## IX. APPENDIX I

## METHOD FOR SAMPLING NITROGEN DIOXIDE AND NITRIC OXIDE

The recommended method is adapted from procedures described by Blacker [211] and by Levaggi et al [212]. This method is highly adaptable to personal monitoring, and it offers a number of advantages over available bubbler-type methods.

### Principle

The following sampling method for nitrogen dioxide and nitric oxide in air employs collection of the NO2 on a triethanolamine-impregnated molecular sieve surface, oxidation of the NO to NO2 by a solid oxidizer, and collection of the converted NO on another section of triethanolamine-impregnated solid sorbent. The trapped NO/NO2 is removed with an absorbing solution and the concentrations are determined by reading the color of the solution with a spectrophotometer.

### General Requirements

Both nitrogen dioxide and nitric oxide concentrations shall be determined within the worker's breathing zone and shall meet the following criteria in order to evaluate conformance with the standard:

(a) Samples collected shall be representative of the individual worker's exposure.

(b) Sampling Data Sheets shall include:

(1) The date and time of sample collection.

(2) Sampling duration.

(3) Volumetric flow rate of sampling.

(4) A description of the sampling location.

(5) Other pertinent information.

Breathing Zone Sampling

Breathing-zone samples shall be collected as near as practicable to the worker's face without interfering with his or her freedom of movement and shall characterize the exposure from each job or specific operation in each production area.

(a) Sampling Equipment

A calibrated personal sampling pump capable of operating at 50 cc/min, ±5%, and a solid sorbent sampling tube containing 400 mg of triethanolamine (TEA)-impregnated molecular sieve (type 13X, 30-40 mesh molecular sieve), a gap of 12 millimeters, 800 mg of #1900277 oxidation material from the Dragerwerk Company of Germany, and another 400 mg section of the TEA sorbent, all packed in a 5-mm ID, 7-mm OD glass tube. The ends of the tube are flame sealed (see Figure XIII-1).

(b) Reagents

(1) Purity -- All chemicals should be analytical grade.

(2) Nitrogen dioxide absorbent -- Add 25 g of triethanolamine to a 250-ml beaker; add 4 g of glycerol, 50 ml of acetone, and sufficient distilled water to bring the volume up to 100 ml. To the mixture add about 50 cc of 30- to 40-mesh molecular sieve 13X (MCB No. MX 1583-1). Stir and let stand in the covered beaker for about 30 minutes. Decant the excess liquid and transfer the molecular sieve to a porcelain pan which is then placed under a heating lamp until most of the moisture has evaporated. Complete the drying in an oven at 110 C for 1 hour. Store in a closed glass container. [211]

(3) Oxidizer -- The oxidizer used in the sampling train is from Dragerwerk of The Federal Republic of Germany. Exact preparation of this oxidizer is proprietary, but the material is available from Dragerwerk through its US distributor, National Mine Safety Company. Substances of equivalent oxidizing characteristics may be used.

(c) Sampling Procedure

Immediately before sampling, the ends of the sampling tube are broken to provide an opening approximately one-half the internal diameter of the tube. The tube should be placed in a vertical position during sampling to avoid channeling. Air being sampled should not be passed through any hose or tubing before entering the sampling tube. Set the flow rate at 50 cc/min and record the starting time and initial counter reading (if applicable). The sampling tube is attached to the worker's clothing to sample from the worker's breathing zone. The sample is collected at 50 cc/min for a minimum 15-minute period. A minimum sample volume of 0.75 liter must be taken to measure 0.5 ppm NO2. Sample volumes should not exceed 1.5 liter if nitric oxide concentrations of 50 ppm or greater are expected. When the sample has been taken, record the time and final counter reading.

The tubes should be sealed with appropriate plastic caps immediately after sampling. Masking tape is a suitable substitute for sealing the tubes. One sampling tube should be handled in the same manner as the sample tubes (break, seal, and transport), except for the taking of an air sample. This tube should be labeled as a blank. At least one blank tube should be provided for every 20 samples.

## Shipping

After sampling, the tubes should be capped and labeled. The tubes should be packed with cushioning material to prevent the tubes from being broken in transit.

## Calibration of Sampling Trains

Since the accuracy of an analysis can be no greater than the accuracy of the volume of air which is measured, the accurate calibration of a sampling pump is essential to the correct interpretation of the pump's indication. The frequency of calibration is dependent on the use, care, and handling to which the pump is subjected. In addition, pumps should be recalibrated if they have been misused or if they have just been repaired or received from a manufacturer. If the pump receives hard usage, more frequent calibration may be necessary.

Ordinarily, pumps should be calibrated in the laboratory both before they are used in the field and after they have been used to collect a large number of field samples. The accuracy of calibration is dependent on the type of instrument used as a reference. The choice of a calibration instrument will depend largely upon where the calibration is to be performed. For laboratory testing, primary standards such as a spirometer or soapbubble meter are recommended, although other standard calibrating instruments such as a wet test meter or dry gas meter can be used. The actual setup will be the same for all instruments. Instructions for calibration with the soapbubble meter follow. If another calibration device is selected, equivalent procedures should be used.

(a) Flowmeter Calibration Test Method

For calibration of low flow pumps, ie, 50-200 cc/min, a soapbubble meter with calibration marks from 1 to 100 ml is recommended.

(1) Procedure

(A) Check the voltage of the pump battery with a voltmeter to assure adequate voltage for calibration. Charge the battery if necessary.

(B) Assemble the sampling train as shown in Figure XIII-2, connecting the sampling tube in line between the soapbubble meter and the water manometer and then connecting the personal sampling pump after the manometer.

(C) Turn the pump on and moisten the inside of the soapbubble meter by immersing the buret in the soap solution and draw bubbles up the inside until they are able to travel the entire buret length without bursting.

(D) Adjust the pump rotameter to provide a flow rate of 50 cc/minute.

(E) Check the water manometer to ensure that the pressure drop across the sampling train does not exceed 2.5 inches of water.

(F) Start a soapbubble up the buret and, with a stopwatch, measure the time it takes for the bubble to move from one calibration mark to another. For a 100-ml buret, a convenient calibration volume is 50 ml. At the same time, record the initial and final counter readings as the bubble travels between the chosen calibration marks on the bubblemeter. This can be accomplished by quickly reading the counter numbers when the soapbubble passes the calibration marks while the pump is running, or the pump can be turned off when the soapbubble reaches the final calibration mark and a counter reading taken.

(G) Repeat the procedure in (F) above at least 2 times, average the results, and calculate the flow rate by dividing the volume between the preselected marks by the time required for the soapbubble to traverse the distance. Also calculate the pump stroke factor (cc/stroke) by subtracting the initial counter reading from the final counter reading, thus obtaining the number of strokes, and dividing this number into the volume over which the strokes were recorded.

(H) Data for the calibration include the volume measured, number of pump strokes measured, elapsed time, pressure drop, air temperature, atmospheric pressure, serial number of the pump, date, and name of the person performing the calibration.

# X. APPENDIX II

## ANALYTICAL METHOD FOR NITROGEN DIOXIDE AND NITRIC OXIDE

The recommended method is based on procedures described by Blacker [211] and by Levaggi et al. [212]

### Principle

The nitrogen dioxide absorbed on the first section of molecular sieve and the nitrogen dioxide, after oxidation of nitric oxide to nitrogen dioxide, on the second section of molecular sieve are treated with sulfanilamide and N-1-naphthylethylenediamine dihydrochloride. Absorbance of the color developed is measured at 540 nm.

### Apparatus

Spectrophotometer -- A laboratory instrument suitable for measuring the absorbance at 540 nm, utilizing 1-cm cells or larger.

### Reagents

Absorbing solution -- Dissolve 15.0 g of triethanolamine in approximately 500 ml of distilled water, add 0.5 ml of n-butanol, and dilute to 1 liter.

Hydrogen peroxide -- Dilute 0.2 ml of 30% hydrogen peroxide to 250 ml with distilled water.

Sulfanilamide -- Dissolve 10.0 g of sulfanilamide in 400 ml of distilled water. Add 25 ml of concentrated phosphoric acid, mix well, and dilute to 500 ml.

NEDA -- Dissolve 0.5 g of N-1-naphthylethylenediamine dihydrochloride in 500 ml of distilled water. This solution will be stable for several months if kept well-stoppered in a brown bottle in the refrigerator. Alternatively, weighed small amounts of the solid reagent may be stored.

Standard solution -- Dissolve 150.0 mg of reagent-grade sodium nitrite in distilled water, and dilute to 1 liter. This solution contains 100 μg of NO2 (ion)/ml.

## Preparation of Standard Curve

Dilute 2 ml of stock standard (100 μg of NO2 (ion)/ml) to 100 ml with absorbing solution to prepare a solution containing 2 μg of NO2 (ion)/ml. To a series of 25-ml glass-stoppered graduated cylinders add 0, 1, 3, 5, and 7 ml of standard (2 μg of NO2 (ion)/ml). Add absorbing solution to bring the volume in each cylinder up to 10 ml. Add 1 ml of hydrogen peroxide solution, 10 ml of sulfanilamide solution, and 1.4 ml of NEDA solution, with thorough mixing after the addition of each reagent. Allow 10 minutes for complete color development and measure absorption at 540 nm, using the treated blank to zero the spectrophotometer. Prepare the standard curve by plotting absorbance versus concentration.

## Procedure

With a tweezer remove and discard the glass wool plug from one end of the nitrogen dioxide sample tube (Appendix I) and transfer the molecular sieve to a 25-ml glass-stoppered graduate. Add absorbing solution to make the volume up to 20 ml, and then shake vigorously for about 30 seconds. Allow a few minutes for the solids to settle, and then transfer 10 ml to a 25-ml glass-stoppered graduate. Prepare a blank in the same manner from unexposed molecular sieve obtained from an unused nitrogen dioxide absorber tube. To the sample and the blank add 1 ml of hydrogen peroxide solution, 10 ml of sulfanilamide solution, and 1.4 ml of NEDA solution with thorough mixing after the addition of each reagent. Allow 10 minutes for complete color development and measure absorbance at 540 nm, using the treated blank to zero the spectrophotometer. Determine NO2 (ion) in the aliquot of the sample from the standard curve.

Calculations

$$\text{ppm (v/v) of NO2 (gas)} = \frac{\mu\text{l NO2 (gas)}}{\text{liters (air)}}$$

$$1\ \mu\text{l NO2 (gas)} = 1.88\ \mu\text{g NO2 (gas) at 25 C and 760 mmHg}$$

$$1\ \mu\text{g NO2 (gas)} = 0.63\ \mu\text{g NO2 (ion)}$$

If

r = sampling rate, liters of air/minute, and

t = sampling time in minutes,

$$\mu\text{l NO2 (gas)} = \frac{\mu\text{g NO2 (ion) in aliquot} \times 2}{1.88 \times 0.63}$$

$$= \mu\text{g NO2 (ion) in aliquot} \times 1.69\text{, then}$$

$$\text{ppm NO2 (gas)} = \frac{\mu\text{g NO2 (ion) in aliquot} \times 1.69}{r \times t}$$

The concentration of nitric oxide, expressed in ppm of nitrogen dioxide (gas), is equivalent to the concentration of nitrogen dioxide as calculated above.

# XI. APPENDIX III

## DETERMINATION OF EXPOSURE AREAS TO NITROGEN DIOXIDE WITH DETECTOR TUBES AND WITH PORTABLE DIRECT-READING INSTRUMENTS

### Detector Tubes

(a) Atmospheric Sampling

(1) Equipment Used

A typical sampling train consists of a detector tube with a corresponding sampling pump. A specific manufacturer's pump may only be used with his detector tubes because these are normally integrated units.

(2) Sampling Procedures

A specific procedure depends on the manufacturer's instructions but normally consists of breaking both tips off a detector tube, inserting the tube into the pump, and taking a specific number of strokes with the pump.

(3) Handling and Shipping of Samples

Detector tubes are not stable with time because the stain in some tubes fades in a few minutes. The tubes should be read immediately in accordance with the manufacturer's instructions and charts and no attempt should be made to save the used tubes.

(b) General Principles

Gas detector tubes contain a chemically impregnated packing which indicates the concentration of a contaminant in the air by means of a chemically produced color change. The color changes are not permanent or stable, so the stained tubes must be read immediately after the samples are taken. The length of stain or color intensity is read according to the manufacturer's instructions and may involve comparing the stain with a chart, a color comparator, or a direct concentration reading from calibration marks on the tube. Detailed descriptions are provided by individual manufacturer's instructions.

Tubes obtained from commercial sources which bear the certified seal of NIOSH adhere to the requirements as specified for Certification of Gas Detector Tube Units in 42 CFR Part 84 (Federal Register 38:11458, May 8, 1973). A user may perform his own calibration on commercially acquired tubes by generating accurately known concentrations of nitrogen dioxide in air and correlating concentration with stain length or color intensity.

The use of detector tubes with their respective pumps for compliance purposes is inappropriate because sampling times are necessarily very brief; thus, an excessive number of sampling periods would be required to permit calculation of a time-weighted average in the case of nitric oxide. In addition, the accuracy of detector tubes is limited [see (e) below].

(c) Range and Sensitivity

Certification standards require that certified tubes have a range of from 1/2 to 5 times the time-weighted average concentration for the duration of the sampling period. The sensitivity varies with tube brands.

(d) Interferences

Interferences vary with tube brands. The manufacturer's instructions must be consulted.

(e) Accuracy

Certification standards under the provisions of 42 CFR Part 84 (Federal Register 38:11458, May 8, 1973) specify reliability to within ±25%

of the actual concentration in the range of 0.75 to 5 times the standard and ±35% in the range from 0.5 up to, but not including, 0.75 times the standard.

(f) Advantages and Disadvantages

The use of detector tubes is relatively inexpensive and rapid. There is far less time lag than that experienced with laboratory analytical procedures. Rapid detecting units are valuable for determining whether a hazardous condition exists at a given location at a given time so that workers may be evacuated or suitable protective devices provided. In addition, industrial operators and process engineers need inexpensive and rapidly responsive devices for day-to-day evaluation of the atmospheric levels in a work area.

In evaluating measurements performed with detector tubes, interferences, difficulty in endpoint readings, and possible calibration inaccuracies must all be considered. These factors affect the accuracy of detector tubes. Thus, the use of such tubes must be limited to estimating the concentration of the contaminant.

## Portable Direct-Reading Instruments

Several portable direct-reading instruments for the measurement of occupational exposures to nitrogen dioxide are available. With proper calibration and maintenance, they can be more sensitive and accurate than detector tubes, and they provide even more rapid indications of levels of exposure. Such instruments serve useful purposes by providing immediate on-the-spot information as to levels of nitrogen dioxide concentrations in work areas. This makes them particularly useful for evaluating the need for and effectiveness of control measures. In view of their size and weight, they are not practicable to use for personal sampling. Weights range from about 10 pounds to more than 25 pounds. The instruments do not give information on the levels of any nitric oxide present. Prices of commercially available nitrogen dioxide direct-reading meters are generally in the range of $1,000 to $2,000.

A NIOSH publication [228] has evaluated four commercially available direct reading nitrogen dioxide instruments. The publication discusses such factors and characteristics as portability, ease and simplicity of operation, completeness of instructions in the operation manual, maintenance procedures, direct reading capabilities, cost, ability to operate as a continuous monitor, cost and availability of replacement components, range of concentrations measured, accuracy of manufacturer's calibration, zero drift, response time, stability of calibration setting, ability to record continuously, linearity of response, specificity for nitrogen dioxide, severity of interferences, ease of calibration and zeroing, effects of temperature and humidity, durability, shipping problems, sensitivity, and life of components used to measure nitrogen dioxide.

# XII. APPENDIX IV

## MATERIAL SAFETY DATA SHEET

The following items of information which are applicable to a specific product or material shall be provided in the appropriate block of the Material Safety Data Sheet (MSDS).

The product designation is inserted in the block in the upper left corner of the first page to facilitate filing and retrieval. Print in upper case letters as large as possible. It should be printed to read upright with the sheet turned sideways. The product designation is that name or code designation which appears on the label, or by which the product is sold or known by employees. The relative numerical hazard ratings and key statements are those determined by the procedures described in Chapter V, Part B, of the NIOSH publication, An Identification System for Occupationally Hazardous Materials. [229] The company identification may be printed in the upper right corner if desired.

### (a) Section I. Product Identification

The manufacturer's name, address, and regular and emergency telephone numbers (including area code) are inserted in the appropriate blocks of Section I. The company listed should be a source of detailed backup information on the hazards of the material(s) covered by the MSDS. The listing of suppliers or wholesale distributors is discouraged. The trade name should be the product designation or common name associated with the material. The synonyms are those commonly used for the product, especially formal chemical nomenclature. Every known chemical designation or competitor's trade name need not be listed.

(b) Section II. Hazardous Ingredients

The "materials" listed in Section II shall be those substances which are part of the hazardous product covered by the MSDS and individually meet any of the criteria defining a hazardous material. Thus, one component of a multicomponent product might be listed because of its toxicity, another component because of its flammability, while a third component could be included both for its toxicity and its reactivity. Note that a MSDS for a single component product must have the name of the material repeated in this section to avoid giving the impression that there are no hazardous ingredients.

Chemical substances should be listed according to their complete name derived from a recognized system of nomenclature. Where possible, avoid using common names and general class names such as "aromatic amine," "safety solvent," or "aliphatic hydrocarbon" when the specific name is known.

The "%" may be the approximate percentage by weight or volume (indicate basis) which each hazardous ingredient of the mixture bears to the whole mixture. This may be indicated as a range or maximum amount, ie, "10-40% vol" or "10% max wt" to avoid disclosure of trade secrets.

Toxic hazard data shall be stated in terms of concentration, mode of exposure or test, and animal used, ie, "100 mg/kg LD50-oral-rat," "25 mg/kilo LD50-skin-rabbit," "75 ppm LC man," or "permissible exposure from 29 CFR 1910.1000," or if not available, from other sources of publications, such as the American Conference of Governmental Industrial Hygienists or the American National Standards Institute Inc. Flammable or reactive data could be flash point, shock sensitivity, or other brief data indicating nature of the hazard.

### (c) Section III. Physical Data

The data in Section III should be for the total mixture and should include the boiling point and melting point in degrees Fahrenheit (Celsius in parentheses); vapor pressure, in conventional millimeters of mercury (mmHg); vapor density of gas or vapor (air = 1); solubility in water, in parts/hundred parts of water by weight; specific gravity (water = 1); percent volatiles (indicated if by weight or volume) at 70 degrees F (21.1 degrees C); evaporation rate for liquids or sublimable solids, relative to butyl acetate; and appearance and odor. These data are useful for the control of toxic substances. Boiling point, vapor density, percent volatiles, vapor pressure, and evaporation are useful for designing proper ventilation equipment. This information is also useful for design and deployment of adequate fire and spill containment equipment. The appearance and odor may facilitate identification of substances stored in improperly marked containers, or when spilled.

### (d) Section IV. Fire and Explosion Data

Section IV should contain complete fire and explosion data for the product, including flash point and autoignition temperature in degrees Fahrenheit (Celsius in parentheses); flammable limits, in percent by volume in air; suitable extinguishing media or materials; special firefighting procedures; and unusual fire and explosion hazard information. If the product presents no fire hazard, insert "NO FIRE HAZARD" on the line labeled "Extinguishing Media."

### (e) Section V. Health Hazard Information

The "Health Hazard Data" should be a combined estimate of the hazard of the total product. This can be expressed as a TWA concentration, as a permissible exposure, or by some other indication of an acceptable standard. Other data are acceptable, such as lowest LD50, if multiple components are involved.

Under "Routes of Exposure," comments in each category should reflect the potential hazard from absorption by the route in question. Comments should indicate the severity of the effect and the basis for the statement if possible. The basis might be animal studies, analogy with similar products, or human experiences. Comments such as "yes" or "possible" are not helpful. Typical comments might be:

> Skin Contact--single short contact, no adverse effects likely; prolonged or repeated contact, mild irritation and possibly some blistering.
>
> Eye Contact--some pain and mild transient irritation; no corneal scarring.

"Emergency and First Aid Procedures" should be written in lay language and should primarily represent first aid treatment that could be provided by paramedical personnel or individuals trained in first aid.

Information in the "Notes to Physician" section should include any special medical information which would be of assistance to an attending physician including required or recommended preplacement and periodic medical examinations, diagnostic procedures, and medical management of overexposed workers.

(f) Section VI. Reactivity Data

The comments in Section VI relate to safe storage and handling of hazardous, unstable substances. It is particularly important to highlight instability or incompatibility with common substances or circumstances, such as water, direct sunlight, steel or copper piping, acids, alkalies, etc. "Hazardous Decomposition Products" shall include those products released under fire conditions. It must also include dangerous products produced by aging, such as peroxides in the case of some ethers. Where applicable, shelf life should also be indicated.

(g) Section VII. Spill or Leak Procedures

Detailed procedures for cleanup and disposal should be listed with emphasis on precautions to be taken to protect workers assigned to cleanup detail. Specific neutralizing chemicals or procedures should be described in detail. Disposal methods should be explicit including proper labeling of containers holding residues and ultimate disposal methods such as "sanitary landfill" or "incineration." Warnings such as "comply with local, state, and federal antipollution ordinances" are proper but not sufficient. Specific procedures shall be identified.

(h) Section VIII. Special Protection Information

Section VIII requires specific information. Statements such as "Yes," "No," or "If necessary" are not informative. Ventilation requirements should be specific as to type and preferred methods. Respirators shall be specified as to type and NIOSH or US Bureau of Mines approval class, ie, "Supplied air," "Organic vapor canister," "Suitable for dusts not more toxic than lead," etc. Protective equipment must be specified as to type and materials of construction.

(i) Section IX. Special Precautions

"Precautionary Statements" shall consist of the label statements selected for use on the container or placard. Additional information on any aspect of safety or health not covered in other sections should be inserted in Section IX. The lower block can contain references to published guides or in-house procedures for handling and storage. Department of Transportation markings and classifications and other freight, handling, or storage requirements and environmental controls can be noted.

(j) Signature and Filing

Finally, the name and address of the responsible person who completed the MSDS and the date of completion are entered. This will facilitate correction of errors and identify a source of additional information.

The MSDS shall be filed in a location readily accessible to workers potentially exposed to the hazardous material. The MSDS can be used as a training aid and basis for discussion during safety meetings and training of new employees. It should assist management by directing attention to the need for specific control engineering, work practices, and protective measures to ensure safe handling and use of the material. It will aid the safety and health staff in planning a safe and healthful work environment and suggesting appropriate emergency procedures and sources of help in the event of harmful exposure of employees.

# MATERIAL SAFETY DATA SHEET

## I PRODUCT IDENTIFICATION

| | |
|---|---|
| MANUFACTURER'S NAME | REGULAR TELEPHONE NO.<br>EMERGENCY TELEPHONE NO. |

ADDRESS

**TRADE NAME**

**SYNONYMS**

## II HAZARDOUS INGREDIENTS

| MATERIAL OR COMPONENT | % | HAZARD DATA |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

## III PHYSICAL DATA

| | | |
|---|---|---|
| BOILING POINT, 760 MM HG | | MELTING POINT |
| SPECIFIC GRAVITY ($H_2O$=1) | | VAPOR PRESSURE |
| VAPOR DENSITY (AIR=1) | | SOLUBILITY IN $H_2O$, % BY WT |
| % VOLATILES BY VOL. | | EVAPORATION RATE (BUTYL ACETATE=1) |
| APPEARANCE AND ODOR | | |

## IV FIRE AND EXPLOSION DATA

| | | | |
|---|---|---|---|
| FLASH POINT (TEST METHOD) | | AUTOIGNITION TEMPERATURE | |

| | | | | |
|---|---|---|---|---|
| FLAMMABLE LIMITS IN AIR, % BY VOL. | LOWER | | UPPER | |

| | |
|---|---|
| EXTINGUISHING MEDIA | |
| SPECIAL FIRE FIGHTING PROCEDURES | |
| UNUSUAL FIRE AND EXPLOSION HAZARD | |

## V HEALTH HAZARD INFORMATION

HEALTH HAZARD DATA

ROUTES OF EXPOSURE

INHALATION

SKIN CONTACT

SKIN ABSORPTION

EYE CONTACT

INGESTION

EFFECTS OF OVEREXPOSURE

ACUTE OVEREXPOSURE

CHRONIC OVEREXPOSURE

EMERGENCY AND FIRST AID PROCEDURES

EYES

SKIN

INHALATION

INGESTION

NOTES TO PHYSICIAN

## VI REACTIVITY DATA

CONDITIONS CONTRIBUTING TO INSTABILITY

INCOMPATIBILITY

HAZARDOUS DECOMPOSITION PRODUCTS

CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION

## VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

NEUTRALIZING CHEMICALS

WASTE DISPOSAL METHOD

## VIII SPECIAL PROTECTION INFORMATION

VENTILATION REQUIREMENTS

SPECIFIC PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY (SPECIFY IN DETAIL)

EYE

GLOVES

OTHER CLOTHING AND EQUIPMENT

## IX SPECIAL PRECAUTIONS

| |
|---|
| PRECAUTIONARY STATEMENTS |
| OTHER HANDLING AND STORAGE REQUIREMENTS |

PREPARED BY

ADDRESS:

DATE