a clean disconnect.

Safety showers and eyebaths should be in the unloading area and should be tested prior to every DCP handling operation to ensure that they are operational. Consideration should be made to contain leaks and avoid discharging DCP to the environment.

For more information on DCP transportation or materials of construction issues, contact your Dow AgroSciences representative.

**SUGGESTED RAIL CAR UNLOADING CHECKLIST**

Date: \_\_\_\_\_ Rail Car #: \_\_\_\_\_

Material to Unload: \_\_\_\_\_

<p><b>Before Unloading:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Rail car spotted on an unloading containment pad?</li> <li><input type="checkbox"/> Wheels checked and brakes set?</li> <li><input type="checkbox"/> Product seals intact?</li> <li><input type="checkbox"/> Dry-disconnect fittings in good condition?</li> <li><input type="checkbox"/> Receipt material identification checked?</li> <li><input type="checkbox"/> Receiving tank level verified?</li> <li><input type="checkbox"/> Contents thawed?</li> <li><input type="checkbox"/> Steam lines disconnected?</li> <li><input type="checkbox"/> Car vented properly?</li> <li><input type="checkbox"/> Ground wire attached?</li> <li><input type="checkbox"/> Proper protective equipment being worn?</li> <li><input type="checkbox"/> Safety shower and eye bath operational?</li> <li><input type="checkbox"/> Barricades and warning signs placed, if needed?</li> <li><input type="checkbox"/> Unloading line connected properly?</li> <li><input type="checkbox"/> Discharge valves open?</li> <li><input type="checkbox"/> Transfer occurring properly?</li> </ul>	<p><b>After Unloading:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Rail car empty? Verified?</li> <li><input type="checkbox"/> Receiving tank level verified?</li> <li><input type="checkbox"/> All valves closed and capped?</li> <li><input type="checkbox"/> Pump turned off?</li> <li><input type="checkbox"/> Vent piping disconnected?</li> <li><input type="checkbox"/> Unloading line purged?</li> <li><input type="checkbox"/> Unloading line disconnected?</li> <li><input type="checkbox"/> Ground wire removed?</li> <li><input type="checkbox"/> Chocks removed?</li> <li><input type="checkbox"/> Barricade and warning signs removed?</li> <li><input type="checkbox"/> Dome cover tight?</li> <li><input type="checkbox"/> Spills/leakage cleaned up?</li> </ul> <p style="text-align: right;">Unloader's Signature _____</p>
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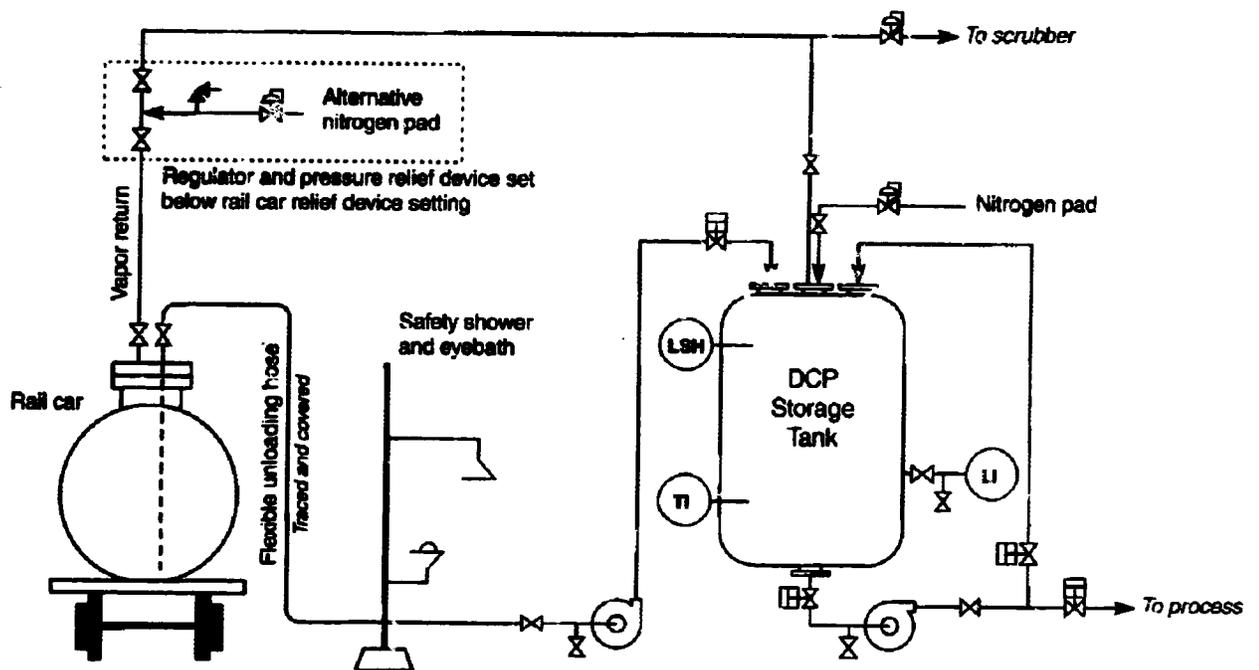


FIGURE 1: Typical DCP rail car unloading and storage system design: top unloading with a pump.

### Spill Clean up

Use the recommended personal protective equipment: neoprene or nitrile gloves, neoprene boots, face shield, and Saranex or neoprene suit. Contain small amounts of solid material and scoop into a steel or plastic container for disposal. Do not use water to wash down spill area.

For molten DCP, wear full personal protective equipment (neoprene or nitrile gloves, neoprene boots, full-face respirator, and Saranex or neoprene suit), contain and isolate the spill, and allow the material to solidify. Scoop solid material into a steel or plastic container. For large spills, the use of self-contained breathing equipment should be considered.

Dispose of containers in accordance with all federal, state, and local guidelines and regulations. Under no circumstances should DCP be allowed to enter sewers or natural waters because of its toxicity to fish and aquatic organisms. See the MSDS for detailed ecological information.

### CERCLA/SARA Reportable Quantities

A spill of 100 pounds or more of product is a reportable quantity (RQ) and must be reported to federal, state, and local emergency agencies. Verify with state and local agencies that this RQ is applicable at your location.

### Storage

Suggested materials of construction for dry DCP storage and handling systems include carbon steel and 316 stainless steel. Handling wet DCP will require systems constructed of more corrosion-resistant materials such as Hastelloy C or monel. Contact your Dow AgroSciences representative for more information on materials of construction compatibilities.

Storage tanks should be equipped with a regulated nitrogen pad/depad system. The tank should be vented to a scrubber system to avoid emissions of DCP. However, the scrubber must be properly isolated from the storage tank to avoid contamination of DCP with scrubber solution. Tank levels should be continuously monitored and have a redundant high-level alarm. Secondary containment should be constructed from or coated with an acid-resistant material. Safety showers and eyebaths must be located nearby.

To clear piping and equipment for maintenance, all piping should be sloped to a drain. Double-block valve and bleed systems should be used whenever possible to isolate DCP from maintenance personnel. To minimize the potential for contaminating the DCP system with water, no water lines should be hard piped into the system.

## Commitment to Responsible Care® and Product Stewardship

This *2,4-Dichlorophenol Safe Handling Guide* has been prepared as part of Dow AgroSciences' product stewardship program and Responsible Care. Dow AgroSciences is dedicated to meeting the guiding principles of the global Responsible Care initiative. These principles emphasize continuous improvement in pollution prevention, employee health and safety, distribution, process safety, product stewardship, and community awareness and emergency response.

This guide includes considerations for handling DCP and describes equipment suitable for storage and handling of bulk quantities. The guide details Dow AgroSciences' interpretation of many codes and regulations relevant to this type of product. If government requirements applicable to your facility are more stringent, those requirements must be followed.

This guide is not intended as, and should not be used as, a substitute for engineering or legal advice. Applicable legislation and regulations are constantly changing. Future regulatory and judicial developments could necessitate changes to the procedures recommended in this guide. Each user or handler of 2,4-dichlorophenol is responsible for compliance with all applicable federal, state, and local laws, regulations, and codes.

Dow AgroSciences urges you to review your applications and procedures regularly to ensure that personnel handling DCP are thoroughly trained and properly equipped. These individuals should be aware of all potential hazards and should know how to administer first aid. For more information regarding this product, contact your Dow AgroSciences representative.