NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND

SUPPORTING DOCUMENTATION FOR

*** TELLURIUM ***

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for TELLURIUM

The basic text of this document contains the draft technical standard approved by the Joint Review Committee of the NIOSH/OSHA Standards Completion Program and the supporting documentation for the substance TELLURIUM.

The SCP draft technical standards are recommendations to the Department of Labor for its consideration in rulemaking and have no legal status until final rules have been promulgated by that agency. This draft standard is provided for your information only.

The References and Sources, Respirator Table Documentation and Use/Exposure and Control Documentation are the working documents used by the various SCP working groups during the development of the draft technical standard and serve as the technical foundation for the standard. The classification for each substance and the regulatory statements were derived following a decision logic established for the various sections of the standard.

(a) Definitions. (1) "Permissible exposure" means exposure of employees to airborne concentrations of tellurium and compounds (as tellurium) not in excess of 0.1 milligrams per cubic meter (mg/M3) averaged over an eight-hour work shift (time weighted average), as stated in $ 1910.1000, Table Z-1.

(2) "Action level" means one-half of the permissible exposure for tellurium and compounds averaged over an eight-hour work shift.

(3) This section does not include tellurium hexafluoride.

(b) Initial determination and exposure measurement. (1) Each employer who has a place of employment in which tellurium and compounds is released into the workplace air shall determine if there is any possibility that any employee may be exposed to airborne concentrations of tellurium above the permissible level. The initial determination shall be made each time there is a change in production, process, or control measures which may result in an increase in airborne concentrations of tellurium and compounds.

(2) A written record of the initial determination shall be made and shall contain at least the following information:

(i) Any information, observations, or calculations which may indicate employee exposure to tellurium and compounds;

(ii) Any measurements of tellurium and compounds taken;

(iii) Any employee complaints of symptoms which may be attributable to exposure to tellurium and compounds; and

(iv) Date of initial determination, work being performed at the time, location within work site, and employees considered.

(3) If the employer determines that any employee may be exposed to tellurium and compounds above the permissible exposure, the exposure of the employee in each work operation who is believed to have the greatest exposure shall be measured. The exposure measurement shall be representative of the maximum eight-hour time weighted average exposure of the employee.

(4) If the exposure measurement taken pursuant to paragraph (b) (3) of this section reveals employee exposure to tellurium and compounds above the action level, the employer shall:

(i) Identify all employees who may be exposed above the permissible level; and

(ii) Measure the exposure of the employees so identified.

(5) If an employee exposure measurement reveals that an employee is exposed to tellurium and compounds above the action level, but not above the permissible exposure, the exposure of that employee shall be measured at least every three months.

(6) If an employee exposure measurement reveals that an employee is exposed to tellurium and compounds above the permissible exposure, the employer shall:

(i) Measure the exposure monthly of the employee so exposed; and

(ii) Institute control measures as required by paragraph (d) of this section; and

(iii) Individually notify, in writing, within five days, every employee who is found to be exposed to tellurium and compounds above the permissible exposure. The employee shall also be notified of the results of the exposure measurements and of the corrective action being taken to reduce the exposure to below the permissible exposure.

(7) If two consecutive employee exposure measurements taken at least one week apart reveal that the employee is exposed to tellurium and compounds below the action level, the employer may terminate measurement for the employee.

(8) For purposes of this paragraph, employee exposure is that which would occur if the employee were not using a respirator.

(c) Methods of measurement. (1) An employee's exposure shall be obtained by any combination of long term or short term samples which represents the employee's actual exposure averaged over an eight-hour work shift (See Appendix B (IV) of this section).

(2) The method of measurement shall have an accuracy, to a confidence level of 95 percent, of not less than that given in Table 1.

Table 1

Concentration	Required Accuracy (Percent of True Value)
Above permissible exposure	± 25
At or below permissible exposure and above the action level	± 35
At or below the action level	± 50

(d) Compliance. (1) No employee shall be exposed to tellurium and compounds above the permissible exposure as defined in paragraph (a)(1) of this section.

(2) Employee exposures to airborne concentrations of tellurium compounds shall be controlled to at or below the permissible exposure by engineering and work practice controls.

(i) Engineering and work practice controls shall be instituted to reduce exposures to at or below the permissible exposure, except to the extent that such controls are not feasible.

(ii) Wherever engineering and work practice controls are not sufficient to reduce exposures to at or below the permissible exposure, they shall nonetheless be used to reduce exposure to the lowest level feasible and shall be supplemented by respirators in accordance with paragraph (d)(4) of this section.

(3) Engineering controls. When local exhaust is used to control exposure, measurements which demonstrate system effectiveness, for example, air velocity or static pressure shall be made at least every three months. Measurements of system effectiveness shall also be made within five days of any change in production, process, or control which might result in an increase in airborne concentrations of tellurium compounds.

(4) Compliance with the permissible exposure shall not be achieved by the use of respirators except:

(i) During the time period necessary to install or implement engineering or work practice controls; or

(ii) In work situations in which engineering and work practice controls are not feasible; or

(iii) To supplement engineering and work practice controls when such controls fail to reduce airborne concentrations of tellurium compounds to at or below the permissible exposure; or

(iv) For operations which require entry into tanks or closed vessels; or

(v) In emergencies.

(5) Where respirators are needed and permitted under this paragraph to reduce employee exposure, the employer shall select and provide the appropriate respirator from Table 2 and shall ensure that the employee uses the respirator provided.

TABLE 2 RESPIRATORY PROTECTION FOR TELLURIUM AND COMPOUNDS (AS TELLURIUM)

CONDITION	PERMISSIBLE RESPIRATORY PROTECTION
Particulate Concentration	
0.5 mg/M3 or less	Any dust and mist respirator except single use.
1 mg/M3 or less	Any dust and mist respirator, except single-use respirator or quarter-mask.
	Any fume respirator or high efficiency particulate filter respirator.
	Any supplied-air respirator.
	Any self-contained breathing apparatus.
5 mg/M3 or less	A high efficiency particulate filter respirator with a full facepiece.
	Any supplied-air respirator with a full facepiece, helmet or hood.
	Any self-contained breathing apparatus with a full facepiece.
50 mg/M3 or less	A powered air-purifying respirator with a high efficiency particulate filter.
	A Type C supplied-air respirator operated in pressure - demand or other positive pressure or continuous-flow mode.
Greater than 50 mg/M3 or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
	A combination respirator which includes a Type C supplied - air respirator with a full facepiece operated in pressure - demand or other positive pressure or continuous-flow mode

	and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any escape self-contained breathing apparatus.
	A high efficiency particulate filter respirators.

(6) Respirators shall be approved by the Mining Enforcement and Safety Administration (formerly Bureau of Mines) or by the National Institute for Occupational Safety and Health under the provisions of 30 CFR Part 11.

(7) The employer shall institute a respiratory protection program in accordance with § 1910.134(b), (d), (e), and (f).

(e) Fire and safety. (1) The employer shall familiarize himself with the information contained in the Substance Technical Guidelines (Appendix B of this section) for metallic tellurium.

(2) For the purpose of compliance with § 1910.309, locations classified as hazardous locations due to the presence of metallic tellurium shall be Class II, Group E.

(3) For the purpose of compliance with § 1910.157, metallic tellurium is classified as a Class D fire hazard.

(4) For the purpose of compliance with § 1910.178, locations classified as hazardous locations due to the presence of metallic tellurium shall be Class II, Group E.

(5) Sources of ignition such as smoking or open flames are prohibited where metallic tellurium presents a fire or explosion hazard.

(6) Metallic tellurium and hydrogen telluride shall be stored so as not to come in contact with strong oxidizers.

(f) Personal protective equipment. (1) Employers shall provide and ensure that employees use appropriate protective clothing and equipment necessary to prevent the skin from becoming frozen from contact with hydrogen telluride or from contact with vessels containing hydrogen telluride.

(2) Employers shall provide and ensure that employees use appropriate protective clothing and equipment necessary to prevent repeated or prolonged skin contact with potassium telluride, sodium tellurate or liquids containing these compounds. Face shields shall comply with § 1910.133(a)(2),(a)(4), (a)(5), and (a)(6).

(3) Employers shall ensure that employees whose clothing may have become contaminated with potassium tellurite, sodium tellurate, or liquids containing these compounds change into uncontaminated clothing before leaving the work premises.

(4) Employers shall ensure that clothing contaminated with potassium tellurite or sodium tellurate is placed in closed containers for storage until it can be discarded or until the employer provides for the removal of the contaminant from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the contaminant, the employer shall inform the person performing the operation of the hazardous properties of the contaminant.

(5) Employers shall ensure that clothing which becomes wet with liquid hydrogen telluride be removed immediately and not reworn until the hydrogen telluride has evaporated.

(6) Employers shall ensure that non-impervious clothing which becomes contaminated with potassium tellurite be removed promptly and not reworn until the potassium tellurite is removed from the clothing.

(7) Employers shall provide and ensure that employees use splash-proof safety goggles which comply with § 1910.133(a)(2)-(a)(6) where liquid hydrogen telluride may contact the eyes.

(g) Spills and disposal. In the event that tellurium compounds are spilled the employer shall immediately provide available ventilation and then clean up the spill.

(h) Sanitation. (1) Employers shall ensure that employees whose skin becomes contaminated with potassium tellurite promptly wash or shower to remove any contaminant from the skin.

(2) Employers shall ensure that employees do not eat or smoke in areas where potassium tellurite, sodium tellurate, or liquids containing these compounds are handled, processed or stored.

(3) Employers shall ensure that employees who handle potassium tellurite, sodium tellurate, or liquids containing these compounds wash their hands thoroughly with soap or mild detergent and water before eating or smoking.

(i) Training and information. (1) Each employer who has a workplace in which tellurium and compounds is present shall keep a copy of this regulation with Appendixes A, B and C at the workplace. This material shall be made readily available to affected employees.

(2) Each employer who has employees exposed to tellurium compounds above the action level without regard to the use of respirators, or employees who may have repeated or prolonged skin contact with solid potassium telluride or liquids containing potassium telluride, or who may have skin contact with liquid hydrogen telluride or frozen vessels containing hydrogen telluride or who may have eye contact with liquid hydrogen telluride or employees who work where tellurium and compounds present a fire or explosion hazard shall annually:

(i) Inform affected employees of the information contained in the Substance Safety Data Sheet for tellurium and compounds (Appendix A of this section);

(ii) Advise affected employees as to the signs and symptoms of exposure to tellurium and compounds.

(iii) Instruct affected employees to advise the employer of the development of signs and symptoms of overexposure to tellurium and compounds which are listed in Appendix A of the section;

(iv) Instruct affected employees to inform the employer if they develop any of the medical conditions listed in paragraph (j)(2) of this section; and

(v) Provide training to ensure that employees understand the precautions of safe use, emergency procedures, and the correct use of protective equipment relative to tellurium and compounds.

(j) Medical survillance. (1) The employer shall provide medical procedures as required by this paragraph. All medical procedures shall be performed by or under the supervision of a physician at no cost to the employee.

(2) Each employer who has employees exposed to airborne concentrations of tellurium and compounds above the action level, without regard to the use of respirators, or employees who may have repeated or prolonged skin contact with solid potassium telluride or liquids containing potassium telluride, shall obtain information as to whether such employee has a history of any of the following medical conditions:

(i) Chronic lung disease;

(ii) Skin disease;

(iii) Neurological disorders; and

(iv) Blood disease.

(3) The employer shall provide a medical examination for the employee if:

(i) The employee provides a history of any of the medical conditions listed in paragraph (j)(2) of this section; or

(ii) The employee informs the employer of the development of any of the medical conditions listed in paragraph (j)(2) of this section or any of the signs or symptoms of exposure to tellurium and compounds which are listed in Appendix A which the employee suspects are caused by exposure to tellurium and compounds.

(4) The employer shall provide to the examining physician the following information:

(i) A copy of this regulation with Appendixes A, B and C for tellurium and compounds;

(ii) A description of the affected employee's duties as they relate to his exposure to tellurium and compounds;

(iii) A description of any personal protective equipment and respirators required to be used;

(iv) The results of any measurements which may indicate the affected employee's exposure;

(v) The affected employee's anticipated exposure; and

(vi) Upon request of the physician, any available information from previous medical examinations of the affected employee.

(5) Where a medical examination is required by paragraph (j)(3) of this section, following such examination the employer shall obtain a written opinion from the examining physician which conforms with paragraph (j)(6) of this section.

(6)(i) The physician's written opinion by the examining physician shall specifically state: (A) Whether the employee has any detected medical condition which would place the employee at increased risk of material impairment of the employee's health from exposure to tellurium and compounds;

(B) Any recommended limitations upon the employee's exposure to tellurium and compounds including limitations upon the use of personal protective equipment and respirators;

(C) That the employee has been informed by the physician of any detected medical conditions which require further medical examination or treatment.

(ii) The physician's written opinion shall not reveal specific medical findings or diagnoses unrelated to the employee's employment.

(iii) The employer shall provide the employee with a copy of the physician's written opinion.

(7) No employee shall be exposed to tellurium and compounds in such a way as would put the employee at increased risk of material impairment of his

health from such exposure. The employer shall base this decision on any information available including the physician's written opinion.

(8) The employer shall provide emergency medical treatment for any employee injured through exposure to tellurium and compounds.

(9) If an employee refuses any required medical examination, the employer shall inform the employee of the possible health consequences of such refusal and obtain a signed statement from the employee indicating that the employee understands the risk involved by refusal to be examined.

(10) No medical procedure which would be performed pursuant to this section need be performed if records of a previous such procedure performed within the past six months are acceptable to the examining physician.

(k) Recordkeeping. (1) Exposure determination. (i) The employer shall keep an accurate record of all determinations required to be made pursuant to paragraph (b)(1) of this section.

(ii) This record shall include the written determination required in paragraph (b)(2) of this section.

(iii) This record shall be maintained until replaced by a more recent record.

(2) Exposure measurements. (i) The employer shall keep an accurate record of all measurements taken to determine employee exposure to tellurium and compounds.

(ii) This record shall include:

(A) The date of measurement;

(B) Operations involving exposure to tellurium and compounds which are being monitored;

(C) Sampling and analytical method used and evidence of their accuracy;

(D) Number, duration, and results of samples taken; and

(E) Name and exposure of the employee monitored.

(iii) This record shall be maintained until replaced by a more recent record but in no event for less than one year.

(3) Mechanical ventilation. (i) When mechanical ventilation is used as an engineering control, the employer shall maintain an accurate record of the measurements demonstrating the effectiveness of such ventilation required by paragraph (d)(3) of this section.

(ii) This record shall include:

(A) Date of measurement;

(B) Type of measurement taken;

(C) Result of measurement.

(iii) These records shall be maintained for at least one year.

(4) Employee training and information. (i) The employer shall keep an accurate record of all employee training and information required by paragraph (i) of this section.

(ii) This record shall include:

(A) Date of training;

(B) Name of employee trained;

(C) Content or scope of training provided.

(iii) This record shall be maintained until replaced by a more recent record.

(5) Medical surveillance. (i) The employer shall keep an accurate record of employee medical surveillance required by paragraph (j) of this section.

(ii) This record shall include:

(A) The name of the employee;
(B) Information concerning medical conditions obtained from the employee pursuant to paragraph (j)(2) of this section;
(C) Any employee medical complaints relative to exposure to tellurium and compounds;
(D) A copy of information provided to the physician pursuant to paragraph (j)(4)(ii), (iii), (iv), (v), and (vi) of this section.
(E) Physician's written opinion; and
(F) A signed statement of any refusal to be examined.
(iii) This record shall be maintained for the duration of and for one year after termination of the employment of the affected employee.
(6) Access to records. (i) All records required to be maintained by this section shall be made available upon request to authorized representatives of the Assistant Secretary of Labor for Occupational Safety and Health and the Director of the National Institute for Occupational Safety and Health.
(ii) Each employee or former employee shall have access to the exposure determination and exposure measurement records required to be maintained by this section which indicate his own exposure to tellurium and compounds.
(iii) Employee medical records required to be maintained by this section shall be made available upon written request to a physician designated by the employee or former employee.
(l) Employee observation of measurement. (1) The employer shall give each employee or his representative an opportunity to observe any measurement of his exposure to tellurium and compounds which is conducted pursuant to this section.
(2) When observation of measurement of employee exposure to tellurium and compounds requires entry into an area where the use of personal protective devices, including respirators, is required, the observer shall be provided with and required to use such equipment and comply with all other applicable safety procedures.
(3) Without interfering with the measurement, observers shall be entitled to:
(i) Receive an explanation of the measurement procedure.
(ii) Visually observe all steps related to the measurement of the airborne concentration of tellurium and compounds that are being performed at the place of exposure; and
(iii) Record the results obtained.

NOTE: The information contained in the following appendix for tellurium and compounds is neither intended, by itself, to create any additional obligations not otherwise imposed, nor detract from any existing obligations. To the extent the information supplements this regulation for tellurium and compounds, it is advisory in nature.

APPENDIX A

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for TELLURIUM

SUBSTANCE SAFETY DATA SHEET FOR TELLURIUM AND COMPOUNDS (AS TELLURIUM)

I. SUBSTANCE IDENTIFICATION

A. Substance: Tellurium and compounds

B. Permissble exposure: 0.1 milligram of tellurium and compounds (as tellurium) per cubic meter of air (mg/M3) averaged over an eight-hour workshift.

C. Appearance and odor: a) Tellurium: Odorless, grayish colored solid with a metallic luster; b) Hydrogen telluride: Colorless gas with an arsenic-like odor; c) Potassium tellurite: White, odorless solid; d) Sodium tellurate: White, odorless solid

II. HEALTH HAZARD DATA

A. Ways in which the chemical affects your body: Tellurium and compounds can affect your body if you inhale them or if they come in contact with your eyes or skin or if you swallow them. They may enter your body through your skin.

B. Effects of exposure:

1. Short-term Exposure: Tellurium, hydrogen telluride, potassium tellurite, or sodium tellurate causes garlic odor of the breath and sweat, dryness of the mouth, metallic taste, sleepiness, loss of appetite and nausea. Tellurium dioxide exposure may cause a temporary loss of sweat function.
2. Long-term Exposure: Tellurium hydride is highly toxic. It has produced irritation of the lungs and destruction of red blood cells in animals.
3. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms and suspect that they are caused by exposure to tellurium and compounds.

III. EMERGENCY FIRST AID PROCEDURES

A. Eye Exposure: If tellurium and compounds get into your eyes, wash your eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation persists after washing, get medical attention. Contact lenses should not be worn when working with this chemical.

B. Skin Exposure: If tellurium and compounds get on your skin, promptly wash the contaminated skin using soap or mild detergent and water. If tellurium and compounds penetrate through your clothing, remove the clothing promptly and wash the skin using soap or mild detergent and water. Get medical attention promptly.

C. Breathing: If you or any other person breathes in large amounts of tellurium and compounds, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

D. Swallowing: When tellurium and compounds have been swallowed, give the person large quantities of water immediately. After the water has been swallowed try to get

the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical attention immediately.

E. Rescue: Move affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty yourself. Understand your emergency rescue procedures and know the locations of the equipment before the need arises.

IV. RESPIRATORS AND PROTECTIVE CLOTHING

A. Respirators: Respirators are not the best way to control exposure to tellurium and compounds. You can only be required to wear them for routine use if your employer is in the process of installing controls or control measures prove inadequate. You may be required to wear respirators for non-routine activities or in emergencies. If respirators are worn, they must have a Mining Enforcement and Safety Administration (MESA) or National Institute for Occupational Safety and Health (NIOSH) approval label. (Older respirators may have a Bureau of Mines approval label.) For effective protection, respirators must fit your face and head snugly. Respirators should not be loosened or removed in work situations where there use is required. If you can smell hydrogen telluride while wearing a respirator, the respirator is not working correctly; go immediately to fresh air. If you experience difficulty breathing while wearing a respirator, tell your employer.

B. Protective Clothing: You must wear appropriate protective clothing and equipment to prevent the skin from becoming frozen from contact with liquid hydrogen telluride or from contact with vessels containing hydrogen telluride. You must wear appropriate protective clothing and equipment to prevent repeated or prolonged skin contact with potassium tellurite or liquids containing potassium tellurite. Replace or repair impervious clothing that has developed leaks.

C. Eye Protection: You must wear splash-proof safety goggles where liquid hydrogen telluride may contact your eyes.

V. PRECAUTIONS FOR SAFE USE, HANDLING, AND STORAGE

A. Tellurium is a combustible solid.

B. Tellurium, hydrogen telluride, potassium tellurite, or sodium tellurate must be stored in tightly closed containers in a well ventilated area.

C. Tellurium and hydrogen telluride must be stored so as not to come in contact with strong oxidizers.

D. Sources of ignition such as smoking and open flames are prohibited wherever tellurium is handled, used or stored in a manner that could create a potential fire or explosion hazard.

E. If your work clothing may have become contaminated with potassium tellurite, sodium tellurate, or liquids containing these compounds, you must change into uncontaminated clothing before leaving the work premises.

F. You must promptly remove any non-impervious clothing that becomes contaminated with potassium tellurate and this clothing must not be reworn until the potassium tellurate is removed from the clothing.

G. You must immediately remove any non-impervious clothing that becomes wet with hydrogen telluride and this clothing must not be reworn until the hydrogen telluride is removed from the clothing.

H. If your skin becomes contaminated with potassium tellurite, you must promptly wash or shower to remove any potassium tellurite from your skin.

I. You must not eat or smoke in areas where tellurium and compounds or liquids containing these compounds are handled, processed, or stored.

J. If you handle potassium tellurite, sodium tellurate, or liquids containing these compounds, you must wash your hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

K. Fire extinguishers, where provided, must be readily available and you should know where they are and how to operate them.

L. Ask your supervisor where tellurium and compounds are used in your work area and for any additional safety and health rules.

VI. ACCESS TO INFORMATION

A. Each year your employer is required to inform you of the information contained in this Substance Safety Data Sheet for Tellurium and Compounds, emergency procedures, and correct use of protective equipment.

B. Your employer is required to determine whether you are being exposed to tellurium and compounds. You or your representative have the right to observe employee exposure measurements and to record the results obtained. If your employer determines that you are being overexposed, he is required to inform you of the exposure and the actions which are being taken to reduce your exposure.

C. Your employer is required to keep records of your exposure and medical examinations. Your employer is required to keep exposure data for at least one year and to keep medical data during your employment, and for a period of one year following your termination of employment. Your employer is required to make the exposure data available to you upon your request. Your employer is also required to release your medical records to your physician upon your written request.

D. Your employer must give you a copy of the physicians written opinion for any physical examination required by this standard.

NOTE: The information contained in the following appendix for tellurium and compounds is neither intended, by itself, to create any additional obligations not otherwise imposed, nor detract from any existing

obligations. To the extent the information supplements this regulation for tellurium and compounds, it is advisory in nature.

APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES FOR TELLURIUM AND COMPOUNDS (AS TELLURIUM)

(This standard for tellurium and compounds should not be interpreted to apply c listed below for which substance specific information has been provided)

a. Tellurium

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: Tellurium, metallic
2. Formula: Te
3. Molecular weight: 127.6

B. Physical Data

1. Boiling point (760 mm Hg): 1390 C (2534 F)
2. Specific gravity (water = 1): 6.24
3. Vapor density (air = 1 at boiling point of Tellurium): Not applicable
4. Melting point: 450 C (842 F)
5. Vapor pressure at 20 C (68 F): Essentially zero
6. Solubility in water, grams of tellurium per 100 grams of water at 20 C (68 F): Insoluble
7. Evaporation rate (butyl acetate = 1): Not applicable
8. Appearance and odor: Odorless, grayish, colored solid with a metallic luster

b. Hydrogen telluride

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: Tellurium hydride
2. Formula: H_2Te
3. Molecular weight: 129.6

B. Physical Data

1. Boiling point (760 mm Hg): -2 C (28 F)
2. Specific gravity (water = 1): 2.6 (liquid)
3. Vapor density (air = 1 at boiling point of Hydrogen telluride): 4.5
4. Melting point: -50 C (-58 F)
5. Vapor pressure at 20 C (68 F): 1600 mm Hg approx.
6. Solubility in water, grams of hydrogen telluride per 100 grams of water at 20 C (68 C): Reacts
7. Evaporation rate (butyl acetate = 1): Not applicable
8. Appearance and odor: Colorless gas with a characteristic od like arsenic

c. Potassium tellurite

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: None
2. Formula: K_2TeO_3
3. Molecular weight: 253.8

B. Physical Data

1. Boiling point (760 mm Hg): Decomposes
2. Specific gravity (water = 1): Data not available
3. Vapor density (air = 1 at boiling point of Potassium tellurite): Not applicable
4. Melting point: 450 C (842 F) decomposes
5. Vapor pressure at 20 C (68 F): Essentially zero
6. Solubility in water, grams of potassium tellurite per 100 grams of water at 20 C (68 F): Very soluble
7. Evaporation rate (butyl acetate = 1): Not applicable
8. Appearance and odor: White, odorless solid

d. Sodium tellurate

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: Sodium tellurate dihydrate
2. Formula: $Na_2H_4TeO_6$
3. Molecular weight: 273.6

B. Physical Data

1. Boiling point (760 mm Hg): Decomposes
2. Specific gravity (water = 1): Data not available
3. Vapor density (air = 1 at boiling point of Sodium tellurate): Not applicable
4. Melting point: 170 C (388 F) decomposes
5. Vapor pressure at 20 C (68 F): Essentially zero
6. Solubility in water, grams of sodium tellurate per 100 grams of water at 20 C (68 F): 0.8
7. Evaporation rate (butyl acetate = 1): Not applicable
8. Appearance and odor: White, odorless solid

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

A. Fire

1. Flash point: Not applicable
2. Minimum ignition temperature: a) Tellurium - 340 C (644 F) 550 C (1022 F) cloud; b) Hydrogen telluride - data not available; c) Potassium tellurite and d) Sodium tellurate - not applicable
3. Flammable limits in air, % by volume: Tellurium, potassium tellurite, and sodium tellurate - not applicable; hydrogen telluride - data not available
4. Extinguishing media: Tellurium - water; Hydrogen telluride rarely handled as such; Potassium tellurite and sodium tellurate - not applicable
5. Special fire-fighting procedures: Use water spray to cool containers exposed to a fire.
6. Unusual fire and explosion hazards: Tellurium is a combustible solid. All ignition sources must be controlled where tellurium is used, handled or stored in

a manner that could create a potential fire or explosion hazard.

7. For purposes of complying with 29 CFR 1910.309, the classification of hazardous locations as described in Article 500 of the National Electrical Code for tellurium shall be Class II, Group E.

B. Reactivity

1. Conditions contributing to instability: None (Hydrogen telluride is unstable, but is rarely worked with as such.)
2. Incompatibilites: Contact of tellurium metal or hydrogen telluride with strong oxidizers may cause fires and explosions.
3. Hazardous decomposition products: None.
4. Special precautions: None.

III. SPILL, LEAK, AND DISPOSAL PROCEDURES

A. If tellurium and compounds are spilled, the following steps should be taken:

1. Ventilate area of spill or leak.
2. Collect spilled material in the most convenient and safe manner and deposit in sealed containers for reclamation, or for disposal in a secured sanitary landfill. Liquid containing tellurium and compounds should be absorbed in vermiculite, dry sand, earth or a similar material.
3. For hydrogen telluride, stop flow of gas.

B. Persons not wearing protective equipment should be restricted from areas of spills or leaks until cleanup has been completed.

C. Waste disposal methods: Tellurium and compounds may be disposed of in sealed containers in a secured sanitary landfill.

IV. MONITORING AND MEASUREMENT PROCEDURES

A. EXPOSURE ABOVE THE ACTION LEVEL: Measurements taken for the purpose of determining employee exposure under this section are best taken such that the eight-hour exposure may be determined from a single eight-hour sample or two four-hour samples. Several short-time interval samples (up to 30-minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee). Sampling and analyses may be performed by collection of the particulates and vapors using a high efficiency membrane filter with subsequent chemical analysis of the filter. Detector tubes certified by NIOSH under 42 CFR part 84 or other direct-reading devices calibrated to measure tellurium and compounds may be used. The method of measurement must determine the concentration of tellurium and compounds to plus or minus 35% of the true value.

B. EXPOSURE ABOVE THE PERMISSIBLE EXPOSURE: The monitoring and measurements under this section should be essentially the same as described above. Laboratories performing chemical

analyses should be accredited in Industrial Hygiene Chemistry by the American Industrial Hygiene Association. The method of measurement must determine the concentration of tellurium, hydrogen telluride, potassium tellurite, or sodium tellurate to plus or minus 25% of the true value.

C. METHODS: Methods meeting these accuracy requirements are available from the National Technical Information Service, U. S. Department of Commerce, Springfield, Virginia 22161 under the title "NIOSH Analytical Methods for Set N" (Order number XXXXXXXXXX).

D. QUALIFIED PERSONS: Since many of the duties relating to employee protection are dependent on the results of monitoring and measuring procedures, employers should assure that the evaluation of employee exposures is performed by a competent industrial hygienist or other technically qualified person.

V. MISCELLANEOUS PRECAUTIONS

A. Store tellurium and compounds in tightly closed containers in a well ventilated area.

B. Employers should advise employees of all areas and operations where their exposure to tellurium and compounds could occur.

VI. COMMON OPERATIONS

Common operations in which high exposures to tellurium and compounds may

a) Tellurium: During its metallurgy; during its use as a speci the manufacture of alloys, including semiconductors and thei

b) Hydrogen telluride: as a by-product in the electrolytic refining of lead; when zinc or aluminum tellurides are treated with acids.

c) Potassium tellurite and

d) Sodium tellurate; No commercial uses.

NOTE: The information contained in the following appendix for tellurium and compounds is neither intended, by itself, to create any additional obligations not otherwise imposed, nor detract from any existing obligations. To the extent the information supplements this regulation for tellurium and compounds, it is advisory in nature.

APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. ROUTE OF ENTRY

Inhalation; skin absorption.

II. TOXICOLOGY

Fume or dust of tellurium and its compounds causes garlic odor of the breath and malaise in humans. In animals, acute tellurium intoxication results in restlessness, tremor, diminished reflexes, paralysis, convulsions, somnolence, coma, and death. Tellurium compounds are more toxic than the metal. Administration to pregnant rats of 500 to 3000 ppm tellurium in the diet resulted in high

incidence of hydrocephalic offspring. Weaning rats fed elemental tellurium at a level of 1 percent (10,000 ppm) in the diet developed a neuropathy characterized by segmental demyelination; remyelination and functional recovery occurred despite continued administration of tellurium. Iron foundry workers exposed to concentrations between 0.01 to 0.1 mg/M3 complained of garlic odor of the breath and sweat, dryness of the mouth and metallic taste, somnolence, anorexia, and occasional nausea; urinary concentrations ranged from zero to 0.06 mg/liter; somnolence and metallic taste in the mouth did not appear with regularity until the level of tellurium in the urine was at least 0.01 mg/liter. Skin lesions in the form of scaly itching patches and loss of sweat function occurred in workers exposed to tellurium dioxide in an electrolytic lead refinery. Hydrogen telluride is highly toxic and has caused pulmonary irritation and hemolysis of red blood cells in animals; this gas is very unstable, however, and its occurrence as an actual industrial hazard is unlikely.

III. SIGNS AND SYMPTOMS

Garlic odor of breath and sweat; dryness of mouth, metallic taste; somnolence; anorexia, nausea; loss of sweat function; dermatitis. Hydrogen telluride may cause pulmonary symptoms and hemolysis.

IV. SPECIAL TESTS

The garlic odor is a sensitive and characteristic sign of absorption of tellurium. The concentration of tellurium in the urine may be informative when exposures are high. Signs and symptoms did not occur when the levels were less than 0.01 mg of tellurium per liter of urine, although the garlic odor was reported from a single exposure where the urine levels varied from 0.008 to 0.016 mg/liter.

V. TREATMENT

Remove from exposure. Promptly wash skin with soap or mild detergent and water. If swallowed and the person is conscious, induce vomiting. Observe for delayed pulmonary edema and hemolysis if hydrogen telluride exposure has occurred.

VI. SURVEILLANCE AND PREVENTIVE CONSIDERATIONS

A. GENERAL

Tellurium causes garlic odor of the breath and malaise in workers. Skin absorption may occur. Tellurium in the diet is teratogenic in rats. Although this has not been reported in humans, an increased risk to women of child bearing age

must be considered. Hydrogen telluride may cause pulmonary effects and hemolysis. It is important that the physician become familiar with plant operating conditions in which exposure to tellurium occurs. Those with skin disease may not tolerate the wearing of protective clothing and those with chronic respiratory disease may not tolerate the wearing of negative pressure respirators.

B. PREPLACEMENT

Routine medical histories and physical examinations are not required. However, the employer must screen employees for history of certain medical conditions (listed below) which might place the employee at increased risk from tellurium exposure. Only those giving a positive history of these conditions must be referred for further medical examinations.

1. Skin disease -- Tellurium can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of this agent.

2. Neurologic disorders -- By analogy to effects observed in experimental animals, tellurium may adversely affect the nervous system in man.

3. Blood disease -- Hydrogen telluride is reported to cause hemolysis in animals. Persons with pre-existing blood disorders may be at increased risk from exposure.

4. Chronic respiratory disease -- Hydrogen telluride and other gaseous compounds of tellurium are reported to cause pulmonary effects. In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of certain compounds of tellurium might cause exacerbation of symptoms.

C. PERIODIC EXAMINATIONS

Routine periodic examinations are not required. However, if the employer becomes aware of an employee with the above listed conditions, he must refer such employee for further medical examination.

VII. REFERENCES

1. American Conference of Governmental Industrial Hygienists: "Tellurium," Documentation of the Threshold Limit Values for Substances in Workroom Air (3d ed., 2d printing), Cincinnati, 1974, pp. 245-246.

2. Hygienic Guide Series: "Tellurium," American Industrial Hygiene Association Journal, 25:198-201, 1964.

3. Patty, Frank A.: Industrial Hygiene and Toxicology, Vol. II - Toxicology (2d ed. revised), Interscience Publishing Company, New York, 1963, pp. 907-909.

4. Browning, Ethel: Toxicity of Industrial Metals (2d ed.), Butterworths, London, 1969, pp. 310-316.

5. Cerwenka, E.A. and W.C. Cooper: "Toxicology of Selenium and Tellurium and Their Compouns," Archives of Environmental Health, 3:189, 196-200, 1961.

6. Cooper, W.C., ed.: Tellurium, Van Nostrand Reinhold Company, New York, 1971, pp. 313-321.

7. Duckett, S.: "Fetal Encephalopathy Following Ingestion of Tellurium," Experientia, 26:1239-1241, 1970.

8. Lampert, P., et al: "Tellurium Neuropathy," Acta Neuropathologica (Berl.), 15:308-317, 1970.

REFERENCES AND SOURCES
TELLURIUM COMPOUNDS
1910.1000

(e) Fire and Safety

(1) Electrical - Classification based on National Electrical Code, N
Article 500-2.

(f) Personal Protective Equipment, and, (h) Sanitation

Eye: No references

Skin: Browning, "Toxicity of Industrial Metals;" "Tellurium," Comm. of
Dept. of Env. Resources, Hygienic Information Guide No. 34' Plunk
"Handbook of Industrial Toxicology;" Schwartz et al., "Occupatio
Diseases of the Skin;" AIHA Hygienic Guide Series; Cerwenka, E.
Cooper, W. C., "Toxicology of Selenium and Tellurium and Their C
Archives of Environmental Health, Vol. 3, pg. 189-200.

Ingestion: DeMeig, R. H., "The Toxicity of Ingested Elementary Telluri
Rats and Rat Tissues," Journ. Ind. Hyg.. 28(5), p.229-232; Grant,
"Toxicology of the Eye;" Browning, "Toxicity of Industrial Metals
ACGIH, "Documentation of the Threshold Limit Values for Substance
the Workroom Air;" Gleason, "Bulletin of Supplementary Material
Clinical Toxicology of Commercial Products"

COMMENTS

Eye - Classification: 2 for hydrogen telluride
Output statement numbers: 10
Exceptions: None

A search of the literature failed to reveal any information
concerning the effect of direct eye contact with tellurium, hydr
telluride, potassium tellurite, or sodium tellurate. All except
telluride are therefore assigned a classification of zero. The
boiling point (28 degrees F) of this latter compound indicates th
classification of 2 is warranted to prevent the possibility of
frostbite-type burns.

Skin - Classification: See below
Output statement numbers: See below
Exceptions: None

Browning reports that "skin lesions in the form of dry, scal
itching patches and loss of sweat function have been described .
workers in an electrolytic lead refinery" but gives no details as
whether the elemental metal or its compounds were involved. The
Hygienic Guide and Plunkett suggest that the element may be absor
through the skin but this is concluded to be unlikely. Patty not
the garlic odor may result "from skin absorption from handling te
compounds." Schwartz reports "salts of tellurium are believed to
absorbed through the skin . . ." and reports that "moderate expos
the fumes and dust of tellurium for a few weeks or months caused
metallic taste in the mouth, inhibition of sweat, and a scaliness
itching of the skin." Concerning the workers in the electrolytic
refinery, he notes that they "were exposed to the dust and fumes
tellurium, probably as hydrogen telluride in the fumes and oxides
telluride in the furnace dust."

Cerwenka and Cooper state that "there is some indication tha
soluble tellurium compounds may possibly be absorbed through the
as is the case with selenites and selenates." The AIHA says esse

the same, adding "garlic breath has developed after the handling tellurous acid."

Tellurium has a melting point of 842 degrees F, is insoluble water, and has a vapor pressure of essentially zero at 20 degrees Hydrogen telluride has a boiling point of 28 degrees F and reacts water. Potassium tellurite has a melting point of 842 degrees F (decomposes), is very soluble in water, and has a vapor pressure essentially zero at 20 degrees C. Sodium tellurate has a melting of 338 degrees F (decomposes), is 0.8% soluble in water, and has vapor pressure of essentially zero at 20 degrees C.

From the available information, it is deduced that tellurium negligible effect in direct contact with the skin, that hydrogen telluride presents a frostbite hazard, and that potassium telluri be absorbed through the skin. No deductions can be made concerni effects of sodium tellurate since it is only slightly water solub To be noted is that any skin lesions reported in the literature c attributed to the inhibition of sweating by these substances and to any direct action on the skin.

These observations lead to the conclusions that hydrogen tel should be treated as a low-boiling liquid and that potassium tell warrants classifications of 2 and 6. Because of the lack of deta information, however, only statements 2, 17g, and 17i are specifi this latter compound.

Ingestion - Classification: 1 and 5
Output statement numbers: 5b, 7a, 19, 20b
Exceptions: 7a added

It is well documented that tellurium absorbed into an organi ingestion produces a garlic odor on the breath. DeMeig has studi effects of the oral administration of metallic tellurium to rats; fed them the metal in their food in doses of 375, 750, and 1500 p for periods of 7 - 21 days. At its completion he found no effect food consumption or body weight, although at the highest concentr (1500 ppm) there was a signigicantly lower increase in weight. I general, gross anatomical observations failed to show any abnorma in any of the rats and any garlic-like odor disappeared after dis tinuance of feeding. Grant reports that "experimentally in cats, chronic poisoning has been induced by injection of an oily suspen metallic tellurium subcutaneously or intramuscularly, and this ha found after three months to cause degenerative changes in the gan cells of the retina and in the brain." Browning reports that "ab from the intestinal tract is low, only about 25 per cent of the a ingested." She also reports that Hensen, in a self-experiment, "ingested daily for 7 days doses of 0.4 - 0.88 g of potassium tel he experienced definite drowsiness during the first 3 days; towar end of the period he had anorexia, nausea and cardiac oppression his breath smelt (sic) strongly of the characteristic tellurium c which remained for about 7 weeks."

The ACGIH notes that "tellurium and its compounds, when adde the diet of rats, have shown tellurite and tellurate to be toxic administered at concentrations of 25 to 50 parts per million. El tellurium, on the other hand, had only slight effect on growth at concentration of 1500 ppm. . . . Ingestion or inhalation of as l

as 40 micrograms of Te in soluble form has caused breath odor."

In general, according to Gleason, "tellurium compounds are l
toxic than the corresponding selenium compounds, except that tell
appear to be more toxic than selenites. Although tellurite is mo
toxic than tellurate, limited data suggests (sic) that both would
in toxicity class 5 when given by mouth (i.e., extremely toxic)."

From the available information, it is concluded that classi
of 1 and 5 are justified for potassium tellurite and sodium tellu
Elemental tellurium appears to present a low degree of hazard, in
context of this standard, and is therefore assigned a classificat
Hydrogen telluride is a gas at normal ambient temperatures, and a
a highly toxic compound, is excluded from consideration in this s

SUBSTANCE TECHNICAL GUIDELINES

The references cited for this document include:

Kirk-Othmer, "Encyclopedia of Chemical Technology," 2nd. ed., Vol. 19, p. 756 (K-O)

K. N. Palmer, "Dust Explosions and Fires," Chapman and Hall, London, 1973 (Palmer)

Lange's Handbook of Chemistry, 11th ed. (Lange)

Gmelin's Handbuch der Anorganischem Chemie, Vol. 11; vol. 21, p. 647; vol. 22, p. 799 and supplements (Gmelin)

Sources of data items used:

I. A.1. Synonyms: K-O, Lange
2. Formula: K-O, Gmelin
3. Molecular weight: K-O, Lange, ADL

B.1. Boiling point: Gmelin, Lange
2. Specific gravity: K-O, Lange, ADL
3. Vapor density: ADL
4. Melting point: K-O, Gmelin
5. Vapor pressure: Gmelin
6. Solubility in water: K-O, Gmelin
7. Evaporation rate: Not applicable
8. Appearance and odor: K-O, Gmelin

II. A.1. Flash point: Not applicable
2. Autoignition temperature: Palmer
3. Flammable limits: For hydrogen telluride, data not available; for tellurium, potassium tellurite, and sodium tellurate, not applicable
4. Extinguishing media: ADL
5. Special fire fighting procedures: ADL
6. Unusual fire and explosion hazards: Palmer, Gmelin

B.1. Conditions contributing to instability: ADL, Gmelin
2. Incompatibilities: K-O, Gmelin
3. Hazardous decomposition products: None
4. Special precautions: None

III. A. Steps if released or spilled: ADL

C. Waste disposal method: ADL

V. Miscellaneous precautions: ADL

VI. Common operations: K-O, ACGIH

USE/EXPOSURE AND CONTROL DOCUMENT

References used in the preparation of this document include:

Allen, C. K., "Tellurium," Engineering and Mining Journal 176(3), p. 148 - 9,

1975 (E/MJ)
Browning, E., "Toxicity of Industrial Metals," Butterworths, 1969 (Browning)
Hamilton, A. and Hardy, H. L., "Industrial Toxicology," Publishing Sciences Group, Inc., 3rd edition, 1974 (H/H)
International Labour Organization, "Encyclopedia of Occupational Health and Safety," Geneva, 1972 (ILO)
Kirk, R. and Othmer, D., "Encyclopedia of Chemical Technology," Interscience Publishers, 2nd edition, 1972 (K-O)
Patty, F. A., "Industrial Hygiene and Toxicology," Vol. II, Interscience, 1962 (Patty)
"Tellurium," American Conference of Governmental Industrial Hygienists, Hygienic Guide Series, March - April 1964 (Guide)
"Tellurium," Mining Annual Review - 1972 (Mining Rev)
"Tellurium," Commonwealth of Pennsylvania, Department of Environmental Resources, Occupational Health, Hygiene Information Guide No. 34, July 1971 (Penna #34)
U. S. Department of Interior, Bu Mines Bulletin 650, "Mineral Facts and Problems," 1970 (Bu Mines)

References for Specific Use/Exposure

1. ILO, K-O, Bu Mines, E/MJ, Browning, Patty, Penna #34
2. Bu Mines, E/MJ, ILO, Browning, H/H, K-O
3. ILO, Browning, H/H, K-O, Bu Mines
4. ILO, Mining Rev, Browning, H/H, Penna #34, Bu Mines, K-O
5. ILO, Browning, Penna #34, Bu Mines, K-O
6. Bu Mines, Mining Rev, K-O
7. Bu Mines
8. Penna #34, Bu Mines
9. H/H, Browning
10. Mining Rev., Browning, Bu Mines, K-O

References for Specific Control Methods

K-O, Penna #34, Guide and ILO were the references used in all of the Specific Control Methods.

RESPIRATOR TABLE DOCUMENTATION

SUBSTANCE: Tellurium Compounds

D. O. L. STANDARD: 0.1 mg/M3 (as Tellurium)

Eye Irritation Level: Tellurium is not known to be an eye irritant.

Basis for IDLH: Since there is no evidence of an IDLH concentration for tellur in the available toxicological information, respirators have been select on the basis of the protection factor afforded by each device up to 500 X the permissible exposure limit. Similar inorganic compounds of te sodium tellurate, are twice as toxic acutely as the corresponding seleni e.g. sodium selenate.

Other Toxicological Information: According to the Documentation of TLV's, "there have been no reports of serious illness or death in workers exposed to tellurium and its compounds in industry. The physical complaints and findings which have been reported are sleepiness, loss of appetite, nausea, metallic taste, and a garlic odor to the breath, and perspiration. Of these, the latter is the most troublesome symptom. It is often the only sign that tellurium has been absorbed into the body, and it does not indicate that other symptoms and illnesses are imminent. Some workmen find the odor to be highly objectionable and a handicap socially; others do not seem to mind

it.

"The recommended threshold limit for Te and its compounds (except H2Te) as dust or fume in air is 0.1 mg Te/M3. Although this concentration is safe, so far as poisoning is concerned, it will probably result in garlic breath among exposed employees. Ingestion or inhalation of as little as 40 micrograms of Te in soluble form has caused breath odor."

According to the AIHA Hygienic Guides, "the maximum concentration of tellurium in the air which does not cause garlic breath appears to be 0.01 to 0.02 milligram per cubic meter."

The Hygienic Information Guide for Tellurium of the Pennsylvania Department of Environmental Resources Occupational Health states that "hydrogen telluride is a powerful blood poison causing break down of red blood cells." The Documentation of TLV's states that "the gas is highly unstable, however, and its occurrence as an actual industrial hazard is very doubtful."

USE/EXPOSURE AND CONTROL DOCUMENT
TELLURIUM COMPOUNDS

	Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1.	Inhalation of dust or fume and skin contact with dust or fume during recovery, purification, and packaging of tellurium (usually recovered from anode mud of copper and lead refining and prepared as powder, slabs, tablets, or sticks)	A,B,D	Process enclosure; local exhaust ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, coats); good personal hygiene practice
2.	Inhalation of dust or fume and skin contact with dust or fume during manufacture of alloys with copper, steel, lead, tin, silver, magnesium, nickel, and phosphorus (telnic bronze). (Te improves workability and machinability of the metals.) Tellurium-copper is used in electrical and communications industries and for welding and cutting tips. Tellurium-lead alloys are used in marine-cable sheathing and for chemical process equipment	A,B,D	Process enclosure or local exhaust ventilation; personal protective equipment (gloves, goggles, respiratory protecti devices, coats); good persona hygiene practice
3.	Inhalation of dust or fume and skin contact with dust or fume during use in manufacture of cast iron (acts as carbide stabilizer; used for control of chill rate of iron castings). Tellurium is added as pellets, tablets, or powder or is used as a mold dressing. Tellurium-chilled iron is used in mining, automotive, railroad, and other equipment	A,B,D	Process enclosure or local exhaust ventilation; personal protective equipment (gloves, goggles, respiratory protecti devices, coats); good persona hygiene practice
4.	Inhalation of dust or fume and skin contact with dust or fume during use in manufacture of natural and	A,B,D	Process enclosure or local exhaust ventilation; personal protective equipment (gloves, goggles, respiratory protecti

	synthetic rubber and plastics. Rubber is used in hose and cable coverings for mining, dredging, and welding; in vehicular tires; in special conveyor belts.		devices, coats); good persona hygiene practice
5.	Inhalation of dust or fume and skin contact with dust or fume during use in ceramics and glass manufacture (used in special optical glass and for manufacture of black, red, blue, and brown colorants for ceramics)	A,B,D	Process enclosure or local exhaust ventilation; personal protective equipment (gloves, goggles, respiratory protecti devices, coats); good persona hygiene practice
6.	Inhalation of dust or fume and skin contact with dust or fume during use in manufacture of thermoelectric devices (small cooling boxes, water-coolers, remote-power generators, solar-energy converters, small-scale control apparatus)	A,B,D	Process enclosure or local exhaust ventilation; personal protective equipment (gloves, goggles, respiratory protecti devices, coats); good persona hygiene practice
7.	Inhalation of dust or fume and skin contact with dust or fume during use in manufacture of electronic devices (Li-Te batteries, solar cells, infrared windows, dopants for semiconductor equipment	A,B,D	Process enclosure or local exhaust ventilation; personal protective equipment (gloves, goggles, respiratory protecti devices, coats); good persona hygiene practice
8.	Inhalation of dust or fume and skin contact with dust or fume during manufacture of tellurium compounds (insecticides, germicides, fungicides, photographic print toners)	A,B,D	Process enclosure or local exhaust ventilation; personal protective equipment (gloves, goggles, respiratory protecti devices, coats); good persona hygiene practice
9.	Inhalation of dust or fume and skin contact with dust or fume during refining of various minerals (tellurium is an impurity in lead, bismuth, and copper ores)	A,B,D	Process enclosure or local exhaust ventilation; personal protective equipment (gloves, goggles, respiratory protecti devices, coats); good persona hygiene practice

10.	Inhalation of dust or fume and skin contact with dust or fume during use as a catalyst for acrylic monomer production	A,B,D	Process enclosure or local exhaust ventilation; personal protective equipment (gloves, goggles, respiratory protective devices, coats); good personal hygiene practice

A -- Inhalation
B -- Skin and eye contact resulting in localized irritation
C -- Ingestion
D -- Skin contact resulting in absorption and subsequent systemic poisoning

------ JES2 JOB STATISTICS ------

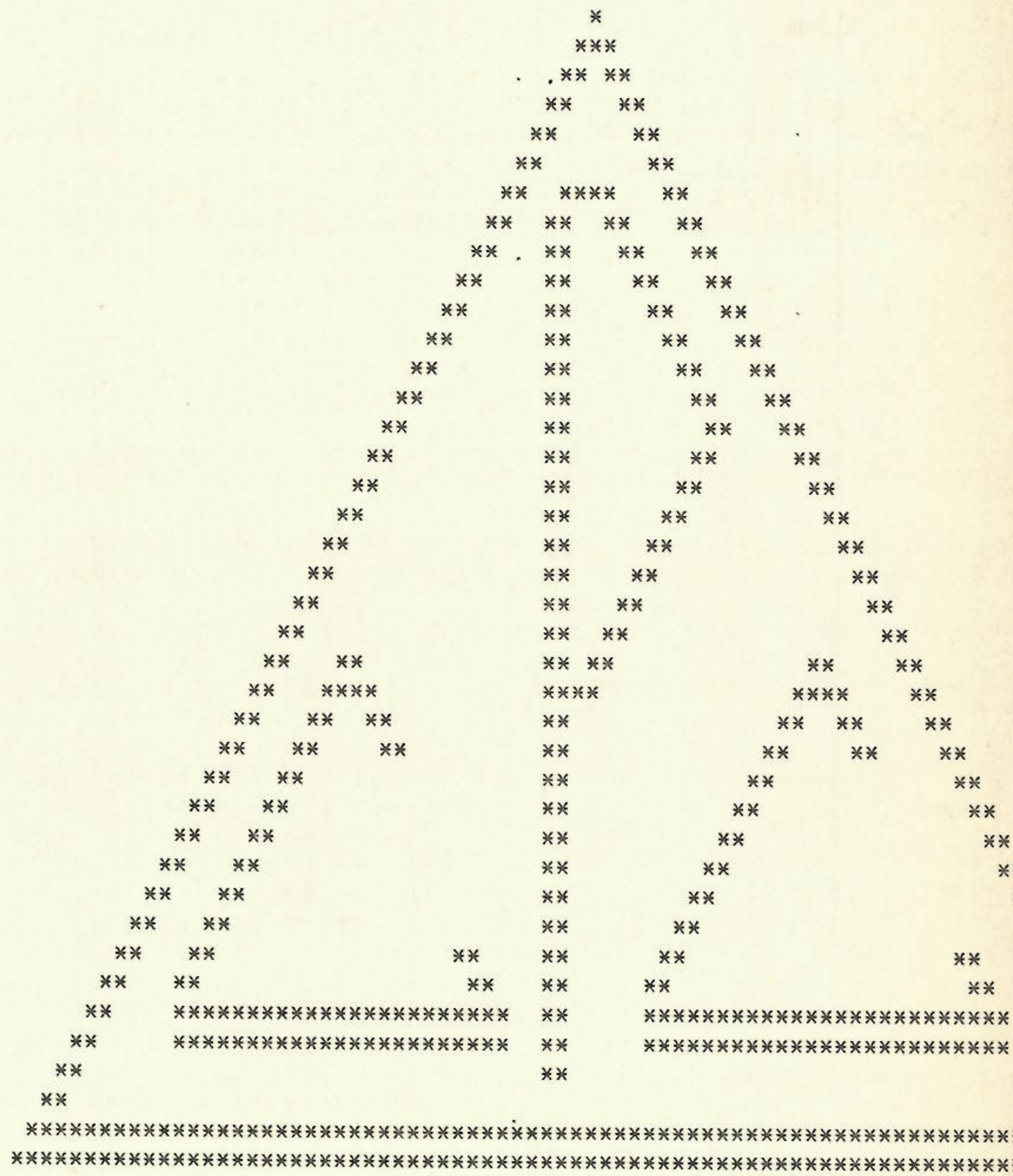
1,457 CARDS READ

0 SYSOUT PRINT RECORDS

0 SYSOUT PUNCH RECORDS

0.00 MINUTES EXECUTION TIME

```
*** JES2 NJE *A*   FWMMITS  OSH   JOB 1852   END   PRINTER8   MITS-PERIF-0205   4.34.38
*** JES2 NJE *A*   FWMMITS  OSH   JOB 1852   END   PRINTER8   MITS-PERIF-0205   4.34.38
*** JES2 NJE *A*   FWMMITS  OSH   JOB 1852   END   PRINTER8   MITS-PERIF-0205   4.34.38
*** JES2 NJE *A*   FWMMITS  OSH   JOB 1852   END   PRINTER8   MITS-PERIF-0205   4.34.38
*** JES2 NJE *A*   FWMMITS  OSH   JOB 1852   END   PRINTER8   MITS-PERIF-0205   4.34.38
*** JES2 NJE *A*   FWMMITS  OSH   JOB 1852   END   PRINTER8   MITS-PERIF-0205   4.34.38
*** JES2 NJE *A*   FWMMITS  OSH   JOB 1852   END   PRINTER8   MITS-PERIF-0205   4.34.38
```



```
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*
```

```
*** JES2 NJE *A*   FWMMITS  OSH   JOB 1852   END   PRINTER8   MITS-PERIF-0205   4.34.38
*** JES2 NJE *A*   FWMMITS  OSH   JOB 1852   END   PRINTER8   MITS-PERIF-0205   4.34.38
*** JES2 NJE *A*   FWMMITS  OSH   JOB 1852   END   PRINTER8   MITS-PERIF-0205   4.34.38
*** JES2 NJE *A*   FWMMITS  OSH   JOB 1852   END   PRINTER8   MITS-PERIF-0205   4.34.38
*** JES2 NJE *A*   FWMMITS  OSH   JOB 1852   END   PRINTER8   MITS-PERIF-0205   4.34.38
*** JES2 NJE *A*   FWMMITS  OSH   JOB 1852   END   PRINTER8   MITS-PERIF-0205   4.34.38
*** JES2 NJE *A*   FWMMITS  OSH   JOB 1852   END   PRINTER8   MITS-PERIF-0205   4.34.38
```