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The background of the advertisement features a collage of safety equipment. In the upper left, a pair of clear safety glasses with black frames is shown. Below them, a pair of white nitrile gloves is visible. In the center and right, there are several respirators. One is a white cup-shaped respirator with a black filter, and another is a grey respirator with a large black circular filter. The equipment is set against a dark, textured background.

Respiratory Protection for Select Glycol Ethers

CELLOSOLVE® Solvent
CELLOSOLVE® Acetate
Methyl CELLOSOLVE® Solvent

UNION
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IMPORTANT:

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Respiratory Protection for Select Glycol Ethers

CELLOSOLVE® Solvent ~ CELLOSOLVE® Acetate ~ Methyl CELLOSOLVE® Solvent

Introduction

As part of our on-going Product Stewardship Program, Union Carbide Corporation (UCC) has lowered the Recommended Exposure Limits for three glycol ethers, as shown in the following table. All values have a Skin Notation, indicating that measures must be taken to prevent skin absorption.

| Glycol Ether | UCC Recommended Exposure Limits | | | |
|-----------------------------------|---------------------------------|----------------------------|-----|-------------|
| | Previous | | New | |
| | TWA ⁽¹⁾ | STEL ⁽²⁾ 15 min | TWA | STEL 15 min |
| CELLOSOLVE® Solvent (EGEE) | 5 | – | 2 | 5 |
| CELLOSOLVE® Acetate (EGEEA) | 5 | – | 2 | 5 |
| Methyl CELLOSOLVE® Solvent (EGME) | 5 | – | 0.2 | 0.4 |
| | 2* | 5* | | |

* Women of child-bearing potential
(1) TWA is an 8-hour Time Weighted Average
(2) STEL is a 15-minute Short Term Exposure Limit

Safety Considerations

When considering the use of any Union Carbide products in a particular application, you should review our latest Material Safety Data Sheets and ensure that the use you intend can be accomplished safely. For Material Safety Data Sheets and other product safety information, contact the Union Carbide Sales Office nearest you. Before handling any other products mentioned in the text, you should obtain available product safety information and take necessary steps to ensure safety of use.

No chemical should be used as or in a food, drug, medical device, or cosmetic, or in a product or process in which it may contact a food, drug, medical device, or cosmetic until the user has determined the suitability and legality of the use. Since government regulations and use conditions are subject to change, it is the user's responsibility to determine that this information is appropriate and suitable under current, applicable laws and regulations.

Union Carbide requests that you read, understand, and comply with the information contained in this publication and the current Material Safety Data Sheet(s). You should furnish the information in this publication to your employees, contractors, and customers, or any other users of the product(s), and request that they do the same.

Note:

Union Carbide has prepared this bulletin to provide you with information so that you can make independent, informed decisions concerning the use of respiratory protection to prevent occupational overexposures to CELLOSOLVE® Solvent, CELLOSOLVE Acetate, and Methyl CELLOSOLVE Solvent.

Product Descriptions

| | Glycol Ether | | |
|----------------------------------|---|---|---|
| | CELLOSOLVE® Solvent | CELLOSOLVE® Acetate | Methyl CELLOSOLVE® Solvent |
| CAS No. | 110-80-5 | 111-15-9 | 109-86-4 |
| Molecular Weight | 90.12 | 132.16 | 76.1 |
| Formula | C ₂ H ₅ OCH ₂ CH ₂ OH | C ₂ H ₅ OCH ₂ CH ₂ OCOCH ₃ | CH ₃ OCH ₂ CH ₂ OH |
| Chemical Name | Ethylene Glycol Monoethyl Ether | Ethylene Glycol Monoethyl Ether Acetate | Ethylene Glycol Monomethyl Ether |
| Density at 20°C, µg/µL | 929 | 973 | 965 |
| Vapor Pressure at 20°C, mm Hg | 4.08 | 1.472 | 6.17 |

Controlling Exposure

If an operation creates the potential for employee overexposure, accepted engineering or administrative controls such as enclosure or confinement of the operation, general or local ventilation, or work practices that minimize exposures should be the first choices for control. When effective engineering or administrative controls are not feasible, or when they are being implemented or evaluated, appropriate respiratory protection can be used to control employee exposures.

Determining the Need for Respiratory Protection

The need for respiratory protection for employees working with CELLOSOLVE® Solvent, CELLOSOLVE Acetate, and Methyl CELLOSOLVE Solvent can be determined by completing the following steps:

STEP 1:

Conduct Workplace Survey

The workplace should be surveyed to identify the job categories (facility areas, job tasks, employees) that use or have the potential for exposure to CELLOSOLVE Solvent, CELLOSOLVE Acetate, and/or Methyl CELLOSOLVE Solvent.

STEP 2:

Conduct Industrial Hygiene Monitoring/Exposure Assessment

Industrial hygiene monitoring, or other acceptable exposure assessment methods should be used to define the full-shift, time-weighted average (TWA) exposures and their ranges under normal operating conditions for CELLOSOLVE Solvent, CELLOSOLVE Acetate, and Methyl CELLOSOLVE Solvent. Any peak exposures should also be defined.

Union Carbide has published a separate technical bulletin, *Workplace Monitoring for Select Glycol Ethers: CELLOSOLVE® Solvent, CELLOSOLVE Acetate, Methyl CELLOSOLVE Solvent*, which outlines Union Carbide’s two methods for monitoring workplace exposures to these three products. Both methods collect these select glycol ethers on carbon media (organic vapor monitor and carbon tube) and analyze them by gas chromatography. These methods have been validated in Union Carbide’s laboratories for full-shift personnel and area monitoring. Contact your Union Carbide sales representative to obtain a copy of this bulletin.

If your facility does not have the resources or the expertise to conduct its own industrial hygiene monitoring, local industrial hygiene associations can be contacted for information on available industrial hygiene consultants.

STEP 3:

Compare Exposure Assessment to Applicable Occupational Exposure Limits (OEL)

Once the potential for exposures to CELLOSOLVE Solvent, CELLOSOLVE Acetate, and Methyl CELLOSOLVE Solvent have been estimated, they should be compared to the applicable occupational exposure limit (OEL) recommended for the particular glycol ether in use. Please follow Union Carbide’s Recommended Internal Exposure Limits (IELs), unless there is a more stringent local government or company requirement in existence. Union Carbide’s recommended IELs are shown in the table below. Included for reference are other selected occupational exposure limits currently in effect in the United States.

| Glycol Ether | Occupational Exposure Limit | | |
|---|-----------------------------|-------------------------|--------------------------|
| | UCC IEL ⁽¹⁾ | OSHA PEL ⁽²⁾ | ACGIH TLV ⁽³⁾ |
| CELLOSOLVE® Solvent (Ethylene Glycol Monoethyl Ether) | 2 ppm TWA 5 ppm STEL | 200 ppm TWA | 5 ppm TWA |
| CELLOSOLVE® Acetate (Ethylene Glycol Monoethyl Ether Acetate) | 2 ppm TWA 5 ppm STEL | 100 ppm TWA | 5 ppm TWA |
| Methyl CELLOSOLVE® Solvent (Ethylene Glycol Monomethyl Ether) | 0.2 ppm TWA 0.4 ppm STEL | 25 ppm TWA | 5 ppm TWA |

(1) Internal Exposure Limit
(2) Permissible Exposure Limit
(3) Threshold Limit Value

In addition, OSHA, ACGIH, and Union Carbide limits have “skin” notations, indicating that special precautions must be taken to prevent skin absorption.

ACGIH

American Conference of Governmental Industrial Hygienists

OSHA

United States Occupational Safety and Health Administration

STEL

Short-term Exposure Limit.

A 15-minute time-weighted average exposure that should not be exceeded at anytime during a workday, even if the TWA is within the applicable OEL.

TWA

Time-weighted average exposure concentration for a normal 8-hour workday or a 40-hour workweek.

Determining the Need for Respiratory Protection ~ continued

STEP 4:

Reduce Potential for Overexposure Where Identified

When the estimated exposures to CELLOSOLVE® Solvent, CELLOSOLVE Acetate, and Methyl CELLOSOLVE Solvent have been determined to exceed the applicable occupational exposure limit recommended for the particular glycol ether in use, then acceptable control measures must be utilized. Examples of acceptable control measures include (but are not limited to):

- ◆ Enclosure or confinement of the operation
- ◆ Increased general ventilation
- ◆ Local exhaust ventilation
- ◆ Work practices that minimize exposures
- ◆ Respiratory protection and protective clothing

Types of Respiratory Protection

Two general types of respiratory protection are used to control exposures to CELLOSOLVE Solvent, CELLOSOLVE Acetate, and Methyl CELLOSOLVE Solvent:

Organic Vapor Chemical Cartridge Respirator

The organic vapor chemical cartridge respirator contains a chemical adsorbent to remove CELLOSOLVE Solvent, CELLOSOLVE Acetate, and Methyl CELLOSOLVE from ambient air. In situations where paints and coatings containing these products are sprayed, the organic vapor cartridge must be fitted with a particulate prefilter. Measures must also be taken to prevent skin absorption.

Organic vapor chemical cartridge respirators can utilize a half or full facepiece. These are air-purifying respirators.

This type of respirator is limited to those environments where there is sufficient oxygen to sustain life and the air-contaminant level is known to be within the specified concentration limitation of the respirator used. This type of respirator should not be used during emergency situations (such as fires, chemical spills, etc.) or during operations where the ambient air contaminant concentration is unknown.

Air-supplying Respirators

Air-supplying respirators provide a respirable atmosphere to the wearer, independent of the ambient air, via a compressed air bottle, air hose, or air compressor. They include:

- ◆ Air-line respirators (pressure-demand type)
- ◆ Air-line respirators (demand type)
- ◆ Self-contained breathing apparatus (SCBA)
- ◆ Air-line respirators in combination with a self-contained breathing apparatus (i.e., air-line respirator with an escape bottle)

Air-line respirators can utilize a half or full facepiece. A self-contained breathing apparatus utilizes a full facepiece. Air-supplying respirators have three types of airflow: Continuous flow to the mask, demand (mask is under negative pressure), and pressure-demand (which keeps the mask under positive pressure during use). Air-line respirators are limited to those environments where there is sufficient oxygen to sustain life and the air-contaminant level is known to be within the specified concentration limitation of the respirator used.

Self-contained breathing apparatus (SCBA) can be used during emergency situations (such as fires, chemical spills, etc.) and during operations where the ambient air glycol ether concentration is unknown.

Air-line respirators in combination with self-contained breathing apparatus (air-line respirator with an escape bottle) can be used during operations where emergency escape may be necessary if the airline should fail.

Respiratory Protection Guidelines

The choice of respiratory protection depends on an assessment of a number of factors:

Potential for Oxygen Deficiency

Whether during routine or under emergency or unusual conditions, the potential for oxygen deficiency must be determined. Oxygen measuring equipment, such as a combustible gas/oxygen analyzer, can be used to determine oxygen levels.

Air Contaminants Present

The information contained in this bulletin applies to environments containing CELLOSOLVE® Solvent, CELLOSOLVE Acetate, and Methyl CELLOSOLVE Solvent. The presence of other contaminants may change the respiratory protection requirements. Please contact a safety and health professional for additional assistance in respirator selection if other contaminants are expected to be present.

Respiratory protection options recommended by Union Carbide are based on respirator “Assigned Protection Factors” obtained from the American National Standard for Respirator Protection, ANSI Z88.2-1992. The “Assigned Protection Factor” is the minimum workplace level of respiratory protection that would be provided by a properly functioning respirator, or class of respirators, to fit-tested and trained users.

Respiratory Protection Guidelines ~ continued

Air Concentration of Chemicals Present

Industrial hygiene monitoring for CELLOSOLVE® Solvent, CELLOSOLVE Acetate, and Methyl CELLOSOLVE Solvent is discussed in an earlier section of this bulletin.

Physical Form of the Contaminant

Are the contaminants gases, vapors, dusts, fumes, mists or a combination? CELLOSOLVE Solvent, CELLOSOLVE Acetate, and Methyl CELLOSOLVE Solvent, if present in the air, will be in the form of a vapor and/or a mist.

Odor Thresholds and/or Warning Properties

A material's descriptive odor and whether it irritates the eyes or respiratory tract can serve as warning properties and must be considered when selecting respiratory protection:

| Glycol Ether | Odor Threshold | Odor Description |
|----------------------------|-----------------------|-------------------------|
| CELLOSOLVE® Solvent | 0.54 ppm | Sweet, musty |
| CELLOSOLVE® Acetate | 0.13 ppm | Sweet, musty |
| Methyl CELLOSOLVE® Solvent | 0.22 ppm | Sweet, alcohol-like |

American Industrial Hygiene Association, *Odor Thresholds for Chemicals with Established Occupational Health Standards*, 1989

Organic Vapor Cartridge Service Life

Union Carbide retained Miller-Nelson Research, Inc., a nationally respected industrial hygiene testing and research firm to conduct service life testing on organic vapor cartridges for CELLOSOLVE Solvent, CELLOSOLVE Acetate, and Methyl CELLOSOLVE Solvent under a variety of test conditions. The results of this study are enumerated in the table below:

| Glycol Ether | Challenge Concentration, ppm | Humidity % RH | 10% Breakthrough Time, hr |
|----------------------------|-------------------------------------|----------------------|----------------------------------|
| CELLOSOLVE® Solvent | 500 | 80 | 4 |
| | 500 | 20 | 5 |
| | 100 | 80 | 18 |
| | 10 | 80 | >18 |
| CELLOSOLVE® Acetate | 500 | 80 | 3 |
| | 500 | 20 | 4 |
| | 100 | 80 | 18 |
| | 10 | 80 | >18 |
| Methyl CELLOSOLVE® Solvent | 500 | 80 | 5 |
| | 500 | 20 | 6 |
| | 100 | 80 | 17 |
| | 10 | 80 | >18 |

Respirator Selection

Based on Union Carbide's Recommended Exposure Limits, ANSI's respirator "Assigned Protection Factors" and cartridge service life testing data from Miller-Nelson, the following respiratory protection options are recommended:

CELLOSOLVE® Solvent and CELLOSOLVE® Acetate

| Concentration or Condition of Use | Respirator Type |
|---|---|
| Less than or equal to 20 ppm | Chemical cartridge respirator with organic vapor cartridge(s)* and half-mask facepiece; or Air-line respirator (demand) with half-mask facepiece |
| Less than or equal to 50 ppm | Full facepiece respirator with organic vapor cartridge(s)* |
| Less than or equal to 100 ppm | Air-line respirator (pressure demand) with a half-mask facepiece; or Air-line respirator (continuous flow) with a half-mask facepiece; or Air-line respirator (with escape bottle) with a half-mask facepiece |
| Less than or equal to 200 ppm | Air-line respirator (demand) with a full facepiece |
| Less than or equal to 2000 ppm | Air-line respirator (pressure demand) with a full facepiece; or Air-line respirator (continuous flow) with a full facepiece |
| Greater than 2000 ppm or unknown concentrations | Self-contained breathing apparatus (SCBA) (pressure demand) with full facepiece; or Air-line respirator (pressure demand with escape bottle) with a full facepiece |
| Emergency Conditions (such as firefighting) | Self-contained breathing apparatus (SCBA) (pressure demand) with full facepiece |

* NOTE: Based on the organic vapor service life testing data of Miller-Nelson Research, Inc., Union Carbide recommends that at a minimum cartridges be changed after each 12-hour work shift when used to protect employees from potential exposures to CELLOSOLVE Solvent, CELLOSOLVE Acetate, and Methyl CELLOSOLVE Solvent.

Respirator Selection ~ continued

Methyl CELLOSOLVE® Solvent

| Concentration or Condition of Use | Respirator Type |
|--|---|
| Less than or equal to 2 ppm | Chemical cartridge respirator with organic vapor cartridge(s)* and half-mask facepiece; Air-line respirator (demand) with half-mask facepiece |
| Less than or equal to 10 ppm | Air-line respirator (pressure demand) with a half-mask facepiece; or Air-line respirator (continuous flow) with a half-mask facepiece; or Air-line respirator (with escape bottle) with a half-mask facepiece |
| Less than or equal to 20 ppm | Full facepiece respirator with organic vapor cartridge(s)*; or Air-line respirator (demand) with a full facepiece |
| Less than or equal to 200 ppm | Air-line respirator (pressure demand) with a full facepiece; or Air-line respirator (continuous flow) with a full facepiece |
| Greater than 200 ppm or unknown concentrations | Self-contained breathing apparatus (SCBA) (pressure demand) with full facepiece; or Air-line respirator (pressure demand with escape bottle) with a full facepiece |
| Emergency Conditions (such as firefighting) | Self-contained breathing apparatus (SCBA) (pressure demand) with full facepiece |

* NOTE: Based on the organic vapor service life testing data of Miller-Nelson Research, Inc., Union Carbide recommends that at a minimum cartridges be changed after each 12-hour work shift when used to protect employees from potential exposures to CELLOSOLVE Solvent, CELLOSOLVE Acetate, and Methyl CELLOSOLVE Solvent.

Respirator Protection Program

Respirators should only be used as part of a comprehensive Respiratory Protection Program. This bulletin is not meant to be the definitive resource on respiratory protection. Utilize information contained in other references:

- ◆ Occupational Health and Safety Administration's (OSHA) *Respiratory Protection Standard*, 29 CFR 1910.134.
- ◆ American National Standard Institute's (ANSI) *Standard for Respiratory Protection*, ANSI Z88.2-1992.

Comply with all applicable laws, rules, and regulations.

The ANSI standard recommends that a Respiratory Protection Program contain the following elements:

Program Administration

A knowledgeable person shall be assigned responsibility for the program's administration.

Standard Operating Procedures

Written standard operating procedures covering the complete respirator program shall be established and implemented.

Limitations of Respirator Wearers

A physician shall determine whether an employee has any medical conditions that would preclude the use of respirators.

Respirator Selection

Respirators are selected based upon the nature of the hazard, the concentration of the contaminant, the applied protection factor of the respirator, and the activity of the worker in the hazard area.

Training

Each respirator wearer shall be given training (and retraining) in the proper selection, use, limitations and maintenance of respirators they will use.

Respirator Fit

Each person shall be fit-tested before being assigned a tight fitting-respirator.

Maintenance, Inspection, and Storage

Respirators are inspected, maintained and stored as required by the manufacturer and any applicable governmental regulation.

Summary

Respiratory protection can effectively control occupational exposures to CELLOSOLVE® Solvent, CELLOSOLVE Acetate, and Methyl CELLOSOLVE Solvent when the appropriate respirator is used properly.

Half-mask and full facepiece air-purifying respirators with organic vapor cartridges are effective in removing CELLOSOLVE Solvent, CELLOSOLVE Acetate, and Methyl CELLOSOLVE Solvent vapors from air when concentrations are less than the respirator type's maximum use concentration for the specific contaminant and conditions. For exposure concentrations greater than these levels, an air-supplying respirator should be used. See the tables on pages 7 and 8.

United States ~ Customer Service Center

10235 West Little York Rd., Suite 300
Houston, TX 77040

(800) 568-4000 or (713) 849-7000
Fax: (713) 849-7021

Emergency Service

Union Carbide maintains 24-hour emergency service for its products. The Chemical Manufacturers Association (CHEMTREC), Transport Canada (CANUTEC), and the National Chemical Emergency Center also maintain 24-hour emergency service:

| Location | Union Carbide Products | All Chemical Products |
|--|--|--|
| Mainland United States and Puerto Rico | Phone Union Carbide HELP: (800) UCC-HELP (toll-free), i.e., (800) 822-4357 | Phone CHEMTREC: (800) 424-9300 (toll-free) |
| Alaska and Hawaii | Phone Mainland United States: (304) 744-3487 (collect) | Phone CHEMTREC: (800) 424-9300 (toll-free) |
| Canada | Phone Union Carbide: (514) 640-6400 (collect) | Phone CANUTEC: (613) 996-6666 (collect) |
| Continental Europe, Ireland, Middle East, North and Central Africa | Phone BIG (Geel-Belgium): (32)(0) 14 58-45-45 | Phone CHEMTREC (United States): (703) 527-3887 (collect) |
| United Kingdom | Phone National Chemical Emergency Center (Culham-UK): (44)(0) 1865-407-333 | Phone CHEMTREC (United States): (703) 527-3887 (collect) |
| Latin America, Asia/Pacific, South Africa, and any other location worldwide | Phone United States: (304) 744-3487 (collect) | Phone CHEMTREC (United States): (703) 527-3887 (collect) |
| At sea, radio U.S. Coast Guard, who can directly contact Union Carbide HELP | (toll-free) (800) 822-4357 or CHEMTREC (800) 424-9300 | |

DO NOT WAIT. Phone if in doubt. You will be referred to a specialist for advice.