

**Louisiana Division  
Consolidated Audit**

**Hazardous  
Materials  
Transportation  
Review**

**March 1991**

**Dow Confidential**

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Louisiana Division  
March 1991

**Dow U.S.A.**

The Dow Chemical Company  
P.O. Box 180  
Baton Rouge, Louisiana 70803-0180

To: Plant Superintendent/Department Head

**SUBJECT: HAZARDOUS MATERIALS TRANSPORTATION  
REVIEW (HMTR)**

The HMTR audit will be part of the Louisiana Division Consolidated Audit Process. The audit will be the responsibility of the Superintendent/Department Head.

The purpose of this audit is to provide an in-depth review of our Louisiana Division hazardous materials transportation practices of materials which, if released, could possibly cause injury to the public. The audit will be reviewing the chemicals shipped or received, including the plant's waste materials with a Hazardous Materials Transportation Index (HMTI) of 2, 3, or 4. (Does not include pipeline transportation).

You should begin your preparations by reviewing the attached program guidelines and developing or updating the HMT Indexes for your plants' various chemicals and potential loss of containment from worst case transportation scenario. You will need to complete and send a copy of the review package to the Audit Facilitator ten (10) calendar days prior to the audit.

A HMTR Audit Team is required for a HMTI of 2, 3, or 4. A U.S. Area Loss Prevention Representative will be required for a HMTI of 3, or 4. A HMTI of 1 requires a review by the Superintendent and his Manager only.

**NOTE:** Prompt response to the HMTI calculations is necessary. A 30 day pre-audit notification to the U.S. Area will be necessary for some materials. Contact Dean Smith at extension 8879 for U.S. Area Loss Prevention Representatives as audit team members (required for HMTI's of 3 or 4). Dean should also be contacted for a Functional Audit Team if the HMTI of materials is 2, 3, or 4.

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The list of contacts below can be used as additional resources.

|              |               |      |
|--------------|---------------|------|
| Ind. Hygiene | Gary Meier    | 1809 |
| Purchasing   | Randy Normand | 8481 |
| Loss Prev.   | Buck Bailey   | 1539 |
| HMTI         | Dean Smith    | 8879 |
| CEI          | Jim Gibson    | 8163 |
| F&EI         | Maurice Oubre | 8953 |
| Safety       | Don Jones     | 6097 |

Attached are the "Guidelines for a Hazardous Materials Transportation Review ", including the Audit Instructions which give the details about what is needed to prepare for the audit and how the audit will be conducted. If there are any questions concerning the audit, please contact me at extension 8879.

Dean Smith  
HMTR Functional Team Leader  
Building 3302D  
Ext. 8879

**GUIDELINES FOR A  
HAZARDOUS MATERIALS  
TRANSPORTATION REVIEW**

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## INTRODUCTION

This document is intended to aid in the set-up and execution of Hazardous Materials Transportation Review. Similar to Process Hazard Reviews currently conducted in Dow plants, the Hazardous Materials Transportation Review will address another area of safety - hazardous materials transportation practices.

## WHAT IS A HAZARDOUS MATERIALS TRANSPORTATION REVIEW?

The objective of a Hazardous Materials Transportation Review is to anticipate and prevent, through a complete evaluation of transportation modes and various chemical properties, incidents which may cause loss of containment of a chemical while being transported.

While each review will vary with the nature of the product and the transportation requirements, a general outline is as follows:

- \* Review loading and securement procedures. Do not limit to Dow internal procedures, but include Dow carriers, customer procedures used to secure "empties" returned to Dow, and procedures used by third party personnel involved with swapping, tolling, or repacking operations performed for Dow.
- \* Examine in-route procedures. Carefully review regulatory requirements, routing practices, emergency procedures, and other in-route procedures deemed important.
- \* Consider materials of construction and appropriateness of design used for each distribution container or package.
- \* Review unloading procedures, including product stewardship literature given to customers by Dow.

## RESPONSIBILITIES

1. Prioritize the currently transported materials. Determine the combined or individual numbers derived from the C.E.I.-F.E.I. and Skin Ranking Grids (Appendices A - F). The final index obtained should help indicate the priority of the action to be taken.

Another important way to prioritize current materials is the choice of a worst case leak scenario. This may be challenged and changed several times before obtaining a realistic leak scenario which truly reflects the hazard potential of a particular distribution package or piece of equipment.

2. Ensure consistent and appropriate practices based on the properties of each material shipped from more than one site.

For example, the practices for shipping liquid chlorine should be consistent. (This does not necessarily mean equal.) The technology center can help serve this vital role.

When creating internal policies and guidelines, be sure they are essential for the safe transportation and storage of Dow's products and raw materials. Unnecessary policies and guidelines may restrict and impede the distribution of products to Dow customers and raw materials to Dow plants.

Keep in mind, once an operating discipline is established, it must be adhered to.

3. Develop pre-start up guidelines for transportation.

Before the decision is made to ship or receive a product or raw material not previously transported, a pre-start up review of the transportation system to be used should be given. This is similar to the pre-start up review of the plant producing the product.

## PREPARING FOR A REVIEW

### What Products and Raw Materials Should Be Reviewed?

Chemicals to be reviewed include:

- \* All Dow products identified as having a Hazardous Materials Transportation Index of 2, 3, or 4 using Appendix A (Tables 1 and 2).
- \* All raw materials or purchased chemicals identified as having an HMTI of 2, 3, or 4 using Appendix A (Tables 1 and 2).
- \* All Dow products (1) terminalized or warehoused and shipped from a different location than where they were manufactured or (2) repackaged by others and shipped to a Dow customer.
- \* Chemicals produced by other companies and shipped in Dow's name to Dow customers through swaps, tolls, and/or trades. (Appendix G)
- \* All transported waste materials identified as having an HMTI of 2, 3, or 4 using Appendix A (Tables 1 and 2).

### Worst Case Thinking

Product Review Team members should use "worst case" thinking in evaluating the safety of the transportation operation. An evaluation should then be made of the "worst case" scenario consequences.

For consistency, one should consider the following scenarios:

1. For bulk rail and bulk truck (including intermodal portable containers) - rollover and rupture of tank releasing entire contents.
2. For drum shipments - rollover of container and rupture of three drums. If a flammable material is involved, the ensuing fire would be expected to involve the entire contents of the container.
3. For cylinders - break off of the cylinder valve with material leaking from a 1" hole.

NOTE: The suggested worst case scenarios should not preclude any scenarios that may be considered to be "worst case" by virtue of special chemical properties or equipment used. For example, drum quantities of easily polymerized material may heat up and result in an explosion.

However, unreliability of protection systems should not be allowed to be a cause of an accident. Regular documented testing of all elements of the protection systems is essential.

# HAZARDOUS MATERIALS TRANSPORTATION REVIEW AUDIT PREPARATION INSTRUCTIONS

These HMTR Audit Instructions are being sent to Louisiana Division plants/departments as an audit to be accomplished in the Consolidate Audit Process. You should start your preparations early and do a quality job on the Review Package.

## A. Chemicals of Concern

The audit should review all chemicals shipped or received, including waste materials, with a Hazardous Materials Transportation Index (HMTI) of 2, 3 or 4. (An HMTI of 1 requires a review by the superintendent and his manager only.) Note: Pipeline transportation practices are not a part of this audit.

## B. Review Package

The Review Package requirements must be completed and sent to the Louisiana Division Auditing Facilitator at least 10 calendar days prior to the audit.

The Review Package should contain (for each chemical):

1. A copy of HMTR Audit Presentation, Page 7, Section E.
2. For chemicals involved in Swaps, Tolls, and Trades a completed Appendix G, Page 21.
3. A calculation of the HMTI with the associated CEI and F&EI data sheets or output from Lotus 1, 2, 3 programs. Also the dispersion data (for the quantities, distance, and conditions for the transportation worst case scenario) as per the CEI program instructions in the CEI Audit instructions.
4. A completed Physical Properties Sheet (see Appendix H, Page 22).

### HMT Review Audit Instructions

5. A completed Chemical Properties Sheet (see Appendix H, Page 23).
6. A completed Health and Environmental Effects Sheet (see Appendix H, Page 24).
7. A completed Equipment Construction Sheet (see Appendix H, Page 25).
8. A completed Loading Procedures Sheet (see Appendix H, Page 26-27).
9. A completed Unloading Procedures Sheet (see Appendix H, Page 31-32).
10. A completed Outplant Contracts Sheet (see Appendix H, Page 33-34).
11. A completed "Inventory Practices of Full Tank Cars and/or Tank Trucks" (see Appendix H, Page 35).
12. A Transportation Equipment Data and Emergency Response (TEDER) sheet.
13. A list of the shipping quantities by mode and the specification of the containers (railcar, tank truck, drum, etc.) used.
14. Emergency response call reports and accident investigation reports documenting corrective actions.
15. A copy of special governmental regulations required for shipment, such as DOT exemptions.
16. Any business information as it pertains to the distribution operations (i.e., customer selectivity...Have we ever turned down shipping to anyone or with any carrier because they failed to follow safe practices?).

**NOTE:** This package should be used as the basis for the presentation which will be given to the Hazardous Materials Transportation Functional Audit Team on the day of the audit. The package will also be used by the HMTR Functional Audit Team to develop questions to be discussed during the review.

**C. U.S. Area Representatives**

The Functional Audit Team will invite appropriate Dow U.S. Area or Corporate representatives for reviews with HMTI's of 3 or 4 as needed. The plant will notify the Functional Audit Team Leader a minimum of 30 days in advance.

**D. Plant Team**

The Material Owner (Superintendent) is responsible to organize his Plant Team which as a group is responsible to complete the audit questionnaire and make the presentation to the HMTR Functional Audit Team.

**E. The Audit**

**Plant Team Presentation/Discussion:**

Your team should be prepared to lead a discussion with the Functional Audit Team which addresses each of the major areas of the questionnaire. Follow the attached Hazardous Material Transportation Review Audit Agenda (See Page 11).

## **Hazardous Materials Transportation Review Calculations Using Lotus 1-2-3**

A copy of the Lotus 1-2-3\* program is included for your use in calculating the Chemical Exposure and Fire & Explosion Indexes and the Skin (Hazard) Ranking for the Hazardous Materials Transportation Review.

A sample spread sheet with data for 45,000 lbs. of acrylic acid is shown on page 10. The worse case scenario assumes the loss of the entire contents of the container.

The entire spread sheet is "write protected" except for the description of the product and container and the 11 pieces of input data (shown on the screen in the green column) required for the calculations.

The input data required is as follows:

1. The Dow EEPG concentration as shown in the CEI Audit instructions. (Note: If the EEPG value for your hazardous material is not available, use three times the TLV for the material).
2. The Material Factor as found in Appendix A of the F&EI Guide.
3. The NFPA Health Rating (Nh) as found in Appendix A of the F&EI Guide.
4. The NFPA Flammability Rating (Nf) as found in Appendix A of the F&EI Guide.
5. The Heat of Combustion (Hc) as found in Appendix A of the F&EI Guide.
6. The Molecular Weight of the hazardous material.
7. The Vapor Pressure in mm Hg at 25 degrees C.
8. Is the material thermally unstable below 100 degrees C. (That is, does a measurable exotherm [ARC or equivalent] take place below 100 degrees C.) Yes or No.
9. The physical state penalty. (Choose one from the three choices given).

10. The pressure in PSI in the shipping container at 50 degrees C.

11. The Dermal LD50 in mg/kg for skin exposure.

NOTE: The weight of material in the shipping container is fixed at 45,000 lbs.

Once the input data has been entered, press the F9 key to calculate the CEI, F&EI, and Skin Rank values, press ALT and P at the same time.

If there are any questions regarding this Lotus spread sheet, please call Dean Smith at Ext. 8879.

\*Trademark

**SAMPLE OUTPUT FROM LOTUS 1-2-3 PROGRAM**  
**HAZARDOUS MATERIALS TRANSPORTATION REVIEW**  
**CEI, F&EI, AND SKIN RANK CALCULATIONS**  
**(REVISED 5/14/90)**

| TANK CAR<br>STYRENE              |         |              |
|----------------------------------|---------|--------------|
| INPUT DATA                       |         |              |
| EEPG CONCENTRATION PPM           | 200.00  | • SUMMARY •  |
| MATERIAL FACTOR (F&EI GUIDE)     | 24      | • •••••••    |
| NFPA HEALTH RATING (Nh)          | 2       | • CEI •      |
| NFPA FLAMMABILITY RATING (Nf)    | 3       | • 64.00 •    |
| BTU'S PER MLBS                   | 17.00   | • •••••••    |
| MOLECULAR WEIGHT                 | 104     | • F&EI •     |
| VAPOR PRESSURE MM HG @25 DEG C   | 7.00    | • 142.22 •   |
| THERMAL INSTABILITY DEG C        | 32      | • •••••••    |
| PHYSICAL STATE PENALTY           | 1.00    | • SKIN RAN • |
| VISCOUS LIQUID ----- .70         |         | • 0 •        |
| LIQUID ----- 1.00                |         | • •••••••    |
| COMPRESSED GAS ----- 1.20        |         |              |
| LIQUIFIED FLAM GAS --- 1.30      |         |              |
| LBS OF PRODUCT PER CONTAINER     | 150,000 |              |
| SHIPPING PRESSURE(PSI OF MATERIA | 5       |              |
| RELIEF VALVE SETTING (LBS)       | 75      |              |
| DERMAL LD50 FOR SKIN EXPOSURE    | 2.001   |              |

| CALCULATED FACTORS              |          |                                  |        |
|---------------------------------|----------|----------------------------------|--------|
| CHEMICAL EXPOSURE INDEX RANKING |          | FIRE & EXLOSION INDEX RATING     |        |
| ACUTE HEALTH HAZARD FACTOR      | 21714.29 | MATERIAL FACTOR                  | 24.00  |
| ACUTE HEALTH FACTOR SCALE #     | 1.00     | GP BASE FACTOR                   | 1.00   |
| LBS VAPOR RELEASED IN 15 MIN.   | 893.55   | HANDLING & TRANSFER FACTOR       | 0.85   |
| VAPOR QUANTITY SCALE #          | 2.00     | ACCESS FACTOR                    | 0.35   |
| DISTANCE SCALE #                | 4.00     | SPIILL CONTROL FACTOR            | 0.50   |
| MOLECULAR WEIGHT SCALE #        | 4.00     | F1-GENERAL PROCESS FACTOR        | 2.70   |
| SHIPPING PRESSURE FACTOR        | 0.00     | -----                            |        |
| THERMAL INSTABILITY FACTOR      | 2.00     | SP BASE FACTOR                   | 1.00   |
| PROCESS PENALTIES FACTOR        | 2.00     | TOXIC MATERIALS FACTOR           | 0.40   |
| PROCESS PENALTIES SCALE #       | 2.00     | PROCESS OPERATION, PURGE FACT    | 0.30   |
| CHEMICAL EXPOSURE INDEX         | 64.00    | QUANTITY IN STORAGE FACTOR       | 0.40   |
| CHEMICAL EXPOSURE SCALE #       | 1.00     | IGNITION SOURCE FACTOR (FIRED HT | 0.00   |
|                                 |          | OPERATING PRESSURE FACTOR        | 0.09   |
|                                 |          | F2-SPECIAL PROCESS HAZARDS FACT  | 2.19   |
| -----                           |          | -----                            |        |
| SKIN RANKING                    | 0.00     | F3-UNIT HAZARD FACTOR (=F1*F2)   | 5.93   |
|                                 |          | F&EI-FIRE & EXPLOSION INDEX      | 142.22 |
|                                 |          | FIRE & EXPLOSION RANKING         | 4      |

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## **Hazardous Materials Transportation Review Audit Agenda**

### **I. Overview Presentation to the Audit Team (45 minutes)**

Note: Timing is approximate

1. Provide a list of all products and purchased materials as shown on plant cost sheets.
2. Review the hazardous materials to be covered in the audit, and the nature of the hazards (ie., flammable, reactive, toxic, etc.). Including the methods and modes of transportation.
3. Review any transportation incidents in the last two years.
4. Give the status of items agreed to be acted on by the plant from the previous HMTR audit.
5. Review your loader/unloader training program.
6. Based upon the answers given to the questions in the "Guidelines For A Hazardous Materials Transportation Review Process", discuss the major hazardous materials transportation concerns for the plant.
7. Review planned hazardous material transportation improvements.

### **II. HMTR Guidelines Questionnaire (45 minutes)**

- A. Review the information provided in the HMTR questionnaire on an exception basis.

### **III. Documentation Audit and Facility Tour (30 minutes)**

- A. Following the plant presentation, selected members of the Audit Team will examine the plant's loading/unloading areas and applicable documentation discussed during the audit. (Documentation should be readily available for the auditors). This will include:
  1. Documentation of DOT training;
  2. Examples of completed loading/unloading checksheets;
  3. Loading/unloading procedures.

#### IV. Audit Report

- A. The HMT Functional Audit Team Leader will summarize the team's findings and furnish the Audit Facilitator a written audit report of their recommendations by Monday following audit week.

## APPENDIX A

### RELATIVE HAZARD RANKING

Dow products, products shipped by other companies to Dow customers in Dow's name, Dow-purchased raw materials, and transported Dow waste materials need to be ranked by using the Chemical Exposure Index (C.E.I.) calculations, the Fire and Explosion Index (F.E.I.) calculations and the effects of the chemical on skin contact.

The numerical ranking for skin is intended to indicate the relative risk from a single dermal exposure, such as might occur in a transportation accident, that could result in the absorption of acutely toxic or lethal amounts. It does not address skin burns or chronic absorption. The principal criterion used (See Table 1 below) is the actual or estimated animal dermal LD50. When there have been cases of human lethality from a single skin exposure, the chemical in question should be ranked in the highest category, regardless of the lower animal toxicity (eg. phenol).

TABLE 1

#### SKIN RANKING CRITERIA FOR HAZARDOUS MATERIALS

##### TRANSPORTATION REVIEW PURPOSES

| <u>SKIN RANK</u> | <u>BASIS</u>                                                                                            |
|------------------|---------------------------------------------------------------------------------------------------------|
| 4                | Dermal LD50 of < 200 mg/kg or lethal to humans                                                          |
| 3                | Dermal LD50 of 200-500 mg/kg                                                                            |
| 2                | Dermal LD50 of 501-1000 mg/kg                                                                           |
| 1                | Dermal LD50 of 1001-2000 mg/kg or single exposure judged acutely toxic                                  |
| 0                | Dermal LD50 of >2000 mg/kg. Dermal single exposure judged not to be toxic, or no information available. |

Once these indices are determined, they should be plotted on the C.E.I. - F.E.I. and Skin Ranking Grids shown in Table 2 to obtain a Hazardous Materials Transportation Index (HMTI).

TABLE 2

**HAZARDOUS MATERIAL TRANSPORTATION INDEX**  
**CHEMICAL EXPOSURE INDEX - FIRE AND EXPLOSION INDEX -**  
**SKIN RANKING GRIDS**

|                                     |         |                                 |      |       |        |      |
|-------------------------------------|---------|---------------------------------|------|-------|--------|------|
| CHEMICAL EXPOSURE<br>INDEX (C.E.I.) | 400+    | 4                               | 4    | 4     | 4      | 4    |
|                                     | 300-400 | 3                               | 3    | 3     | 3      | 4    |
|                                     | 100-299 | 2                               | 2    | 2     | 3      | 4    |
|                                     | 1-99    | 1                               | 1    | 2     | 3      | 4    |
|                                     | 0       | 0                               | 1    | 2     | 3      | 4    |
|                                     |         | 0                               | 1-40 | 61-96 | 97-127 | 128+ |
|                                     |         | FIRE & EXPLOSION INDEX (F.E.I.) |      |       |        |      |

|   |   |   |   |   |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|

EFFECTS ON SKIN

The purpose for calculating the HMTI Index is to determine:

- \* Priority of product review
- \* Level of management involvement in the reviews

When calculating the C.E.I. in a transportation environment, the shortest distance (1,000 feet) from the point of release should be used. This is done because it is impossible to determine the point where loss of containment during transportation may occur.

Appendices B, C and D illustrate typical calculations for the Dow-produced products Ethylene Oxide and Liquid Chlorine.

Appendix E illustrates a typical calculation for a Dow-purchased raw material, Methacrylonitrile.

Appendix F places all of the above chemicals in the C.E.I.-F.E.I. and Skin Ranking Grids.

Table 3 will indicate the action to be followed based on the ranking grid number of the chemicals.

TABLE 3  
TYPICAL REVIEW LEVELS

This table illustrates various review levels. The superintendent should be present for all different levels of the review.

| <u>Ranking<br/>Grid No.</u> | <u>Review Committee</u>                  |
|-----------------------------|------------------------------------------|
| 1                           | Superintendent + Manager                 |
| 2                           | Division Review Committee                |
| 3 & 4                       | Division Review Committee + Area<br>Rep. |

# APPENDIX B

CHEMICAL NAME: \_\_\_\_\_

## CHEMICAL EXPOSURE INDEX

Complete the following Table (See Note 1) by filling in and multiplying the appropriate Risk Factor Scale numbers for each of the major Risk areas as identified in the following formula:

$$\begin{array}{ccccccc}
 \boxed{\text{I.}} & \times & \boxed{\text{II.}} & \times & \boxed{\text{III.}} & \times & \boxed{\text{IV.}} & \times & \boxed{\text{V.}} & = & \boxed{\text{VI.}} \\
 \text{Acute} & & \text{Vapor} & & \text{Distance} & & \text{Molecular} & & \text{Process} & & \text{Chemical} \\
 \text{Hazard} & & \text{Quantity} & & \text{(Receptor)} & & \text{Weight} & & \text{Parameters} & & \text{Exposure} \\
 \text{Scale} & & \text{Scale} & & \text{Scale} & & \text{Scale} & & \text{Scale} & & \text{Index} \\
 \text{No.} & & \text{No.} & & \text{No.} & & \text{No.} & & \text{No.} & & 
 \end{array}$$

Identification of Containment Vessels  
being evaluated:

Name or Number (See Notes 2 & 3)

Source #1 Tank Car Rupture of  
Ethylene Oxide

Source #2 (if needed) \_\_\_\_\_

| I. | II. | III. | IV. | V. | VI.<br>(CEI) |
|----|-----|------|-----|----|--------------|
| 3  | 4   | 4    | 3   | 2  | 288          |
|    |     |      |     |    |              |
|    |     |      |     |    |              |
|    |     |      |     |    |              |
|    |     |      |     |    |              |
|    |     |      |     |    |              |
|    |     |      |     |    |              |

\* NOTE 1 - The distance scale number in Column III for chemicals in a transportation environment will always be less than 1,000 feet.

NOTE 2 - Only different sources of the same chemical should be evaluated on this sheet. Use a separate Chemical Exposure Index for every different chemical.

NOTE 3 - Use additional sheets if additional sources with differing potential impact are present.

## HAZARDOUS MATERIALS TRANSPORTATION

## FIRE AND EXPLOSION INDEX

DOW

LOCATION \_\_\_\_\_

DATE \_\_\_\_\_

PLANT \_\_\_\_\_

PROCESS UNIT \_\_\_\_\_

EVALUATED BY \_\_\_\_\_

REVIEWED BY \_\_\_\_\_

## MATERIALS AND PROCESS

MATERIALS IN PROCESS UNIT \_\_\_\_\_

STATE OF OPERATION

☐ START-UP ☐ SHUT-DOWN ☐ NORMAL OPERATION

BASIC MATERIAL(S) FOR MATERIAL FACTOR \_\_\_\_\_

MATERIAL FACTOR (SEE TABLE I OR APPENDICES A OR B) *Note requirements when unit temperature over 140°F* \_\_\_\_\_

## 1. GENERAL PROCESS HAZARDS

|                                                               | PENALTY | PENALTY USED |
|---------------------------------------------------------------|---------|--------------|
| BASE FACTOR _____                                             | 1.00    | 1.00         |
| A. EXOTHERMIC CHEMICAL REACTIONS (FACTOR .30 to 1.25)         |         |              |
| B. ENDOTHERMIC PROCESSES (FACTOR .20 to .40)                  |         |              |
| C. MATERIAL HANDLING & TRANSFER (FACTOR .25 to 1.05)          |         |              |
| D. ENCLOSED OR INDOOR PROCESS UNITS (FACTOR .25 to .90)       |         |              |
| E. ACCESS                                                     | .35     |              |
| F. DRAINAGE AND SPILL CONTROL (FACTOR .25 to .50) _____ Gals. |         |              |
| GENERAL PROCESS HAZARDS FACTOR (F <sub>1</sub> ) _____        |         |              |

## 2. SPECIAL PROCESS HAZARDS

|                                                                                                               |      |      |
|---------------------------------------------------------------------------------------------------------------|------|------|
| BASE FACTOR _____                                                                                             | 1.00 | 1.00 |
| A. TOXIC MATERIAL(S) (FACTOR 0.20 to 0.80)                                                                    |      |      |
| B. SUB-ATMOSPHERIC PRESSURE (< 300 mm Hg)                                                                     | .50  |      |
| C. OPERATION IN OR NEAR FLAMMABLE RANGE <input type="checkbox"/> INERTED <input type="checkbox"/> NOT INERTED |      |      |
| 1. TANK FARMS STORAGE FLAMMABLE LIQUIDS                                                                       | .50  |      |
| 2. PROCESS UPSET OR PURGE FAILURE                                                                             | .30  |      |
| 3. ALWAYS IN FLAMMABLE RANGE                                                                                  | .80  |      |
| D. DUST EXPLOSION (FACTOR .25 to 2.00) (SEE TABLE II)                                                         |      |      |
| E. PRESSURE (SEE FIGURE 2) OPERATING PRESSURE _____ psig RELIEF SETTING _____ psig                            |      |      |
| F. LOW TEMPERATURE (FACTOR .20 to .30)                                                                        |      |      |
| G. QUANTITY OF FLAMMABLE/UNSTABLE MATERIAL: QUANTITY _____ lbs., H <sub>C</sub> = _____ BTU/lb                |      |      |
| 1. LIQUIDS, GASES AND REACTIVE MATERIALS IN PROCESS (SEE FIG. 3)                                              |      |      |
| 2. LIQUIDS OR GASES IN STORAGE (SEE FIG. 4)                                                                   |      |      |
| 3. COMBUSTIBLE SOLIDS IN STORAGE, DUST IN PROCESS (SEE FIG. 5)                                                |      |      |
| H. CORROSION AND EROSION (FACTOR .10 to .75)                                                                  |      |      |
| I. LEAKAGE — JOINTS AND PACKING (FACTOR .10 to 1.50)                                                          |      |      |
| J. USE OF FIRED HEATERS (SEE FIG. 6)                                                                          |      |      |
| K. HOT OIL HEAT EXCHANGE SYSTEM (FACTOR .15 to 1.15) (SEE TABLE III)                                          |      |      |
| L. ROTATING EQUIPMENT                                                                                         | .50  |      |
| SPECIAL PROCESS HAZARDS FACTOR (F <sub>2</sub> ) _____                                                        |      |      |
| UNIT HAZARD FACTOR (F <sub>1</sub> x F <sub>2</sub> = F <sub>3</sub> ) _____                                  |      |      |
| FIRE AND EXPLOSION INDEX (F <sub>3</sub> x MF = F & E) _____                                                  |      |      |

FORM C-22380 R-4-87 (471-038)

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# APPENDIX D

CHEMICAL NAME: \_\_\_\_\_

## CHEMICAL EXPOSURE INDEX

Complete the following Table (See Note 1) by filling in and multiplying the appropriate Risk Factor Scale numbers for each of the major Risk areas as identified in the following formula:

$$\begin{array}{ccccccc}
 \boxed{\text{I.}} & \times & \boxed{\text{II.}} & \times & \boxed{\text{III.}} & \times & \boxed{\text{IV.}} & \times & \boxed{\text{V.}} & = & \boxed{\text{VI.}} \\
 \text{Acute} & & \text{Vapor} & & \text{Distance} & & \text{Molecular} & & \text{Process} & & \text{Chemical} \\
 \text{Health} & & \text{Quantity} & & \text{(Remoteness)} & & \text{Weight} & & \text{Parameters} & & \text{Exposure} \\
 \text{Hazard} & & \text{Scale} & & \text{Scale} & & \text{Scale} & & \text{Scale} & & \text{Index} \\
 \text{Scale} & & \text{No.} & & \text{No.} & & \text{No.} & & \text{No.} & & \\
 \text{No.} & & & & & & & & & & 
 \end{array}$$

Identification of Containment Vessels  
being evaluated:

Name or Number (See Notes 2 & 3)

Source #1 Tank Car Rupture of  
Liquid Chlorine

Source #2 (if needed) \_\_\_\_\_

| I. | II. | III. | IV. | V. | VI.<br>(CED) |
|----|-----|------|-----|----|--------------|
| 4  | 4   | 4    | 4   | 2  | 512          |
|    |     |      |     |    |              |
|    |     |      |     |    |              |
|    |     |      |     |    |              |
|    |     |      |     |    |              |
|    |     |      |     |    |              |

\* NOTE 1 - The distance scale number in Column III for chemicals in a transportation environment will always be less than 1,000 feet.

NOTE 2 - Only different sources of the same chemical should be evaluated on this sheet. Use a separate Chemical Exposure Index for every different chemical.

NOTE 3 - Use additional sheets if additional sources with differing potential impact are present.

# HAZARDOUS MATERIALS TRANSPORTATION

CHEMICAL NAME: \_\_\_\_\_

## APPENDIX E

### CHEMICAL EXPOSURE INDEX

Complete the following Table (See Note 1) by filling in and multiplying the appropriate Risk Factor Scale numbers for each of the major Risk areas as identified in the following formula:

|                                           |   |                                   |   |                                          |   |                                     |   |                                      |   |                               |
|-------------------------------------------|---|-----------------------------------|---|------------------------------------------|---|-------------------------------------|---|--------------------------------------|---|-------------------------------|
| I.                                        | X | II.                               | X | III.                                     | X | IV.                                 | X | V.                                   | = | VI.                           |
| Acute<br>Health<br>Hazard<br>Scale<br>No. |   | Vapor<br>Quantity<br>Scale<br>No. |   | Distance<br>(Reciprocal)<br>Scale<br>No. |   | Molecular<br>Weight<br>Scale<br>No. |   | Process<br>Penalties<br>Scale<br>No. |   | Chemical<br>Exposure<br>Index |

Identification of Containment Vessels  
being evaluated:

Name or Number (See Notes 2 & 3)

Source #1 ISO Container Tank  
Rupture of  
Methacrylonitrile  
(MAN)

Source #2 (if needed) \_\_\_\_\_

| I. | II. | III. | IV. | V. | VI.<br>(CEI) |
|----|-----|------|-----|----|--------------|
| 3  | 3   | 4    | 4   | 2  | 288          |
|    |     |      |     |    |              |
|    |     |      |     |    |              |
|    |     |      |     |    |              |
|    |     |      |     |    |              |
|    |     |      |     |    |              |

**NOTE 1** — The distance scale number in Column III for chemicals in a transportation environment will always be less than 1,000 feet.

**NOTE 2** — Only different sources of the same chemical should be evaluated on this sheet. Use a separate Chemical Exposure Index for every different chemical.

**NOTE 3** — Use additional sheets if additional sources with differing potential impact are present.

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# APPENDIX F

## HAZARDOUS MATERIAL TRANSPORTATION INDEX

Chemical Exposure Index -  
Fire and Explosion Index - Skin Ranking Grids

CHEMICAL EXPOSURE  
INDEX (C.E.I.)

|         |                |   |   |   |      |
|---------|----------------|---|---|---|------|
| 400+    | C <sub>1</sub> | 4 | 4 | 4 | 4    |
| 300-400 | 3              | 3 | 3 | 3 | 4    |
| 100-299 | 2              | 2 | 2 | 3 | E.O. |
| 1-99    | 1              | 1 | 2 | 3 | 4    |
| 0       | 0              | 1 | 2 | 3 | 4    |

0 1-50 61-96 97-127 128+

FIRE & EXPLOSION INDEX (F.E.I.)

|   |   |   |   |      |
|---|---|---|---|------|
| 0 | 1 | 2 | 3 | SKIN |
|---|---|---|---|------|

EFFECTS ON SKIN

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Distribution Ranking Index  
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| MATERIAL                                   | HIGHEST<br>ORI | F&E1<br>RANK | CE1<br>RANK | INHALE<br>TOX | SKIN<br>ABSORP | SKIN/EYE<br>CORR | AQUATIC<br>TOX | BIODEG-<br>RADATION | *OTHER<br>EFFECTS* |
|--------------------------------------------|----------------|--------------|-------------|---------------|----------------|------------------|----------------|---------------------|--------------------|
| DIMETHYLAMINE                              | 4              | 4            | 4           | 4             |                |                  | 1              | 1                   |                    |
| DINITRO ORTHO SEC BUTYLPHENOL (DINOSEB)#   | 4              | P            | P           | 3             | 4              | 2                | 3              | 3                   |                    |
| DOMANOL* EB GLYCOL ETHER                   | 4              | 1            | 1           | 2             | 4              | 2                | 1              | 1                   |                    |
| EPICHLOROHYDRIN                            | 4              | 4            | 1           | 4             | 3              | 2                | 1              | 1                   |                    |
| ETHANE-PROMIX                              | 4              | 4            | 1           |               | 1              | 1                |                |                     |                    |
| ETHYL ACRYLATE                             | 4              | 4            | 2           | 3             | 3              | 2                | 2              | 1                   |                    |
| ETHYL CHLORIDE                             | 4              | 4            | 2           | 3             | 1              | 1                |                |                     |                    |
| ETHYLALUMINUM DICHLORIDE (15% IN HEPTANE)  | 4              | 4            | 2           | 3             |                |                  |                |                     |                    |
| ETHYLENE                                   | 4              | 4            | 1           | 1             |                | 1                |                |                     |                    |
| ETHYLENE DICHLORIDE                        | 4              | 2            | 2           | 4             | 2              | 2                | 1              | 3                   |                    |
| ETHYLENE OXIDE                             | 4              | 4            | 4           | 3             | 1              |                  | 1              | 1                   |                    |
| HYDROGEN                                   | 4              | 4            | 1           | 1             | 1              | 1                |                |                     |                    |
| HYDROGEN CHLORIDE, ANHYDROUS               | 4              | 1            | 4           | 4             | 1              | 3                |                |                     |                    |
| HYDROGEN FLUORIDE, ANHYDROUS               | 4              | 1            | 1           | 4             | 3              |                  |                |                     |                    |
| ISOBUTANE-PROMIX                           | 4              | 4            | 2           |               | 1              | 1                |                |                     |                    |
| ISOPRENE MIX                               | 4              | 3            | 4           | 4             |                | 2                |                |                     |                    |
| MAGNESIUM ALKYL CATALYSTS (10% IN HEPTANE) | 4              | 4            | 2           | 3             |                |                  |                |                     |                    |
| METHACRYLONITRILE                          | 4              | 4            | 2           | 2             | 4              | 1                | 1              | 2                   |                    |
| METHANE                                    | 4              | 4            | 1           | 1             |                | 1                |                |                     |                    |
| METHYL ACRYLATE                            | 4              | 4            | 2           | 3             | 2              | 2                | 2              | 1                   |                    |
| METHYL CHLORIDE                            | 4              | 4            | 4           |               | 1              | 1                | 1              |                     |                    |
| METHYL MERCAPTAN                           | 4              | 4            | 4           |               |                | 1                | 3              |                     |                    |
| METHYL METHACRYLATE                        | 4              | 4            | 1           | 2             | 1              | 2                | 1              | 1                   |                    |
| METHYLAL (DIMETHOXYMETHANE)                | 4              | 4            | 1           | 2             | 1              | 2                |                |                     |                    |
| MICHIGAN NATURAL GAS CONDENSATE            | 4              | 4            | 2           | 3             | 2              | 2                |                |                     |                    |
| MONOCHLOROACETIC ACID                      | 4              | 1            | 1           | 3             | 4              | 3                | 1              | 1                   |                    |
| NITROMETHANE                               | 4              | 4            | 1           | 3             | 1              | 1                | 1              | 2                   |                    |
| PENTENES CUT                               | 4              | 3            | 4           | 4             |                | 2                |                |                     |                    |
| PHENOL                                     | 4              | 1            | 1           | 2             | 4              | 3                | 1              | 1                   |                    |
| PIPERYLENE CONCENTRATE                     | 4              | 3            | 4           | 4             | 1              | 1                |                |                     |                    |
| PROPANE-PROMIX                             | 4              | 4            | 2           | 1             | 1              | 1                |                |                     |                    |
| PROPYLENE                                  | 4              | 4            | 2           | 1             | 1              | 1                |                |                     |                    |
| PROPYLENE DICHLORIDE                       | 4              | 3            | 1           | 4             | 1              | 1                | 1              | 3                   |                    |

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| MATERIAL                                  | HIGHEST<br>DRI | F&E1<br>RANK | CEI<br>RANK | INHALE<br>TOX | SKIN<br>ABSORP | SKIN/EYE<br>CORR | AQUATIC<br>TOX | BIODEG-<br>RADATION | "OTHER<br>EFFECTS" |
|-------------------------------------------|----------------|--------------|-------------|---------------|----------------|------------------|----------------|---------------------|--------------------|
| PROPYLENE OXIDE                           | 4              | 4            | 4           | 2             | 2              | 3                | 1              | 1                   |                    |
| PYROLYSIS GASOLINE                        | 4              | 3            | 4           | 3             | 2              | 2                |                |                     |                    |
| STYRENE                                   | 4              | 4            | 1           | 2             | 2              | 2                | 1              | 1                   |                    |
| SULFUR DIOXIDE                            | 4              | 1            | 4           | 4             |                | 1                |                |                     |                    |
| SULFUR MONOCHLORIDE                       | 4              | 1            | 2           | 4             |                | 3                |                |                     |                    |
| SULFUR TRIOXIDE                           | 4              | 1            | 4           | 4             |                | 3                |                |                     |                    |
| T-BUTYL PERACETATE (20% IN ISOPAR C)      | 4              | 4            | 2           | 3             | 1              | 2                | 2              |                     |                    |
| T-BUTYL PEROXIDE (IN ISOPAR C)            | 4              | 4            | 2           | 3             | 1              | 2                | 2              |                     |                    |
| T-BUTYL PERPIVALATE (20% IN ISOPAR C)     | 4              | 4            | 2           | 3             | 1              | 2                | 2              |                     |                    |
| TELONE C-17#                              | 4              | 2            | 4           | 3             | 3              | 2                | 3              |                     |                    |
| TOLUENE DIISOCYANATE (TDI)                | 4              | 1            | 1           | 2             | 1              | 2                | 1              | 3                   | 4                  |
| TRIETHYLALUMINUM (IN HEPTANE)             | 4              | 4            | 1           | 3             |                |                  |                |                     |                    |
| TRIMETHYLAMINE                            | 4              | 4            | 4           | 3             | 1              | 3                | 1              | 1                   |                    |
| VIKANE (SULFURYL FLUORIDE)#               | 4              | 1            | 4           | 4             | 1              | 1                |                |                     |                    |
| VINYL ACETATE                             | 4              | 4            | 2           | 2             | 1              | 3                | 1              | 1                   |                    |
| VINYL CHLORIDE                            | 4              | 4            | 2           | 4             | 1              | 1                |                |                     |                    |
| VINYLDENE CHLORIDE                        | 4              | 4            | 4           | 2             | 1              | 2                | 1              | 3                   |                    |
| VORANATE* (ALL FORMULATIONS)              | 4              | 1            | 1           | 2             | 1              | 2                | 1              | 3                   | 4                  |
| 1,1,1-TRICHLOROETHANE (ALL FORMULATIONS)  | 3              | 1            | 1           | 3             | 1              | 1                | 1              | 3                   |                    |
| 1,1,2-TRICHLOROETHANE                     | 3              | 1            | 1           | 3             | 2              | 1                | 1              |                     |                    |
| 1,3-DICHLOROPROPENE (75,200,trans)        | 3              | 2            | 3           | 3             | 3              | 2                | 3              |                     |                    |
| 1,3-DIOXOLANE                             | 3              | P            | P           | 3             | 1              | 2                |                |                     |                    |
| 1-OCTENE                                  | 3              | 3            | 1           | 2             |                | 2                |                |                     |                    |
| 2,4-D BUTOXYETHYL ESTER#                  | 3              | P            | P           | 1             | 2              | 1                | 3              |                     |                    |
| 2,4-D BUTYL ESTER#                        | 3              | P            | P           |               |                |                  | 3              | 1                   |                    |
| 2,4-D ISOPROPYLAMINE SALTS#               | 3              | P            | P           | 1             | 2              | 3                |                |                     |                    |
| 2,4-D TRIETHANOLAMINE SALT-4 HERB. CONC.# | 3              | P            | P           | 1             | 2              | 3                |                |                     |                    |
| 2,4-D TRIISOPROPANOLAMINE SALTS#          | 3              | P            | P           | 1             | 3              | 2                |                |                     |                    |
| 2,4-DICHLOROPHENOL#                       | 3              | P            | P           |               | 2              | 3                | 2              |                     |                    |
| 2,6-DI-TERT-BUTYLPHENOL#                  | 3              | P            | P           | 1             |                | 3                | 2              | 2                   |                    |
| 2-CYANOPYRIDINE#                          | 3              | P            | P           | 1             | 3              | 2                |                |                     |                    |

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| MATERIAL                           | HIGHEST<br>DRI | F&E1<br>RANK | CE1<br>RANK | INHALE<br>TOX | SKIN<br>ABSORP | SKIN/EYE<br>CORR | AQUATIC<br>TOX | BIODEG-<br>RADATION | "OTHER<br>EFFECTS" |
|------------------------------------|----------------|--------------|-------------|---------------|----------------|------------------|----------------|---------------------|--------------------|
| 2-ETHYLHEXANOL                     | 3              | 1            | P           | 2             | 2              | 3                |                |                     |                    |
| 2-HYDROXYPROPYL ACRYLATE           | 3              | 1            | 1           |               | 3              | 3                | 2              | 1                   |                    |
| ACETIC ACID, GLACIAL               | 3              | 2            | 1           | 3             | 1              | 3                |                |                     |                    |
| ACETIC ANHYDRIDE                   | 3              | 2            | 1           | 3             | 1              | 3                |                |                     |                    |
| ACETONE                            | 3              | 3            | 1           | 2             | 1              | 2                | 1              | 1                   |                    |
| ACRYLIC ACID                       | 3              | 3            | 1           | 2             | 3              | 3                | 1              | 1                   |                    |
| ALUMINUM CHLORIDE SOLUTION         | 3              | 1            | 1           | 2             |                | 3                |                |                     |                    |
| AMINOETHYLETHANOLAMINE             | 3              | 1            | 1           | 1             | 1              | 3                | 1              | 3                   |                    |
| AMINOETHYLPIPERAZINE (95-100%)     | 3              | 1            | 1           | 1             | 3              | 3                | 1              | 3                   |                    |
| ASPIRIN                            | 3              | P            | P           | 3             | 1              | 1                |                |                     |                    |
| BENZENE                            | 3              | 3            | 3           | 3             | 1              | 2                | 1              | 1                   |                    |
| BENZENE/TOLUENE MIXTURE            | 3              | 3            | 2           | 3             | 1              | 2                | 2              | 1                   |                    |
| C-9 RAFFINATE 1                    | 3              | 3            | 1           | 2             | 1              | 2                |                |                     |                    |
| CALIFORNIA NATURAL GAS CONDENSATE  | 3              | 3            | 1           | 3             | 2              | 2                |                |                     |                    |
| CAUSTIC SODA SOLUTIONS (50% & 73%) | 3              | 1            | 1           |               | 1              | 3                | 1              |                     |                    |
| CHLOROFORM                         | 3              | 1            | 2           | 3             |                | 2                | 1              | 3                   |                    |
| CUMENE                             | 3              | 3            | 1           |               | 1              | 1                | 1              | 1                   |                    |
| CURITHANE* 103                     | 3              | P            | P           | 3             | 2              | 1                |                |                     |                    |
| CURITHANE* 51                      | 3              | P            | P           | 2             | 2              | 3                |                |                     |                    |
| CYCLOHEXANE                        | 3              | 3            | 1           |               | 1              | 1                |                |                     |                    |
| CYCLOHEXANONE                      | 3              | 1            | 1           | 2             | 3              | 2                |                |                     |                    |
| DER* 331 EPOXY RESIN               | 3              | 1            | 1           | 1             | 1              | 1                | 3              | 3                   |                    |
| DER* 662 PMX60                     | 3              | 3            | 1           |               | 2              | 1                |                |                     |                    |
| DER* 667 PMT55                     | 3              | 3            | 1           |               | 2              | 1                |                |                     |                    |
| DEWATERING AID M269                | 3              | P            | P           | 1             | 1              | 1                | 3              | 2                   |                    |
| DIBROMONITRILOPROPIONAMIDE         | 3              | P            | P           | 1             | 1              | 3                | 3              |                     |                    |
| DICYCLOPENTADIENE                  | 3              | 3            | 1           | 3             | 1              | 1                | 1              | 3                   |                    |
| DIETHYLAMINE                       | 3              | 3            | 3           | 3             | 3              | 3                | 1              |                     |                    |
| DIETHYLENE GLYCOL                  | 3              | 1            | 1           | 1             | 2              | 1                | 3              | 1                   |                    |
| DIETHYLENETRIAMINE                 | 3              | 1            | 1           | 3             | 3              | 3                | 1              | 3                   |                    |
| DIETHYLTOLUENEDIAMINE              | 3              | P            | P           | 1             | 3              | 2                |                |                     |                    |
| DIMETHYLAMINOETHANOL               | 3              | P            | P           | 2             | 2              | 3                | 1              | 1                   |                    |
| DIOXANE (DIETHYLENE ETHER)         | 3              | 3            | 1           | 3             | 2              | 1                | 1              | 3                   |                    |

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| MATERIAL                               | HIGHEST<br>DRI | F&E1<br>RANK | CEI<br>RANK | INHALE<br>TOX | SKIN<br>ABSORP | SKIN/EYE<br>CORR | AQUATIC<br>TOX | BIODEG-<br>RADATION | "OTHER<br>EFFECTS" |
|----------------------------------------|----------------|--------------|-------------|---------------|----------------|------------------|----------------|---------------------|--------------------|
| DIVINYLBENZENE                         | 3              | 2            | 1           | 2             | 1              | 2                | 2              | 3                   |                    |
| DMA* 4 HERBICIDE#                      | 3              | P            | P           | 1             | 3              | 3                |                |                     |                    |
| DMA* 6 SEQUESTERED WEED KILLER#        | 3              | P            | P           | 1             | 3              | 3                |                |                     |                    |
| DOMANOL* PM GLYCOL ETHER               | 3              | 3            | 1           |               |                | 1                | 1              | 1                   |                    |
| DOWFAX* 2A1 SURFACTANT                 | 3              | P            | P           | 2             | 1              | 3                | 3              | 3                   |                    |
| DOWFAX* 3B2 SOLUTION SURFACTANT        | 3              | P            | P           | 2             | 1              | 3                | 2              |                     |                    |
| DOWTHERM* A HEAT TRANSFER AGENT        | 3              | 1            | 1           | 2             | 1              | 1                | 3              | 1                   |                    |
| E-CAPROLACTONE                         | 3              | P            | P           | 1             | 1              | 3                |                |                     |                    |
| EB-BD-A FUEL OIL BOTTOMS               | 3              | 1            | 1           | 2             | 1              | 3                |                |                     |                    |
| ETHYL ALCOHOL CRUDE                    | 3              | 3            | 1           | 2             | 1              | 2                | 1              | 1                   |                    |
| ETHYLBENZENE                           | 3              | 3            | 1           | 2             | 1              | 1                | 2              | 1                   |                    |
| ETHYLENEAMINE DE-1585                  | 3              | P            | P           | 3             | 3              | 3                |                |                     |                    |
| ETHYLENEAMINE DE-2575                  | 3              | P            | P           | 3             | 3              | 3                |                |                     |                    |
| ETHYLENEAMINE E-100                    | 3              | P            | P           | 1             | 3              | 2                | 1              |                     |                    |
| ETHYLENEAMINE S-1107                   | 3              | P            | P           | 3             | 3              | 3                |                |                     |                    |
| ETHYLENEDIAMINE                        | 3              | 1            | 1           | 3             | 3              | 3                | 2              | 1                   |                    |
| ETHYLENEDIAMINETETRAACETIC ACID        | 3              | P            | P           | 1             | 1              | 2                | 1              | 3                   |                    |
| FORMALDEHYDE SOLUTION (37% & 50%)      | 3              | 1            | 1           | 3             | 3              | 3                |                |                     |                    |
| HC-77 RT CRACKING CATALYST             | 3              | P            | P           |               | 1              | 3                |                |                     |                    |
| HC-88 RT CRACKING CATALYST             | 3              | P            | P           | 3             |                | 3                |                |                     |                    |
| HEXANE                                 | 3              | 3            | 2           | 3             | 2              | 1                | 2              |                     |                    |
| HYDROCHLORIC ACID (ALL CONCENTRATIONS) | 3              | P            | P           | 3             | 1              | 3                |                |                     |                    |
| HYDROGEN PEROXIDE - AQUEOUS SOLUTIONS  | 3              | 1            | 1           | 2             | 3              | 3                |                |                     |                    |
| ISOBUTYL ALCOHOL                       | 3              | 3            | 1           |               | 1              | 2                | 1              | 1                   |                    |
| ISOPAR C (ISOOCTANE)                   | 3              | 3            | 1           |               | 1              | 1                | 2              |                     |                    |
| ISOPROPANOLAMINE MIX                   | 3              | P            | P           | 1             | 1              | 3                |                |                     |                    |
| ISOPROPYL ALCOHOL                      | 3              | 3            | 1           | 3             | 1              | 2                | 1              | 1                   |                    |
| ISOPROPYL CHLOROFORMATE                | 3              | P            | P           | 3             | 2              | 3                | 2              | 1                   |                    |
| MCPA, DIMETHYLAMINE SALT (TECHNICAL)#  | 3              | P            | P           | 1             | 2              | 3                |                |                     |                    |
| MCPP ANINE#                            | 3              | P            | P           | 1             | 1              | 3                |                |                     |                    |
| METHACRYLIC ACID                       | 3              | 3            | 1           | 2             | 3              | 3                | 1              | 1                   |                    |
| METHANOL                               | 3              | 3            | 1           | 3             | 2              | 1                | 1              | 1                   |                    |
| METHYL ETHYL KETONE                    | 3              | 3            | 1           |               | 1              | 1                | 1              | 1                   |                    |

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| MATERIAL                                   | HIGHEST<br>ORI | F&E1<br>RANK | CE1<br>RANK | INHALE<br>TOX | SKIN<br>ABSORP | SKIN/EYE<br>CORR | AQUATIC<br>TOX | BIODEG-<br>RADATION | "OTHER<br>EFFECTS" |
|--------------------------------------------|----------------|--------------|-------------|---------------|----------------|------------------|----------------|---------------------|--------------------|
| METHYL ISOBUTYL KETONE                     | 3              | 3            | 1           | 3             | 1              | 2                | 1              | 1                   |                    |
| METHYL SALICYLATE                          | 3              | P            | P           | 3             | 1              | 1                |                |                     |                    |
| METHYLDIETHANOLAMINE                       | 3              | P            | P           | 2             | 1              | 3                |                |                     |                    |
| METHYLENE CHLORIDE (ALL FORMULATIONS)      | 3              | 1            | 1           | 3             | 1              | 2                | 1              |                     |                    |
| METHYLENE DIANILINE                        | 3              | P            | 1           | 3             | 2              | 1                | 1              |                     |                    |
| METHYLENE DIISOCYANATE (MDI)               | 3              | 1            | 1           | 3             |                | 1                | 1              | 3                   |                    |
| MONOCHLOROBENZENE                          | 3              | 3            | 1           | 2             | 1              | 1                | 2              | 1                   |                    |
| MONOETHANOLAMINE                           | 3              | 1            | 1           | 2             | 3              | 3                | 1              | 1                   |                    |
| MONOISOPROPANOLAMINE                       | 3              | 1            | 1           | 2             | 2              | 3                |                | 2                   |                    |
| N-BUTYL ALCOHOL                            | 3              | 3            | 1           | 3             | 2              | 2                | 1              | 1                   |                    |
| N-HEPTANE                                  | 3              | 3            | 1           | 3             | 1              | 2                | 2              |                     |                    |
| N-SERVE* 24#                               | 3              | P            | P           | 1             | 3              | 2                |                |                     |                    |
| NAPHTHA                                    | 3              | 3            | 2           |               |                |                  |                |                     |                    |
| NATURAL GAS CONDENSATE                     | 3              | 3            | 2           | 3             | 2              | 2                |                |                     |                    |
| NATURAL GAS LIQUIDS                        | 3              | 3            | 2           | 3             | 1              | 2                |                |                     |                    |
| NATURAL GASOLINE-PROMIX                    | 3              | 3            | 1           | 3             | 2              | 2                |                |                     |                    |
| P-TERT-BUTYLPHENOL                         | 3              | P            | P           | 1             | 1              | 3                |                |                     |                    |
| PENTACHLOROPYRIDINE#                       | 3              | 1            | 1           | 1             | 1              | 2                | 3              |                     |                    |
| PERCHLOROETHYLENE (ALL FORMULATIONS)       | 3              | 1            | 1           | 3             | 1              | 1                | 2              | 3                   |                    |
| PHOSPHORIC ACID (75-85% AQUEOUS SOLUTIONS) | 3              | 1            | 1           | 1             | 2              | 3                |                |                     |                    |
| PICOLINE (ALPHA)#                          | 3              | 3            | 1           | 3             | 3              | 3                |                |                     |                    |
| PICOLINE (BETA)#                           | 3              | 3            | 1           | 3             | 2              | 3                |                |                     |                    |
| PIPERAZINE AMINE MIX                       | 3              | P            | P           | 3             | 3              | 3                |                |                     |                    |
| PIPERAZINE ANHYDROUS (DIETHYLENE DIAMINE)  | 3              | 1            | P           | 3             | 1              | 3                | 1              | 3                   |                    |
| POLYGLYCERINE                              | 3              | P            | P           | 1             | 1              | 3                | 1              | 1                   |                    |
| POLYGLYCOL 15-200                          | 3              | P            | P           |               | 1              | 1                | 1              | 3                   |                    |
| POLYPROPYLENE GLYCOL (MW 400-4000)         | 3              | P            | P           |               | 1              | 1                | 1              | 3                   |                    |
| PROCESSED MDEA BOTTOMS                     | 3              | P            | P           | 2             | 1              | 3                |                |                     |                    |
| QUAT 188                                   | 3              | P            | P           | 1             | 1              | 2                | 1              | 3                   |                    |
| RECYCLED ETHYLBENZENE                      | 3              | 3            | 1           | 2             | 1              | 1                | 2              | 1                   |                    |
| RESIN OIL 60                               | 3              | 3            | 1           | 2             | 1              | 2                |                |                     |                    |
| RESIN OIL 80                               | 3              | 3            | 1           | 2             | 1              | 1                |                |                     |                    |
| SEC-BUTYL ALCOHOL                          | 3              | 3            | 1           | 2             | 1              | 3                | 1              | 1                   |                    |

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| MATERIAL                                 | HIGHEST<br>DRI | F&E1<br>RANK | CE1<br>RANK | INHALE<br>TOX | SKIN<br>ABSORP | SKIN/EYE<br>CORR | AQUATIC<br>TOX | BIODEG-<br>RADATION | *OTHER<br>EFFECTS* |
|------------------------------------------|----------------|--------------|-------------|---------------|----------------|------------------|----------------|---------------------|--------------------|
| SULFURIC ACID                            | 3              | 1            | 1           | 3             |                | 3                |                |                     |                    |
| T-AMYL ALCOHOL                           | 3              | 3            | P           | 3             | 2              | 2                | 1              | 3                   |                    |
| TELONE* 11 SOIL FUMIGANT#                | 3              | 2            | 3           | 3             | 3              | 2                | 3              |                     |                    |
| TETRAETHYLENEPENTAMINE                   | 3              | 1            | 1           | 3             | 3              | 3                | 1              | 3                   |                    |
| TOLUENE                                  | 3              | 3            | 1           | 2             | 1              | 1                | 2              | 1                   |                    |
| TOLUENE/BENZENE STREAM                   | 3              | 3            | 2           | 3             | 1              | 2                |                |                     |                    |
| TRICHLOROETHYLENE                        | 3              | 1            | 1           | 3             | 1              | 1                | 2              | 3                   |                    |
| TRICLOPYR, BUTOXYETHYL ESTER#            | 3              | P            | P           | 1             | 1              | 1                | 3              |                     |                    |
| TRICLOPYR, TEA SALT#                     | 3              | P            | P           | 1             | 1              | 3                | 1              | 1                   |                    |
| TRIETHANOLAMINE                          | 3              | 1            | 1           | 1             | 1              | 2                | 1              | 3                   |                    |
| TRIETHYLAMINE                            | 3              | 3            | 2           | 3             | 3              | 3                | 1              |                     |                    |
| TRIETHYLENETETRAMINE                     | 3              | 1            | 1           | 3             | 3              | 3                | 1              | 2                   |                    |
| VERSENE* 100 CHELATING AGENT             | 3              | 1            | 1           |               | 1              | 3                | 1              | 3                   |                    |
| VERSENE* 220 CRYSTALS CHELATING AGENT    | 3              | 1            | 1           | 1             | 1              | 2                | 1              | 3                   |                    |
| VERSENEX* 80                             | 3              | 1            | 1           |               | 1              | 3                | 1              | 3                   |                    |
| VERSENOL* 120                            | 3              | 1            | 1           |               | 1              | 3                | 1              | 3                   |                    |
| VINYLBENZYL CHLORIDE                     | 3              | P            | P           | 2             | 3              | 2                |                |                     |                    |
| VORANOL* 202 POLYOL                      | 3              | P            | P           | 1             | 1              | 1                | 1              | 3                   |                    |
| VORANOL* 5771 POLYETHER POLYOL BLEND     | 3              | P            | P           | 1             | 1              | 3                | 1              | 3                   |                    |
| VORANOL* 800 POLYOL                      | 3              | P            | P           | 1             | 1              | 2                | 1              | 3                   |                    |
| XYLENE                                   | 3              | 3            | 1           | 2             | 1              | 2                | 1              | 1                   |                    |
| ZINC CHLORIDE 50#                        | 3              | P            | P           |               |                | 3                | 3              |                     |                    |
| 2,4-D ISOOCTYL ESTER#                    | 2              | P            | P           | 1             | 2              | 1                | 1              | 1                   |                    |
| 2,4-D, BUTYL ESTERS#                     | 2              | P            | P           | 1             | 2              | 1                |                |                     |                    |
| AIRCRAFT DEICING FLUID                   | 2              | P            | P           | 2             | 1              | 1                |                |                     |                    |
| ALIPHATIC ALKYL GLYCIDYL ETHER (C12-C14) | 2              | P            | P           | 2             | 1              | 1                |                |                     |                    |
| AMBITROL* CM COOLANT                     | 2              | P            | P           | 2             | 1              | 1                | 1              | 1                   |                    |
| AMBITROL* INHIBITOR COOLANT              | 2              | P            | P           | 2             | 1              | 1                |                |                     |                    |
| BIPHENYL CONCENTRATE (MOLTEN)            | 2              | 1            | 2           | 1             | 1              | 1                |                |                     |                    |
| BIPHENYLYL PHENYL ETHER                  | 2              | P            | P           | 1             | 2              | 1                |                |                     |                    |
| BISPHENOL A                              | 2              | 1            | 1           | 1             | 1              | 2                | 2              | 1                   |                    |

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| MATERIAL                              | HIGHEST<br>DRI | F&E1<br>RANK | CE1<br>RANK | INHALE<br>TOX | SKIN<br>ABSORP | SKIN/EYE<br>CORR | AQUATIC<br>TOX | BIODEG-<br>RADATION | *OTHER<br>EFFECTS* |
|---------------------------------------|----------------|--------------|-------------|---------------|----------------|------------------|----------------|---------------------|--------------------|
| -----                                 | -----          | -----        | -----       | -----         | -----          | -----            | -----          | -----               | -----              |
| BRAKE FLUID 2000                      | 2              | P            | P           | 1             | 1              | 2                |                |                     |                    |
| CALCIUM CHLORIDE                      | 2              | 1            | 1           | 1             | 1              | 2                | 1              |                     |                    |
| CARBON DIOXIDE                        | 2              | 1            | 2           |               |                |                  |                |                     |                    |
| DEN* 439 EPOXY NOVOLAC                | 2              | P            | P           | 1             | 1              | 1                | 2              |                     |                    |
| DER* 324 EPOXY RESIN                  | 2              | P            | P           | 2             | 1              | 1                |                |                     |                    |
| DER* 325 EPOXY RESIN                  | 2              | P            | P           | 2             | 1              | 1                |                |                     |                    |
| DER* 333 EPOXY RESIN                  | 2              | 2            | 1           |               | 1              | 1                | 2              | 1                   |                    |
| DER* 337 -X90 EPOXY RESIN             | 2              | 2            | 1           |               | 1              | 1                |                |                     |                    |
| DER* 338 -X90 EPOXY RESIN             | 2              | 2            | 1           | 1             | 1              | 1                | 2              | 1                   |                    |
| DER* 343 EPOXY RESIN                  | 2              | 2            | 1           |               | 1              | 1                | 2              | 1                   |                    |
| DER* 345 EPOXY RESIN                  | 2              | 2            | 1           |               | 1              | 1                | 2              | 1                   |                    |
| DER* 361-X97 EPOXY RESIN              | 2              | 2            | 1           |               | 1              | 1                |                |                     |                    |
| DER* 365 EPOXY RESIN                  | 2              | 2            | 1           |               | 1              | 1                | 2              | 1                   |                    |
| DER* 511 -A80 EPOXY RESIN             | 2              | 2            | 1           |               | 1              | 1                | 2              | 1                   |                    |
| DER* 521 -A80 EPOXY RESIN             | 2              | 2            | 1           |               | 1              | 1                | 1              | 1                   |                    |
| DER* 661 -A75 EPOXY RESIN             | 2              | 2            | 1           |               | 1              | 1                | 2              | 1                   |                    |
| DER* 671 -EK80 EPOXY RESIN            | 2              | 2            | 1           |               | 1              | 1                | 2              |                     |                    |
| DER* 671 -PM75                        | 2              | 2            | 1           | 2             | 2              | 1                |                |                     |                    |
| DER* 671 -X75 EPOXY RESIN             | 2              | 2            | 1           |               | 1              | 1                | 2              | 1                   |                    |
| DER* 671 -XM75 EPOXY RESIN            | 2              | 2            | 1           |               | 1              | 2                |                |                     |                    |
| DER* 671 -175 EPOXY RESIN             | 2              | 2            | 1           | 2             | 1              | 1                | 1              | 1                   |                    |
| DER* 684 -EK40 EPOXY RESIN            | 2              | 2            | 1           |               | 1              | 1                |                |                     |                    |
| DICHLORODIFLUOROMETHANE (FREON 12)    | 2              | P            | P           | 2             | 1              | 1                |                |                     |                    |
| DICHLOROTETRAFLUOROETHANE (FREON 114) | 2              | P            | P           | 2             | 1              | 1                |                |                     |                    |
| DIETHANOLAMINE                        | 2              | 1            | 1           | 1             | 1              | 2                | 1              | 1                   |                    |
| DIETHYLBENZENE                        | 2              | 1            | 1           |               | 1              | 2                | 2              | 2                   |                    |
| DIISOPROPANOLAMINE                    | 2              | 1            | 1           | 1             | 1              | 2                | 1              | 2                   |                    |
| DIPHENYL OXIDE                        | 2              | 1            | 1           | 2             | 1              | 1                | 2              | 1                   |                    |
| DIPROPYLENE GLYCOL                    | 2              | 1            | 1           | 1             | 1              | 1                | 1              | 2                   |                    |
| DOWANOL* DB GLYCOL ETHER              | 2              | P            | P           | 1             | 1              | 2                | 1              | 1                   |                    |
| DOWANOL* DPM GLYCOL ETHER             | 2              | P            | P           |               |                | 1                | 1              | 2                   |                    |
| DOWANOL* DPNB GLYCOL ETHER            | 2              | P            | P           | 1             | 1              | 1                | 1              | 2                   |                    |
| DOWANOL* EPH GLYCOL ETHER             | 2              | P            | P           | 1             | 2              | 2                | 1              | 1                   |                    |

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| MATERIAL                                 | HIGHEST<br>DRI | F&E1<br>RANK | CE1<br>RANK | INHALE<br>TOX | SKIN<br>ABSORP | SKIN/EYE<br>CORR | AQUATIC<br>TOX | BIODEG-<br>RADATION | *OTHER<br>EFFECTS* |
|------------------------------------------|----------------|--------------|-------------|---------------|----------------|------------------|----------------|---------------------|--------------------|
| DOMANOL* TMN GLYCOL ETHER                | 2              | P            | P           | 1             | 1              | 2                | 1              | 2                   |                    |
| DOMANOL* TMN GLYCOL ETHER                | 2              | P            | P           | 1             | 1              | 1                | 1              | 2                   |                    |
| DOWEX* RESINS - ANION FORM               | 2              | P            | P           | 1             | 1              | 2                |                |                     |                    |
| DOWEX* RESINS - CATION FORM              | 2              | P            | P           | 1             | 1              | 2                |                |                     |                    |
| DOWFAX* 2A0 SURFACTANT                   | 2              | P            | P           |               | 1              | 2                |                |                     |                    |
| DOWFROTH* 1012-C FLOTATION FROTHER       | 2              | P            | P           | 1             | 1              | 2                |                |                     |                    |
| DOWFROTH* 250-C FLOTATION FROTHER        | 2              | P            | P           | 2             | 1              | 2                |                |                     |                    |
| DOWICIL* 200 ANTIMICROBIAL               | 2              | P            | P           | 1             |                | 1                | 1              | 2                   |                    |
| DOWICIL* 75 ANTIMICROBIAL                | 2              | P            | P           | 1             | 2              | 1                | 1              | 2                   |                    |
| DOWTHERM* G HEAT TRANSFER AGENT          | 2              | P            | P           | 2             | 1              | 1                |                |                     |                    |
| DOWTHERM* LF HEAT TRANSFER FLUID (NEW)   | 2              | P            | P           | 2             | 2              | 2                |                |                     |                    |
| DOWTHERM* SR-1                           | 2              | P            | P           | 2             | 1              | 1                |                |                     |                    |
| DURSBAW* F#                              | 2              | P            | P           | 1             | 2              | 1                |                |                     |                    |
| ETHYLENE GLYCOL                          | 2              | 1            | 1           | 2             |                | 1                | 1              | 1                   |                    |
| FLUROXYPYR METHYL ESTER#                 | 2              | P            | P           | 2             | 1              | 1                | 2              |                     |                    |
| FUEL OIL NO.6                            | 2              | 1            | 1           | 2             | 1              | 2                |                |                     |                    |
| MAGNESIUM CHLORIDE, 70X                  | 2              | 1            | 1           |               | 1              | 2                | 1              |                     |                    |
| MAGNESIUM HYDROXIDE                      | 2              | 1            | 1           | 1             | 1              | 2                |                |                     |                    |
| MCPA, ISOCTYL ESTER (TECHNICAL)#         | 2              | P            | P           | 1             | 2              | 2                |                |                     |                    |
| MCPA, MIXED BUTYL ESTERS#                | 2              | P            | P           | 1             | 2              | 2                |                |                     |                    |
| N-BUTOXYPROPANOL                         | 2              | P            | P           | 2             | 2              | 2                | 1              | 1                   |                    |
| ORGANIC AMINE 70                         | 2              | P            | P           | 1             | 1              | 2                | 1              | 2                   |                    |
| P-PHENYLPHENOL                           | 2              | P            | P           |               | 1              | 1                | 2              | 1                   |                    |
| PICLORAM, ISOCTYL ESTERS#                | 2              | P            | P           | 1             | 1              | 2                | 2              |                     |                    |
| POLYETHYLBENZENE 120                     | 2              | P            | P           | 2             | 1              | 2                |                |                     |                    |
| POLYGLYCOL E-600                         | 2              | P            | P           |               | 1              | 1                | 1              | 2                   |                    |
| POTASSIUM CHLORIDE (FROM DCTFP PROCESS)# | 2              | 1            | 1           |               | 1              | 2                | 1              |                     |                    |
| SULFUR                                   | 2              | 1            | 1           | 1             | 2              | 1                |                |                     |                    |
| TETRABROMOBISPHENOL A                    | 2              | P            | P           | 1             | 1              | 1                | 2              |                     |                    |
| TOLUENE/XYLENE MIX                       | 2              | P            | P           | 2             | 1              | 2                |                |                     |                    |
| TOLUENEDIAMINE                           | 2              | P            | P           |               | 2              | 2                | 1              | 1                   |                    |
| TRICHLOROFLUOROMETHANE (FREON 11)        | 2              | P            | P           | 2             |                | 1                |                |                     |                    |
| TRIETHYLENE GLYCOL                       | 2              | 1            | 1           | 1             | 1              | 1                | 1              | 2                   |                    |

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| MATERIAL                                  | HIGHEST<br>DRI | F&E<br>RANK | CEI<br>RANK | INHALE<br>TOX | SKIN<br>ABSORP | SKIN/EYE<br>CORR | AQUATIC<br>TOX | BIODEG-<br>RADATION | *OTHER<br>EFFECTS* |
|-------------------------------------------|----------------|-------------|-------------|---------------|----------------|------------------|----------------|---------------------|--------------------|
| TRIFLUORO HERBICIDAL INTERMEDIATE#        | 2              | P           | P           | 2             | 2              | 1                |                |                     |                    |
| TRISOPROPANOLAMINE                        | 2              | 1           | 1           | 1             | 1              | 2                | 1              |                     |                    |
| VINYL TOLUENE (METHYL STYRENE)            | 2              | 2           | 1           | 2             | 2              | 1                | 1              | 1                   |                    |
| VORANOL* 3913 COPOLYMER POLYOL            | 2              | P           | P           | 1             | 1              | 2                |                |                     |                    |
| AQUEOUS ACRYLAMIDE (50X)                  | 1              | 1           | 1           |               |                | 1                |                |                     |                    |
| BRAKE FLUID 920                           | 1              | P           | P           | 1             | 1              | 1                |                |                     |                    |
| BRAKE FLUID HD50-4                        | 1              | P           | P           | 1             | 1              | 1                |                |                     |                    |
| CATALYST, OXY EDC                         | 1              | P           | P           |               |                | 1                |                |                     |                    |
| COKE (CARBON)                             | 1              | 1           | 1           | 1             | 1              | 1                |                |                     |                    |
| DECABROMODIPHENYL OXIDE                   | 1              | P           | P           | 1             | 1              | 1                |                |                     |                    |
| DER* 668 PMA 50 EPOXY RESIN               | 1              | P           | P           | 1             | 1              | 1                |                |                     |                    |
| DER* 755 EPOXY RESIN                      | 1              | P           | P           |               | 1              | 1                |                |                     |                    |
| DOWANOL* DC-100 GLYCOL ETHER              | 1              | P           | P           |               |                | 1                |                |                     |                    |
| DOWANOL* DM GLYCOL ETHER                  | 1              | P           | P           | 1             | 1              | 1                | 1              | 1                   |                    |
| DOWANOL* PM ACETATE                       | 1              | P           | P           | 1             |                | 1                | 1              | 1                   |                    |
| DOWANOL* PPH GLYCOL ETHER                 | 1              | P           | P           | 1             | 1              | 1                | 1              | 1                   |                    |
| DOWANOL* TPM GLYCOL ETHER                 | 1              | P           | P           | 1             | 1              | 1                | 1              | 1                   |                    |
| DOWTHERM* HT HEAT TRANSFER FLUID          | 1              | P           | P           | 1             | 1              | 1                |                |                     |                    |
| DRYTECH 534                               | 1              | P           | P           |               | 1              | 1                |                |                     |                    |
| ETHAFOAM* 4101                            | 1              | 1           | 1           | 1             | 1              | 1                |                |                     |                    |
| ETHOCEL* ETHYLCELLULOSE                   | 1              | 1           | 1           | 1             | 1              | 1                |                |                     |                    |
| ETHYLENE/ACRYLIC ACID COPOLYMERS          | 1              | P           | P           | 1             | 1              | 1                |                |                     |                    |
| GLYCERINE                                 | 1              | 1           | 1           | 1             | 1              | 1                | 1              | 1                   |                    |
| HEXABROMOCYCLODECANE                      | 1              | P           | P           | 1             | 1              | 1                | 1              |                     |                    |
| HYDROCARBON RESIDUALS                     | 1              | 1           | 1           |               |                |                  |                |                     |                    |
| ISOPLAST* ENGINEERING THERMOPLASTIC RESIN | 1              | 1           | 1           |               | 1              | 1                |                |                     |                    |
| LIQUIDOW* (CALCIUM CHLORIDE SOLUTIONS)    | 1              | 1           | 1           | 1             | 1              | 1                | 1              |                     |                    |
| MAGNESIUM INGOT                           | 1              | 1           | 1           |               | 1              | 1                |                |                     |                    |
| MAGNESIUM SULFATE                         | 1              | 1           | 1           | 1             | 1              | 1                |                |                     |                    |
| MAGNUM* RESINS                            | 1              | 1           | 1           |               | 1              | 1                |                |                     |                    |
| METHOCEL* METHYLCELLULOSE                 | 1              | 1           | 1           | 1             | 1              | 1                |                |                     |                    |

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| MATERIAL                                      | HIGHEST<br>DRI | F&E1<br>RANK | CE1<br>RANK | INHALE<br>TOX | SKIN<br>ABSORP | SKIN/EYE<br>CORR | AQUATIC<br>TOX | BIODEG-<br>RADATION | "OTHER<br>EFFECTS" |
|-----------------------------------------------|----------------|--------------|-------------|---------------|----------------|------------------|----------------|---------------------|--------------------|
| MODIFIER A                                    | 1              | P            | P           | 1             | 1              | 1                |                |                     |                    |
| O-CRESOL                                      | 1              | 1            | 1           |               |                |                  |                | 1                   |                    |
| OXYGEN                                        | 1              | 1            | 1           |               |                |                  |                |                     |                    |
| PELLETHANE* POLYURETHANE ELASTOMERS           | 1              | 1            | 1           |               | 1              | 1                |                |                     |                    |
| POLYCARBONATE RESINS                          | 1              | 1            | 1           | 1             | 1              | 1                |                |                     |                    |
| POLYETHYLENE D (INSECTICIDE GRANULES)         | 1              | 1            | 1           | 1             | 1              | 1                |                |                     |                    |
| POLYETHYLENE-ALL KINDS                        | 1              | 1            | 1           | 1             | 1              | 1                |                |                     |                    |
| POLYETHYLOXAZOLINE (MW 85,000)                | 1              | P            | P           | 1             | 1              | 1                | 1              |                     |                    |
| POLYGLYCOL E-1000                             | 1              | P            | P           |               | 1              | 1                | 1              |                     |                    |
| POLYOL 80                                     | 1              | P            | P           | 1             | 1              | 1                | 1              | 1                   |                    |
| POLYOXYBUTYLENE ALCOHOL 1616                  | 1              | P            | P           | 1             | 1              | 1                |                |                     |                    |
| PRIMACOR* 4990 ADHESIVE POLYMER               | 1              | 1            | 1           | 1             | 1              | 1                |                |                     |                    |
| PROPYLENE GLYCOL                              | 1              | 1            | 1           | 1             | 1              | 1                | 1              | 1                   |                    |
| PULSE* ENGINEERING RESINS                     | 1              | 1            | 1           |               | 1              | 1                |                |                     |                    |
| Q-1 REACTANT                                  | 1              | P            | P           |               | 1              | 1                |                |                     |                    |
| QUATREX* SOLID RESINS                         | 1              | 1            | 1           | 1             | 1              | 1                |                |                     |                    |
| RAP 177 LATEX                                 | 1              | P            | P           | 1             | 1              | 1                |                |                     |                    |
| ROVEL* POLYMERS                               | 1              | 1            | 1           | 1             | 1              | 1                |                |                     |                    |
| SALICYLIC ACID                                | 1              | P            | P           |               | 1              | 1                | 1              | 1                   |                    |
| SARAN* RESINS                                 | 1              | 1            | 1           |               | 1              | 1                |                |                     |                    |
| SSR ULTRA COOLANT                             | 1              | P            | P           | 1             | 1              | 1                |                |                     |                    |
| STYROM* POLYSTYRENE                           | 1              | 1            | 1           | 1             | 1              | 1                |                |                     |                    |
| SYN-TET#                                      | 1              | P            | P           | 1             | 1              | 1                |                |                     |                    |
| TETRAETHYLENE GLYCOL                          | 1              | 1            | 1           | 1             | 1              | 1                | 1              | 1                   |                    |
| TRIPROPYLENE GLYCOL                           | 1              | 1            | 1           |               | 1              | 1                | 1              |                     |                    |
| TYRIL* SAN RESINS                             | 1              | 1            | 1           |               | 1              | 1                |                |                     |                    |
| VERSENE* DIAMMONIUM EDTA CHELATING AGENT      | 1              | 1            | 1           | 1             | 1              | 1                |                |                     |                    |
| VERSENE* PHOTO CHELATE EK                     | 1              | 1            | 1           | 1             | 1              | 1                |                |                     |                    |
| VERSENE* TETRAAMMONIUM EDTA CHELATING AGENT   | 1              | 1            | 1           | 1             | 1              | 1                |                |                     |                    |
| XAS-010883.00 DEVELOPMENTAL COMPRESSOR LUBRIC | 1              | P            | P           | 1             | 1              | 1                |                |                     |                    |

\* Trademark of The Dow Chemical Company

P = Perv Blank = Information not available

# = Dow materials

PREPARED BY H. S. A. SAFETY & LOSS PREVENTION

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11/3/91

HAZARDOUS MATERIAL TRANSPORTATION REVIEW

CHEMICALS OF CONCERN

TRAVEL ON THE ROADS OF LOUISIANA

|                       |                               |
|-----------------------|-------------------------------|
| 1. CHLORINE           | 1 TON CYLINDERS, 150# BOTTLES |
| 2. HYDROGEN           | DOW OWNED TRAILER             |
| 3. BETZ POLYMERS      |                               |
| A. CORTROL 778P       | BULK                          |
| B. BP-1B              | BULK                          |
| C. BETZ CDP           | BULK                          |
| D. BETZ 35A           | BULK                          |
| E. BETZ BP-78101      | SEMI-BULK, BULK               |
| 4. NALCO POLYMERS     |                               |
| A. NALCO 8799         | BULK                          |
| B. NALCO 8184         | BULK                          |
| 5. PETROLEUM PRODUCTS |                               |
| A. REGAL R&O32        | BULK                          |
| B. DIESEL FUEL        | DIVISION                      |
| C. TRANSFORMER OIL    | DRUMS, BULK                   |
| 6. SPECILITY GAS      |                               |
| A. ACETELYENE         | BOTTLES                       |
| B. OXYGEN             | BOTTLES                       |
| C. ARGON              | BOTTLES                       |
| D. CO2                | BOTTLES                       |
| E. HELIUM             | BOTTLES-BANK                  |
| F. HYDROGEN           | BOTTLES-BANK                  |
| G. NITROGEN           | BOTTLES                       |
| H. AIR                | BOTTLES, BOTTLES-BANK         |

## HMTR REVIEW POWER 1/UTILITIES

### SUMMARY

POWER 1/UTILITIES IS NOT A CHEMICAL PRODUCTION FACILITY. AS SUCH WE ONLY IMPORT MATERIALS. IMPORTED ITEMS INCLUDE HYDROGEN, CHLORINE, BETZ AND NALCO POLYMERS, LUBRICATING OILS AND SPECILITY GASES. ALL HAVE VERY LOW POTENTIAL FOR A TRANSPORTATION ACCIDENT WITH THE EXCEPTION OF THE HYDROGEN AND THE CHLORINE. HYDROGEN AND CHLORINE WILL BE THE ONLY TWO DISCUSSED. MSDS SHEETS ARE PROVIDED FOR THE REST.

### STRENGTHS

HAVE MADE CUSTOMER VISIT TO HYDROGEN SUPPLIER

HAVE WRITTEN PROCEDURES FOR ACCEPTING HYDROGEN TRAILERS

BOTH HYDROGEN AND CHLORINE CONTAINERS ARE WELL MADE

NO HYDROGEN OR CHLORINE ACCIDENTS

HYDROGEN TRAILER CHECKED TWICE PER SHIFT, PERSON RECEIVES TRAILER

CHLORINE CYLINDER CHECKED ONCE PER SHIFT, PERSON RECEIVES CYLINDER

OPPORTUNITIES FOR IMPROVEMENT

VISIT THE CHLORINE SUPPLIER

HAZARDOUS MATERIALS TRANSPORTATION REVIEW  
CEI, F&EI, AND SKIN RANK CALCULATIONS  
(REVISED 5/14/90)

CYLINDER  
CHLORINE

\*\*\*\*\*

INPUT DATA

\*\*\*\*\*

|                                     |         |
|-------------------------------------|---------|
| EEPG CONCENTRATION PPM              | 3.00    |
| MATERIAL FACTOR (F&EI GUIDE)        | 1       |
| NFPA HEALTH RATING (Nh)             | 3       |
| NFPA FLAMMABILITY RATING (Nf)       | 0       |
| BTU'S PER MLBS                      | 0.00    |
| MOLECULAR WEIGHT                    | 35      |
| VAPOR PRESSURE MM HG @25 DEG C.     | 1000.00 |
| THERMAL INSTABILITY DEG C           | 120     |
| PHYSICAL STATE PENALTY              | 1.20    |
| VISCOUS LIQUID -----                | .70     |
| LIQUID -----                        | 1.00    |
| COMPRESSED GAS -----                | 1.20    |
| LIQUIFIED FLAM GAS ---              | 1.30    |
| LBS OF PRODUCT PER CONTAINER        | 2,000   |
| SHIPPING PRESSURE (PSI OF MATERIAL) | 150     |
| RELIEF VALVE SETTING (LBS)          | 150     |
| DERMAL LD50 FOR SKIN EXPOSURE       | 1       |

\*\*\*\*\*

\* SUMMARY \*

\*\*\*\*\*

\* CEI \*

\* 192.00 \*

\* \*

\* F&EI \*

\* 4.34 \*

\* \*

\* SKIN RAN \*

\* 4 \*

\*\*\*\*\*

\*\*\*\*\*

CALCULATED FACTORS

\*\*\*\*\*

| CHEMICAL EXPOSURE INDEX RANKING |        | FIRE & EXPLOSION INDEX RATING     |       |
|---------------------------------|--------|-----------------------------------|-------|
| ACUTE HEALTH HAZARD FACTOR      | 3.00   | MATERIAL FACTOR                   | 1.00  |
| ACUTE HEALTH FACTOR SCALE #     | 4.00   | GP BASE FACTOR                    | 1.00  |
| LBS VAPOR RELEASED IN 15 MIN.   | 840.00 | HANDLING & TRANSFER FACTOR        | 0.00  |
| VAPOR QUANTITY SCALE #          | 2.00   | ACCESS FACTOR                     | 0.35  |
| DISTANCE SCALE #                | 4.00   | SPILL CONTROL FACTOR              | 0.50  |
| MOLECULAR WEIGHT SCALE #        | 3.00   | F1-GENERAL PROCESS FACTOR         | 1.85  |
| SHIPPING PRESSURE FACTOR        | 2.00   | -----                             | ----- |
| THERMAL INSTABILITY FACTOR      | 0.00   | SP BASE FACTOR                    | 1.00  |
| PROCESS PENALTIES FACTOR        | 2.00   | TOXIC MATERIALS FACTOR            | 0.60  |
| PROCESS PENALTIES SCALE #       | 2.00   | PROCESS OPERATION, PURGE FACTOR   | 0.30  |
| CHEMICAL EXPOSURE INDEX         | 192.00 | QUANTITY IN STORAGE FACTOR        | 0.00  |
| CHEMICAL EXPOSURE SCALE #       | 2.00   | IGNITION SOURCE FACTOR (FIRED NT) | 0.00  |
|                                 |        | OPERATING PRESSURE FACTOR         | 0.44  |
|                                 |        | F2-SPECIAL PROCESS HAZARDS FACTOR | 2.34  |
| *****                           | *****  |                                   |       |
| SKIN RANKING                    | 4.00   | F3-UNIT HAZARD FACTOR (=F1*F2)    | 4.34  |
|                                 |        | F&EI-FIRE & EXPLOSION INDEX       | 4.34  |
|                                 |        | FIRE & EXPLOSION RANKING          | 1     |

23-Feb-92

|     | AA                                        | AB      | AC | AD                                | AE           | AF | AG |
|-----|-------------------------------------------|---------|----|-----------------------------------|--------------|----|----|
| 97  | HAZARDOUS MATERIALS TRANSPORTATION REVIEW |         |    |                                   |              |    |    |
| 98  | CEI, F&EI, AND SKIN RANK CALCULATIONS     |         |    |                                   |              |    |    |
| 99  | (REVISED 5/14/90)                         |         |    |                                   |              |    |    |
| 100 |                                           |         |    |                                   |              |    |    |
| 101 |                                           |         |    |                                   |              |    |    |
| 102 | TUBE TRUCK                                |         |    |                                   |              |    |    |
| 103 | HYDROGEN                                  |         |    |                                   |              |    |    |
| 104 | .....                                     |         |    |                                   |              |    |    |
| 105 | INPUT DATA                                |         |    |                                   |              |    |    |
| 106 | .....                                     |         |    |                                   |              |    |    |
| 107 | EEPG CONCENTRATION PPM                    | 1.00    |    |                                   | * SUMMARY *  |    |    |
| 108 | MATERIAL FACTOR (F&EI GUIDE)              | 21      |    |                                   | * ***** *    |    |    |
| 109 | NFPA HEALTH RATING (Nh)                   | 0       |    |                                   | * CEI *      |    |    |
| 110 | NFPA FLAMMABILITY RATING (Nf)             | 4       |    |                                   | * 0.00 *     |    |    |
| 111 | BTU'S PER MLBS                            | 51.60   |    |                                   | * *          |    |    |
| 112 | MOLECULAR WEIGHT                          | 1       |    |                                   | * F&EI *     |    |    |
| 113 | VAPOR PRESSURE MM HG @25 DEG C.           | 1000.00 |    |                                   | * 130.86 *   |    |    |
| 114 | THERMAL INSTABILITY DEG C                 | 120     |    |                                   | * *          |    |    |
| 115 | PHYSICAL STATE PENALTY                    | 1.20    |    |                                   | * SKIN RAN * |    |    |
| 116 | VISCOUS LIQUID -----                      | .70     |    |                                   | * 4 *        |    |    |
| 117 | LIQUID -----                              | 1.00    |    |                                   | * ***** *    |    |    |
| 118 | COMPRESSED GAS -----                      | 1.20    |    |                                   |              |    |    |
| 119 | LIQUIFIED FLAM GAS ---                    | 1.30    |    |                                   |              |    |    |
| 120 | LBS OF PRODUCT PER CONTAINER              | 8,806   |    |                                   |              |    |    |
| 121 | SHIPPING PRESSURE (PSI OF MATERIAL)       | 1,800   |    |                                   |              |    |    |
| 122 | RELIEF VALVE SETTING (LBS)                | 3,000   |    |                                   |              |    |    |
| 123 | DERMAL LD50 FOR SKIN EXPOSURE             | 1       |    |                                   |              |    |    |
| 124 |                                           |         |    |                                   |              |    |    |
| 125 |                                           |         |    |                                   |              |    |    |
| 126 |                                           |         |    |                                   |              |    |    |
| 127 |                                           |         |    |                                   |              |    |    |
| 128 | .....                                     |         |    |                                   |              |    |    |
| 129 | CALCULATED FACTORS                        |         |    |                                   |              |    |    |
| 130 | .....                                     |         |    |                                   |              |    |    |
| 131 | CHEMICAL EXPOSURE INDEX RANKING           |         |    | FIRE & EXPLOSION INDEX RATING     |              |    |    |
| 132 |                                           |         |    |                                   |              |    |    |
| 133 | ACUTE HEALTH HAZARD FACTOR                | 1.00    |    | MATERIAL FACTOR                   | 21.00        |    |    |
| 134 | ACUTE HEALTH FACTOR SCALE #               | 4.00    |    | GP BASE FACTOR                    | 1.00         |    |    |
| 135 | LBS VAPOR RELEASED IN 15 MIN.             | 122.74  |    | HANDLING & TRANSFER FACTOR        | 0.85         |    |    |
| 136 | VAPOR QUANTITY SCALE #                    | 2.00    |    | ACCESS FACTOR                     | 0.35         |    |    |
| 137 | DISTANCE SCALE #                          | 4.00    |    | SPILL CONTROL FACTOR              | 0.50         |    |    |
| 138 | MOLECULAR WEIGHT SCALE #                  | 0.00    |    | F1-GENERAL PROCESS FACTOR         | 2.70         |    |    |
| 139 | SHIPPING PRESSURE FACTOR                  | 2.00    |    | -----                             | -----        |    |    |
| 140 | THERMAL INSTABILITY FACTOR                | 0.00    |    | SP BASE FACTOR                    | 1.00         |    |    |
| 141 | PROCESS PENALTIES FACTOR                  | 2.00    |    | TOXIC MATERIALS FACTOR            | 0.00         |    |    |
| 142 | PROCESS PENALTIES SCALE #                 | 2.00    |    | PROCESS OPERATION, PURGE FACTOR   | 0.30         |    |    |
| 143 | CHEMICAL EXPOSURE INDEX                   | 0.00    |    | QUANTITY IN STORAGE FACTOR        | 0.28         |    |    |
| 144 | CHEMICAL EXPOSURE SCALE #                 | 0.00    |    | IGNITION SOURCE FACTOR (FIRED HT  | 0.00         |    |    |
| 145 |                                           |         |    | OPERATING PRESSURE FACTOR         | 0.77         |    |    |
| 146 |                                           |         |    | F2-SPECIAL PROCESS HAZARDS FACTOR | 2.31         |    |    |
| 147 | .....                                     |         |    |                                   |              |    |    |
| 148 | SKIN RANKING                              | 4.00    |    | F3-UNIT HAZARD FACTOR (=F1*F2)    | 6.23         |    |    |
| 149 |                                           |         |    | F&EI-FIRE & EXPLOSION INDEX       | 130.86       |    |    |
| 150 |                                           |         |    | FIRE & EXPLOSION RANKING          | 4            |    |    |
| 151 |                                           |         |    |                                   |              |    |    |
| 152 |                                           |         |    |                                   |              |    |    |
| 153 | 22-Feb-92                                 |         |    |                                   |              |    |    |
| 154 |                                           |         |    |                                   |              |    |    |
| 155 |                                           |         |    |                                   |              |    |    |
| 156 |                                           |         |    |                                   |              |    |    |

# CHEMICAL EXPOSURE INDEX

PLANT Utilities LOCATION Block 40  
 CHEMICAL (One per Index) CHLORINE TOTAL QUANTITY IN PLANT 2000 lbs  
 LARGEST SINGLE CONTAINMENT 2000 lbs TEMPERATURE OF CONTAINMENT Ambient  
 PRESSURE OF CONTAINMENT 80 PSI BOILING POINT -29 °F  
 FLASH POINT, °C NONE MOLECULAR WEIGHT 70.9  
 VAPOR PRESSURE 6650 mm Hg

EMERGENCY EXPOSURE PLANNING GUIDELINE (EEPG) CONCENTRATION,  
 (Refer to CEI Pg. 6 & Tables I & II, Pgs. 10-11) 3.0

- I. Complete the Chemical Exposure Index Summary (on page 5)  
 and show highest CEI to the Public \_\_\_\_\_

288

This CEI number determines the level of review needed:

- 0 to 100 Internal review — Superintendent and Major Manager review and sign every two years.
- 100 to 300 Site Review Committee, Superintendent and Major Manager review every two years.
- 300 to 400 Area Representative and the preceding group review every two years.
- Above 400 Corporate Representative and the preceding group review every two years.

- II. Complete Chemical Exposure Review Checklist (see page 7, CEI) prepare Review Package, and indicate date ready for further reviews.  
 (Will be scheduled with Loss Prevention Contact) \_\_\_\_\_

- III. List any Sights, Odors, or Sounds which might come from your facility and cause public concern or inquiries (e.g., smoke, large relief valves, odors below hazardous levels such as mercaptans or amines, etc.)

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Reviewed by:

Date

Plant Superintendent or Manager: \_\_\_\_\_

Major or General Manager: \_\_\_\_\_

Site Review Representative: \_\_\_\_\_  
 (If Public CEI is above 100)

Area Review Representative: \_\_\_\_\_  
 (If Public CEI is above 300)

Corporate Review Representative: \_\_\_\_\_  
 (If Public CEI is above 400)

# CHEMICAL EXPOSURE INDEX SUMMARY

Complete the following Table (See Note 1) by filling in and multiplying the appropriate Risk Factor Scale numbers for each of the major Risk areas as identified in the following formula (See "Definitions of Scale Numbers" CEI, page 6):

$$\begin{array}{ccccccccc}
 \boxed{\text{I.}} & \times & \boxed{\text{II.}} & \times & \boxed{\text{III.}} & \times & \boxed{\text{IV.}} & \times & \boxed{\text{V.}} & = & \boxed{\text{VI.}} \\
 \text{ACUTE} & & \text{VAPOR} & & \text{DISTANCE} & & \text{MOLECULAR} & & \text{PROCESS} & & \text{CHEMICAL} \\
 \text{HEALTH} & & \text{QUANTITY} & & \text{(RECIPROCAL)} & & \text{WEIGHT} & & \text{PENALTIES} & & \text{EXPOSURE} \\
 \text{HAZARD} & & \text{SCALE} & & \text{SCALE} & & \text{SCALE} & & \text{SCALE} & & \text{INDEX} \\
 \text{SCALE} & & \text{NO.} & & \text{NO.} & & \text{NO.} & & \text{NO.} & & \\
 \text{NO.} & & & & & & & & & & 
 \end{array}$$

Identification of Containment Vessels  
being evaluated:

Name or Number (See Notes 2 & 3)

Source #1 CHLORINE 1 TEN CYLINDER BLACK 40

To (1) Public

(2) Other in-company Facility

(3) Non-company Plant or Business

Source #2 (if needed) \_\_\_\_\_

To (1) Public

(2) Other in-company Facility

(3) Non-company Plant or Business

| I. | II. | III. | IV. | V. | VI.<br>(CEI) |
|----|-----|------|-----|----|--------------|
| 4  | 3   | 3    | 4   | 2  | 288          |
| 4  | 3   | 4    | 4   | 2  | 384          |
| 4  | 3   | 3    | 4   | 2  | 288          |
|    |     |      |     |    |              |
|    |     |      |     |    |              |
|    |     |      |     |    |              |

**NOTE 1** — The distance scale number in column III is the only factor normally expected to change, so column III and the corresponding CEI (column VI) are all that would normally be expected to differ from the first calculation for each source.

**NOTE 2** — Only different sources of the same chemical should be evaluated on this sheet. Use a separate Chemical Exposure Index for every different chemical.

**NOTE 3** — Use additional sheets if additional sources with differing potential impact are present.

**NOTE 4** — It is important to document the worst case scenarios for future reference. See "Review Procedure and Check List," page 7.

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# CHEMICAL EXPOSURE INDEX

PLANT: UTILITIES  
LOCATION: LAD  
CHEMICAL: CHLORINE

TOTAL QUANTITY IN PLANT: 2000.00 lb  
LARGEST SINGLE CONTAINMENT: 2000.00 lb  
STORAGE TEMPERATURE: 86.00 deg F  
STORAGE PRESSURE: 80.00 psia  
BOILING POINT: -29.18 deg F  
FLASH POINT: 0.00 deg F  
MOLECULAR WEIGHT: 70.90  
EEPG CONCENTRATION: 1.0 ppm

## EXPOSURE RISK POTENTIAL SUMMARY

ACUTE HEALTH HAZARD FACTOR: 4 (1.0 - 9.9)  
VAPOR QUANTITY FACTOR: 3 (1,000 lbs - 10,000 lbs)  
MOLECULAR WEIGHT FACTOR: 4 ( > 45)  
PF LOSS PENALTIES: 2 (overpressure or run-away reaction potential)

| DISTANCE            | DISTANCE FACTOR       | E.R.P. VALUE |
|---------------------|-----------------------|--------------|
| TO THE PUBLIC       | 3 (1000 ft - 5279 ft) | 288          |
| TO DOW PLANTS       | 4 ( < 1000 ft)        | 384          |
| TO OTHER BUSINESSES | 3 (1000 ft - 5279 ft) | 288          |

EXPOSURE RISK POTENTIAL TO THE PUBLIC = 288

BIANNUAL REVIEW - SITE, SUPERINTENDENT AND MAJOR MANAGER

THE CHEMICAL EXPOSURE INDEX IS A SIMPLE, EMPIRICAL AND RELATIVE METHOD  
FOR RATING THE TOXIC HAZARDS OF CHEMICALS IN A QUANTITATIVE MANNER.

\*\* FOR INTERNAL DOW USE ONLY \*\*

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# DISPERSION SUMMARY

|                       |             |                       |             |
|-----------------------|-------------|-----------------------|-------------|
| TOTAL DISCHARGED =    | 2000.00 LBS | SOURCE HEIGHT =       | 0.00 FT     |
| RELEASE DURATION =    | 15.00 MIN   | SOURCE DIAMETER =     | 0.16 FT     |
| MOLECULAR WEIGHT =    | 70.90       | EXIT VELOCITY =       | 621.04 FT/S |
| SOURCE TEMPERATURE =  | 86.00 DEG F | PERCENT DILUTION =    | 0.00        |
| EEPG-/CONCENTRATION = | 1.0 ppm     | AMBIENT TEMPERATURE = | 86.00 DEG F |

THE RELEASE IS A GAS RELEASE

THE RELEASE IS CONTINUOUS

THE RADII OF EXPOSURE ARE BASED ON PEAK CONCENTRATIONS

## RADII OF EXPOSURE (miles) @ ground level - @ plume centerline

| CONC<br>(ppm) | UNSTABLE<br>12. mph<br>(20 %)* | NEUTRAL<br>8. mph<br>(40 %)* | STABLE<br>4. mph<br>(40 %)* |
|---------------|--------------------------------|------------------------------|-----------------------------|
| 1.0           | 0.721                          | 3.441                        | 21.500                      |
| 10.0          | 0.243                          | 0.864                        | 3.521                       |
| 100.0         | 0.093                          | 0.238                        | 0.815                       |

\* APPROXIMATE % OF TIME IN THIS WEATHER CONDITION

UNSTABLE ATMOSPHERIC CONDITION - SLIGHT SOLAR RADIATION WITH LOW WIND SPEEDS (<10 mph) OR STRONG RADIATION WITH HIGH WIND SPEEDS (>10 mph).

NEUTRAL ATMOSPHERIC CONDITION - WELL MIXED ATMOSPHERE DUE TO MODERATE/STRONG WIND SPEEDS (>7 mph) AND SLIGHT/MODERATE SOLAR RADIATION. ANY OVERCAST CONDITION.

STABLE ATMOSPHERIC CONDITION - LOW WIND SPEEDS (<10 mph) AT NIGHT.

THE CHEMICAL EXPOSURE INDEX IS A SIMPLE, EMPIRICAL AND RELATIVE METHOD FOR RATING THE TOXIC HAZARDS OF CHEMICALS IN A QUANTITATIVE MANNER.

\*\* FOR INTERNAL DOW USE ONLY \*\*

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# CHEMICAL EXPOSURE INDEX

PLANT: UTILITIES  
LOCATION: LAD  
CHEMICAL: CHLORINE

TOTAL QUANTITY IN PLANT: 2000.00 lb  
LARGEST SINGLE CONTAINMENT: 2000.00 lb  
STORAGE TEMPERATURE: 86.00 deg F  
STORAGE PRESSURE: 80.00 psia  
BOILING POINT: -29.18 deg F  
FLASH POINT: 0.00 deg F  
MOLECULAR WEIGHT: 70.90  
EEPG CONCENTRATION: 3.0 ppm

## EXPOSURE RISK POTENTIAL SUMMARY

ACUTE HEALTH HAZARD FACTOR: 4 (1.0 - 9.9)  
VAPOR QUANTITY FACTOR: 3 (1,000 lbs - 10,000 lbs)  
MOLECULAR WEIGHT FACTOR: 4 (> 45)  
PROCESS PENALTIES: 2 (overpressure or run-away reaction potential)

| DISTANCE            | DISTANCE FACTOR       | E.R.P. VALUE |
|---------------------|-----------------------|--------------|
| TO THE PUBLIC       | 3 (1000 ft - 5279 ft) | 288          |
| TO DOW PLANTS       | 4 (< 1000 ft)         | 384          |
| TO OTHER BUSINESSES | 3 (1000 ft - 5279 ft) | 288          |

EXPOSURE RISK POTENTIAL TO THE PUBLIC = 288

BIANNUAL REVIEW - SITE, SUPERINTENDENT AND MAJOR MANAGER

THE CHEMICAL EXPOSURE INDEX IS A SIMPLE, EMPIRICAL AND RELATIVE METHOD  
FOR RATING THE TOXIC HAZARDS OF CHEMICALS IN A QUANTITATIVE MANNER.  
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\*\*\*\*\* DOW CONFIDENTIAL \*\*\*\*\* DOW CONFIDENTIAL \*\*\*\*\* DOW CONFIDENTIAL \*\*\*\*\*

#### DISPERSION SUMMARY

|                      |             |                       |             |
|----------------------|-------------|-----------------------|-------------|
| TOTAL DISCHARGED =   | 2000.00 LBS | SOURCE HEIGHT =       | 0.00 FT     |
| RELEASE DURATION =   | 15.00 MIN   | SOURCE DIAMETER =     | 0.16 FT     |
| MOLECULAR WEIGHT =   | 70.90       | EXIT VELOCITY =       | 621.04 FT/S |
| SOURCE TEMPERATURE = | 86.00 DEG F | PERCENT DILUTION =    | 0.00        |
| EEPG CONCENTRATION = | 3.0 ppm     | AMBIENT TEMPERATURE = | 86.00 DEG F |

THE RELEASE IS A GAS RELEASE

THE RELEASE IS CONTINUOUS

THE RADII OF EXPOSURE ARE BASED ON PEAK CONCENTRATIONS

| CONC<br>(ppm) | RADII OF EXPOSURE (miles)<br>@ ground level - @ plume centerline |                              |                             |
|---------------|------------------------------------------------------------------|------------------------------|-----------------------------|
|               | UNSTABLE<br>12. mph<br>(20 %)*                                   | NEUTRAL<br>8. mph<br>(40 %)* | STABLE<br>4. mph<br>(40 %)* |
| 3.0           | 0.425                                                            | 1.762                        | 8.153                       |
| 30.0          | 0.150                                                            | 0.460                        | 1.735                       |
| 300.0         | 0.064                                                            | 0.137                        | 0.411                       |

\* APPROXIMATE % OF TIME IN THIS WEATHER CONDITION

UNSTABLE ATMOSPHERIC CONDITION - SLIGHT SOLAR RADIATION WITH LOW WIND SPEEDS (<10 mph) OR STRONG RADIATION WITH HIGH WIND SPEEDS (>10 mph).

NEUTRAL ATMOSPHERIC CONDITION - WELL MIXED ATMOSPHERE DUE TO MODERATE/STRONG WIND SPEEDS (>7 mph) AND SLIGHT/MODERATE SOLAR RADIATION. ANY OVERCAST CONDITION.

STABLE ATMOSPHERIC CONDITION - LOW WIND SPEEDS (<10 mph) AT NIGHT.

THE CHEMICAL EXPOSURE INDEX IS A SIMPLE, EMPIRICAL AND RELATIVE METHOD FOR RATING THE TOXIC HAZARDS OF CHEMICALS IN A QUANTITATIVE MANNER.

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# CHEMICAL EXPOSURE INDEX

PLANT Utilities LOCATION Block 18 LAD  
 CHEMICAL (One per Index) CHLORINE TOTAL QUANTITY IN PLANT 750 #  
 LARGEST SINGLE CONTAINMENT 150 # BOTTLE TEMPERATURE OF CONTAINMENT AMBIENT  
 PRESSURE OF CONTAINMENT 80 psig BOILING POINT -29°F  
 FLASH POINT, °C NONE MOLECULAR WEIGHT 70.9  
 VAPOR PRESSURE 6650 mm Hg

EMERGENCY EXPOSURE PLANNING GUIDELINE (EEPG) CONCENTRATION,  
 (Refer to CEI Pg. 6 & Tables I & II, Pgs. 10-11) 3

- I. Complete the Chemical Exposure Index Summary (on page 5)  
 and show highest CEI to the Public \_\_\_\_\_

192

This CEI number determines the level of review needed:

- 0 to 100 Internal review — Superintendent and Major Manager review and sign every two years.
- 100 to 300 Site Review Committee, Superintendent and Major Manager review every two years.
- 300 to 400 Area Representative and the preceding group review every two years.
- Above 400 Corporate Representative and the preceding group review every two years.

- II. Complete Chemical Exposure Review Checklist (see page 7, CEI) prepare Review Package, and indicate date ready for further reviews.  
 (Will be scheduled with Loss Prevention Contact) \_\_\_\_\_

- III. List any Sights, Odors, or Sounds which might come from your facility and cause public concern or inquiries (e.g., smoke, large relief valves, odors below hazardous levels such as mercaptans or amines, etc.)
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

Reviewed by:

Date

Plant Superintendent or Manager: \_\_\_\_\_

Major or General Manager: \_\_\_\_\_

Site Review Representative: \_\_\_\_\_  
 (If Public CEI is above 100)

Area Review Representative: \_\_\_\_\_  
 (If Public CEI is above 300)

Corporate Review Representative: \_\_\_\_\_  
 (If Public CEI is above 400)

# CHEMICAL EXPOSURE INDEX SUMMARY

Complete the following Table (See Note 1) by filling in and multiplying the appropriate Risk Factor Scale numbers for each of the major Risk areas as identified in the following formula (See "Definitions of Scale Numbers" CEI, page 6):

$$\begin{array}{ccccccccc}
 \boxed{\text{I.}} & \times & \boxed{\text{II.}} & \times & \boxed{\text{III.}} & \times & \boxed{\text{IV.}} & \times & \boxed{\text{V.}} & = & \boxed{\text{VI.}} \\
 \text{ACUTE} & & \text{VAPOR} & & \text{DISTANCE} & & \text{MOLECULAR} & & \text{PROCESS} & & \text{CHEMICAL} \\
 \text{HEALTH} & & \text{QUANTITY} & & \text{(RECIPROCAL)} & & \text{WEIGHT} & & \text{PENALTIES} & & \text{EXPOSURE} \\
 \text{HAZARD} & & \text{SCALE} & & \text{SCALE} & & \text{SCALE} & & \text{SCALE} & & \text{INDEX} \\
 \text{SCALE} & & \text{NO.} & & \text{NO.} & & \text{NO.} & & \text{NO.} & & \\
 \text{NO.} & & & & & & & & & & 
 \end{array}$$

Identification of Containment Vessels being evaluated:

Name or Number (See Notes 2 & 3)

Source #1 1" CHLORINE LINE  
25# RELEASED

To (1) Public

(2) Other in-company Facility

(3) Non-company Plant or Business

Source #2 (if needed) 150 # B. HIL

To (1) Public

(2) Other in-company Facility

(3) Non-company Plant or Business

| I. | II. | III. | IV. | V. | VI.<br>(CEI) |
|----|-----|------|-----|----|--------------|
| 4  | 1   | 3    | 4   | 2  | 96           |
| 4  | 1   | 4    | 4   | 2  | 128          |
| 4  | 1   | 3    | 4   | 2  | 96           |
| 4  | 2   | 3    | 4   | 2  | 192          |
| 4  | 2   | 4    | 4   | 2  | 256          |
| 4  | 2   | 3    | 4   | 2  | 192          |

**NOTE 1** — The distance scale number in column III is the only factor normally expected to change, so column III and the corresponding CEI (column VI) are all that would normally be expected to differ from the first calculation for each source.

**NOTE 2** — Only different sources of the same chemical should be evaluated on this sheet. Use a separate Chemical Exposure Index for every different chemical.

**NOTE 3** — Use additional sheets if additional sources with differing potential impact are present.

**NOTE 4** — It is important to document the worst case scenarios for future reference. See "Review Procedure and Check List," page 7.

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# CHEMICAL EXPOSURE INDEX

PLANT: UTILITIES  
LOCATION: LAD  
CHEMICAL: CHLORINE

TOTAL QUANTITY IN PLANT: 750.00 lb  
LARGEST SINGLE CONTAINMENT: 150.00 lb  
STORAGE TEMPERATURE: 86.00 deg F  
STORAGE PRESSURE: 6.80 psia  
BOILING POINT: -29.18 deg F  
FLASH POINT: 0.00 deg F  
MOLECULAR WEIGHT: 70.90  
EEPG CONCENTRATION: 3.0 ppm

## EXPOSURE RISK POTENTIAL SUMMARY

ACUTE HEALTH HAZARD FACTOR: 4 (1.0 - 9.9)  
VAPOR QUANTITY FACTOR: 2 (100 lbs - 999 lbs)  
MOLECULAR WEIGHT FACTOR: 4 (> 45)  
ACCESS PENALTIES: 2 (overpressure or run-away reaction potential)

| DISTANCE            | DISTANCE FACTOR       | E.R.P. VALUE |
|---------------------|-----------------------|--------------|
| TO THE PUBLIC       | 3 (1000 ft - 5279 ft) | 192          |
| TO DOW PLANTS       | 4 (< 1000 ft)         | 256          |
| TO OTHER BUSINESSES | 3 (1000 ft - 5279 ft) | 192          |

EXPOSURE RISK POTENTIAL TO THE PUBLIC = 192

BIANNUAL REVIEW - SITE, SUPERINTENDENT AND MAJOR MANAGER

THE CHEMICAL EXPOSURE INDEX IS A SIMPLE, EMPIRICAL AND RELATIVE METHOD  
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\*\* FOR INTERNAL DOW USE ONLY \*\*

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#### DISPERSION SUMMARY

|                      |             |                       |             |
|----------------------|-------------|-----------------------|-------------|
| TOTAL DISCHARGED =   | 150.00 LBS  | SOURCE HEIGHT =       | 0.00 FT     |
| RELEASE DURATION =   | 15.00 MIN   | SOURCE DIAMETER =     | 0.16 FT     |
| MOLECULAR WEIGHT =   | 70.90       | EXIT VELOCITY =       | 46.58 FT/S  |
| SOURCE TEMPERATURE = | 86.00 DEG F | PERCENT DILUTION =    | 0.00        |
| EEPG CONCENTRATION = | 3.0 ppm     | AMBIENT TEMPERATURE = | 86.00 DEG F |

THE RELEASE IS A GAS RELEASE

THE RELEASE IS CONTINUOUS

THE RADII OF EXPOSURE ARE BASED ON PEAK CONCENTRATIONS

| CONC<br>(ppm) | RADII OF EXPOSURE (miles)<br>@ ground level - @ plume centerline |                              |                             |
|---------------|------------------------------------------------------------------|------------------------------|-----------------------------|
|               | UNSTABLE<br>12. mph<br>(20 %)*                                   | NEUTRAL<br>8. mph<br>(40 %)* | STABLE<br>4. mph<br>(40 %)* |
| 3.0           | 0.116                                                            | 0.370                        | 1.465                       |
| 30.0          | 0.041                                                            | 0.099                        | 0.361                       |
| 300.0         | 0.013                                                            | 0.031                        | 0.096                       |

\* APPROXIMATE % OF TIME IN THIS WEATHER CONDITION

UNSTABLE ATMOSPHERIC CONDITION - SLIGHT SOLAR RADIATION WITH LOW WIND SPEEDS (<10 mph) OR STRONG RADIATION WITH HIGH WIND SPEEDS (>10 mph).

NEUTRAL ATMOSPHERIC CONDITION - WELL MIXED ATMOSPHERE DUE TO MODERATE/STRONG WIND SPEEDS (>7 mph) AND SLIGHT/MODERATE SOLAR RADIATION. ANY OVERCAST CONDITION.

STABLE ATMOSPHERIC CONDITION - LOW WIND SPEEDS (<10 mph) AT NIGHT.

THE CHEMICAL EXPOSURE INDEX IS A SIMPLE, EMPIRICAL AND RELATIVE METHOD FOR RATING THE TOXIC HAZARDS OF CHEMICALS IN A QUANTITATIVE MANNER.

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M A T E R I A L   S A F E T Y   D A T A   S H E E T

Dow Chemical U.S.A.\* Midland, MI 48674   Emergency Phone: 517-636-4400

Product Code: 16276

Page: 1

PRODUCT NAME: CHLORINE, GASEOUS H.P.

Effective Date: 06/13/90   Date Printed: 06/19/90

MSDS:001122

1.   INGREDIENTS: (% w/w, unless otherwise noted)

Chlorine

CAS# 007782-50-5   99.9%

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200). In addition, other substances not 'Hazardous' per this OSHA Standard may be listed. Where proprietary ingredient shows, the identity may be made available as provided in this standard.

2.   PHYSICAL DATA:

BOILING POINT: -29.3F (-34C)  
VAP PRESS: 82 psig @ 68F, 20C  
VAP DENSITY: 2.49 @ 32F, 0C  
SOL. IN WATER: 0.73g/100g H2O @ 20C  
SP. GRAVITY: 1.47 @ 32F, 0C; 53.2 psia  
APPEARANCE: Amber color; liquified gas under pressure;  
              vaporizes to greenish - yellow gas.  
ODOR: Pungent odor.

3.   FIRE AND EXPLOSION HAZARD DATA:

FLASH POINT: None  
METHOD USED: Not applicable

FLAMMABLE LIMITS  
LFL: Not applicable  
UFL: Not applicable

EXTINGUISHING MEDIA: Chlorine will react or cause reducing

(Continued on Page 2)

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Product Code: 16276

Page: 2

PRODUCT NAME: CHLORINE, GASEOUS H.P.

Effective Date: 06/13/90 Date Printed: 06/19/90

MSDS:001122

3. FIRE AND EXPLOSION HAZARD DATA: (CONTINUED)

materials to burn without oxygen. Water is effective only as a cooling media to reduce the reaction rate, however, water should not be applied directly to the chlorine leak. Where practical attempts should be made to reduce the available reactants through the isolation of the reaction from the chemical supply. This should be attempted only by properly trained personnel using prescribed protective equipment.

FIRE & EXPLOSION HAZARDS: May react to cause fire and/or explosion upon contact with many organic compounds, ammonia, hydrogen, or many metals, and with all metals, including steel, at elevated temperatures.

FIRE-FIGHTING EQUIPMENT: A positive pressure self-contained breathing apparatus for respiratory protection and protective clothing.

4. REACTIVITY DATA:

STABILITY: (CONDITIONS TO AVOID) Avoid proximity to flammable materials including chemicals.

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) Many organic compounds, ammonia, hydrogen, moist or hot steel, and many metals. May react explosively with some organics under confinement.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

HAZARDOUS POLYMERIZATION: Will not occur.

5. ENVIRONMENTAL AND DISPOSAL INFORMATION:

(Continued on Page 3)

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Product Code: 16276

Page: 3

PRODUCT NAME: CHLORINE, GASEOUS H.P.

Effective Date: 06/13/90   Date Printed: 06/19/90

MSDS:001122

5. ENVIRONMENTAL AND DISPOSAL INFORMATION:

ACTION TO TAKE FOR SPILLS/LEAKS: Move unprotected personnel cross-wind to a clear area. Do not use water directly on a chlorine leak. A fog nozzle may be used to absorb gas. The leak should be isolated or controlled by trained personnel using prescribed protective equipment.

DISPOSAL METHOD: Prior to disposal, the active chlorine must be reduced or destroyed. Chlorine may be absorbed in dilute solutions of caustic (NaOH), soda ash (Na<sub>2</sub>CO<sub>3</sub>), or hydrated lime (Ca(OH)<sub>2</sub>). Caustic and soda ash solutions should contain approximately 3 pounds per gallon, lime 1 pound per gallon, for 1 pound chlorine. Local, municipal or state authorities should be contacted for disposal of resultant product.

6. HEALTH HAZARD DATA:

EYE: May cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness.

SKIN CONTACT: Short single exposure may cause severe skin burns.

SKIN ABSORPTION: The dermal LD<sub>50</sub> has not been determined.

INGESTION: Ingestion is unlikely due to physical state.

INHALATION: A single brief (minutes) inhalation exposure to easily attainable concentrations may cause serious adverse effects, even death. Excessive exposure may cause severe irritation to upper respiratory tract and lungs and may cause lung injury. The LC<sub>50</sub> for mice was 137 ppm and for rats 293 ppm for 1 hour.

(Continued on Page 4)

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Page: 4

PRODUCT NAME: CHLORINE, GASEOUS H.P.

Effective Date: 06/13/90   Date Printed: 06/19/90

MSDS:001122

6. HEALTH HAZARD DATA: (CONTINUED)

SYSTEMIC & OTHER EFFECTS: Excessive exposure may cause liver, lung and kidney effects, severe irritation to upper respiratory tract and lungs, and lung injury. Excessive exposure to chlorine gas has been known to also cause erosion of tooth enamel. No evidence has been found that chlorine is a carcinogen. Limited data suggests that chlorine is not teratogenic but may be slightly embryotoxic when administered at high doses in drinking water to pregnant rats. In animal studies, has been shown not to interfere with reproduction. Results of mutagenicity tests in animals have been negative. Has been shown to have mutagenic activity in bacteria.

7. FIRST AID:

EYES: Immediate and continuous irrigation with flowing water for at least 30 minutes is imperative. Prompt medical consultation is essential.

SKIN: Wash off in flowing water or shower. Remove contaminated clothing immediately and launder before reuse.

INGESTION: No adverse effects anticipated by this route of exposure due to gaseous state.

INHALATION: Remove to fresh air. If not breathing, give mouth-to-mouth resuscitation. If breathing is difficult, give oxygen. Call a physician.

NOTE TO PHYSICIAN: If burn is present, treat as any thermal burn, after decontamination. Excellent warning properties force rapid escape from chlorine gas; thus most inhalations are mild to moderate. If escape is not possible, exposure to high

(Continued on Page 5)

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Product Code: 16276

Page: 5

PRODUCT NAME: CHLORINE, GASEOUS H.P.

Effective Date: 06/13/90 Date Printed: 06/19/90

MSDS:001122

7. FIRST AID: (CONTINUED)

concentrations for a very short time can result in dyspnea, hemoptysis and cyanosis with later complications being tracheobronchopneumonitis and pulmonary edema. Oxygen, intermittent positive pressure breathing and aerosolized bronchodilators are of therapeutic value in the light to moderate inhalation. A severe inhalation should be hospitalized and treated as a respiratory emergency. Any chlorine inhalation in an individual with compromised pulmonary function (COPD) should be regarded as a severe inhalation and a respiratory emergency.

8. HANDLING PRECAUTIONS:

EXPOSURE GUIDELINE(S): Chlorine: ACGIH TLV is 1 ppm TWA, 3 ppm STEL; OSHA PEL is 0.5 ppm TWA, 1 ppm STEL.

VENTILATION: Control airborne concentrations below the exposure guideline. Use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations. Lethal concentrations may exist in areas with poor ventilation.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator.

SKIN PROTECTION: Use protective clothing impervious to this material. Selection of specific items such as gloves, boots, apron, or full-body suit will depend on operation. Safety shower should be located in immediate work area. Remove contaminated clothing immediately and launder before reuse.

(Continued on Page 6)

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Product Code: 16276

Page: 6

PRODUCT NAME: CHLORINE, GASEOUS H.P.

Effective Date: 06/13/90   Date Printed: 06/19/90

MSDS:001122

8. HANDLING PRECAUTIONS: (CONTINUED)

EYE PROTECTION: Use chemical goggles. If vapor exposure causes eye irritation, use a positive pressure full-face respirator. Eye wash fountain should be located in immediate work area.

9. ADDITIONAL INFORMATION:

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: No attempt should be made to handle or store chlorine without a complete review of the Chlorine Manual, available from the Chlorine Institute, Inc., 2001 L Street N.W., Washington, DC 20036.

MSDS STATUS: Revised section 9 and regsheet.

(Continued on Page 7) —

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Dow Chemical U.S.A.\* Midland, MI 48674 Emergency Phone: 517-636-4400

Product Code: 16276

Page: 7

PRODUCT NAME: CHLORINE, GASEOUS H.P.

Effective Date: 06/13/90 Date Printed: 06/19/90

MSDS:001122

REGULATION INFORMATION: (Not meant to be all-inclusive--selected regulations represented.)

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations. See MSD Sheet for health and safety information.

U.S. REGULATIONS

SARA 313 INFORMATION: This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

| CHEMICAL NAME | CAS NUMBER  | CONCENTRATION |
|---------------|-------------|---------------|
| CHLORINE      | 007782-50-5 | 100 %         |

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

An immediate health hazard  
A delayed health hazard  
A sudden release of pressure hazard  
A reactive hazard

(Continued on Page 8)

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# CHEMICAL EXPOSURE INDEX

PLANT POWER 1 LOCATION Block 28 CAO  
CHEMICAL (One per Index) HYDROGEN TOTAL QUANTITY IN PLANT 53,000  
LARGEST SINGLE CONTAINMENT 8600 TEMPERATURE OF CONTAINMENT AMBIENT  
PRESSURE OF CONTAINMENT 1800 BOILING POINT -434  
FLASH POINT, °C 0 MOLECULAR WEIGHT 2

## EMERGENCY EXPOSURE PLANNING GUIDELINE (EEPG) CONCENTRATION, (Refer to CEI Pg. 6 & Tables I & II, Pgs. 10-11)

- I. Complete the Chemical Exposure Index Summary (on page 5)  
and show highest CEI to the Public 0

This CEI number determines the level of review needed:

- 0 to 100 Internal review — Superintendent and Major Manager review and sign every two years.  
100 to 300 Site Review Committee, Superintendent and Major Manager review every two years.  
300 to 400 Area Representative and the preceding group review every two years.  
Above 400 Corporate Representative and the preceding group review every two years.

- II. Complete Chemical Exposure Review Checklist (see page 7, CEI) prepare Review Package, and indicate date ready for further reviews.  
(Will be scheduled with Loss Prevention Contact) \_\_\_\_\_

- III. List any Sights, Odors, or Sounds which might come from your facility and cause public concern or inquiries (e.g., smoke, large relief valves, odors below hazardous levels such as mercaptans or amines, etc.)  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Reviewed by:

Date

Plant Superintendent or Manager: \_\_\_\_\_  
Major or General Manager: \_\_\_\_\_  
Site Review Representative: \_\_\_\_\_  
(If Public CEI is above 100)  
Area Review Representative: \_\_\_\_\_  
(If Public CEI is above 300)  
Corporate Review Representative: \_\_\_\_\_  
(If Public CEI is above 400)

# CHEMICAL EXPOSURE INDEX SUMMARY

Complete the following Table (See Note 1) by filling in and multiplying the appropriate Risk Factor Scale numbers for each of the major Risk areas as identified in the following formula (See "Definitions of Scale Numbers" CEI, page 6):

$$\begin{array}{c} \boxed{\text{I.}} \\ \text{ACUTE} \\ \text{HEALTH} \\ \text{HAZARD} \\ \text{SCALE} \\ \text{NO.} \end{array} \times \begin{array}{c} \boxed{\text{II.}} \\ \text{VAPOR} \\ \text{QUANTITY} \\ \text{SCALE} \\ \text{NO.} \end{array} \times \begin{array}{c} \boxed{\text{III.}} \\ \text{DISTANCE} \\ \text{(RECIPROCAL)} \\ \text{SCALE} \\ \text{NO.} \end{array} \times \begin{array}{c} \boxed{\text{IV.}} \\ \text{MOLECULAR} \\ \text{WEIGHT} \\ \text{SCALE} \\ \text{NO.} \end{array} \times \begin{array}{c} \boxed{\text{V.}} \\ \text{PROCESS} \\ \text{PENALTIES} \\ \text{SCALE} \\ \text{NO.} \end{array} = \begin{array}{c} \boxed{\text{VI.}} \\ \text{CHEMICAL} \\ \text{EXPOSURE} \\ \text{INDEX} \end{array}$$

Identification of Containment Vessels  
being evaluated:

Name or Number (See Notes 2 & 3)

Source #1 HYDROGEN - TRAILER

To (1) Public

(2) Other in-company Facility

(3) Non-company Plant or Business

Source #2 (if needed) \_\_\_\_\_

To (1) Public

(2) Other in-company Facility

(3) Non-company Plant or Business

| I. | II. | III. | IV. | V. | VI.<br>(CEI) |
|----|-----|------|-----|----|--------------|
| 1  | 3   | 3    | 0   | 2  | 0            |
| 1  | 3   | 4    | 0   | 2  | 0            |
| 1  | 3   | 3    | 0   | 2  | 0            |
|    |     |      |     |    |              |
|    |     |      |     |    |              |
|    |     |      |     |    |              |

**NOTE 1** — The distance scale number in column III is the only factor normally expected to change, so column III and the corresponding CEI (column VI) are all that would normally be expected to differ from the first calculation for each source.

**NOTE 2** — Only different sources of the same chemical should be evaluated on this sheet. Use a separate Chemical Exposure Index for every different chemical.

**NOTE 3** — Use additional sheets if additional sources with differing potential impact are present.

**NOTE 4** — It is important to document the worst case scenarios for future reference. See "Review Procedure and Check List," page 7.

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# CHEMICAL EXPOSURE INDEX

PLANT: POWER 1  
LOCATION: LAD  
CHEMICAL: HYDROGEN

TOTAL QUANTITY IN PLANT: 53000.00 lb  
LARGEST SINGLE CONTAINMENT: 8600.00 lb  
STORAGE TEMPERATURE: 86.00 deg F  
STORAGE PRESSURE: \*\*\*\*\* psia  
BOILING POINT: -434.00 deg F  
FLASH POINT: 0.00 deg F  
MOLECULAR WEIGHT: 2.00  
EEPG CONCENTRATION: 1000.0 ppm

## EXPOSURE RISK POTENTIAL SUMMARY

ACUTE HEALTH HAZARD FACTOR: 1 (1,000 - 100,000)  
VAPOR QUANTITY FACTOR: 3 (1,000 lbs - 10,000 lbs)  
MOLECULAR WEIGHT FACTOR: 0 (< 15)  
PROCESS PENALTIES: 2 (overpressure or run-away reaction potential)

| DISTANCE            | DISTANCE FACTOR       | E.R.P. VALUE |
|---------------------|-----------------------|--------------|
| TO THE PUBLIC       | 3 (1000 ft - 5279 ft) | 0            |
| TO DOW PLANTS       | 4 (< 1000 ft)         | 0            |
| TO OTHER BUSINESSES | 3 (1000 ft - 5279 ft) | 0            |

EXPOSURE RISK POTENTIAL TO THE PUBLIC = 0

NO REVIEW - SUPERINTENDENT AND MAJOR MANAGER APPROVAL

THE CHEMICAL EXPOSURE INDEX IS A SIMPLE, EMPIRICAL AND RELATIVE METHOD  
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# DISPERSION SUMMARY

|                      |             |                       |             |
|----------------------|-------------|-----------------------|-------------|
| TOTAL DISCHARGED =   | 8600.00 LBS | SOURCE HEIGHT =       | 0.00 FT     |
| RELEASE DURATION =   | 15.00 MIN   | SOURCE DIAMETER =     | 0.16 FT     |
| MOLECULAR WEIGHT =   | 2.00        | EXIT VELOCITY =       | ***** FT/S  |
| SOURCE TEMPERATURE = | 86.00 DEG F | PERCENT DILUTION =    | 0.00        |
| EEPG CONCENTRATION = | 1000.0 ppm  | AMBIENT TEMPERATURE = | 86.00 DEG F |

THE RELEASE IS A GAS RELEASE

THE RELEASE IS CONTINUOUS

THE RADII OF EXPOSURE ARE BASED ON PEAK CONCENTRATIONS

| CONC<br>(ppm) | RADII OF EXPOSURE (miles)<br>@ ground level - @ plume centerline |                              |                             |
|---------------|------------------------------------------------------------------|------------------------------|-----------------------------|
|               | UNSTABLE<br>12. mph<br>(20 %)*                                   | NEUTRAL<br>8. mph<br>(40 %)* | STABLE<br>4. mph<br>(40 %)* |
| 1000.0        | 0.271                                                            | 1.077                        | 4.676                       |
| 10000.0       | 0.085                                                            | 0.269                        | 1.068                       |
| 100000.0      | 0.027                                                            | 0.067                        | 0.258                       |

\* APPROXIMATE % OF TIME IN THIS WEATHER CONDITION

UNSTABLE ATMOSPHERIC CONDITION - SLIGHT SOLAR RADIATION WITH LOW WIND SPEEDS (<10 mph) OR STRONG RADIATION WITH HIGH WIND SPEEDS (>10 mph).

NEUTRAL ATMOSPHERIC CONDITION - WELL MIXED ATMOSPHERE DUE TO MODERATE/STRONG WIND SPEEDS (>7 mph) AND SLIGHT/MODERATE SOLAR RADIATION. ANY OVERCAST CONDITION.

STABLE ATMOSPHERIC CONDITION - LOW WIND SPEEDS (<10 mph) AT NIGHT.

THE CHEMICAL EXPOSURE INDEX IS A SIMPLE, EMPIRICAL AND RELATIVE METHOD FOR RATING THE TOXIC HAZARDS OF CHEMICALS IN A QUANTITATIVE MANNER.

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Dow Chemical U.S.A.\* Midland, MI 48674   Emergency Phone: 517-636-4400

Product Code: 40530

Page: 1

PRODUCT NAME: HYDROGEN

Effective Date: 10/06/88   Date Printed: 01/18/91

MSDS:000469

1. INGREDIENTS: (% w/w, unless otherwise noted)

Hydrogen (essentially)   CAS# 001333-74-0   100%

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200). In addition, other substances not 'Hazardous' per this OSHA Standard may be listed. Where proprietary ingredient shows, the identity may be made available as provided in this standard.

2. PHYSICAL DATA:

BOILING POINT: -423F, -247C  
VAP PRESS: Gas  
VAP DENSITY: 0.069  
SOL. IN WATER: 2.1 cc/100cc H2O  
SP. GRAVITY: Not available.  
APPEARANCE: Colorless.  
ODOR: Odorless gas.

3. FIRE AND EXPLOSION HAZARD DATA:

FLASH POINT: Flammable gas.  
METHOD USED: Not applicable.

FLAMMABLE LIMITS  
LFL: 4.1 Vol%  
UFL: 74.2 Vol%

EXTINGUISHING MEDIA: Water fog, foam, CO2, dry chemical.

(Continued on Page 2)

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M A T E R I A L   S A F E T Y   D A T A   S H E E T

Dow Chemical U.S.A.\* Midland, MI 48674 Emergency Phone: 517-636-4400

Product Code: 40530

Page: 2

PRODUCT NAME: HYDROGEN

Effective Date: 10/06/88 Date Printed: 01/18/91

MSDS:000469

3. FIRE AND EXPLOSION HAZARD DATA: (CONTINUED)

FIRE & EXPLOSION HAZARDS: Do not extinguish fire unless source of hydrogen escape can be shut off. If a leak or spill has not ignited, use water spray to disperse the gas or vapor and to protect men attempting to stop a leak. A hydrogen flame may be pale or invisible. Auto-ignition temperature is 1022F, 550C. Keep away from possible ignition sources.

FIRE-FIGHTING EQUIPMENT: Wear positive pressure self-contained breathing apparatus.

4. REACTIVITY DATA:

STABILITY: (CONDITIONS TO AVOID) Avoid spark or flame source that can cause ignition.

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) Air, oxygen, halogens.

HAZARDOUS DECOMPOSITION PRODUCTS: None known.

HAZARDOUS POLYMERIZATION: Will not occur.

5. ENVIRONMENTAL AND DISPOSAL INFORMATION:

ACTION TO TAKE FOR SPILLS/LEAKS: Avoid getting concentrations approaching 4% by strong ventilation. Avoid sparks and flames.

DISPOSAL METHOD: Disperse in air.

6. HEALTH HAZARD DATA:

(Continued on Page 3)

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M A T E R I A L   S A F E T Y   D A T A   S H E E T

Dow Chemical U.S.A.\* Midland, MI 48674 Emergency Phone: 517-636-4400

Product Code: 40530 Page: 3

PRODUCT NAME: HYDROGEN

Effective Date: 10/06/88 Date Printed: 01/18/91 MSDS:000469

6. HEALTH HAZARD DATA:

EYE: No effect.

SKIN CONTACT: No effect.

SKIN ABSORPTION: Not absorbed in toxic amounts.

INGESTION: Not applicable.

INHALATION: The limiting factor is available oxygen.

SYSTEMIC & OTHER EFFECTS: Could exclude enough oxygen to cause asphyxiation.

7. FIRST AID:

EYES: Liquid: Irrigate with flowing water immediately and continuously for 15 minutes. Refer to medical personnel. As a gas injury is unlikely.

SKIN: Liquid: Wash off in flowing water. Call physician and/or transport to medical facility. As a gas injury is unlikely.

INGESTION:

INHALATION: Remove to fresh air if effects occur. Call physician and/or transport to medical facility. If respiration stops, give mouth-to-mouth resuscitation.

NOTE TO PHYSICIAN:

Eyes: Liquid: May produce frost-bite type of injury. Stain for evidence of corneal injury. If cornea is burned, instill

(Continued on Page 4)

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M A T E R I A L   S A F E T Y   D A T A   S H E E T

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Dow Chemical U.S.A.\* Midland, MI 48674 Emergency Phone: 517-636-4400

Product Code: 40530

Page: 4

PRODUCT NAME: HYDROGEN

Effective Date: 10/06/88 Date Printed: 01/18/91

MSDS:000469

7. FIRST AID: (CONTINUED)

antibiotic steroid preparation frequently. Consult ophthalmologist. Gas: No effect expected.  
Skin: Liquid: May produce frost-bite type of injury. Gas: No effect expected.  
Respiratory: Is an asphyxiant. Administer oxygen if available. Bronchodilators, expectorants, and antitussives may be of help. Mechanical support of respiration may be needed.  
Oral:  
Systemic: Consult standard literature. No specific antidote. Treatment based on the sound judgment of the physician and the individual reactions of the patient.

8. HANDLING PRECAUTIONS:

VENTILATION: Fire and explosion hazard. Protect against flammable or explosive concentrations and/or flames. Strong ventilation required if accidental leak occurs.

RESPIRATORY PROTECTION: None usually required. In emergencies use a self-contained breathing apparatus, primarily to supply oxygen.

SKIN PROTECTION: None required.

EYE PROTECTION: Not necessary.

9. ADDITIONAL INFORMATION:

(Continued on Page 5)

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M A T E R I A L   S A F E T Y   D A T A   S H E E T

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Dow Chemical U.S.A.\* Midland, MI 48674   Emergency Phone: 517-636-4400

Product Code: 40530

Page: 5

PRODUCT NAME: HYDROGEN

Effective Date: 10/06/88   Date Printed: 01/18/91

MSDS:000469

9. ADDITIONAL INFORMATION:

REGULATORY REQUIREMENTS:

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

A fire hazard

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

MSDS STATUS: Revised Section 1 - 4.

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The Information Herein Is Given In Good Faith, But No Warranty,  
Express Or Implied, Is Made. Consult The Dow Chemical Company  
For Further Information.

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DOW CHEMICAL U. S. A.  
LOUISIANA DIVISION

60 DAY CHECK

UNIT NO. D-1 LOCATION BR DATE 12, 9, 91

OT SPEC NO. MC 331 SERIAL NO. 116614

HYDRASTATIC TEST  
DATE OF LAST INSPECTION 6/87 CAPACITY CU. FT. —

VERIFY CURRENT STATE INSPECTION

STATE LA EXPIRES 10, 31, 92

VERIFY LEGAL REGISTRATION

AND LICENSE PLATE EXPIRES 6, 30, 92

TYPE

☐ ALUMINUM ☒ STEEL  
☐ STAINLESS ☐ INSULATED  
☒ NON INSULATED  
☐ OTHER

|                                                  |                                     | OK                                  | REP                      |
|--------------------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| SEC. 1<br>UNDER CARRIAGE SUSPENSION<br>5TH WHEEL | A. Inspect/retorque "U" bolts       | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                                                  | B. Inspect/torque arm bolt/bushings | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                                                  | C. Visual check of tandem alignment | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                                                  | D. Inspect wheel lugs               | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                                                  | E. Check oil level                  | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                                                  | F. Inspect wheel seals for leaks    | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                                                  | G. Inspect spring hangers           | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                                                  | H. Inspect upper 5th wheel          | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                                                  | I. Inspect mounting bolts & tighten | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                                                  | J. Inspect landing gear & lubricate | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

|                        |                                                                      | OK                                  | REP                      |
|------------------------|----------------------------------------------------------------------|-------------------------------------|--------------------------|
| SEC. 2<br>BRAKE SYSTEM | A. Adjust brakes                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                        | B. Inspect all links and bushings                                    | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                        | C. Record <u>75</u> % lining remaining                               | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                        | D. Pressurize air system inspect for leaks, hoses, diaphragms/valves | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                        | E. Drain air tank                                                    | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                        | F. Inspect drums & rotors for cracks                                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

|                         |                                                        | OK                                  | REP                      |
|-------------------------|--------------------------------------------------------|-------------------------------------|--------------------------|
| SEC. 3<br>TANK EXTERNAL | A. Inspect tank for corrosion/cracks & defective welds | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                         | B. Inspect external tube/damage                        | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                         | C. Inspect fender/bad dent/cracks                      | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                         | D. Inspect bumper flaps                                | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                         | E. Inspect frame for cracks                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                         | F. Inspect loose bolts/hinges                          | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                         | G. Inspect for signs/decals                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                         | H.                                                     | <input type="checkbox"/>            | <input type="checkbox"/> |
|                         | I. Gauges                                              | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

|                        |                                                 | OK                                  | REP                      |
|------------------------|-------------------------------------------------|-------------------------------------|--------------------------|
| SEC. 4<br>ELECT. RICAL | A. Inspect light plug receptacle                | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                        | B. Inspect all junction boxes                   | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                        | C. Inspect lights, markers, stop, tail & signal | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                        | D. Inspect reflectors                           | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

|                        |                                   | OK                                  | REP                      |
|------------------------|-----------------------------------|-------------------------------------|--------------------------|
| SEC. 5<br>TIRES & RIMS | A. Check tire inflation           | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                        | B. Inspect tire condition         | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                        | C. Inspect rims for cracks/dents  | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|                        | D. Check tire matching and mating | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

Mechanic's Signature

*[Signature]*

Foreman's Signature

REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## QUESTIONNAIRE

### SWAPS - TOLLS - TRADES

Suggested items to consider on swaps, tolls, trades and use of third party shipping containers, rail cars, storage tanks, etc.

1. Is your product involved in swaps, tolls, or trades?  
Yes [ ] No [X]
2. If no, do not answer the following questions.
3. If yes, who is responsible for making the swaps, tolls, or trades agreements? \_\_\_\_\_
4. Does your plant have any input into the transportation practices for this product?  
Consider:  
Specification for equipment  
Yes [ ] No [ ]  
Securement training and procedures for loading personnel  
Yes [ ] No [ ]  
Difference in quality which could result in customer problems, such as reactivity  
Yes [ ] No [ ]
5. Do non-Dow shippers load on heels?  
Yes [ ] No [ ]
6. Do non-Dow shippers load through dedicated piping/equipment when it is critical to do so?  
Yes [ ] No [ ]
7. Do non-Dow shippers load through cross header systems (possible contaminates)?  
Yes [ ] No [ ]
8. Are similarities and/or differences between Dow and other non-Dow shippers documented?  
Yes [ ] No [ ]

## HAZARDOUS MATERIALS TRANSPORTATION

### REVIEW QUESTIONNAIRE (NOT INCLUSIVE)

The following is a list of items to consider when preparing a review. It is by no means all inclusive. The Product Review Team is encouraged to modify and expand the list to best suit their individual needs.

#### I. PHYSICAL PROPERTIES

- |     |                                |                             |
|-----|--------------------------------|-----------------------------|
| 1.  | Molecular Weight-              | 2.0                         |
| 2.  | Odor-                          | NONE                        |
| 3.  | Appearance-                    | NONE                        |
| 4.  | Color-                         | NONE                        |
| 5.  | Chemical Formula-              | H2                          |
| 6.  | Solubility: In Water, Others-  | NO                          |
| 7.  | Boiling Point-                 | -423 F                      |
| 8.  | Freezing Point-                | -434 F                      |
| 9.  | Flash Point (Method)-          |                             |
| 10. | Flammable Limits-              | 4-75%                       |
| 11. | Autoignition Temperature-      | 1100 F                      |
| 12. | Density of Material-           | 0.005209 LB/FT3 @ 70F 1 ATM |
| 13. | Vapor Pressure - mm Hg at 20C- | GAS                         |
| 14. | Explosive Limits-              | 4-75%                       |
| 15. | Heats of Reaction-             |                             |

## HAZARDOUS MATERIALS TRANSPORTATION

### REVIEW QUESTIONNAIRE (NOT INCLUSIVE)

The following is a list of items to consider when preparing a review. It is by no means all inclusive. The Product Review Team is encouraged to modify and expand the list to best suit their individual needs.

#### I. PHYSICAL PROPERTIES

- |     |                                |                 |
|-----|--------------------------------|-----------------|
| 1.  | Molecular Weight-              | 70.9            |
| 2.  | Odor-                          | PUNGENT         |
| 3.  | Appearance-                    | YELLOW-GREENISH |
| 4.  | Color-                         | YELLOW-GREENISH |
| 5.  | Chemical Formula-              | CL2             |
| 6.  | Solubility: In Water, Others-  | YES             |
| 7.  | Boiling Point-                 | -29.3 F         |
| 8.  | Freezing Point-                | -280 C          |
| 9.  | Flash Point (Method)-          | NONE            |
| 10. | Flammable Limits-              | NONE            |
| 11. | Autoignition Temperature-      | NONE            |
| 12. | Density of Material-           | 2.49 @ 32 F     |
| 13. | Vapor Pressure - mm Hg at 20C- | 82 PSIG @ 68 F  |
| 14. | Explosive Limits-              | NONE            |
| 15. | Heats of Reaction-             |                 |

## HAZARDOUS MATERIALS TRANSPORTATION

### REVIEW QUESTIONNAIRE

#### II. CHEMICAL PROPERTIES

##### HYDROGEN

1. Chemical composition if the material is formulated or not pure.

HYDROGEN

2. Do you have ARC run on material?

Yes [ ] No [X]

3. Does material react with water?

Yes [ ] No [X]

What are products? \_\_\_\_\_

4. Does material undergo autodecomposition?

Yes [ ] No [X]

5. Are the potential reactive chemical consequences of pH, water, rust, light, promoters and other possible containments known?

Yes [ ] No [X]

6. Does material polymerize?

Yes [ ] No [X]

7. If material freezes, will inhibitor separate?

Yes [ ] No [X]

8. What are the products of oxidation (fire)?

WATER

- \* 9. List some of the main transportation related reactive chemical concerns, in order of magnitude or priority.

1. FIRE OR EXPLOSION

- \* Answer question 9 even if an MSD sheet is supplied.

## HAZARDOUS MATERIALS TRANSPORTATION

### REVIEW QUESTIONNAIRE

#### II. CHEMICAL PROPERTIES

##### CHLORINE

1. Chemical composition if the material is formulated or not pure.  
CHLORINE
2. Do you have ARC run on material?  
Yes [ ] No [X]
3. Does material react with water?  
Yes [X] No [ ]  
What are products? HCL
4. Does material undergo autodecomposition?  
Yes [ ] No [X]
5. Are the potential reactive chemical consequences of pH, water, rust, light, promoters and other possible containments known?  
Yes [X] No [ ]
6. Does material polymerize?  
Yes [ ] No [X]
7. If material freezes, will inhibitor separate?  
Yes [ ] No [X]
8. What are the products of oxidation (fire)?  
CHLORINE IS AN OXIDIZER - VARIOUS CHLORIDES, POSSIBLE  
PHOSGENE GAS
- \* 9. List some of the main transportation related reactive chemical concerns, in order of magnitude or priority.  
1. OVEREXPOSURE TO A TOXIC GAS  
2. REACTIONS WITH WATER TO FORM HCL

\* Answer question 9 even if an MSD sheet is supplied.

## HAZARDOUS MATERIALS TRANSPORTATION

### REVIEW QUESTIONNAIRE

#### III. HEALTH AND ENVIRONMENTAL EFFECTS

##### HYDROGEN

1. What is acute toxicity of the materials?

- Inhalation (LC50 in ppm) NONE

- Dermal (LD50 in mg/kg) NONE

- Oral (LD50 in mg/kg) NONE

2. Are potential health effects reversible?

Yes [X]      No [ ]      Get people to fresh air

3. Can people readily escape contaminated areas?

Yes [X]      No [ ]      Get people out of the area.

4. What is effect on aquatic life? NONE

5. Does material biodegrade?

Yes [ ]      No [X]

6. Would a spill cause long-term groundwater toxicity problems?

Yes [ ]      No [X]

7. Does material exhibit any warning properties?

Yes [X]      No [ ]      GAS IS UNDER PRESSURE WILL HAVE A SOUND  
WHEN BEING RELEASED.

8. Is material corrosive to skin?

Yes [ ]      No [X]

9. Has recommended protective equipment been tested?

Yes [X]      No [ ]      NA [ ]

10. Please Submit -

-- A Material Safety Data Sheet (MSDS)

-- A Transportation Equipment Data - Emergency Response Sheet (TEDER)

## HAZARDOUS MATERIALS TRANSPORTATION

### REVIEW QUESTIONNAIRE

#### III. HEALTH AND ENVIRONMENTAL EFFECTS

##### CHLORINE

1. What is acute toxicity of the materials?
  - Inhalation (LC50 in ppm) Mice 137 ppm; Rats 293 ppm both for 1 hour
  - Dermal (LD50 in mg/kg) Not Determined
  - Oral (LD50 in mg/kg) Unlikely
2. Are potential health effects reversible?  
Yes ☒ No ☐
3. Can people readily escape contaminated areas?  
Yes ☒ No ☐
4. What is effect on aquatic life? MAY KILL AQUATIC LIFE
5. Does material biodegrade?  
Yes ☐ No ☒
6. Would a spill cause long-term groundwater toxicity problems?  
Yes ☐ No ☒
7. Does material exhibit any warning properties?  
Yes ☒ No ☐ GAS WILL EMIT A YELLOW-GREENISH CLOUD  
WHEN BEING RELEASED.
8. Is material corrosive to skin?  
Yes ☒ No ☐
9. Has recommended protective equipment been tested?  
Yes ☒ No ☐ NA ☐
10. Please Submit -
  - A Material Safety Data Sheet (MSDS)
  - A Transportation Equipment Data - Emergency Response Sheet (TEDER)

## HAZARDOUS MATERIALS TRANSPORTATION

### REVIEW QUESTIONNAIRE

#### IV. EQUIPMENT CONSTRUCTION

##### HYDROGEN

1. Is this product corrosive to the material of construction of the shipping container?

Yes [ ] No [X]

2. Are specific materials of construction required to be used or to be avoided?

Yes [ ] No [X]

3. Are materials of construction concerns communicated to the customer or supplier (eg. aluminum not acceptable for PDC)?

Yes [X] No [ ] NA [ ]

4. How do you assure the proper material of construction is being used?

Use of a dedicated Trailer and receiving system.

5. Does this product require insulation against extreme heat or cold conditions?

Yes [ ] No [X]

If yes, how do you assure that insulated equipment is used?

6. What are the minimum equipment specifications for this product for the modes of transportation used (for DOT, IMO, etc.)?

DOT

7. What are the preferred specification for this product for the modes of transportation used?

DOT

Which are used? DOT

## HAZARDOUS MATERIALS TRANSPORTATION

### REVIEW QUESTIONNAIRE

#### IV. EQUIPMENT CONSTRUCTION

##### CHLORINE

1. Is this product corrosive to the material of construction of the shipping container?

Yes [ ] No [X]

2. Are specific materials of construction required to be used or to be avoided?

Yes [X] No [ ]

3. Are materials of construction concerns communicated to the customer or supplier (eg. aluminum not acceptable for PDC)?

Yes [X] No [ ] NA [ ]

4. How do you assure the proper material of construction is being used?

CONSULT WITH THE CHLORINE FOLKS AT CHLORINE

5. Does this product require insulation against extreme heat or cold conditions?

Yes [ ] No [X]

If yes, how do you assure that insulated equipment is used?

6. What are the minimum equipment specifications for this product for the modes of transportation used (for DOT, IMO, etc.)?

DOT

7. What are the preferred specification for this product for the modes of transportation used?

DOT

Which are used? DOT

## HAZARDOUS MATERIALS TRANSPORTATION

### REVIEW QUESTIONNAIRE

#### V. HYDROGEN AND CHLORINE LOADING PROCEDURES

NOTE: WE DO NOT LOAD THIS MATERIAL!

1. Is material of construction verified before loading?  
Yes [ ]      No [ ]      NA [X]
2. Is material to be loaded in dedicated tank or shipping containers?  
Yes [ ]      No [ ]      NA [X]
3. Are hoses dedicated to this material?  
Yes [ ]      No [ ]      NA [X]
4. Is there a potential for cross contamination in the loading process?  
Yes [ ]      No [ ]      NA [X]
5. Who/How are checks for the cleanliness and integrity of tank cars, trucks, drums, or other containers made before loading?  
        N/A      
Are there written procedures, checklists and training available?  
Yes [ ]      No [ ]      NA [X]  
Are heels analyzed?  
Yes [ ]      No [ ]      NA [X]
6. Are dew-point checks needed for this product prior to loading?  
Yes [ ]      No [ ]      NA [X]
7. Who is responsible for the general safety conditions of tank cars, trucks, drums, or other containers (leaking valves, brakes, tires, gaskets, floor surface in trailers, damage, mixed shipment product mix, etc.)?     N/A      
How are inspections made?     N/A
8. Are drivers involved in loading this product in your plant?  
Yes [ ]      No [ ]      NA [X]

9. If so, do drivers have training in what to do in case of emergency in the plant?  
Yes [ ] No [ ] NA [X]
10. Do drivers that load products have training on how to properly secure the shipping container?  
Yes [ ] No [ ] NA [X]
11. How do you assure that trucks, rail cars, and containers are properly labeled and placarded for the hazard?  
N/A
12. How do you assure that trucks, rail cars, containers, and marine vessels are properly secured after loading? N/A
13. Are loading procedures current?  
Yes [ ] No [ ] NA [X]  
Written by whom? N/A  
Reviewed/Approved by whom? N/A
14. What specific personal protective equipment is required for loading this product?  
N/A
15. Have loaders received DOT training within the last two years?  
Yes [ ] No [ ] NA [X]
16. What measures are used to assure container is not overloaded?  
N/A
17. Is the vapor space prevented from passing through a flammable envelope during loading?  
Yes [ ] No [ ] NA [X]  
Is inert padding/purging required?  
Yes [ ] No [ ] NA [X]

## HAZARDOUS MATERIALS TRANSPORTATION

### REVIEW QUESTIONNAIRE

#### VI. IN ROUTE PROCEDURES HYDROGEN

1. What is the driver selection process used by the carrier?

CARRIER HAS GUIDELINES FOR THE SELECTION OF DRIVERS

2. Are TEDER and MSD sheets available?

Yes ☒ No ☐

3. Is there a specific packet for handling precautions given to the driver?

Yes ☒ No ☐

4. Do you require drivers to have the same personal protective equipment as your loaders?

Yes ☐ No ☐ NA ☒

5. What is the worst case reasonable situation that could occur?

TRUCK IS IN AN ACCIDENT, RELEASING HYDROGEN, FIRE OR EXPLOSION

Have you conducted simulated loss of containment "What If" scenarios with people (including carriers) who can contribute to in emergency plan?

Yes ☐ No ☐ NA ☒

6. Have you determined what evacuation plans would be recommended in case of an emergency?

Yes ☐ No ☐ NA ☒

NOTE: Utilize the dispersion data (for the quantities, distance, and conditions for the transportation worst case scenario) as per the CEI program instructions in the CEI audit. Information to be provided to emergency responders should be consistent with current DOT Emergency Response Guidebook recommendations for specifically named chemicals.

7. Is specialized equipment and/or a procedure required to respond to a leak of this product?

Yes ☐ No ☒

Is it available?

Yes ☐ No ☐ NA ☒

Where? \_\_\_\_\_

8. Is there a maximum time a product can remain in a shipping container before it is unloaded (e.g. anhydrous (HCl)?  
Yes [ ] No [X]
9. Should this product require special transportation modes and routes?  
Yes [ ] No [X]  
Why/Why not? PRODUCT IS VERY STABLE AND CONTAINED WELL
10. Are local, state, or federal special permits or approvals required (e.g. Dot exemptions)?  
Yes [ ] No [X]
11. What regulatory requirements are applicable (DOT, U.S. Coast Guard, IMO (International Marine), IATA (air)?  
\_\_\_\_\_  
\_\_\_\_\_
12. Do you place any restrictions on the carrier (i.e., daylight movement only, special routes, or weather restrictions)?  
Yes [ ] No [X]
13. Who will be the "knowledgeable" Dow contacts in an emergency response (E/R) situation?  
SHIFT SUPERVISORS AT POWER 1, MARTY MORRISON, GERVEY SMITH  
\_\_\_\_\_
14. Does this product require special training for Dow's E/R Teams and medical personnel?  
Yes [ ] No [X]  
If yes, what is the frequency of training? \_\_\_\_\_
15. Does there need to be a definition of geographical responsibility on what E/R Team reacts to an emergency (i.e., related to question 14)? This could be U.S., overseas, etc.  
Yes [ ] No [X]

16. Do drivers have training in what to do in case of emergency?

Yes [ X ]      No [ ]

Who provides the training? CARRIER

17. Has a Driver Performance Evaluation Program been established?

Yes [X]      No [ ]

18. What are the carrier policies regarding highway emergencies? (Dow recommends a first call to CHEMTREC be included in the emergency plan.)

DRIVER CALLS CHEMTREC AND POSSIBLE AIR PRODUCTS - SUPPLIER

19. Do you audit carrier performance relative to the transportation of your products?

Yes [ X ]      No [ ]      NA [ ]

DIVISION TRANSPORTATION

## HAZARDOUS MATERIALS TRANSPORTATION

### REVIEW QUESTIONNAIRE

#### VI. IN ROUTE PROCEDURES CHLORINE

1. What is the driver selection process used by the carrier?

CARRIER HAS GUIDELINES FOR THE SELECTION OF DRIVERS

2. Are TEDER and MSD sheets available?

Yes [X]      No [ ]

3. Is there a specific packet for handling precautions given to the driver?

Yes [X]      No [ ]

4. Do you require drivers to have the same personal protective equipment as your loaders?

Yes [ ]      No [ ]      NA [X]

5. What is the worst case reasonable situation that could occur?

TRUCK IS IN AN ACCIDENT, RELEASING CHLORINE A TOXIC GAS

Have you conducted simulated loss of containment "What If" scenarios with people (including carriers) who can contribute to in emergency plan?

Yes [X]      No [ ]      NA [ ]      Emergency drills have been done on plant site.

6. Have you determined what evacuation plans would be recommended in case of an emergency?

Yes [ ]      No [X]      NA [ ]

NOTE: Utilize the dispersion data (for the quantities, distance, and conditions for the transportation worst case scenario) as per the CEI program instructions in the CEI audit. Information to be provided to emergency responders should be consistent with current DOT Emergency Response Guidebook recommendations for specifically named chemicals.

7. Is specialized equipment and/or a procedure required to respond to a leak of this product?

Yes [X]      No [ ]

Is it available?

Yes [X]      No [ ]      NA [ ]

Where? CHLORINE, VAN WATERS AND ROGERS

8. Is there a maximum time a product can remain in a shipping container before it is unloaded (e.g. anhydrous (HCl)?  
Yes ☐ No ☒
9. Should this product require special transportation modes and routes?  
Yes ☐ No ☒  
Why/Why not? PRODUCT IS CONTAINED WELL.
10. Are local, state, or federal special permits or approvals required (e.g. Dot exemptions)?  
Yes ☒ No ☐
11. What regulatory requirements are applicable (DOT, U.S. Coast Guard, IMO (International Marine), IATA (air)?  
DOT
12. Do you place any restrictions on the carrier (i.e., daylight movement only, special routes, or weather restrictions)?  
Yes ☒ No ☐ DAYLIGHT DELIVERYS ONLY
13. Who will be the "knowledgeable" Dow contacts in an emergency response (E/R) situation?  
VAN WATERS AND ROGERS, CHLORINE PERSONNEL
14. Does this product require special training for Dow's E/R Teams and medical personnel?  
Yes ☒ No ☐  
If yes, what is the frequency of training? ANNUALLY
15. Does there need to be a definition of geographical responsibility on what E/R Team reacts to an emergency (i.e., related to question 14)? This could be U.S., overseas, etc.  
Yes ☐ No ☒

16. Do drivers have training in what to do in case of emergency?

Yes ☒ No ☐

Who provides the training? VAN WATERS AND ROGERS

17. Has a Driver Performance Evaluation Program been established?

Yes ☒ No ☐

18. What are the carrier policies regarding highway emergencies? (Dow recommends a first call to CHEMTREC be included in the emergency plan.)

DRIVER CALLS CHEMTREC AND VAN WATER AND ROGERS - SUPPLIER

19. Do you audit carrier performance relative to the transportation of your products?

Yes ☐ No ☐ NA ☒

## HAZARDOUS MATERIALS TRANSPORTATION

### REVIEW QUESTIONNAIRE

#### VII. UNLOADING PROCEDURES

##### HYDROGEN

1. Is material unloaded by driver or local operating personnel?

TRAILER IS LEFT AT DOW. OPERATIONS HOOKS UP THE TRAILER.

Are they trained in the procedures?

Yes [X]      No [ ]

Does this include emergency procedures in case of hose failures, gaskets, etc.?

Yes [X]      No [ ]

Who conducts the training and how often? SHIFT SUPERVISOR

ANNUALLY AS PART OF THEIR JOB REVIEW

Is the training documented?

Yes [X]      No [ ]

2. Are unloading procedures current?

Yes [X]      No [ ]

Written by whom? OPERATING PERSONNEL

Reviewed and approved by whom? BY STAFF

3. Have procedures been established and customers informed to ensure proper securement of the shipping container, rail car, truck, vessel or drums after unloading?

Yes [X]      No [ ]      NA [ ]

4. Should car, truck, or marine vessel be inerted as it is emptied?

Yes [ ]      No [X]

5. Is the vapor space prevented from passing through a flammable envelope during unloading?

Yes [X]      No [ ]

6. Is sampling/analysis required prior to unloading?

Yes [ ]      No [X]

7. Are unloading areas equipped with the required safety equipment (i.e., suitable fire extinguishing, equipment, spill basins, etc.)?

Yes ☒ No ☐

8. Are unloading operations "attended" throughout the entire period of unloading?

Yes ☐ No ☒

Is the "attendance" by people, electronic devices, or both:

For rail cars: N/A

For tank trucks: N/A

## HAZARDOUS MATERIALS TRANSPORTATION

### REVIEW QUESTIONNAIRE

#### VII. UNLOADING PROCEDURES

##### CHLORINE

1. Is material unloaded by driver or local operating personnel?

CYLINDERS ARE LEFT AT DOW TO BE OFFLOADED WHEN IT IS NEEDED.

Are they trained in the procedures?

Yes [X]      No [ ]

Does this include emergency procedures in case of hose failures, gaskets, etc.?

Yes [X]      No [ ]

Who conducts the training and how often? SHIFT SUPERVISOR

ANNUALLY AS PART OF THEIR JOB REVIEW

Is the training documented?

Yes [X]      No [ ]

2. Are unloading procedures current?

Yes [X]      No [ ]

Written by whom? OPERATIONS

Reviewed and approved by whom? SUPERVISOR

3. Have procedures been established and customers informed to ensure proper securement of the shipping container, rail car, truck, vessel or drums after unloading?

Yes [X]      No [ ]      NA [ ]

4. Should car, truck, or marine vessel be inerted as it is emptied?

Yes [ ]      No [X]

5. Is the vapor space prevented from passing through a flammable envelope during unloading?

Yes [X]      No [ ]

6. Is sampling/analysis required prior to unloading?

Yes [ ]      No [X]

7. Are unloading areas equipped with the required safety equipment (i.e., suitable fire extinguishing, equipment, spill basins, etc.)?

Yes [ ] No [ X]

8. Are unloading operations "attended" throughout the entire period of unloading?

Yes [ ] No [X]

Is the "attendance" by people, electronic devices, or both:

For rail cars: N/A

For tank trucks: N/A

## HAZARDOUS MATERIALS TRANSPORTATION

### REVIEW QUESTIONNAIRE

#### VIII. OUTPLANT CONTRACTS (TERMINALS - WAREHOUSES - REPACKERS)

Items to consider on use of off-site contracted services and operation:

1. Are facilities covered by Standard Dow Contract (i.e., approved by U.S. Area or Division Terminal's Focal Point)?

Yes [ ] No [ ] NA [X]

Is there a current Contractual Exhibit B or Dow Operating Procedures in existence for the location?

Yes [ ] No [ ] NA [X]

2. Have facilities been audited and approved by U.S. Area Terminal's Focal Point or representative?

Yes [ ] No [ ] NA [X]

3. Is surrounding area free of residential or public facilities, i.e., hospitals, schools, etc.?

Yes [ ] No [ ] NA [X]

What is approximate distance to nearest public facility and the corresponding highest CEI number? N/A

What is approximate distance to nearest residence and the corresponding highest CEI number? N/A

4. Are contract facilities covered by Dow Technology Center Audits and/or QAC Reviews?

Yes [ ] No [ ] NA [X]

5. Are products positively identified prior to loading or off-loading?

Yes [ ] No [ ] NA [X]

How is product quality monitored/maintained? N/A

6. Have contract facility employees been trained in proper handling of Dow products with regard to Safety, Industrial Hygiene, Environmental, proper packaging (materials of construction), securement, etc.?

Yes [ ] No [ ] NA [X]

7. Are appropriate blocking and bracing procedures available to cover loading of packaged goods?

Yes [ ]      No [ ]      NA [X]

8. Does facility have a formal emergency plan?

Yes [ ]      No [ ]      NA [X]

Ability to prevent run-off water in case of a fire?

Yes [ ]      No [ ]      NA [X]

**Resource and Information:**

G. R. Mutscher - U.S. Area Warehousing/Terminals Focal Point  
2020 WHDC  
Midland, Michigan      Phone (517) 636-5841

Ernie Wall - Louisiana Division Terminals Focal Point  
Building 3302D  
Plaquemine, Louisiana      Phone (504) 389-6497

## HAZARDOUS MATERIAL TRANSPORTATION

### REVIEW QUESTIONNAIRE

#### IX. INVENTORY PRACTICES OF FULL CONTAINERS CHLORINE AND HYDROGEN

1. Is there a policy setting the maximum number of containers (rail car, trucks, drums, etc.) or quantity of material that can be stored at one location?  
Yes [ ]      No [X]  
Should there be?  
Yes [ ]      No [X]
2. Is it necessary to know the location, as well as types, of chemicals being inventoried side-by-side while inside Dow?  
Yes [ ]      No [X]
3. Are inhibitor levels or other time dependent variables monitored for chemicals in storage in shipping containers?  
Yes [ ]      No [X]  
How? \_\_\_\_\_
4. Have adequate safety-loss prevention and environmental principals (i.e., fire monitors, flammable detectors, spill containment, CEI & F & EI calculations) been considered for your materials?  
Yes [X]      No [ ]
5. Is reconfirmation of securement done prior to shipment?  
Yes [ ]      No [X]      NA [X]
6. Have emergency procedures, including hurricanes, freezing weather, etc. been developed for materials in storage in shipping containers?  
Yes [X]      No [ ]

C.E.I.

DO A 121406  
CONFIDENTIAL

# **POWER 1/UTILITIES**

## **CEI SUMMARY**

### **SUMMARY**

**CHLORINE IS THE ONLY CHEMICAL WITH A LARGE CEI. IT ALSO HAS A HIGH RADIUS OF ODOR DETECTION. NO ACCIDENTS/INCIDENTS HAVE OCCURED IN THE LAST TWO YEARS WITH THE BOTTLES OR CYLINDERS. DURING DELIVERIES THERE ARE TWO PEOPLE PRESENT.**

### **STRENGTHS**

**CHLORINE IS THE ONLY CHEMICAL WITH A LARGE CEI NUMBER.**

**NO ACCIDENTS/INCIDENTS IN THE LAST TWO YEARS INVOLVING CHLORINE CYLINDERS OR BOTTLES.**

**PROCEDURES IN PLACE TO HAVE TWO PEOPLE STANDING BY WHEN BOTTLES/CYLINDERS ARE RECEIVED.**

**PROCEDURES ARE IN PLACE TO START-UP/SHUT DOWN EQUIPMENT AND FOR LINE OPENINGS.**

### **OPPORTUNITIES FOR IMPROVEMENT**

**HAVE A YEARLY TRAINING CLASS ON CHLORINE AND CHLORINE HANDLING.**

**DOW CONFIDENTIAL**

BLOCK LIMIT 107 • 50.00' N

BLOCK LIMIT 199 • 00.00' E

BLOCK LIMIT 194 • 00.00' E



T-3  
(caustic)

WATER HOUSE

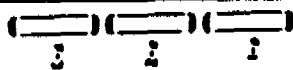
Tool Shop

Room 2

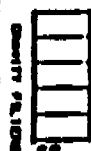
Room 1

OFFICE AND CONTROL ROOM

Cl<sub>2</sub> Supply



1-3



BLOCK LIMIT 101 • 50.00' N

1-1

1-1

1-2

Cl<sub>2</sub> Monitor

Cl<sub>2</sub> Monitor

3

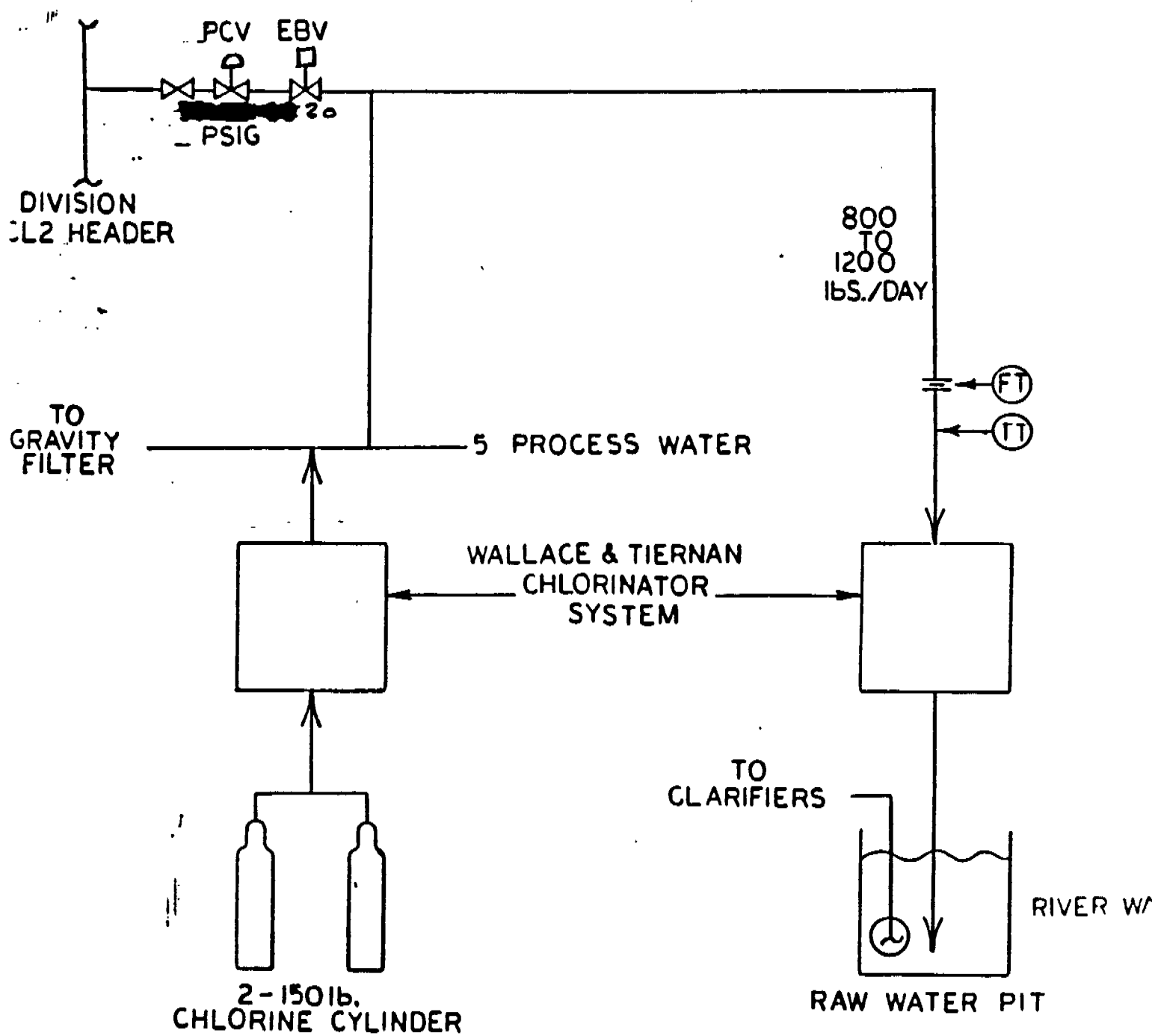
1

2

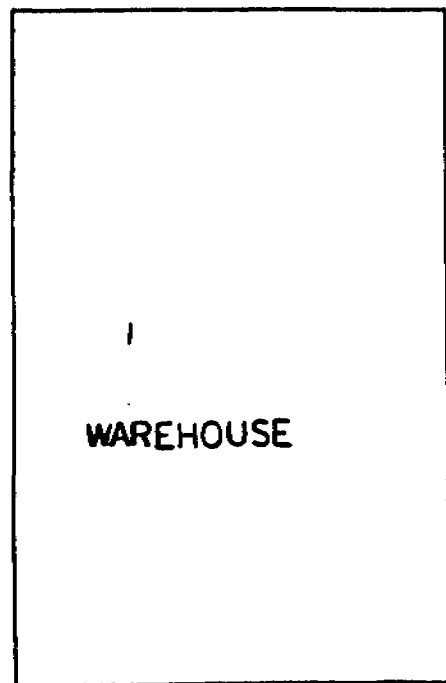
PORT BRIDGE

CAUSTIC ROAD

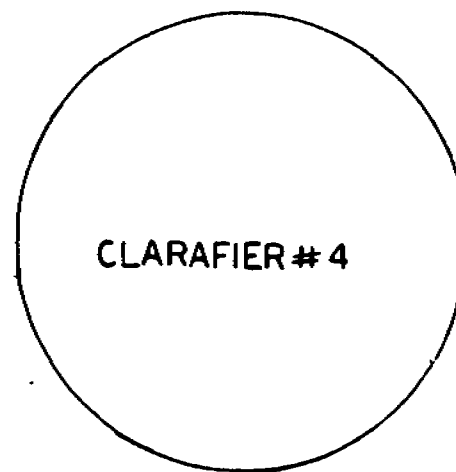
WATER CANAL ROAD



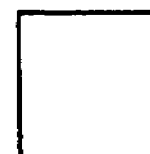
BLOCK 18



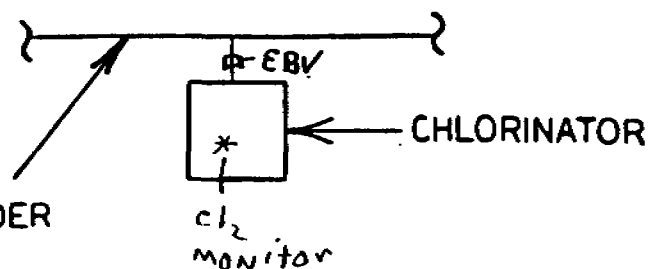
WAREHOUSE



CLARAFIER # 4



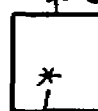
SWITCH  
GEAR  
ROOM



DIVISION CL2 HEADER

EBV

CHLORINATOR



cl<sub>2</sub>  
monitor

RI 00K 35

1 TON  
CHLORINE  
CYLINDER

FINAL  
CLARIFIER

*Future  
Cl<sub>2</sub> monitor  
3/92*

BIOLOGICAL  
FILTER

SPIROGESTOR

CHLORINE ROAD

MAYFLOWER ROAD

DO A 121411  
CONFIDENTIAL