

NIOSH

criteria for a recommended standard
occupational exposure to

sodium hydroxide



criteria for a recommended standard

**OCCUPATIONAL EXPOSURE
TO
SODIUM HYDROXIDE**



**U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health
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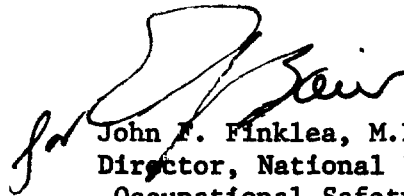
PREFACE

The Occupational Safety and Health Act of 1970 emphasizes the need for standards to protect the health and safety of workers exposed to an ever-increasing number of potential hazards at their workplace. The National Institute for Occupational Safety and Health has projected a formal system of research, with priorities determined on the basis of specified indices, to provide relevant data from which valid criteria for effective standards can be derived. Recommended standards for occupational exposure, which are the result of this work, are based on the health effects of exposure. The Secretary of Labor will weigh these recommendations along with other considerations such as feasibility and means of implementation in developing regulatory standards.

It is intended to present successive reports as research and epidemiologic studies are completed and as sampling and analytical methods are developed. Criteria and standards will be reviewed periodically to ensure continuing protection of the worker.

I am pleased to acknowledge the contributions to this report on sodium hydroxide by members of my staff, the valuable and constructive comments presented by the Review Consultants on Sodium Hydroxide, by the ad hoc committees of the American Conference of Governmental Industrial Hygienists and the American Occupational Medical Association, by Robert B. O'Connor, M.D., NIOSH consultant in occupational medicine, and by William A. Burgess on respiratory protection. The NIOSH recommendations for

standards are not necessarily a consensus of all the consultants and professional societies that reviewed this criteria document on sodium hydroxide. Lists of the NIOSH Review Committee members and of the Review Consultants appear on the following pages.

A handwritten signature in black ink, appearing to read "John F. Finklea". The signature is stylized and cursive, written over the printed name.

John F. Finklea, M.D.
Director, National Institute for
Occupational Safety and Health

The Office of Research and Standards Development, National Institute for Occupational Safety and Health, had primary responsibility for development of the criteria and recommended standard for sodium hydroxide. The University of Michigan developed the basic information for consideration by NIOSH staff and consultants under contract No. HSM-99-73-31. Jack E. McCracken, Ph.D., had NIOSH program responsibility and served as criteria manager.

**REVIEW COMMITTEE
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH**

**Alfred C. Blackman
Assistant Director for Safety
Office of the Director**

**Bobby J. Gunter, Ph.D.
Division of Prevention
DHEW Region VIII**

**Trent R. Lewis, Ph.D.
Division of Laboratories and
Criteria Development**

**Frank L. Mitchell, D.O.
Office of Research and
Standards Development**

**Elaine Nelson, C.O.H.N.
Division of Occupational
Health Programs**

Ex Officio:

**Herbert E. Christensen, D.Sc.
Deputy Director, Office of
Research and Standards Development**

NIOSH REVIEW CONSULTANTS ON SODIUM HYDROXIDE

Kenneth J. Bonkowski
UAW-International Union, United Automobile,
Aerospace and Agricultural Implement Workers of America
Detroit, Michigan 48214

Stuart I. Brown, M.D.
Eye and Ear Hospital
Pittsburgh, Pennsylvania 15213

William E. MacDonald, Ph.D.
Research and Teaching Center of Toxicology
School of Medicine, University of Miami
Coral Gables, Florida 33124

R. Warren McNab
BASF Wyandotte Corporation
Wyandotte, Michigan 48192

Irma M. West, M.D.
Occupational Health Section
Department of Health
Sacramento, California 95814

Ex Officio:

Keith H. Jacobson, Ph.D.
Office of Research and
Standards Development

CRITERIA DOCUMENT: RECOMMENDATIONS FOR AN
OCCUPATIONAL EXPOSURE STANDARD FOR SODIUM HYDROXIDE

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I. RECOMMENDATIONS FOR A SODIUM HYDROXIDE STANDARD

The National Institute for Occupational Safety and Health recommends that worker exposure to sodium hydroxide in the workplace be controlled by compliance with the following sections. The standard is designed to protect the health and safety of workers over a working lifetime. Compliance with the standard should prevent adverse effects of occupational exposure to sodium hydroxide. The standard is measurable by techniques that are valid, reproducible, and available. Sufficient technology exists to permit compliance with the recommended standard. The standard will be subject to review and revision as necessary.

Occupational exposure to sodium hydroxide is defined as exposure to airborne concentrations of sodium hydroxide exceeding one-half of the recommended workplace environmental limit. Adherence only to sections 4(a), 4(b), 6(a) (1, 2, 7, 8, and 9), and 7(a) is required when workplace environmental concentrations of sodium hydroxide are not greater than one-half of the recommended workplace environmental limit. Synonyms for sodium hydroxide include caustic soda, lye, and white caustic.

Section 1 - Environmental (Workplace Air)

(a) Concentration: Occupational exposure to sodium hydroxide shall be controlled so that no worker is exposed to sodium hydroxide at a concentration greater than 2.0 mg/cu m of air for any 15-minute sampling period.

(b) Sampling and Analysis: Procedures for sampling, calibration of equipment, and analysis of sodium hydroxide samples shall be as provided

in Appendices I and II, or by any method shown to be equivalent to the methods specified.

Section 2 - Medical

Medical surveillance shall be performed as outlined below for all workers occupationally exposed to sodium hydroxide, including maintenance personnel periodically or occasionally exposed during routine maintenance or emergency repair operations.

(a) Comprehensive preplacement medical examinations shall be provided to all workers subject to exposure to sodium hydroxide. The examinations shall include an evaluation of the advisability of the workers' using negative or positive pressure respirators.

(b) Medical examinations shall be made available promptly to all workers with signs or symptoms of skin, eye, or upper respiratory tract irritation from exposure to sodium hydroxide.

(c) If clinical evidence of injury from exposure to, or local contact with, sodium hydroxide is developed from these medical examinations, the worker shall be kept under a physician's care until the worker has completely recovered or maximal improvement has occurred.

(d) Examinations of current workers shall be performed within 6 months of the promulgation of a standard incorporating these recommendations.

(e) The medical representatives of the Secretary of Health, Education, and Welfare, of the Secretary of Labor, of the employee or former employee, and of the employer shall have access to all pertinent medical records.

(f) Medical records shall be maintained for all persons with exposure to sodium hydroxide and for maintenance personnel with occasional exposure. Applicable medical records, including information on all required medical examinations, shall be retained for at least 5 years after the termination of the individual's employment.

Section 3 - Labeling (Posting)

(a) All shipping and storage containers of anhydrous or hydrated sodium hydroxide (solid caustic soda) shall bear the following label in addition to, or in combination with, labels required by other statutes, regulations, or ordinances:

CAUSTIC SODA
(Sodium Hydroxide)
DANGER! CAN CAUSE SEVERE BURNS OR BLINDNESS

Before using, secure information on procedure and protective measures for safe handling.
Do not get in eyes, on skin or clothing.
Avoid breathing dusts or mists.
Do not take internally.
When handling, wear goggles or face shield. While making solutions, add slowly to surface of solution to avoid spattering.
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes; for skin and eye burns, call a physician.
Remove contaminated clothing and shoes and wash before reuse.
Spill or leak: Thoroughly flush area with water.

(b) All shipping and storage containers of solutions of sodium hydroxide (liquid caustic soda) shall bear the label in 3(a) except that LIQUID CAUSTIC SODA shall replace CAUSTIC SODA, and (Sodium Hydroxide Solution) shall replace (Sodium Hydroxide).

(c) In areas or equipment where contact with, or inhalation of, sodium hydroxide (solid or solution) is likely, the following warning signs

shall be posted in readily visible locations, particularly at entrances to these areas:

EXTREMELY DANGEROUS CHEMICAL
(CAUSTIC SODA, SODIUM HYDROXIDE)
USED IN THIS AREA
CAN CAUSE BURNS OR BLINDNESS
Unauthorized Persons Keep Out

Any special precautionary requirements for safety equipment or practice in the area should also be noted on the sign.

If respiratory protective devices are to be used, add to the warning sign a statement specifying the requirements for use of such equipment and describing the location of the respirators.

(d) During any loading, unloading, or transfer of sodium hydroxide solution (liquid caustic soda) through temporary transfer lines or lines with temporary connections, the following sign shall be prominently displayed in the area, particularly at points of potential release of, or exposure to, this chemical.

EXTREMELY DANGEROUS CHEMICAL
(CAUSTIC SODA, SODIUM HYDROXIDE)
CAN CAUSE BURNS OR BLINDNESS
TRANSFER IN PROGRESS
Unauthorized Persons Keep Away

If the area or equipment is posted as provided in section 3 subsection (c), the temporary sign is not required.

(e) During loading or unloading of a tank car or tank truck with sodium hydroxide solution (liquid caustic soda), caution signs as follows:

STOP!
TANK CAR
CONNECTED

shall be displayed at least 50 ft fore and aft of the car or truck in addition to applicable signs described in Section 3, subsections (c) and(d).

In Section 3, subsections (c), (d), and (e), signs shall also be printed in the predominant language of non-English-speaking workers, if any, unless they are otherwise informed. All illiterate workers shall be so informed.

Section 4 - Personal Protective Equipment

Engineering controls shall be used to maintain airborne sodium hydroxide concentrations at or below the prescribed limit. Requirements for personal protective equipment shall be as approved under provisions of 29 CFR 1910.132.

(a) Eye and Face Protection

Eye protective equipment shall be provided by the employer and used by the employee where eye contact with sodium hydroxide is likely.

(1) Selection, use, and maintenance of eye protective equipment shall be in accordance with provisions of the American National Standard for Occupational and Educational Eye and Face Protection, ANSI Z87.1-1968.

(2) At all operations where there is danger of sodium hydroxide (solid or in solution) coming in contact with the eyes, chemical safety goggles with resistant glass or plastic lenses and adequate air vents that do not allow entry of liquids shall be worn. Plastic chemical goggles may be worn over metal or plastic frame safety spectacles with prescription safety lenses. Safety spectacles may not be used alone for

protection from splashes, mists, or dust of sodium hydroxide.

(3) At any operation where splashes of sodium hydroxide solution are likely to occur and there is danger of such splashes striking the face, a full-length (8-inch minimum) plastic face shield shall be worn in addition to chemical safety goggles.

(4) Protective hats with brims shall be worn by workers at operations or in areas where there is a likelihood of overhead splashes or leaks. Where there is also danger of falling objects, hard hats with brims shall be worn. (Aluminum hard hats shall be excluded because they are incompatible with strong caustics.)

(b) Skin Protection

(1) Sodium hydroxide will produce skin burns at the site of contact. Impervious protective clothing made of rubber, neoprene, or other caustic-resistant material, such as gloves, aprons, suits, hoods, boots, and overshoes, shall be provided by the employer and worn by the employee when there is a likelihood of body contact with sodium hydroxide.

(2) Sodium hydroxide-wetted clothing, unless impervious, shall be removed promptly.

(3) Work clothing should not be made from wool; cotton is preferred because it is not rapidly affected by sodium hydroxide. Pant legs should cover the tops of boots. Shirts should be long-sleeved and buttoned at the collar. Leather footwear does not provide adequate protection against spills of sodium hydroxide.

(c) Respiratory Protective Equipment

Engineering controls shall be used wherever feasible to maintain airborne sodium hydroxide concentrations below those recommended in Section

1 above. Compliance with the permissible exposure limit by the use of respirators is only allowed when airborne sodium hydroxide concentrations are in excess of the workplace environmental limit while required engineering controls are being installed or tested, when nonroutine maintenance or repair is being accomplished, or during emergencies. When a respirator is thus permitted, it shall be selected and used in accordance with the following requirements:

(1) For the purpose of determining the type of respirator to be used, the employer shall measure, when possible, the airborne concentration of sodium hydroxide in the workplace initially and thereafter whenever process, worksite, climate, or control changes occur which are likely to increase the airborne concentration of sodium hydroxide.

(2) The employer shall ensure that no worker is occupationally exposed to sodium hydroxide because of improper respirator selection, fit, use, or maintenance.

(3) A respiratory protection program meeting the requirements of 29 CFR 1910.134 which incorporates the American National Standard Practices for Respiratory Protection Z88.2-1969 shall be established and enforced by the employer.

(4) The employer shall provide respirators in accordance with Table I-1 and shall ensure that the employee uses the respirator provided.

(5) Respiratory protective devices described in Table I-1 shall be those approved under the provisions of 30 CFR 11.

(6) The employer shall ensure that respirators are adequately cleaned, and that employees are instructed on the use of

respirators assigned to them and on how to test for leakage.

(7) Respirators specified for use in higher concentrations of airborne sodium hydroxide may be used in workplaces with lower concentrations of airborne sodium hydroxide.

(8) Where an emergency may develop which could result in employee injury from sodium hydroxide, the employer shall provide an escape device as listed in Table I-1.

TABLE I-1
RESPIRATOR SELECTION GUIDE

Multiples of Ceiling	Respirator Type
Less than 5X	Single use respirator with dust filter, half or quarter mask, valveless.
Less than 10X	<ul style="list-style-type: none"> (1) Single use respirator with dust filter, quarter or half mask, with valves. (2) Quarter or half mask respirator with replaceable dust, mist, or high efficiency particulate filter. (3) Type C supplied air respirator, demand (negative pressure) mode with quarter or half mask facepiece.
Less than or equal to 100X	<ul style="list-style-type: none"> (1) Full facepiece respirator with chin style or front or back mounted canister with high efficiency particulate filter. (2) Powered air-purifying respirator with half or full facepiece, hood, or helmet, with high efficiency particulate filter. (3) Supplied air respirator with full facepiece, hood, or helmet in continuous flow mode or with full facepiece in demand (negative pressure) or pressure-demand (positive pressure) mode. (4) Self-contained breathing apparatus with full facepiece in demand (negative pressure) mode.
Greater than 100X (Immediately dangerous to life or health)	<ul style="list-style-type: none"> (1) A combination respirator which includes a Type C supplied air respirator with a full facepiece operated in continuous or pressure-demand (positive pressure) mode and an auxiliary self-contained breathing apparatus.

TABLE I-1, (CONTINUED)
RESPIRATOR SELECTION GUIDE

Multiples of Ceiling	Respirator Type
	(2) Self-contained breathing apparatus with full facepiece operated in pressure-demand (positive pressure) mode.
Emergency Entry or Escape from Unknown Concentration	Self-contained breathing apparatus with full facepiece operated in pressure-demand (positive pressure) mode.
Escape	(1) Gas mask with full facepiece with chin style, front or back mounted canister with high efficiency particulate filter. (2) Self-contained breathing apparatus with full facepiece operating in demand (negative pressure) or pressure-demand (positive pressure) mode.

Note: Wearers of quarter or half mask devices may find it necessary to use full facepiece devices if eye irritation is noted.

Section 5 - Informing Employees of Hazards from Sodium Hydroxide

At the beginning of employment or assignment for work at operations or in an area which may involve exposure to sodium hydroxide (dry solids or solutions), each employee shall be informed of the hazards and possible injuries associated with occupational exposure. He shall be instructed in the proper procedures for the safe handling and use of this compound, in the operation and use of protective systems and devices, and in appropriate emergency procedures.

Instructions shall include, as a minimum, all relevant information in the pertinent Material Safety Data Sheet(s) (Appendix III). This

information shall be posted in the work area and kept on file readily accessible to the worker at all places of employment where exposure may occur. The worker shall be apprised of the location and availability of this information.

Information as required shall be recorded on the Material Safety Data Sheet in Appendix III or a similar form approved by the Occupational Safety and Health Administration, US Department of Labor.

The worker must be apprised of the need for rapid removal of sodium hydroxide from skin and eyes and should be informed that severe damage can occur without irritation or pain. The worker must also be cautioned on ways of preventing accidental ingestion such as storage of sodium hydroxide only in designated labeled containers.

Section 6 - Work Practices

(a) Control of contact with skin and eyes

(1) Each employee working in an area where sodium hydroxide (solid or solution) is used shall be instructed in safe work procedures and in the proper use of all protective and process equipment.

(2) Each employee working in such areas where contact with sodium hydroxide is likely shall wear full-body protective clothing, close-fitting chemical goggles, and gloves, all of a caustic-resistant material. In areas where splashes of caustic solution are likely, a full-length plastic face shield shall be worn in addition to chemical goggles. Broad-brim hats shall be worn. Boots or overshoes of caustic-resistant material shall be worn in all areas where there is a likelihood of spills or of other causes of serious sodium hydroxide contamination of the floor and

walkways.

(3) Transfer of solutions of sodium hydroxide (liquid caustic soda) from tank cars, tank trucks, and other portable tanks shall be done only by fully trained employees under adequate supervision. All applicable requirements of the US Department of Transportation (DOT) shall be followed (49 CFR Chapter I) in regard to:

(A) Positioning of cars or trucks, blocking wheels, setting hand brakes, and otherwise securing before connecting transfer or steam lines.

(B) Inspection of tanks and posting of warning signs before transfer of the solution.

(C) Venting of tanks before connection.

(D) Heating of solution and lines to proper temperature to melt or prevent crystallization of sodium hydroxide must be done carefully to prevent overheating. No open fires may be used.

(E) Inspection of valves, lines, and joints after connection and before the transfer is started.

(F) Attendance of operator throughout the period of transfer.

(G) Assuring that the storage tank has adequate space to accommodate the contents of the tank car or truck.

(H) Flushing of tank and lines before, and flushing and draining after, disconnecting.

(I) Securely covering partially or fully filled tanks before moving them.

(4) In the handling of drums of sodium hydroxide the following practices shall be observed:

(A) Open or unsealed containers of caustic solution shall be handled only by workers wearing proper personal protective devices and using appropriate mechanical assistance which provides for protection from splashes and spills.

(B) Open or unsealed containers of solid sodium hydroxide shall be handled only by persons wearing proper personal protective devices and using adequate mechanical assistance.

(C) Emptied containers shall be flushed free of sodium hydroxide before being returned, stored, or discarded.

(D) Drums shall be stored so there will be no accumulation of water. Drums containing anhydrous or hydrated, solid sodium hydroxide may be stored on their side to minimize external corrosion around the bottom seam. Drums of anhydrous flake, granular, or ground sodium hydroxide should be stored in an upright position. Tiers of drums shall be separated by planks or other means to provide stability.

(5) In the preparation of solutions from sodium hydroxide, the following practice shall apply:

(A) Sodium hydroxide flakes, beads, chunks, or other forms capable of being added by hand shall be added to the water slowly and with agitation to prevent a dangerous rise in temperature causing boiling and spattering. Localized, highly concentrated solutions may form which will cause overheating when mixed with water. Do not attempt to increase the concentration of sodium hydroxide in solution by more than 5% sodium hydroxide with any single addition of sodium hydroxide.

(B) Sodium hydroxide cylindrical cake (molten sodium hydroxide solidified in a drum) shall be handled by mechanical equipment and dissolved in equipment designed for this purpose with protection of the workers from splashes or other skin contact with sodium hydroxide. In some situations anhydrous solid sodium hydroxide may be dissolved without first removing it from the steel drum. This may be accomplished by punching holes in the ends and sides of the drum with an axe or chisel lowering the drum in a perforated basket into an appropriate quantity of water and stirring the solution.

(C) The employee shall not add water to solid sodium hydroxide or to concentrated solutions thereof.

(D) Adequate respiratory protection shall be used in this process.

(6) Spills of sodium hydroxide solids or solutions shall be cleaned up immediately. Spilled solids may be taken up by careful shoveling followed by thorough flushing of the area with water. Spills of solution or of small amounts of solid shall be flushed away with water. Spills of sodium hydroxide on walkways create a serious slip and fall hazard; footwear used where spillage has resulted shall be appropriately slip-resistant. Residual sodium hydroxide on walkways shall be flushed or chemically neutralized to eliminate the hazard of fall on a slippery floor or walkway. Dry materials should not be cleaned by sweeping with a broom; vacuum-cleaning or wet-mopping may be used where appropriate.

(7) If sodium hydroxide in any form gets into an employee's eyes, it must be flushed out immediately with copious quantities of water for at least 15 minutes. The employer shall ensure that the

exposed employee receives immediate attention by medical personnel and subsequently by an ophthalmologist. Safety fountains for flushing the eyes shall be conveniently located in all areas where there is likelihood of sodium hydroxide splashes or dust.

(8) An employee who gets sodium hydroxide solid or solution on his skin or clothing shall immediately wash with a copious flow of water under an emergency shower or an equally effective washing facility. It may be necessary to scrub areas of skin under flowing water to remove sodium hydroxide. In cases of skin contact, there is often considerable delay before an irritation is noticeable. Attention must be directed to this latent period to prevent skin damage. Goggles shall not be taken off until the adjacent area has been thoroughly flushed. Contaminated clothing shall be removed during the shower flushing which shall be continued for as long as 1 hour or more, and the services of a physician shall be obtained. Safety showers shall be provided in all areas where serious contact with sodium hydroxide is likely.

(9) Severe burns of the lips, mouth, throat, esophagus, and stomach will result if sodium hydroxide is taken internally. Do not induce vomiting if sodium hydroxide is swallowed. If the victim is conscious, give milk or water, then egg white in water or cooking oil, followed by more water, vinegar, or lemon juice. Call a physician.

(b) Control of airborne contamination

Any operation where dusts or mists of sodium hydroxide may be dispersed into the air in concentrations exceeding the recommended workplace environmental limit shall be provided with local exhaust ventilation, shall be fully enclosed, or shall be controlled by other means equally effective

to keep the airborne concentration below the recommended workplace environmental limit.

(c) General practices for safe handling

(1) All process equipment shall be constructed of alkali-resistant material, shall be regularly inspected for leaks, and shall be maintained in a safe operating condition.

(2) Pressure tanks or other apparatus shall not be used at pressures in excess of their safe rating and shall be regularly tested for safety at the pressures used.

(3) Tanks shall be provided with overflow openings, baffled to prevent obstruction, and shall be provided with troughs to conduct any overflow away from the employees and walkways.

(4) Air release lines for venting pressure from a line or vessel in which sodium hydroxide is used shall be directed into a pit or a trap, or directed straight down with the end of the line close to the ground so the discharge when venting cannot strike employees or walkways.

(5) The employer shall ensure that all safety equipment, personal protective devices, and work clothing are regularly cleaned, inspected, and maintained in good condition.

(A) Contaminated protective clothing shall be laundered before reuse.

(B) When respiratory protective devices are provided and required for wear in an area or at a task, they shall be worn and maintained in accordance with the principles given in Section 4 and with any requirements for obtaining a variance.

(6) Good personal hygiene shall be encouraged.

(7) Good housekeeping practices shall be observed to prevent or minimize contamination of areas and equipment and to prevent build-up of such contamination.

(8) Electrical equipment used in sodium hydroxide service shall be designed to prevent deterioration or electrical shorting which can result from accumulations of sodium hydroxide on wiring and terminals. Protective enclosures or splash walls shall be provided in heavy use areas. Pneumatically operated equipment may be substituted for electrical equipment in some areas.

(9) Precautions shall be taken to:

(A) Prevent contact of molten anhydrous sodium hydroxide with combustible containers, pallets, and other organic materials.

(B) Avoid contact of sodium hydroxide with chemically reactive metals such as aluminum, tin, zinc, magnesium, copper, bronze, brass, chromium, and others because flammable, explosive hydrogen gas may result, or structural defects may occur.

(C) Avoid accidental mixing of sodium hydroxide and concentrated acids.

(10) Attention shall be directed to the danger of embrittlement which may result from contact of steel with sodium hydroxide at elevated temperatures.

(11) Sodium hydroxide shall be stored or transferred in appropriately designated and labelled containers which cannot be mistaken for food or beverage containers.

Section 7 - Sanitation

(a) Eye flushing fountains and emergency showers with adequate pressure of cool water shall be provided as specified in Section 6.

(b) Clothing change and locker room facilities shall be provided in a nonexposure area. Workers should be encouraged to change work clothing daily. Contaminated clothing or personal protective equipment shall be cleaned before being reused.

Shower and basin washing facilities shall be located in the locker room area.

(c) Food storage and preparation and eating facilities, if provided, shall be located in nonexposure areas.

Section 8 - Monitoring and Recordkeeping

Workroom areas will not be considered to have occupational exposure to sodium hydroxide if environmental levels, as determined on the basis of an industrial hygiene survey or by the judgment of a compliance officer, do not exceed half of the workplace environmental limit. Records of these surveys, including the basis for concluding that airborne concentrations of sodium hydroxide are not above half of the workplace environmental limit, shall be maintained until a new survey is conducted. Surveys shall be repeated when any process change indicates a need for reevaluation or at the discretion of the compliance officer. Requirements set forth below apply to areas in which there is sodium hydroxide exposure.

Employers shall maintain records of accidental sodium hydroxide releases. In addition, records of workplace environmental exposures to sodium hydroxide shall be maintained based upon the following sampling and

analytical schedules except as otherwise indicated by the judgment of a professional industrial hygienist. Samples representative of the exposure in the breathing zones of at least 25% of the employees in each operation or process shall be collected. Every employee shall be included in the sampling at least once every 2 years.

(a) Initial and Recurrent Sampling and Analytical Procedures

(1) The first environmental sampling and analysis shall be completed within 6 months of the promulgation of a standard incorporating these recommendations.

(2) Samples shall be collected and analyzed at least every 6 months in accordance with Appendices I and II to evaluate whether or not the work environment conforms with the recommended workplace environmental limit.

(b) Special Sampling and Analytical Procedures

(1) Monitoring of the airborne sodium hydroxide in the workplace shall be repeated at 15-day intervals when the concentration has been found to exceed the recommended workplace environmental limit. In such cases, suitable controls shall be initiated, and monitoring shall continue at 15-day intervals until 2 consecutive surveys indicate that exposures are at or below the recommended workplace environmental limit.

(2) Sampling and analysis of airborne sodium hydroxide shall be accomplished within 30 days after installation of a new process or process change.

(c) Recordkeeping procedures

Applicable medical records and records of all sampling and chemical analysis of airborne sodium hydroxide shall be maintained for at least 5

years after termination of employment. Records shall indicate the type of personal protective devices, if any, in use at the time of sampling. Each employee shall be able to obtain information on his own workplace environmental exposure.