Refer to the Safety Data Sheets and Transportation Equipment Data/Emergency Response sheet for each glycol ether and glycol ether acetate for the most recent storage and handling information for the product.

**Storage of Glycol Ethers**
The storage of glycol ethers presents no unusual problems. They are very stable organic liquids that have relatively low freezing points. Heated storage is not normally required. The exception is DOWANOL™ EPh and PPh, which freeze below 55°F (13°C).

Most glycol ethers do not present a significant flammability hazard at normal storage temperature. They have relatively low vapor pressures. The most volatile glycol ether products are DOWANOL™ PM, PnP, and PMA which have flash points of 88°F, 118°F, and 108°F respectively.

**Storage Tanks: Material and Construction**
The storage tanks used for glycol ethers and glycol ether acetates and blends of glycol ether products should be constructed of mild steel, carbon steel, or stainless steel. Storage vessels and piping constructed of aluminum and aluminum alloys should be avoided. Plastic tank linings are not recommended, because these materials are often affected by glycol ether products.

Either vertical or horizontal storage tanks may be used. A vertical tank is more economical to install and occupies less space. However, if future compartmentation of the storage tank is likely, a horizontal tank is easier to modify than a vertical tank. Above-ground storage is always recommended for ease of installation, maintenance, gauging, and piping arrangement. Storage tanks for glycol ether products should meet the requirements of local, state, and federal regulations and guidelines for chemical storage. Flash points of glycol ether products range from 88°F/31°C for DOWANOL™ PM to >300°F/>149°C for DOWANOL™ EPh6. For instance, DOWANOL PM is classified as a flammable liquid according to the Department of Transportation (DOT) regulations, CFR 49. Other glycol ethers may be classified as flammable or combustible liquids or are not regulated by the DOT. It is important to keep in mind, however, that while some glycol ethers are not regulated by the DOT, all glycol ethers have flammability limits which should be taken into consideration when a flammability hazard is being assessed. (Note: All local fire codes should be consulted when installing storage facilities for glycol ether products. Also, to avoid the possibility of induced static electricity, which can cause accidental ignition, all tanks, pumps, and transfer lines used for glycol ether products should be fully grounded. Finally, fire hazards can be lessened by maintaining diking and by removing all vegetation around storage tanks).

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To avoid the possibility of induced static electricity, ground all tanks, pumps, and transfer lines used for glycol ether products, and install a dip line as the product inlet line. Float-type gauges with tape indicators or differential pressure cells work well as level indicators for glycol ethers and acetates.

Pressure vacuum relief valves (PVRV) are recommended for storage tanks containing glycol ethers and glycol ether acetates because they are hygroscopic. Breathers allow for slight changes in tank pressure, thereby reducing moisture pick-up from the outside air. The overpressure relief and the breather should be mounted on a flame arrestor.

PVRV that contain moisture-absorbent drying beds are also available in long-term storage. Moisture pick-up by glycol ethers and acetates can be further reduced by nitrogen blanketing or padding of the storage tanks. Nitrogen blanketing is recommended for quality and safety reasons.

Drum Recommendations
Glycol ethers may be stored in 55-gallon drums made of mild steel. It is important to remember to replace the drum cap securely after each withdrawal, or the product will gradually pick up moisture from the air.

Avoid drums constructed of galvanized metals that may bring glycol ethers, especially Butyl CELLSOLVE® or Butyl CARBITOL®, in contact with zinc or tin since metal corrosion and discoloration can result. Zinc is very reactive in contact with some glycol ethers; hydrogen may be produced. Copper and copper alloys, such as bronze and brass, will cause discoloration via decomposition with all glycol ether products.
Polyethylene and polypropylene storage drums may be used if water contamination of the glycol ether or glycol ether acetate is not critical. Drums made of these materials can provide adequate shelf life for the product, but they will absorb water through the drum walls. Polyethylene storage drums should be product-dedicated, because glycol ethers and glycol ether acetates may be retained in the walls of the drums over time. Figure 2 can be used to determine the contents of partially filled drums without removing the drum caps.

**Auxiliaries**

Pumps, lines, valves and fittings of steel are adequate for use with glycol ethers. If rated at the appropriate pressure, polyethylene and polypropylene pipes are adequate; however, glycol ethers should not be allowed to stand in these pipes. PVC- or fiberglass-reinforced pipes are not recommended. Avoid equipment constructed of aluminum or aluminum alloys, galvanized metals, and copper or copper alloys. Bronze and brass fittings are acceptable for temporary or minimum contact situations.

Centrifugal pumps work well for storage systems, with packed pumps used for intermittent service and mechanical seals for continuous service.

All equipment must be free of moisture before operation. The chances of product deterioration and/or discoloration are minimized when the equipment, including pumps, lines, valves, fittings, and storage vessels, cleaned thoroughly prior to use.

Glycol ethers and acetates are difficult to contain, due to low viscosities, and prone to leak past defective fittings or packing.

Consequently, the installation of all fittings and gaskets should be done carefully. Aqueous graphite suspensions are preferred for pipe dope on screwed piping, but they work best when all cutting oil has been removed from the threads. Ball valves with plastic seals and seats of Teflon\(^1\) resin are strongly recommended. Butyl rubber or EPDM can be used for gaskets and packing.

**Cleaning and Maintenance**

Sound maintenance procedures are vital to proper storage and handling of glycol ether products. Maintaining diking around all product storage tanks and removing all vegetation from the area diminishes fire hazards. The maintenance and prompt repair of the storage tanks and transfer equipment piping and valves is critical for safeguarding product quality.

Storage tanks should be thoroughly cleaned and dried before use. They should be equipped with 18-inch manholes and a bottom drain. Good results can be obtained by buffing and steaming the tank, then washing with water and thoroughly air-drying. Avoid brushing or otherwise mechanically disturbing the surface of the tank after the tank has been dried.

To minimize the formation of rust, fill the tank as soon as possible after cleaning. If the cleaning is thorough, there will be less chance for discoloration, even upon extended storage.

\(^1\)Trademark of E.I. DuPont de Nemours, Inc.
To minimize air contact and possible moisture pick-up after cleaning, the tank may be purged with dry nitrogen prior to filling. The dry nitrogen is then displaced as the tank is filled, and a pad remains on top to help extend product quality.

Strict maintenance schedules for cleaning, service, and replacement of auxiliary equipment used for glycol ether products should be developed. Particular attention should be paid to packings, gaskets, and other components of transfer equipment which may be affected by glycol ether and glycol ether acetate products.

**Product Shelf Life**
The quality of glycol ether products can be affected by storage conditions, temperature and time. Product deterioration can take the form of lowered pH values and/or color changes.

To safeguard against this product deterioration, develop product inventory and use policies that put your glycol ether inventory into production prior to the recommended shelf life limits noted in Table 1.

**Safe Handling**
Develop, implement, and strictly enforce safe handling procedures and practices for workers in all operations involving glycol ether products. The viability of your storage and handling program for these products relies on close attention to worker safety issues.

Customers are urged to develop, implement, strictly enforce, monitor, and periodically review and evaluate safe handling procedures and practices in *all* handling and storage operations involving glycol ether products.

The greatest potential hazards in working with glycol ethers and glycol ether acetates are skin and eye contact and vapor inhalation. Written procedures are highly recommended, detailing how workers should wear the appropriate personal protective equipment (PPE) for their tasks and the hazard potential involved.

Consult the current Safety Data sheets for more detailed information on the safe handling of glycol ether products.

<table>
<thead>
<tr>
<th>Table 1: Product Shelf Life</th>
<th>Products</th>
<th>Shelf Life</th>
<th>Conditions of Temperature and Storage</th>
<th>Deterioration Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DOWANOL™ PM, DPM, TPM, PnB, DPNB, TPnB, PnP, DPNP</strong> &lt;br&gt;<strong>Butyl CELLOSOLVE™</strong> &lt;br&gt;<strong>Butyl CARBITOL™, Methyl CARBITOL, CARBITOL</strong></td>
<td>24 months – Drums &lt;br&gt;6 months - Bulk</td>
<td>Normal conditions – Store below 90°F. Material is hygroscopic; should be in closed containers. Aluminum containers should be avoided.</td>
<td>Lowering of pH – possible rise in color on prolonged standing.</td>
<td></td>
</tr>
<tr>
<td><strong>DOWANOL™ PPh, EPh glycol ether products</strong></td>
<td>24 months – Drums &lt;br&gt;6 months - Bulk</td>
<td>Store below 110°F. Aluminum containers should be avoided.</td>
<td>Develops yellow color.</td>
<td></td>
</tr>
</tbody>
</table>
The disposal of glycol ethers must be carried out in strict accordance with all local, state, and federal laws and regulations governing the disposal of chemicals.

**Suggested Precautions**
The following precautionary measures are suggested for operations where contact with glycol ethers is likely:

- Wear suitable eye protection, such as chemical workers’ goggles or safety glasses with side shields.
- Practice reasonable care, good housekeeping, and personal cleanliness to avoid skin exposure.
- Avoid prolonged or repeated breathing of vapors of glycol ethers, especially if the material is hot. Also, be sure that adequate ventilation is provided for workers handling or using glycol ethers and glycol ether acetates. Customers are urged to consult the most recent Safety Data Sheets for the current exposure guidelines.
- In the event of upper respiratory irritation, use an air-purifying organic vapor respirator.

**First Aid Measures**
Consult the current Safety Data Sheet (SDS) for the specific glycol ether product in question for recommendations on procedures for emergency first aid.

**Product Stewardship**
The Dow Chemical Company has a fundamental concern for all who make, distribute, and use its product, and for the environment in which we live. This concern is the basis for our Product Stewardship philosophy by which we assess the health and environmental information on our products and then take appropriate steps to protect employee and public health and the environment. Our Product Stewardship program rests with each and every individual involved with Dow products from the initial concept and research to the manufacture, sale, distribution, use, and disposal of each product.

**Customer Notice**
Dow encourages its customers and potential users of Dow products to review their applications of such products from the standpoint of human health and environmental quality. To help ensure that Dow products are not used in ways for which they are not intended or tested, Dow personnel will assist customers in dealing with ecological and product safety considerations. A Dow salesperson can arrange the proper contacts. Dow product literature, including Safety Data Sheets, should be consulted prior to use of Dow products. These may be obtained from a Dow sales representative or sales office.

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