

Disposal of Draeger Tubes at Savannah River Site

RECORDS ADMINISTRATION



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by

N. P. Malik

Westinghouse Savannah River Company
Savannah River Site
Aiken, South Carolina 29808

J. O. Burgess

K. R. Liner

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DISPOAL OF DRAEGER TUBES AT SAVANNAH RIVER SITE

Jennifer O. Burgess, Keith R. Liner, and Narinder P.S. Malik
Westinghouse Savannah River Company
Aiken, South Carolina 29802

INTRODUCTION

The Savannah River Site (SRS) is a Department of Energy (DOE) facility located in Aiken, South Carolina that is operated by the Westinghouse Savannah River Company (WSRC). At SRS Draeger tubes are used to identify the amount and type of a particular chemical constituent in the atmosphere. Draeger tubes rely on a chemical reaction to identify the nature and type of a particular chemical constituent in the atmosphere.ⁱ Disposal practices for these tubes were identified by performing a hazardous waste evaluation per the Resource Conservation and Recovery Act (RCRA). Additional investigations were conducted to provide guidance for their safe handling, storage and disposal. A list of Draeger tubes commonly used at SRS was first evaluated to determine if they contained any material that could render them as a RCRA hazardous waste. Disposal techniques for Draeger tubes that contained any of the toxic contaminants listed in South Carolina Hazardous Waste Management Regulations (SCHWMMR)ⁱⁱ R.61-79.261.24 (b) and/or contained an acid in the liquid form were addressed.

EVALUATION

A hazardous waste evaluation was performed per the Resource Conservation and Recovery Act (RCRA) on the Draeger tubes used at the SRS as listed in Attachment #1. The purpose of this evaluation was to identify those Draeger tubes that are considered RCRA hazardous waste when sent for disposal. Additional investigations were conducted to provide guidance for their safe handling, storage and disposal.

The list of Draeger tubes on Attachment #1 was first evaluated to determine if they contained any material that could render them a RCRA hazardous waste. Tubes that contained any of the toxic contaminants listed in South Carolina Hazardous Waste Management Regulations (SCHWMMR) R.61-79.261.24 (b) Table 1 and/or contained an acid in the liquid form were identified.

Calculations were performed to determine the concentration of toxic material present in the tubes. Attachment #1 identifies those tubes that contain a toxic contaminant listed in (SCHWMMR) R.61-79.261.24 (b) Table 1. The following steps were evaluated and considered:

- A calculation for the tubes that contain an acid in the liquid form is not required as outlined below.
- The amount of toxic material in the tube was first calculated based on the chemical reaction equation.
- The tubes were then weighed to determine their weight.

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- The amount of toxic material in the tube was then divided by the total weight of the tube to arrive at a concentration of toxic material per tube.
- The toxic material concentration was divided by a factor of 20 to obtain the maximum theoretical leachate concentration. The division factor represents the 20 to 1 ratio of the extraction fluid to the solid used in the Toxic Characteristic Leaching Procedure (TCLP).
- The maximum theoretical leachate concentration was compared to the RCRA TCLP regulatory concentration limit in SCHWMMR R.61-79.261.24 (b) Table 1, to identify those tubes that would exceed the RCRA toxicity limit and would be considered hazardous waste when sent for disposal.

Based on a per tube analysis, all but three of the tubes identified in Attachment #1 as containing a toxic contaminant listed in SCHWMMR R.61-79.261.24 (b) Table 1 exceed the RCRA toxicity limit and were considered RCRA characteristically hazardous due to toxicity.

Attachment #2 lists those tubes that exceed the RCRA toxicity limit and are therefore considered characteristically hazardous waste due to toxicity when sent for disposal as a waste stream. The tubes that contain acid may also be characteristically hazardous due to corrosivity. Due to depletion of free liquid, it is difficult to analyze the acid contents.

Therefore, those tubes were considered corrosive, as they had acid in them at one time.

Based on the above findings, guidance were developed for three specific situations with regard to used and unused Draeger tube management:

1. Newly generated used Draeger tubes
2. Used Draeger tubes that had been accumulated; and
3. Draeger tubes that are unused and are past their expiration date

GUIDANCE FOR MANAGING DRAEGER TUBES

Guidance for the safe handling and disposal of Draeger tubes is given as follows:

(1) Newly Generated Used Draeger Tubes

All Draeger tubes, hazardous or non-hazardous, that are routinely used and that have not been accumulated can be put in the sanitary waste for disposal. As with other characteristically hazardous waste, a few tubes in the larger routine sanitary waste stream should not render the whole waste stream hazardous. At SRS, it is an acceptable practice that has been used for items such as batteries, cadmium plated screws, lead washers, etc. (WSRC-IM-90-138).ⁱⁱⁱ For the safety and protection of workers, the tube ends shall be taped. The tubes shall then be put into a small bag with an absorbent and sealed to prevent any cuts from the glass tubes. The tubes can then be put into a sanitary waste container for disposal.

All tubes that originate from a radiological area that cannot be free released from the radiological area by Radiological Controls-Operations personnel can

be handled as low level waste. If the tubes have not been accumulated they can be put into the appropriate low-level waste container for disposal. As with other characteristically hazardous waste, a few tubes in the larger routine low-level waste stream should not render the whole waste stream hazardous.

For the safety and protection of workers, the tube ends shall be taped. The tubes shall then be put into a small bag with an absorbent and sealed to prevent any leak of free liquid and cuts from the glass tubes. The tubes can then be put into a low-level waste container for disposal.

(2) Used Draeger Tubes That Have Been Accumulated

Draeger tubes that have been accumulated must first be evaluated to determine if any of the tubes listed in Attachment #2 are present.

If tubes listed in Attachment #2 are present in the accumulated quantity, the tubes shall be placed in a hazardous waste satellite accumulation area and managed as characteristically hazardous waste in accordance with WSRC Manual 3Q, "Environmental Compliance Manual", Procedure 6.9, "Hazardous or Mixed Waste Management at Satellite Accumulation Areas."^{iv} The tubes should be disposed of in a labpack or could be sent to the Hazardous Waste Storage Facility in accordance with WSRC Manual 1S, "Waste Acceptance Criteria Manual," Procedure 3.18, "Hazardous, Mixed, and Polychlorinated Biphenyl Waste Acceptance Criteria."^v

If none of the tubes listed in Attachment #2 are present in the accumulated quantity, the waste should be considered as nonhazardous and disposed of as special waste (a category of sanitary waste used at SRS). At SRS, it is required to complete a special waste form due to the accumulation of tubes.

The same process should be used for accumulated tubes that Radiological Controls-Operations personnel free release from a radiological area. If tubes listed in Attachment #2 are present, the tubes should be placed in a mixed waste satellite accumulation area and managed as a mixed waste in accordance with WSRC Manual 3Q, "Environmental Compliance Manual", Procedure 6.9, "Hazardous or Mixed Waste Management at Satellite Accumulation Areas." Those tubes should be sent to the Mixed Waste Storage Facility in accordance with WSRC Manual 1S, "Waste Acceptance Criteria Manual," Procedure 3.18, "Hazardous, Mixed, and Polychlorinated Biphenyl Waste Acceptance Criteria."

If none of the tubes as listed in Attachment #2 are present in the accumulated quantity, the tubes should be handled as low-level waste and placed in the appropriate low-level waste container. No special forms would be required for disposal.

(3) Draeger Tubes That are Unused and are Past Their Expiration Date

At SRS the most desirable method to handle unused Draeger tubes past their expiration date is to make them available to the Chemical Commodities Management Center (CCMC). If possible, the CCMC will excess the tubes for

reuse. The CCMC may not be able to take the unused tubes for excess at the desired time.

Once the decision is made to discard the tubes they can be managed as follows:

- Nonhazardous tubes identified as listed in Attachment #1 should be disposed of as special waste. If the accumulated quantity of tubes is large a special waste form must be completed
- Hazardous tubes identified in Attachment #2 shall be placed in a hazardous waste satellite accumulation area waste in accordance with WSRC Manual 3Q, "Environmental Compliance Manual", Procedure 6.9, "Hazardous or Mixed Waste Management at Satellite Accumulation Areas." The tubes can be disposed of in the next available labpack or can be sent to the Hazardous Waste Storage Facility in accordance with WSRC Manual 1S, "Waste Acceptance Criteria Manual," Procedure 3.18, "Hazardous, Mixed, and Polychlorinated Biphenyl Waste Acceptance Criteria."

ACKNOWLEDGEMENT

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REFERENCES

- i. Draeger Tube Handbook
- ii. SC R.61-79, "South Carolina Hazardous Waste Management Regulations"
- iii. WSRC-IM-90-138, "Savannah River Site Waste Disposal Manual(U)"
- iv. WSRC Manual 3Q, "Environmental Compliance Manual", Procedure 6.9, "Hazardous or Mixed Waste Management at Satellite Accumulation Areas (U)"
- v. WSRC Manual 1S, "Waste Acceptance Criteria Manual," Procedure 3.18, "Hazardous, Mixed, and Polychlorinated Biphenyl Waste Acceptance Criteria (U)"

ATTACHMENT #1: List Of Draeger Tubes That Contain Toxic Contaminants

Draeger Tubes used at SRS	Additional Notes
Acetic Acid 5/a	
Acetone 100 B	
Air Current Tubes	Contains fuming sulfuric acid.
Air Current Smoke Tube	
Alcohol 100/a	Contains Chromium
Ammonia 0.5%/a	
Ammonia 0.25/a	
Ammonia 2/a	
Ammonia 5/a	
Benzene 0.5/a	Free liquid contains sulfuric acid.
Benzene* 0.5/c	
Benzene* 0.05	
Benzene* 15/a	
Carbon Dioxide 100/a	
Carbon Dioxide 100/a-P	
Carbon Monoxide 2/a	
Carbon Monoxide 5/a p	
Carbon Monoxide 5/c	
Carbon Monoxide 50/a D	
Carbon Monoxide 50/a-I	Selenium may be present if the incomplete reaction
Chlorine 0.2/a	
Formaldehyde 0.2/a	Free liquid contains sulfuric acid.
Formic Acid 1/a	
Hydrazine 0.2/a	Contains Silver in the form of silver nitrate
Hydrocarbons 2	Selenium may be present if the incomplete reaction
Hydrocarbon (Petroleum)	
Hydrochloric Acid 1/a	
Hydrochloric Acid 10/a-d	
Hydrochloric Acid/Nitric Acid 1/a	
Hydrogen Fluoride 1.5/B	
Hydrogen Sulfide 1/d	
Mercaptan 0.5/a	
Mercury Vapor 0.1/b	Contains Mercury in form of a mercury complex
Methylene Chloride 100/a	Chromium is considered a toxic
Monostyrene (Styrene Monomer) 10/a	
Nitric Acid 1/a	
Nitrogen Dioxide 0.5/c	
Nitrous Fumes 0.5/a	Contains Chromium
Oil 10/a P	Free liquid contains sulfuric acid.
Ozone 0.05/b	
Perchloroethylene 10/b	
Phenol 1/b	
Phosgene 0.02/a	
Simultaneous Test Set I	Contains a Mercury Chloride and a lead containing compound Contains Selenium Dioxide and a chromium containing compound Contains a chromium contains compound
Simultaneous Test Set II	Contains a mercury containing compound
Simultaneous Test Set III	Contains a chromium compound
Sulfuric Acid 1/a	Contains barium
Sulfur Dioxide 1/a	
Toluene 5/b	
Toluene Diisocyanate 0.02/a	Free liquid contains sulfuric acid.
Trichloroethane 50/d	
Trichloroethylene 2/a	Contains chromium
Trichloroethylene* 10/a	Contains chromium
Triethylamine 5/a	
Water Vapor 0.1/a	
Water Vapor 1/b	
Water Vapor 5/a-p	Contains selenium
Xylene 10/a	

ATTACHMENT #2: List Of Draeger Tubes That Exceed RCRA Toxic Limits

Draeger Tubes	Management
Air Current Tube	MUST BE MANAGED AS HAZARDOUS DUE TO SULFURIC ACID
Alcohol 100/a	MUST BE MANAGED AS HAZARDOUS DUE TO CHROMIUM CONTENT
Benzene 0.5/a	MUST BE MANAGED AS HAZARDOUS DUE TO SULFURIC ACID
Carbon Monoxide 50/a-l	MUST BE MANAGED AS HAZARDOUS DUE TO SELENIUM CONTENT
Formaldehyde 0.2/a	MUST BE MANAGED AS HAZARDOUS DUE TO SULFURIC ACID
Hydrocarbons 2	MUST BE MANAGED AS HAZARDOUS DUE TO SELENIUM CONTENT
Methylene Chloride 100/a	MUST BE MANAGED AS HAZARDOUS DUE TO CHROMIUM CONTENT
Nitrous Fumes 0.5/a	MUST BE MANAGED AS HAZARDOUS DUE TO CHROMIUM CONTENT
Oil 10/a P	MUST BE MANAGED AS HAZARDOUS DUE TO SULFURIC ACID
Simultaneous Test Set I	MUST BE MANAGED AS HAZARDOUS DUE TO MERCURY, CHROMIUM, AND LEAD CONTENT
Simultaneous Test Set II	MUST BE MANAGED AS HAZARDOUS DUE TO MERCURY CONTENT
Simultaneous Test Set III	MUST BE MANAGED AS HAZARDOUS DUE TO CHROMIUM CONTENT
Sulfuric Acid 1/a	MUST BE MANAGED AS HAZARDOUS DUE TO CHROANILIC ACID
Toluene Diisocyanate 0.02/a	MUST BE MANAGED AS HAZARDOUS DUE TO SULFURIC ACID
Water Vapor 5/a-p	MUST BE MANAGED AS HAZARDOUS DUE TO SELENIUM CONTENT

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Document Approval Sheet

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Anthony Jouns
703-A, B204
5-8112

P.O. Box 616
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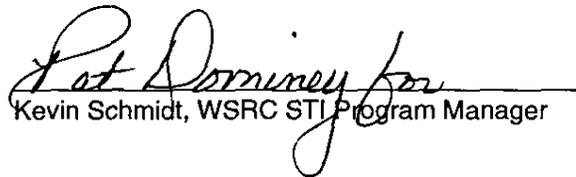
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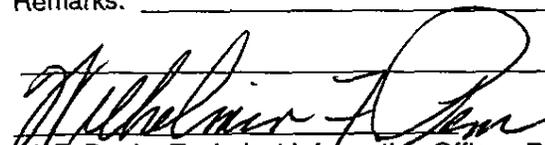
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K. DESCRIPTION/ABSTRACT

The Savannah River Site (SRS) is a Department of Energy (DOE) facility located in Aiken, South Carolina that is operated by the Westinghouse Savannah River Company (WSRC). At SRS Draeger tubes are used to identify the amount and type of a particular chemical constituent in the atmosphere. Draeger tubes rely on a chemical reaction to identify the nature and type of a particular chemical constituent in the atmosphere. Disposal practices for these tubes were identified by performing a hazardous waste evaluation per the Resource Conservation and Recovery Act (RCRA). Additional investigations were conducted to provide guidance for their safe handling, storage and disposal. A list of Draeger tubes commonly used at SRS was first evaluated to determine if they contained any material that could render them as a RCRA hazardous waste. Disposal techniques for Draeger tubes that contained any of the toxic contaminants listed in South Carolina Hazardous Waste Management Regulations (SCHWMR) R-61-79.261.24 (b) and/or contained an acid in the liquid form were addressed.

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Name and/or Position Kevin Schmidt, Manager STI Program & Site Support
E-mail _____ Phone (803) 725-2765
Organization Westinghouse Savannah River Company
2. Releasing Official I verify that all necessary reviews have been completed (e.g. Patent, Copyright, ECI, UCNI, etc.)
Released by (name) Kevin Schmidt Date (mm/dd/yyyy) 10/13/2000
E-Mail _____ Phone _____ (803) 725-2765