

# OCCUPATIONAL SAFETY AND HEALTH GUIDELINE FOR DIURON

## INTRODUCTION

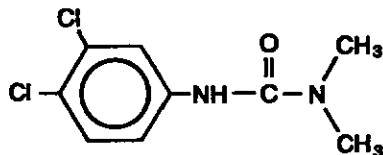
This guideline summarizes pertinent information about diuron for workers and employers as well as for physicians, industrial hygienists, and other occupational safety and health professionals who may need such information to conduct effective occupational safety and health programs. Recommendations may be superseded by new developments in these fields; readers are therefore advised to regard these recommendations as general guidelines and to determine periodically whether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

## SUBSTANCE IDENTIFICATION

### • Formula



### • Structure



### • Synonyms

3-(3,4-Dichlorophenyl)-1,1-dimethylurea; dichlorfenidim; Crisuron; Diurex; Karmex Diuron Herbicide; Telvar Diuron Weed Killer

### • Identifiers

1. CAS No.: 330-54-1
2. RTECS No.: YS8925000
3. DOT UN: 2767 55
4. DOT label: None

### • Appearance and odor

Diuron is a white, odorless, crystalline solid. It is available commercially as an 80 percent wettable powder or a 35 percent aqueous suspension.

## CHEMICAL AND PHYSICAL PROPERTIES

### • Physical data

1. Molecular weight: 233.1
2. Boiling point (760 mm Hg): 189° to 190°C (372.2° to 374°F) (decomposes)
3. Specific gravity: Data not available
4. Vapor density: Data not available
5. Melting point: 158° to 159°C (316.4° to 318.2°F)
6. Vapor pressure at 50°C (122°F): 0.0000031 mm Hg

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Public Health Service  
Centers for Disease Control and Prevention  
National Institute for Occupational Safety and Health  
Education and Information Division

U.S. DEPARTMENT OF LABOR  
Occupational Safety and Health Administration

7. Solubility: Slightly soluble in water and hydrocarbons; soluble in acetone.

8. Evaporation rate: Data not available

### Reactivity

1. Conditions contributing to instability: Heat, sparks, and open flame.

2. Incompatibilities: None reported

3. Hazardous decomposition products: Toxic gases (such as chlorine and oxides of nitrogen) may be released in a fire involving diuron.

4. Special precautions: Diuron hydrolyzes in fairly strong acids.

### Flammability

The National Fire Protection Association has not assigned a fire hazard rating for diuron; this substance is not flammable.

1. Flash point: Not applicable

2. Autoignition temperature: Not applicable

3. Flammable limits in air: Not applicable

4. Extinguishant: Use dry chemical, CO<sub>2</sub>, water spray, fog, or standard foam to fight fires involving diuron.

Fires involving diuron should be fought upwind from the maximum distance possible. Isolate the hazard area and deny access to unnecessary personnel. Emergency personnel should stay out of low areas and ventilate closed spaces before entering. Containers of diuron should be moved from the fire area if it is possible to do so safely. Stay away from the ends of containers. Dikes should be used to contain fire-control water for later disposal. Firefighters should wear a full set of protective clothing and self-contained breathing apparatus when fighting fires involving diuron. Chemical protective clothing that is specifically recommended for diuron may not provide thermal protection unless so stated by the clothing manufacturer. Structural firefighters' protective clothing is not effective against fires involving diuron.

## EXPOSURE LIMITS

### • OSHA PEL

The Occupational Safety and Health Administration (OSHA) has not promulgated a permissible exposure limit (PEL) for diuron [29 CFR 1910.1000, Table Z-1].

### • NIOSH REL

The National Institute for Occupational Safety and Health (NIOSH) has established a recommended exposure limit (REL) of 10 mg/m<sup>3</sup> as a TWA for up to a 10-hr workday and a 40-hr workweek for diuron [NIOSH 1992].

### • ACGIH TLV

The American Conference of Governmental Industrial Hygienists (ACGIH) has assigned diuron a threshold limit value (TLV) of 10 mg/m<sup>3</sup> as a TWA for a normal 8-hr workday and a 40-hr workweek [ACGIH 1991].

### • Rationale for limits

The NIOSH limit is based on the risk of respiratory irritation associated with diuron exposure [NIOSH 1992].

## HEALTH HAZARD INFORMATION

### • Routes of exposure

Exposure to diuron can occur through inhalation, ingestion, and eye or skin contact.

### • Summary of toxicology

1. *Effects on Animals:* Acute exposure to diuron causes mild skin irritation and narcosis in animals, and chronic exposure to this substance may cause blood changes and spleen and liver enlargement. In contact with the unbroken skin of guinea pigs, diuron caused no irritation; in contact with broken skin, however, this substance caused a moderate degree of irritation [EPA 1987]. The dermal LD<sub>50</sub> in rabbits is greater than 2,500 mg/kg [EPA 1987]. Instilled into the eyes of rabbits, diuron caused no irritation [EPA 1987]. The oral LD<sub>50</sub> in rats is 1,017 mg/kg [NIOSH 1993]. Acutely poisoned animals showed signs of central

nervous system depression before death [EPA 1987]. Rats fed daily doses of diuron ranging from 2,000 to 8,000 ppm in the diet for 42 days showed decreased red blood cell counts and hemoglobin values (2,000 ppm or greater), growth retardation (4,000 ppm or greater), and increased mortality (8,000 ppm) [EPA 1987]. Rats fed diuron at a dietary dose of 5,000 ppm for 90 days showed reduced body weights, enlarged spleens, splenic hemosiderosis, and chronic methemoglobinemia [EPA 1987]. Rats fed diuron at a dietary dose of 250 ppm or higher for 2 years showed growth retardation, decreased red blood cell counts, decreased hemoglobin values, splenic hemosiderosis, and increased mortality [EPA 1987]. Oral exposure to 250 mg/kg/day of an 80 percent diuron solution on days 6 through 15 of gestation caused a statistically significant increase in wavy rib abnormalities in the offspring of rats [EPA 1987].

2. *Effects on Humans:* No information on the toxic effects of occupational exposure to diuron is available. Based on effects seen in animals, acute exposure to diuron would be expected to cause mild skin irritation and headaches, drowsiness, and incoordination in humans.

• **Signs and symptoms of exposure**

1. *Acute exposure:* No signs or symptoms of acute exposure to diuron have been reported in humans.
2. *Chronic exposure:* No signs or symptoms of chronic exposure to diuron have been reported in humans.

• **Emergency procedures**

**WARNING!**

Seek immediate medical attention for severely affected victims or for victims with signs and symptoms of toxicity or irritation!

Keep unconscious victims warm and on their sides to avoid choking if vomiting occurs. Initiate the following emergency procedures:

1. *Eye exposure:* Irritation may result. *Immediately and thoroughly* flush the eyes with large amounts of

water, occasionally lifting the upper and lower eyelids.

2. *Skin exposure:* Irritation may result. *Immediately and thoroughly* wash contaminated skin with soap and water.
3. *Inhalation exposure:* Move the victim to fresh air *immediately*. Have victim blow his or her nose, or use a soft tissue to remove particulates or residues from the nostrils.

If the victim is not breathing, clean any chemical contamination from the victim's lips and perform cardiopulmonary resuscitation (CPR); if breathing is difficult, give oxygen.

4. *Ingestion exposure:* Take the following steps if diuron or any material containing it is ingested:

—Have the victim rinse the contaminated mouth cavity several times with a fluid such as water.

—Have the victim drink a glass (8 oz) of fluid such as water.

—Induce vomiting by giving syrup of ipecac as directed on the package. If ipecac is unavailable, have the victim touch the back of the throat with a finger until productive vomiting ceases.

—Do *not* force an unconscious or convulsing person to drink fluid or to vomit.

5. *Rescue:* Remove an incapacitated worker from further exposure and implement appropriate emergency procedures (e.g., those listed on the material safety data sheet required by OSHA's hazard communication standard [29 CFR 1910.1200]). All workers should be familiar with emergency procedures, the location and proper use of emergency equipment, and methods of protecting themselves during rescue operations.

**EXPOSURE SOURCES AND CONTROL METHODS**

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

—Manufacture, formulation, and use as a pre-emergence herbicide

—Use as a general weed killer and as a soil sterilant

—Use as a sugar cane flowering suppressant

The following methods are effective in controlling worker exposures to diuron, depending on the feasibility of implementation:

—Process enclosure

—Local exhaust ventilation

—General dilution ventilation

—Personal protective equipment

Good sources of information on control methods are as follows:

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

## MEDICAL MONITORING

Workers who may be exposed to chemical hazards should be monitored in a systematic program of medical surveillance that is intended to prevent occupational injury and disease. The program should include education of employers and workers about work-related hazards, early detection of adverse health effects, and referral of workers for diagnosis and treatment. The occurrence of disease or other work-related adverse health effects should prompt immediate evaluation of primary preventive measures

(e.g., industrial hygiene monitoring, engineering controls, and personal protective equipment). A medical monitoring program is intended to supplement, not replace, such measures. To place workers effectively and to detect and control work-related health effects, medical evaluations should be performed (1) before job placement, (2) periodically during the term of employment, and (3) at the time of job transfer or termination.

### • Preplacement medical evaluation

Before a worker is placed in a job with a potential for exposure to diuron, a licensed health care professional should evaluate and document the worker's baseline health status with thorough medical, environmental, and occupational histories, a physical examination, and physiologic and laboratory tests appropriate for the anticipated occupational risks. These should concentrate on the function and integrity of the blood.

A preplacement medical evaluation is recommended to detect and assess medical conditions that may be aggravated or may result in increased risk when a worker is exposed to diuron at or below the prescribed exposure limit. The examining health care professional should consider the probable frequency, intensity, and duration of exposure as well as the nature and degree of any applicable medical condition. Such conditions (which should not be regarded as absolute contraindications to job placement) include a history and other findings consistent with adverse effects on the blood.

### • Periodic medical examinations and biological monitoring

Occupational health interviews and physical examinations should be performed at regular intervals during the employment period, as mandated by any applicable Federal, State, or local standard. Where no standard exists and the hazard is minimal, evaluations should be conducted every 3 to 5 years or as frequently as recommended by an experienced occupational health physician. Additional examinations may be necessary if a worker develops symptoms attributable to diuron exposure. The interviews, examinations, and medical screening tests should focus on identifying the adverse effects of diuron on the blood. Current health status should be compared with the baseline health status of the individual worker or with expected values for a suitable reference population.

Biological monitoring involves sampling and analyzing body tissues or fluids to provide an index of exposure to

a toxic substance or metabolite. No biological monitoring test acceptable for routine use has yet been developed for diuron.

- **Medical examinations recommended at the time of job transfer or termination**

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

## **WORKPLACE MONITORING AND MEASUREMENT**

Determination of a worker's exposure to airborne diuron is made using an OSHA Versatile Sampler (OVS-2) 13 mm XAD-2 tube (270/140 mg sections, 20/60 mesh) with glass fiber filter enclosed. Samples are collected at a maximum flow rate of 1.0 liter/min until a maximum air volume of 60 liters is collected. Analysis is conducted by high performance liquid chromatography using ultraviolet detection. This method is described in the OSHA Computerized Information System [OSHA 1992] and the *OSHA Chemical Information Manual* [OSHA 1987].

## **PERSONAL HYGIENE**

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

Clothing contaminated with diuron should be removed immediately, and provisions should be made for the safe removal of the chemical from the clothing.

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

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

## **STORAGE**

Diuron should be stored in a cool, dry, well-ventilated area in tightly sealed containers that are labeled in accordance with OSHA's hazard communication standard [29 CFR 1910.1200]. Containers of diuron should be protected from physical damage and should be stored separately from heat, sparks, and open flame. Because containers that formerly contained diuron may still hold product residues, they should be handled appropriately.

## **SPILLS AND LEAKS**

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

1. Do not touch the spilled material.
2. Notify safety personnel.
3. Remove all sources of heat and ignition.
4. Ventilate the area of the spill or leak.
5. Water spray may be used to reduce vapors.
6. For small dry spills, use a clean shovel and gently place the material into a clean, dry container, creating as little dust as possible; cover and remove the container from the spill area.
7. For small liquid spills, take up with sand or other noncombustible absorbent material and place into closed containers for later disposal.
8. For large liquid spills, build dikes far ahead of the spill to contain the diuron for later reclamation or disposal.

## **SPECIAL REQUIREMENTS**

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

## Emergency planning requirements

Diuron is not subject to EPA emergency planning requirements under the Superfund Amendments and Reauthorization Act (SARA) [42 USC 11022].

## Reportable quantity requirements for hazardous releases

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

The reportable quantity for diuron is 100 lb. If an amount equal to or greater than this quantity is released within a 24-hour period in a manner that will expose persons outside the facility, employees are required to do the following:

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

## • Community right-to-know requirements

Employers are not required by Section 313 of SARA to submit a Toxic Chemical Release Inventory form (Form R) to EPA reporting the amount of diuron emitted or released from their facility annually.

## • Hazardous waste management requirements

EPA considers a waste to be hazardous if it exhibits any of the following characteristics: ignitability, corrosivity, reactivity, or toxicity, as defined in 40 CFR 261.21-261.24. Although diuron is not specifically listed as a hazardous waste under the Resource Conservation and

Recovery Act (RCRA) [40 USC 6901 et seq.], EPA requires employers to treat any waste as hazardous if it exhibits any of the characteristics discussed above.

Providing detailed information about the removal and disposal of specific chemicals is beyond the scope of this guideline. The U.S. Department of Transportation, EPA, and State and local regulations should be followed to ensure that removal, transport, and disposal of this substance are conducted in accordance with existing regulations. To be certain that chemical waste disposal meets EPA regulatory requirements, employers should address any questions to the RCRA hotline at (800) 424-9346 or at (202) 382-3000 in Washington, D.C. In addition, relevant State and local authorities should be contacted for information about their requirements for waste removal and disposal.

## RESPIRATORY PROTECTION

### • Conditions for respirator use

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

### • Respiratory protection program

Employers should institute a complete respiratory protection program that, at a minimum, complies with the requirements of OSHA's respiratory protection standard [29 CFR 1910.134]. Such a program must include respirator selection, an evaluation of the worker's ability to perform the work while wearing a respirator, the regular training of personnel, respirator fit testing, periodic workplace monitoring, and regular respirator maintenance, inspection, and cleaning. The implementation of an adequate respiratory protection program (including selection of the correct respirator) requires that a knowledgeable person be in charge of the program and that the program be evaluated regularly. For additional informa-

tion about the selection and use of respirators and about the medical screening of respirator users, consult the *NIOSH Respirator Decision Logic* [NIOSH 1987b] and the *NIOSH Guide to Industrial Respiratory Protection* [NIOSH 1987a].

## PERSONAL PROTECTIVE EQUIPMENT

Protective clothing (gloves, boots, and coveralls, as appropriate) should be worn to prevent skin contact with diuron. Chemical protective clothing should be selected on the basis of available performance data, manufacturers' recommendations, and evaluation of the clothing under actual conditions of use. No reports have been published on the resistance of various protective clothing materials to diuron permeation. If permeability data are not readily available, protective clothing manufacturers should be requested to provide information on the best chemical protective clothing for workers to wear when they are exposed to diuron.

If diuron is dissolved in water or an organic solvent, the permeation properties of both the solvent and the mixture must be considered when selecting personal protective equipment and clothing.

Safety glasses, goggles, or face shields should be worn during operations in which diuron might contact the eyes (e.g., through dust particles or splashes of solution). Eyewash fountains and emergency showers should be available within the immediate work area whenever the potential exists for eye or skin contact with diuron. Contact lenses should not be worn if the potential exists for diuron exposure.

## REFERENCES CITED

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