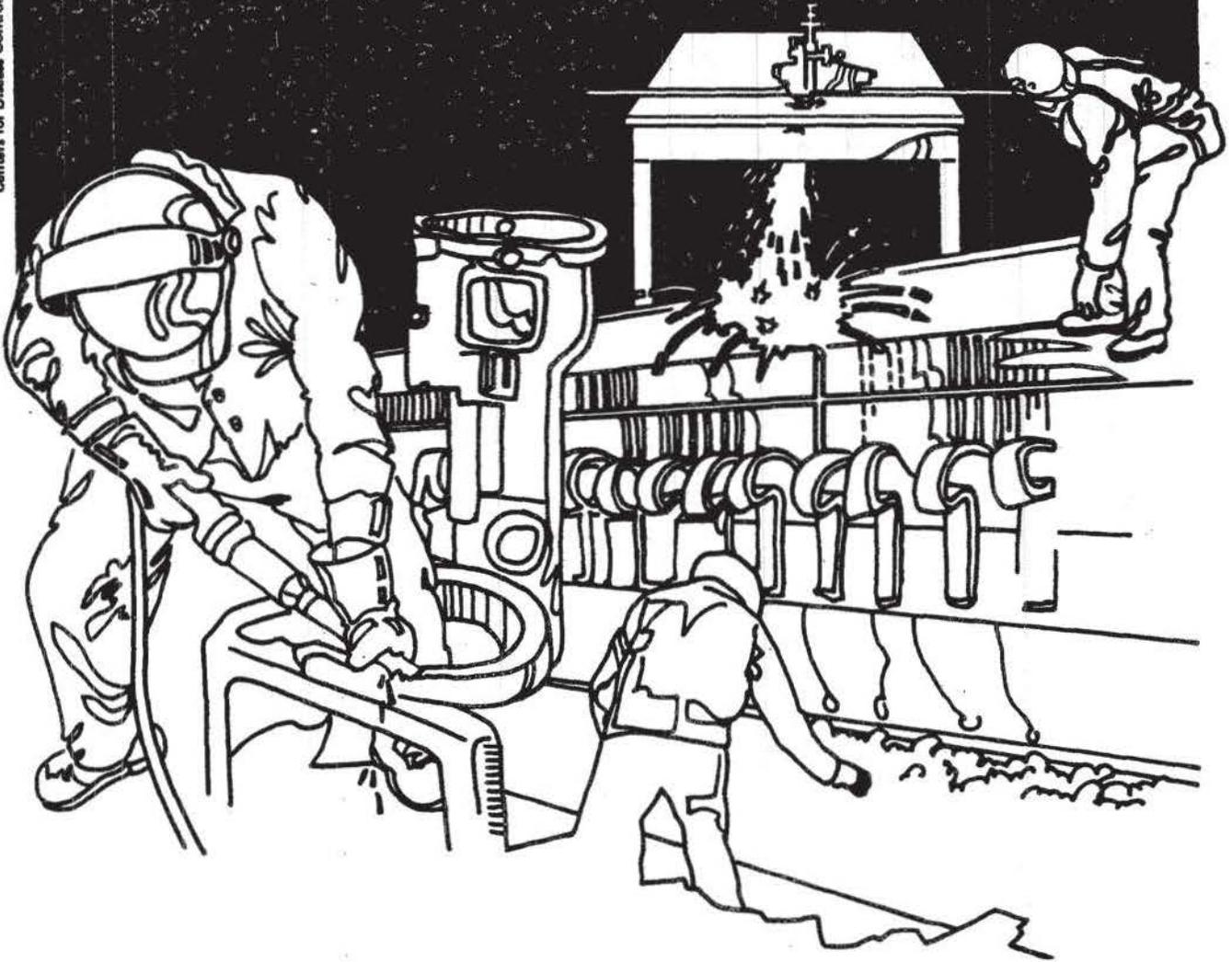


NIOSH



Health Hazard Evaluation Report

HETA 82-056-1186
MONROE COUNTY INCINERATOR
KEY LARGO, FLORIDA

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

HETA 82-056-1186
September 1982
Monroe County Incinerator
Key Largo, Florida

NIOSH Investigators:
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I. SUMMARY

On November 24, 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation at the Monroe County Incinerator, North Key Largo Plant #1 in Key Largo, Florida. The request stated that employees are concerned with possible biohazards from the handling of hospital waste (human body parts, blood-contaminated bedding and wearing apparel, syringes, and operating room waste) at the incinerator. Exposure to ash from the incinerated hospital waste was also of concern. No complaints of adverse health effects were mentioned in the request.

The incinerator employs twelve people, including the supervisor, and operates three shifts per day six days a week. Plant #1 has three furnaces with a combined capacity of 300,000 lbs. per 24 hr. day. The current waste load is 132,000 lbs. of municipal refuse and 4200 lbs. of hospital waste per day. Each furnace is charged with 560 lbs. of mixed municipal and hospital wastes every 8 minutes. When there are no hospital wastes to be burned, furnaces are charged with municipal wastes alone.

Interviews with several incinerator operators and general laborers did not reveal any incident of human body parts being seen or spilled from bags. Blood had been observed leaking from bags onto truckbeds and the incinerator floor. Samples of the grate ash were analyzed for organic content and found to contain 0.08 to 0.12 percent volatile material which is consistent with, or less than, that expected in municipal incinerator operation.

The State Epidemiologist was contacted and found to be aware of the concern for worker exposure to infectious waste as it was being handled by personnel outside hospitals and health care units. The 1982 Florida Legislature adopted a bill providing regulation of infectious waste disposal. The act requires that each hospital and ambulatory surgical center properly identify, segregate, and separate infectious from solid waste, and that any transporter of infectious waste be notified of the existence and location of such waste.

No immediate biohazard at the incinerator was identified during the survey; however, worker exposure to infectious wastes due to breakage of the bags because of mishandling is possible. There is no indication of unburned infectious wastes in the grate ash.

The bill enacted by the 1982 Florida Legislature should be strictly observed by persons delivering wastes, and incinerator managers should reject any waste not properly bagged and marked.

KEYWORDS: SIC 4953; incinerator, infectious waste, biohazards, hospital waste.

II. INTRODUCTION

On November 24, 1981, the National Institute for Occupational Safety and Health received a request for a health hazard evaluation at the Monroe County Incinerator, North Key Largo Plant #1 in Key Largo, Florida. The request stated that employees are concerned with what appears to be biohazards from the handling of hospital waste (human body parts, blood-contaminated bedding and wearing apparel, syringes, and operating room waste) at the incinerator. Exposure to fly ash from the incinerated hospital waste was also of concern.

A walk-through survey of the facility was conducted January 6-7, 1981 by the Occupational Health Studies Group, University of North Carolina, Chapel Hill, North Carolina, under a cooperative agreement with, and as a representative of NIOSH. The team of investigators consisted of an industrial hygiene engineer and an industrial hygienist. No interim reports or letters were submitted to NIOSH or to Monroe County officials. However, there was contact after the survey by telephone with the County Manager to suggest evaluation and recommendations for correction of safety problems.

III. BACKGROUND

The following information was obtained in the initial discussions with the Manager and the Supervisor, Municipal Services District, an incinerator foreman, and employees. North Key Largo Plant #1 is one of three incinerators in Monroe County. This incinerator began operation during September 1981 and burned household waste for the first few months while operations were being organized. Due to the closing of other incinerators in neighboring counties for repair, or because of obsolescence during this period, hospital wastes from several counties, predominantly Dade County, are now brought to Plant #1 for incineration. Several private contractors pick up waste at the hospitals and bring it to the incinerator, where it is mixed with household waste and burned.

Plant #1 has three furnaces with a combined capacity of 300,000 lbs. per 24 hr. day. The current waste load is 132,000 lbs. of municipal garbage and 4200 lbs. of hospital waste per day. Each furnace is charged with 560 lbs. of mixed municipal and hospital wastes every 8 minutes. When there are no hospital wastes to be burned, furnaces are charged with municipal wastes alone.

The incinerator has a reciprocating grate which agitates the charge to help expose unburned material and moves burning material and ash toward the ash quench pit located at the end of the furnace away from the charging door. The grate is designed to retain the cinders and ash. However, due to the design of the incinerator, some of the ash passes through the reciprocating grate and accumulates inside the ash hopper of the incinerator. This requires an employee to go beneath the incinerator periodically and remove an iron cover so ash will fall to the floor and be further removed by sprayed water or scraped out by hand. While the cover is open, dry ash becomes airborne and the employee is exposed to this ash.

IV. METHODS AND MATERIALS

Environmental evaluation consisted of interviews with Monroe County officials and affected personnel about procedures for handling hospital and household waste and about environmental conditions, a walk-through industrial hygiene survey, and collection of bulk settled ash material for analysis of organic chemical content. The number of employees at the incinerator is small and they were requested to provide such information as they were able in the interview; no questionnaires were used.

Communication with State of Florida, Department of Health and Rehabilitative Services, was initiated after the survey of the incinerator. Information was obtained concerning a bill before the 1982 Legislature dealing with guidelines for the classification and handling of disposable infectious waste.

V. EVALUATION CRITERIA

The criteria for evaluation of the potential for a biohazard to county incinerator employees was based on guidelines recommended to hospitals for the packaging, storing and disposal of potentially hazardous hospital waste. Criteria for evaluation were also based on guidelines for hospitals, renal dialysis centers, nursing homes and laboratories for the classification and handling of disposable infectious waste to be presented to the 1982 Legislature of the State of Florida.²

Evaluation of the general environment was based on the judgment of the industrial hygiene investigating team, following observation of working procedures and personal interviews of incinerator employees.

The volatile material content of the "siftings" was evaluated in terms of the amount of organic material expected in municipal incinerator grate ash. This may be 0.1 to 1.1 percent unburned combustibles by weight in ash³, or 0.96 percent putrescible material by weight of ash siftings.⁴

VI. RESULTS AND DISCUSSION

The Monroe County, Key Largo Plant #1 incinerator employs twelve people including the supervisor and operates three shifts per day six days a week. The incinerator with its three independent burning units is enclosed in a large metal building with three large garage type doors that generally stay open due to the warm weather in Key Largo. County refuse trucks dump domestic and municipal wastes at one end of the building. Incinerator operators using a front-end loader charge this waste on a 7-8 minute cycle to each incinerator unit.

Independent contractors delivering hospital wastes by truck in various colored plastic bags to the incinerator were observed during the survey. A contractor typically backs a truck containing the hospital wastes into the incinerator house and loads the front-end loader with wastes from the truck by hand.

About 180 to 200 pounds of hospital waste is included with each charge of household waste into the incinerator. Hospital waste burns at high temperatures due to its high plastic content, and requires mixing with the high-moisture, cooler-burning household waste to avoid exceeding the rated burning temperature of the incinerator. Mixing is accomplished by the front-end loader operator charging two loads of household waste to a loading hopper for each load of hospital waste.

Several incinerator operators and general laborers were interviewed. On occasion the plastic bags of hospital waste are reported to break during handling or transport in the truck. One incinerator employee reported seeing human body parts and blood being spilled from the truck onto the floor of the incinerator building. This report was the basis of the evaluation request. Interviews revealed no further incidents of human body parts being seen or spilled from bags. Blood had been observed leaking from bags onto truckbeds and the incinerator floor. Also reported were markings such as "Isolation Bag" and "Contaminated" on hospital materials spilled from bags.

During the survey the procedure of transferring hospital waste from the truck to the charging hopper was observed. None of the bags were broken and all material appeared to be double-bagged as requested by hospital officials. Where color tinted or clear bags were used, materials covered with blood and disposable surgical equipment could be observed through the bags. No human body parts were seen through transparent bags or in the few bags opened by the investigating team.

One worker was observed while he was removing an ash hopper cover from the bottom of the incinerator and scraping out grate ash. This procedure required approximately 30 minutes and the worker wore monogoggles but no dust respirator. Samples of the ash were analyzed for organic content and found to contain 0.08 to 0.12 percent volatile material (loss on ignition at 1000°F).

The finding of 0.08 and 0.12 percent of volatile material in the grate siftings (ash) is consistent with or less than expected in municipal incinerator operation. There is no indication that hospital wastes are leaving the incinerator partly unburned.

Contact was made with the State Epidemiologist at the Department of Health and Rehabilitative Services after the on-site survey to learn the State's policy on handling hospital waste. The State Epidemiologist was aware of the concern for worker exposure to infectious waste as it was being handled by personnel outside the hospitals and health care units, and stated that guidelines (minimum

standards) for hospitals, renal dialysis centers, nursing homes, and laboratories for the classification and handling of disposable infectious waste were in review for presentation to the 1982 State Legislature for adoption. These guidelines are intended to aid hospitals, renal dialysis centers, nursing homes, and laboratories in classifying and handling disposable infectious waste in preparation for collection and disposal. They are not intended to be all-encompassing recommendations for handling human tissues/waste specimens (or materials in contact with such specimens) within hospitals. The guidelines state that hospitals and other institutions should develop additional internal policies for the protection of employees from contact with potentially infectious material and for the proper sterilization of reusable items.

Interviews with employees at the incinerator revealed no complaints of adverse health effects.

Aside from the ash handling and potential biohazard, two additional conditions were observed.

First, the quenched ash conveyor channel lacks guard rails at several points. A worker could easily lose his footing, fall into the channel and be mangled or drowned. Guard chains provided at some access points are too low to be effective as guard rails. The investigating team informed the Manager and Supervisor of the incinerator that free safety consulting services are available from the Bureau of Industrial Safety and Health in Florida, which could further evaluate and suggest recommendations for correction of any safety problem within the facilities.

Second, the incinerator building roof drains to a cistern. The collected rain water is sprayed inside the ignition chamber if the temperature rises above 1800°F. An auxiliary water line from the County drinking water system is connected to the cistern. This line has a vacuum breaker but enters the cistern below its overflow level. News reports heard while at Key Largo indicated a continual low-pressure problem in the Keys water system. This backflow connection creates the potential for contaminated cistern water to enter the drinking water system.

VII. CONCLUSIONS

1. No immediate biohazard at the incinerator was identified during the survey; however, worker exposure to infectious wastes due to breakage of the bags because of mishandling is possible. Also, improperly labeled bags or non-color-coded bags might be disposed of by regular garbage handling methods, creating the possibility of worker exposure to biohazards.
2. Employees are exposed to potentially excessive dust concentrations when cleaning out ash hoppers. On the basis of the low percentage of volatile material in the ash and personal observation, there is no indication of unburned infectious wastes in the ash.

3. The unguarded ash conveyor channel presents a safety hazard.
4. Unsafe cistern water may backflow into the municipal drinking water system.

VIII. RECOMMENDATIONS AND FOLLOW-UP

1. In making arrangements with private contractors to dispose of hospital wastes, County officials should require that infectious or contaminated wastes be delivered in double impervious plastic bags of at least two mils in thickness each, and color-coded in a manner consistent with the coding system used by hospitals in the area.
2. The 1982 Florida Legislature enacted a bill regulating disposal of infectious waste by hospitals, renal dialysis centers, nursing homes, and laboratories. (See Appendix) County officials should insist on strict observance of these regulations by persons delivering wastes, and reject any wastes not properly bagged or marked.
3. Access points to the ash conveyor channel should be guarded properly.
4. Equipment and procedures to remove and convey hopper ash with minimal exposure of workers should be provided. It is understood that installment of a screw conveyor is being considered. In the meantime, disposable NIOSH-approved dust masks and eye protection should be worn by employees while cleaning hoppers. Other personal protection is not considered necessary for this operation.
5. Municipal water line connections to cisterns at all County incinerators should be inspected and steps taken if needed to ensure that the municipal system is protected from backflow of cistern water.

IX. REFERENCES

1. Accreditation Manual for Hospitals, Joint Commission on Accreditation of Hospitals, 1979 Edition.
2. Guidelines for Hospitals, Renal Dialysis Centers, Nursing Homes and Laboratories for the Classification and Handling of Disposable Infectious Waste. 1982 Proposed Legislation, State of Florida, submitted by Robert A. Gunn, M.D., M.P.H., State Epidemiologist, March 1982.
3. Rubel, F. N., Incineration of Solid Wastes. Noyes Data Corp. Park Ridge, NJ (1974).

4. Stear, James R., Municipal Incineration: A Review of Literature Environmental Protection Agency Publication No. AP-79 (June 1971).
5. An act relating to the regulation of infectious waste disposal. Florida Senate Bill 746; companion to HB 766, effective July 1, 1982.

X. AUTHORSHIP AND ACKNOWLEDGEMENTS

The cooperation of Mr. Charles Agrero, Mr. Jack Julian, Mr. Vern Griffeth, and other Municipal Service District employees is hereby acknowledged.

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XI. DISTRIBUTION AND AVAILABILITY

Copies of this Determination report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After ninety (90) days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from the NIOSH Publications Office at the Cincinnati, Ohio address.

Copies of this report have been sent to:

- (a) Municipal Services District, Monroe County, Key West, Florida
- (b) U.S. Department of Labor, OSHA, Region IV
- (c) NIOSH Region IV
- (d) Florida Department of Health and Rehabilitative Services
- (e) Florida Department of Labor

APPENDIX

Act relating to the regulation of infectious waste disposal,
ES/HB 766, effective date July 1, 1982.

CHAPTER 82-125

Committee Substitute for House Bill No. 766

An act relating to the regulation of infectious waste disposal; adding subsection (7) to s. 395.01, Florida Statutes, defining "solid waste," "liquid waste," and "infectious waste"; creating s. 395.24, Florida Statutes, requiring that each hospital and ambulatory surgical center shall properly identify, segregate, and separate infectious from solid waste; requiring that any transporter of infectious waste shall be notified of the existence and locations of such waste; adding a paragraph to s. 403.7045(3), Florida Statutes, providing that infectious waste from hospitals and ambulatory surgical centers shall be separated from other solid waste and disposed of by certain methods; providing for review and repeal in accordance with the Regulatory Sunset Act; providing an effective date.

Be It Enacted by the Legislature of the State of Florida:

Section 1. Subsection (7) is added to section 395.01, Florida Statutes, to read:

395.01 Definitions.--As used in this chapter:

(7)(a) "Solid waste" means all solid material emanating from patient care, which includes, but is not limited to, the following disposables: linens, gowns, intravenous material, catheters, syringes, needles, clinical laboratory specimen containers, tubes, drainage systems, renal dialyzers and accessories, and other disposable items which may be contaminated with urine, feces, blood, secretions, or other bodily fluids.

(b) "Liquid waste" means all material emanating from patient care that may be and is routinely placed into the sewage system, which includes, but is not limited to, urine, feces, blood, secretions, drainage fluids, and other bodily fluids.

(c) "Infectious waste" means all solid wastes from patients under strict or respiratory infectious isolation, or all solid wastes from patients pertaining to the maintenance of enteric, wound/skin, discharge, and blood infectious precautions, or all unautoclaved microbiologic waste derived from processing clinical specimens, which includes, but is not limited to, all cultures and disposable items that may be contaminated with culture organisms, or all solid waste which constitutes solid pathological tissue specimens. For the purposes of this definition, the term "infectious waste" does not include solid waste emanating from patients not in infectious isolation or on infectious precautions, or solid waste emanating from patients on infectious precautions but emanating from bodily excretions or secretions from areas not under precaution, or solid waste from operating rooms except for such wastes emanating from patients under infectious isolation or on infectious precautions, or solid waste emanating from emergency rooms except from patients under infectious isolation or on infectious precautions, or solid wastes emanating from patients in dialysis units unless the patient is under infectious isolation or on infectious precautions, or any liquid waste from any patient unless the patient is infected with a U.S. Public Health Service Centers for Disease Control Class IV viral agent, in which case liquid waste shall be considered as infectious waste.

Section 2. Section 395.24, Florida Statutes, is created to read:

395.24 Identification, segregation, and separation of infectious waste.--Each hospital and ambulatory surgical center shall ensure that

CODING: Words in ~~struck through~~ type are deletions from existing law; words in underscoring type are additions.

infectious waste is properly identified, segregated, and separated from other solid waste at the generating facility. Any transporter or potential transporter of such waste shall be notified of the existence and locations of such waste.

Section 3. Paragraph (d) is added to subsection (3) of section 403.7045, Florida Statutes, to read:

403.7045 Application of act and integration with other acts.--

(3) The following wastes or activities shall be regulated pursuant to this act in the following manner:

(d) Infectious waste as defined in s. 395.01(7) emanating from hospitals and ambulatory surgical centers as defined in s. 395.01 shall be disposed of by any means authorized by the department, including land disposal after sterilization or incineration. Any person who unknowingly disposes into a sanitary landfill any such waste which has not been properly segregated or separated from other solid wastes by the generating facility shall not be guilty of a violation under this act. Nothing herein shall be construed to prohibit the department from seeking injunctive relief pursuant to s. 403.131 to prohibit the unauthorized disposal of infectious waste.

Section 4. Each section within chapter 395, Florida Statutes, which is added or amended by this act, is repealed on October 1, 1992, and shall be reviewed by the Legislature pursuant to s. 11.61, Florida Statutes.

Section 5. This act shall take effect July 1, 1982.

Approved by the Governor April 5, 1982.

Filed in Office Secretary of State April 6, 1982.

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