NIOSH/OSHA STANDARDS COMPLETION PROGRAM

DRAFT TECHNICAL STANDARD AND SUPPORTING DOCUMENTATION FOR

*** 2-AMINOPYRIDINE ***

NIOSH/OSHA Draft Technical Standard and Supporting Documentation for 2-AMINOPYRIDINE

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 2-AMINOPYRIDINE.

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 2-aminopyridine not in excess of 0.5 parts per million (ppm) (2 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 2-aminopyridine.

(b) Exposure determination and measurement. (1) Each employer who has a place of employment in which 2-aminopyridine is released into the workplace air shall determine if any employee may be exposed to airborne concentrations of 2-aminopyridine at or above the action level. The determination shall be made each time there is a change in production, process, or control measures which could result in an increase in airborne concentrations of 2-aminopyridine.

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

(i) Any information, observations, or calculation which may indicate employee exposure to 2-aminopyridine;

(ii) Any measurements of 2-aminopyridine taken;

(iii) Any employee complaints of symptoms which may be attributable to exposure to 2-aminopyridine; and

(iv) Date of determination, work being performed at the time, location within work site, name, and social security number of each employee considered.

(3) If the employer determines that any employee may be exposed to 2-aminopyridine at or above the action level, 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 2-aminopyridine at or above the action level, the employer shall:

(i) Identify all employees who may be exposed at or above the action level; and

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

(5) If an employee exposure measurement reveals that an employee is exposed to 2-aminopyridine at or above the action level, but not above the permissible exposure, the exposure of that employee shall be measured at least every two months.

(6) If an employee exposure measurement reveals that an employee is exposed to 2-aminopyridine 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 2-aminopyridine above the permissible exposure. The employee shall also be notified of the corrective action being taken to reduce the exposure to at or below the permissible exposure.

(7) If two consecutive employee exposure measurements taken at least one week apart reveal that the employee is exposed to 2-aminopyridine 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
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 2-aminopyridine above the permissible exposure as defined in paragraph (a)(1) of this section.

(2) Employee exposures to airborne concentrations of 2-aminopyridine 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 technically 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 mechanical ventilation is used to control exposure, measurements which demonstrate system effectiveness, for example, air velocity, static pressure, or air volume, 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 2-aminopyridine.

(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 technically not feasible; or

(iii) To supplement engineering and work practice controls when such controls fail to reduce airborne concentrations of 2-aminopyridine 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 2-AMINOPYRIDINE

CONDITION	PERMISSIBLE RESPIRATOR PROTECTION
Vapor Concentration	
5 ppm (20 mg/M3) or less	Any supplied-air respirator with a full facepiece, helmet or hood. Any self-contained breathing apparatus with a full facepiece.
Greater than 5 ppm (20 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. (Supplied-air suits may be necessary.)
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any gas mask providing protection against organic vapors and particulates. Any escape self-contained breathing apparatus.

(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 2-aminopyridine.

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

(3) For the purpose of compliance with § 1910.178, locations classified as hazardous locations due to the presence of 2-aminopyridine shall be Class II, Group G.

(4) Sources of ignition such as smoking or open flames are prohibited where 2-aminopyridine presents a fire or explosion hazard.

(5) 2-Aminopyridine 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 impervious clothing, gloves, face shields (eight-inch minimum) and other appropriate protective clothing necessary to prevent skin contact with 2-aminopryidine or solutions containing 2-aminopyridine, where contact may occur. Face shields shall comply with § 1910.133(a)(2),(a)(4), (a)(5), and (a)(6).

(2) Employers shall ensure that employees whose clothing may have become contaminated with 2-aminopyridine or solutions containing 2-aminopyridine change into uncontaminated clothing before leaving the work premises.

(3) Employers shall ensure that clothing contaminated with 2-aminopyridine is placed in closed containers for storage until it can be discarded or until the employer provides for the removal of 2-aminopyridine from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the 2-aminopyridine, the employer shall inform the person performing the operation of the hazardous properties of 2-aminopyridine.

(4) Where exposure of an employee's body to 2-aminopyridine or solutions containing 2-aminopyridine may occur, employers shall provide facilities for quick drenching of the body within the immediate work area for emergency use.

(5) Employers shall ensure that non-impervious clothing which becomes contaminated with 2-aminopyridine be removed immediately and not reworn until the 2-aminopyridine is removed from the clothing.

(6) Employers shall provide and ensure that employees use safety goggles (cup-cover type dust and splash safety goggles) which comply with § 1910.133 (a)(2)-(a)(6) where 2-aminopyridine or solutions containing 2-aminopyridine may contact the eyes.

(g) Spills and disposal. In the event that 2-aminopyridine is 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 2-aminopyridine immediately wash or shower to remove any 2-aminopyridine from the skin.

(2) Employers shall ensure that all employees subject to skin contact with 2-aminopyridine or solutions containing 2-aminopyridine wash any areas

of the body which may have contacted 2-aminopyridine at the end of each work day.

(3) Employers shall ensure that employees do not eat or smoke in areas where 2-aminopyridine or solutions containing 2-aminopyridine are handled, processed or stored.

(4) Employers shall ensure that employees who handle 2-aminopyridine or solutions containing 2-aminopyridine wash their hands thoroughly before eating, smoking or using toilet facilities.

(i) Training and information. (1) Each employer who has a workplace in which 2-aminopyridine 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 2-aminopyridine above the action level or employees who may have skin or eye contact with 2-aminopyridine or solutions containing 2-aminopyridine or employees who work where 2-aminopyridine presents a fire or explosion hazard, shall annually:

(i) Inform affected employees of the information contained in the Substance Safety Data Sheet for 2-aminopyridine (Appendix A of this section);

(ii) Advise affected employees as to the signs and symptoms of exposure to 2-aminopyridine.

(iii) Instruct affected employees to advise the employer of the development of signs and symptoms of exposure to 2-aminopyridine 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 2-aminopyridine.

(j) Medical surveillance. (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) The employer shall obtain from each employee who is exposed, or will be exposed, to liquid 2-aminopyridine or airborne concentrations of 2-aminopyridine at or above the action level, information as to whether such employee has a history of any of the following medical conditions:

(i) Convulsive disorders

(ii) Liver disease

(iii) Kidney disease

(iv) Chronic lung 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 2-aminopyridine which are listed in Appendix A which the employee suspects are caused by exposure to 2-aminopyridine.

(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 2-aminopyridine;

(ii) A description of the affected employee's duties as they relate to his exposure to 2-aminopyridine;

(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 shall be a signed statement by the examining physician specifically stating: (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 2-aminopyridine or would directly or indirectly aggravate any detected medical condition;

(B) Any recommended limitations upon the employee's exposure to 2-aminopyridine 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 exposure to 2-aminopyridine.

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

(7) No employee shall be exposed to liquid 2-aminopyridine or airborne concentrations of 2-aminopyridine in such a way as would put the employee at increased risk of material impairment of his health from such exposure. This determination may be based on the physician's written opinion.

(8) The employer shall provide emergency and follow-up medical examinations and treatment for any employee injured through exposure to 2-aminopyridine.

(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 2-aminopyridine.

(ii) This record shall include:

(A) The date of measurement;

(B) Operations involving exposure to 2-aminopyridine which are being monitored;

(C) Sampling and analytical methods used and evidence of their accuracy, including the method, results and date of calibration of sampling equipment;

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

(E) Name, social security number 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 and social security number 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) Results of tests required by paragraph (j)(2) and (j)(5) of this section;

(B) Any employee medical complaints relative to exposure to 2-aminopyridine;

(C) A copy of information provided to the physician pursuant to paragraph (j)(6)(ii), (iii), (iv), (v), and (vi) of this section.

(D) Physician's written opinion; and

(E) A signed statement of any refusal to be examined.

(iii) This record shall be maintained for the duration 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) Employee exposure determination and exposure measurement records required to be maintained by this section shall be made available to employees and former employees and their designated representatives.

(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 affected employees or their representatives an opportunity to observe any measurement of employee exposure to 2-aminopyridine which is conducted pursuant to this section.

(2) When observation of measurement of employee exposure to 2-aminopyridine 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 2-aminopyridine that are being performed at the place of exposure; and

(iii) Record the results obtained.

NOTE: The information contained in the following appendixes is advisory in nature and is not intended, by itself, to create any additional obligations not otherwise imposed or detract from any existing obligation.

APPENDIX A

SUBSTANCE SAFETY DATA SHEET FOR 2-AMINOPYRIDINE

I. SUBSTANCE IDENTIFICATION

A. Substance: 2-Aminopyridine

B. Permissible Exposure: 0.5 parts of 2-aminopyridine per million parts of air (ppm) (2 milligrams of 2-aminopyridine per cubic meter of air, (mg/M3)) averaged over an eight-hour work shift.

C. Appearance and Odor: Colorless solid with a characteristic odor.

II. HEALTH HAZARD DATA

A. Ways in Which the Chemical Affects Your Body: 2-Aminopyridine can affect your body if you inhale it or if it comes in contact with your eyes or skin or if you swallow it. It may enter your body through your skin.

B. Effects of Overexposure:

1. Short-Term Exposure: 2-Aminopyridine may cause headache, dizziness, nausea and weakness. It may also cause flushing of the arm and legs, convulsions and death.
2. Long-Term Exposure: Not known.
3. Reporting Signs and Symptoms: You should inform your employer if you develop any signs or symptoms and suspect they are caused by exposure to 2-aminopyridine.

III. EMERGENCY FIRST AID PROCEDURES

A. Eye Exposure: If 2-aminopyridine or solutions containing 2-aminopyridine get into your eyes, wash your eyes immediately with large amounts of water. lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention. Contact lenses should not be worn when working with this chemical.

B. Skin Exposure: If 2-aminopyridine or solutions containing 2-aminopyridine get on your skin, immediately flush the contaminated skin with water. If 2-aminopyridine or solutions containing 2-aminopyridine penetrate through your clothing, remove the clothing immediately and flush the skin with water. If irritation persists after washing, get medical attention.

C. Breathing: If you or any other person breathes in large amounts of 2-aminopyridine 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 2-aminopyridine has 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 2-aminopyridine. 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 2-aminopyridine 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. Supplied-air suits: in some work situations the wearing of supplied-air suits may be necessary. Your employer should instruct you in their proper use and operation.

C. Protective Clothing: You must wear impervious clothing, gloves, face shield or other appropriate protective clothing to prevent skin contact with 2-aminopyridine or solutions containing 2-aminopyridine where skin contact may occur. Replace or repair impervious clothing that has developed leaks.

D. Eye Protection: You must wear dust resistant safety goggles where 2-aminopyridine may contact your eyes. You must wear splash-proof safety goggles where solutions containing 2-aminopyridine may contact your eyes.

V. PRECAUTIONS FOR SAFE USE, HANDLING AND STORAGE

A. 2-Aminopyridine is a combustible solid and its vapors can form explosive mixtures with air at elevated temperatures.

B. 2-Aminopyridine must be stored in tightly closed containers in a well-ventilated area away from heat and strong oxidizers.

C. Sources of ignition such as smoking and open flames are prohibited wherever 2-aminopyridine is handled, used or stored in a manner that could create a potential fire or explosion hazard.

D. If your work clothing may have become contaminated with 2-aminopyridine or solutions containing 2-aminopyridine, you must change into uncontaminated clothing before leaving the work premises.

E. You must immediately remove any non-impervious clothing that becomes contaminated with 2-aminopyridine and this clothing must not be reworn until the 2-aminopyridine is removed from the clothing.

F. If your skin becomes contaminated with 2-aminopyridine, you must immediately wash or shower to remove the 2-aminopyridine from your skin.

G. If you are subject to skin contact with 2-aminopyridine or solutions containing 2-aminopyridine, at the end of each work day you must wash any areas of your body that may have contacted 2-aminopyridine.

H. You must not eat or smoke in areas where 2-aminopyridine or solutions containing 2-aminopyridine is handled, processed or stored.

I. If you handle 2-aminopyridine or solutions containing 2-aminopyridine, you must wash your hands thoroughly with soap or mild detergent and water before eating, smoking or using toilet facilities.

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

K. Ask your supervisor where 2-aminopyridine is used in your work area and for any additional plant 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 2-aminopyridine. In addition, your employer must instruct you in the safe use of 2-aminopyridine, emergency procedures, and the correct use of protective equipment.

B. Your employer is required to determine whether you are being exposed to 2-aminopyridine. 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 of the actions which are being taken to reduce your exposure.

C. Your employer is required to keep records of exposure determinations, exposure measurements, and medical surveillance. Your employer is required to make records of exposure determinations and your exposure measurements available to you or your representative upon your request. Your employer is required to release your medical records to your physician upon your written request.

APPENDIX B

SUBSTANCE TECHNICAL GUIDELINES FOR 2-AMINOPYRIDINE

I. PHYSICAL AND CHEMICAL DATA

A. Substance Identification

1. Synonyms: Alpha-aminopyridine
2. Formula: $NH_2C_5H_4N$
3. Molecular weight: 94.1

B. Physical Data

1. Boiling point (760 mm Hg): 210 C (410 F)
2. Specific gravity (water = 1): Greater than 1
3. Vapor density (air = 1 at boiling point of 2-aminopyridine): 3.2
4. Melting point: 56 C (133 F)
5. Vapor pressure at 20 C (68 F): Low
6. Solubility in water, % by weight at 20 C (68 F): Greater than 100
7. Evaporation rate (butyl acetate = 1): Data not available

8. Appearance and odor: Colorless solid with a characteristic odor

II. FIRE, EXPLOSION AND REACTIVITY HAZARD DATA

A. Fire

1. Flash point: 68 C (154 F)(closed cup)
2. Autoignition temperature: Data not available
3. Flammable limits in air, % by volume: Data not available
4. Extinguishing media: Carbon dioxide, dry chemical, alcohol
5. Special fire-fighting procedures: None.
6. Unusual fire and explosion hazards: 2-Aminopyridine is a combustible solid. At elevated temperatures its vapors can form explosive mixtures with air. All ignition sources must be controlled where 2-aminopyridine is used, handled or stored in a manner that could create a potential fire or explosion hazard.

B. Reactivity

1. Conditions contributing to instability: Heat.
2. Incompatibilities: Contact with strong oxidizers may cause fires and explosions.
3. Hazardous decomposition products: Toxic gases and vapors (such as oxides of nitrogen and carbon monoxide) may be released in a fire involving 2-aminopyridine.
4. Special precautions: None.

III. SPILL AND DISPOSAL PROCEDURES

A. If 2-aminopyridine is spilled, the following steps should be taken:

1. Ventilate area of spill.
2. For small quantities, sweep onto paper or other suitable material, place in an appropriate container and burn in a safe place (such as a fume hood). Large quantities may be reclaimed; however, if this is not practical, dissolve in a flammable solvent (such as alcohol) and atomize in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.

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

C. Waste disposal methods: 2-Aminopyridine may be disposed of:

1. By making packages of 2-aminopyridine in paper or other flammable material and burning in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.
2. By dissolving 2-aminopyridine in a flammable solvent (such as alcohol) and atomizing in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device.

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 average 8-hour exposure may be determined from a single eight-hour sample or two (2) 4-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 followed by an adsorption tube with subsequent chemical analysis of both the filter and adsorption tube. Detector tubes certified by NIOSH under 42 CFR part 84 or other direct reading devices calibrated to measure 2-aminopyridine may be used. The method of measurement must determine the concentration of 2-aminopyridine to plus or minus 35%.

B. EXPOSURE ABOVE THE PERMISSIBLE EXPOSURE: The monitoring and measurements under this section should be essentially the same as described under paragraph IV. a. 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 2-aminopyridine to plus or minus 25%.

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 K" (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 2-aminopyridine in tightly closed containers in a cool, well-ventilated area.

B. Use of supplied-air suits or other impervious coverings may be necessary to prevent skin contact with 2-aminopyridine where the concentration of 2-aminopyridine is unknown or is greater than 5 ppm. Supplied-air suits should be selected, used, and maintained under the immediate supervision of persons knowledgeable in the limitations and potential life endangering characteristics of supplied-air suits.

C. Employers should advise employees of all areas and operations where exposure to 2-aminopyridine could occur.

VI. COMMON OPERATIONS

Common operations in which exposure to 2-aminopyridine is likely to occur are: during its production and its use as an intermediate in the synthesis of sulfapyridine and other pharmaceuticals, dyes, antioxidants, and herbicides.

APPENDIX C - MEDICAL SURVEILLANCE GUIDELINES

I. ROUTE OF ENTRY

Inhalation; skin absorption.

II. TOXICOLOGY

2-Aminopyridine in aqueous solution is a central nervous system excitant and convulsant. The LD50 in mice by intraperitoneal injection was 35 mg/kg; lethal doses in animals produced excitement, tremors, convulsions, tetany and death. Fatal doses were readily absorbed through the skin. In industrial experience intoxication has occurred from inhalation of the dust or vapor, or by skin absorption following direct contact. Fatal intoxication occurred in a chemical worker who spilled a solution of 2-aminopyridine on his clothing during a distillation; he continued to work in contaminated clothing for 1 1/2 hours. Two hours later, he developed dizziness, headache, respiratory distress, and convulsions that progressed to respiratory failure and death; it is probable that skin absorption was a contributing factor in this case. A non-fatal intoxication from exposure to an undetermined concentration of 2-aminopyridine in air resulted in severe headache, weakness, convulsions and a stuporous state that lasted several days. A chemical worker exposed to an estimated air concentration of 20 mg/M3 (5.2 ppm) developed severe pounding headache, nausea, flushing of the extremities, and elevated blood pressure, but recovered fully within 24 hours. An aqueous solution dropped in a rabbit's eye was only mildly irritating.

III. SIGNS AND SYMPTOMS

Headache, dizziness; excitement; nausea; flushing of extremities and elevated blood pressure; respiratory distress; weakness; convulsions; stupor.

IV. SPECIAL TESTS

None in common usage.

V. TREATMENT

Remove from exposure. Immediately flush eyes and skin with water. Give artificial resuscitation if indicated. Observe for convulsions and institute appropriate treatment.

VI. SURVEILLANCE AND PREVENTIVE CONSIDERATIONS

A. GENERAL

The most severe effect of exposure to 2-aminopyridine is convulsions. Skin absorption is known to occur. It is important that the physician become familiar with plant operating conditions in which exposure to 2-aminopyridine 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 examination 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 2-aminopyridine exposure. Only those giving a positive history of these conditions must be referred for further medical examinations.

1. Convulsive disorders -- 2-Aminopyridine causes convulsion. Persons with a history of convulsive disorders may be more susceptible to the effects of this agent.

2. Liver disease -- Although 2-aminopyridine is not known as a liver toxin in humans, the importance of this organ in the biotransformation and detoxification of foreign substances should be considered before exposing persons with impaired liver function.

3. Kidney disease -- Although 2-aminopyridine is not known as a kidney toxin in humans, the importance of this organ in the elimination of toxic substances justifies special consideration in those with impaired renal function.

4. Chronic respiratory disease -- In persons with impaired pulmonary function, especially those with obstructive airway diseases, the breathing of 2-aminopyridine might cause exacerbation of symptoms due to its irritant properties.

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: "2-Aminopyridine," Documentation of the Threshold Limit Values for Substances in Workroom Air (3d ed., 2d printing), Cincinnati, 1974, p. 11.

2. Patty, Frank A.: Industrial Hygiene and Toxicology, Vol. II - Toxicology (2d ed. revised), Interscience Publishing Company, New York, 1963, pp. 2191-2192.

3. Grant, W. Morton: Toxicology of the Eye (2d ed.), Charles Thomas, Illinois, 1974, p. 118.

REFERENCES AND SOURCES
2-AMINOPYRIDINE
1910.93

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

Eyes: Grant, "Toxicology of the Eye"

Skin: Fairhill, "Industrial Toxicology;" Patty, "Industrial Hygiene and Toxicology"

Ingestion: Sax, "Dangerous Properties of Industrial Materials;" Patty, "Industrial Hygiene and Toxicology;" Fairhill, "Industrial Toxicology"

COMMENTS

Eyes: Classification: 2 and 6
Output statement numbers: 10 and 12 combined
Exceptions: None
2-Aminopyridine appears to have little action on the cornea and rarely produces visual impairment. Grant reports that "test applications of 0.02 M solutions at pH 5 to 7 for ten minutes to rabbit eyes from which the corneal epithelium has been removed produced relatively slight or no injury with 2-aminopyridine." He continues, "tested in a 0.02 M aqueous solution of pH 9.4 by dropping for ten minutes on a rabbit's cornea from which the epithelium had been removed caused only transient corneal haze and slight delay in return to normal." The substance itself and solutions containing it are given classifications of 6 and 2 respectively, since the low concentrations tested above were marginally capable of causing some effects.

Skin: Classification: 2 and 6
Output statement numbers: 2, 5b, 7a, 8b, 14g, 14i, 15, 20a
Exceptions: See below
Fairhill reports that skin contact results in "dizziness, headache and difficulty in breathing." Patty notes, "2-aminopyridine is readily absorbed through the skin and produces convulsive deaths by this route," and gives a guinea pig percutaneous LD50 of 0.5 ml/kg in a diluted solution. Also reported by Patty is the case of chemical operator "who spilled 2-aminopyridine during distillation (and) continued to work in contaminated clothing for 1 1/2 hours. Two hours later he developed dizziness, headache, respiratory distress, and convulsions that progressed to respiratory failure and death." Patty concludes "it is probable that skin absorption was important in this case." The pure substance is a white powder or crystal with a melting point of 132.8 F, a solubility in water of greater than 100%, and a vapor pressure of approximately 1 mm Hg at 20 C.

The fact that the chemical operator mentioned above worked 1 1/2 hours in contaminated clothing suggests strongly that 2-aminopyridine does not rapidly produce local effects. To prevent exposures which can potentially lead to excessive skin absorption, the substance and

solutions containing it are given classifications of 6 and 2 respectively but statement 2 is modified to prevent skin contact where it may occur, statement 15 is specified, statements 14g and 14i are used instead of those numbered 16 or 17, and statement 8b is specified for where "extensive" exposure may occur. Since 2-aminopyridine is a white crystal or powder which dissolves in water, and may thus be indistinguishable on the skin or clothes, statements 5b and 15 are applied not only to the solid but also to solutions containing it.

Ingestion - Classification: 1 and 5
Output statement numbers: 19, 20a
Exceptions: None

Sax rates the acute systemic hazard of 2-aminopyridine as severe, noting "ingestion results in strychnine-like convulsions, headache, collapse and epileptiform." Patty lists an oral rat LD50 of 0.2 g/kg and an oral mouse LD50 of 0.05 g/kg. He continues, "lethal doses in experimental animals produce central nervous system stimulation and excitement with tremors progressing to convulsions, tetany and death." Systemic effects including "gastro-intestional distress respiratory failure and liver damage with fatty degeneration" also resulted from ingestion. The form of 2-aminopyridine is that of a white powder, according to Fairhall. Considering that it may not be distinguishable on a worker's food, clothing, cigarettes or hands and that upon ingestion lethal convulsions and CNS stimulation may occur, this substance represents serious potential to cause injury through accidental acute or chronic ingestion in the workplace. Classifications of 1 and 5 are concluded to be warranted.

SUBSTANCE TECHNICAL GUIDELINES

The references cited for this document include:

Reilly Tar and Chemical Corp., Material Safety Data Sheet (Reilly)
Kirk-Othmer, "Encyclopedia of Chemical Technology," 2nd edition, Vol. 16, p. 802 (K-O)

Sources of data items used:

I. A. 1. Synonyms: Reilly
2. Formula: Reilly
3. Molecular weight: ADL

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

II. A. 1. Flash point: ADL Measurement
2. Autoignition temperature: Data not available
3. Flammable limits: Not available
4. Extinguishing media: Reilly

5. Special fire fighting procedures: ADL
6. Unusual fire and explosion hazards: ADL

B. 1. Conditions contributing to instability: ADL
2. Incompatibilities: ADL
3. Hazardous decomposition products: ADL
4. Special precautions: None

III. A. Steps if released or spilled: Reilly

C. Waste disposal method: ADL

V. Miscellaneous precautions: ADL

VI. Common operations: K-O

USE/EXPOSURE AND CONTROL DOCUMENT

References used in the preparation of this document include:

"2-Aminopyridine," Reilly Tar and Chemical Co., Material Safety Data Sheet, May 1971 (Reilly)

"Chemical Abstracts," 66 - 75 (1967 - 71); 79 (1973); 80 (1974) (CA)

Considine, D. M., "Chemical and Process Technology Encyclopedia," McGraw Hill, 1974 (Considine)

International Labour Organization, "Encyclopedia of Occupational Health and Safety," Geneva, 1972 (ILO)

Kirk, R. and Othmer, D., "Encyclopedia of Chemical Technology," Interscience Publishers, 1st edition, 1954 (Chem Tech); 2nd edition, 1972 (K-O)

Klingsberg, E. - editor, "Pyridine and its Derivatives," Part III, Interscience, 1962 (Klingsberg)

Patty, F. A., "Industrial Hygiene and Toxicology," Vol. II, Interscience, 1962 (Patty)

References for Specific Use/Exposure

1. ILO, Patty, Chem Tech, Considine, Klingsberg, K-O, CA
2. Considine, Klingsberg, K-O, CA
3. ILO, K-O, Klingsberg, CA

References for Specific Control Methods

Patty, ILO and Reilly were the references used in numbers 1 - 3.

RESPIRATOR TABLE DOCUMENTATION

SUBSTANCE: 2-Aminopyridine

D. O. L. STANDARD: 0.5 ppm, 2 mg/M3

WARNING PROPERTIES:

Odor threshold: There is no information available concerning the odor threshold of 2-aminopyridine.

Eye Irritation Level: Grant reports that "2-Aminopyridine tested in 0.02M aqueous solution at pH 9.4 by dropping on a rabbit's cornea from which the epithelum had been removed caused only transient corneal haze and slight delay in return to normal." The vapor of 2-aminopyridine is not specifically stated as being an eye irritant, but since Patty reports that this compound is a strong base and that it is soluble in water, 2-aminopyridine is treated as an eye irritant for the purposes of this standard. In addition, Patty points out that most of the amino pyridines "cause rather intense skin and eye irritation." Only full face-piece respirators are permitted.

Evaluation of Warning Properties: Since there are no quantitative data relating warning properties to air concentrations of 2-aminopyridine, this substance is treated as a material with poor warning properties. The concentration of 2-aminopyridine in saturated air could

result in a significant exposure relative to the permissible exposure.

IDLH: 5 ppm

Basis for IDLH Value: Very little quantitative information is available upon which to base an IDLH concentration. The chosen IDLH (5 ppm) is based upon the report in the Documentation of TLV's that a 5-hour exposure to an estimated 5 ppm 2-aminopyridine produced "headache, increased blood pressure, and nausea" in a worker.

Other Toxicological Information: Patty reports that industrial exposures to 2-aminopyridine have resulted in poisoning. Such symptoms as "headache, nausea, flushing of the extremities," elevated blood pressure, dizziness, respiratory distress, stupor, and "convulsions that progressed to respiratory failure and death" have been observed.

The only available quantitative information concerning an acute poisoning caused by inhalation of the vapor involves a worker who inhaled approximately 5 ppm 2-aminopyridine for 5 hours. The Documentation of TLV's reports that "the chief symptoms were headache, increased blood pressure and nausea." The concentration at which the worker was exposed (5 ppm) was estimated by taking air samples after the incident.

Patty reports that more serious poisonings have been observed, but no quantitative information is given.

Patty reports a guinea pig skin absorption LD50 of 0.5 ml/kg. According to Patty "aminopyridine is readily absorbed through the skin and produces convulsive deaths by this route."

LFL: Data not available

VAPOR PRESSURE AT 20 DEG. C.: Estimated to be approximately 1 mm Hg

SATURATED CONCENTRATION AT 20 DEG. C.: Estimated to be approximately 1300 ppm (5000 mg/M3)

NOTE: Acute toxicological information is needed upon which to base a more accurate IDLH before this substance is promulgated as a standard.

NIOSH/OSHA Draft Technical Standard
and Supporting Documentation for 2-AMINOPYRIDINE

USE/EXPOSURE AND CONTROL DOCUMENT
2-AMINOPYRIDINE

	Use/Exposure	Principal Route of Entry	Currently Used Control Methods
1.	Inhalation of vapor and skin contact with solid during use in production of chemical intermediates for the manufacture of pharmaceuticals (antihistamines pyrilamine and pyribenzamine; sulfa drugs, sulfapyridine; antiinflammatories, sedatives)	A,D	Local exhaust ventilation; general dilution ventilation; personal protective equipment (gloves, goggles, respiratory protective devices)
2.	Inhalation of vapor and skin contact with solid during use in the production of chemical intermediates for the manufacture of dyes, lubricant antioxidants, herbicides	A,D	Local exhaust ventilation; general dilution ventilation; personal protective equipment (gloves, goggles, respiratory protective devices)
3.	Inhalation of vapor and skin contact with solid during manufacture and distribution of 2-aminopyridine and during maintenance of storage containers	A,D	Local exhaust ventilation; general dilution ventilation; personal protective equipment (gloves, goggles, respiratory protective devices)

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 ------

1,170 CARDS READ

0 SYSOUT PRINT RECORDS

0 SYSOUT PUNCH RECORDS

0.00 MINUTES EXECUTION TIME

```
*** JES2 NJE *A*    FWMMITS  OSH    JOB  303    END    PRINTER8   MITS-PERIF-0205    11.27.57
*** JES2 NJE *A*    FWMMITS  OSH    JOB  303    END    PRINTER8   MITS-PERIF-0205    11.27.57
*** JES2 NJE *A*    FWMMITS  OSH    JOB  303    END    PRINTER8   MITS-PERIF-0205    11.27.57
*** JES2 NJE *A*    FWMMITS  OSH    JOB  303    END    PRINTER8   MITS-PERIF-0205    11.27.57
*** JES2 NJE *A*    FWMMITS  OSH    JOB  303    END    PRINTER8   MITS-PERIF-0205    11.27.57
*** JES2 NJE *A*    FWMMITS  OSH    JOB  303    END    PRINTER8   MITS-PERIF-0205    11.27.57
*** JES2 NJE *A*    FWMMITS  OSH    JOB  303    END    PRINTER8   MITS-PERIF-0205    11.27.57
*** 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*
*** JES2 NJE *A*
*** JES2 NJE *A*
*** JES2 NJE *A*    FWMMITS  OSH    JOB  303    END    PRINTER8   MITS-PERIF-0205    11.27.57
*** JES2 NJE *A*    FWMMITS  OSH    JOB  303    END    PRINTER8   MITS-PERIF-0205    11.27.57
*** JES2 NJE *A*    FWMMITS  OSH    JOB  303    END    PRINTER8   MITS-PERIF-0205    11.27.57
*** JES2 NJE *A*    FWMMITS  OSH    JOB  303    END    PRINTER8   MITS-PERIF-0205    11.27.57
*** JES2 NJE *A*    FWMMITS  OSH    JOB  303    END    PRINTER8   MITS-PERIF-0205    11.27.57
*** JES2 NJE *A*    FWMMITS  OSH    JOB  303    END    PRINTER8   MITS-PERIF-0205    11.27.57
*** JES2 NJE *A*    FWMMITS  OSH    JOB  303    END    PRINTER8   MITS-PERIF-0205    11.27.57
```