Appendix A

HAZARDOUS MATERIALS CLASSIFICATION SYSTEMS

National Fire Protection Association, 704M System ............................................A3

Department of Transportation, DOT Chart 11 ......................................................A5

U.S. Department of Labor, Sample Material Safety Data Sheet (MSDS) .................A9
National Fire Protection Association, 704M System

The marking system designed by the National Fire Protection Association identifies hazard characteristics of materials at terminal and industrial sites. It uses a diamond divided into four quadrants, with each quadrant representing a different characteristic, as explained below.

The risk level ratings, ranging from four (highest risk) to zero (minimum risk), are based upon protective equipment normally used by firefighters.

Health (Blue)

Health hazards in firefighting generally result from a single exposure, which may vary from a few seconds up to an hour. Only hazards arising out of an inherent property of the material are considered. It should be noted, however, that the physical exertion demanded in firefighting or other emergency conditions tends to intensify the effects of any exposure.

Risk level 4: Materials too dangerous to human health to expose firefighters. A few whiffs of the vapor could cause death or the vapor or liquid could be fatal on penetrating the firefighter’s normal full protective clothing. The normal full protective clothing and breathing apparatus available to the average fire department will not provide adequate protection against inhalation or skin contact with these materials.

Risk level 3: Materials extremely hazardous to health, but areas may be entered with extreme care. Full protective clothing including self-contained breathing apparatus, coat, pants, gloves, and boots, with bands around the legs, arms, and waist should be provided. No skin surface should be exposed.

Risk level 2: Materials hazardous to health, but areas may be entered freely with full facemask self-contained breathing apparatus that also provides eye protection.

Risk level 1: Materials only slightly hazardous to health. It may be desirable to wear self-contained breathing apparatus.

Risk level 0: Materials which on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials.

Flammability (Red)

Susceptibility to burning is the basis for assigning risk levels within this category. The method of attacking the fire is influenced by the material’s susceptibility factor.

Risk level 4: Very flammable gases or very volatile flammable liquids. Shut off flow and keep cooling water streams on exposed tanks or containers.

Risk level 3: Materials that can be ignited under almost all normal temperature conditions. Water may be ineffective because of the low flash point.
Risk level 2: Materials that must be moderately heated before ignition will occur. Water spray may be used to extinguish the fire because the material can be cooled below its flash point.

Risk level 1: Materials that must be preheated before ignition will occur. Water may cause frothing if it gets below the surface of the liquid and turns to steam. However, water fog gently applied to the surface will cause a frothing that will extinguish the fire.

Risk level 0: Materials that will not burn.

Reactivity/Stability (Yellow)
The assignment of degrees in the reactivity category is based upon the susceptibility of materials to release energy either by themselves or in combination with water. Fire exposure is one of the factors considered, along with conditions of shock and pressure.

Risk level 4: Materials that (in themselves) are readily capable of detonation or of explosive decom­position or reaction at normal temperatures and pressures. Includes materials that are sensitive to mechanical or localized thermal shock. If a chemical with this hazard rating is in an advanced or massive fire, the area should be evacuated.

Risk level 3: Materials that (in themselves) are capable of detonation or of explosive decomposition or reaction that require a strong initiating source that must be heated under confinement before initiation. Includes materials that are sensitive to thermal or mechanical shock at elevated temperatures and pressures, or that react explosively with water without requiring heat or confinement. Firefighting should be done from an explosive-resistant location.

Risk level 2: Materials that (in themselves) are normally unstable and readily undergo violent chemical change, but do not detonate. Includes materials that can undergo chemical change with rapid release of energy at normal temperatures and pressures, or that can undergo violent chemical change at elevated temperatures and pressures. Also includes those materials that may react violently with water or that may form potentially explosive mixtures with water. In advanced or massive fires, firefighting should be done from a safe distance or from a protected location.

Risk level 1: Materials that (in themselves) are normally stable but that may become unstable at elevated temperatures and pressures or that may react with water with some release of energy, but not violently. Caution must be used in approaching the fire and applying water.

Risk level 0: Materials that (in themselves) are normally stable even under fire exposure conditions and that are not reactive with water. Normal firefighting procedures may be used.

Special Information (White)
The quadrant includes information on specific characteristics of the material (e.g., reactivity with water, tendency to oxidize).
Refer to 49 CFR, Part 172:

Marking - Subpart D
Labeling - Subpart E
Placarding - Subpart F
Emergency Response - Subpart G

NOTE: This document is for general guidance only and must not be used to determine compliance with 49 CFR, Parts 100-185.
Inhalation Hazard Materials

Materials which meet the inhalation toxicity criteria have additional "communication standards" prescribed by the HMR. First, the words “Poison-Inhalation Hazard” must be entered on the shipping paper, as required by Section 172.203(m)(3). Second, packagings must be marked "Inhalation Hazard" or, alternatively, when the words "Inhalation Hazard" appear in the device or placard, the "Inhalation Hazard" marking is not required on the package. Transport vehicles, freight containers, portable tanks and unit load devices that contain a poisonous material subject to the "Poison-Inhalation Hazard" shipping description, must be placarded with a POISON INHALATION HAZARD or POISON GAS placard, as appropriate. This shall be in addition to any other placard required for that material in Section 172.504.

For complete details, refer to one or more of the following:

- Code of Federal Regulations, Title 49, Transportation, Parts 100-185. [All modes]
- International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air [Air]
- International Maritime Organization (IMO) Dangerous Goods Code [Water]
- Transportation of Dangerous Goods Regulations of Transport Canada. [All Modes]
MATERIAL SAFETY DATA SHEETS

The Material Safety Data Sheet (MSDS) has become a major source of chemical information. It is the key document used to provide hazard information to employees and can become an invaluable tool for emergency response personnel when used in a chemical emergency.

The Occupational Safety and Health Administration’s (OSHA) Hazard Communication Standard (29 CFR 1910.1200) requires all manufacturers of pure chemicals and/or mixtures to evaluate their products and relate, via MSDSs, any hazards that may be encountered while handling these materials. This standard is intended for all workplaces, manufacturing and nonmanufacturing alike. The Environmental Protection Agency’s (EPA) Emergency Response and Community Right-to-Know Act of 1986 ensures the availability of MSDSs to emergency response personnel, such as fire departments, first aid crews, and hospital emergency room staff.

The MSDS contains a wealth of information that may be understood with a minimum of training. Below is a brief explanation of the format and information found in a properly prepared MSDS.

Section 1
This section identifies the material by product or trade name and chemical name. It is the product or trade name that is usually found on the container labels, although the chemical name is also required by some states. Section I also contains the manufacturer’s name, address, and telephone number.

Section 2
Section 2 provides physical data about the product that can be utilized for proper identification. Included are specifics such as color, odor, specific gravity (weight), vapor pressure, and boiling point.

Section 3
This section lists the chemical ingredients of the material, if they are known or suspected to be hazardous. Hazardous materials that are not carcinogens must be reported if they represent 1 percent or more of the product. Carcinogens must be reported and identified as such if their levels are 0.1 percent or higher. Also included in Section 3 are Threshold Limit Values (TLVs) and the OSHA Permissible Exposure Limit (PEL).

Section 4
Section 4 includes fire and explosion hazard data. This information is especially useful when devising both in-house and community contingency plans. Plant first responders, local fire departments, and hazmat teams need unlimited access to this information.
Section 5
Section 5 contains health hazard data. It describes any acute (short-term exposure) and/or chronic (long-term exposure) effects on the body. These include routes of exposure (inhalation, dermal contact, ingestion) and the bodily organs affected, as well as the signs and symptoms of overexposure. First aid procedures are also be found in this section. (NOTE: First aid measures recommended in MSDSs are not always correct and should be confirmed.)

Section 6
This section contains information on the reactivity of the product. It lists other chemicals that, when mixed with the product, will result in a chemical reaction. If a product is water reactive, it will be noted.

Also included in Section 6 is information on hazardous decomposition products, such as carbon monoxide and other hazardous gases, that are formed and emitted during chemical reactions or fires. It is imperative that this section be carefully noted by both in-house and local firefighters.

Section 7
Section 7 lists the procedures that should be used if the product spills or leaks, including waste disposal methods.

Section 8
Section 8 contains information regarding the proper personal protective equipment (PPE) necessary to handle the product in a manner that will minimize exposure. Ventilation practices are also listed in this section.

Summary
A Material Safety Data Sheet can aid in making the right decisions on health and safety issues in a plant or in a community. It must be noted, however, that it is but one of many references that should be used to make final determinations. MSDSs are offered by manufacturers for identification and verification and are not the last word on safety and health practices.
## 1. MATERIAL SAFETY DATA SHEET

<table>
<thead>
<tr>
<th>PRODUCT NAME:</th>
<th>CAS #</th>
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</thead>
<tbody>
<tr>
<td>CHEMICAL NATURE:</td>
<td></td>
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<tr>
<td>% ACTIVITY:</td>
<td></td>
</tr>
</tbody>
</table>

## 2. PHYSICAL DATA

<table>
<thead>
<tr>
<th>BOILING POINT, 760 MM HG</th>
<th>FREEZE POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIFIC GRAVITY</td>
<td>VAPOR PRESSURE AT 20 C</td>
</tr>
<tr>
<td>VAPOR DENSITY</td>
<td>SOLUBILITY IN H2O</td>
</tr>
<tr>
<td>PER CENT VOLATILES BY WEIGHT</td>
<td>IONIC NATURE</td>
</tr>
<tr>
<td>APPEARANCE AND ODOR</td>
<td></td>
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</tbody>
</table>

## 3. CHEMICAL INGREDIENTS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>%</th>
<th>TLV (Units)</th>
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<tbody>
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## 4. FIRE AND EXPLOSION HAZARD DATA

<table>
<thead>
<tr>
<th>FLASH POINT (test methods)</th>
<th>AUTOIGNITION TEMPERATURE</th>
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<table>
<thead>
<tr>
<th>FLAMMABLE LIMITS IN AIR, % by volume</th>
<th>Lower</th>
<th>Upper</th>
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| EXTINGUISHING MEDIA | |
|---------------------||
| SPECIAL FIRE FIGHTING PROCEDURES | |
| UNUSUAL FIRE AND EXPLOSION HAZARDS | |

SAMPLE MATERIAL SAFETY DATA SHEET
## 5. HEALTH HAZARD DATA

- **Threshold Limit Value**
- **Effects of Exposure**
- **Emergency and First Aid Procedures**

## 6. REACTIVE DATA

<table>
<thead>
<tr>
<th>Stability</th>
<th>Conditions to Avoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unstable</td>
<td></td>
</tr>
<tr>
<td>Stable</td>
<td></td>
</tr>
</tbody>
</table>

- **Compatibility**
- **Hazardous Decomposition Products**
- **Hazardous Polymerization**

## 7. SPILL OR LEAK PROCEDURES

- **Steps to Be Taken if Material Is Released or Spilled**
- **Waste Disposal Method**

## 8. SPECIAL PROTECTION INFORMATION

- **Respiratory Protection**
  - Local Exhaust
  - Mechanical
- **Protective Gloves**
- **Other Protective Equipment**
- **Eye Protection**
- **Other**

## 9. SPECIAL PRECAUTIONS

- **Precautionary Labeling**
- **Other Handling and Storage Conditions**

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*Sample Material Safety Data Sheet*