State of Michigan
Department of Environmental Quality
HAZARDOUS WASTE MANAGEMENT FACILITY OPERATING LICENSE

N E OF LICENSEE:	Michigan State University
NAME OF FACILITY OWNER:	Michigan State University
NAME OF FACILITY OPERATOR:	Michigan State University
NAME OF TITLEHOLDER OF LAND:	Michigan State University
FACILITY NAME:	Michigan State University Waste Storage Facility
FACILITY LOCATION:	3634 East Jolly Road Lansing, Michigan 48910
EPA IDENTIFICATION (ID) NUMBER:	MID 053 343 976

EFFECTIVE DATE: January 31. 2014

REAPPLICATION DATE: July 31, 2014

EXPIRATION DATE: January 31, 2024

AUTHORIZED ACTIVITIES

Pursuant to Part 111, Hazardous Waste Management, of Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451), being §§324.11101 to 324.11153 of the Michigan Compiled Laws, and the hazardous waste management administrative rules (hereafter called the "rules") promulgated there under, being R 299.9101 *et. seq.* of the Michigan Administrative Code, by the Michigan Department Environmental Quality (MDEQ), an operating license (hereafter called the "license") is issued to Michigan State University Waste Storage Facility (hereafter called the "licensee") to operate a hazardous waste management facility (hereafter called the "facility") located at latitude 84°29'54" and longitude 42°40'58". The licensee is authorized to conduct the following hazardous waste management activities:

☒ STORAGE	☐ TREATMENT	☐ DISPOSAL	☐ POSTCLOSURE
☒ Container	☐ Container	☐ Landfill	☐ Tank
☐ Tank	☐ Tank	☐ Land Application	☐ Surface Impoundment
☐ Waste Pile	☐ Surface Impoundment	☐ Surface Impoundment	☐ Landfill
☐ Surface Impoundment	☐ Incinerator		☐ Waste Pile
☐ Drip Pad	☐ Other:		

APPLICABLE REGULATIONS AND LICENSE APPROVAL

The conditions of this license were developed in accordance with the applicable provisions of the rules, effective November 5, 2013. The licensee shall comply with all terms and conditions of this license, Part 111, and its rules. This license consists of the 16 pages of conditions attached hereto as well as those in Attachments 1 through 11, and the applicable rules contained in R 299.9101 through R 299.11008, as specified in the license. For purposes of compliance with this license, applicable rules are those that are in effect on the date of issuance of this license in accordance with R 299.9521(3)(a).

This license is based on the information in the license application submitted on April 19, 2013, and any subsequent amendments (hereafter referred to as the "application"). Pursuant to R 299.9519(11)(c), the license may be revoked if the licensee fails, in the application or during the license issuance process, to disclose fully all relevant facts or, at any time, misrepresents any relevant facts. As specified in R 299.9519(1), the facility shall be constructed, operated, and maintained in accordance with Part 111 of Act 451, the rules, and this license.

This license is effective on the date of issuance and shall remain in effect for 10 years from the date of issuance, unless revoked pursuant to R 299.9519 or continued in effect as provided by the Michigan Administrative Procedures Act, 1969 PA 306, as amended (Act 306).

Issued this 31st day of January, 2014

by: Elizabeth M Browne

Elizabeth M. Browne, Chief
Office of Waste Management and Radiological Protection

HAZARDOUS WASTE MANAGEMENT FACILITY OPERATING LICENSE
FOR

Michigan State University
MID 053 343 976

TABLE OF CONTENTS

PART III: CONSTRUCTION FOR EXPANSION CONDITIONS

PART IV: CONTAINER STORAGE CONDITIONS

PART V: ENVIRONMENTAL MONITORING CONDITIONS

PART VI: CORRECTIVE ACTION CONDITIONS

LIST OF ATTACHMENTS

PART I
STANDARD CONDITIONS

TERMINOLOGY AND REFERENCES

Throughout this license, the term "Office" means the Office of Waste Management and Radiological Protection within the MDEQ responsible for administering Part 111 of Act 451 and the rules. Throughout this license, "Director" means the Director of the MDEQ or the Director's duly authorized designee such as the Office Chief. All of the provisions of Title 40 of the Code of Federal Regulations (CFR) referenced in this license are adopted by reference in R 299.11003.

B. EFFECT OF LICENSE

Except as otherwise provided by law, any treatment, storage, or disposal of hazardous waste not specifically authorized in this license is prohibited. Issuance of this license does not authorize any injury to persons or property, any invasion of other private rights, or any infringement of federal, state, or local law or regulations {R 299.9516(8)}; nor does it obviate the necessity of obtaining such permits or approvals from other units of government as may be required by law. Compliance with the terms of this license does not constitute a warranty or representation of any kind by the MDEQ, nor does the MDEQ intend that compliance with this license constitutes a defense to any order issued or any action brought under Act 451 or any other applicable state statute or §106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) {42 U.S.C. 9606(a)}, the Resource Conservation and Recovery Act of 1976, as amended (RCRA), and its rules, or any other applicable federal statute. The licensee, however, does not represent that it will not argue that compliance with the terms of this license may be a defense to such future regulatory actions. Each attachment to this license is a part of, and is incorporated into, this license and is deemed an enforceable part of the license.

C. SEVERABILITY

The provisions of this license are severable, and if any provision of this license, or the application of any provision of this license to any circumstance, is held invalid, the application of such provision to other circumstances and the remainder of this license shall not be affected thereby.

D. RESPONSIBILITIES

1. The licensee shall comply with Part 111 of Act 451, the rules, and all conditions of this license, except to the extent authorized by the MDEQ pursuant to the terms of an emergency operating license. Any license noncompliance, except to the extent authorized by the MDEQ pursuant to the terms of an emergency operating license, constitutes a violation of Part 111 of Act 451 and is grounds for enforcement action, license revocation, license modification, or denial of a license renewal application. {§§11148, 11150, and 11151 of Act 451; R 299.9521(1)(a) and (c) and (3)(a) and (b); and 40 CFR §270.30(a)}

2. If the licensee wishes to continue an activity regulated by this license after the expiration date of this license, the licensee shall submit a complete application for a new license to the Office Chief at least 180 days before this license expires, July 31, 2023, unless an extension is granted pursuant to R 299.9510(5). To the extent the licensee makes a timely and sufficient application for renewal of this license, this license and all conditions herein will remain in effect beyond the license expiration date and shall not expire until a decision on the application is finally made by the MDEQ, and if the application is denied or the terms of the new license are limited, until the last day for applying for judicial review of the new license or a later date fixed by order of the reviewing court consistent with §91(2) of Act 306. {R 299.9521(1)(a) and (c) and (3)(a) and 40 CFR §270.30(b)}

3. The licensee shall comply with the conditions specified in R 299.9521(1)(b)(i) to (iii) and 40 CFR §270.30(c) through (k), (l)(2), (3), (5), (7), and (11), and (m). {§§11123(3), 11146(1) and (2), and 11148(1) of Act 451 and R 299.9501(1), R 299.9516, R 299.9519, R 299.9521(1)(a) and (b) and (3)(a) and (b), R 299.9522, and R 299.9525}

4. The licensee shall give notice to the Office as soon as possible prior to any planned physical alterations or additions to the licensed facility. {R 299.9501, R 299.9519(1), and Part 6 of the Part 111 Rules}

E. SUBMITTAL DEADLINES

When the deadline for submittals required under this license falls on a weekend or legal state holiday, the deadline shall be extended to the next regular business day. This extension does not apply to the deadline for financial mechanisms and associated renewals, replacements, and extensions of financial mechanisms required under this license. The licensee may request extension of the deadlines for submittals required under this license. The licensee shall submit such requests at least five business days prior to the existing deadline for review and approval by the Office Chief. Written extension requests shall include justification for each extension. {R 299.9519 and R 299.9521(3)(a)}

PART II
GENERAL OPERATING CONDITIONS

A. GENERAL WASTE ANALYSIS

The licensee shall ensure that any waste managed at the facility has been properly characterized pursuant to R 299.9302 and comply with the procedures described in the attached Waste Analysis Plan, Attachment 1, of this license. {R 299.9605(1), and 40 CFR §264.13}

B. SECURITY

The licensee shall comply with the barrier, surveillance, and signage requirements of R 299.9605(1) and 40 CFR §264.14.

C. GENERAL INSPECTION REQUIREMENTS

The licensee shall inspect the facility in accordance with the Inspection Schedule, Attachment 2, of this license and comply with the inspection requirements of R 299.9605(1) and 40 CFR §264.15.

D. PERSONNEL TRAINING

The licensee shall comply with the personnel training requirements of R 299.9605 and 40 CFR §264.16. The Personnel Training Program, Attachment 3, of this license shall, at a minimum, cover all items in R 299.9605 and 40 CFR §264.16.

. PREPAREDNESS AND PREVENTION

The licensee shall comply with the preparedness and prevention requirements of R 299.9606 and 40 CFR Part 264, Subpart C.

F. CONTINGENCY PLAN

The licensee shall comply with the contingency plan requirements of R 299.9607 and 40 CFR Part 264, Subpart D. The Contingency Plan, Attachment 4, of this license and the prescribed emergency procedures shall be immediately implemented by the licensee whenever there is a fire, explosion, or other release of hazardous waste or hazardous waste constituents that threatens or could threaten human health or the environment, or if the licensee has knowledge that a spill has reached surface water or groundwater.

G. DUTY TO MITIGATE

Upon notification from the Office Chief or his or her designee that an activity at the facility may present an imminent and substantial endangerment to human health or the environment, the licensee shall immediately comply with an order issued by the Office Chief pursuant to §11148(1) of Act 451 to halt such activity and conduct other activities as required by the Office Chief to eliminate the said endangerment. The licensee shall not resume the halted activity without the prior written approval from the Office Chief. {§11148 of Act 451 and R 299.9521(3)(b)}

H. **MANIFEST SYSTEM**

The licensee shall comply with the manifest requirements of R 299.9304, R 299.9305, and R 299.9608.

I. **RECORD KEEPING AND REPORTING**

1. The licensee shall comply with the written operating record requirements of R 299.9609 and 40 CFR §264.73 and Part 264, Appendix I.

2. The licensee shall comply with the biennial report requirements of R 299.9610. {R 299.9521(1)(a) and 40 CFR §270.30(l)(9)}

3. The licensee shall submit the results of all environmental monitoring required by this license and any additional environmental sampling or analysis conducted beyond that required by this license, in the form of an Environmental Monitoring Report to the Office Chief within 60 days after any sample collection. In addition, the licensee shall submit air monitoring results to MDEQ, Air Quality Division. {R 299.9521(1)(a) and R 299.9521(3)(b) and 40 CFR §270.30(l)(4)}

4. The licensee shall provide environmental monitoring information or data that is required pursuant to this license, to an authorized representative of an environmental or emergency response department of the city of Lansing or county of Ingham, who requests such information or data and that has jurisdiction over the facility. Such information or data shall be made available on the same day the licensee forwards this information to the Office Chief. {R 299.9521(3)(b)}

5. The licensee shall immediately report to the Office Chief any noncompliance with the license that may endanger human health or the environment by doing both of the following:

   (a) The licensee shall immediately notify the Hazardous Waste Section at 517-284-6562, if the noncompliance occurs Monday through Friday during the period of 8:00 a.m. to 5:00 p.m., except state holidays, or by calling the MDEQ Pollution Emergency Alerting System (PEAS) at 1-800-292-4706 during all other times. This notice shall include the following:

      (i) Information concerning the fire, explosion, release, or discharge of any hazardous waste or hazardous waste constituent that could threaten human health or the environment, that has reached surface water or groundwater, or that may endanger public drinking water supplies or the environment; and

      (ii) A description of the occurrence and its cause, including all of the information outlined in R 299.9607(2)(a)-(i).

   (b) The licensee shall also follow up the verbal notice by providing a written report to the Office Chief within five days of the time the licensee becomes aware of the circumstances. The written report shall contain all of the information in Condition II.I.5.(a)(i)-(ii) of this license along with a description of the noncompliance and its cause; the periods of noncompliance (including exact dates and times); whether the noncompliance has been corrected and, if not, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance and when those activities occurred or will occur. The Office Chief may waive the 5-day written notice requirement in favor of submittal of a written report within 15 days of the time the licensee becomes aware of the circumstances.

{R 299.9521(1)(a) and R 299.9607 and 40 CFR §270.30(l)(6)}

6. The licensee shall report all other instances of noncompliance with this license, Part 111 of Act 451, the rules, and any other applicable environmental laws or rules that apply to the licensed facility, at the time monitoring reports required by this license are submitted or within 30 days, whichever is sooner. The reports shall contain the information listed in Condition II.I.5. of this license. {R 299.9521(1)(a) and 40 CFR §270.30(l)(10)}

7. The licensee may make minor modifications to the forms contained in the attachments to this license. The modifications may include changing the format, updating existing references and information, adding necessary information, and changing certification and notification information in accordance with Part 111 of Act 451 and its rules and RCRA and its regulations. The licensee shall submit the modifications to the Office Chief prior to implementing the use of the modified form(s). If the Office Chief does not reject or require revision of the modified form(s) within 14 days of receipt, the licensee shall implement use of the modified form(s) and the form(s) shall be incorporated into this license as a replacement for the existing form(s).

J. CLOSURE

The licensee shall comply with the closure requirements of R 299.9613. The licensee shall close the facility in accordance with the Closure Plan, Attachment 5, of this license, all other applicable requirements of this license, and all other applicable laws. {R 299.9613 and 40 CFR Part 264, Subpart G, except 40 CFR §§264.112(d)(1), 264.115, and 264.120}

K. WASTE MINIMIZATION

The licensee shall certify, at least annually, that the licensee has a hazardous waste minimization program in place. {R 299.9609(1)(a) and 40 CFR §264.73(b)(9), and §3005(h) of RCRA, 42 U.S.C. §6925(h)}

L. LAND DISPOSAL RESTRICTIONS

The licensee shall comply with all of the requirements of 40 CFR Part 268. {R 299.9627 and 40 CFR Part 268}

M. AIR EMISSION STANDARDS

1. The licensee shall comply with the requirements of 40 CFR Part 264, Subpart CC, regarding air emission standards for tanks, surface impoundments, and containers.

2. The licensee shall notify the Office Chief of any waste management units that become subject to the requirements of 40 CFR Part 264, Subparts AA, BB, and/or CC within 30 days of the start of the regulated activity.

{R 299.9630, R 299.9631, and R 299.9634 and 40 CFR Part 264, Subparts AA, BB, and CC}

N. **DOCUMENTS TO BE MAINTAINED AT THE FACILITY**

The licensee shall maintain at the facility the following documents and amendments required by this license, until closure/postclosure is completed, certified by an independent registered professional engineer, and the facility is released from financial assurance requirements for closure/postclosure by the Director:

1. Waste Analysis Plan, including Quality Assurance/Quality Control (QA/QC) Plans.
2. Inspection Schedules and records.
3. Personnel Training Program documents and records.
4. Contingency Plan.
5. Closure Plan.
6. Operating record.
7. Site Security Plan.
8. Facility engineering plans and specifications.
9. Record keeping procedures.
10. Environmental monitoring plans, including Sampling and Analysis Plans and QA/QC Plans.
11. Environmental monitoring data and statistical records.
13. Preventative procedures (Personnel Protection Plan).
14. Hazardous waste minimization program certification.

{R 299.9521(3)(a)}

O. **ENGINEERING PLANS**

The licensee shall construct, operate, and maintain the facility in accordance with the Engineering Plans, Attachment 6, of this license and any modifications to those plans shall be made in accordance with this license.

PART III

CONSTRUCTION FOR EXPANSION CONDITIONS

A. **CONSTRUCTION**

1. The licensee shall expand the facility to include hazardous waste storage operations in the West Storage Building in accordance with the Engineering Plans, Attachment 6, of this license.

2. The licensee shall construct an enclosed corridor between the East Storage Building and the Middle Storage Building in accordance with the Engineering Plans, Attachment 6, of this license.

3. The licensee shall construct a designated aisle in the Middle Storage Building for the transport of hazardous waste containers to the West Storage Building.

4. The licensee shall complete all tasks identified in the *Michigan State University Waste Storage Facility Alteration and Document Submittal Schedule* included in Attachment 6 of this license, in accordance with the schedule provided therein.

5. The licensee shall notify the Office Chief at least seven days prior to initiating any alterations for the expanded facility.

6. The licensee shall obtain written approval from the Office Chief prior to initiating any alterations that modify the design standards or increase the containment or storage capacity approved in the Engineering Plans, Attachment 6, of this license. The alterations shall become part of this license upon approval by the Office Chief.

7. The licensee shall ensure that the registered professional engineer who signs the certification of construction required under §11123(2)(n)(ii) of Act 451, or competent subordinates under his or her direct supervision, are on-site at all times when construction activity authorized under this license is performed.

8. The authorization to construct the expanded facility is valid for 3 years from the issuance date of this license. This authorization remains valid for a period of not more than 10 years if construction is initiated within the 3-year period and proceeds in a continuous manner. {R 299.9516(1)}

B. **POSTCONSTRUCTION DOCUMENTATION**

1. The licensee shall submit postconstruction documentation to the Office Chief following completion of the construction for the expanded facility. The postconstruction documentation shall include the following:

   (a) Any changes in, or additions to, the previously submitted disclosure information, or a certification that the disclosure listings previously submitted continues to be correct.

   (b) A certification under the seal of a licensed professional engineer verifying that the construction has proceeded according to the plans approved by the Office Chief and, if applicable, the approved construction permit, including as-built plans.

   (c) A certification of the expanded facility capability of treating, storing, or disposing of hazardous waste in compliance with Part 111 of Act 451.

(d) Information regarding any deviations from the specific conditions in this license.

{§§11123(2)(n) and 11125(9)}

2. The licensee shall submit the required postconstruction documentation in accordance with the schedule below.

POSTCONSTRUCTION DOCUMENTATION	SUBMITTAL DEADLINE
Updated disclosure information or certification that disclosure continues to be correct	Within 30 days after the change or within 30 days of construction completion, whichever occurs first.
Certification of construction	Within 30 days of construction completion and anytime thereafter, when requested by the Office Chief.
Certification of capability signed and sealed by licensed professional engineer	Within 30 days of construction completion.
Information regarding any deviations from specific conditions in license	As soon as the licensee becomes aware of the need to make the deviation, if applicable.

{§11125(9)}

C. OPERATION

1. The license shall not treat, store, or dispose of hazardous waste in the expanded facility until final written authorization is obtained from the Office Chief. {§11124(1)}

2. The licensee shall operate the expanded facility in compliance with Part 111 of Act 451, the rules, and this license. {R 299.9519(1)}

PART IV
CONTAINER STORAGE CONDITIONS

A. **COVERAGE OF LICENSE**

The hazardous waste container storage areas at the facility shown in Attachment 8, Figure C1-1a and Figure C-2, are covered by this license. Any expansion or enlargement beyond the facility boundary shown in the Site Plan or beyond the 7,900 gallon storage design capacity requires a new operating license for the expansion, enlargement, or alteration of an existing facility from the Director. The Site Plan is incorporated into this license as part of Attachment 6. {R 299.9521(1)(b)}

B. **WASTE IDENTIFICATION AND QUANTITY**

1. The licensee may store no more than a total volume of 7,900 gallons of the hazardous wastes listed in the Acceptable Waste Codes, Attachment 7, in containers at the facility subject to the terms of this license. The maximum number of containers of hazardous waste that may be stored at the facility is restricted to the following limits for the rooms identified in Figure C1-1a and Figure C-2. {R 299.9521(2)(d)}

2. The maximum volume and number of 55-gallon containers, or an equivalent volume in other size containers, of hazardous waste that may be stored in the individual container storage areas at the facility shall be restricted as follows: {R 299.9521(2)(d)}

Location	Container Storage Area Room Number	Hazardous Waste Container Storage Capacity Irrespective of Container Size	Maximum Number of 55-Gallon Containers
East Storage Building	Room 100 – Consolidation Room	3,480 gallons	50
	Room 120 – Lab Pack Room	200 gallons	0
	Room 130 – Storage Room	750 gallons	0
West Storage Building	Room W120 – Waste Storage Area	3,470 gallons	100

3. The licensee shall restrict the storage of corrosive, solvent, and lab-pack wastes to the respective areas in the East Storage Building shown on Figure C1-1a. {R 299.9605(1) and 40 CFR 264.17}

4. The licensee shall restrict the storage of hazardous waste in the West Storage Building to the respective area shown on Figure C-2. {R 299.9605(1) and 40 CFR 264.17}

5. The licensee shall not mix or consolidate hazardous waste in the West Storage Building.

6. The licensee shall restrict the storage of hazardous waste to the interior of the facility.

7. The licensee shall not store hazardous waste in the Middle Storage Building.

8. Figure C1-1a and Figure C-2 are incorporated into this license as part of Attachment 8.

C. **USE AND MANAGEMENT OF CONTAINERS**

1. The licensee shall manage all containers in compliance with R 299.9521(3)(b), R 299.9614, and R 299.9627 and 40 CFR §§264.171, 264.172, 264.173, and 268.50(a)(2)(i).

2. The licensee shall only place containers, stacked no greater than one high, into the hazardous waste container storage areas referenced in Condition III.A. of this license in accordance with the configuration shown in Figure C1-1a and Figure C-2 of Attachment 8, Container Storage Program, of this license or an alternate configuration approved by the Office Chief. {R 299.9521(3)(b)}

3. The licensee shall operate and maintain the containment system in accordance with the requirements of R 299.9614 and 40 CFR §264.175 and the attached plans and specifications in Attachment 6 of this license.

D. **SPECIAL REQUIREMENTS FOR IGNITABLE OR REACTIVE WASTES**

1. The licensee shall locate containers holding ignitable or reactive wastes in accordance with R 299.9614 and 40 CFR §264.176.

2. The licensee shall take precautions to prevent the accidental ignition or reaction of ignitable or reactive wastes by following the procedures specified in portions of the Preparedness and Prevention, Attachment 9, of this license. The licensee shall document compliance with this condition and place this documentation in the operating record. {R 299.9605 and 40 CFR §264.17(a) and (c)}

E. **SPECIAL REQUIREMENTS FOR INCOMPATIBLE WASTES OR MATERIALS**

1. The licensee is prohibited from placing incompatible wastes or incompatible wastes and materials in the same container. {R 299.9521(2)(d) and (3)(b)}

2. The licensee shall prevent the placement of hazardous waste in an unwashed container that previously held an incompatible waste or material. {R 299.9614 and 40 CFR §264.177(b)}

3. The licensee shall document compliance with Conditions III.E.1. and III.E.2. of this license and place this documentation in the operating record. {R 299.9605 and 40 CFR §264.17(c)}

4. The licensee shall separate containers of incompatible wastes as indicated in the procedures contained in Attachment 9 of this license. {R 299.9614 and 40 CFR §264.177(c)}

F. **DISPOSITION OF ACCUMULATED LIQUIDS**

The licensee shall remove all liquids accumulated in the containment system within 24 hours of detection and manage the liquids in accordance with the requirements of Part 111 of Act 451 and the rules. {R 299.9521(3)(b) and R 299.9614(1)(a) and 40 CFR §264.175(b)(5)}

PART V
ENVIRONMENTAL MONITORING CONDITIONS

A. AMBIENT AIR MONITORING PROGRAM

1. The licensee shall conduct an ambient air monitoring in accordance with the program specified in Attachment 10 of this license. {R 299.9611(2)(c)}

2. The licensee shall report ambient air monitoring results as required by Condition II.I.3 of this license.

PART VI
CORRECTIVE ACTION CONDITIONS

A. CORRECTIVE ACTION AT THE FACILITY

1. The licensee shall implement corrective action for all releases of a contaminant from any waste management unit (WMU) at the facility, regardless of when the contaminant may have been placed in or released from the WMU. For the purposes of this license, the term "corrective action" means an action determined by the Office Chief to be necessary to protect the public health, safety, welfare, or the environment, and includes, but is not limited to, investigation, evaluation, cleanup, removal, remediation, monitoring, containment, isolation, treatment, storage, management, the temporary relocation of people, and the provision of alternative water supplies, or any corrective action allowed under Title II of the federal Solid Waste Disposal Act, PL 89-272, as amended, or regulations promulgated pursuant to that act. For the purposes of this license, the process outlined in Part 111 of Act 451 and the environmental protection standards adopted in R 299.9629 shall be used to satisfy the corrective action obligations under this license. {§§11102 and 11115a of Act 451 and R 299.9629}

2. To the extent that a release of a hazardous substance, as defined in §20101(t) of Act 451, that is not also a contaminant, as defined in §11102(2) of Act 451, is discovered while performing corrective action under this license, the licensee shall take concurrent actions as necessary to address the Part 201, Environmental Remediation, of Act 451 remedial obligations for that release. {R 299.9521(3)(b)}

B. CORRECTIVE ACTION BEYOND THE FACILITY BOUNDARY

The licensee shall implement corrective action beyond the facility in accordance with §11115a of Act 451 and R 299.9629(2).

C. IDENTIFICATION OF WASTE MANAGEMENT UNITS AND AREAS OF CONCERN

The WMUs and areas of concern (AOCs) at the facility are identified below and shown on Figure B5-2 in Attachment 5, Closure Plan, of this license.

WMU 1	Waste Storage Facility (i.e., East, Middle, and West Storage Buildings)
AOC 1	Mercury Impacted Soil Area discovered in 1991
AOC 2	Mercury Impacted Soil Area discovered in 2001

1. WMU 1 does not require corrective action at this time. The unit is currently operating pursuant to the act and its rules with no evidence of a release of any contaminants. Corrective action may be required when the unit undergoes final closure.

2. AOC 1, identified in the *MSU Waste Storage Facility Soil Remediation Plan* dated May 3, 1991, does not require further corrective action. The MDEQ approved the July 12, 1991, *Report of Soil Remediation*, documenting removal of the mercury impacted soils on August 9, 1991.

3. AOC 2, identified in the *Mercury Delineation Report and Removal Work Plan* dated November 5, 2001, does not require further corrective action. The MDEQ approved the December 3, 2001, *Corrective Action Report – Removal of Mercury Impacted Soil*, documenting removal of the mercury impacted soils on December 19, 2001.

{§§11102 and 11115a of Act 451 and R 299.9521(3)(b) and R 299.9629}

4. Within 30 days of discovery of a new WMU or a release of a contaminant from a new WMU, the licensee shall provide written notification to the Office Chief. The written notification shall include all of the following information:

   (a) The location of the unit on the facility topographic map.

   (b) The designation of the type of unit.

   (c) The general dimensions and structural description, including any available drawings of the unit.

   (d) The date the unit was operated.

   (e) Specification of all waste(s) that have been managed in the unit.

   (f) All available information pertaining to any release of a contaminant from the unit.

5. Based on a review of all of the information provided in Condition V.C.4. of this license, the Office Chief may require corrective action for the newly-identified WMU. The licensee shall submit a written remedial investigation (RI) Work Plan to the Office Chief within 60 days of written notification by the Office Chief that corrective action for the unit is required.

{§§11102 and 11115a of Act 451 and R 299.9504(1), R 299.9508(1)(b), and R 299.9629 and 40 CFR §270.14(d)}

D. CORRECTIVE ACTION INVESTIGATION

The licensee shall conduct a Corrective Action Investigation to determine if a release of a contaminant(s) from any of the WMU identified in Condition V.C. of this license has occurred and, if a release(s) has occurred, evaluate the nature and extent of the release(s). The licensee shall submit a written Corrective Action Investigation Work Plan, Corrective Action Investigation Final Report documenting compliance with the approved Work Plan and supporting further corrective action at the facility, and Corrective Action Investigation progress reports to the Office Chief for review and approval in accordance with Condition V.K. of this license. The Office Chief will approve, modify and approve, or provide a Notice of Deficiency (NOD) for the Work Plan and Final Report. Upon approval, the Work Plan and Final Report become enforceable conditions of this license. {§§11102 and 11115a of Act 451 and R 299.9629}

E. **INTERIM MEASURES**

The licensee shall conduct interim measures (IM) at the facility, if determined necessary by the licensee or the Office Chief, to cleanup or remove a released contaminant or to take other actions, prior to the implementation of corrective measures, as may be necessary to prevent, minimize, or mitigate injury to the public health, safety, or welfare, or to the environment. The licensee shall submit a written IM Work Plan, an IM Final Report documenting compliance with the approved Work Plan and supporting further corrective action at the facility, and IM progress reports to the Office Chief for review and approval in accordance with Condition V.K. of this license. The Office Chief will approve, modify and approve, or provide an NOD for the Work Plan and Final Report. Upon approval, the Work Plan and Final Report become enforceable conditions of this license. {§§11102 and 11115a of Act 451 and R 299.9629}

F. **DETERMINATION OF NO FURTHER ACTION**

1. The licensee shall continue corrective action measures to the extent necessary to ensure that the applicable environmental protection standards adopted in Part 111 of Act 451, are met, if the limits are not less stringent than allowed pursuant to the provisions of RCRA.

2. Based on the results of the Corrective Action Investigation and other relevant information, the licensee shall submit a written request for a license minor modification to the Office Chief if the licensee wishes to terminate corrective action for a specific WMU identified in Condition VI.C. of this license. The licensee must demonstrate that there have been no releases of a contaminant(s) from the WMU and that the WMU does not pose a threat to public health, safety, welfare, or the environment.

3. Based on the results of the Corrective Action Investigation and other relevant information, the licensee shall submit a written request for a license major modification to the Office Chief if the licensee wishes to terminate facility-wide corrective action. The licensee must conclusively demonstrate that there have been no releases of a contaminant(s) from any of the WMU at the facility and that none of the WMUs pose a threat to public health, safety, welfare, or the environment.

4. If, based upon a review of the licensee's request for a license modification pursuant to Condition VI.F.2. or VI.F.3. of this license, the results of the completed Corrective Action Investigation, and other relevant information, the Office Chief determines that the releases or suspected releases of a contaminant(s) do not exist and that the WMU(s) do not pose a threat to public health, safety, welfare, or the environment, the Office Chief will approve the requested modification, subject to Conditions VI.F.5. and VI.F.6., below.

5. A determination of no further action shall not preclude the Office Chief from requiring continued or periodic monitoring of air, soil, groundwater, or surface water, if necessary to protect public health, safety, welfare, or the environment, when facility-specific circumstances indicate that potential or actual releases of a contaminant(s) may occur.

6. A determination of no further action shall not preclude the Office Chief from requiring further corrective action at a later date, if new information or subsequent analysis indicates that a release or potential release of a contaminant(s) from a WMU at the facility may pose a threat

to public health, safety, welfare, or the environment. The Office Chief will initiate the necessary license modifications if further corrective action is required at a later date.

{§§11102 and 11115a of Act 451 and R 299.9629(2)}

G. CORRECTIVE MEASURES STUDY

If the Office Chief determines, based on the results of the Corrective Action Investigation and other relevant information, that remedial activities are necessary, the Office Chief will notify the licensee in writing that a Corrective Measures Study (CMS) is required. If required by the Office Chief, the licensee shall conduct a CMS to develop and evaluate the corrective measures alternative(s) necessary to address the release(s) of a contaminant(s) or hazardous substances and the WMU(s) that are identified in the approved Corrective Action Investigation Final Report as requiring final remedial activities. The licensee shall submit a written CMS Work Plan, a CMS Final Report documenting compliance with the approved Work Plan and supporting further corrective action at the facility, and CMS progress reports to the Office Chief for review and approval in accordance with Condition VI.K. of this license. The Office Chief will approve, modify and approve, or provide an NOD for the Work Plan and Final Report. Upon approval, the Work Plan and Final Report become enforceable conditions of this license. {§§11102 and 11115a of Act 451 and R 299.9629}

H. CORRECTIVE MEASURES IMPLEMENTATION PLAN

1. The licensee shall conduct final corrective measures based on the CMS Final Report approved by the Office Chief. The licensee shall submit a written Corrective Measures Implementation (CMI) Work Plan to the Office Chief for review and approval. The licensee shall also submit a written CMI Final Report documenting the compliance with the approved CMI Work Plan with justification that the corrective actions may cease, and CMI progress reports to the Office Chief for review and approval in accordance with Condition VI.K. of this license. The Office Chief will approve, modify and approve, or provide an NOD for the Work Plan and Final Report. Upon approval, the Work Plan and Final Report become enforceable conditions of this license.

2. The Office will provide notice of its draft decision on the CMI Work Plan to persons on the facility mailing list and provide an opportunity for a public hearing.

3. The licensee shall implement the approved CMI Work Plan within 60 days of receipt of the Office Chief's written approval of the Work Plan.

{§§11102 and 11115a of Act 451 and R 299.9629}

I. CORRECTIVE ACTION MANAGEMENT UNITS

If applicable, the licensee shall comply with the requirements of R 299.9635 in order to designate an area at the facility as a corrective action management unit for implementation of corrective measures. {R 299.9521(3)(a)}

J. TEMPORARY UNITS

If applicable, the licensee shall comply with the requirements of R 299.9636 in order to designate tank or container storage units used for the treatment or storage of remediation wastes as temporary units for implementation of corrective measures. {R 299.9521(3)(a)}

K. SUMMARY OF CORRECTIVE ACTION SUBMITTALS

The licensee shall submit the required documents in accordance with Conditions VI.D, VI.E, VI.G, and VI.H. of this license and the schedule below.

Document	Submittal Deadline
Written notification of a new release of a contaminant from an existing WMU, a new WMU, or a release of a contaminant from a new WMU	Within 30 days of discovery
Corrective Action Investigation Work Plan for a newly-identified release of a contaminant from an existing WMU, a new WMU, or a release of a contaminant from a new WMU	Within 60 days of receipt of notification that a Corrective Action Investigation is required
Revised Corrective Action Investigation Work Plan for WMUs and contaminant releases	Within 30 days of receipt of Corrective Action Work Plan NOD
Corrective Action Investigation progress reports	Within 30 days of initiation of the Corrective Action Investigation and every 60 days thereafter, unless otherwise approved
Corrective Action Investigation Final Report for WMUs and contaminant releases	Within 60 days of completion of Corrective Action Investigation
Revised Corrective Action Investigation Final Report for WMUs and contaminant releases	Within 30 days of receipt of Corrective Action Investigation Final Report NOD
IM Work Plan for WMUs and contaminant releases	Within 60 days of receipt of notification that IM Work Plan is required
Revised IM Work Plan for WMUs and contaminant releases	Within 30 days of receipt of IM Work Plan NOD
IM progress reports	Within 30 days of initiation of the IM and every 30 days thereafter, unless otherwise approved
IM Final Report for WMUs and contaminant releases	Within 60 days of completion of the IM
Revised IM Final Report for WMUs and contaminant releases	Within 30 days of receipt of IM Final Report NOD
CMS Work Plan for WMUs and contaminant releases	Within 60 days of receipt of notification that CMS is required
Revised CMS Work Plan for WMUs and contaminant releases	Within 30 days of receipt of CMS Work Plan NOD
CMS progress reports	Within 30 days of initiation of the CMS and every 60 days thereafter, unless otherwise approved
CMS Final Report for WMUs and contaminant releases	Within 60 days of completion of the CMS
Revised CMS Final Report for WMUs and contaminant releases	Within 30 days of receipt of CMS Final Report NOD
CMI Work Plan for WMUs and contaminant releases	Within 60 days of approval of the CMS Final Report

Document	Submittal Deadline
Revised CMI Work Plan for WMUs and contaminant releases	Within 30 days of receipt of CMI Work Plan NOD
CMI progress reports	Within 30 days of implementation of the CMI Work Plan and every 30 days thereafter, unless otherwise approved
CMI Final Report for remediated WMUs and contaminant releases	Within 60 days of the remedial actions have been completed and cleanup criteria have been met
Revised CMI Final Report for WMUs and contaminant releases	Within 30 days of receipt of CMI Final Report NOD

L. CORRECTIVE ACTION DOCUMENTS RETENTION

The licensee shall maintain all corrective action documents required by this license at the facility. The documents shall be maintained for the operating life of the facility or until the facility is released from financial assurance requirements for corrective action by the Director, whichever is longer. The licensee shall offer such documents to the Office Chief prior to discarding those documents. {§§11102 and 11115a of Act 451 and R 299.9521(3)(b) and R 299.9629}

ATTACHMENT 1

WASTE ANALYSIS PLAN

FORM EQP 5111 ATTACHMENT TEMPLATE A3
WASTE ANALYSIS PLAN (WAP)

This document is an attachment to the Michigan Department of Environmental Quality's *Instructions for Completing Form EQP 5111, Operating License Application Form for Hazardous Waste Treatment, Storage, and Disposal Facilities.* See Form EQP 5111 for details on how to use this attachment.

The administrative rules promulgated pursuant to Part 111, Hazardous Waste Management, of Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451), being R 299.9504, R 299.9508, and R 299.9605, and Title 40 of the Code of Federal Regulations (CFR) §§270.14(b)(3) and 264.13(b) and (c), establish requirements for WAPs for hazardous waste management facilities. All references to 40 CFR citations specified herein are adopted by reference in R 299.11003.

This license application template addresses requirements for a WAP for the hazardous waste management units and the hazardous waste management facility for the Michigan State University Waste Storage facility. All activities associated with the WAP will be conducted at the 3634 E. Jolly Road, Lansing, MI facility.

Ensure that all samples collected for the purposes of waste characterization are collected, transported, analyzed, stored, and disposed by trained and qualified individuals in accordance with the Quality Assurance/Quality Control (QA/QC) Plan. The QA/QC Plan should, at a minimum, include the written procedures outlined in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," U.S. Environmental Protection Agency (EPA) Publication No. SW-846, Third Edition, Chapter 1 (November 1986), and its updates.

This template is organized as follows:

A3.A COMMERCIAL FACILITY

The Michigan State University Waste Storage Facility is a commercial facility that receives wastes generated off site. The off-site MSU locations are as follows: Kellogg Biological Station, Hickory Corners; Clarksville Station, Clarksville; Hidden Lake Gardens, Tipton; Lake City Station, Lake City; NW Horticulture Station, Traverse City; Russ Forest Station, Decatur; SW Research Station, Bention Harbor; Trevor Nichols Station, Fennville; Saginaw Valley Bean and Beet Station, Saginaw; and the UP Tree Improvement Station, Escanaba.

The MSU Waste Storage Facility has developed a WAP to ensure that its facility at 3634 E. Jolly Road, Lansing, MI will accept only wastes that it is authorized to accept. The hazardous wastes stored at the MSU WSF will be properly characterized prior to waste acceptance. All generators will be required to provide a complete waste characterization, including chemical analysis when appropriate. Waste screening will be conducted on every shipment of waste to ensure that the waste conforms to the waste profile for the generator and information on incoming manifests and to ensure that the waste is properly managed within the facility.

MSU's Waste Disposal Guide is the process used to ensure that waste streams generated meet the quality control criteria required by MSU EHS Department. The comprehensive guide provides procedures for identification, packaging, labeling, and pick-up requests. A copy of the Waste Disposal Guide is located in Appendix A10-1.

In accordance with R 299.9609 and 40 CFR §264.73 and Part 264, Appendix I, MSU WSF will retain all records and results of waste determinations performed as specified in 40 CFR §§264.13, 264.17, 264.314, 264.1034, 24.1063, 264.1083, 268.4(a), and 268.7 in the facility operating record until closure of the facility.

A3.A.1 Initial Waste Characterization Requirements for Generators [R 299.9605(1) and R 299.9504(1)(c) and 40 CFR §264.13(b)(5)]

The MSU WSF will require the following waste profile information for initial waste shipments from all campus and off-site MSU generators prior to shipment.

MSU generators must provide all information required before any waste is picked up at the point of generation. Hazardous and mixed waste is picked up from the generator as requested. At the time of pickup, there is verification that the waste profile forms and MSU Material Pick Up Tag (MPUT) (Appendix A-10-1, page 29, Waste disposal Guide) and labels are properly filled out. The information on the container label is compared with the following information on the MPUT for verification: the container number, volume of the waste, chemical constituents, and concentration of the chemical constituents. Each laboratory has a chemical disposal reference document that includes the instructions for proper labeling the MPUT for hazardous and mixed waste. The EPA Uniform

Hazardous Waste Manifest is completed utilizing this information provided by the generator on the MPUT. EHS staff also assists in proper waste characterization profile.

The characteristics of the initial hazardous waste constituents used are identified through MSU generator knowledge or as necessary by analysis of the waste streams and are recorded on MPUT. Additional testing, if required, is conducted by an outside contract laboratory. Table A3.A.1 lists the hazardous waste codes of the hazardous and mixed waste stored at the MSU WSF.

The waste generation and profiling processes provides information of known characteristics. From the characteristics of the initial products and the waste generated from the process, the ignitable, corrosive, reactive or toxic characteristics are identified. Waste analyses for these characteristic parameters are usually unnecessary. A pH test may be conducted to verify whether a waste is corrosive. The waste generation and profiling processes also provides known RCRA listed hazardous waste constituents. A waste analysis for the RCRA listed constituents is usually unnecessary.

MSU has specific manifest requirements for transporting hazardous wastes. The generator of hazardous and mixed waste is required to properly identify the hazardous characteristics (by constituent) of the waste on the MPUT form so that they are immediately apparent to the receiving personnel. The hazardous and mixed waste transported to the storage facility are properly manifested in accordance with state and federal regulations on an EPA Uniform Hazardous Waste Manifest, accompanied by appropriate LDR Notifications.

Figure A3.A.1 Information to be on Each Generator Waste Profile Form.

In addition to the waste profile information submitted by the generator, MSU WSF will:

☐ Require submittal of a representative waste sample

☐ Conduct an audit of the generator facility

☐ Review industry literature to identify typical waste streams

X Other: The Pick-Up Tag and Hazardous waste Manifest is completed for each waste pick up and is verified prior to arrival at the MSU WSF.

A3.A.1(a) Generator Waste Characterization Discrepancies
[R 299.9605(1) and R 299.9504(1)(c) and 40 CFR §§264.13(a)(3) and (4), 264.13(b)(c), and 264.72]

A3.A.1(b) Subsequent Waste Shipment Procedures
[R 299.9605(1) and R 299.9504(1)(c) and 40 CFR §§264.13(a)(3) and 264.13(b)(4)]

The initial analysis of waste from each generator will be reviewed or repeated each time the waste is picked up to ensure that the analysis is accurate and up-to-date.

A3.A.1(c) Additional Waste Analysis Requirements
[R 299.9605(1) and R 299.9504(1)(c) and 40 CFR §§264.13(b)(6) and 264.13(c(3)]

MSU WSF will review the waste profile information to ensure that the facility is authorized to receive the waste, and can manage the waste in compliance with the following:

X	R 299.9605 and 40 CFR §264.17	General requirements for ignitable, reactive, or incompatible wastes [Template C1, Sections C1G and C1H]
☐	R 299.9605 and 40 CFR §264.314	Special requirements for bulk and containerized liquids [Template , Section]
☐	R 299.9630 and 40 CFR §264.1034(d)	Test methods and procedures (Subpart AA) [Template A3, Section A3.A.2(c)]
☐	R 299.9631 and 40 CFR §264.1063(d)	Test methods and procedures (Subpart BB) [Template A3, Section A3.A.2(c)]
☐	40 CFR §264.1083	Waste determination procedures (Subpart CC) [Template A3, Section A3.A.2(c)]
X	R 299.9627 and 40 CFR §268.7	Waste analysis and record keeping LDR requirements [Template A3, Sections A3.A.3, A3.B.3 and A3.C]
☐	R 299.9228	Universal waste requirements [Template , Section]

FIGURE A3.A.1
INFORMATION THAT MUST BE SHOWN ON A GENERATOR'S WASTE PROFILE FORM – See attached MSU Waste pick-up tag (attached)

A3.A.2 Waste Acceptance Procedures

[R 299.9605(1) and R 299.9504(1)(c), and 40 CFR §§264.13(c), 264.72(a) and (b), and 264.73(b)]

Waste shipments arrive at the facility in the following containers:

X Drums	☐ Totes	☐ Tanker trucks
X Carboys	☐ Wrangler box	☐ Filter bags
☐ Roll-off boxes	☐ Vacuum trucks	X Other: Lab-packs

Upon receipt of wastes from an off-site generator, MSU WSF staff will perform all of the following tasks:

- Review paperwork
- Visually inspect the waste
- Perform waste screening/fingerprint analysis of waste, if required

These tasks are discussed below.

A3.A.2(a) Review Paperwork

[R 299.9605(1) and R 299.9504(1)(c), and 40 CFR §§264.13(c), 264.72(a) and (b), and 264.73(b)]

MSU WSF will review all paperwork, including manifests and LDR notifications, before any wastes are accepted by the facility. MSU WSF will review all paperwork for completeness. In addition, the manifest and LDR notification will be compared for consistency. The manifest will also be compared to the waste profile and analytical information provided by the generator and to the waste shipment to ensure the accuracy of information provided on shipment paperwork. The manifest will also be compared to the number of containers, the volume, and/or the weight of the waste in the shipment. All discrepancies will be resolved before processing the waste.

3.A.2(b) Visual Inspection of Waste

[R 299.9605(1) and R 299.9504(1)(c) and 40 CFR §264.13(c)]

MSU WSF will visually inspect a minimum of one container and up to a maximum of 100 percent of the containers from each generator. The contents of the container will be visually inspected for the following:

X Color X pH X Physical State X Consistency X Other: MSU pick-up tag description, volume, waste codes

Visual observations will be recorded and compared to the waste profile information. All discrepancies will be resolved before processing the waste.

A3.A.2(c) Waste Screening/Fingerprinting

[R 299.9605(1) and R 299.9504(1)(c) and 40 CFR §§264.13(b)(14) and 264.13(c)(2)]

Table A3.A.1 lists the waste analysis procedures, including screening parameters for each hazardous waste, the rationale for the selection of these parameters, test methods that will be used to test for these parameters, the appropriate reference, whether the waste is specified in R 299.9216, the frequency of waste screening, and the rationale for the frequency. The sampling methods that will be used to obtain a representative sample of the waste to be analyzed and the sampling equipment and rationale are summarized in Table A3.A.2. The results of the waste screening/fingerprint analysis will be compared to the waste profile information and analytical results provided by the generator during the initial waste characterization process. The outside container of inner laboratory pack containers will be 100 percent visually inspected. Containers of personal protective equipment (PPE) or debris will undergo visual inspection. All discrepancies will be resolved before processing the waste.

Table A3.A.1 Waste Analysis Procedures –

Screening Parameters (*Check as appropriate*)	Rationale for Parameter	Test Method	Reference	Frequency	Rationale for Frequency
D004-07,08,011	Characteristic	SW-846 6020	Regulated Level 5.0 mg/l	Confirmed at time of pick-up	Generator Knowledge
D005	Characteristic	SW-846 6020	100 mg/l	Confirmed at pick-up	Generator Knowledge
D006	Characteristic	SW-846 6020	1.0 mg/l	Confirmed at pick-up	Generator Knowledge
D009	Characteristic	SW-846 7471	0.2mg/l	Confirmed at pick-up	Generator knowledge
D010	Characteristic	SW-846 6020	1.0mg/l	Confirmed at pick	Generator knowledge
D012	Characteristic	SW-846	0.02mg/l	Confirmed at pick	Generator knowledge
D013	Characteristic	SW-846	0.4mg/l	Confirmed at pick	Generator knowledge
D014	Characteristic	SW-846	10.0mg/l	Confirmed at pick	Generator knowledge
D015	Characteristic	SW-846	0.5mg/l	Confirmed at pick	Generator knowledge
D016	Characteristic	SW-846	10.0mg/l	Confirmed at pick	Generator knowledge
D017	Characteristic	SW-846	1.0mg/l	Confirmed at pick	Generator knowledge
D018	Characteristic	SW-846 8260C	0.5mg/l	Confirmed at pick	Generator knowledge
D019	Characteristic	SW-846 8260C	0.5mg/l	Confirmed at pick	Generator knowledge
D020	Characteristic	SW-846	0.03mg/l	Confirmed at pick	Generator knowledge
D021	Characteristic	SW-846 8260C	100mg/l	Confirmed at pick	Generator knowledge

Screening Parameters (*Check as appropriate*)	Rationale for Parameter	Test Method	Reference	Frequency	Rationale for Frequency
D022	Characteristic	SW-846 8260C	6.0mg/l	Confirmed at pick	Generator knowledge
D023, D024, D025, D026	Characteristic	SW-846 8270D	200mg/l	Confirmed at pick	Generator knowledge
D027	Characteristic	SW-846 8270C	7.5mg/l	Confirmed at pick	Generator knowledge
D028	Characteristic	SW-846 8260C	0.5mg/l	Confirmed at pick	Generator knowledge
D029	Characteristic	SW-846 8260C	0.7mg/l	Confirmed at pick	Generator knowledge
D030	Characteristic	SW-846 8270D	0.13mg/l	Confirmed at pick	Generator knowledge
D031	Characteristic	SW-846 8270D	0.008mg/l	Confirmed at pick	Generator knowledge
D032	Characteristic	SW-846 8270D	0.13mg/l	Confirmed at pick	Generator knowledge
D033	Characteristic	SW-846 8270D	0.5mg/l	Confirmed at pick	Generator knowledge
D034	Characteristic	SW-846 8270D	3.0mg/l	Confirmed at pick	Generator knowledge
D035	Characteristic	SW-846 8260C	200mg/l	Confirmed at pick	Generator knowledge
D036	Characteristic	SW-846 8270D	2.0mg/l	Confirmed at pick	Generator knowledge
D037	Characteristic	SW-846	100mg/l	Confirmed at pick	Generator knowledge
D038	Characteristic	SW-846 8270D	5.0mg/l	Confirmed at pick	Generator knowledge
D039	Characteristic	SW-846 8260C	0.7mg/l	Confirmed at pick	Generator knowledge
D040	Characteristic	SW-846 8260C	0.5mg/l	Confirmed at pick	Generator knowledge

D041	Characteristic	SW-846 8270D	400mg/l	Confirmed at pick-up	Generator knowledge
D042	Characteristic	SW-846 8270D	2.0mg/l	Confirmed at pick-up	Generator knowledge
D043	Characteristic	SW-846 8260C	0.2mg/l	Confirmed at pick-up	Generator knowledge
D001	Characteristic	SW-846 1010&1020	Part 261.21	Confirmed at pick-up	Generator knowledge
D002	Characteristic	SW-846 1110	Part 261.21	Confirmed at pick-up	Generator knowledge
D003	Characteristic	SW-846 7.3.3.2	Part 261.21	Confirmed at pick-up	Generator knowledge
001S	Characteristic	SW-846 8280A		Confirmed at pick-up	Generator knowledge
002S,003S,004S,005S,006S	Characteristic	SW-846 8280A		Confirmed at pick-up	Generator knowledge
007S	Characteristic	SW-846 8280A		Confirmed at pick-up	Generator knowledge
F002	Listed Waste	SW-846 8260A	Part 261.31(a)	Confirmed at pick-up	Generator knowledge
F003	Listed Waste	SW-846 8260C	Part 261.31(a)	Confirmed at pick-up	Generator knowledge
F004	Listed Waste	SW-846 8270D	Part 261.31(a)	Confirmed at pick-up	Generator knowledge
F005	Listed Waste	SW-846 8260C	Part 261.31(a)	Confirmed at pick-up	Generator knowledge
F025	Listed Waste	SW-846 8260A	Part 261.31(a)	Confirmed at pick-up	Generator knowledge
F027	Listed Waste	SW-846 8260A	Part 261.31(a)	Confirmed at pick-up	Generator knowledge
F032	Listed Waste	SW-846 8260A	Part 261.31(a)	Confirmed at pick-up	Generator knowledge
Screening Parameter (*Check as appropriate*)	Rationale for Parameter	Test Method	Reference	Frequency	Rationale for Frequency

X Free Liquids	Waste Contains free liquids	Generator knowledge, SW846, 9095B	Liquid/Solid	Confirmed at Pick-up	Generator knowledge
☐ Ignitability					
☐ Reactivity					
X Compatibility	Waste – Container compatibility	EPA compatibility chart	40CFR 264.17	N/A	Generator knowledge
X Land Disposal Restrictions	40CFR 268	40CFR 268	40CFR 268	Confirmed at pickup	Required by rules
☐ Volatile Organic Compound Content[1]					
X Radioactivity	Check for radioactivity	Generator knowledge/survey meter	10CFR 20.1003	Confirmed at pick-up	Generator knowledge
☐ Other: [*describe]*					

[1] *According to R 299.9630 and 40 CFR §264.1034(d), TSDFs must identify and meet specific technical requirements for all process vents associated with distillation, fractionation, thin-film evaporation, solvent extraction, or air/stream stripping processes that manage wastes with a 1 part per million by weight (ppmw) or greater total organics concentration on a time-weighted annual average basis. Total organic concentrations in the waste can be measured using SW-846 Method 8260B. According to R 299.9631 and 40 CFR §264.1050, TSDFs must also determine if its equipment contains or contacts organic wastes with 10 percent or greater total organic content. The total organic content can be determined using (1) American Society of Testing and Materials Methods D2267-88, E169-87, or E260-85, (2) SW-846 Method 8260B, or (3) knowledge of the nature of the wastes stream or the waste generating process.*

Table A3.A.2 Representative Sampling Procedures

Container Type or Material	Sampling Method	Sampling Equipment	Rationale
[1]Solids	Grab	Scoop, Auger or Trowel	Representative Sample
Organic Liquids	Grab	Coliwasa	Representative Sample
Aqueous	Grab	Coliwasa	Representative Sample
Oils	Grab	Coliwasa	Representative Sample
Sludge	Grab	Trier	Representative Sample

[1] The sampling method should demonstrate equivalence with the sampling methods described in 40 CFR, Part 261, Appendix I.

A3.A.3. Procedures to Ensure Compliance with Land Disposal Restrictions (LDR) Requirements [R 299.9627 and 40 CFR, Part 268]

All shipments of wastes subject to LDR received at the facility will be accompanied by appropriate generator notification and LDR notification in accordance with R 299.9627 and 40 CFR §268.7. The LDR notification accompanying generator wastes will be reviewed, and any discrepancies in the LDR notification and the associated manifest, analytical records, or Waste Profile Form will require shipment rejection unless additional, satisfactory, clarifying information is provided by the generator. All information obtained to document LDR compliance will be maintained in the facility operating record until closure of the facility.

If the facility receives a shipment of waste without LDR notification, or a notification with incorrect or incomplete information, the following actions will be conducted:
If the facility receives a shipment of waste without LDR notification, or a notification with incorrect or incomplete information, the following actions will be conducted:
If the LDR discrepancy can be resolved, corrections will be made to the LDR notification and the waste procedure process will continue.
If the LDR discrepancy cannot be resolved, the waste stream in questions will be returned to the generator along with a completed discrepancy section of the hazardous waste manifest. Documentation will be maintained at the facility

In accordance with the LDR regulations, all wastes shipped off site will be analyzed, or generator knowledge will be used when appropriate, to determine whether the waste meets the applicable LDR treatment standards specified in R 299.9627 and 40 CFR §§268.41-43. All analytical results will be maintained in the facility operating record until closure of the facility. Wastes that are determined through analysis to meet treatment standards as specified in R 299.9627 and 40 CFR §268.41-43 will be shipped off-site.

MSU WSF will supply LDR notifications and certification, including appropriate analytical records to support the certification, to the receiving facility with each shipment of waste. The notifications and certifications will contain the information required under R 299.9627 and 40 CFR §268.7. Any additional data obtained from the generators (e.g., Waste Profile Forms, original LDR notifications, analysis provided by generators) will be provided to the licensed TSDF where the waste will be sent.

A3.A.3(a) Spent Solvent and Dioxin Wastes
[R 299.9627 and 40 CFR §§264.13(a)(1), 268.7, 268.30, 268.31, 268.40, 268.41, 268.42, and 268.43]

<u>*Spent solvent wastes (F002-F005)*</u> are accepted at the facility. Generator process knowledge will be used to determine the presence of spent solvent wastes (F002-F005). Generator process knowledge will be documented on the waste material profile report and LDR notification. The LDR notification will provide additional information regarding the appropriate treatment standards for the waste and whether it has already been treated to the appropriate standards.

A3.A.3(b) Listed Wastes
[R 299.9627, R 299.9213, and R 299.9214 and 40 CFR §§264.13(a)(1), 268.7, 268.33, 268.34, 268.35, 268.36, 268.39, 268.40, 268.41, 268.42, and 268.43]

Generator process knowledge will be used to determine whether listed waste meets the applicable treatment standards or to demonstrate that the waste has been treated by the appropriate specified treatment technology. In accordance with R 299.9627 and 40 CFR §268.41, where treatment standards are based on concentrations in the waste extract, the facility will use toxicity characteristic leaching procedures (TCLP) to determine if wastes meet treatment standards. *Generator process knowledge* will be documented on the waste material profile report and LDR notification.

A3.A.3(c) Characteristic Wastes
[R 299.9627, R 299.9208, and R 299.9212 and 40 CFR §§261.3(d)(1), 264.13(a)(1), 268.7, 268.9, 268.37, 268.40, 268.41, 268.42, 268.43 and Part 268, Appendix I and Appendix IX]

Generator process knowledge will be used to determine whether characteristic waste meets the applicable treatment standards or to demonstrate that the waste has been treated by the appropriate specified treatment technology. In accordance with R 299.9627 and 40 CFR §268.41, where treatment standards are based on concentrations in the waste extract, generators shipping waste to the facility will determine if their wastes meet treatment standards.

Characteristic D008 lead nonwastewaters and D004 arsenic nonwastewaters will be analyzed using TCLP to determine compliance with treatment standards of 40 CFR §§268.40 and 268.48. If after treatment a hazardous waste displays a characteristic for the first time, the characteristic waste code will be added to the LDR notification and facility records. Wastes will be retreated, as appropriate, to meet the characteristic treatment standards of 40 CFR §§268.40 and 268.48 prior to land disposal. In addition, the Generator process knowledge will be used to identify the underlying hazardous constituents that are expected to be present in the waste. Generator process knowledge will be documented on the waste material profile report and LDR notification.

A3.A.3(d) Radioactive Mixed Waste
[R 299.9627 and 40 CFR §§268.7, 268.35(c), 268.35(d), 268.36, and 268.42(d)]

Generator process knowledge will be used to determine whether a radioactive mixed waste meets the applicable treatment standard.

A3.A.3(e) Leachates
[R 299.9627 and 40 CFR §260.10 and 40 CFR §§268.35(a) and 268.40]

The facility does not accept single-source or multi-source F039 leachates.

A3.A.3(f) Laboratory Packs
[R 299.9627 and 40 CFR §§268.7and 268.42(c) and Part 268, Appendix IV and Appendix V]

The laboratory packs accepted at the facility are not land disposed.

Generator process knowledge will be used and documented to determine applicable treatment standards on the waste stream, manifest profile and LDR notification.

If a laboratory pack hazardous waste is combined with non-laboratory pack hazardous waste prior to or during treatment, the entire mixture will be treated to meet the most stringent treatment standards for each waste constituent before being land disposed.

A3.A.3(g) Contaminated Debris
[R 299.9627 and 40 CFR §§268.2(g), 268.7, 268.9, 268.36, 268.45, and 270.13(n)]

Contaminated debris is not accepted at the facility.

A3.A.3(h) Waste Mixtures and Wastes with Overlapping Requirements
[R 299.9627 and 40 CFR §§264.13(a), 268.7, 268.41(b), 268.43(b), and 268.45(a)]

Generator process information and analytical data will be used to demonstrate that those waste mixtures and wastes with multiple codes are properly characterized. Each waste that has more than one characteristic will be identified with a number for each characteristic. Waste identified as meeting a listing and exhibiting a characteristic will be primarily identified with the listed waste code for the purpose of manifesting, etc.

A3.A.3(i) Dilution and Aggregation of Wastes
[R 299.9627 and 40 CFR §268.3]

Listed wastes, if destined for land disposal, may not be diluted from the point of generation to the point of land disposal. Characteristic wastes may only be diluted if, (1) the waste is managed in a Clean Water Act (CWA)/CWA-equivalent surface unit or a Class I Safe Drinking Water Act injection well, (2) the waste has a concentration-based treatment standard or is treated using the DEACT technology-based treatment standard, and (3) the waste is not a D003 reactive waste.

The facility may not dilute or partially treat a listed waste to change its treatability category (i.e., from nonwastewater to wastewater), in order to comply with different treatment standards. If the wastes are all legitimately amenable to the same type of treatment to be performed, the facility may aggregate wastes for treatment.

A3.C NOTIFICATION, CERTIFICATION, AND RECORDKEEPING REQUIREMENTS [R 299.9627 and R 299.9609 and 40 CFR §§264.73, 268.7, and 268.9(d)]

MSU WSF will perform the following procedures for preparing and/or maintaining applicable notifications and certifications to comply with LDRs:

All hazardous waste accepted at the MSU WSF will be accompanied by the LDR notification, if applicable. Staff personnel will review the accuracy of all paperwork including; manifest, waste profile documents (pick up tag) and LDR notification, before any waste is accepted by the facility.

A3.C.1 Retention of Generator Notices and Certifications [R 299.9627 and 40 CFR §268.7(a)(7)]

MSU WSF will retain a copy of all notices, certifications, demonstrations, data, and other documentation associated with compliance to LDRs.

The following notices and certifications submitted by the initial generator of the waste will be reviewed and maintained:

- Notices of restricted wastes not meeting treatment standards or exceeding levels specified in RCRA §3004(d), including the information listed in R 299.9627 and 40 CFR §268.7(a)(1).
- Notices of restricted wastes meeting applicable treatment standards and prohibition levels, including the information in R 299.9627 and 40 CFR §268.7(a)(2).

A3.C.2 Notification and Certification Requirements for Treatment Facilities [R 299.9627 and 40 CFR §268.7(b)]

The treatment facility will submit a notice and certification to the land disposal facility with each shipment of restricted waste or treatment residue of a restricted waste. The notice will include the information specified in R 299.9627 and 40 CFR §§268.7(b)(4) and 268.7(b)(5).

If the waste or treatment residue will be further managed at a different treatment or storage facility, the facility will comply with the notice and certification requirements applicable to generators as specified in R 299.9627 and 40 CFR §268.7(b)(6).

A3.C.3 Waste Shipped to Subtitle C Facilities [R 299.9627 and 40 CFR §§268.7(a) and 268.7(b)(6)]

For restricted waste or waste treatment residues that will be further managed at a Subtitle C (hazardous waste management) facility, the facility will submit notifications and certifications in compliance with the notice and certification requirements applicable to generators under R 299.9627 and 40 CFR §268.7(a) and (b)(6). Each shipment of waste to be transported off-site to a RCRA-authorized Subtitle C TSDF will include a written notification and certification that the waste either meets or does not meet applicable treatment standards of prohibition levels.

A3.C.4 Waste Shipped to Subtitle D Facilities
[R 299.9627 and 40 CFR §§268.7(d) and 268.9(d)]

The facility does not ship waste to Subtitle D facilities.

A3.C.5 Recyclable Materials
[R 299.9627 and 40 CFR §268.7(b)(7)]

The facility does **not accept** recyclable materials used in a manner constituting disposal.

A3.C.6 Record Keeping
[R 299.9608(4), R 299.9609, R 299.9610(3), and R 299.9627 and 40 CFR §§264.72, 264.73, 268.7(a)(5), 268.7(a)(6), 268(a)(7), and 268.7(d)]

MSU WSF maintains a facility operating log in accordance with R 299.9609 and 40 CFR §264.73. The operating log consists of:

Date Received and Quantity
Location of Storage and type of container
Date of disposal
Copies of manifest and LDR notification
Copies of generator fact sheet and any required finger print documentation

Copies of all necessary notifications and certifications, as well as relevant inspection forms and monitoring data, are also maintained on file at the facility. Files will be maintained for a minimum of three years (for inspection records and LDR notification), or until facility closure (for inventory records).

If a significant manifest discrepancy is discovered (such as variation in one-piece count or misrepresentation of the type of waste or corrosive rather than flammable) that cannot be resolved with the generator or transporter within 15 days of receipt, facility personnel will submit to the Director and Regional Administrator a letter describing the discrepancy and all attempts to reconcile the discrepancy. The letter will include a copy of the discrepant manifest or shipping document.

A3.C.7 Required Notice
[R 299.9605(1) and 40 CFR §264.12(a) and (b))]

The facility will notify the Office Chief in writing at least four weeks before the date the facility expects to receive hazardous waste from a foreign source. Notice of subsequent shipments of the same waste from the same foreign source is not required. When receiving such hazardous waste, the facility will comply with applicable treaties or other agreements entered into between the country in which the foreign source is located and the United States.

When the facility is to receive hazardous waste from an off-site source, the facility will inform the generator in writing that the facility has the appropriate license for and will accept the waste the generator is shipping. The facility will keep a copy of this written notice in the operating record.

1) Enter information on tag as waste is added to the container.
2) Keep waste containers sealed.
3) Do not put solid waste material (paper, plastic, etc) into liquid waste containers.
4) Do not mix incompatible chemicals in the same container.
5) Place leaking waste containers in a secondary container and call the ORCBS, as soon as possible, for disposal.
6) Do not put corrosive chemicals into metal cans.
7) Do not dispose of animal carcasses in the dumpster.
8) Store animal carcasses in an appropriate freezer, walk-in cooler or refrigerator.
9) Autoclave and/or incinerate infectious waste.
10) Place autoclaved biohazard waste bags in an opaque bag prior to disposal.
11) Refer to the Michigan State University Waste Disposal Guide for more detailed instructions.

RCRA Hazardous Waste Codes

O D001 Ignitable	O D023 o-Cresol
O D002 Corrosive	O D024 m-Cresol
O D003 Reactive	O D025 p-Cresol
O D004 Arsenic	O D026 Cresol
O D005 Barium	O D027 1,4-Dichlorobenzene
O D006 Cadmium	O D028 1,2-Dichloroethane
O D007 Chromium	O D029 1,1-Dichloroethylene
O D008 Lead	O D030 2,4-Dinitrotoluene
O D009 Mercury	O D031 Heptachlor
O D010 Selenium	O D032 Hexachlorobenzene
O D011 Silver	O D033 Hexachloro-1,3-benzene
O D012 Endrin	O D034 Hexachloroethane
O D013 Lindane	O D035 Methyl ethyl ketone
O D014 Methoxychlor	O D036 Nitrobenzene
O D015 Toxaphene	O D037 Pentachlorophenol
O D016 2,4-D	O D038 Pyridine
O D017 2,4,5-TP	O D039 Tetrachloroethylene
O D018 Benzene	O D040 Trichloroethylene
D019 Carbon Tetrachloride	O D041 2,4,5-Trichlorophenol
D020 Chlordane	O D042 2,4,6-Trichlorophenol
D021 Chlorobenzene	O D043 Vinyl Chloride
O D022 Chloroform	O 001D Copper O 003D Zinc

Project Leader ____________ Dept. ________
Bldg & Room No ____________ Phone ________
Filled Out By ____________ Date ________

Container Size ________ ☐ Solid ☐ Liquid ☐ Contaminated Items

CONTENTS:

Unabbreviated Chemical Name	Amount or Approx Conc (ppm)

Color ☐ Colorless ☐ Light Brown ☐ Other ________

Consistency ☐ Waterlike ☐ Viscous/Oily ☐ Other ________

BIOLOGICAL AND ANIMAL ITEMS:

CATEGORY	DESCRIBE
☐ Biohazardous Agents ________	☐ Animals Type: ________ #: ________
☐ Chemically-contaminated animals or tissue. List chemical in ppm	☐ Bedding, Manure, Feed ☐ Tissue or Blood Specimen ☐ Plastics (syringes, vials, gloves, etc)
☐ Non-infectious, non-hazardous ☐ Autoclaved	☐ Other ________

Please indicate special handling or storage precautions:

OFFICE USE ONLY MANIFEST DOCUMENT #

O-22684

See Instructions on Back Side
Indicate RCRA Waste Codes on Back Side

ATTACHMENT 2

INSPECTION SCHEDULE

FORM EQP 5111 ATTACHMENT TEMPLATE A5
INSPECTION REQUIREMENTS

This document is an attachment to the Michigan Department of Environmental Quality's *Instructions for Completing Form EQP 5111, Operating License Application Form for Hazardous Waste Treatment, Storage, and Disposal Facilities.* See Form EQP 5111 for details on how to use this attachment.

The administrative rules promulgated pursuant to Part 111, Hazardous Waste Management, of Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451), being R 299.9504, R 299.9508, R 299.9605 and Title 40 of the Code of Federal Regulations (CFR) §§264.15 and 270.14(b)(5), establish requirements for inspections at hazardous waste management facilities. All references to 40 CFR citations specified herein are adopted by reference in R 299.11003

This license application template addresses requirements for inspections at the following hazardous waste management facility: Michigan State University Waste Storage Facility in Lansing, Michigan.
(Check as appropriate)

☐ Applicant for Operating License for Existing Facility

X Applicant for Operating License for New, Altered, Enlarged, or Expanded Facility

This template is organized as follows:

INTRODUCTION
The owner or operator of a hazardous waste management facility must inspect the facility for malfunctions and deterioration, operator errors, and discharges that may be causing, or may lead to: (1) release of hazardous waste constituents into the environment or (2) a threat to human health. The owner or operator must conduct these inspection often enough to identify problems in time to correct them before they harm human health or the environment [R 299.9605 and 40 CFR §264.15(a)].

A5.A WRITTEN SCHEDULE
[R 299.9605 and 40 CFR §264.15(b)(1)]

To meet the inspection requirements develop and follow a written schedule for inspecting monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment (e.g., as dikes and sump pumps) that are important to preventing, detecting, or responding to environmental or human health hazards. This written inspection schedule must be kept at the facility.

A5.A.1 Types of Problems

[R 299.9605 and 40 CFR §264.15(b)(3)]

On a daily basis, when the facility is utilized, a visual inspection of the containers and floors in all storage rooms will be conducted. Containers will be inspected for corrosion, leaks in seals, overflows, tightness of lids, as well as possible signs of corrosion, degradation, weakness or other factors that could lead to an accidental release. If leakage or the imminent possibility of leakage from any of the containers is observed, an immediate transfer of waste materials from the damaged container to a secure container is performed.

Containers are inspected before and after consolidation occurs at the facility. Caps and lids are checked for tightness to ensure that no harmful vapor release occurs. In addition, the Vapor Detection Alarm System at the site provides for the constant 24-hour detection of leakage of flammable liquids from the containers. There are no floor drains in the facility, and no sumps to check for the possible presence of released liquids.

Inspections of the safety equipment, the security devices, and the operational structural equipment are performed on a weekly basis. The complete list of equipment and devices, and possible problems associated with each, is included in the Inspection Schedule provided in **Appendix A5-1**.

A5.A.2 Frequency of Inspection

[R 299.9605 and 40 CFR §§264.15(b)(4), 264.174, 264.193, 264.195, 264.226, 264.254, 264.278, 264.303, 264.347, 264.602, 264.1033, 264.1052, 264.1053, 264.1058, and 264.1083 through 264.1089, where applicable]

The minimum frequency of inspection is based on the requirements for each unit on the written schedule. Areas subject to spills (e.g., loading and unloading areas) are inspected daily when in use, while other equipment or systems may be inspected weekly or monthly as required. The attached inspection schedule (**Appendix A5-1**) includes the items, types of problems to check for, and frequencies of inspection.

A5.B REMEDY SCHEDULE

[R 299.9605 and 40 CFR §264.15(c)]

If either daily or weekly inspections reveal that non-emergency maintenance is needed, these measures will be completed as soon as possible. This will preclude the possibility of a release of waste materials, and reduce the need for emergency repairs. If any leaks have occurred, the spilled material will be collected immediately and disposed of as hazardous waste. Leaks from containers at the Waste Storage Facility will be remediated by either transferring the leaking container to an oversized container, or by transferring the remaining contents of the leaking container to a different compatible container. Spilled liquids will be controlled by the use of dikes and chemical spill absorbent materials.

Decontamination will proceed as follows:

1. Personnel will wear personal protective equipment as warranted by the nature of the spilled material. At a minimum this would include impermeable coveralls, appropriate gloves, protective footwear, respirators with appropriate filter cartridges, and safety glasses. Depending upon the extent and severity of the spill, the Hazardous Waste Coordinator or his/her designee may require more extensive personnel protection measures.

2. Smoking is prohibited within the WSF.
3. Possible sources of ignition will be eliminated.
4. Following the absorption of all released chemicals, the floor and walls will be decontaminated as necessary. Equipment will be decontaminated or discarded.
5. All hazardous wastes generated in the process of decontamination will be collected as either solids (i.e. vermiculite, absorbent pillows, etc.) or liquids (i.e. rinse waters, soaps, base solutions, etc.) and disposed of as a hazardous waste.

The area affected by the spill will be examined to verify that no deterioration of the containment system has occurred. If damage to the containment system has occurred, appropriate remedial actions will be taken immediately. Besides addressing the spill or release of the hazardous materials, the Hazardous Waste Coordinator and/or his or her designee may notify authorities if warranted in Section A7 Contingency Plan.

In the event of an emergency involving the release of hazardous constituents to the environment, efforts will be directed toward the containment of the hazard, removal of hazardous materials from the environment, and subsequent decontamination of affected areas. The Environmental Health & Safety Office will file the appropriate written reports. In addition, following the completion of the emergency response the following actions will occur:

1. A safety inspection will be conducted by the Emergency Coordinator. This inspection will certify that the decontamination process has been completed, and that the proper emergency equipment is on-hand at the site.
2. The Environmental Compliance Officer will notify the USEPA Regional Administrator, and the appropriate local authorities that the facility is in compliance.
3. The Emergency Coordinator will record the time, date and details of all emergency responses that require implementation of the Contingency Plan. A written report will be submitted to the USEPA Regional Administrator within 15 days of the incident.

The Emergency Coordinator will ensure that no incompatible wastes are stored at areas of the Waste Storage Facility that have been impacted by the emergency situation, until the emergency has been remediated. As an initial step, all wastes that have not been impacted will be removed from the affected zone to a secure area which has been approved by a representative of the MDNRE. The remaining wastes will be characterized to determine their chemical nature and will be treated according to the process described in Section A7 Contingency Plan. Once an emergency situation has been managed, the Emergency Coordinator will provide for the treatment, storage, and disposal of all recovered wastes, contaminated soils, and other contaminated materials. Details of these activities are provided in Section A7 Contingency Plan.

It is essential that all emergency equipment at the Waste Storage Facility is constantly available and operable. To ensure that this is the case, following all emergency situations, all equipment must be either decontaminated or replaced before regular operations are resumed at the site. A list of all emergency equipment is contained in **Attachment A7-3.** The decontamination and inspection processes for emergency equipment is included in Section A7 Contingency Plan.

A5.C INSPECTION LOG OR SUMMARY
[R 299.9605 and 40 CFR §264.15(d)]

A current operating inspection log is kept at the facility, and an example is provided as Table A5.C.1. Any observations made or repairs made are tracked in the comments section.

Append -1 Inspection Schedule

Area/Equipment	Specific Item	Types of Problems	Frequency of Inspection
Monitoring Equipment	Enmet ISA-44-5 gas detection system	Power, electrical circuitry, M.S.O. sensors dirty, line voltage, heater voltage	Daily
Safety and Emergency Equipment	Absorbents (vermiculite or Superfine)	Out of stock	Weekly
	Absorbent pads and pigs (universal)	Out of stock	Weekly
	Solvent/acid spill kits	Out of stock	Weekly
	Emergency eyewash and shower	Stick valve, leaking, low water pressure	Weekly
	Air purifying respirator cartridges	Out of stock	Weekly
	Fire extinguishers	Low charge	Monthly
	Fire Alarm system	Low charge, malfunctioning sensors and horns	Per NFPA
	Telephone system	Power failure	Monthly
	First aid supplies	Items out of stock	Weekly
	Protective clothing (gloves, impermeable suits)	Out of stock	Weekly
	Mercury Vacuum	Dirty filter, spent filter	Monthly
Security Devices	Intruder Alarm	Power failure	Daily
	Storage building locks	Corroding, malfunctioning	Daily
Operating/Structural Equipment	Heating/ventilation system	Power failure, dirty filters	Monthly
	Exhaust fans	Power failure	Daily
	Storage area foundation	Erosion, cracks, settlement	Weekly
	Building Exterior	Cracks, Forced entry	Monthly
Container Storage Area	Container placement and stacking	Aisle space, height of stacks	Weekly
	Sealing of containers	Open lids	Daily
	Labeling of containers	Date missing, damaged or improper labels	Daily
	Container integrity	Corrosion, leakage, structural damage	Daily
	Segregation compatibilities	Incompatible wastes stored in same area	Weekly
	Debris and refuse	Trip/fall hazards	Weekly
	Warning signs	Damaged or missing	Weekly
	Floor coating	Peeling, exposed concrete, unsealed cracks	Daily
	Mercury floor survey	Detectable levels on mercury meter	Monthly
Loading/Unloading Dock	Concrete pads and adjoining surface areas	Accidental releases	Daily
	Floor coating	Peeling, exposed concrete, unsealed cracks	Daily
	Dock	Accumulated liquids, accidental releases	Daily
	Canopy Area	Forced Entry, compromised structure	Weekly

Table A.5C.1

WSF Inspection Checklist Vers .0

(requirements of 40 CFR 264.1

	D - Daily ekly M - monthly			Time is PM unless otherwise stated													
Freq.	Specific Item (Building location)	3/1/2013	3/2/2013	3/3/2013	3/4/2013	3/5/2013	3/6/2013	3/7/2013	3/8/2013	3/9/2013	3/10/2013	3/11/2013	3/12/2013	3/13/2013	3/14/2013	3/15/2013	3/16/2013
		Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
D	Enmet Vapor Detection Sys. (E.)																
D	Sonitrol Monitoring Sys. (E.)																
D	Exhaust Fans/Fume Hood (E.)																
D	Storage Building Locks (All)																
D	APR Respirator Cartridges (E. & W.)																
D	Sealing of Containers (E. & W.)																
D	Labeling of Containers (E. & W.)																
D	Container Integrity (E. & W.)																
D	Floor Coating - Inside (E. & W.)																
D	Floor Coating - Outside (E. & W.)																
D	Accidental Releases (E. & W.)																
D	Loading containment area (E. & W.)																
W	Eyewash & Shower (All)																
W	First Aid Supplies (All)																
W	Protective Clothing (All)																
W	Absorbants (All)																
W	Spill Control Materials/Kits (E. & W.)																
W	Acid Spill Kits (E.)																
W	Storage Area Foundations (E. & W.)																
W	Container Segregation/Stack (E. & W.)																
W	Incompatible Segregation E. & W.)																
W	Debris & Refuse (E. & W.)																
W	Doors(s) - Warning Signs (E. & W.)																
W	Canopy Area/Dock (E. & W.)																
M	Heating/Ventilation Sys. (E.)																
M	Fire Alarm System (E. & W.)																
M	Telephone System (E. & W.)																
M	Fire Extinguishers (E. & W.)																
M	Vapor Alarm Calibration (E.)																
M	Building Exterior (All)																
	Comments:																

ATTACHMENT 3

PERSONNEL TRAINING PROGRAM

FORM EQP 5111 ATTACHMENT TEMPLATE A10
PERSONNEL TRAINING

This document is an attachment to the Michigan Department of Environmental Quality's *Instructions for Completing Form EQP 5111, Operating License Application Form for Hazardous Waste Treatment, Storage, and Disposal Facilities*. See Form EQP 5111 for details on how to use this attachment.

The administrative rules promulgated pursuant to Part 111, Hazardous Waste Management, of the Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451), R 299.9501, R 299.9605 and Title 40 Code of Federal Regulations (CFR) §§264.16 and 270.14(b)(12), establish requirements for personnel training programs at hazardous waste management facilities. All references to 40 CFR citations specified herein are adopted by reference in R 299.11003.

This license application template addresses requirements for a personnel training program at the hazardous waste management facility for the Michigan State University Waste Storage Facility in Lansing, Michigan. The information included in the template demonstrates how the facility meets the personnel training requirements for hazardous waste management facilities.

This template is organized as follows:

A10.A CONTENT OF INTRODUCTORY AND CONTINUING EDUCATION TRAINING PROGRAMS

[R 299.9605 and 40 CFR §264.16(a)]

The purpose of the MSU training program is to prepare the EHS employees to operate and maintain the Hazardous Waste Storage Facility in a safe manner. The training programs reduce the possibility of mistakes in the handling of the waste materials.

Employees are thoroughly familiar with their responsibilities and aware of the rationale for the protocols which are required at the site.

A great diversity of job responsibilities exists within the EHS office. In addition, the office is responsible for interacting with departments across campus. The campus generates the waste transported and stored by EHS personnel. The following personnel are included in the consideration of hazardous waste management at the MSU Waste Storage Facility:

-EHS Director
- Environmental Compliance Officer
- Chemical Safety Officer
- Hazardous Waste Coordinator
- Hazardous Materials Professional
- Industrial Hygienist I & II
- Clerical Staff

Since the job descriptions of some personnel require that they be more directly involved in the storage and transport activities than others, a tiered training program has been implemented. An outline of the general instruction received by the various job classification is contained in Section A10.A.1.

The tiered training program is designed to provide relevant information to each employee. This enables them to effectively handle any emergency situation they might reasonably be expected to encounter. For example, the Industrial Hygienists receive training pertaining to emergency procedures, hazardous materials, and hazardous waste management. But because they are not expected to actually transport or consolidate hazardous wastes, and are not in the vicinity of the storage facility, they are not required to receive intensive training related to DOT regulations, or the Waste Facility Operations.

The responsibilities of the EHS Director, Environmental Compliance Officer, Hazardous Waste Coordinator, Chemical Safety Officer, Hazardous Materials Professional, and other EHS personnel are described briefly in section A10.B.1.

A10.A.1 Outline for Introductory Training Program

[R 299.9605 and 40 CFR §§264.16(a)(1) and 264.16(d)(3)]

Both **Hazardous Materials Professionals** and **Hazardous Materials Coordinators** receive the following training or information with the opportunity to ask questions:

I.Hazardous Waste Management Policy Overview
(Michigan State University Waste Disposal Guide **Appendix A10-1**)

II. Hazardous Materials
A. Corrosives Safety-(Acids and Caustics video)
B. Flammable Solvent Safety-(Flammable liquids video)

C. Introduction to Toxicology-(Toxicology video)
D. Reactive Materials-(Reactive and Explosive Materials video)
E. Chemical Safety Intial Training
F. Hazardous Waste Initial Training
G. Radiation Safety Initial Training
H. Bloodborne Pathogen Training

III. Department of Transportation
A. DOT Awareness Training
B. DOT Function Specific Training
1. Manifesting of Wastes
2. Use of ORCBS Database
3. Labeling, Placarding, Marking, Packaging of Hazardous Materials

IV. Regulatory Overview
A. Michigan Right-to-Know Law (including use and location of MSDS materials)
B. USEPA 40 CFR 264 Rules and Regulations
C. PA 451 Part 111 and 121 Rules and Regulations
D. Land Disposal Restriction Rules and Regulations

V. Waste Building Training
A. Operating License
B. Contingency Plan
C. Fire and Vapor Monitoring System
D. Spill Cleanup Equipment and Supplies
E. Burglar Alarm System
F. Evacuation Procedures

VI. Personal Protective Clothing
A. SCBA Training
B. Respiratory Protection/ Fit Testing
C. Chemical resistant suit, boot, glove selection

Some of the more general training requirements will be waived if an equivalent level of competency has been shown due to prior training or experience.

Indirectly involved personnel (Director, Environmental Compliance Officer, Chemical Safety Officer, Industrial Hygienist, and office staff) receive the following training:

Introductory Training for Indirectly Involved Personnel

Laboratory Chemical Safety Seminar
A. Introduction
    1. Objectives
    2. Chemical Hygiene Plan

B. Film: Laboratory Safety & Chemical Hygiene

C. Chemical Hazard Classes
    1. Physical Hazards
    2. Health Hazards

D. Right-To-Know Law
    1. Labels
    2. Material Safety Data Sheets (MSDS)

E. Hazard Control Methods
    1. Engineering Controls
    2. Administrative Controls
    3. Personal Protective Equipment

F. Laboratory Safety Inspection

G. Hazardous Waste Disposal
    1. Chemical Waste
    2. Biohazardous Waste

H. Chemical Spills and Emergencies

Department of Transportation Awareness Training

A. Definition of "Person" reg. applicable DOT regulations

B. Steps Required to Ship Materials
    1. Hazard Classes
    2. Shipping Names
    3. Marking and Labeling Requirements
    4. Shipping Papers
    5. Placarding
    6. Shipping Containers
    7. Material Compatibility

Waste Storage Facility (Director, Environmental Compliance Officer, Chemical Safety Officer,
Industrial Hygienist I & II only)

A. Contingency Plan - review of procedures, facility tour

B. Waste code assignation - state and federal codes, criteria for application of codes

C. WSF vapor detection system/alarm systems

A10.A.2 Outline for Continuing Education
[R 299.9605 and 40 CFR §§264.16(a)(1) and 264.16(d)(3)]

Annual MSU WSF Refresher Training will generally consist of items as follows:

Training for Hazardous Material Professionals and Hazardous Material Coordinators

1. Contingency Plan - review of procedures, facility tour

2. Waste code assignation - changes in state and federal codes, review of criteria for application of codes

3. Department of Transportation - changes in proper shipping names, review of how shipping papers are completed, acceptable packaging materials, placarding, or any other pertinent changes

4. Review of Personal Protective Equipment donning/doffing

5. Chemical compatibility and proper storage updates

7. Mixed waste updates training

8. WSF Inspection & Shutdown

9. WSF vapor detection system/alarm systems

10. Waste hauling vehicles maintenance, inspection and operation

11. Decontamination (personal and of equipment)

12. Other related topics as needed.

Training for Director, Chemical Safety Officer, Environmental Compliance Officer, Industrial Hygienist I & II

1. Contingency Plan - review of procedures, facility tour

2. Waste code assignation - changes in state and federal codes, review of criteria for application of codes

3. Department of Transportation awareness training every three years

4. WSF vapor detection system/alarm systems

Training for Clerical Staff

1. Department of Transportation awareness training every three years

A10.B PERSONNEL SUBJECT TO TRAINING REQUIREMENTS

[R 299.9605 and 40 CFR §§264.16(a),(d)]

A10.B.1 Job Titles and Job Descriptions

[R 299.9605 and 40 CFR §§264.16(d)(1),(2)]

EHS Assistant Director:
The Director oversees the daily operational, financial and personnel activities of the ORCBS. The Director is also responsible for the development, implementation, and maintenance of a comprehensive radiation, chemical and biological safety program at Michigan State University.

Environmental Compliance Officer:
The Environmental Compliance Officer (ECO) is responsible for the compliance of the WSF, ensuring that operating license requirements are followed. The ECO is also responsible for review of training, review of WSF operations and any verbal or written communications with the DNRE.

Chemical Safety Officer:
The EHS Chemical Safety Officer (CSO) is responsible for the development and maintenance of an effective training program for EHS. The CSO must also be an individual trained in the management of hazardous wastes and capable of directing the training sessions. The CSO oversees the University's teaching, research, outreach and support activities involving the use, storage, transportation and disposal of hazardous chemicals. Other programs the CSO directs include the Chemical Hygiene Plan, laboratory inspections, safety training classes, industrial hygiene consultations, chemical fume hood testing, indoor air monitoring, respiratory protection, employee Right-to-Know, material safety data sheets (MSDS), and emergency and spill response.

Hazardous Waste Coordinator:
The Hazardous Waste Coordinator (HWC) supervises and helps conduct and coordinate the campus-wide hazardous waste program. The HWC ensures that hazardous wastes are properly handled, transported, and stored. Work which takes place at the Waste Storage Facility is directly supervised by the HWC. The HWC provides guidance, instruction, and supervision of specific techniques and procedures to maintain operational safety and compliance with regulatory requirements. The HWC is responsible for the preparation and maintenance of records and reports dealing with hazardous waste transportation and storage.

Hazardous Materials Professional:
The Hazardous Materials Professional (HMP) assists in the development, implementation and monitoring of University programs designed to facilitate the safe handling, storage, transport and disposal of regulated and non-regulated hazardous chemical, biohazardous and radioactive materials. The HMP assists in preparing for, participates in, and reviews responses to spills and releases of hazardous materials. The HMP assists in the management and review of University programs and policies

which maintain licensure by and ensure compliance with state and federal hazardous materials regulations. Some of the primary responsibilities of the HMP involve the direct handling of hazardous waste materials and manipulation of waste materials at the Chemical Waste Facility.

Industrial Hygienist II:
The position of Industrial Hygienist II (IH2) has been established by EHS to assist in the safe, efficient management of hazardous wastes. The IH2 assists in developing, overseeing, implementing and monitoring programs to control or eliminate chemical and occupational hazards. The IH2 assists in overseeing the safe and proper storage, use and transport of hazardous materials. The IH2 assists in developing and conducts training programs related to hazardous materials. The IH2 reviews research and related campus activities involving hazardous materials in order to maintain compliance with state, federal and University regulations and guidelines.

Industrial Hygienist I:
The position of Industrial Hygienist I (IH1) has been established by EHS to assist in the safe, efficient management of hazardous wastes. The primary function of the IH1 is to monitor and test equipment and working environments to ensure compliance with health and safety regulations. The IH1 responds to concerns with the quality of occupational working environments. In addition the IH1 assists in the implementation of training programs designed to comply with occupational safety regulations

Clerical Staff (Office Supervisor I and Secretary II):
The Clerical Staff are involved in the management of hazardous waste in only a few areas. The primary area is in the scheduling of training for University personnel. In addition, calls which come to EHS are often first taken and forwarded by the Clerical Staff. The Clerical Staff has a basic knowledge of hazardous materials and can determine how best to route calls or page response personnel in the event of hazardous material spills.

A10.B.2 Description of How Training is Designed to Meet Actual Job Tasks
[R 299.9605 and 40 CFR §§264.16(a)(1) and (d)(3)]

New employees are given an overview of the policies of the EHS department and the responsibilities of EHS personnel. They are provided basic information relating to the responsibilities of the position being filled. Also included is information pertaining to the responsibilities of Safety Personnel involved with the handling of hazardous materials. The "Policies, Procedures, and Guidelines for Radiation, Chemical, and Biological Safety" document provided as **Appendix A10-2** will be examined. In addition, new employees are oriented with the WSF Environmental Management System and the QA/QC protocols in place.

The actual moving of hazardous waste from the University to the Waste Storage Facility involves far more than merely transporting an item from one place to another. Each decision made when moving a container involves knowledge of EPA, DOT, and State of Michigan laws, the University policy, and the WSF Operating license. As an introduction to this vast array of governing laws, a new employee is required to read through the Waste Disposal Guide. In addition each is required to take Chemical Safety, Radiation Safety, Hazardous Waste, and Bloodborne Pathogen Initial training. These courses serve as general instruction on the hazards which will or may be encountered by the person in the course of their duties. Since the research done at Michigan State University is so diverse, an encompassing program of instruction is necessary. And since there is no standard set of compounds with which persons may be dealing, only a broad approach adequately addresses those kinds of information needs.

Right-to-Know training is given to inform employees of their rights and access to information on hazardous materials. A more in depth instruction is given for MSDS location and search since an exact knowledge of chemicals is often required when determining how to properly ship materials or in the event of emergency response or spill response. Since the Hazardous Materials Professionals (HMP) and Hazardous Waste Coordinator (HWC) often respond to and clean up chemical spills both on campus and during consolidation at the WSF, an accurate knowledge of the materials with which they are working is pertinent. To aid employees in their understanding of chemical nature, a number of instructional videos are available on topics such as flammable liquids, corrosives, and reactive and explosive materials. In addition, numerous audio/visual materials are available to EHS personnel.

A regulatory overview is provided by guiding new HMPs and HWCs through PA 451 parts 111 and 121, enabling them to gain an understanding of the requirements for the transportation and storage of hazardous waste. A majority of the tasks done by the HMPs involves the transportation or storage of hazardous waste. Since many portions of 40 CFR 264 Rules are referenced in PA 451, employees are presented selected portions of this section for study.

All EHS employees are given Department of Transportation awareness training since even the clerical staff come in contact with hazardous materials shipped to the office as new product. HMPs and HWCs receive a more in depth training that involves more of the regulations regarding the packaging, labeling, marking, classification, and shipping hazards of materials. They are also instructed on placarding vehicles and required to have a valid commercial driver's license with a hazardous materials endorsement. Also involved in the transportation process is instruction on how materials are recorded and tracked by EHS. By nature this process involves a good foundation in the knowledge of identifying and classifying hazardous wastes and assigning of waste codes. The EHS department is the body responsible for ensuring that waste codes are placed on hazardous waste packages before they are shipped to the WSF. Employees are given hands on training using the database set up and maintained by EHS.

HMPs and HWCs are given a thorough introduction to the Hazardous Waste Storage Facility. A large portion of their time is spent consolidating, storing, and preparing hazardous waste for shipment from the WSF. The introductory training addresses the following:

Procedures for using, inspecting, and repairing the emergency and monitoring equipment

The function of the phone and alarm systems at the facility
Responses to fires, explosions, and spills
Shutdown of the facility
Response to a release of contaminants to the environment

In addition they are required to read through the Operating License and Contingency Plan and are given the opportunity to ask questions at any time. They are physically shown all the operating systems and locations of all equipment addressed in the License. They are also shown the location of all records stored at the WSF. Supervised work takes place within the facility soon after new employment. It is during this supervised time that new employees working in the WSF are shown how it functions, how materials are stored and consolidated, and other operating standards.

The use of personal protective clothing and equipment (PPE) while at the WSF or while picking up waste materials from campus generators is incorporated into a number of the training sessions. The Initial Chemical Safety training presents some of the more rudimentary aspects of PPE. As the new employees progress in their supervised work, they are shown the proper protective equipment for the work they are expected to do. They are also given knowledge of how to access information on PPE for applications outside of the compounds they would normally encounter. All persons expected to work in hazardous environments are fit tested for full or half mask air purifying respirators or a self-contained breathing apparatus (SCBA) as necessary.

All persons working directly with the WSF are required to participate in the annual refresher training. This review is intended to keep all personnel apprised of any recent modifications of the Contingency Plan, and to keep them informed of recent innovations in the handling and storage of hazardous wastes. Because of the importance of the Contingency Plan in these matters, a review of the plan will be an integral part of the review. Section A10.A.2 lists examples of the types of topics to be reviewed annually.

Training records for each employee, including documentation of their successful completion of the training, will be maintained at the EHS office and the WSF. At the time of hire, each person receives a written description of the responsibilities of their position, WSF security information, and a listing of the introductory and continuing training required for the position.

A10.C FREQUENCY OF REQUIRED TRAINING
[R 299.9605 and 40 CFR §§264.16(b), (c)]

A10.C.1 Initial Training
[R 299.9605 and 40 CFR §264.16(b)]

All MSU WSF personnel must complete introductory training within six months of their employment or assignment to a new position. Employees do not work in unsupervised positions until they have completed the training.

A10.C.2 Continuing Education
[R 299.9605 and 40 CFR §264.16(c)]

All MSU WSF personnel take part in continuing education training annually.

A10.D TRAINING DIRECTOR
[R 299.9605 and 40 CFR §264.16(a)(2)]

The Hazardous Waste Coordinator will conduct the training programs. The HWC is qualified based on years of experience in the field of hazardous waste, in addition to off-site training provided by qualified consultants and contractors.

A10.E DOCUMENTATION AND RECORD KEEPING REQUIREMENTS
[R 299.9605 and 40 CFR §§264.16(d) and (e)]

A10.E.1 Documentation
[R 299.9605 and 40 CFR §264.16(d)]

A10.E.1(a) Job Titles and Names of Employees Filling Each Job
[R 299.9605 and 40 CFR §264.16(d)(1)]

The job titles of Hazardous Waste Coordinator and Hazardous Materials Professional incorporate all EHS personnel who are directly involved with the storage and transportation of hazardous waste. Individual records are maintained in separate folders at the EHS office for each person employed in this capacity. The records of each employee include their names, job title, and description of responsibilities. Future employees are included by the addition of folders with the information specific to their conditions of employment. The EHS Environmental Compliance Officer and the Chemical Safety Officer are responsible for the development and currency of the training programs.

All training records of current personnel will be maintained at least three (3) years following the close of the facility. The training records of former employees will be maintained for at least three years from their last date of employment. If an individual is transferred within the department, his/her records will be maintained as a current employee.

A10.E.1(b) Written Job Descriptions
[R 299.9605 and 40 CFR §264.16(d)(2)]

The records described in A10.E.1(a) of each employee include his/her name, job title, and description of responsibilities.

A10.E.1(c) Written Description of Type and Amount of Training Given to Each Position
[R 299.9605 and 40 CFR §264.16(d)(3)]

The Hazardous Waste Coordinator maintains a record with a written description of the type and amount of training given to each position

A10.E.1(d) Documentation That Training Has Been Given to and Completed by Facility Personnel

[R 299.9605 and 40 CFR §264.16(d)(4)]

The records described in A10.E.1(a) of each employee contain documentation of all training completed

A10.E.2 Record Keeping

[R 299.9605 and 40 CFR §264.16(e)]

Extensive records relating to the facility and the EHS personnel will be maintained at the EHS office and WSF. These records will include the following: names and job titles of personnel presently employed, job descriptions, training records for each employee.

Records for former employees are kept for a minimum of three years at the EHS department office.

Appendix A10-1

MSU Waste Disposal Guide

MICHIGAN STATE
UNIVERSITY

Waste Disposal Guide

How to Properly Dispose of Waste Materials Generated at Michigan State University

Environmental Health & Safety (EHS) /
Office of Radiation, Chemical & Biological Safety (ORCBS)
C124 Research Complex-Engineering
East Lansing, MI 48824-1326

Revised April 2009

CONTACT INFORMATION

Campus Emergency:	911
ORCBS Phone Number:	(517) 355-0153
ORCBS Fax Number:	(517) 353-4871
ORCBS E-mail Address:	orcbs@msu.edu
ORCBS Web Address:	http://www.orcbs.msu.edu

TABLE OF CONTENTS

Sections

Appendices

INTRODUCTION

Excellence in research and education is of primary importance at Michigan State University. In support of this activity, the Office of Radiation, Chemical and Biological Safety (ORCBS) provides for disposal of hazardous chemical waste, radioactive waste, and, together with University Laboratory Animal Resources (ULAR), certain biohazardous waste. This document contains updated university procedures for safe handling and packaging of such wastes.

The enclosed procedures are necessary to comply with rules from the regulatory agencies governing hazardous materials. The U.S. Environmental Protection Agency (EPA) and the Michigan Department of Environmental Quality (DEQ) regulate disposal of chemical wastes in a cradle-to-grave fashion. The Nuclear Regulatory Commission (NRC) regulates the disposal of radioactive material. The U.S. Department of Transportation (DOT) governs transportation, labeling and packaging of hazardous substances while the Michigan Department of Public Health (MDPH) serves to ensure the safety and health of employees who handle such materials. The Michigan Medical Waste Regulatory Act governs medical waste as part of biohazardous waste.

Our goal is to provide for the disposal of hazardous wastes in a safe, efficient, and ecologically sound manner. We need your cooperation to meet this goal. Please abide by the guidelines set forth in this document and comply with the applicable regulatory requirements for the waste that you generate. Call the **Office of Radiation, Chemical and Biological Safety (355-0153)** for questions about radioactive, chemical, and biohazardous waste disposal or **University Laboratory Animal Resources (353-5064)** for questions regarding pathological waste disposal.

Finally, if you handle any potentially hazardous materials, know the hazards and how to protect yourself from them. Companion documents detailing regulatory requirements, risks, handling precautions and other safety related information are listed below.

- Michigan State University Chemical Hygiene Plan
- Michigan State University Radiation Safety Manual
- Michigan State University Biological Safety Manual
- Michigan State University Bloodborne Pathogens Exposure Control Plan

HAZARDOUS WASTE DEFINED

Hazardous materials are substances that have hazardous characteristics such as: flammable, corrosive, reactive, toxic, radioactive, poisonous, carcinogenic, or infectious. In a general sense, wastes that contain these materials are considered hazardous because they present a potential risk to humans and/or the environment. Hazardous waste management plans generally separate waste into three broad groups: **radioactive, chemical, and biohazardous.**

Radioactive waste is classified as either low-level or high-level waste. Low-level waste is typical of that found at medical and research institutions (such as Michigan State University) while high-level waste is typical of that generated at nuclear reactors. At Michigan State University, a radioactive waste is any waste with detectable radioactivity that is generated from procedures involving licensed radioactive material.

Chemical waste includes a wide range of material such as discarded commercial chemical products (DCCP), process wastes, and wastewater. Some chemicals and chemical mixtures are hazardous wastes because they are specifically listed by the EPA. A chemical waste that is not listed by the EPA is still a hazardous waste if it has one or more of EPA's four hazardous characteristics: **ignitablity, corrosivity, reactivity** or **toxicity.**

Biohazardous waste is a term used to describe different types of waste that might include infectious agents. Currently, the following waste categories are considered to be biohazardous waste.

- **Medical waste** means any solid waste which is generated in the diagnosis, treatment (e.g., provision of medical services), or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals, as well as all categories defined by the Michigan Medical Waste Regulatory Act (MMWRA).
- **Regulated waste** as defined by the Michigan Occupational Safety and Health Act (MIOSHA) on Bloodborne Infectious Diseases.
- **Laboratory waste and regulated waste** as defined in the "Guidelines For Research Involving Recombinant DNA Molecules" (NIH) and the CDC/NIH "Guidelines on Biosafety in Microbiological and Biomedical Laboratories."
- **Pathological Waste (e.g., animal carcasses).**

Finally, workers who generate hazardous waste(s) of any kind must be aware that there may be mixed hazards in their waste; that is, a combination of any of the three types of hazardous waste. For example, animal carcasses containing radioactive material, a hazardous chemical, and perhaps an infectious agent would need to be managed according to the considerations and requirements of all three types of hazards defined above.

If you will be generating mixed waste, contact the appropriate safety officer to determine the proper way to handle and manage this material before the waste is generated.

REQUIREMENTS FOR CHEMICAL WASTE

Laboratories and other MSU units that generate hazardous waste are now required to comply with the generator requirements of the Resource Conservation and Recovery Act (RCRA, CFR Title 40) and Michigan Hazardous Waste Management Act (Michigan Public Act 451). **Every generator site (laboratory) is subject to inspection by the EPA and DEQ.** The changes necessary for compliance are summarized below.

Manifesting
Waste must be manifested when it is transported from campus to the MSU central waste storage facility. To do this, generators complete a Waste Pick-up Request form (see Appendix B) and send it to the ORCBS. The ORCBS prepares a manifest to pick-up the waste on campus, and then the waste is tracked to the waste facility with yet another manifest required by EPA/DEQ.

Labeling
Each container of hazardous waste must be labeled with the words "*Hazardous Waste,*" and have a completed waste tag attached. An exception to this rule is individual small bottles of discarded commercial chemical product; however, if the discarded commercial product is not in the original container, it must also have a waste tag.

Accumulation Time
Chemical wastes shall not be accumulated for longer than 90 days. *Each container shall be labeled with a collection start date and chemical constituents when waste is first added to the container.*

Collection & Storage
Collect and store compatible wastes (see Appendix C) in strong, tight containers in a secured area that is protected from the weather, such that none can escape by gravity into the environment. Keep lids tightly secured when not in use.

Emergency Response Personnel
Attach to the outer door of each laboratory the name and phone number of a person(s) to contact in case of an emergency.

Waste Minimization
Institute methods to recycle wastes and to reduce waste volume and toxicity. Substitute nonhazardous or less toxic materials whenever possible. Purchase only the amount of chemical that is needed. Excess chemicals often become waste and any purchase savings are outweighed by disposal costs.

Training
Personnel who handle hazardous waste or prepare it for shipping shall receive training on proper handling procedures and emergency response procedures. This includes Right-to-Know training, review of this document, and completion of the Chemical Hygiene & Laboratory Safety and Hazardous Waste training courses.

CLASSIFICATION OF CHEMICAL WASTE

A chemical waste is considered to be a hazardous waste if it is specifically listed by the EPA as a hazardous waste or if it meets any of the four hazardous characteristics below*. If a chemical waste is not on the EPA list of hazardous wastes, and does not meet any of the hazardous waste characteristics, it is a nonhazardous waste†.

Hazardous Waste Characteristics

1. Ignitable Waste

- A liquid that has a flash point of less than 140° F.
- A solid that is capable of causing fire through friction or absorption of moisture, or can undergo spontaneous chemical change that can result in vigorous and persistent burning.
- A substance that is an ignitable compressed gas or oxidizer.

2. Corrosive Waste

- An aqueous solution which has a pH less than or equal to 2 or greater than or equal to 12.5 is a corrosive waste.

3. Reactive Waste

- A material that is normally unstable or undergoes violent chemical change without detonating.
- A material that can react violently with water to form potentially explosive mixtures or can generate dangerous or possibly lethal gases (cyanide or sulfide bearing).
- A material capable of detonation or explosive reaction.

4. Toxic Waste

- A waste that contains one of the constituents in concentrations equal to or greater than the values shown in (Appendix H or Appendix I) is a toxic waste.

A chemical waste can also be classified as either a process waste or a discarded commercial chemical product (DCCP). This distinction is important when manifesting and labeling. A process waste is any waste that, by virtue of some use, process or procedure, no longer meets the manufacturer's original product specifications. Examples of process wastes are chromatography effluents, diluted chemicals, reaction mixtures, contaminated paper, etc.

A discarded commercial chemical product is the original (virgin) material, in the original container. Examples of DCCP are small bottles of unused or outdated chemicals from laboratories, dark rooms, or service areas.

* Most of the chemicals in the Hazardous Materials Table are EPA listed wastes or common laboratory wastes with a hazardous characteristic.

† Although a chemical waste may be nonhazardous by EPA's definition, there are additional requirements for disposal at the state and local level that are beyond the scope of this manual. If you have questions about the release of a chemical waste to the environment or the sanitary sewer, contact the ORCBS for clarification. Release of di minimis (minimal) quantities of hazardous materials from laboratory operations, such as rinsing and washing glassware is allowed.

CONTAINERS

The ORCBS supplies containers for chemical and radioactive waste collection. A variety of smaller containers are available at General Stores.

Original containers of a hazardous material may be reused once to collect the same type of waste material. For example, many solvents and acids come packaged in 1-gallon or smaller glass bottles which are suitable for waste collection.

ORCBS Containers

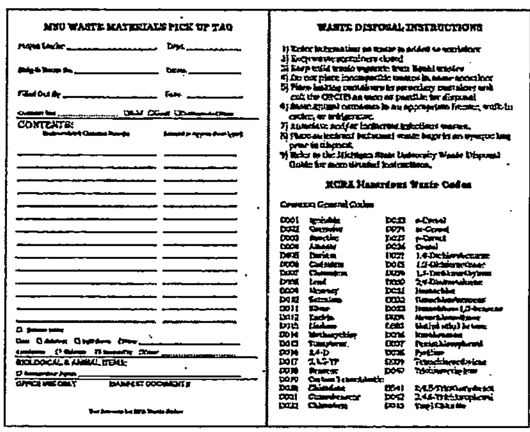
Chemical Waste:
- 5-gallon Polyethylene Container
- 30-gallon Polyethylene Drum-Open Head
- 55-gallon Fiber Drum
- 55-gallon Metal Drum-Open or Closed Head
- 55-gallon Polyethylene Drum-Closed Head

Radioactive Waste:
- 5-gallon Polyethylene Carboy
- 2.5-gallon Polyethylene Carboy
- 2-cubic foot Cardboard Box with Plastic Liners

General Stores containers suitable for collecting waste:
See the web site at http://universitystores.msu.edu

CONTAINER LABEL

Label every chemical waste container with the MSU Materials Pickup Tag (below and Appendix A). An exception is individual containers of discarded commercial chemical product (DCCP) since the manufacturer's label properly identifies the contents.



MSU Materials Pick-up Tag

GENERAL LABELING & PACKAGING PROCEDURES

Collect small volumes of process waste in your own containers. Collect larger volumes in 5-gallon cans. Collect solid waste e.g., contaminated gloves, glassware, paper, etc., in cardboard boxes lined with two plastic bags. **Keep liquid and solid wastes separate.**

Attach an MSU Materials Pick-up Tag (Appendix A) to each and every container of process waste. Tags are available from the ORCBS upon request. In the contents section of the tag, enter the volume and composition of all the waste as it is added to the container. For solutions, list the solute and solvent concentrations. (Include the amount of water present.) Be as accurate as possible in your description of wastes.

Date and label each container with the words *"Hazardous Waste."* Containers supplied by the ORCBS are delivered with labels that have this wording. Small bottles of discarded chemical commercial products do not need to be labeled with the words *"Hazardous Waste."*

Separate wastes into the different waste categories. That is, collect acids in a separate container from solvents etc.

Do NOT mix incompatible materials in the same container.

Do NOT put corrosive or reactive chemicals in metal cans.

For liquids, fill containers to about 90% of container volume. **Do NOT fill containers to the top.** Leave at least 2 inches of space in 5-gallon liquid waste containers to allow for liquid expansion and pumping. Make sure the caps on all cans and bottles have gaskets and are tightly secured before the pickup.

SPECIFIC LABELING AND PACKAGING PROCEDURES

Formalin and Formaldehyde Solutions

Dilute formaldehyde solutions should be stored for disposal by the ORCBS. Formaldehyde is a suspected carcinogen with a low permissible exposure limit (PEL) and poor warning properties.

Ethidium Bromide Solutions

Collect ethidium bromide solutions for disposal. Ethidium bromide is mutagenic at higher concentrations. Very dilute solutions of ethidium bromide may be discarded by flushing down a sanitary sewer. The maximum concentration for doing so is a *working solution* of 5 ppm or less. Do not intentionally dilute any solution to avoid proper disposal methods.

Ethidium Bromide Gels

Ethidium bromide gels should be collected in double wrapped plastic bags. Excess buffer should be removed before wrapping or absorbed into paper towel. The gels can then be given to the ORCBS.

Ignitable Liquids and Organic Solvents

Keep halogenated wastes separate from nonhalogenated solvent wastes if possible. Separate organic solvents from aqueous solutions whenever possible. Keep acidified solvents separate from other solvent and acid wastes.

Acids, Bases, and Aqueous Solutions

Do NOT mix strong inorganic acids or oxidizers with organic compounds. Keep acids, bases or aqueous solutions containing heavy metals (Appendix H) separate from other wastes. Avoid mixing concentrated acids and bases together in the same container.

Mercury Solutions

Keep wastes containing mercury salts separate from all other wastes.

Corrosive Materials

The following corrosive liquids shall not be mixed with any other hazardous waste under any circumstances. These liquids must be packaged in their own separate shipping container.

- Nitric acid exceeding 40 percent concentration
- Perchloric acid
- Hydrogen peroxide exceeding 52 percent strength by weight
- Nitrihydrochloric or Nitrohydrochloric acid diluted

Perchloric Acid and Perchlorates

Keep perchloric acid and perchlorate wastes separate from other wastes and in exclusive use containers.

Toxic Wastes

Separate toxic wastes (process wastes with constituents listed in Appendix H) from other hazardous wastes whenever possible. For example, do not mix aqueous waste containing heavy metals with wastes that do not. **This is especially true for wastes containing mercury.**

Severe Toxicity Wastes

Keep severe toxicity wastes separate from other wastes whenever possible (Appendix I).

Sharps

Collect all needles in a sharps container. Sharps containers are available at General Stores. **Do NOT put needles in cardboard boxes with other solid debris.** See sharps in the biohazardous waste section of this manual.

Paint and Paint Thinner

Separate solid paint sludge from paint thinners by pouring off thinners into a separate waste container. **Do NOT put brushes, rollers, paper or other debris in paint wastes.** Keep water and water-base paint wastes separate from oil-base paint wastes. Rinsate from water-base paint cleanup is nonhazardous and can be disposed of down the sanitary sewer. Label wastes as paint thinners, paint stripper waste or paint sludge.

Chromatographic Adsorbent (Silica Gel)

Collect spent silica gel in a box lined with two plastic bags or a polyethylene container. **Do NOT mix adsorbent with liquid wastes. Do NOT mix paper, plastic, gloves or glassware with silica.** If the adsorbent does not contain any of the constituents in concentrations greater than those listed in Appendix H (heavy metals, organics and pesticides) or severely toxic compounds (Appendix I), dispose of it in the dumpster. If it contains any of these compounds, indicate the concentration of contaminants on the waste tag and collect it for disposal as a hazardous waste.

Broken Mercury Thermometers

Collect elemental mercury and glass from broken thermometers in an impermeable, sealed container. A wide mouth polyethylene or glass jar with a screw top cap works well. Label the container as *"broken thermometer and elemental mercury."*

Chemotherapy Waste

Collect contaminated gloves, paper, glass, etc. in bags and place inside a 55-gallon fiber barrel. Collect infusion sets and discarded drugs, and place inside a separate 55-gallon fiber barrel fitted with a polyethylene liner. Label the fiber drum with a Materials Pick-up Tag. Collect unused or partially used chemotherapy agents listed in Appendix J separately from other chemotherapy wastes. Those areas that generate smaller volumes may collect chemotherapy waste in a box lined with two plastic bags.

Photodeveloper and Photofixer

Photodeveloper is a hazardous waste if it contains constituents in concentrations greater than those listed in Appendix H, if it is corrosive (pH < 2 or > 12.5) or if it is ignitable. Most spent photodeveloper is nonhazardous and can be poured into the sanitary sewer.

Used photofixer contains silver, a heavy metal, and therefore is hazardous. It may also be corrosive. Collect fixer and developer in separate 5-gallon polyethylene containers.

Oils, Lubricating Fluids and Cooling Fluids

This category of material is collected for recycling and includes: motor oil, transmission fluid, lubricating oil, cutting oil, hydraulic oil, and mineral oil. Collect waste oils in 1-gallon, 5-gallon or 55-gallon containers depending on the volume of material generated. This waste stream is nonhazardous if it is recycled and therefore exempt from the 90 day storage limit. **Do NOT mix flammable solvents, halogenated solvents (degreasers), water or antifreeze with waste oils.**

Polychlorinated Biphenyls (PCB) Waste

PCB wastes require special handling. **Do NOT mix PCB waste with other waste** whenever possible. Collect PCB liquids in a metal or polyethylene container. Collect PCB contaminated debris, rags etc. in a 4-6 mil plastic bag or in a box lined with a 4-6 mil plastic bag if sharp objects are present that may puncture the bag. Always indicate the level of PCB on waste tags and pick-up request forms.

Batteries

Battery Type	Uses
Alkaline	• most common battery type, found in cell sizes AAA to D
Nickel/Cadmium (NiCd)	• some laptop computers • rechargeable 9-volt, AA, or D cell batteries • some walkie talkies
Lithium ion or nickel hydride	• cell phones • cameras • newer laptop computers
Lead acid batteries	• cars and motorcycles • deep cycle electric backup power for lights and communications (Sealed lead acid batteries can be as small as a D-cell battery.)
Mercury or silver oxide	• hearing aids • watches

Batteries should be segregated into these categories when storing and when a request for a pick-up is made. (Battery type is usually indicated on battery labels.) To prevent a buildup of heat or sparks, batteries larger than 9-volt should be stored such that the terminals are not touching.

Batteries may be collected in any container with which they are compatible, but must be sent for disposal within one year of start of collection. Label the container with the words "used batteries" or "spent batteries for recycling."

Alkaline batteries may be discarded in the general refuse. They are not harmful to the environment and the cost of actual recycling far outweighs the benefit.

Animal Waste Contaminated with Hazardous Chemicals

PCB, dioxin and aflatoxin contaminated animal carcasses and bedding require special handling and will be picked up by the ORCBS. See pathological waste disposal procedures.

Gas Cylinders

Promptly return discarded gas cylinders to the vendor to regain your deposit on the cylinder and minimize rental charges. Complete a *Materials Return Authorization* form and contact General Stores for this service. Those that cannot be returned to the manufacturer will be picked up by the ORCBS.

Explosive Materials

Potentially explosive materials, such as dry picric acid or peroxide contaminated solvents will be picked up separately from other wastes. Contact the ORCBS as soon as possible if you discover any potentially explosive materials. See Explosives Materials List (Appendix K).

Bulk Chemicals (20-, 30- or 55-gallon Drums)

Barrels should be in good condition, have workable bungs and be DOT approved. Original shipping containers are DOT approved for disposal of the used or discarded original material. DO NOT store metal barrels outside where they will rust. DO NOT pack smaller containers of chemicals into a large drum for disposal.

Agricultural Chemicals (Pesticides, Herbicides, Fungicides, etc.)

Return unused agricultural chemicals to the manufacturer for disposal. Many companies will accept them. Alternatively, retain the material and use it as it was intended. If the manufacturer will not accept the material or you cannot use it as intended, prepare a packing list of all agricultural chemicals designated for disposal. Include on the list the common name, the chemical name, the MSU number from the master list, the container size and the number of containers for each chemical. Experimental agricultural chemicals must be identified with a chemical name. Additionally, list the manufacturer's contact person and phone number or any paperwork verifying their nonacceptance of the material for return. Mail the information to the Hazardous Waste Coordinator, C124 Research Complex-Engineering, Campus. Your list will be mailed to our disposal vendor for approval. You will then be contacted to arrange for a pick-up.

Asbestos

Asbestos, including asbestos which is immersed or fixed in a natural or artificial binder (i.e., cement, plastic, asphalt, resins or mineral ore), shall be packaged wet in a minimum of two, 6-mil nonrigid plastic bags or other rigid containers that are dust and sift-proof. Sharp or blunt edges likely to cause puncture or tears in the shipping container shall be adequately protected to prevent container failure. For large volumes of asbestos, contact the Physical Plant.

Contaminated Debris From Laboratories

This includes gloves, paper, plastic, and other inert debris contaminated with hazardous chemicals. Whether this material is a hazardous waste depends on how it is generated, the contaminants and the concentration of contaminants. If the debris contains any of the constituents in concentrations greater than those listed in Appendix H (heavy metals, organics and pesticides) or Appendix I (severely toxic compounds) it is a hazardous waste. If it comes from the cleanup of a hazardous material spill it is a hazardous waste. If it is neither of these, it is a nonhazardous waste and may be disposed of in the dumpster.

In some cases it is not prudent to dispose of nonhazardous waste into the dumpster. For example, ethidium bromide (mutagen) or phenol (poison) contaminated solid debris is best disposed of by incineration. In general, any waste contaminated with trace levels of a poison or carcinogen should be collected for incineration.

Non-contaminated Debris from Laboratories

Work practices must be followed by all University Department laboratory staff in disposing and separating nonhazardous waste from hazardous waste. The laboratory is responsible for separating hazardous and nonhazardous waste and preventing accidental exposure of custodians to hazardous materials. Do NOT place hazardous waste, sharps or broken glass into the normal paper waste receptacles.

Empty Bottles in Hallway:

1. Deface the chemical label on ALL empty chemical containers placed in the hallway for custodial pickup by crossing out the chemical name on the container label.
2. Solvent Bottles: For those bottles placed in the hallway for custodial pickup, rinse and/or air-dry in a chemical fume hood until they are free of liquid and odor. All rinsate should be disposed of as a hazardous waste.
3. Corrosive Bottles: All corrosive liquid bottles should be triple rinsed with water and free of hazards and odor. Collect rinsate as hazardous waste.
4. Rinsed and/or clean all bottles formerly containing hazardous powders or solid chemicals. Collect rinsate as hazardous waste.

Empty 5-Gallon Metal Cans

1. Place cap on empty 5-gallon metal cans and place can in the hallway or leave in the lab for disposal via ORCBS. Do not leave 5-gallon cans uncapped.
2. Empty cans do not need to be empty to dryness like glass bottles. Residual liquid is acceptable in 5-gallon metal cans.

Broken Glass Containers

1. Label all broken glass containers "Nonhazardous Waste" "Broken Glass Only." ORCBS has broken glass container labels available.
2. Do NOT place hazardous waste, medical waste (sharps) or hazardous chemicals into the broken glass container. Contaminated glass that is hazardous must be disposed of via the ORCBS as hazardous waste. Do NOT place miscellaneous paper/plastic trash into the broken glass container.
3. Wear cut resistant gloves when handling the broken glass container.
4. Labs may carry their own broken glass container to the building lodal (dumpster) if they desire.

Housekeeping

1. Clean up all powders on the floor as well as chemical spills. Custodial staff is not responsible for cleaning up unknown powders or chemical spills on the floor.
2. A "Trouble Tag" will be used by custodial staff when conditions prevent them from picking up trash, broken glass, empty bottles or performing routine cleaning.

Fluorescent Tubes/Incandescent Bulbs

If you have commercially available fluorescent tubes or other lighting wastes, they should be surrendered to the custodial staff in your building. If the lighting waste are highly pressurized, out of the ordinary, or broken, then a pickup request should be submitted to the ORCBS. For bulk containers, see the ORCBS website for additional information at:
http://www.orcbs.msu.edu/waste/resources_links/universal_waste/universal_waste.htm#silvertubes

Recyclable Materials

Items suitable for recycling such as newspapers, magazines, corrugated cardboard, printer cartridges and many other paper products, contact the Office of Recycling and Waste Management at http://www.recycle.msu.edu.

Laboratory Equipment

In general, equipment must be free of all associated chemical, radiological, or biological hazards. Uncontaminated laboratory equipment may be sent to the MSU Surplus Store. Requirements for decontamination of laboratory equipment prior to acceptance by MSU Surplus will depend on the hazards associated with the equipment. In all cases, it is the responsibility of the Principal Investigator or his/her representative to decontaminate the equipment and remove hazard-warning labels from the equipment PRIOR to pickup by MSU Surplus. All laboratory equipment must have a completed *Equipment Release Form* attached. (http://www.orcbs.msu.edu/chemical/programs_guidelines/chem_hygiene/chem_hygiene_plan/chp_app_p.pdf)

Equipment bearing mercury will not be accepted by MSU Surplus. Equipment that previously held radiological materials must be surveyed by ORCBS staff prior to release to MSU Surplus. MSU Surplus will accept lab glassware placed in a box with the *Equipment Release Form* attached to the box. Glassware and other small items with visible or obvious chemical residues will not be accepted by MSU Surplus or sold to the public.

For more specific information regarding policies for acceptance of equipment or other materials by MSU Surplus, visit the ORCBS website at http://www.orcbs.msu.edu/waste/resources_links/surplus_acceptance_guidelines.pdf.

SCHEDULING A CHEMICAL WASTE PICK-UP

Step 1. Gather the waste containers destined for disposal.

Step 2. Use the Hazardous Materials Table (Appendix G) to look up an ID# for each chemical.

Step 3. Enter ID#'s and names of the chemicals from the Hazardous Materials Table, the container size and the number of containers on the Pick-up Request Form.

Step 4. Indicate if any replacement containers are needed. Use the comments section of the Pick-up Request Form to denote any scheduling conflicts e.g., "Lab open in afternoons only" or "will not be here Friday." A trained departmental employee must be present to sign the manifest at the time of the pick-up.

Step 5. Fill out the on-line request form located on the ORCBS web site **(http://www.orcbs.msu.edu)**. An ORCBS technician will visit your lab within 10 working days to remove the material.

NOTE: Improperly packaged, unlabeled or overfilled containers will not be picked up!

HOW TO COMPLETE A PICK-UP REQUEST FORM

Complete a Pick-up Request Form for each pick-up

A. Process Wastes or Waste Mixtures

Select an ID number that appropriately describes the waste mixture and enter the technical name of all components contributing to the hazards of the mixture or solution in the description field. (Substances listed in Appendix H or Appendix I or in concentrations greater than 1 ppm.)

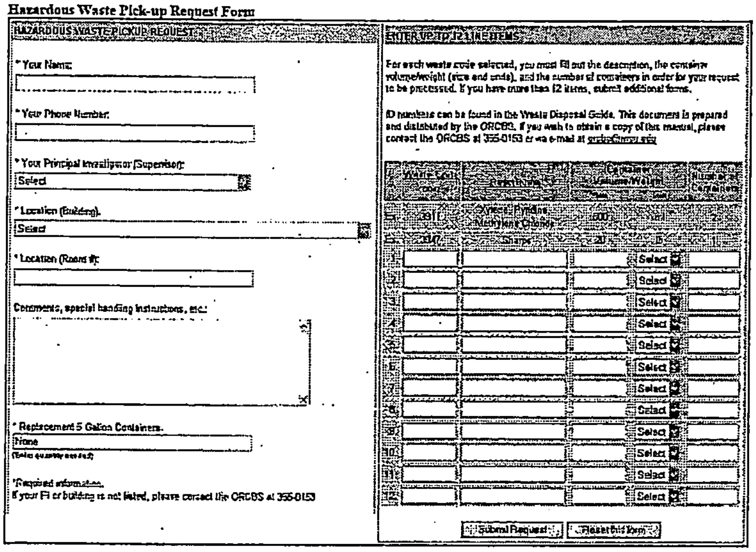
If you cannot determine the hazard class of the material, enter the ID# for Hazardous Waste Liquid, N.O.S., or the Hazardous Waste Solid, N.O.S. on the Pick-up Request Form and enter the chemical name of each constituent in the description field.

B. Discarded Commercial Chemical Products

Enter an ID# from the Hazardous Materials Table for each chemical. If no ID# exists for a chemical, select the ID# for the appropriate N.O.S. description found in Appendix G, and enter the chemical name in the description field.

If you cannot determine the hazard class of the material, enter the ID# for Hazardous Waste Liquid, N.O.S., or Hazardous Waste Solid, N.O.S. on the Pick-up Request Form and enter the chemical name in the description field.

Hazardous Waste Pick-up Request Form


HAZARDOUS WASTE PICKUP REQUEST

* Your Name:

* Your Phone Number:

* Your Principal Investigator (Supervisor):

Select

* Location (Building):

Select

* Location (Room #):

Comments, special handling instructions, etc.:

* Replacement 5 Gallon Containers.

None

*Required information.

If your PI or building is not listed, please contact the ORCBS at 355-0153

ENTER UP TO 12 LINE ITEMS

For each waste code selected, you must fill out the description, the container volume/weight (size and units), and the number of containers in order for your request to be processed. If you have more than 12 items, submit additional forms.

ID numbers can be found in the Waste Disposal Guide. This document is prepared and distributed by the ORCBS. If you wish to obtain a copy of this manual, please contact the ORCBS at 355-0153 or via e-mail at orcbs@msu.edu

Submit Request | Reset this form

N.O.S. MARKING (NOT OTHERWISE SPECIFIED)

Some chemical waste offered for disposal may have to be identified under one of the N.O.S. (not otherwise specified) shipping names indexed in the Hazardous Materials Table (Appendix G). This is due to practical considerations which prohibit listing all dangerous materials by name, and the fact that new chemical products are introduced annually, allowing only periodic updating of the chemical indexes. If the hazard class of the waste is known and that waste is not listed by name in the Hazardous Materials Table, then an N.O.S. shipping name must be assigned.

If a proper shipping name is listed on the manifest by an N.O.S. entry (i.e., Flammable Liquid N.O.S.), the entry does not provide sufficient information about the material to ensure that appropriate action be taken in the event of an accident. For this reason, it is necessary that these N.O.S. descriptions be supplemented with the technical name of the material(s).

Chemical Compatibility

Accidental mixing of one hazardous waste with another may result in a vigorous and dangerous chemical reaction. Generation of toxic gases, heat, possible overflow or rupturing of receptacles, fire, and even explosions are possible consequences of such reactions.

The Chemical Compatibility Chart (next page and Appendix C), shows chemical combinations believed to be dangerously reactive in the case of accidental mixing. The chart provides a broad grouping of chemicals with an extensive variety of possible binary combinations.

Generally speaking, an "X" on the chart indicates where one group can be considered dangerously reactive with another group. However, there may be some combination between the groups that would not be dangerously reactive; therefore, the chart should not be used as an infallible guide.

The following procedure explains how the chart should be used in determining compatible information.

1. Determine the reactivity group of a particular waste.
2. Enter the chart with the reactivity group that forms an unsafe combination with the chemical in question.

For example, crotonaldehyde is an aldehyde in group 19. The chart shows that chemicals in this group should be segregated from sulfuric acid and nitric acids, caustics, ammonia and all types of amines (aliphatic, alkanol, and aromatic). According to note A, crotonaldehyde is also incompatible with nonoxidizing mineral acids.

COMPATIBILITY TABLE

CARGO GROUPS	REACTIVE GROUPS	1 NON-OXIDIZING MINERAL ACIDS	2 SULFURIC ACID	3 NITRIC ACID	4 ORGANIC ACIDS	5 CAUSTICS	6 AMMONIA	7 ALIPHATIC AMINES	8 ALKANOLAMINES	9 AROMATIC AMINES	10 AMIDES	11 ORGANIC ANHYDRIDES	12 ISOCYANATES	13 VINYL ACETATE	14 ACRYLATES	15 SUBSTITUTED ALLYLS	16 ALYKENE OXIDES	17 EPICHLOROHYDRIN	18 KETONES	19 ALDEHYDES	20 ALCOHOLS, GLYCOLS	21 PHENOLS, CRESOLS	22 CAPROLACTAM SOLUTION	
NON-OXIDIZING MINERAL ACIDS	1		X			X	X	X	X	X	X	X	X	X			X	X		A	E			1
SULFURIC ACID	2	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	2
NITRIC ACID	3		X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		3
ORGANIC ACIDS	4		X			X	X	X	X	C			X				X	X			F			4
CAUSTICS	5	X	X	X	X							X	X				X	X		X	X	X	X	5
AMMONIA	6	X	X	X	X						X	X	X	X			X	X		X		X		6
ALIPHATIC AMINES	7	X	X	X	X							X	X	X	X	X	X	X	X	X	X	X	X	7
ALKANOLAMINES	8	X	X	X	X							X	X	X	X	X	X	X	B	X				8
AROMATIC AMINES	9	X	X	X	C							X	X							X				9
AMIDES	10	X	X	X			X						X									X		10
ORGANIC ANHYDRIDES	11	X	X	X		X	X	X	X	X														11
ISOCYANATES	12	X	X	X	X	X	X	X	X	X	X					D					X		X	12
VINYL ACETATE	13	X	X	X			X	X	X															13
ACRYLATES	14		X	X				X	X															14
SUBSTITUTED ALLYLS	15		X	X				X	X				D											15
ALYKENE OXIDES	16	X	X	X	X	X	X	X	X															16
EPICHLOROHYDRIN	17	X	X	X	X	X	X	X	X															17
KETONES	18		X	X				X	B															18
ALDEHYDES	19	X	X	X		X	X	X	X	X														19
ALCOHOLS, GLYCOLS	20	E	X	X	F	X		X					X											20
PHENOLS, CRESOLS	21		X	X		X		X			X													21
CAPROLACTAM SOLUTION	22		X			X		X					X											22
OLEFINS	30		X	X																				30
PARAFFINS	31																							31
AROMATIC HYDROCARBONS	32			X																				32
MISC. HYDROCARBON	33			X																				33
ESTERS	34		X	X																				34
VINYL HALIDES	35			X																			X	35
HALOGENATES	36		G			H		I																36
NITRILES	37		X																					37
CARBON DISULFIDE	38							X	X															38
SULFOLANE	39																							39
GLYCOL ETHERS	40		X										X											40
ETHERS	41		X	X																				41
NITROCOMPOUNDS	42					X	X	X	X	X														42
MISC. WATER SOLUTIONS	43		X										X											43
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	

Reactivity Differences (Deviations) Within Chemical Groups

A. Formaldehyde (19), Acrolein (19), Crotonaldehyde (19), and 2-Ethyl-3-Propyl Acrolein (19) are not compatible with group 1, Nonoxidizing Mineral Acids.
B. Isophorone (18) and Mesityl Oxide (18) are not compatible with group 8, Alkanolamines
C. Acrylic Acid (4) is not compatible with group 9, Aromatic amines.
D. Allyl Alcohol (15) is not compatible with group 12, Isocyanates.
E. Furfuryl Alcohol (20) is not compatible with group 1, Nonoxidizing Mineral Acids.
F. Furfuryl Alcohol (20) is not compatible with group 4, Organic Acids.
G. Dichloroethyl Ether (36) is not compatible with group 2, Sulfuric Acid.
H. Trichloroethylene (36) is not compatible with group 5, Caustics.
I. Ethylenediamine (7) is not compatible with Ethylene Di-chloride (36).

DISPOSAL OF UNKNOWNS

Chemical wastes with no identification (unknowns) present a particularly dangerous threat, due to their unknown composition and characteristics. Unknown waste should not be transported, treated, or disposed of until chemical analysis has been completed to determine hazardous properties. Under no circumstances should an unknown waste be placed in a shipping container with properly labeled and manifested wastes.

The ORCBS will accept unknowns at its discretion provided that they have been roughly classified. Unknowns may be classified by obtaining the following information and adding it to both the waste tags and pick-up request forms.

Solids

- Water Solubility
- Reactivity with water
- pH in water
- Flammability (will it burn)

Liquids

- pH of solution
- Reactivity, miscibility, relative density in water
- Flammability (will it burn)

All tests performed should be conducted in a functioning fume hood. Use as small a sample as reasonably possible while performing tests. Add a small amount of sample to water rather than adding water to the sample. When performing flame tests with solids, use a small spatula to minimize potential reactions. For liquids, use cotton tipped applicators to dip into the liquid before igniting.

Other information may be obtained by querying colleagues or neighboring lab personnel who may have knowledge of the types of chemicals which were used in that area.

If it is believed that handling or opening an unknown may cause it to detonate or react adversely, then contact the ORCBS for an on-site consultation prior to testing.

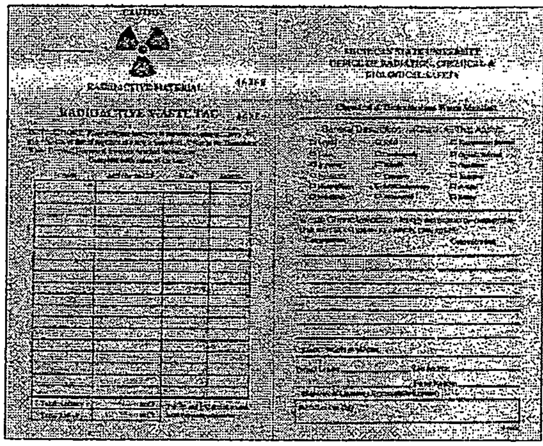
Departments are strongly encouraged to analyze their unknown wastes. Alternatively, the ORCBS can make arrangements for disposal of unknowns. A charge of $75.00 per container will be assessed for analysis.

RADIOACTIVE WASTE

The ORCBS provides radioactive waste pick-up and disposal services for all University units. Typically, individual units collect radioactive wastes in the ORCBS supplied containers, label the material with the yellow radioactive waste pick-up tag (Appendix D), provide secondary packing if necessary and submit the on-line pickup request form on the ORCBS web site (Appendix E).

A. General Labeling and Packaging Procedures

Attach a yellow radioactive waste tag (below and Appendix D) to each container of radioactive waste. Tags are available at the ORCBS. Any material considered radioactive waste must bear a completed radioactive waste pick-up tag.



MSU Radioactive Waste Pick-up Tag

Enter the isotope information on the front of the radioactive waste tag and the chemical form and concentration on the back of the tag. A complete description of the chemical contents as well as the radioactive content is needed. For mixtures or solutions, the identity and amount (percent, molarity, ppm, etc.) of all constituents must be included. Fill out waste tags as material is added to the containers. Prior to the pick-up, total the quantity of radioisotope in millicuries and record this information on the tag.

Any radioactive waste that also meets the definition of a hazardous chemical waste (page 5) must be managed as a mixed waste, according to the requirements of both the radioactive and chemical constituents. This includes labeling the container with the words "*Hazardous Waste*" and a maximum accumulation time of 90 days. Most radioactive waste does not meet the mixed waste criterion; however, wastes which are flammable, corrosive, or toxic fall into this category (e.g., scintillation vials). Contact a Health Physicist at the ORCBS (355-0153) if you are unsure of your waste category.

B. Specific Labeling and Packaging Procedures

Radioactive Liquid Waste

Use separate carboys for each isotope. ^3H and ^{14}C are the only exceptions and can be mixed together in a single carboy. Use separate carboys for aqueous and nonaqueous solutions. Liquid waste containers must have secondary containment, such as a plastic bus tray, to contain leaks or spills.

To the best of your ability, and in accordance with waste minimization requirements, **adjust the pH of aqueous wastes to between 5.5 and 10.0.** Neutralization of corrosive liquids greatly reduces disposal costs and risks.

Radioactive Solid Waste

Collect contaminated gloves, paper, glassware, etc. in cardboard boxes lined with two plastic bags. **Do NOT put liquids into the solid waste container.** Use different containers for each isotope. ^3H and ^{14}C are the only exceptions and can be mixed together in a single container. **Do NOT overfill boxes and do NOT exceed 20 pounds total weight per box. Do NOT put syringes, needles or broken glass into cardboard boxes.** Sharps containers are available at General Stores.

Be careful not to over or underestimate the activity of solid waste. This waste may be stored in drums for decay and storage space is limited. Refer to the Radiation Safety Manual for guidance on waste quantification methods.

Radioactive Scintillation Vials

Make sure all vial caps are tightly closed. Separate high activity vials (> 0.05 µCi/gm) from low activity vials. Mark the high activity vials with a piece of radioactive tape. **Do NOT mix scintillation vials containing other nuclides in the same tray with ^3H and/or ^{14}C.** These other nuclides must be processed in a different manner and must be in separate trays.

Place used vials in the original trays and in the original box. Tape the box shut and attach a waste tag. If no boxes are available, trays may be taped together in sets of 5 or less.

If you wish to reuse your vials, empty the liquid into a separate radioactive waste carboy. **Do NOT mix flammable scintillation fluid with other aqueous wastes.**

Animal Wastes Contaminated with Radioisotopes

Animal waste, including carcasses or other biological or pathological wastes contaminated with radioisotopes will be picked up by the ORCBS. Animal carcasses should be double-bagged using opaque, 4-6 mil plastic bags. Bags are available at General Stores in various sizes. A properly completed radioactive waste pick-up tag must be attached.

Iodination (Unbound $^{125}I_2$) Waste

Handle all iodination waste material in a fume hood. Waste from iodinations present an increased health hazard due to the presence of volatile iodine which, if inhaled, will bioaccumulate in the thyroid glands. Store iodination waste in the back of a chemical fume hood in tightly closed containers.

Place solid iodination waste in double plastic bags immediately after generation. Collect contaminated needles and place the syringe, with needle intact, in a small leak proof and puncture resistant container which can be sealed (such as a plastic bottle or glass jar). Place this sealed container in the double plastic bag with other solid iodination waste.

Collect liquid iodination waste in a disposable plastic bottle and keep the bottle tightly closed. **NEVER mix liquid iodination waste with other radioactive waste. NEVER mix waste that contains volatile iodine with ^{125}I waste that does not.**

Label all iodination waste as "Free Iodine" in the chemical section (back side) of the radioactive waste tag. Also, please note on pick-up requests that the waste is free iodine.

Radioactive Waste Requiring Shielding

Shield ^{32}P waste with Plexiglass. **DO NOT use metal waste containers for ^{32}P waste unless the metal container is also shielded with Plexiglass.** Shield high energy gamma waste with enough lead to prevent potential exposures. Dispose of high activity radioisotope waste as soon as possible.

SCHEDULING A RADIOACTIVE WASTE PICK-UP

Step 1. Gather the waste containers destined for disposal. Check to make sure each container is labeled with a Radioactive Waste Pick-up Tag (Appendix D) and that both sides of the tag are filled out.

Step 2. Wipe the container to check for contamination. If contaminated, decontaminate the container.

Step 3. Use the Hazardous Materials Table (Appendix G) to assign an ID# for each type of radioactive waste.

Step 4. Enter the ID#'s from the Hazardous Materials Table, a description of the waste, the container size and the number of containers on the Pick-Up Request Form (Appendix E). See example below.

Step 5. Indicate if any replacement containers are needed. Use the comments section of the Pickup Request Form to denote any scheduling conflicts e.g., "Lab open in afternoons only" or "will not be here Friday." For mixed waste, a trained radiation worker must be present to sign the manifest at the time of the pick-up.

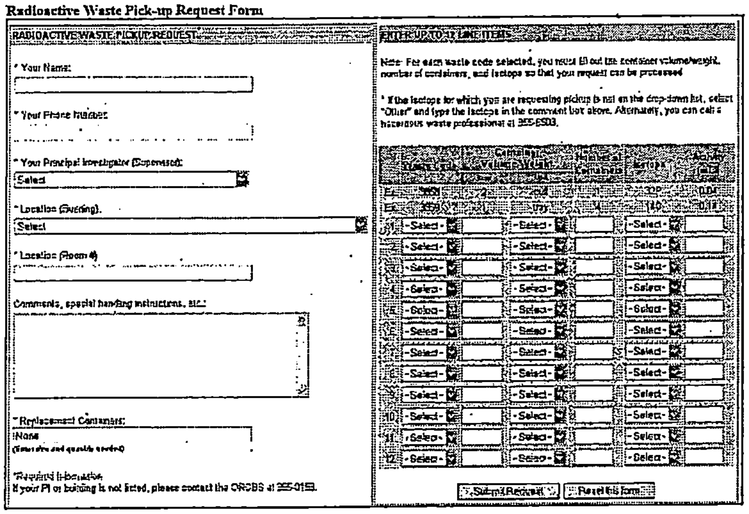
Step 6. Fill out the on-line request form located on the ORCBS web site **(http://www.orcbs.msu.edu)**. An ORCBS technician will visit your lab in 3 to 5 working days to remove the material. **Improperly packaged, unlabeled, contaminated or overfilled containers will not be picked up.**

HOW TO COMPLETE A RADIOACTIVE WASTE PICK-UP REQUEST FORM

Complete a Pick-up Request Form for each radioactive waste pick-up.

Enter one of the 5 possible ID numbers for radioactive waste from the Hazardous Materials Table (Appendix G). In the description enter the isotope, the total quantity in mCi and a description of the chemical constituents in the waste. Also, enter the container size and the number of containers in the appropriate locations on the form.

Radioactive Waste Pick-up Request Form



BIOHAZARDOUS WASTE

At Michigan State University the term **biohazardous waste** is used to describe different types of waste that might include infectious agents. Generally speaking, infectious agents are classified in four risk groups with risk group 1 being of no or very low risk and risk group 4 being of high risk to the individual and the community. With the exception of risk group 4, all others are used at MSU (predominantly risk group 1 and 2 agents).

To provide for a safe work environment, all infectious agents need to be handled at a certain containment or biosafety level depending on: virulence, pathogenicity, stability, route of spread, communicability, operation(s), quantity, and availability of vaccines or treatment. The applicable biosafety level not only defines the general handling procedures, but also the treatment of biohazardous waste. Under normal circumstances, a risk group 2 agent requires biosafety level 2 containment and biohazardous waste procedures. Nevertheless, if a risk group 2 agent is grown in mass quantities, biosafety level 3 containment is necessary.

Please refer to the most recent editions of the CDC/NIH Biosafety in Microbiological and Biomedical Laboratories, the NIH Guidelines for Research Involving Recombinant DNA, or the ORCBS Biosafety training for a comprehensive discussion on this matter.

Currently, the following waste categories are considered to be biohazardous waste.

- **Medical waste**, which means any solid waste which is generated in the diagnosis, treatment (e.g., provision of medical services), or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals, as well as all categories defined by the Michigan Medical Waste Regulatory Act (MMWRA).
- **Regulated waste** as defined by the Michigan Occupational Safety and Health Act (MIOSHA) on Bloodborne Infectious Diseases.
- **Laboratory waste and regulated waste** as defined in the "Guidelines For Research Involving Recombinant DNA Molecules" (NIH) and the CDC/NIH "Guidelines on Biosafety in Microbiological and Biomedical Laboratories."

According to the MMWRA, Medical Waste includes:

a) Cultures and stocks of infectious agents and associated biologicals, including laboratory waste, biological production wastes, discarded live and attenuated vaccines, culture dishes, and related devices;

b) Liquid human and animal waste, including blood, blood products, and body fluids, but not including urine or materials stained with blood or body fluids;

c) Pathological waste, which means human organs, tissues, body parts other than teeth, products of conception, and fluids removed by trauma or during surgery or autopsy or other medical procedure, and not fixed in formaldehyde;

d) Sharps, which means needles, syringes, scalpels, and intravenous tubing with needles attached, independent of whether they are contaminated or not;

e) Contaminated wastes from animals that have been exposed to agents infectious to humans, these being primarily research animals;

In addition, the MIOSHA Bloodborne Pathogen Standard regulates the following waste:

- liquid or semi-liquid blood or other potentially infectious materials;
- contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed;
- items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling;
- contaminated sharps which includes any contaminated object that can penetrate;
- pathological and microbiological wastes containing blood or other potentially infectious materials.

The CDC/NIH Biosafety Guidelines cover contaminated waste that is potentially infectious or hazardous for humans and animals. The same is true for the NIH Guidelines on recombinant DNA which also includes contaminated waste potentially infectious or hazardous for plants.

General Labeling, Packaging and Disposal Procedures

Currently, biohazardous waste is to be decontaminated before leaving MSU. Most of the waste can be autoclaved prior to disposal, while some waste will be incinerated. The responsibility for decontamination and proper disposal of biohazardous waste lies with the producing facility (e.g., laboratory and department). The ORCBS and ULAR assists only in the disposal of sharps and pathological waste including animal carcasses.

All biohazardous waste needs to be packaged, contained and located in a way that protects and prevents the waste from release at any time at the producing facility prior to ultimate disposal. If storage is necessary, putrefaction and the release of infectious agents in the air must be prevented. **No biohazardous waste can be stored for more than 90 days.**

If not stated otherwise (see below), most biohazardous waste will be disposed of in biohazard bags. Currently, MSU requires the use of orange biohazard bags that include the biohazard symbol and a built-in heat indicator with the word ("AUTOCLAVED"). Bags that meet these requirements are available in various sizes at general stores and biochemistry stores. All waste disposed of in these bags is to be autoclaved until the waste is decontaminated. The built-in heat indicator will turn dark. For specific autoclave procedures please contact the ORCBS. All autoclaves used for the decontamination of biohazardous waste will be tested by the ORCBS at least on an annual basis. Please contact our office for more information. After successful autoclaving (decontamination), all biohazard bags need to be placed in opaque (black) plastic non-biohazard bags that are leak-proof. These opaque bags can be put in the lodal or picked up by custodial services. Biohazardous waste that is decontaminated is no longer considered hazardous and the biohazard symbol needs to be removed or the waste labeled as decontaminated (e.g., "AUTOCLAVED" Heat indicator).

WASTE PROCEDURES FOR BIOSAFETY LEVEL 1 AND 2

Cultures, Stocks and Related Materials

Cultures and stocks of **infectious agents** and associated biologicals (as previously defined), shall be placed in biohazard bags and decontaminated by autoclaving. Double or triple bagging may be required to avoid rupture or puncture of the bags.

Bulk Liquid Waste, Blood and Blood Products

All liquid biohazardous waste from humans or animals such as blood, blood products, and certain body fluids can be disposed of directly by flushing down a **sanitary sewer**. All other liquid biohazardous waste needs to be autoclaved prior to disposal.

Sharps

Sharps must be placed in a rigid, puncture resistant, closable, and leak-proof container that is labeled with the word **"Sharps"** and the biohazard symbol. MSU approved sharps containers are available through General Stores. Food containers (e.g., empty coffee cans) are **not permissible** as sharps containers. Sharps must be handled with extreme caution. The clipping, breaking and recapping of needles is highly discouraged and dangerous. Sharps containers should not be filled more than 2/3 full. Filled sharps containers must be closed securely (use the attached lid) and labeled with an MSU materials pick-up tag. Do not store used and closed sharps containers for more than 90 days. **Never place any type of sharps in the lodal.** Contact the ORCBS for sharps pick-up and incineration.

Contaminated Solid Waste

Contaminated solid waste includes cloth, plastic and paper items that have been exposed to agents that are infectious or hazardous to humans, animals, or plants. These contaminated items shall be placed in biohazard bags and decontaminated by autoclaving. Double or triple bagging may be required to avoid rupture or puncture of the bags. **Contaminated pasteur pipettes are considered sharps** and need to be disposed of in a sharps container.

WASTE SPECIFIC PROCEDURES FOR BIOSAFETY LEVEL 3

Biohazardous waste including risk group 2 and 3 agents that are handled at Biosafety Level 3 is to be autoclaved at the point of origin (laboratory, or facility). In addition, this waste may be incinerated. Please contact the ORCBS for special instructions. Transportation of un-autoclaved waste outside of the building is not permitted.

PATHOLOGICAL WASTE

The University Laboratory Animal Resources (ULAR) office provides removal, transportation and disposal services for University units that generate pathological waste. According to the MMWRA, pathological waste consists of human organs, tissues, body parts other than teeth, products of conception, and fluids removed by trauma or during surgery or autopsy or other medical procedure, and not fixed in formaldehyde. At MSU, animal carcasses are also considered pathological waste. Although not all pathological waste is infectious, it is prudent to handle such waste as if it were because of the possibility of unknown infection in the source.

Human pathological waste is also covered by "Universal Precautions" according to the MIOSHA Bloodborne Pathogen Standard. For more information on this subject, refer to MSU's Exposure Control Plan. Copies are available at the ORCBS (355-0153). Typically, carcasses or tissues are collected in plastic bags, labeled, stored in area freezers, cold rooms or refrigerators and removed for incineration by ULAR. Many units have routine weekly ULAR pickups. For non scheduled pickup, call ULAR at 353-5064, or fax a completed "*ULAR Pathological Waste Pick-up Request Form*" (Appendix F) 4 to 5 working days before the desired pick-up date to ULAR (Fax: 432-2766).

Animal Waste (ULAR Specific Procedures)

A. Non-Infectious Material

- **Rodents and Small Amounts of Waste**
  Use opaque bags or wrap items in a paper towel if using clear plastic bags. 2 mil plastic bags or sealable kitchen bags are acceptable for small numbers of animals. Use an opaque 4 mil bag for large numbers.
- **Rabbits and Larger Animals**
  Use 4 mil black plastic bags. If over 50 lbs - double bag. For ease of handling, do not load the bags with more than 30 lbs. if multiple animals are involved.

B. Infectious Material (Biohazardous Agents)

1. For waste generated from projects involving experimental infections, follow the instructions on the Animal Hazard Control Form which is posted on the animal room door.
2. For other infectious animal waste, place in a sealed, leak-proof container and then put biohazard labeling on it. Do not use a biohazard bag as a primary container, as it might not be strong enough. For large amounts, use the supplied fiber drums.

C. Chemically Contaminated Animals or Tissue

1. Follow instructions on the Animal Hazard Control Form posted on the room door.
2. Follow instructions from the ORCBS regarding disposal of animals which have been treated with hazardous chemicals in a laboratory in terminal experiments.

D. General Instructions

If the waste tag is not filled out properly and attached to the bag, the waste will not be picked up. There MUST be a box checked in the left hand lower section of the waste tag. All containers must be sealed. Leaky or improperly labeled containers will not be picked up.

DEPARTMENT OR FACILITY SPECIFIC PROCEDURES

Departments or facilities may establish biohazardous waste procedures that are more stringent than the above listed procedures. A written copy of these procedures should be made available to the ORCBS for review prior to implementation.

MSU WASTE MATERIALS PICK UP TAG

Project Leader ____________________ Dept. ____________

Bldg & Room No ____________________ Phone ____________

Filled Out By ____________________ Date ____________

Container Size ______________ ☐Solid ☐Liquid ☐Contaminated Items

CONTENTS:

Unabbreviated Chemical Name(s)	Amount or Approx Conc (ppm)

☐ Balance Water

Color ☐ Colorless ☐ Light Brown ☐Other ____________

Consistency ☐ Waterlike ☐ Viscous/Oily ☐Other ____________

BIOLOGICAL & ANIMAL ITEMS:

☐ Biohazardous Agents ____________

OFFICE USE ONLY MANIFEST DOCUMENT #

See Reverse for EPA Waste Codes

WASTE DISPOSAL INSTRUCTIONS

1) Enter information as waste is added to container
2) Keep waste containers closed
3) Keep solid waste separate from liquid wastes
4) Do not place incompatible wastes in same container
5) Place leaking containers in secondary container and call the ORCBS as soon as possible for disposal
6) Store animal carcasses in an appropriate freezer, walk-in cooler, or refrigerator.
7) Autoclave and/or incinerate infectious wastes.
8) Place autoclaved biohazard waste bags in an opaque bag prior to disposal.
9) Refer to the Michigan State University Waste Disposal Guide for more detailed instructions.

RCRA Hazardous Waste Codes

Common General Codes

D001	Ignitable	D023	o-Cresol
D002	Corrosive	D024	m-Cresol
D003	Reactive	D025	p-Cresol
D004	Arsenic	D026	Cresol
D005	Barium	D027	1,4-Dichlorobenzene
D006	Cadmium	D028	1,2-Dichloroethane
D007	Chromium	D029	1,1-Dichloroethylene
D008	Lead	D030	2,4-Dinitrotoluene
D009	Mercury	D031	Heptachlor
D010	Selenium	D032	Hexachlorobenzene
D011	Silver	D033	Hexachloro-1,3-benzene
D012	Endrin	D034	Hexachloroethane
D013	Lindane	D035	Methyl ethyl ketone
D014	Methoxychlor	D036	Nitrobenzene
D015	Toxaphene	D037	Pentachlorophenol
D016	2,4-D	D038	Pyridine
D017	2,4,5-TP	D039	Tetrachloroethylene
D018	Benzene	D040	Trichloroethylene
D019	Carbon Tetrachloride		
D020	Chlordane	D041	2,4,5-Trichlorophenol
D021	Chlorobenzene	D042	2,4,6-Trichlorophenol
D022	Chloroform	D043	Vinyl Chloride

HAZARDOUS WASTE PICKUP REQUEST

* Your Name:

* Your Phone Number:

* Your Principal Investigator (Supervisor):
Select

* Location (Building):
Select

* Location (Room #):

Comments, special handling instructions, etc.:

* Replacement 5 Gallon Containers:
None
(Enter quantity needed)

*Required Information.
If your PI or building is not listed, please contact the ORCBS at 355-0153.

ENTER UP TO 12 LINE ITEMS

For each waste code selected, you must fill out the description, the container volume/weight (size and units), and the number of containers in order for your request to be processed. If you have more than 12 items, submit additional forms.

ID numbers can be found in the Waste Disposal Guide. This document is prepared and distributed by the ORCBS. If you wish to obtain a copy of this manual, please contact the ORCBS at 355-0153 or via e-mail at orcbs@msu.edu

	Waste Code (ID#)	Description	Container Volume/Weight		Number of Containers
			Size	Units	
Ex.	3811	Xylene, Pyridine Methylene Chloride	500	ml	2
Ex.	3847	Sharps	20	lb	1
1				Select	
2				Select	
3				Select	
4				Select	
5				Select	
6				Select	
7				Select	
8				Select	
9				Select	
10				Select	
11				Select	
12				Select	

Submit Request | Reset this form

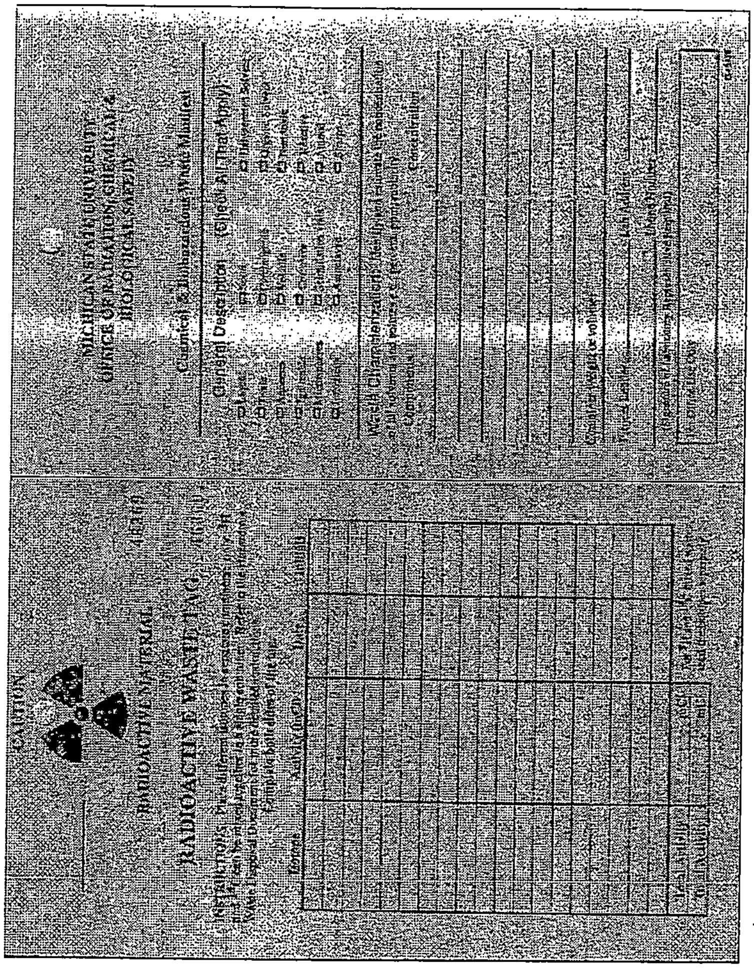
Appendix C. Compatibility Table

CARGO GROUPS	REACTIVE GROUPS	NON-OXIDIZING MINERAL ACIDS	SULFURIC ACID	NITRIC ACID	ORGANIC ACIDS	CAUSTICS	AMMONIA	ALIPHATIC AMINES	ALKANOLAMINES	AROMATIC AMINES	AMIDES	ORGANIC ANHYDRIDES	ISOCYANATES	VINYL ACETATE	ACRYLATES	SUBSTITUTED ALLYLS	ALYKENE OXIDES	EPICHLOROHYDRIN	KETONES	ALDEHYDES	ALCOHOLS, GLYCOLS	PHENOLS, CRESOLS	CAPROLACTAM SOLUTION	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
NON-OXIDIZING MINERAL ACIDS	1		X			X	X	X	X	X	X	X	X	X			X	X		A	E			1
SULFURIC ACID	2	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	2
NITRIC ACID	3		X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		3
ORGANIC ACIDS	4		X			X	X	X	X	C			X				X	X			F			4
CAUSTICS	5	X	X	X	X							X	X				X	X		X	X	X	X	5
AMMONIA	6	X	X	X	X						X	X	X	X			X	X		X		X		6
ALIPHATIC AMINES	7	X	X	X	X							X	X	X	X	X	X	X	X	X	X	X	X	7
ALKANOLAMINES	8	X	X	X	X							X	X	X	X	X	X	X	B	X				8
AROMATIC AMINES	9	X	X	X	C							X	X							X				9
AMIDES	10	X	X	X			X						X									X		10
ORGANIC ANHYDRIDES	11	X	X	X		X	X	X	X	X														11
ISOCYANATES	12	X	X	X	X	X	X	X	X	X	X					D					X		X	12
VINYL ACETATE	13	X	X	X			X	X	X															13
ACRYLATES	14		X	X				X	X															14
SUBSTITUTED ALLYLS	15		X	X				X	X				D											15
ALYKENE OXIDES	16	X	X	X	X	X	X	X	X															16
EPICHLOROHYDRIN	17	X	X	X	X	X	X	X	X															17
KETONES	18		X	X				X	B															18
ALDEHYDES	19	X	X	X		X	X	X	X	X														19
ALCOHOLS, GLYCOLS	20	E	X	X	F	X		X					X											20
PHENOLS, CRESOLS	21		X	X		X		X			X													21
CAPROLACTAM SOLUTION	22		X			X		X					X											22
OLEFINS	30		X	X																				30
PARAFFINS	31																							31
AROMATIC HYDROCARBONS	32			X																				32
MISC. HYDROCARBON	33			X																				33
ESTERS	34		X	X																				34
VINYL HALIDES	35			X																			X	35
HALOGENATES	36		G			H		I																36
NITRILES	37		X																					37
CARBON DISULFIDE	38							X	X															38
SULFOLANE	39																							39
GLYCOL ETHERS	40		X										X											40
ETHERS	41		X	X																				41
NITROCOMPOUNDS	42					X	X	X	X	X														42
MISC. WATER SOLUTIONS	43		X										X											43
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	

Reactivity Differences (Deviations) Within Chemical Groups

- A. Formaldehyde (19), Acrolein (19), Crotonaldehyde (19), and 2-Ethyl-3-Propyl Acrolein (19) are not compatible with group 1, Nonoxidizing Mineral Acids.
- B. Isophorone (18) and Mesityl Oxide (18) are not compatible with group 8, Alkanolamines
- C. Acrylic Acid (4) is not compatible with group 9, Aromatic amines.
- D. Allyl Alcohol (15) is not compatible with group 12, Isocyanates.
- E. Furfuryl Alcohol (20) is not compatible with group 1, Nonoxidizing Mineral Acids.
- F. Furfuryl Alcohol (20) is not compatible with group 4, Organic Acids.
- G. Dichloroethyl Ether (36) is not compatible with group 2, Sulfuric Acid.
- H. Trichloroethylene (36) is not compatible with group 5, Caustics.
- I. Ethylenediamine (7) is not compatible with Ethylene Di-chloride (36).

Appendix D. MSU Radioactive Waste Tag


CAUTION

RADIOACTIVE MATERIAL

RADIOACTIVE WASTE TAG

MICHIGAN STATE UNIVERSITY

OFFICE OF RADIATION, CHEMICAL & BIOLOGICAL SAFETY

Chemical & Biohazardous Waste Manifest

General Description (Check All That Apply)

Waste Characterization

RADIOACTIVE WASTE PICKUP REQUEST

* Your Name:

* Your Phone Number:

* Your Principal Investigator (Supervisor):
Select

* Location (Building):
Select

* Location (Room #):

Comments, special handling instructions, etc.:

* Replacement Containers:
None
(Enter size and quantity needed)

*Required Information.
If your PI or building is not listed, please contact the ORCBS at 355-0153.

ENTER UP TO 12 LINE ITEMS

Note: For each waste code selected, you must fill out the container volume/weight, number of containers, and isotope so that your request can be processed.

* If the isotope for which you are requesting pickup is not on the drop-down list, select "Other" and type the isotope in the comment box above. Alternately, you can call a hazardous waste professional at 355-6503

	Waste Code	Container Volume/Weight		Number of Containers	Isotope*	Activity (mCi)
		size	unit			
Ex	3858	2	cuft	1	32P	0.04
Ex	3859	1	tray	4	14C	0.14
1	-Select-		-Select-		-Select-	
2	-Select-		-Select-		-Select-	
3	-Select-		-Select-		-Select-	
4	-Select-		-Select-		-Select-	
5	-Select-		-Select-		-Select-	
6	-Select-		-Select-		-Select-	
7	-Select-		-Select-		-Select-	
8	-Select-		-Select-		-Select-	
9	-Select-		-Select-		-Select-	
10	-Select-		-Select-		-Select-	
11	-Select-		-Select-		-Select-	
12	-Select-		-Select-		-Select-	

Submit Request | Reset this form

Appendix F. ULAR Pathological Waste Pick Up Request Form

University Laboratory Animal Resources Pathological Waste Pick Up Request Form					Date:________________			
Use this form to request a pick up of pathological waste. Fax at 432-2766, or mail the request to ULAR, C100 Clinical Center, attention Waste Supervisor. All waste must have a completed MSU Materials Pick Up Tag attached to each container or bag. Waste must be properly packaged in accordance with the Waste Disposal Guide. Please call the ORCBS at 355-0153 if you have any questions about hazardous waste disposal. Please call ULAR at 353-5064 for pick up information.								
Project Leader					Department		Account Number	
Building Where Pick Up is Located					Room Number		Requested Pick Up Date	
Contact Person					Telephone Number		Fax Number	
BIOHAZARD?	YES		NO		CHEMICALLY CONTAMINATED?	YES		NO
Special Instructions								
Waste Description								
Container Size/Type					Number of Containers			
Waste Description								
Container Size/Type					Number of Containers			
REPLACEMENT FIBER BARRELS NEEDED?					YES		QTY	NO

ULAR: This form is to be attached to the "Daily Miscellaneous Pick Up/Delivery Report"

Appendix G. Hazardous Materials Table

N.O.S. Descriptions

3811	Flammable liquid, n.o.s. (FL)
3812	Combustible liquid, n.o.s. (CL)
3813	Hazardous Waste Liquid, n.o.s. (OE)
3814	Acid liquid, n.o.s. (C)
3817	Flammable liquid, corrosive, n.o.s (FL, C)
3820	Hazardous Waste Solid, n.o.s. (OE)
3821	Formaldehyde solution (P, OA)
3823	Corrosive solids, n.o.s. (C)
3824	Flammable liquid, poisonous, n.o.s. (FL, P)
3825	Bases, liquid, n.o.s. (C)
3838	Flammable solid, n.o.s (FS)
3839	Organic peroxide, liquid or solution, n.o.s. (OG)
3840	Organic peroxide, solid, n.o.s. (OG)
3841	Oxidizing substances,liquid,corrosive,n.o.s. (OX)
3842	Oxidizer, corrosive, solid, n.o.s. (OX)
3843	Oxidizer, n.o.s. (OX)
3844	Oxidizer, poisonous liquid, n.o.s. (P, OX)
3845	Oxidizer, poisonous solid, n.o.s. (P, OX)
3848	Poisonous liquid, n.o.s. (P)
3849	Poisonous solid, corrosive, n.o.s (P)
3850	Poisonous solid, n.o.s. (P)
3851	Pyrophoric liquid, n.o.s. (FL, R)
3853	Water reactive solid, n.o.s (FS)
3856	Drugs, n.o.s. (C, P)

Common Process Wastes

3815	Chromic Acid Solution (C)
3818	Nitric Acid Solution (C)
3826	Photofixer (P)
3827	Xylene for Reclamation (FL)
3828	Oil, n.o.s., Petroleum oil (CL)
3846	Chemotherapy Waste Solid (*)
3847	Sharps Container (P)
3852	Resin solution (FL)
3854	NoChromix Cleaning Solution (C)
3855	Contaminated Solid Debris (*)

Radioactive Waste

3857	Radioactive, Liquids
3858	Radioactive, Solids (Inc. Animals and Tissue)
3859	Radioactive, Scintillation Vials (FL)
3861	Radioactive, Other (Liquids)(eg: old stocks)
3864	Radioactive, Other (Solids)(eg: sealed source)

Commercial Chemical Products

4178	A2213 (P)
1758	Abamectin
5	Acephate
6	Acetaldehyde (FL, P)
2057	Acetaldehyde Ammonia (OA)
2058	Acetaldehyde Cyanohydrin (P)
1774	Acetamide (*, P)
7	Acetanilid
8	Acetic Acid (C)
9	Acetic Anhydride (C)
1630	Acetoacetic Acid Ethyl Ester
10	Acetone (FL, P)
1826	Acetone Cyanohydrin (P)
1827	Acetone Thiosemicarbazide
11	Acetonitrile (FL, P)
2059	Acetophenone (P)
4049	Acetorphine
2060	Acetoxytriphenylstannane
2061	Acetyl Bromide (C)
1431	Acetyl Chloride (FL, P)
2062	Acetyl Iodide (C)
12	Acetylacetone (FL)
13	2-Acetylaminofluorene (P)
1756	Acetylbromazine
4050	Acetyldihydrocodeine
14	Acetylene (FG)
15	Acetylene Tetrabromide (P, OA)
4006	Acetylmethadol
2063	Acetylphenylglycine
16	Acetylsalicylic Acid
17	Acetylthiocholine Iodide (P)
2064	1-Acetyl-2-thiourea (P)
1593	Acifluorfen
2065	Acridine (P)
18	Acridine Orange
19	Acrolein (FL, P)
20	Acrylamide (P)
21	Acrylic Acid (C, P)
2066	Acrylic Anhydride (C)
22	Acrylonitrile (FL, P)
1829	Acryloyl Chloride (P)
2067	Acti-dione
1775	Actinomycin D (P)
2068	Adhesives (FL)
2069	Adipic Acid (OE)
1830	Adiponitrile (P)
2070	Adrenaline Chloride (I)
24	Adriamycin (P)
4155	Aerosols (FL)
25	Aflatoxin (P)
1370	Alachlor
2071	Alanine Methylester Hydrochloride
2072	Alanine Thiohydantoin
2073	Alcohol (FL)
27	Aldicarb (P)
4179	Aldicarb Sulfone (P)
4180	Aldoxycarb (P)
28	Aldrin (P)
4098	Alfentanil
1346	Alginic Acid
1667	Alizarin Red (P)
2074	Allantoin (*)
2075	Allo Threonine
2076	Allyl Acetate
29	Allyl Alcohol (FL, P)
1831	Allylamine (FL, P)
2077	Allyl Bromide (FL)
2078	Allyl Carbonate
30	Allyl Chloride (FL, P)
2079	Allyl Chlorocarbonate (FL)
4172	Allyl Chloroformate
2080	Allyl Cyanide
3882	Allylcyclopentylbarbituric Acid
31	Allyl Glycidyl Ether (AGE) (P)
2081	Allyl Isothiocyanate
4007	Allylprodine
32	Allyl Propyl Disulfide (P)
2082	Allyl Trichlorosilane (C)
4008	Alphacetylmethadol
4009	Alphameprodine
4010	Alpha-methylfentanyl
3883	Alphaprodine Hydrochloride

Appendix G. Hazardous Materials Table

3884	Alphenal
4132	Alprazolam
2083	Alumina (*)
2084	Aluminum Acetate
34	Aluminum Ammonium Sulfate (*)
2085	Aluminum Bromide, Anhydrous (C)
35	Aluminum Chloride (C)
1663	Aluminum Citrate
2086	Aluminum Fluoride
2087	Aluminum Hydride (FS)
2088	Aluminum Hydroxide (C)
36	Aluminum Hydroxide Hydrate
2089	Aluminum Isopropoxide
2090	Aluminum Isopropylate
1668	Aluminum Nitrate (P, OX)
2091	Aluminum Oxide (*)
2092	Aluminum Phosphate (C)
1832	Aluminum Phosphide (FS, R, P)
2093	Aluminum Powder (FS)
37	Aluminum Potassium Sulfate (*)
2094	Aluminum Silicate
2095	Aluminum Sodium Sulfate
2096	Aluminum Subacetate
38	Aluminum Sulfate (*)
2097	Aluminum Tungstate
1669	Amaranth
2098	Amberlite (*)
2099	Amberol Resin
2100	Amidol
2101	4-Aminoacetanilide
2102	Aminoacetic Acid
2103	p-Aminoacetophenone
2104	2-Aminoanthracene
44	2-Aminoanthraquinone (P)
2105	4-Aminoantipyrine
2106	Aminoazobenzene (P)
45	o-Aminoazotoluene (P)
2107	p-Aminobenzaldehyde
2108	p-Aminobenzene
3928	Fenfluramine Hydrochloride
2109	p-Aminobenzoic Acid
2110	Aminobenzotrifluoride
1650	4-Aminobenzoyl Hydrazide
46	4-Aminobiphenyl (P)
2111	Aminobutane
2035	(4-Aminobutyl)diethoxymethylsilane
2112	Aminobutyric Acid (I)
2113	Aminobutyrolactone Hydrobromide
2114	Aminocaproic Acid (I)
2115	Aminodimethylaniline
2116	Aminodimethylaniline Oxalate
4173	Amino Dimethyl Butyronitrile
2117	Aminoethanol
2118	3-Amino-9-ethyl Carbazole (P)
4161	3-Amino-9-ethyl carbazole hydrochloride (P)
2119	Aminoethylpiperazine (C)
2120	2-Amino-2-(hydroxymethyl)-1,3-propanediol (P)
2121	Aminoisobutyric Acid
2122	Aminomethane
42	1-Amino-2-methylanthraquinone (P)
2123	2-Amino-1-methylbenzene (P)
2125	4-Amino-1-methylbenzene (P)
2126	5-(Aminomethyl)-3-isoxazolol (P)
2127	Aminomethylpropanediol
2128	2-Amino-2-methyl-1-propanol (I)
2130	Aminonaphtholdisulfonic Acid
2129	Aminonaphthol Hydrochloride
2131	Aminonaphtholsulfonic Acid (C)
2132	Aminonicotinamide
43	2-Amino-5-(5-nitro-furyl)-1,3,4-thiadiazole (P)
1777	4-Amino-2-nitrophenol (P)
2133	Amino-2-propanone Semicarbazone Hydroch
1380	p-Aminophenyl Mercuric Acetate (P)
1976	4-Aminopropiophenone
2134	Aminopropyldiethanolamine (C)
2135	Aminopropylmorpholine (C)
1529	Aminopterin (P)
47	2-Aminopyridine (P)
1981	4-Aminopyridine (P)
1658	p-Aminosalicylic Acid
3885	4-Amino-2,2,6,6-tetramethylpiperidine
3172	N-(Aminothioxomethyl)acetamide (P)
2138	3-Amino-1,2,4-triazole (P)
1833	Amitron
40	Amitraz
1834	Amiton Oxalate
48	Amitrole (P)
49	Amizine
50	Ammonia (NFG)
2139	Ammonium Hydrogen Sulfate (OB)
51	Ammonium Acetate (P)
2140	Ammonium Arsenate (P)
2141	Ammonium Benzoate (OE)
2142	Ammonium Bicarbonate (*)
2143	Ammonium Bichromate (OX)
2144	Ammonium Bifluoride (C)
2145	Ammonium Bisulfate (OB)
1670	Ammonium Borate
52	Ammonium Bromide
2146	Ammonium Carbamate (OA)
2147	Ammonium Carbonate (OA)
53	Ammonium Chloride (*)
1788	Ammonium (VI) Chromate (P, OE)
2148	Ammonium Chromium Fluoride
2149	Ammonium Citrate (*)
2150	Ammonium Cyanide
2151	Ammonium Dichromate (OX)
54	Ammonium Fluoride (OB)
2152	Ammonium Fluoborate (OB)
1772	Ammonium Formate
1345	Ammonium Hexachloropalladate
2153	Ammonium Hydrogen Fluoride, Solution (C)
2154	Ammonium Hydrosulfide Solution (OA)
55	Ammonium Hydroxide (C, P)
2155	Ammonium Iodate (OX)
2156	Ammonium Lactate
1675	Ammonium meta-vanadate (P)
56	Ammonium Molybdate (P)
57	Ammonium Nitrate (OX)
58	Ammonium Oxalate (OA)
2157	Ammonium Pentaborate
1421	Ammonium Perchlorate (OX)
2158	Ammonium Permanganate (OX)
59	Ammonium Peroxydisulfate (R, OX)
60	Ammonium Persulfate (R, OX)
2159	Ammonium Phosphate (*)
2160	Ammonium Picrate (FS, P)
2161	Ammonium Polysulfide (OA)
2162	Ammonium Silicofluoride (OB)
62	Ammonium Sulfamate (OE)
2163	Ammonium Sulfate (*)
64	Ammonium Sulfide (FL)

Appendix G. Hazardous Materials Table

65	Ammonium Sulfite (OE)
2164	Ammonium Tartrate (I)
66	Ammonium Thiocyanate (OE)
2165	Ammonium Thiosulfate (OE)
2166	Ammonium Vanadate (P)
3886	Amobarbital
1835	Amphetamine
3887	L-Amphetamine Free Base
3888	D-Amphetamine Sulfate
4099	Anileridine
3889	DL-Amphetamine Sulfate
3890	D-Amphetamine-d3 Sulfate
67	Ampicillin (*)
69	Amyl Acetate (FL)
2167	Amyl Alcohol (CL)
2168	n-Amylamine (FL)
2169	Amyl Carbonate
2170	Amyl Chloride (FL)
2171	Amylene (FL)
2172	Amyl Ether
2173	Amyl Formate (FL)
2174	Amyl Mercaptan (FL)
2175	Amyl Nitrate (FL)
2176	Amyl Trichloride (C)
2177	Amyl Trichlorosilane (C)
70	Ancymidol
71	5a-Androstan-17ß-ol-3-one
2178	Anhydrite
1674	Anhydrone (Magnesium Perchlorate) (OX)
2180	Anilazine (P)
72	Aniline (P)
2181	Aniline Hydrochloride (P)
2182	Aniline Sulfate
73	o-Anisidine (P)
74	o-Anisidine Hydrochloride (P)
1673	Anthracene (P)
2183	Anthraquinone
2184	Anthrone (P)
2185	Antifreeze (*)
2186	Antimonous Chloride (C)
2187	Antimonous Trichloride (C)
1672	Antimony (P)
2189	Antimony Chloride
2190	Antimony Fluoride (C)
2191	Antimony Lactate (OA)
77	Antimony, Other Compounds
2188	Antimony (III) Oxide
2192	Antimony Pentachloride (C)
1837	Antimony Pentafluoride (R, C)
2193	Antimony Pentoxide (OX)
78	Antimony Potassium Tartrate (P, OA)
2194	Antimony Sulfide
2195	Antimony Tribromide (C)
2196	Antimony Trichloride (C)
2197	Antimony Trifluoride (C)
79	Antimony Trioxide (P, OE)
1838	Antimycin A (P)
3891	Aprobarbital
2198	Aquacide 1-A (P)
2199	Arabinogalactan
2200	Arabitol (*)
82	Aramite
84	Argon (NFG)
2201	Aroclor (OE)
2202	Arsenic Acid (P)
2203	Arsenic Bromide (P)
2204	Arsenic Chloride (P)
2205	Arsenic Disulfide (P)
2206	Arsenic Iodide (P)
85	Arsenic, Other Compounds (P)
2207	Arsenic (III) Oxide (P)
2208	Arsenic (V) Oxide (P)
1839	Arsenic Pentoxide (P)
2209	Arsenic Sulfide (P)
2210	Arsenic Trichloride (P)
89	Arsenic Trioxide (P)
2211	Arsenic Trisulfide (P)
90	Arsenious Acid (P)
1840	Arsenous Oxide
1841	Arsenous Trichloride (P)
91	Arsine (P)
92	Asana
93	Asbestos (P, OE)
1671	Ascarite (C)
2212	Ascorbic Acid (*)
2213	Asparagine Thiohydantoin
2214	Aspartic Acid (*)
95	Asphalt (C, OC)
96	Atrazine
97	Atrinal
1747	Atropine (P)
2215	Atropine Sulfate (I)
98	Auramine (P)
2216	Aureomycin Hydrochloride
2217	Aurin Tricarboxylic Acid
99	Avermectin
100	Azaguanine
101	4-Azaleucine
103	Azaserine (P)
1778	Azathioprine (P)
1842	Azinphos-ethyl (P)
104	Azinphos-methyl (P)
2218	Aziridine (FL, P)
4162	Azobenzene (P)
2219	Azocarmine B
105	Azocasein
2220	Azodicarbonamide
2221	Balsam
2222	Barak
2223	Barban
107	Barbital
2224	Barbital Sodium
2225	Barbituric Acid (I)
1682	Barium (FS)
109	Barium Acetate (P)
1681	Barium Carbonate
110	Barium Chloride (P)
2226	Barium Chlorate (OX)
2227	Barium Cyanide (P)
1679	Barium Diphenylamine Sulfonate
1680	Barium Hydroxide (C)
2228	Barium Molybdate
2229	Barium Naphthenate
1678	Barium Nitrate (OX)
2230	Barium Oxide (P)
2231	Barium Perchlorate (OX)
2232	Barium Permanganate (OX).
2233	Barium Peroxide (OX)
2234	Barium Sulfate (P)
113	Barium Sulfide
83	Basal Oil
4301	Batteries - Alkaline (OE)

Appendix G. Hazardous Materials Table

4302	Batteries - Lead/Acid (C)
4303	Batteries - Lithium (FS, R)
4304	Batteries - Mercury (OB)
4305	Batteries - Nickel/Cadmium (OE)
4306	Batteries - Silver Oxide (OE)
115	Bendiocarb
4182	Bendiocarb Phenol (P)
116	Benomyl (P)
117	Bensulida
1595	Bentazon (*)
2235	Bentonite (clay)
2236	3,4-Benzacridine (P)
2237	Benz[c]acridine (P)
1779	Benzal Chloride (C, P)
119	Benzaldehyde (CL, C)
2238	Benzaldehyde Phenylhydrazone
2239	Benzalkonium Chloride
2240	4,4-Benzamine
2241	Benzanilide
2242	1,2-Benzanthracene (P)
118	Benz[a]anthracene (P)
2298	Benz[c]anthracene (P)
2243	Benzenamine (P)
120	Benzene (FL, P)
2244	Benzeneacetic Acid (C, P)
1846	Benzenearsonic acid
2245	Benzenedicarboxylic Acid (C)
2246	Benzenedicarboxylic Acid Anhydride
2247	Benzenediol
2248	1,3-Benzenediol (P, OE)
2251	Benzenephosphorus Dichloride (C)
2249	Benzenephosphorus Oxydichloride (C)
2252	Benzenephosphorus Thiodichloride (C)
1596	Benzenesulfonamide
2253	Benzenesulfonic Acid (P)
2254	Benzenesulfonic Acid Chloride (P)
2255	Benzenesulfonyl Chloride (C, P)
2256	Benzenethiol (P)
4011	Benzethidine
121	Benzidine (P)
2257	Benzidine Dihydrochloride (P)
2258	Benzidine Hydrochloride (P)
2259	Benzimidazole
123	Benzo[b]fluoranthene (P)
2260	Benzo[j,k]fluorene (P)
2261	Benzoic Acid (I)
2262	Benzoin
2263	Benzoin-a-oxime
2264	Benzol (FL)
2265	Benzonitrile (CL)
2266	Benzophenone
2267	Benzopinacol
2268	3,4-Benzopyrene (P)
122	Benzo[a]pyrene (P)
2269	p-Benzoquinone (P)
2270	Benzotriazole
124	Benzotrichloride (C, P)
3892	Benzoylecgonine Hydrate
3893	Benzoylecgonine-d3
1430	Benzoyl Chloride (C)
125	Benzoyl Peroxide (OG)
2271	1,2-Benzphenanthrene (P)
3894	Benzphetamine Hydrochloride
2272	Benzyl Acetate
129	Benzylamine (C)
126	Benzyl Benzoate
2273	Benzyl Bromide (C)
127	Benzyl Chloride (C, P)
2274	Benzyl Chlorocarbonate (C)
2275	Benzyl Chloroformate (C)
1848	Benzyl Cyanide (P)
2276	Benzyldimethylamine (FL)
2277	Benzylethanolamine
4051	Benzylmorphine
128	Benzyl Violet 4B (P)
1433	Benzyl Viologen
2279	Beryllium Carbonate
2280	Beryllium Chloride (P)
2278	Beryllium Dust or Metal (P)
2281	Beryllium Fluoride (P)
1677	Beryllium Nitrate (OX)
130	Beryllium, Other Compounds (P)
131	Beryllium Oxide
132	Beryllium Sulfate
2282	Beryllium Trichloride
4012	Betacetylmethadol
134	Betadine
2283	Betaine
4013	Betameprodine
4014	Betamethadol
4015	Betaprodine
4100	Bezitramide
2284	Bicine
2285	Biethyl-ethanolamine
1784	Bi-Flourides (C)
1601	Binapacryl
2286	Biotin (*)
2287	2,2'-Bioxirane (FL, P)
2288	Biphenol
136	Biphenyl (I)
2053	(1,1'-Biphenyl)-4,4'-diamine (P)
2289	2,2-Bipyridine
2290	Bipyridyl
2291	Bipyridyl Hydrochloride
2292	Bis(aminopropyl)piperazine (C)
140	Bisbenzimide (I)
2294	Bis(2-chloroethoxy)methane (P)
2295	Bis(2-chloroethyl)ether (FL, P)
137	N,N-bis(2-Chloroethyl)-2-Naphthylamine
114	Bischloroethyl Nitrosourea (P)
2296	Bis(2-chloroisopropyl)ether (FL, P)
1951	3,3-Bis(chloromethyl) Oxetane
260	Bis(chloromethyl) ether (FL, P)
1849	Bis(chloromethyl) ketone
4205	Bis(diethylcarbamodithioato-S,S')-zinc (P)
2297	Bis(1,1-dimethylbutyl)oxalate
4183	Bis(dimethylthiocarbamoyl) sulfide (P)
4207	Bis(dimethylcarbamodithioato-S,S')-copper (P)
4204	Bis(dimethylcarbamodithioato-S,S)-mang (P)
4206	Bis(dimethylcarbamodithioato-S,S')-zinc (P)
2299	Bis(2-ethylhexyl)phthalate (FL, P)
2300	Bismarck Brown R
2301	Bis(o-methoxyphenyl)carbonate
2302	Bis(1-methylcyclohexyl)oxalate
4184	Bis(pentamethylene)thiuram tetrasulfide (P)
1482	p-bis[2-(Phenyloxazolyl)]-Benzene
2304	Bismuth Carbonate
2303	Bismuth Dust or Metal
2305	Bismuth Nitrate (OX)
1683	Bismuth, Other Compounds
2306	Bismuth Salicylate
2307	Bismuth Subnitrate (OX)

Appendix G. Hazardous Materials Table

2308	Bismuth Sulfide
141	Bismuth Telluride
2309	Bismuth Trioxide (*)
2310	Bisphenol A (P)
2311	Bisphenol B
2293	Bis(tri-n-butyl tin) oxide (P)
1850	Bitoscanate
143	Bleach (C)
1364	Blenoxane
145	Boric Acid (I)
2312	Boron (FS)
2313	Boron Fluoride Ethyl Ether (FL)
2314	Boron Nitride
146	Boron Oxide
147	Boron Tribromide (C)
1851	Boron Trichloride (C)
148	Boron Trifluoride (P)
1852	Boron Trifluoride Etherate (FL)
2315	Boron Trifluoride Methanol Solution (FL)
2316	Boron Trifluoride Monoethylamine (C)
149	Bromacil (*)
1853	Bromadiolone
3895	Broazepam
1739	Bromcresol Green Indicator
150	Bromine (C)
2317	Bromine Cyanide (P)
151	Bromine Pentafluoride
2318	Bromine Trifluoride
2319	Bromoacetic Acid (C)
2320	Bromoacetone (P)
1363	Bromoacetylbromide (C)
2321	p-Bromoaniline
1358	Bromobenzene (FL, C)
2322	Bromochloromethane (OA)
2323	Bromocresol Green (P)
4071	4-Bromo-2,5-dimethoxy-amphetamine
2324	Bromoethane (FL)
152	Bromoform (FL, P)
2325	Bromomethane (FL, P)
2326	Bromonaphthalene
2328	Bromophenylhydrazine Hydrochloride (P)
2327	4-Bromophenyl Phenyl Ether (P)
2329	1-Bromo-2-propanone (P, PA)
2330	2-Bromopropionic Acid (C)
2331	n-Bromosuccinimide
2332	Bromothymol
2333	Bromothymol Blue (P)
2334	Bromotoluene (C)
2335	Bromotrichloromethane (FL)
2336	Bromoxynil (P)
1366	Bromphenol Blue (P)
1789	Brono
2337	Brucine (P)
154	Brucine Sulfate
3896	Bufotenine Monooxalate
4077	Bufotenine
3897	Butabarbital
159	1,3-Butadiene (P)
160	1,3-Butadiene Diepoxide
3898	Butalbital
162	Butane
1602	Butanedioic Acid
161	1, 3-Butanediol (FL)
2339	2,3-Butanedione Monoxime
2338	Butane Dioxime
2340	1,4-Butanesultone (P)
2341	2,4-Butanesultone (P)
2342	Butanoic Acid (C)
163	2-Butanone (FL, P)
2344	2-Butanone Peroxide (OG, P)
2345	2-Butenal (FL, P)
3899	Butethal
1527	Butoxamine
164	2-Butoxyethanol (CL)
166	n-Butyl Acetate (FL)
179	sec-Butyl Acetate (FL)
167	tert-Butyl Acetate (FL)
168	Butyl Acrylate
169	n-Butyl Alcohol (FL, P)
170	sec-Butyl Alcohol (FL)
171	tert-Butyl Alcohol (FL)
178	n-Butylamine (FL)
2347	sec-Butylamine (FL)
2348	Butylaminoethanol
2349	Butylaniline
4185	Butylate (P)
1543	Butylated Hydroxytoluene
4163	Butyl benzyl phthalate (P)
2350	Butyl Borate (FL)
2351	Butyl Bromide (FL)
2352	Butyl Carbitol
2353	Butyl Catechol
2354	Butyl Cellosolve (FL)
2355	Butyl Chloride (FL)
172	tert-Butyl Chromate
2356	Butyl-p-cresol
2357	Butyl Ether (FL)
4208	Butylethylcarbamothioic acid, S-propyl ester (P)
2358	Butyl Formate (FL)
173	n-Butyl Glycidyl Ether (CL)
2359	Butyl Isocyanate (FL)
174	n-Butyl Lactate (CL)
175	Butyl Lithium In Ether Solution (FS, P)
176	Butyl Mercaptan
2361	Butyl Methacrylate (FL)
2036	Butylphenoxyisopropyl Chloroethyl Sulfite (P)
2054	Butylphenoxy)-isopropyl-2-chloroethyl sulfite (P)
177	o-sec-Butyl-Phenol
2362	n-Butyl Phthalate (P)
2363	Butyl Sebacate (FL)
2364	Butyl Sulfide (I)
1592	4-tert-Butyltoluene
2365	Butyl Trichlorosilane (C)
1517	Butyraldehyde (FL)
1435	Butyric Acid (C)
180	beta-Butyrolactone (P)
2367	Cab-o-sil (*)
181	Cacodylic Acid (P)
1687	Cadmium Acetate (P)
2369	Cadmium Arsenate (P)
2370	Cadmium Arsenite (P)
2371	Cadmium Bisulfite (C)
2372	Cadmium Bromide (OE)
2373	Cadmium Carbide (FS)
2374	Cadmium Chlorate (OX)
183	Cadmium Chloride (P)
2375	Cadmium Chlorite (OX)
2376	Cadmium Chromate (OE)
1686	Cadmium Dust or Metal (P)
2377	Cadmium Fluoride (P)
2378	Cadmium Iodide (P)
2379	Cadmium Nitrate (OX)

Appendix G. Hazardous Materials Table

2380	Cadmium Oxide (P)
162	Cadmium Other Compounds (P)
165	Cadmium Sulfate (P)
167	Cadmium Sulfide
1854	Cadmiun Oxide
1855	Cadmiun Stearate
2381	Caffeine (P)
2382	Calcein
188	Calcium Acetate (I)
189	Calcium Arsenate (P)
2383	Calcium Bisulfite (C)
1544	Calcium Bromide
2384	Calcium Butyrate
190	Calcium Carbide (FS, R)
2385	Calcium Carbonate (*)
2386	Calcium Chloride (P)
194	Calcium Chromate (P)
2387	Calcium Citrate (*)
195	Calcium Cyanamide (OC)
2388	Calcium Cyanide (P)
2389	Calcium Dichromate (OX)
2390	Calcium Dodecylbenzenesulfonate (OE)
2391	Calcium Fluoride (*)
1685	Calcium Fluorite
2392	Calcium Gluconate
2393	Calcium Hydride (FS)
2394	Calcium Hydrogen Sulfite (C)
196	Calcium Hydroxide (C)
197	Calcium Hypochlorite (OX)
2395	Calcium Lactate (*)
2396	Calcium Metal (FS)
2397	Calcium Molybdate
198	Calcium Nitrate (OX)
1684	Calcium Oxalate
2398	Calcium Oxide (C, OB)
2399	Calcium Permanganate (OX)
2400	Calcium Peroxide (OX)
2401	Calcium Phosphate (*)
2402	Calcium Phosphide (FS)
2403	Calcium Silicide (FS)
2404	Calcium Succinate
2405	Calcium Sulfate (*)
4133	Camazepam
1856	Camphechlor
2406	Camphene (OA)
203	Camphor (FS, C)
2407	Camphor Oil (CL)
2408	Camphoric Acid
1387	Canavanine
3900	Cannibidiol
3901	Cannibinol
1857	Cantharidin
2409	Caproic Acid (C)
204	Caprolactam
2410	Capronitrile (FL)
2411	Caprylic Acid (C)
205	Captafol (P)
206	Captan (P, OE)
1858	Carbachol Chloride
4186	Carbam (P)
4187	Carbamic acid
2412	Carbamimidoselenoic Acid (P)
207	Carbaryl (P, OA)
2413	Carbazole
4231	Carbendazim (P)
2414	Carbethoxymethylmercaptopurine

208	Carbo-Sorb
2415	Carbobenzoxy Chloride (C)
210	Carbofuran (P)
4232	Carbofuran phenol (P)
2416	Carbol Fushin
2417	Carbolic Acid (P)
2418	Carbon (FS)
2419	Carbon Bisulfide (FL, P)
212	Carbon Black (*, P)
213	Carbon Dioxide (NFG)
214	Carbon Disulfide (FL, P)
215	Carbon Monoxide
216	Carbon Tetrabromide
217	Carbon Tetrachloride (P, OA)
1438	Carbonyl Cyanide (P, PA)
218	Carbonyl Fluoride
219	Carbophenothion (P)
220	Carbosulfan
4233	Carbosulfon (P)
221	Carboxymethyl cellulose ether
222	Carboxymethyl cellulose (*)
4234	Carbyne (P)
4235	Carzol (P)
2420	Casein Hydrosylate (*)
2421	Castor Oil
224	Catechol (*)
2422	Cellosolve (CL)
2423	Cellosolve Acetate (CL)
2424	Cellulose (*)
2425	Cellulose Acetate
2426	Ceric Ammonium Nitrate (OX)
2427	Ceric Ammonium Sulfate
2428	Ceric Sulfate
2429	Cerium Metal (FS)
2430	Cerium Nitrate (OX)
2431	Cerium Oxide
2432	Cerium Trifluoride
1691	Cerous Chloride (I)
1347	Cesium Carbonate
226	Cesium Chloride (P)
227	Cesium Hydroxide
2433	Cesium Metal (FS)
2434	Cesium Nitrate (OX)
2435	Cetyl Acetate
228	Charcoal (FS)
232	Chloradazon
2436	Chloral (P)
4134	Chloral Betaine
233	Chloral Hydrate
234	alpha-Chloralose
235	Chlorambucil (P)
2437	Chloramine-B (P)
1384	Chloramine-T (P)
2438	Chloramines (P)
236	Chloramphenicol (*, P)
2439	Chloranil
229	Chlordane (FL, C, P)
238	Chlordauric Acid
239	Chlordecone (P)
3902	Chlordiazepoxide Hydrochloride
3903	Chlordiazepoxide-d5
2440	Chlorfenvinphos (P)
4124	Chlorhexadol
2441	Chlorhexidine
2442	Chloric Acid (OX)
240	Chlorinated Camphene

Appendix G. Hazardous Materials Table

583	Chlorinated dibenzofurans not listed (P)
582	Chlorinated dioxins not listed elsewhere (P)
241	Chlorinated Diphenyl Oxide
2445	Chlorinated diphenyls (P)
242	Chlorine Gas (P)
2446	Chlorine Cyanide (P)
243	Chlorine Dioxide Hydrate, Frozen (OX)
244	Chlorine Trifluoride (P)
2447	Chlornaphazine (P)
247	Chloroacetaldehyde (P)
2453	Chloroacetaldehyde Diethyl Acetal (FL)
2454	Chloroacetamide
248	Chloroacetanilide
230	Chloroacetic Acid, Liquid or Solution (C)
3158	Monochloracetic Acid (C)
3810	Chloroacetic Acid, Solid (C)
249	alpha-Chloroacetophenone (I)
231	Chloroacetyl Chloride (C)
4236	2-Chloroallyl-diethyldithiocarbamate (P)
2455	p-Chloroaniline (P)
250	Chlorobenzene (FL, P)
251	Chlorobenzonitrile
252	o-Chlorobenzylidene Malononitrile
253	Chlorobromomethane
254	1-Chlorobutane
2456	Chlorobutanol (FL)
2457	Chlorobutyric Acid (C)
2449	4-Chloro-m-cresol (P)
2450	p-Chloro-m-cresol (P)
255	Chlorodifluoromethane (R-22) (NFG, P)
2458	Chlorodinitrobenzene (P)
2448	1-Chloro-2,3-epoxypropane (FL, P)
1895	2-Chloroethanesulfonyl Chloride (P)
1860	Chloroethanol
2459	2-Chloroethanol (FL, P)
2460	Chloroethene (FL, P)
2461	Chloroethyl Acrylate (FL)
1861	Chloroethyl Chloroformate
258	1-(2-Chloroethyl)-3-Cyclohexyl-1-Nitrosourea (P)
2462	Chloroethyl Methacrylate (FL)
2463	2-Chloroethylvinyl Ether (FL, P)
259	Chloroform (P)
1781	N-Chloroformyl Morpholine (P)
2464	Chlorogenic Acid
2465	p-Chloromercuribenzoic Acid (P)
2466	Chloromercuriphenyl Sulfonic Acid
2467	Chloromethane (FL, P)
2468	Chloromethoxymethane (FL, P)
1862	Chloromethyl Ether (P)
261	Chloromethyl Methyl Ether (FL, P)
1845	1-(Chloromethyl)-4-Nitro-Benzene
2469	3-(Chloromethyl) Pyridine Hydrochloride (P)
2470	(Chloromethyl)benzene (C, P)
2471	2-Chloronaphthalene (P)
2472	beta-Chloronaphthalene (P)
1651	4-Chloro-1-Naphthol (P)
245	1-Chloro-1-Nitropropane
262	Chloropentafluoroethane (R-115) (NFG)
1864	Chlorophacinone
1793	2-Chlorophenol (P)
1794	3-Chlorophenol (P)
1795	4-Chlorophenol (P)
2473	o-Chlorophenol (P)
2474	p-Chlorophenol (P)
1545	Chlorophenoxy Acetic Acid
4164	1-chloro-4-phenoxybenzene (P)
4121	Chlorphentermine
2451	4-Chloro-m-phenylenediamine (P)
246	4-Chloro-o-Phenylenediamine (P)
1439	Chlorophenyl Hydrazone
2475	1-(o-Chlorophenyl)thiourea (P)
2009	(2-Chlorophenyl)-thiourea (P)
2476	Chlorophenyltrichlorosilane (C)
263	Chloropicrin, Liquid (P)
2477	Chloroplatinic Acid, Solid (OB)
264	Chloroprene, Inhibited (FL, P)
4165	1-Chloropropene (FL, P)
1975	3-Chloropropionitrile (FL, P)
1994	3-Chloropropyl Octyl Sulfoxide
265	Chlorostyrene
2478	Chlorosulfonic Acid (C)
266	Chlorothalonil
267	Chlorotoluene
1791	4-Chloro-o-toluidine (P)
1792	5-Chloro-o-toluidine (P)
2452	4-Chloro-o-toluidine Hydrochloride (P)
2479	2-Chlorotriethylamine Hydrochloride
1637	Chlorotrimethylsilane
1863	Chloroxuron
1603	Chlorpyrifos-Phosphorothioate
268	Chlorpyrifos (P, OA)
1388	Chlortetracycline Hydrochloride
1865	Chlorthiophos
2480	Cholestane
2481	Cholesteryl Oleate
2482	Cholic Acid
2483	Choline Chloride (P)
2484	Cholosterin
2485	Chondroitin Sulfate
269	Choramben
2486	Chorionic Gonadotrophin
2487	Chromacyl Pink
2488	Chromates, Alkaline Salts (P)
271	Chromerge (C)
2489	Chromic Acetate
272	Chromic Acid, Solid (OX)
2490	Chromic Anhydride (OX)
276	Chromic Chloride
2491	Chromic Fluoride, Solid (C)
2492	Chromic Sulfate
2493	Chromium Acetate (OE)
2494	Chromium Carbide (FS)
1796	Chromium Carbonyl (P)
2495	Chromium Chloride
277	Chromium Compounds (P)
278	Chromium Nitrate (OX)
270	Chromates, Other Salts
1690	Chromium (III) Oxide (P)
2497	Chromium Oxychloride (C)
1578	Chromium Potassium Sulfate
1577	Chromium Sulfate (*)
275	Chromium Trioxide (P, OX)
2498	Chromous Chloride (OE)
279	Chromyl Chloride (C, P)
280	Chrysene (P)
281	Cinnabar (P)
1797	Cisplatin (P)
2499	Citraconic Anhydride
2500	Citric Acid (*)
2501	Citrulline
2502	Citrus Red No. 2 (P)
3905	Clobazam

Appendix G. Hazardous Materials Table

285	Cloethocarb
285	Clofentezine
1530	Clonidine (P)
3904	Clonazepam
4016	Clonitazine
2503	Clonitralid (P)
287	Clopidol
2504	Cloprostenol Sodium
3906	Chlorazepate Dipotassium
1780	Clornaphazine (P)
4122	Clortermine
4135	Clotiazepam
4136	Cloxazolam
290	Coal Tar Pitch (P)
2505	Cobalt (P)
2506	Cobalt Acetate (I)
292	Cobalt Carbonyl
293	Cobalt Chloride (*)
2507	Cobalt Chloride Nitrate Trioxide (OX)
294	Cobalt Hydrocarbonyl
2508	Cobalt Naphthenate
295	Cobalt Nitrate (OX)
2509	Cobalt Oxide (*)
2510	Cobalt Sulfate (*)
1378	Cobalt Thiocyanate
2511	Cobaltous Bromide (OE)
2512	Cobaltous Formate (OE)
2513	Cobaltous Nitrate (OX)
2514	Cobaltous Sulfamate (OE)
3907	Cocaine Free Base
3908	Cocaine Hydrochloride
3909	Cocaine-d3
3910	Codeine
4052	Codeine Methylbromide
4053	Codeine-N-Oxide
1389	Colchicine (P)
2515	Collodion (FL)
2516	Columbium Oxide
296	Compressed Air
1390	Concanavaline A
1629	Coomassie Brilliant Blue (P)
2518	Copper Arsenite (P)
2519	Copper Chloride (OB)
2520	Copper Chromate
2521	Copper Cyanide (P)
4213	Copper Dimethyldithiocarbamate (P)
2522	Copper Hydroxide (C)
299	Copper Napthenate
297	Copper Nitrate (OX)
2523	Copper Oxide
300	Copper Sulfate (*)
2524	Corallin
2525	Cottonseed Oil
1866	Coumaphos (P)
2526	Coumarin (P)
1867	Coumatetralyl
303	Crag™ Herbicide
2527	Creatine (I)
304	p-Cresidine (P)
2528	Creosote (P)
305	Cresol (C, P)
2529	Cresyl Carbonate
2530	Cresylic Acid (P)
3829	Crimidine
306	Crotonaldehyde (FL, P)
2531	Crotonic Acid (C)
2532	Crotonyl Chloride (P)
2533	Crotoxyphos (P)
307	Crufomate
2534	Cryolite
4054	Crypenorphine
1604	Cryzalin
308	Cumene (FL, P)
2535	Cumene Hydroperoxide (OG)
4237	m-Cumenyl methyl carbamate (P)
1692	Cupferron (P)
309	Cupric Acetate (OE)
2536	Cupric Ammonium Chloride
311	Cupric Carbonate (P)
312	Cupric Chloride (P)
2537	Cupric Cyanide (P)
2538	Cupric Fluoride
1605	Cupric Hydroxide
1580	Cupric Nitrate (OX)
2539	Cupric Oxalate (OE)
2540	Cupric Oxide
1576	Cupric Selenate (P)
2541	Cupric Sulfate (P)
2542	Cupric Sulfide
2543	Cupric Tartarate (OE)
1688	Cuprous Chloride (OE)
2544	Curcumin
314	Cyanamide
315	Cyanide Salts, Soluble, Not Listed Elsewhere (P)
2545	Cyanoacrylic Adhesive (FL)
4107	4-Cyano-2-dimethylamino-4,4-diphenyl butane
316	Cyanogen Gas (P)
317	Cyanogen Bromide (P)
318	Cyanogen Chloride (P)
3830	Cyanogen Iodide
4109	4-Cyano-1-methyl-4-phenylpiperidine
1869	Cyanophos
2546	Cyanopyridine
2547	Cyanuric Acid
1870	Cyanuric Fluoride (P)
319	Cycasin (P)
4238	Cycloate (P)
1391	Cyclodextrin
2548	1,4-Cyclohexadienedione (P)
320	Cyclohexane (FL, P)
2549	Cyclohexane Carbonyl Chloride
321	Cyclohexanol (FL)
322	Cyclohexanone (FL, P)
323	Cyclohexene (FL)
1383	Cycloheximide (P)
2550	2-Cyclohexyl-4,6-dinitrophenol (P)
324	Cyclohexylamine (FL)
2551	Cyclohexylamine Hydrochloride
1440	Cyclohexylamino Ethanesulfonic Acid
1436	Cyclohexylamino Propane
2552	Cyclohexylenedinitrilotetraacetic Acid
325	Cyclohexylenetetraacetic Acid
4212	Cyclohexylethylcarbamothioic acid, S-ethyl ester
326	Cyclonite
327	Cyclopentadiene (FL)
328	Cyclopentane (FL)
329	Cyclophosphamide (P)
330	Cycocel
331	Cyfluthrin 863
332	Cyhexatin
2553	Cymene (FL)
333	Cypermethrin

Appendix G. Hazardous Materials Table

334	Cyromazine
2554	Cysteine (*)
337	Dacarbazine (P)
2555	Damar Gum
338	Daminozide
2556	Dantrolene
339	Daunomycin (P)
4239	Dazomet (P)
2056	2,4-D, Salts & Esters (P, OA)
1373	2,4-DB
2557	DDD (P)
4166	DDE (P)
2558	DDT (P, OA)
341	DDVP
2559	DEAE Cellulose
342	Decaborane (FS)
1340	Decahydro-Naphthalene (CL, C)
2560	Decane (FL)
1512	n-Decane (CL)
2561	Decanoic Acid
2562	Dehydroacetic Acid
2563	Dejenkolic Acid
4137	Delorazepam
1755	Demerol
343	Demeton (P)
1871	Demeton-S-Methyl
2564	Deoxycholic Acid (*)
3911	Desmethyldiazepam
3912	Desmethyldiazepam-d5
4055	Desomorphine
4156	Deuterium (FG)
2565	Deuterium Oxide (*)
2566	Developer (CL)
344	Dexamethasone (*)
2568	Dextrine
4017	Dextromoramide
3913	Dextropropoxyphene Hydrochloride
2576	Diacetone Acrylamide
349	Diacetone Alcohol (FL, C)
2577	Diacetyl (FL)
350	N,N'-Diacetylbenzidine (P)
1872	Dialifor
2578	Diallate (P)
1392	N,N-Diallyltartardiamide
3914	5,5-Diallylbarbituric Acid
2579	Diamine (FL, C, P)
1790	2,4-Diaminoanisole (P)
351	2,4-Diaminoanisole Sulfate (P)
353	Diaminobenzidine
352	3,3'-Diaminobenzidine (P)
1393	3,5-Diaminobenzoic Acid (P)
354	4,4'-Diaminodiphenyl Ether (P)
355	2,3-Diaminonaphthalene
356	2,4-Diaminophenol Dihydrochloride (P)
2580	Diaminotoluene (P, OA)
357	2,4-Diaminotoluene (P, OA)
4018	Diampromide
2581	Dianisidine
358	o-Dianisidine (P)
359	Dianisidine Dihydrochloride (P)
2582	Diatomite (*)
2583	Diazald (I)
1751	Diazepam
3915	Diazepam-d5
362	Diazinon (P)
363	Diazomethane (P)
364	Dibenz(a,h)Acridine (P)
366	Dibenz(a,j)Acridine (P)
365	Dibenz(a,h)Anthracene (P)
2588	Dibenz[a,h]anthracene (P)
2584	1,2,5,6-Dibenzanthracene (P)
2586	Dibenzo[a,h]anthracene (P)
580	7H-Dibenzo(c,g)Carbazole (P)
367	Dibenzo(a,e)Pyrene (P)
368	Dibenzo(a,h)Pyrene (P)
369	Dibenzo(a,i)Pyrene (P)
2585	1,2,7,8-Dibenzopyrene (P)
2589	Dibenz[a,i]pyrene (P)
2587	Dibenzylamine (FL)
370	Diborane (P)
371	Dibrome
1426	Dibromoacetic Acid
1443	Dibromoacetophenone
372	1,2-Dibromo-3-Chloropropane (P)
2591	Dibromodichloromethane (FL)
2592	Dibromodifluoromethane (OA)
373	1, 2-Dibromoethane (P)
2593	Dibromoethylene
2590	5,7-Dibromo-8-hydroxyquinoline
2594	Dibromomethane (FL, P)
2595	Dibutylamine (FL)
376	2-N-Dibutylaminoethanol
2596	Dibutylammonium Oleate
4216	Dibutylcarbamodithioic acid, sodium salt (P)
464	2,6-Di-tert-Butyl-p-Cresol
2040	N,N'-Dibutylhexamethylenediamine
1652	2,6-Di-tert-Butyl-4-Methylphenol
2575	Di-t-butyl-4-methylphenyl-di-n-butylborate
2597	Dibutyloxalate
2574	Di-t-butyl Oxalate
374	Dibutyl Phosphate
375	Dibutyl Phthalate (P)
2570	Di-n-butyl Phthalate (P)
2598	Dicamba (OE)
2599	Dichlobenil (OE)
1807	Dichlone (P, OE)
1424	Dichloroacetic Acid (C)
2600	Dichloroacetic Anhydride (C)
2601	Dichloroacetyl Chloride (C)
377	Dichloroacetylene (P)
3455	S-(2,3-Dichloroallyl) diisopropylthiocarbamate(P)
381	2,5-Dichloroaniline
382	o-Dichlorobenzene (P, OA)
2602	m-Dichlorobenzene (P, OA)
383	p-Dichlorobenzene (P, OA)
384	3,3'-Dichlorobenzidine (P)
4194	2,2-dimethyl-1,3-benzodioxol-4-ol (P)
2603	Dichlorobutane
1798	cis-1,4-Dichloro-2-butene (FL, P)
3832	trans-1,4-Dichloro-2-butene (FL, P)
379	3,3'-Dichloro-4,4'-Diamino Diphenyl Ether (P)
2604	Dichlorodifluoroethylene (OA)
385	Dichlorodifluoromethane (NFG, P)
380	1, 3-Dichloro-5,5-Dimethyl Hydantoin
2605	Dichlorodiphenyldichloroethane (P)
340	Dichlorodiphenyltrichloroethane (DDT) (P, OA)
386	1,1-Dichloroethane (FL, P)
387	1,2-Dichloroethane (FL, P)
2606	1,2-trans-Dichloroethene (P)
2038	1,2-Dichloroethyl Acetate
389	1,2-Dichloroethylene (P)
2607	1,2-Dichloroethylene (P)

Appendix G. Hazardous Materials Table

2608	1,2-trans-Dichloroethylene (P)
388	Dichloroethyl Ether (FL, P)
1445	Dichlorofluorescein (P)
390	Dichlorofluoromethane (FL, P)
1448	Dichlorohexyl Carbodiimide
391	Dichloroindophenol
2609	Dichloroisopropyl Ether (FL)
392	Dichloromethane (FL, P)
2610	(Dichloromethyl) benzene (C, P)
1873	Dichloromethylphenylsilane
1608	Dichloro-4-Nitroaniline
378	1,1-Dichloro-1-Nitroethane
2611	Dichloropentane (FL)
2612	Dichlorophen
1446	Dichlorophenol
2613	2,4-Dichlorophenol (P)
2614	2,6-Dichlorophenol (P)
335	2,4-Dichlorophenoxyacetic Acid (2,4-D) (P, OA)
2615	2,4-Dichlorophenoxyacetic Acid, Salts & Esters(P)
1799	Dichlorophenyl-2,4-p-Nitrophenyl Ether (P)
2616	Dichlorophenylarsine (P)
2617	2,5-Dichlorophenylhydrazine (P)
2618	Dichlorophenyltrichlorosilane (C)
2619	1,2-Dichloropropane (P)
2620	Dichloropropane
393	1,3-Dichloropropene (P)
2621	Dichloropropene (FL)
394	2, 2-Dichloropropionic Acid (C)
395	Dichlorotetrafluoroethane
1847	4,5-Dichloro-2-(Trifluoromethyl)-Benzimidazole
396	Dichlorvos (P)
1606	Dichobenil
2622	Dichrotophos (P)
397	Dicofol
398	Dicrotophos
2623	Dicumyl Peroxide (OG)
2624	Dicyclohexylamine (FL)
2625	Dicyclohexylcarbodimide
1394	N,N-Dicyclohexylcarbodiimide
399	Dicyclopentadiene
400	Dicyclopentadienyl Iron
2571	Di-n-decylphthalate (FL)
2626	Didymium Nitrate (OX)
401	Dieldrin (P, OA)
402	Diemochlor
404	Diepoxybutane (P)
2627	1,2,3,4-Diepoxybutane (FL, P)
405	Diethanolamine
410	Diethylamine (FL)
411	Diethylaminoethanol
412	Diethylaminoethyl-Cellulose (*)
4175	Diethylarsine (P)
1875	Diethylcarbamazine Citrate
4218	Diethylcarbamodithioic acid, sodium salt (P)
1800	Diethylcarbamoyl Chloride (P)
2628	Diethyl Cellosolve (FL)
1874	Diethyl Chlorophosphate
2634	Diethyldichlorosilane (FL)
2635	Diethyldithiocarbamic acid 2-chlorallyl-ester (P)
1694	Diethyldithiocarbamic Acid, Sodium Salt (P)
2636	Diethylene Glycol Dibenzene Sulfonate
413	Diethylene Triamine
4240	Diethylene glycol, dicarbamate (P)
2637	Diethyleneglycolmonoethyl Ether
403	Diethylenetriaminepentaacetic Acid (C)
4245	N,N-Diethylethanamine (P)

406	Diethyl Ether (FL)
347	Di (2-Ethylhexyl) Phthalate (P)
2569	Di-2-(ethylhexyl) Phosphoric Acid (C)
414	1,2-Diethylhydrazine (FL, P)
2638	N,N'-Diethylhydrazine (FL, P)
407	Diethyl Ketone (FL)
1570	Diethyl 4-Nitrophenylphosphate
3236	O,O-diethyl S-methyldithiophosphate (P)
2633	Diethyl-p-nitrophenyl Phosphate (P)
2629	Diethyl Oxalate (P)
1360	Diethylphosphite
2630	Diethyl Phthalate (FL, P)
3235	O,O-diethyl O-pyazinyl phosphorothioate (P)
2631	Diethyl Phthalate (FL)
1610	Diethyl Propionamide
3916	Diethylpropion Hydrochloride
408	Diethyl Pyrocarbonate (P)
415	Diethylstilbestrol (P)
409	Diethyl Sulfate (P)
4019	Diethylthiambutene
2632	Diethyl Thiourea (P)
4078	Diethyltryptamine
1428	Difluoroacetic Acid
416	Difluorodibromomethane
3831	1,1-Difluoroethylene (P)
2639	Difluorophosphoric Acid (C)
1533	Digitonin (P)
1876	Digitoxin
417	Diglycidyl Ether (P)
1877	Digoxin (P)
2640	Dihydrazine Sulfate (P)
4101	Dihydrocodeine
4214	2,3-Dihydro-2,2-dimethyl-7-benzofuranol (P)
4241	2,3-Dihydro-2,2-dimethyl-7-benzofuranyl methyl
4215	2,3-Dihydro-2,2-dimethyl-methylcarbamate(P)
4056	Dihydromorphone
2641	Dihydropyran (FL)
418	Dihydrosafrole (P)
2642	Diiodofluorescein
2643	Diiodotyrosine
2644	Diisobutylene (FL)
419	Diisobutyl Ketone (CL, C)
420	Diisopropylamine (FL)
2645	Diisopropyl Ether (FL)
1571	Diisopropylfluorophosphate (P)
2646	Diisopropyl Thiourea
1385	Diltiazem Hydrochloride
2647	Dimedone
1878	Dimefox
2648	2,3-Dimercapto-1-propanol (FL)
2649	1,4,5,8-Dimethanonaphthalene (P)
4072	2,5-Dimethoxyamphetamine
422	Dimethoate (P)
1449	Dimethoxybenzaldehyde
423	3,3'-Dimethoxybenzidine (P)
2650	Dimethoxyethylphthalate
2652	Dimethoxypropane (FL)
2653	2,3-Dimethoxystrychnidin-10-one (P)
2651	Dimethoxy Stychnine (P)
424	N,N-Dimethyl Acetamide
429	Dimethyl-p-phenylenediamine (FS)
430	Dimethylamine (FG, P)
1451	Dimethylamine Hydrochloride
1452	Dimethylamino Benzaldehyde (I)
432	4-Dimethylaminoazobenzene (P)
2664	p-Dimethylaminobenzaldehyde

2665	Dimethylaminobenzylidine Rhodanine
2666	Dimethylaminoethanol (FL)
1395	3-Dimethylaminopropionitrile (P)
2668	Dimethylaminopropylamine (FL)
434	Dimethylaniline
3834	Dimethylarsinic Acid (P)
2662	7,12-Dimethyl-1,2-benzanthracene (P)
2671	7,12-Dimethylbenz[a]anthracene (P)
2669	Dimethylbenzene (P)
436	3,3'-Dimethylbenzidene (P)
1453	Dimethylbenzimidazole
4193	2,2-dimethyl-1,3-benzodioxol-4-ol, m carbamate
2670	alpha.alpha-Dimethylbenzylhydroperoxide (P)
2672	Dimethylbutane
4255	tris(Dimethylcarbamodithioato -S,S-iron (P)
4195	Dimethyl Carbamodithioic Acid, potass salt (P)
4196	Dimethyl Carbamodithioic Acid, sodium salt (P)
425	Dimethylcarbamyl chloride (C, P)
2655	Dimethyl Carbonate (FL)
2674	3,5-Dimethylchlorophenol
2656	Dimethyl Chlorothiophosphate (C)
2657	Dimethyl Cyanamide
2675	Dimethylcyclohexane
1450	Dimethyl-1,3-Cyclohexanedione (I)
437	Dimethyldichlorosilane (FL)
4261	Dimethyldithiocarbamate, manganese salt (P)
438	Dimethylformamide (FL)
2677	Dimethylfuran
2678	Dimethylglyoxime (I)
2658	Dimethyl Hexadiene
441	1,1-Dimethylhydrazine (P)
442	1,2-Dimethylhydrazine (P)
1454	Dimethylimidazol
2659	Dimethyl Malonate
4264	N,N-Dimethyl-N-[2-methyl-4-methanimidamide
2051	Dimethyl 4-(methylthio)phenyl phosphate
2679	Dimethylnaphthylamine
428	N,N-Dimethyl-a-Napthylamine
3236	O,O-dimethyl-O-p-nitrophenylphosphorothioate
2680	Dimethylnitrosamine (P)
2681	alpha,alpha-Dimethylphenethylamine (P)
1455	Dimethyl-p-phenylenediamine sulfate
2682	2,4-Dimethylphenol (P)
2683	Dimethylphenylenediamine Hydrochloride
2684	Dimethylphenylenediamine Sulfate
1880	Dimethyl Phosphorochlorodithioate
443	Dimethylphthalate (P)
1811	Dimethylpolysiloxane (P)
426	Dimethyl POPOP (P)
1801	Dimethylsulfamoylchloride (P)
421	Dimethyl Sulfate (C, P)
1881	Dimethyl Sulfide
2681	Dimethyl Sulfone
444	Dimethylsulfoxide (P)
3917	N,N-Dimethyltryptamine
1885	Dimetilan (P)
445	Dinitolmide
447	Dinitrobenzene (P)
2685	3,5-Dinitrobenzoyl Chloride (P)
2686	Dinitrochlorobenzene (P)
446	4,6-Dinitro-o-Cresol (P)
2687	4,6-Dinitro-o-cyclohexylphenol (P)
2688	2,4-Dinitrofluorobenzene
2689	2,4-Dinitro-6-(1-methylpropyl)phenol (P)
1802	Dinitronaphthalene (P)
2690	Dinitrophenol (FS)

2691	2,4-Dinitrophenol Hydrochloride
448	1,2-Dinitrophenol (P)
2693	2,4-Dinitrophenol (FS, P)
1612	Dinitro Phenyl Crotonate
449	2,4-Dinitrophenyl Hydrazine (FS, P)
451	Dinitroresorcinol
452	Dinitrotoluene (P)
2694	2,4-Dinitrotoluene (FS, P)
2695	2,6-Dinitrotoluene (FS, P)
2696	Dinocap (P)
2697	Dinonyl Phthlate (FL)
1886	Dinoseb (P)
1887	Dinoterb
2572	Di-n-octylphthalate (FL, P)
3835	Di-sec-octylphthalate
2698	Dioctyl Sebacetate (FL)
453	1,4-Dioxane (FL, P)
4020	Dioxaphetyl butyrate
454	Dioxathion (P)
2699	Dioxolane (FL)
2700	Dipentene Glycol
1889	Diphacinone
2701	Diphenolcarbazond
3918	Diphenoxylate Hydrochloride
455	Diphenylamine (P)
2708	Diphenylaminechloroarsine (I)
2709	1,5-Diphenylcarbohydrazide
2702	Diphenyl Chlorophosphate (C)
2703	Diphenyl Dichlorosilane (C)
2704	Diphenyl Disulfide
2710	Diphenylethylene Diamine
2711	1,2-Diphenylhydrazine (P)
2712	Diphenylmercury
2713	Diphenylnitrosamine (P)
1456	2,5-Diphenyloxazole (P)
2705	Diphenyl Oxide
2706	Diphenyl Quanidine
2707	Diphenyl Sulfoxide
1538	Diphenyltetramethyldisilazane
2714	Diphenylthiocarbazone
4021	Dipipanone
1754	Diprenorphine
2715	Dipropylamine (FL, P)
4209	Dipropylcarbamothioic acid, S-ethyl ester (P)
4210	Dipropylcarbamothioic acid (P)
4211	Dipropylcarbamothioic acid, S-propyl ester (P)
2716	Dipropylene Glycol (FL)
457	Dipropylene Glycol Methyl Ether
2573	Di-n-propylnitrosamine (P)
456	Dipropyl Ketone
1613	Dipropylthiocarbamate
2717	a,a-Dipyridyl (P)
458	Diquat (OE)
459	Direct Black #38 (P)
460	Direct Blue #6 (P)
1803	Direct Brown #95 (P)
2718	Disodium Phenyl Phosphate
2719	Disodium Phosphate (*)
462	Disulfiram (P)
463	Disulfoton (P)
465	Dithane
1888	Dithiazanine Iodide
466	2,4-Dithiobiuret (P)
467	Dithiooxamide
1457	Dithiopyridine Ether
468	Dithiothreitol (I)

1693	Dithizone
469	Diuron (OE)
470	Divinylbenzene (FL)
2721	Divinyl Ether (FL)
1757	Dobutamine
1498	Docosane
1514	n-Dodecane (CL)
1511	Dodecanol (P)
2724	Dodecylamine
2723	Dodecyl Trichlorosilane (C)
1609	Dodine
2725	Dowex (*)
1765	Dowfume Mc33
472	Dowpon
2726	Doxapram Hydrochloride
2727	Drierite (Calcium Sulfate) (*)
4118	Dronabinol
4057	Drotebanol
4243	Dycarb (P)
3919	Ecgonine Hydrochloride
3920	Ecgonine-d3 Hydrochloride
3921	Ecgonine Methyl Ester Hydrochloride
3922	Ecgonine Methyl Ester-d3 Hydrochloride
474	Econo-Fluor (FL)
461	EDTA (OE)
1891	Emetine Dihydrochloride
478	Endosulfan (P)
479	Endothall (P)
1892	Endothion
480	Endrin (P)
2728	Eosin (P)
1639	Eosin Yellow (P)
482	Epichlorohydrin (FL, P)
2729	Epinephrine (P)
2037	EPN (P)
1740	Epon Resin (FS)
4167	1,2-Epoxybutane (FL, P)
2730	Epoxy Resin (FL)
2731	2,3-Epoxy-1-propanal (P)
4244	EPTC (P)
1893	Ergocalciferol
1894	Ergotamine Tartrate
1738	Eriochrome Black
1767	Eriochome Black T Solution
2732	Erythritol
2733	Erythromycin
4138	Estazolam
484	beta-Estradiol (P)
1804	Estrogens (P)
1614	Ethalfluralin
2734	Ethanal (FL, P)
485	Ethane (FG)
2735	Ethanedithioamide (P)
2736	Ethanenitrile (FL, P)
2737	Ethanesulfonic Acid (C)
2738	Ethanethiol
486	Ethanol (FL)
487	Ethanolamine (FL, C)
3159	Monoethanolamine (FL)
2739	Ethanoyl Chloride (P)
4139	Ethchlorvynol
488	Ethephon
2740	Ether (FL, P)
489	Ethidium Bromide (P)
2741	Ethidium Chloride
3923	Ethinamate

490	Ethinyloestradiol
491	Ethion (P)
2742	Ethionine (P)
492	Ethofumesate
493	Ethoprop
1896	Ethoprophos
494	2-Ethoxyethanol (FL, P)
495	2-Ethoxyethyl Acetate
496	Ethyl Acetate (FL, P)
497	Ethyl Acrylate (FL, P)
498	Ethyl Alcohol (FL)
2743	Ethyl Aldehyde (FL)
509	Ethylamine (FL)
3160	Monoethylamine (FL)
2774	Ethylamino Benzoate (P)
4130	2-(Ethylamino)-2-(2-thienyl)-cyclohexanone
4093	N-Ethylamphetamine
499	Ethyl Amyl Ketone
500	Ethyl Benzene (FL)
1897	Ethylbis(2-Chloroethyl)Amine
2744	Ethyl Borate (FL)
501	Ethyl Bromide (FL)
2745	Ethyl Butyl Acetate (CL)
2746	Ethyl Butyl Ether (FL)
502	Ethyl Butyl Ketone (CL)
2747	Ethyl Butyraldehyde (FL)
2748	Ethyl Butyrate (FL)
2749	Ethyl Carbamate (P)
2750	Ethyl Carbanilate
2775	Ethylcellulose
503	Ethyl Chloride (FL)
2751	Ethyl Chloroacetate (FL)
2752	Ethyl Chlorocarbonate (FL)
2753	Ethyl Chloroformate (FL)
2754	Ethyl Chlorothioformate (FL)
2755	Ethyl Crotonate (FL)
2756	Ethyl Cyanide (FL, P)
4247	S-Ethyl cyclohexyl (ethyl)thiocarbamate (P)
1362	Ethyldiazoacetate
2772	Ethyl-4,4'-dichlorobenzilate (FL, P)
2757	Ethyl Dichorosilane (FL)
4248	S-Ethyl diisobutylthiocarbamate (P)
1653	1-Ethyl-3-(3-Dimethylaminopropyl)Carbodiimide
4249	S-Ethyl dipropylthiocarbmate (P)
510	Ethylene (FG)
2779	Ethylenebis(dithiocarbamic Acid) (C, P)
2776	Ethylene Carbonate
511	Ethylene Chlorohydrin (P)
518	Ethylenediamine (C)
2780	Ethylenediaminetetraacetic Acid (EDTA) (I)
512	Ethylene Dibromide (P)
513	Ethylene Dichloride (FL, P)
2781	Ethylenedinitrilotetraacetic Acid (EDTA) (P)
1898	Ethylene Fluorohydrin
514	Ethylene Glycol (P)
2777	Ethylene Glycol Diethyl Ether (FL)
515	Ethylene Glycol Dinitrate
2778	Ethylene Glycol Monoethyl Ether (CL, P)
1381	Ethylene Glycol Monomethyl Ether (CL, C)
516	Ethylene Oxide (FL, P)
517	Ethylene Thiourea (P)
520	Ethylenimine (FL, P)
504	Ethyl Ether (FL, P)
505	Ethyl Formate (FL)
2758	Ethyl Fumarate
2782	Ethylhexaldehyde (FL)

Appendix G. Hazardous Materials Table

2783	Ethylidene Dichloride (FL, P)
521	Ethylidene Norbornene
2759	Ethyl Lactate (CL)
4140	Ethyl loflazepate
522	Ethylmaleimide (C, I)
506	Ethyl Mercaptan (FL)
2760	Ethyl Methacrylate (FL, P)
507	Ethyl Methane Sulfonate (P)
2761	Ethyl Methyl Ether (FL)
2762	Ethyl Methyl Ketone (FL)
4022	Ethylmethylthiambutene
4094	Ethylmorphine
523	n-Ethylmorpholine (FL)
2048	O-Ethyl-O-methylphosphonothioate
2763	Ethyl Nitrate (FL)
2764	Ethyl Nitrite (FL)
2773	Ethyl-m-nitrocinnamate
2765	Ethyl Oxalate (FL)
3924	1-Ethyl Piperidine
3925	2-Ethyl Piperidine
4084	N-Ethyl-3-piperidyl benzilate
2766	Ethyl Phenol
2767	Ethyl Phenyl Dichlorosilane (C)
4110	Ethyl-4-phenylpiperidine-4-carboxylate
2768	Ethyl Phosphorodichloridate (C)
2769	Ethyl Propionate (FL)
2784	Ethylpyrophosphate (C, P)
2770	Ethyl Silicate (CL)
1899	Ethylthiocyanate
2785	Ethylthiotrifluoroacetate
2771	Ethyl Trichlorosilane (FL)
4250	Ethyl ziram (P)
4023	Etonitazene
4058	Etorphine
4095	Etorphine Hydrochloride
4024	Etoxeridine
524	Famphur (P)
4251	Far-go (P)
525	Fast Garnet GBS Salt
2786	Fehlings A Solution (Copper Sulfate) (C)
2787	Fehlings B Solution (Alkaline Tartarate) (C)
527	Fenamiphos
4092	Fenethylline
1900	Fenitrothion
3927	Fenproporex
528	Fensulfothion (P)
4102	Fentanyl
3928	Fentanyl Citrate
3929	Fentanyl-d5 Citrate
529	Fenthion (P)
530	Fenvalerate
531	Ferbam (P)
2788	Ferric Acetate (P)
2789	Ferric Ammonium Citrate (P)
2790	Ferric Ammonium Oxalate (OE)
532	Ferric Ammonium Sulfate (*)
2791	Ferric Arsenate (P)
2792	Ferric Arsenite (P)
533	Ferric Chloride (C)
2793	Ferric Citrate (I)
2794	Ferric Dextran (P)
4252	Ferric dimethyldithiocarbmate (P)
2795	Ferric Fluoride (C)
1582	Ferric Nitrate (OX)
2796	Ferric Oxide (*)
2797	Ferric Perchlorate (OX)

1696	Ferric Sulfate (*)
534	Ferrous Ammonium Sulfate (*)
2799	Ferrous Arsenate (P)
2800	Ferrous Chloride (C)
535	Ferrous Sulfate (*)
2801	Ferrous Sulfide
2802	Ficin
4253	Filomyl (P)
538	Fluazifop-Butyl
539	Flubenzimine
540	Fluchloralin (P)
541	Flucythrinate
4141	Fludiazepam
1901	Fluenetil
3930	Flunitrazepam
4131	Flupyrazapon
1695	Fluoboric-Acid (C)
291	Fluomine (P)
2803	Fluoranthene (P)
1458	Fluorescamine
2804	Fluorescein (P)
543	Fluorine (P)
544	2-Fluoroacetamide (P)
1902	Fluoroacetic Acid (C)
814	Monofluoracetic Acid (P)
1459	Fluoroacetic Acid, Sodium Salt (P)
1903	Fluoroacetyl Chloride (P)
3161	Monofluorophosphonc Acid, Anhydrous (C)
1460	Fluoropyruvic Acid
2805	Fluorospar (*)
545	Fluorotrichloromethane
1904	Fluorouracil (P)
3931	Flurazepam Dihydrochloride
546	Fluvalinate
1615	Folpet
548	Fonofos (P)
2806	Formamide (P)
549	Formaldehyde (CL, P)
1905	Formaldehyde Cyanohydrin (P)
155	Formalin (OA)
550	Formamide (P)
1616	Formetanate Hydrochloride (P)
551	Formic Acid (C, P)
1906	Formothion
2039	Formparanate (P)
2807	Formvar Powder (P)
552	2-Formylhydrazino-4-5-nitro-2-furyl-Thiazole (P)
1907	Fosthietan
1741	Freon 113 (NFG)
553	Freon 12
1908	Fuberidazole
2808	Fuchsin (P)
554	Fuel Oil (Diesel Fuel) (CL, C)
4177	Fulminic acid (P)
1546	Fumaric Acid (*)
2809	Fumaryl Chloride (C)
1396	Fungizone Amphotercin B
2810	Furacin
1909	Furan (FL, P)
2811	2-Furancarboxaldehyde (FL, P)
2812	Furandimethanol
2813	2,5-Furandione (C, P)
4025	Furethidine
555	Furfural (CL, C, P)
2814	Furfural Acetone (FL)
2815	Furfural Acetophenone (FL)

Appendix G. Hazardous Materials Table

2816	Furfuran (FL, P)
556	Furfuryl Alcohol (FL)
2817	Furosemide (P)
2818	Gadolinium
2819	Gadolinium Oxide
2820	Galena (OE)
2821	Galenite (OE)
2822	Gallic Acid
2823	Gallium (OB)
1910	Gallium Trichloride
2824	Gallotanic Acid
557	Garlon,4
558	Gasoline (FL)
1397	Geneticin (*)
1398	Gentamycin (*)
560	Germanium Tetrahydride
2825	Ghatti Gum (*)
561	Gibberellic Acid
2826	Giemsa's Stain (I)
2827	Glacial Acetic Acid (C)
2828	Gluconic Acid
2829	Glucosamine
2830	Glucose Oxidase (*)
2831	Glucuronolactone
2832	Glutamic Acid (*)
2833	Glutamine (*)
562	Glutaraldehyde (P)
2834	Glutathione (*)
2835	Gluteraldehyde (P)
3932	DL-Glutethimide
2836	Glyceraldehyde
2837	Glyceric Acid
563	Glycerin (*)
2838	Glycerol (*)
2839	Glycerol Monooleate
2840	Glycerol Monostearate
2841	Glycerophosphoric Acid (I)
566	Glycidylaldehyde (FL, P)
567	Glycidol (CL)
2842	Glycil Glycine (*)
2843	Glycine (*)
2844	Glycolaldehyde
2845	Glycolic Acid
568	Glycopeptide (ACTA) Planin
2846	Glycyl Glycine (*)
1399	Glyoxal (FL, I)
2847	Glyoxylic Acid (C)
569	Glyphosate
570	Gold Chloride
2848	Graphite (FS)
719	Grease
2849	Gualacol
2850	Guanidine (P)
572	Guanidine Hydrochloride (P)
2851	Guanidine Nitrate (OX)
573	Guanidinium Hydrochloride
574	Guanidinium Thiocyanate (P)
2852	Gum Acacia (*)
2853	Gum Arabic (*)
2854	Gum Damar
2855	Gum Ghatti (*)
2856	Guthion (P)
581	Hafnium (FS)
2857	Hafnium Oxide
4142	Halazepam
584	Halothane (FL)

4143	Haloxazepam
585	Helium (NFG)
1805	Hematite (P)
1640	2-Hematoxylin (P)
2858	Hemin (*)
2859	Heparin (I)
1532	HEPES (*)
586	Heptachlor (P, OE)
1542	Heptachlor Epoxide
2860	Heptafluorobutyric Acid (C)
587	Heptane (FL)
1505	Heptanoic Acid (C)
1507	Heptanol
2861	Heptanone
4059	Heroin
588	Hexachlorobenzene (P)
589	Hexachlorobutadiene (C, P)
2863	Hexachlorobutane (FL)
2864	Hexachlorocyclohexane (gamma isomer) (P)
590	Hexachlorocyclopentadiene (C, P)
2865	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin
2866	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin
2867	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin
591	Hexachloroethane (P, OA)
592	Hexachloronaphthalene
2869	Hexachloropentadiene (C)
2870	Hexachlorophene (P)
2871	Hexachloropropene (P)
2872	Hexadecyltrichlorosilane (C)
2873	Hexadecyltrimethyl Ammonium Bromide (P)
2874	Hexadiene (FL)
2875	Hexaethyl Tetraphosphate (P)
593	Hexafluoroacetone (P)
2876	Hexafluorophosphoric Acid (C)
2877	Hexaldehyde (FL)
595	Hexamethyldisilizane (FL)
2879	Hexamethylenediamine (C)
2878	Hexamethylene Diamine Carbamate
2880	Hexamethyleneimine (FL)
596	Hexamethylenetetramine (FS)
594	Hexamethylphosphoramide (P)
2881	Hexamethyltetraoxocyclononane (OG)
597	Hexane (FL)
2882	1,6-Hexanediamine (C)
1342	1,2-Hexanediol
2883	Hexanoic Acid (C)
1341	n-Hexanol (CL)
598	2-Hexanone (FL)
1372	Hexazinone
2884	Hexene (FL)
3933	Hexobarbital
599	Hexyl Acetate (FL)
1506	Hexyl Alcohol
600	Hexylene Glycol (FL)
2885	Hexyl Sulfide
2886	n-Hexyl Toluene Sulfonate
2887	Hexyltrichlorosilane (C)
2888	Histamine Dihydrochloride (I)
2889	Histidine (*)
1643	Histo-prep
2890	Homidum Bromide
2891	Homocysteine
2892	Hordenine Sulfate
1697	Humic Acid
2893	Hyamine (P)
2894	Hydracrylic Acid (C)

601	Hydrazine (FL P)
2897	Hydrazinecarbotinoamide (P)
2895	Hydrazine Dihydrochloride (C)
602	Hydrazine Hydrate (C)
2896	Hydrazine Monohydrochloride (C)
603	Hydrazine Sulfate (P)
604	Hydrazobenzene (P)
2898	Hydrindantin (I)
2899	Hydriodic Acid (C)
2900	Hydrobromic Acid (C)
606	Hydrochloric Acid (C)
2901	Hydrocinnaminaldehyde
4096	Hydrocodone
3934	Hydrocodone Bitartrate
1911	Hydrocyanic Acid (P, PA)
607	Hydroflouric Acid (C, P)
2903	Hydrofluoroboric Acid (C)
605	Hydrofluorosilicic Acid (C)
608	Hydrogen (FG)
609	Hydrogen Bromide
610	Hydrogen Chloride Gas (PA)
611	Hydrogen Cyanide (P, PA)
612	Hydrogen Fluoride (C, P)
613	Hydrogen Peroxide (< 8%) (OX)
2041	Hydrogen Peroxide (8 To 52%) (OX)
614	Hydrogen Selenide (P)
615	Hydrogen Sulfide (P)
616	Hydrolic Fluid
4060	Hydromorphinol
3935	Hydromorphone Hydrochloride
617	Hydroquinone (P)
2904	Hydroquinone Dibenzyl Ether
2905	Hydroquinone Diethyl Ether
2906	Hydroquinone Monobenzyl Ether
2907	Hydrosilicofluoric Acid (C)
2908	Hydroxyacetic Acid
2909	Hydroxybenzaldehyde (I)
2910	Hydroxybenzenearsonic Acid
2911	Hydroxybutyric Acid
2912	Hydroxydimethylarsine Oxide (P)
2913	Hydroxydiphenyl (I)
3170	N-(2-Hydroxyethyl) Ethyleneimine (P)
2914	Hydroxyethylmorpholine
3936	1-(2-Hydroxyethyl)piperidine
2915	Hydroxyethyltrimethylammonium Bicarbonate
618	Hydroxylamine (C)
619	Hydroxylamine Hydrochloride (C, *)
1462	Hydroxyphenylpyruvic Acid
2916	Hydroxymercuribenzoate (P)
4220	Hydroxymethyl-methylcarbamodithioic acid(P)
2917	Hydroxymethyl-2-pentanone (FL)
3937	3-Hydroxymethyl-1-methyl piperidine
3938	3-Hydroxy-N-methyl piperidine
2918	Hydroxynaphthoic Acid
1461	2-Hydroxy-5-Nitro-Benzyl Bromide
4026	Hydroxypethidine
2919	Hydroxyphenol
2920	Hydroxyphenylacetophenone
2921	4-Hydroxyproline (*)
2922	alpha-Hydroxypropionitrile (P)
620	2-Hydroxypropyl Acrylate (I)
621	Hydroxyquinoline (P)
2923	8-Hydroxyquinoline Sulfate
2924	Hypochlorite Solution (C, P)
2925	Hypoxanthine
3939	Ibogaine Hydrochloride

2926	2-Imidazolidinethione (P)
623	Imidazole (C)
2927	Iminobispropylamine (FL)
1539	Immersion Oil (CL)
624	Indene
625	Indeno(1,2,3-cd)pyrene (P)
626	Indium, Other Compounds
2928	Indium Chloride (P)
2929	Indole Acetic Acid (*)
622	Indole Butyric Acid
2930	Indole-3-propionic Acid
2931	Indomethacin
2932	Ink (FL)
2933	Iodic Acid
627	Iodine (C, P)
2934	Iodine Monochloride (C)
2935	Iodine Pentafluoride (OX)
2936	Iodine Pentoxide (OX)
628	Iodoacetamide
629	Iodoacetic Acid
1359	Iodobenzene (FL)
630	Iodoform
1463	Iodomethane (P)
1464	Iodonitrotetrazolium Violet (P)
4254	3-Iodo-2-propynyl-n-butylcarbamate (P)
2937	Iosan
2938	Iron (*)
2939	Iron Boride (FS)
2940	Iron Chloride (C)
632	Iron Dextran Complex (P)
2941	Iron Oxide (*)
634	Iron Pentacarbonyl
2942	Isatin (*)
2943	Iso-butyraldehyde (FL)
636	Isoamyl Acetate
637	Isoamyl Alcohol (FL)
2944	Isoamyl Bromide (FL)
1912	Isobenzan (P)
638	Isobutyl Acetate (FL)
639	Isobutyl Alcohol (FL, P)
2946	Isobutylamine (FL)
2945	Isobutyl Isobutyrate (FL)
1465	Isobutyric Acid (C)
2947	Isobutyric Anhydride (C)
1913	Isobutyronitrile
1914	Isocyanic Acid, 3,4-Dichlorophenyl Ester
1915	Isodrin (P)
641	Isofenphos (P)
1916	Isofluorphate (P)
1745	Isoflurane
4256	Isolan (P)
2948	Isoleucine (*)
4103	Isomethadone
2949	Isonicotinamide
2950	Isonicotinic Acid Hydrazine (P)
642	Isooctane (FL)
2951	Isooctene (FL)
643	Isooctyl Alcohol
2952	Isopentane (FL)
2953	Isopentanoic Acid (C)
644	Isophorone
645	Isophorone Diisocyanate
2954	Isoprene (FL)
1618	Isopropanol Alkyl Polyoxyethylene
2955	Isopropanolamine (FL)
646	Isopropoxyethanol (CL)

Appendix G. Hazardous Materials Table

647	Isopropyl Acetate (FL)
648	Isopropyl Alcohol (FL)
651	Isopropylamine (FL)
652	n-Isopropylaniline
1917	Isopropyl Chloroformate (P)
649	Isopropyl Ether (FL)
1918	Isopropyl Formate
650	Isopropyl Glycidyl Ether
2957	Isopropyl Mercaptan (FL)
4257	3-Isopropyl-5-methyl phenyl methylcarbamate(P)
1919	Isopropylmethylpyrazolyl Dimethylcarbamate(P)
2958	Isopropyl Nitrate (FL)
2959	Isopropyl Percarbonate (OG)
2960	Isopropyl Peroxydicarbonate (OG)
4258	3-Isopropylphenyl N-methylcarbamate (P)
653	Isoproterenol (P)
654	Isosafrole (P)
2951	Isovaleric Acid (C)
1400	Kanamycin
1369	Kananycin Sulfate
4168	Kanechlor C (P)
2962	Kaolin (FL)
2963	Karl Fischers Reagent (FL)
656	Kel-Catalyst
657	Kelthane (OE)
658	Kepone (P, OE)
659	Kerb 5-W (P)
1635	Kerosene (CL, FL, C)
1750	Ketamine (P)
4144	Ketazolam
660	Ketene
4027	Ketobemidone
2964	Kinetin
2965	Kjeldahl Catalyst (OX)
661	Kodak Rapid Fixer, Parts A & B
2966	Lacquer (FL)
1467	Lactic Acid (C)
1920	Lactonitrile (P)
662	Lannate (P)
2967	Lanolin
2968	Lanthanum Carbonate
1584	Lanthanum Nitrate (OX)
663	Lanthanum Oxide (I)
2969	Lanthanum Trioxide
2970	Lanthionine
2971	Laquer Thinner (FL)
4259	Larvin (P)
664	Lasiocarpine (P)
2972	Lasix
2974	Lauric Acid
2973	Lauroyl Peroxide (OG)
2975	Lauryl Chloride
665	n-Lauroyl-Sarcosine (P)
2976	Lauryl Trimethylammonium Chloride
2977	Lead (P)
666	Lead Acetate (P, OE)
4300	Lead acid batteries (C)
667	Lead Arsenate (P)
2978	Lead Arsenite (P)
2979	Lead Borate (P)
2980	Lead Carbonate (P)
668	Lead Chloride (OB)
669	Lead Chromate (P)
670	Lead Citrate
2981	Lead Cyanide (P)
2982	Lead Dioxide (OX)
2983	Lead Fluoborate (OB)
2984	Lead Fluoride (OB)
1583	Lead Hydroxide
2985	Lead Iodide (OE)
2986	Lead Monoxide
2987	Lead Naphthenate
671	Lead Nitrate (OX)
2988	Lead Nitrite (OX)
673	Lead Oxide,Red (P)
672	Lead Oxide,Yellow (P)
2989	Lead Peroxide (OX)
674	Lead Phosphate (P)
2990	Lead Sterate (OE)
675	Lead Subacetate (P)
2991	Lead Sulfate (OE)
2992	Lead Sulfide
2993	Lead Telluride
2994	Lead Thiocyanate (OE)
1921	Leptophos (P)
2995	Leucinamide Hydrochloride
2996	Leucine (*)
4028	Levomoramide
4104	Levomethorphan
4105	Levorphanol
3940	Levorphanol Tartrate
4029	Levophenacylmorphan
2997	Levulinic Acid (C)
1922	Lewisite (P)
1753	Lidocaine (I)
2998	Ligroin
2999	Lime (Calcium Oxide) (C)
677	Lime-Away
679	Lindane (P, OA)
1620	Linuron (*)
681	Liquified Petroleum Gas (LPG) (FG)
3000	Lithium (FS, P)
3001	Lithium Acetate (P)
3002	Lithium Aluminum Hydride (FS, P)
3003	Lithium Amide (FS, P)
3004	Lithium Borofluorate (P)
3005	Lithium Borohydride (FS, P)
1547	Lithium Bromide (P)
682	Lithium Carbonate (P)
683	Lithium Chloride (P)
3006	Lithium Chromate (P, OE)
1654	Lithium Dodecyl Sulfate (P)
3007	Lithium-Ferrosilicon (FS, P)
3008	Lithium Fluoride (P)
684	Lithium Hydride (FS, R, P)
685	Lithium Hydroxide (C, P)
3009	Lithium Hypochlorite (P, OX)
686	Lithium Nitrate (P, OX)
3010	Lithium Perchlorate (P)
3011	Lithium Peroxide (P, OX)
3012	Lithium Silicon (FS, P)
687	Lithium Sulfate (P)
4145	Loprazolam
3941	(+/-)-Lorazepam
3942	Lormetazepam
3013	Lu Dox
3014	Luminal
3015	Lutidine (FL)
3016	Lye (Sodium Hydroxide) (C)
3017	Lyphogel
3943	D-Lysergic Acid
4125	Lysergic acid amide

Appendix G. Hazardous Materials Table

4079	Lysergic acid diethylamide
3018	Lysine (*)
3019	Lysine Thiohydantoin
3021	Magnesium Aluminum Phosphide (FS)
3022	Magnesium Aluminum Powder (FS)
3023	Magnesium Arsenate (P)
690	Magnesium Blue
3024	Magnesium Carbonate (*)
3025	Magnesium Chloride (*)
3026	Magnesium Citrate (*)
693	Magnesium Dust or Metal (FS, R)
3027	Magnesium Fluoride (P)
3028	Magnesium Fluosilicate
3029	Magnesium Lactate (*)
694	Magnesium Nitrate (OX)
3030	Magnesium Oxide (*)
3031	Magnesium Perchlorate (OX)
3032	Magnesium Peroxide (OX)
3033	Magnesium Phosphate (*)
1552	Magnesium Phthalocyanine
3034	Magnesium Silicofluoride
3035	Magnesium Stearate
3036	Magnesium Sulfate (*)
3037	Magnesium Trisilicate
3038	Magnesium Zirconate
1597	Malachite Green (P)
697	Malathion (P)
698	Maleic Acid (OA)
699	Maleic Anhydride (C, P)
3039	Maleic Hydrazide (P)
3040	Malic Acid (I)
700	Malonaldehyde
3041	Malonic Acid (C)
1923	Malononitrile (P)
3042	Mandelamine
3043	Manganese
701	Manganese Chloride (*)
4260	Manganese dimethyldithiocarbamate (P)
3045	Manganese Dioxide (OX)
3046	Manganese Naphthenate
3047	Manganese Nitrate (OX)
3044	Manganese (IV) Oxide (OX)
688	Manganese Sulfate (*)
1701	Manganese Sulfate Monohydrate (I)
3048	Manganese Sulfide (*)
704	Manganese Tetroxide
3049	Manganous Chloride (*)
3050	Mannite (*)
4080	Marijuana
3051	Mayors Reagent
3052	MDI
4146	Mebutamate
4091	Mecloqualone
2042	Mechlorethamine
3944	Medazepam
3053	MEK (FL, P)
3054	Melamine
706	Melphalan (P)
3055	Menadione (P)
707	Menthol
3945	Meperidine Hydrochloride
3946	Mephobarbital
3947	Meprobamate
2043	Mephosfolan (P)
3056	Mercaptoacetic Acid (OA)
3057	Mercaptoacetic Acid, Sodium Salt

1548	2-Mercaptobenzothiazole
3059	Mercaptoethane Sulfonic Acid (C)
708	2-Mercaptoethanol (FL)
3060	Mercaptophenol (P)
3061	Mercaptopropionic Acid (C)
1468	Mercaptosuccinic Acid
1924	Mercuric Acetate (P)
3062	Mercuric Ammonium Chloride (P)
3063	Mercuric Benzoate (P)
3064	Mercuric Bromide (P)
709	Mercuric Chloride (P)
3065	Mercuric Cyanide (P)
1585	Mercuric Iodide (P)
3066	Mercuric Nitrate (P)
3067	Mercuric Oleate (P)
710	Mercuric Oxide (P)
3068	Mercuric Oxycyanide (P)
3069	Mercuric Perchlorate (OX)
3070	Mercuric Potassium Cyanide (P)
3071	Mercuric Potassium Iodide (P)
3072	Mercuric Salicylate (P)
3073	Mercuric Subsulfate (P)
3074	Mercuric Sulfate (P)
3075	Mercuric Sulfide (P)
3076	Mercuric Sulfocyanate (P)
3077	Mercuric Thiocyanate (P)
3078	Mercurochrome
3079	Mercurous Acetate (P)
3080	Mercurous Bromide (P)
3081	Mercurous Chloride
3082	Mercurous Gluconate (P)
3083	Mercurous Iodide (P)
1553	Mercurous Nitrate (P)
3084	Mercurous Oxide (P)
3085	Mercurous Sulfate (P)
712	Mercury (C)
711	Mercury-Aryl & Inorganic Compounds (P)
713	Mercury-Organo(alkyl) Compounds (P)
714	Merphalan (P)
3087	Merthiolate (P)
3948	Mescaline Hemisulfate
3949	Mescaline Hydrochloride
3950	Mescaline Sulfate
715	Mesityl Oxide (FL)
716	Mestranol (P)
717	Mesurol (P)
1759	Metalaxyl
4262	Metam sodium (P)
4106	Metazocine
718	Metam-Sodium
3088	Methacrolein (FL)
1925	Methacrolein Diacetate
720	Methacrylic Acid
1926	Methacrylic Anhydride
1927	Methacrylonitrile (FL, P)
2044	Methacryloyl Chloride
1929	Methacryloyloxyethyl Isocyanate
3951	Methadone Hydrochloride
3952	Methadone-d3 Hydrochloride
721	Methamidophos (P)
3953	DL-Methamphetamine Hydrochloride
3954	(+) Methamphetamine Hydrochloride
3955	(-) Methamphetamine Hydrochloride
3956	DL-Methamphetamine-d5 Hydrochloride
722	Methane (FG)
723	Methanesulfonic Acid

Appendix G. Hazardous Materials Table

3089	Methanesulfonic Acid, Ethyl Ester (C, P)
1930	Methanesulfonyl Fluoride (P)
3090	Methanethiol (P)
3091	Methanoic Acid (C, P)
3092	Methanol (FL, P)
3093	Methapyrilene (P)
3957	Mehaqualone Free Base
3958	Methaqualone-d4
724	Methenamine
1931	Methidathion (P)
725	Methiocarb (P)
3094	Methionine (*)
1470	Methionine-dl-Sulfoximine
4147	Methohexital
726	Methomyl (P)
727	Methoxsalen (P)
4073	4-Methoxyamphetamine
4265	2-(Methoxy carbonylamino)-benzimidazole (P)
728	Methoxychlor (P, OE)
729	2-Methoxyethanol
730	Methoxyethyl Acetate
3095	Methoxyethyl Ether
1932	Methoxyethylmercuric Acetate
1744	Methoxyflurane (FL)
4074	5-Methoxy-3,4-methylenedioxy-amphetamine
731	4-Methoxyphenol
3096	Methoxypropanol (FL)
3097	Methoxystyrene (FL)
732	Methyl Acetate (FL)
3098	Methyl Acetone (FL)
733	Methyl Acetylene
734	Methyl Acetylene-Propadiene
735	Methyl Acrylate (FL)
773	Methylacrylonitrile (FL, P)
1928	Methylacryloyl Chloride (FL)
774	Methylal (FL)
736	Methyl Alcohol (FL, P)
775	Methylamine (FL)
776	p-Methylaminophenol Sulfate (P)
3099	Methyl Aminopropane Sulfonic Acid (C)
3133	Methylamyl Acetate (FL)
761	Methyl n-Amyl Ketone (CL)
3134	Methylaniline (FL)
737	N-Methyl Aniline (CL)
3135	2-Methylaziridine (P)
777	Methylazoxymethanol (P)
3136	Methylazoxymethanol sulfate (P)
705	1-Methylaziridine
738	Methyl Benzoate (I)
739	Methyl Bromide (P)
3137	1-Methylbutadiene (FL, P)
3101	Methyl Butene (FL)
762	Methyl n-Butyl Ketone
3102	Methyl Butyrate (FL)
740	2-Methyl Butyric Acid
3103	Methyl Caprylate (FL)
4226	Methylcarbamic acid, 3-methylphenyl ester (P)
4227	Methylcarbamic acid, monosodium salt (P)
4228	Methylcarbamic acid, monopotassium salt (P)
3104	Methyl Carbonate (FL)
741	Methyl Cellosolve (FL, C)
742	Methyl Cellosolve Acetate (FL, C)
3138	Methylcellulose (*)
743	Methyl Chloride (FG, P)
1933	Methyl 2-Chloroacrylate
3105	Methyl Chlorocarbonate (FL, P)

744	Methyl Chloroform (FL, P)
1934	Methyl Chloroformate (FL, P)
745	Methyl Chloromethyl Ether (FL, P)
3139	3-Methylcholanthrene (P)
778	Methyl Cyanide (FL)
771	Methyl-2-Cyanoacrylate
1782	Methylcyclohexane (FL)
780	Methylcyclohexanol
781	Methylcyclohexanone
782	Methylcyclopentadienyl Manganese Tricarbonyl
3140	Methylcyclopentane (FL)
3107	Methyl Cyclopentanol
4061	Methyldesorphine
746	Methyl Demeton (P)
3108	Methyl Dichloroacetate (C)
3109	Methyl Dichlorosilane (FL)
4062	Methyldihydromorphine
4075	4-Methyl-2,5-dimethoxy-amphetamine
1935	Methyl Disulfide (FL)
3145	Methylenebisacrylamide (P)
791	N,N'-Methylene-bis-Acrylamide (P)
787	4,4'-Methylene-bis(2-Chloroaniline) (P)
783	Methylene Bis(4-Cyclohexylisocyanate)
3143	4,4'-Methylenebis (N,N-dimethylaniline) (P)
789	4,4'-Methylene-bis-(N,N-Dimethyl)-Benzenamine
788	4,4'-Methylene-bis(2-Methylaniline) (P)
784	Methylene Bisphenyl Isocyanate
3144	2,2-Methylenebis(3,4,6-trichlorophenol)
3141	Methylene Blue (P)
3142	Methylene Bromide (FL, P)
785	Methylene Chloride (FL, P)
786	4,4'-Methylene Dianiline (P)
3959	3,4-Methylenedioxyamphetamine Hydrochloride
3960	3,4-Methylenedioxymethamphetamine HCL
4222	2-(1-Methylethoxy)-phenol methyl carbamate (P)
3110	Methyl Ethyl Ether (FL)
747	Methyl Ethyl Ketone (FL, P)
748	Methyl Ethyl Ketone Peroxide (OG, P)
4223	3-(1-Methylethyl)-phenol, methyl carbamate (P)
4266	1-Methyl ethylphenyl carbamate (P)
4030	3-Methylfentanyl
749	Methyl Formate (FL)
3146	Methylglycine
750	Methyl Hydrazine (FL, P)
816	Monomethyl Hydrazine (FL, P)
792	3-Methylindole
751	Methyl Iodide (FL, P)
752	Methyl Isoamyl Ketone
753	Methylisobutylcarbinol (CL)
754	Methyl Isobutyl Ketone (FL, P)
3111	Methyl Isobutyl Ketone Peroxide (OG)
755	Methyl Isocyanate (FL, P)
3112	Methyl Isopropenyl Ketone (FL)
756	Methyl Isopropyl Ketone
1936	Methyl Isothiocyanate (FL)
3113	Methyl Lactate
1707	Methyllactic Acid
3148	2-Methyllactonitrile (P)
3114	Methyl Lithium (in Ether) (FL, P)
757	Methyl Mercaptan (P, PA)
1401	Methylmercuric Acetate
1941	Methylmercuric Dicyanamide
758	Methyl Mercuric Hydroxide (P)
3964	4-Methylpiperidine
759	Methyl Methacrylate (FL, P)
760	Methyl Methanesulfonate (P)

Appendix G. Hazardous Materials Table

3115	Methyl Morpholine
3150	1-Methylnaphthalene (P)
1655	2-Methylnaphthalene
3127	2-Methyl-1,4-naphthoquinone
770	2-Methyl-1-Nitroanthraquinone (P)
772	N-Methyl-N'-nitro-N-nitrosoguanidine (FS, P)
3131	Methyl-n-nitroso-p-toluene sulfonamide
3151	Methylpentadiene (FL)
1705	Methyl Orange (P)
763	Methyl Parathion (P)
3116	Methyl Pentane (FL)
3129	4-Methyl-2-pentanone (P)
3961	1-Methylpiperidine
3952	2-Methylpiperidine
3953	3-Methylpiperidine
4085	N-Methyl-3-piperidyl benzilate
3965	Methylphenidate Hydrochloride
1937	Methyl Phenkapton
4111	1-Methyl-4-phenylpiperidine-4-carboxylic acid
4032	1-Methyl-4-Phenyl-4-Propionoxypiperidine
3117	Methyl Phenyl Pyrazolinone
2011	2-Methylphenyl Thiourea
1938	Methyl Phosphonic Dichloride (C, P)
3128	2-Methyl-1-propanol (FL, P)
3130	2-Methyl-2-propenenitrile (FL, P)
3118	Methyl Propionate (FL)
764	Methyl Propyl Ketone (FL)
1706	Methyl Red (P)
1402	5-Methylresorcinol
3119	Methyl Salicylate (*)
766	Methyl Silicate (*)
767	alpha-Methyl Styrene
3120	Methyl Succinic Acid Anhydride
3121	Methyl Sulfate (C)
3122	Methyl Sulfide (FL)
3123	Methyl Sulfone
3124	Methyl Sulfoxide (FL)
1939	Methyl Thiocyanate (FL)
794	Methylthiouracil (P)
1942	Methyltrichlorosilane (FL)
1940	Methyl Vinyl Ketone (FL)
1980	2-Methyl-5-vinylpyridine (FL, P)
1471	Methyl Viologen
3125	Methyl Zimate
3966	Methyprylon
1621	Metolachlor
1943	Metolcarb (P)
4097	Metopon
795	Metribuzin
796	Metronidazole (P)
797	Mevinphos (P)
1944	Mexacarbate (P)
1806	Michler's ketone (P)
3153	Miclomycin C (P)
4148	Midazolam
800	Mikroklone DF (C)
801	Mineral Oil (CL)
1743	Mineral Spirits (CL)
3154	Mipalox (OA)
803	Miral (P)
804	Mirex (P)
805	Mitomycin C (P)
4267	Molinate (P)
3155	Molybdenum Pentachloride (OB)
3156	Molybdenum Trioxide
810	Molybdic Acid (I)
3157	Molybdic Anhydride (P)
811	Monensin
812	Monocrotaline (P)
813	Monocrotophos (P)
3162	Monoplex
3163	Mops (P)
3164	Morin
4031	Morpheridine
4063	Morphine Methylbromide
4064	Morphine Methylsulfonate
3967	Morphine Sulfate
3968	Morphine-d3 Hydrochloride
3969	Morphine-3-beta-D-glucuronide
3970	Morphine-6-beta-D-glucuronide
817	Morpholine (FL)
3166	Moth Balls (Naphthalene) (OA)
819	Motor Grease
3167	Motor Oil (CL)
4268	MTMC (P)
3168	MTT Tetrazolium
820	Muriatic Acid (C)
1704	Murexide
1945	Muscimol
821	Mustard Gas (P)
4066	Myrophine
822	Nacconal NRSF
3174	Nadic Methyl Anhydride
823	Nafenopin (P)
824	Naled (P, OE)
3971	Nalorphine Hydrochloride
825	Naphtha (CL, FL, C)
826	Naphthalene (FS, P)
1622	Naphthalene Acetic Acid (P)
1549	1,3-Naphthalenediol
1550	2,7-Naphthalenediol
3175	Naphthalenedisulfonic Acid (C)
3185	1,4-Naphthalenedione (P)
4269	1-Naphthalenol methylcarbamate (P)
3176	1-Naphthalenylthiourea (P)
3177	Naphthenic Acid (OE)
832	1-Naphthol (P)
833	2-Naphthol (P)
1656	Naphthol Blue Black
3178	1,2-Naphthoquinone-4-sulfonic Acid
828	Naphthyl Acetate
3180	1-Naphthylamine (P)
829	alpha-Naphthylamine (P)
3181	2-Naphthylamine (P)
1785	beta-Naphthylamine (P)
3179	Naphthylamine Hydrochloride
3182	1,5-Naphthylenediamine (P)
1598	N-1-Naphthylethylenediamine Di-HCL (P)
1649	Naphthyl Isothiocyanate
3186	1,4-Naphthoquinone (P)
4270	1-Naphthyl methyl carbamate (P)
80	alpha-Naphthylthiourea (P)
831	Naptalam
834	Narasin
1386	Nembutal
3187	Neodymium Oxide
3188	Neohexane (FL)
3189	Neomycin Sulfate (*)
835	Neon (NFG)
3190	Nepheline
3191	Nessler's Solution
3192	Niacinamide

3193	Nickel Acelate
3194	Nickel Ammonium Sulfate (OE)
838	Nickel Carbonyl (FL P)
1708	Nickel Chloride (P, OE)
3195	Nickel Chromium Fluoride
3196	Nickel Cyanide (P)
3197	Nickel Dibutyldithiocarbonate
1807	Nickel Dust or Metal (FS, P)
3198	Nickel Fluoride
3199	Nickel Hydroxide (C)
1709	Nickel Nitrate (P, OX)
3200	Nickel Oxide
1551	Nickel Phthalocyanide (P)
840	Nickel Subsulfide (P)
1540	Nickel Sulfate (P, OE)
836	Nickel Sulfide (P)
3201	Nickel Tetracarbonyl (FL, P)
3202	Niclosamide
4067	Nicocodeine
4068	Nicomorphine
3203	Nicotinamide
841	Nicotine (P)
3204	Nicotine Hydrochloride (P)
3205	Nicotine Salicylate (P)
1946	Nicotine Sulfate (P)
3206	Nicotine Tartarate (P)
3207	Nicotinic Acid (P)
3208	Nigrosin
4149	Nimetazepam
1357	Ninhydrin (I)
3209	Niobium Diselinide
3210	Niobium Oxide
842	Niridazole (P)
3211	Nithiazide (P)
843	Nitrapyrin
3972	Nitrazepam
844	Nitric Acid (C)
3212	Nitric Ether (FL)
845	Nitric Oxide (P)
887	Nitrilotriacetic Acid (P)
1403	2,2,2'-Nitrilotriethanol (P)
848	5-Nitroacenaphthene (P)
3216	Nitroacetophenone
849	p-Nitroaniline (P)
3214	Nitro-o-anisidine (P)
847	5-Nitro-o-Anisidine (P)
3217	Nitrobenzamide
850	Nitrobenzene (FL, P)
3218	Nitrobenzoic Acid (I)
1646	Nitrobenzyl Pyridine
851	4-Nitrobiphenyl (P)
3213	Nitro Blue Tetrazolium (P)
3219	Nitrocellulose (FL, FS)
3220	o-Nitrochlorobenzene (P)
852	Nitrochlorobenzene, meta or para (P)
2045	Nitrocyclohexane (P)
853	Nitroethane (FL)
3221	Nitrofen (P)
3222	Nitrofuran
846	N-(4-(5-Nitro-2-Furanyl)-2)-Thiazolyl Acetamide
3223	Nitrofurazone
854	1-[(Nitrofurfurylidene)amino]-2-imidazolidinone
855	Nitrogen (NFG)
856	Nitrogen Dioxide (P)
857	Nitrogen Mustard (P)
858	Nitrogen Mustard N-Oxide (P)

859	Nitrogen Trifluoride (NFG)
4176	Nitroglycerin (P)
861	Nitromethane (FL)
1808	1-Nitronaphthalene (P)
1809	2-Nitronaphthalene (P)
3224	p-Nitrophenetole
862	Nitrophenol (P, OE)
3225	4-Nitrophenol (P, OE)
863	p-Nitrophenol (P, OE)
1811	2-Nitro-p-Phenylenediamine (P)
1474	p-Nitrophenyl-b-d-glucoside
1475	p-Nitrophenyl-b-d-maltoside
1476	p-Nitrophenyl-b-d-xylopyranoside
3226	Nitrophenylhydrazine (P)
2050	4-Nitrophenyl-O-phenyl methylphosphonothioal
3227	Nitrophthalic Acid
3228	Nitrophthalic Anhydride
864	1-Nitropropane (FL)
865	2-Nitropropane (FL, P)
1810	Nitropyrenes (mono, di, tri, tetra isomers) (P)
3229	4-Nitropyridine-1-oxide
874	p-Nitrosodiphenylamine (P)
869	N-Nitrosodi-n-butylamine (P)
871	N-Nitrosodiethanolamine (P)
872	N-Nitrosodiethylamine (P)
873	N-Nitrosodimethylamine (P)
870	N-Nitrosodi-n-propylamine (P)
866	N-Nitroso-N-ethylurea (P)
875	Nitrosoguanidine (FS, P)
876	N-Nitrosomethylethylamine (P)
867	N-Nitroso-N-methylurea (P)
868	N-Nitroso-N-methylurethane (P)
877	N-Nitrosomethylvinylamine (P)
878	N-Nitrosomorpholine (P)
879	N-Nitrosonornicotine (P)
3173	N-Nitroso-N-phenylhydroxylamine, Ammonium
880	N-Nitrosopiperidine (P)
881	N-Nitrosopyrrolidine (P)
882	N-Nitrososarcosine (P)
4157	Nitrosyl Chloride (R, C, P)
883	Nitrotoluene (FL)
3215	5-Nitro-o-toluidine (P)
3230	Nitrous Ether (FL)
884	Nitrous Oxide (NFG)
885	Nonane (FL)
1508	Nonanol
1657	Nonenyl Succinic Anhydride (I)
3231	Nonyltrichlorosilane (C)
4033	Noracymethadol
3232	Noradrenaline
1948	Norbormide (P)
3973	Norcodeine Hydrochloride
3974	ll-Nor-tetrahydrocannibinol-9-carboxylic Acid
3233	Nordihydroguaiacetic Acid
4150	Nordiazepam
886	Norethisterone
4034	Norlevorphanol
4035	Normethadone
3975	Noroxymorphone
4036	Norpipanone
3234	Norvaline (*)
1477	Novobiocin
3239	Octachlorocamphene (P, OA)
888	Octachloronaphthalene
4169	Octachlorostyrene (P)
3240	Octadecylamine

Appendix G. Hazardous Materials Table

3241	Ocladecyllrichlorosilane (C)
1690	Octamethyldiphosphoramide (P)
3242	Octamethylpyrophosphoramide (P)
889	Octane (FL)
894	1-Octanol (CL)
3243	Octyl Alcohol (FL)
3244	Octyltrichlorosilane (C)
890	Oestradiol-17B
1787	Oil (petroleum base) (CL, FL, C)
892	Oil Orange SS (P)
893	Oil Red O
3245	Oleic Acid (I)
3246	Olein
3976	Opium Powder
3247	Orcein
3248	Orcinol Monohydrate (I)
1949	Organorhodium Complex
3249	Ornithine Hydrochloride (*)
895	Orthene
896	Ortho X-77 Spreader
3250	Osmium Oxide (P, OX)
897	Osmium Tetroxide (P)
1950	Ouabain (P)
3252	Oxalacetic Acid
898	Oxalic Acid (C)
3253	Oxamic Acid
900	Oxamyl (P)
4151	Oxazepam
3977	Oxazolam
3254	Oxidase
3255	Oxirane (P)
3256	Oxophenyl Arsine (P)
4221	2,2-Oxybis-ethanol, dicarbamate (P)
901	Oxyfluorfen (*)
3978	Oxycodone Hydrochloride
902	Oxydemeton-Methyl (P)
1613	4,4'-Oxydianiline (P)
3257	2,2-Oxydiethanol (FL)
1958	10,10'-Oxydi-Phenoxarsine
1952	Oxydisulfoton (P)
904	Oxygen (NFG)
903	Oxygen Difluoride (P)
905	Oxymetholone (P)
1749	Oxymorphone
3258	Oxyquinoline
3259	Oxytocin
906	Ozone (NFG)
1404	Pactamycin
3260	Paint (FL)
1556	Palladium Sulfate (*)
3261	Palmitoyl Chloride
3262	Pancreatin
908	Panfuran S (P)
3263	Pantethine
3264	Papain (*)
3265	Papanicolaou Stain
1432	p-Aminobenzoic Acid
3266	Paraffin Oil (FL)
910	Paraffin Wax (*)
911	Paraformaldehyde (FS)
4082	Parahexyl-7374
3267	Paraldehyde (FL, P)
3268	Paramethane Hydroperoxide (OG)
1569	Paraoxon (P)
912	Paraquat (P)
1953	Paraquat Methylsulfate

913	Parathion (P)
1954	Parathion-Methyl
1955	Paris Green
914	Parlodion (FS)
4271	Pebulate (P)
3979	Pemoline
1405	Penicillin And Salts (*)
915	Pentaborane (FL, P)
3269	Pentachlorobenzene (P)
3270	1,2,3,7,8-Pentachlorodibenzo-p-dioxin
3271	Pentachloroethane (P)
916	Pentachloronaphthalene
917	Pentachloronitrobenzene (P)
918	Pentachlorophenol (P, OE)
2046	Pentadecylamine
3272	1,3-Pentadiene (FL, P)
919	Pentaerythritol (*)
920	Pentane (FL)
3273	Pentanedione (FL)
3274	Pentanoic Acid (C)
1503	1-Pentanol (FL)
3275	3-Pentanol (FL)
921	2-Pentanone (FL)
3980	Pentazocine Free Base
3981	Pentazocine Hydrochloride
3982	Pentobarbital
3983	Pentobarbital Sodium
3276	Pentylamine (FL)
3277	Pepsin (*)
922	Peracetic Acid (OG, P)
923	Perchloric acid (C)
3278	Perchlorobenzene
924	Perchloroethylene (FL, OA)
925	Perchloromethyl Mercaptan (P)
926	Perchloryl Fluoride
1644	Perfix
1500	Perfluoroheptane
1501	Perfluorohexane
1499	Perfluorooctane
1406	Periodic Acid (OX)
927	Perlite
928	Perma-Fluor
3279	Permanganate Solution (OX)
929	Permethrin (P)
1642	Permount (P)
3280	Permutit
3281	Peroxyacetic Acid (OG, P)
4152	Petrichloral
932	Petroleum Distillates (FL, C)
933	Petroleum Ether (FL)
3282	Petroleum Naphtha (FL)
4083	Peyote
935	Phenacetin (P)
4038	Phenadoxone
4039	Phenampromide
3284	Phenanthrenequinone (I)
1382	Phenanthroline
1479	1,10-Phenanthroline (*)
3285	1,10-Phenanthroline Hydrochloride
1478	Phenazine Methosulfate (P)
4112	Phenazocine
936	Phenazopyridine (P)
937	Phenazopyridine Hydrochloride (P)
3984	Phencyclidine Hydrochloride
3985	Phencyclidine-d5 Hydrochloride
4123	Phendimetrazine

Appendix G. Hazardous Materials Table

3986	Phendimetrizine Bitartrate
3286	Phenesterin (P)
3287	Phenethylamine (FL)
4037	1-(2-Phenethyl)-4-Phenyl-4-Acetoxypiperidine
3288	p-Phenetidine
938	Phenmedipham & Desmediphan (1:1)
4117	Phenmetrazine
3289	Phenobarbitol (P)
939	Phenol (P)
1480	Phenol Red (P)
2047	3-(1-Methylethyl)-Phenol Methylcarbamate
940	Phenolphthalein (I)
3290	Phenolphthalein Disulfate (P)
4040	Phenomorphan
3291	p-Phenolsulfonic Acid (C)
4041	Phenoperidine
1481	Phenosafranine
941	Phenothiazine
1814	Phenoxyacetic acid herbicides (P)
942	Phenoxybenzamine (P)
1641	2-Phenoxyethanol
3987	Phentermine Hydrochloride
3296	Phenylacetaldehyde (FL)
3986	Phenylacetone
3989	3-Phenylacetylamino-2,6-piperidinedione
3297	Phenylalanine (*)
950	Phenylarsine Oxide (P)
3298	Phenylarsonic Acid
3299	Phenylbutazone (P)
4229	Phenylcarbamic acid, 1-methylethyl ester (P)
4119	1-Phenylcyclohexylamine
4089	(1-Phenylcyclohexyl)ethylamine
4090	1-(1-Phenylcyclohexyl)-pyrrolidine
1959	Phenyl Dichloroarsine (P)
951	Phenylenediamine (P)
952	Phenylenediamine Dihydrochloride (OA)
1536	Phenylephrine
944	Phenyl Ether
945	Phenyl Ether-Biphenyl Mixture
3300	Phenylethylamine (FL)
946	Phenyl Glycidyl Ether (P)
3301	Phenylglycine
3302	Phenylglyoxal Monohydrate
953	Phenylhydrazine (P)
1960	Phenylhydrazine Hydrochloride (P)
954	Phenyl Isothiocyanate (P)
3293	Phenyl Lactic Acid
947	Phenyl Mercaptan (P)
955	Phenylmercuric Acetate (P)
956	PhenylmethylsulfonylFluoride (P)
949	N-Phenyl-beta-Naphthylamine (P)
3294	Phenyl Mustard Oil (FL)
3303	Phenylphenol (I)
957	Phenylphosphine
3304	Phenylpropyl Aldehyde (P)
3305	Phenylpyrazolidone
1483	Phenylpyruvic Acid
3295	Phenyl Salicylate (I)
1962	Phenylsilatrane (P)
1963	Phenylthiourea (P)
3306	Phenyltrichlorosilane (C)
3307	Phenylurea (P)
958	Phenylvaleric Acid
943	Phenytoin (P)
3308	Phenytoin Sodium (P)
3309	Phloroglucinol (P)

4069	Pholcodine
959	Phorate (P)
1519	Phorbol Myristal Acetate (P)
2034	Phosazetim (P)
1964	Phosfolan (P)
960	Phosgene (P)
961	Phosmet (P)
1965	Phosphamidon (P)
964	Phosphine (P)
965	Phosphomolybdic Acid (C)
966	Phosphonotrithioate
967	Phosphoric Acid (C)
3310	Phosphoric Anhydride (C)
3311	Phosphoric Oxide (C)
968	Phosphorus Pentoxide (C)
3312	Phosphorus Bromide (C)
3313	Phosphorus Chloride (C)
3314	Phosphorus Heptasulfide (FS)
3315	Phosphorus Oxybromide (C)
971	Phosphorus Oxychloride (R, C)
972	Phosphorus Pentachloride (R, C)
973	Phosphorus Pentasulfide (FS, R P)
969	Phosphorus, Red (FS, P)
3316	Phosphorus Sesquisulfide (FS)
3317	Phosphorus Sulfide (FS, P)
3318	Phosphorus Tribromide (C)
974	Phosphorus Trichloride (R, C)
3319	Phosphorus Trisulfide (FS)
970	Phosphorus, Yellow (FS, P)
3320	Phosphoryl Chloride (C)
1586	Phosphotungstic Acid (C)
1407	Phospray
3321	Phosvel (P)
1375	Photo Resist
3322	Phthalaldehyde (P)
975	Phthalic Acid (*)
976	Phthalic Anhydride (P)
3323	Phthalicdicarboxaldehyde
977	m-Phthalodinitrile
3324	Phthalonitrile
1966	Physostigmine (P)
3636	Physostigmine, Salicylate (1:1) (P)
3325	Phytic Acid (P)
978	Picloram
3326	2-Picoline (P)
979	Picric Acid (FS)
3327	Picrolonic Acid
1968	Picrotoxin (P)
3328	Pigments (P)
4113	Piminodine
4153	Pinazepam
980	Pindone
3329	Pine Oil (CL)
3330	Pinene
3331	Piperazine (C)
982	Piperazine Dihydrochloride
1408	Piperidine (FL)
3990	cis-2,3-Piperidinedicarboxylic Acid
3991	cis-2,4-Piperidinedicarboxylic Acid
3992	cis-2,5-Piperidinedicarboxylic Acid
3993	cis-2,6-Piperidinedicarboxylic Acid
3994	Piperidine-4-sulfonic Acid
4120	1-Piperidinocyclohexanecarbonitrile
983	Piperonyl Butoxide
3332	Piperonyl Sulfoxide (P)
1969	Piprotal

1760	Pirimicarb (P)
1970	Pirimifos-Ethyl
4042	Pintamide
985	Platinum (FS)
3333	Platinum Chloride
3334	Plictran Miticide (P)
987	Poly-Kleen
3335	Polyacrylic Acid
1409	Polybrene
988	Polybrominated Biphenyls (P, OE)
989	Polychlorinated Biphenyls (P, OE)
3336	Polyclar AT Powder
3337	Polyglycol (Polyethylene Glycol Ester) (*)
3338	Polyoxyethylene Cetyl Ether (I)
3339	Polyoxyethylene Sorbitan Mono-oleate
3340	Polypropylene Glycol Ester
3341	Polysulfide Elastomer (P)
992	Polytetrafluoroethylene
993	Polyvinyl Alcohol
3342	Polyvinyl Sulfate
994	Polyvinylpyrrolidine (P)
3343	Ponceau MX (P)
3344	Ponceau 3R (P)
3345	Potash (*)
998	Potassium Acetate (*)
3346	Potassium Alum
3347	Potassium Arsenate (P)
1971	Potassium Arsenite (P)
3348	Potassium Biborate
3349	Potassium Bicarbonate (*)
999	Potassium Bichromate (P)
3350	Potassium Bifluoride (C)
3351	Potassium Biphthalate
3352	Potassium Bisulfate (C)
1000	Potassium Bisulfite
3353	Potassium Bitartarate
1587	Potassium Borate
3354	Potassium Borohydride (FS)
3355	Potassium Bromate (OX)
1001	Potassium Bromide (I)
3356	Potassium Carbonate (*)
1003	Potassium Chlorate (OX)
3357	Potassium Chloride (*)
1005	Potassium Chromate (OE)
3358	Potassium Citrate (*)
3359	Potassium Cyanate
1006	Potassium Cyanide (P)
1007	Potassium Dichromate (P)
4273	Potassium dimethyldithiocarbamate (P)
1008	Potassium Ferricyanide (P)
1009	Potassium Ferrocyanide (P)
1010	Potassium Flouride (OB)
1555	Potassium Fumarate
3360	Potassium Hydrogen Fluoride (C)
1011	Potassium Hydrogen Phthalate (*)
3361	Potassium Hydrogen Sulfate (OB)
1012	Potassium Hydroxide (C)
3362	Potassium Hypochlorite (C, P)
1411	Potassium Iodate (OX)
1013	Potassium Iodide (P)
3363	Potassium Lactate (*)
3364	Potassium Mercuric Iodide
3365	Potassium Metaperiodate (OX)
3366	Potassium Metabisulfate (C)
3367	Potassium Metabisulfite (C)
4275	Potassium N-methyldithiocarbamate (P)

1014	Potassium Metal (FS R)
1015	Potassium Nitrate (OX)
3368	Potassium Nitrite (OX)
1016	Potassium Oxalate
3369	Potassium Perchlorate (OX)
3370	Potassium Periodate (OX)
1017	Potassium Permanganate (OX)
3371	Potassium Peroxide (OX)
1714	Potassium Persulfate (OX)
3372	Potassium Phosphate (*)
3373	Potassium Propionate
3374	Potassium Pyrophosphate
3375	Potassium Pyrosulfate (C)
3376	Potassium Pyrosulfite (C)
3377	Potassium Silicofluoride
1972	Potassium Silver Cyanide (P)
3378	Potassium Sodium Tartrate (I)
3379	Potassium Sorbate
3380	Potassium Sulfate (*)
3381	Potassium Sulfide (FS)
1021	Potassium Sulfite
3382	Potassium Tartarate
3383	Potassium Tellurite
3384	Potassium Tetraborate (*)
1554	Potassium Thiocyanate
1715	Potassium Xanthogenate
1023	PPO (P)
3995	Prazepam
1525	Prazosin (P)
1024	Primiphosmethyl
3385	Procaine (I)
3386	Procaine Hydrochloride
1025	Procarbazine (P)
1026	Procarbazine Hydrachloride (P)
4043	Proheptazine
1027	Progesterone (P)
3387	Proline (*)
3388	Promazine Hydrochloride
1973	Promecarb (P)
1028	Pronamide (P)
1029	Propane (FG)
1030	1,3-Propane Sultone (P)
3390	Propanedinitrile (FL)
3391	Propanenitrile (FL, P)
3392	Propanoic Acid
1502	1-Propanol (FL)
1031	2-Propanol (FL)
3394	2-Propanone (FL, P)
1623	Propargite (OE)
1032	Propargyl Alcohol (FL, P)
1974	Propargyl Bromide (FL)
3396	2-Propenal (FL, P)
3395	2-Propen-1-ol (FL, P)
3397	2-Propenamide (P)
3398	Propenonitrile (FL, P)
3399	Propenoic Acid (C, P)
4044	Properidine
4276	Propham (P)
1510	Propionaldehyde (FL)
1034	Propionic Acid (C)
3400	Propionic Anhydride (C)
1035	Propionitrile (FL, P)
4045	Propiram
1036	Propoxur (P)
1033	beta-Propiolactone (CL, P)
1037	n-Propyl Acetate (FL)

Appendix G. Hazardous Materials Table

1038	Propyl Alcohol (FL)
4277	S-Propyl butyl(ethyl)thiocarbamate (P)
1039	n-Propyl Nitrate (FL)
3408	n-Propylamine (FL, P)
3402	Propyl Carbonate
1977	Propyl Chloroformate (FL)
4278	S-Propyl dipropylthiocarbamate (P)
1040	Propylene (FG)
1041	Propylene Dichloride (FL, P)
3409	Propylene Glycol (I)
1043	Propylene Glycol Dinitrate
1042	Propylene Glycol Monomethyl Ether (CL)
1045	Propylene Oxide (FL, P)
3410	Propylenediamine (FL, P)
1044	1,2-Propylenimine (FL, P)
3403	Propyl Formate (FL)
3404	Propyl Gallate (*)
3405	Propyl Mercaptan (FL)
1046	Propylthiouracil (P)
3406	Propyl Trichlorosilane (C)
3407	Propyl Zirconate
3412	2-Propyn-1-ol (FL, P)
4279	Prosulfocarb (P)
3413	Protamine
3414	Protamine Sulfate (*)
1047	Protargol
3415	Protease (skin/tissue Solubizer)
1541	Protexx (Mounting Fluid)
1978	Prothoate (P)
1048	Pruning Sealer
3416	Prussic Acid (P, PA)
4086	Psilocybin
4087	Psilocyn
3417	Pulegone
1412	Puromycin Dihydrochloride (P)
3418	PVC Cement (FL)
1484	Pyrazole (*)
1979	Pyrene
1764	Pyrenone
3419	Pyrethrins (OE)
1051	Pyrethrum (OE)
3420	4-Pyridinamine (P)
1052	Pyridine (FL, P)
3421	Pyridine-3-sulfonic Acid (C)
3422	Pyridoxine Hydrochloride (*)
1982	Pyriminil (P)
1053	Pyrogallic Acid (P)
1054	Pyrogallol (P)
3423	Pyromellitic Acid
3424	Pyromellitic Dianhydride
3425	Pyrosulfuryl Chloride (C)
3426	Pyroterlanc Acid
3427	Pyroxylin (FS)
3428	Pyrrolidine (FL)
3429	Pyruvic Aldehyde (I)
3430	Pyruvonitrile (FL)
3431	Quicklime (Calcium Oxide) (OB)
1057	Quinacrine Dihydrochloride
3432	Quinacrine Hydrochloride (P)
3433	Quinaldine (I)
3434	Quinhydrone (P)
1557	Quinic Acid
1056	Quinine Sulfate (P)
3435	Quinoline (FL)
1716	Quinolinol (P)
1058	Quinone

4046	Racemoramide
4114	Racemethorphan
4115	Racemorphan
1060	Regulaid
3437	Reinecke Salt
3438	Rennet Powder
3439	Rennin
3440	Resazurin (I)
1061	Reserpine (P)
3441	Resin Solid (P)
3442	Resin Solution (FL)
1376	Resist Developer
1377	Resist Microstrip
3443	Resmethrin (P)
1062	Resorcinol (P, OE)
3444	Rexyn 300 (C)
3445	Rhenium Selenide
1413	Rhodamine 6G
3446	Rhodamine B
3447	Rhodine
1063	Rhodium (FS)
1379	Rhodizonic Acid (*)
3448	Rochelle Salt
1064	Ronnel
3450	p-Rosaniline
3449	Rosaniline Hydrochloride
3451	Rose Bengal (P)
3452	Rosolic Acid
1067	Rotenone (P)
1069	Roundup Herbicide
1070	Rubber Solvent (Naphtha)
3453	Rubidium (FS)
1414	Rubidium Chloride
3454	Ruthenium
1815	Saccharin, Sodium Salt (P)
1073	Safety-Solve Counting Cocktail (FL)
1645	Safranin O (P)
1485	Safranine
1074	Safrole (P)
1983	Salcomine
3456	Salicylaldehyde
1562	Salicylhydroxamic Acid
1075	Salicylic Acid (P)
3457	Samarium Oxide
3458	Saponin (I)
1984	Sarin (P)
1076	Savey
3459	Sebacic Acid
3460	Sebaconitrile (FL)
3996	Secobarbital
3997	Secobarbital Sodium
3461	Selenic Acid, Liquid (C)
1985	Selenious Acid (C, P)
1078	Selenium (P)
3462	Selenium Dioxide (P)
3463	Selenium Disulfide (P)
1079	Selenium Hexafluoride
3464	Selenium Oxide (P)
1986	Selenium Oxychloride (C)
1080	Selenium Sulfide (P)
4281	Selenium, tetrakis(dimethyldithiocarbamate) (P)
3465	Selenourea (P)
3466	Semicarbazide (P)
1486	Semicarbazide Hydrochloride (P)
3467	Separan AP 30
3468	Sephadex (*)

Appendix G. Hazardous Materials Table

3469	Sepharose
3470	Senne (*)
3471	Sesame Oil
1081	Sesone
1082	Sethoxydim
1083	Sevin (P)
1084	Sigmacote
1374	Silane (FG)
3472	Silica (*)
1085	Silica Cristoballite
1093	Silicic Acid (*)
3473	Silicofluoric Acid (C)
3474	Silicon (FS)
3475	Silicon Carbide
3476	Silicon Chloride (C)
3477	Silicon Oxide (*)
3478	Silicon Tetrachloride (C)
1096	Silicon Tetrahydride (FG)
3479	Silicone (*)
3480	Silver (FS)
3481	Silver Acetate (P)
3482	Silver Chloride (P)
3483	Silver Cyanide (P)
3484	Silver Iodate
3485	Silver Lactate
1098	Silver Nitrate (OX)
3486	Silver (II) Oxide (P)
3487	Silver Perchlorate (OX)
3488	Silver Sulfate (I)
3489	Silvex (P)
1099	Simizine (*)
3490	Soda Lime (C)
1486	Sodium 2,6-Dichloro-Benzenoneindophenol (I)
1103	Sodium Acetate (*)
3492	Sodium Aluminate (OB)
3493	Sodium Aluminum Hydride (FS)
1105	Sodium Amide (FS, R)
3494	Sodium Ammonium Phosphate (*)
1987	Sodium Arsenate (P)
1106	Sodium Arsenite (P)
3495	Sodium Ascorbate (*)
1107	Sodium Azide (P)
1108	Sodium Barbital
3497	Sodium Benzene Sulfonate
1487	Sodium Benzoate (I)
3498	Sodium Bifluoride (C)
3499	Sodium Bismuthate
3500	Sodium Bisulfate (C)
1110	Sodium Bisulfite (C)
3501	Sodium Borate (*)
1415	Sodium Borohydride (FS)
3502	Sodium Bromate (OX)
1112	Sodium Bromide (I)
1988	Sodium Cacodylate (P)
1564	Sodium Calcium Hydrate
3503	Sodium Carbonate (*)
1563	Sodium Chlorate (OX)
3504	Sodium Chloride (*)
3505	Sodium Chlorite (OX)
3506	Sodium Chromate (OX)
3507	Sodium Citrate (*)
1559	Sodium Cobaltinitrate (OX)
3509	Sodium Cobaltinitrite (OX)
1117	Sodium Cyanide (P)
3510	Sodium Cyanoborohydride (FS)
3511	Sodium Deoxycholate
3512	Sodium Diatrizoate
4282	Sodium Dibutyldithiocarbamate (P)
3513	Sodium Dichlorophenol-6-sulfonate
1118	Sodium Dichromate (OA)
1119	Sodium Diethyldithiocarbamate (P)
4283	Sodium Dimethyldithiocarbamate (P)
1120	Sodium Diphosphate
1121	Sodium Dithionite (FS)
1122	Sodium Dodecyl Sulfate (*)
3514	Sodium Dodecylbenzenesulfonate (OE)
3515	Sodium Ethylmercurithiosalicylate
1123	Sodium Fluoride (C)
1124	Sodium Fluoroacetate (P)
1489	Sodium Formaldehyde Sulfoxelate
1125	Sodium Formate (I)
3517	Sodium Glycerophosphate (*)
3518	Sodium Glycolate
3519	Sodium Heparin
1768	Sodium Hexanitrocobaltate (OX)
3520	Sodium Hydride (FS)
3521	Sodium Hydrogen Sulfate (C)
3522	Sodium Hydrogen Sulfite (C)
1127	Sodium Hydrosulfate (OB)
1126	Sodium Hydrosulfite (FS)
1128	Sodium Hydroxide (C)
1130	Sodium Hypochlorite (C, P)
1720	Sodium Hypophosphite
1131	Sodium Iodate (OX)
1132	Sodium Iodide (*)
3523	Sodium Isopropyl Sulfonate
3524	Sodium Lactate (*)
3525	Sodium Lauryl Sulfate (*)
1134	Sodium Metabisulfate (OB)
1135	Sodium Metabisulfite (OB)
3526	Sodium Metaborate (*)
1136	Sodium Metal (FS, R)
3527	Sodium Metaperiodate (OX)
3528	Sodium Metaphosphate (*)
3529	Sodium Metasilicate (C)
1137	Sodium Metavanadate (P)
3530	Sodium Methoxide (FS)
3531	Sodium Methylate, Dry (FS)
1138	Sodium Molybdate (I)
3532	Sodium Naphtholate
3533	Sodium Naphthoquinone Sulfonate (I)
1624	Sodium Naphthylphthalamate (P)
3534	Sodium Nicotinate
1140	Sodium Nitrate (OX)
1141	Sodium Nitrite (OX)
4065	Morphine-N-Oxide
1142	Sodium Nitroferricyanide (P)
3535	Sodium Nitroprusside (P)
4284	Sodium N-methyldithiocarbamate (P)
3536	Sodium Orthovanadate
1144	Sodium Oxalate
1145	Sodium Oxide (C)
3537	Sodium p-Hydroxyazobenzene-p-sulfonate
1989	Sodium Pentachlorophenate (OA)
3538	Sodium Perborate (OX)
1146	Sodium Perchlorate (OX)
1416	Sodium Periodate (OX)
3539	Sodium Permanganate (OX)
1718	Sodium Peroxide (OX)
3540	Sodium Persulfate (OX)
3541	Sodium Phenolate (C)
3542	Sodium Phosphate (*)

Appendix G. Hazardous Materials Table

3543	Sodium Phosphate, Dibasic (*)
3544	Sodium Phosphate, Tribasic (*)
3545	Sodium Phosphide (FS)
3546	Sodium Pyrophosphate (*)
3547	Sodium Pyrovanadate
1151	Sodium Salicylate (*)
1990	Sodium Selenate
1991	Sodium Selenite (P)
3548	Sodium Sesquicarbonate (*)
1152	Sodium Silicate (*)
3549	Sodium Silicofluoride
3550	Sodium Stanate (P)
3551	Sodium Succinate (*)
3552	Sodium Sulfate (*)
1154	Sodium Sulfide (FS)
1155	Sodium Sulfite (P)
3553	Sodium Sulfobenzoate
3554	Sodium Tartarate (I)
1992	Sodium Tellurite
3555	Sodium Tetraphenylborate
3556	Sodium Thiocyanate
3557	Sodium Thioglycolate
1157	Sodium Thiosulfate (*)
3558	Sodium Trisulfate (*)
1158	Sodium Tungstate (P)
3559	Sodium Vanadate
1159	Sollex C17
3560	Sorbic Acid (I)
3561	Sorbitol (*)
3562	Sorbose
3563	Stachydrine Hydrochloride
1500	Stannous Chloride (C)
3564	Stannous Sulfate
3566	Stearic Acid (I)
1162	Sterigmatocystin (P)
1163	Stibine
3567	Stilbenediol
1164	Stoddard Solvent (CL)
3568	Streptomycin
1625	Streptomycin Sulfate (*)
1165	Streptozotocin (P)
3570	Strontium Acetate
3571	Strontium Arsenite (P)
3572	Strontium Carbonate
3573	Strontium Chlorate (OX)
1727	Strontium Chloride (*)
1166	Strontium Chromate (P, OX)
3574	Strontium Hydroxide
3575	Strontium Nitrate (OX)
3576	Strontium Oxide
3577	Strontium Peroxide (OX)
3578	Strontium Phosphate
3579	Strontium Sulfate
3580	Strontium Sulfide (P)
3581	Strychnidin-10-one And Salts (P)
1167	Strychnine (P)
1993	Strychnine Sulfate (P)
1169	Styrene (FL, P)
3583	Styrene Oxide
1171	Subtilisins
3584	Succinic Acid (I)
3585	Succinic Anhydride (I)
3586	Succinylcholine Chloride
4116	Sufentanil
3588	Sulfadiazine (P)
1174	Sulfallate (P)
3589	Sulfamethazine
3590	Sulfamic Acid
1600	Sulfanilamide (I)
1728	Sulfanilic Acid (C)
3592	Sulfapyridine
3593	Sulfathiazole (I)
4285	Sulfocarb (P)
3594	Sulfosalicylic Acid (C)
4126	Sulfondiethylmethane
4127	Sulfonethylmethane
4128	Sulfonmethane
1447	Sulfonphthal
3595	Sulfonyldiphenol
1176	Sulfotep (P)
1561	Sulfur (FS)
1177	Sulfur Dioxide
1178	Sulfur Hexafluoride (NFG)
1179	Sulfur Monochloride (C)
1180	Sulfur Pentafluoride
1181	Sulfur Tetrafluoride (P)
1998	Sulfur Trioxide (C)
1182	Sulfuric Acid (C)
1183	Sulfurous Acid (C)
3596	Sulfuryl Chloride (C)
1184	Sulfuryl Fluoride (NFG)
1185	Sulprofos
1186	Super Take Off
1187	Suprlusulfate #2
3597	Surfactants (*)
2055	2,4,5-T (P, OA)
1189	T2 Toxin
1995	Tabun
3598	Talc (*)
1192	Talstar
1417	Tannic Acid
1193	Tantalum (FS)
3600	Tantalum Potassium Fluoride
1194	Tartaric Acid (I)
3601	Taurine
3602	TDE (P, OA)
1996	Tellurium
1196	Tellurium Hexafluoride (P)
3603	Tellurium Oxide
1198	Tempephos
3998	Temazepam
1199	TEPP (C, P)
1200	Terbacil
1997	Terbufos
3605	Tergitol
1201	Terphenyls (P)
3606	Terpin Hydrate
4286	Tersan (P)
1202	Testosterone (I)
3607	Tetrabromo m-Cresolsulfonphthalein
3608	Tetrabromoethane (OA)
3609	Tetrabutylammonium Hydroxide (C)
4290	Tetrabutyl Thioperoxydicarbonic diamide (P)
4287	Tetrabutylthiuram disulfide (P)
1418	Tetracaine Hydrochloride
3610	1,2,4,5-Tetrachlorobenzene (P)
3611	2,3,7,8-Tetrachlorodibenzofuran
1206	2,3,7,8-Tetrachlorodibenzo-p-dioxin (P)
1204	1,1,2,2-Tetrachloro-1,2-Difluoroethane
1205	1,1,1,2-Tetrachloro-2,2-Difluoroethane
1203	2,4,4',5-Tetrachloro Diphenyl Sulfone
3612	1,1,1,2-Tetrachloroethane (P, OA)

1207	1,1,2,2-Tetrachloroethane (P, OA)
3613	1,1,2,2-Tetrachloroethene (P, OA)
1208	Tetrachloroethylene (P, OA)
3614	Tetrachloromethane (P, OA)
1209	Tetrachloronaphthalene
3615	2,3,4,6-Tetrachlorophenol (P)
3616	Tetrachlorophthalic Acid
3617	Tetrachloroquinone
3618	Tetrachlorvinphos (P)
1210	Tetracycline Hydrochloride (*)
1516	n-Tetradecane (I)
1211	Tetraethyl Lead (P)
3619	Tetraethylammonium Bromide
3620	Tetraethylammonium Hydroxide (C)
3621	Tetraethyldithiopyrophosphate (P)
3622	Tetraethylenepentamine (FL)
3623	Tetraethylorthosilicate
3624	Tetraethylplumbane (P)
3625	Tetraethylpyrophosphate (P)
4291	Tetraethyl Thioperoxydicarbonic diamide (P)
2012	Tetraethyltin (P)
3999	8-Tetrahydrocannibinol
4000	9-Tetrahydrocannibinol
1212	Tetrahydrofuran (FL, P)
1343	Tetrahydronaphthalene (CL)
3626	Tetraisopropyl Titanate
1632	Tetramethylammonium Chloride
3628	Tetramethylammonium Hydroxide (C)
1216	Tetramethylbenzidine
1215	3,3',5,5'-Tetramethylbenzidine (P)
3629	Tetramethyldiaminodiphenylmethane
3630	Tetramethylenediamine (C)
3631	Tetramethylethylenediamine (FL)
1213	Tetramethyl Lead
1197	N,N,N',N'-Tetramethylethylenediamine (CL)
3632	Tetramethylmethylenediamine (FL, OA)
4001	2,2,6,6-Tetramethyl piperidine
1214	Tetramethyl Succinonitrile
3627	Tetramethyl Thiourea
3633	Tetramethylthiuram Disulfide
4288	Tetramethylthiuram monosulfide (P)
1490	Tetranitro Blue Tetrazolium
1217	Tetranitromethane (P)
3634	Tetraphenyltin
3635	Tetrapropenylsuccinic Anhydride (CL)
4272	1,1'-Tetrathiodicarbonothionyl)-bispiperdine (P)
1491	Tetrazolium Violet (P)
1218	Tetryl (E)
3637	Thallium (I) Acetate (P)
3638	Thallium (I) Carbonate (P)
3639	Thallium (I) Chloride (P)
1219	Thallium (I) Nitrate (P)
3641	Thallium (III) Oxide (P)
3642	Thallium (I) Selenite (P)
1999	Thallium (I) Sulfate (P)
3643	Thallous Acetate (P)
2000	Thallous Carbonate (P)
2001	Thallous Chloride (P)
2002	Thallous Malonate (P)
4159	Compressed Gases, n.o.s. (NFG)
2003	Thallous Sulfate (P)
4070	Thebacon
4002	Thebaine Alkaloid Powder
3644	Theobromine
3645	Thermite (FS)
1746	Thiamylal Sodium

4088	1-[1-(2-Thienyl)-cyclohexyl]-piperidine
1221	Thimerosal (P)
1222	Thioacetamide (P)
3648	2-Thiobarbituric Acid (P)
1223	4,4'-Thiobis(6-tert-Butyl-m-Cresol)
1957	2,2'-Thiobis(4-Chloro-6-Methyl)-Phenol
1956	2,2'-Thiobis(4,6-Dichloro)-Phenol
3649	Thiocarbamide (P)
2004	Thiocarbazide
1224	Thiocarbohydrazide
1225	4,4'-Thiodianiline (P)
1761	Thiodicarb (P)
3650	Thiodiglycol
2005	Thiofanox (P)
3651	Thiofuran (FL)
1472	Thioglycerol (P)
1226	Thioglycolic Acid (C)
3652	Thioimidodicarbonic Diamide (P)
1565	Thiomalic Acid
3653	Thiomethanol (FG, P)
2006	Thionazin (P)
3654	Thionin
3655	Thionyl Chloride
4003	Thiopental
4004	Thiopental Sodium
4292	Thiophanate sodium (P)
3656	Thiophene (FL)
2007	Thiophenol (P)
3657	Thiophosgene (P)
3658	Thiophosphoryl Chloride (C)
2008	Thiosemicarbazide (P)
1227	Thiourea (P)
1228	Thiram (P, OA)
3659	Thorin
3660	Thorium Chloride
1229	Thorium Dioxide (P)
3661	Thorium Metal
3662	Thorium Nitrate
4129	Tiletamine and Zolazepam
4047	Tilidine
3663	Threonine (*)
1730	Thymol (P)
3664	Thymolphthalein
3665	Tiglic Acid
4293	Tillam (P)
3666	Tin Tetrachloride (C)
1729	Tiron Indicator
4294	Tirpate (P)
3667	Titanium Diboride
3668	Titanium Dioxide (I)
3669	Titanium Hydride (FS)
3670	Titanium Metal (FS)
3671	Titanium Oxide (P)
3672	Titanium Potassium Oxalate
3673	Titanium Sulfate
1230	Titanium Tetrachloride (C)
1589	Titanium Trichloride (FS, C)
1492	Titanous Chloride (FS)
1232	Titanous Sulfate
1816	o-Tolidine (P)
3675	Tolualdehyde
1233	Toluene (FL, P)
3676	Toluene Diisocyanate (P)
1234	Toluene-2,4-Diisocyanate (P)
2013	Toluene-2,6-Diisocyanate (P)
3677	Toluenediamine (P, OA)

Appendix G. Hazardous Materials Table

3678	p-Toluenesulfonic Acid (C)
3679	p-Toluenesulfonyl Chloride (C)
1236	o-Toluidine Hydrochloride (P)
3681	m-Toluidine
1235	o-Toluidine (P)
1817	p-Toluidine (P)
4295	m-Tolyl methyl carbamate (P)
1237	Toxaphene (P, OA)
3684	Tragacanth Gum (*)
1818	Treosulphan (P)
4296	Triallate (P)
3685	Triallyl Cyanurate
2015	Triamiphos (P)
3686	Triaryl Phosphate Esters (P)
2016	Triazofos
1425	Tribromoacetic Acid
3687	Tribromomethane (P)
1238	Tributyl Phosphate (P)
3688	Tributylamine (C)
4170	Tributyltin (also salts and esters) (P)
702	Tricarbonyl Methylcyclopentadienyl Manganese
1762	Trichlorfon (P, OA)
2021	Trichloro(chloromethyl)silane
2022	Trichloro(dichlorophenyl)silane (C)
1240	1,1,2-Trichloro-1,2,2-Trifluoroethane (I)
3689	Trichloro-s-triazinetrione (OX)
3690	Trichloroacetaldehyde (CL, P)
1241	Trichloroacetic Acid (C)
2017	Trichloroacetyl Chloride (C)
4171	1,2,3-Trichlorobenzene (P)
1242	1,2,4-Trichlorobenzene (P)
1819	2,3,4-Trichlorobutene-1 (P)
1244	1,1,1-Trichloroethane (P, OA)
1243	1,1,2-Trichloroethane (P)
3691	Trichloroethene (P, OA)
1245	Trichloroethylene (P, OA)
2018	Trichloroethylsilane (FL)
1246	Trichlorofluoromethane (P)
3692	Trichloroisocyanuric Acid (OX)
3693	Trichloromethane (P, OA)
3694	Trichloromethanesulfonyl Chloride (P)
3695	Trichloromethanethiol (P)
1247	Trichloronaphthalene
2019	Trichloronate (P)
3696	2,4,5-Trichlorophenol (P, OA)
1248	2,4,6-Trichlorophenol (P, OA)
1188	2,4,5-Trichlorophenoxyacetic Acid (P, OA)
3698	2,4,5-Trichlorophenoxyacetic Acid Amine (OE)
3699	2,4,5-Trichlorophenoxypropionic Acid Ester(OE)
3700	2,4,5-Trichlorophenoxypropionic Acid (P, OA)
2020	Trichlorophenylsilane (C)
1249	1,2,3-Trichloropropane (CL)
3701	Trichlorosilane (FL)
3702	Trichlorotrifluoroethane (*)
1515	n-Tridecane
3703	Triethanolamine Dodecylbenzenesulfonate (FL)
1250	Triethanolamine Hydrochloride (P)
2023	Triethoxysilane (FL)
1251	Triethylamine (FL, P)
1252	Triethylenetetramine (C)
1361	Triethyl Phosphite (CL)
1427	Trifluoroacetic Acid (C)
3704	Trifluoroacetic Anhydride (C)
1253	Trifluorobromomethane (NFG)
1844	3-(Trifluoromethyl) Benzeneamine (P)
1254	Trifluralin (P)
1255	Triforine
3705	Trigonelline (I)
3706	Trihexylamine (P)
1256	1,3,5-Trihydroxybenzene
1344	1,2,6-Trihydroxyhexane
3708	Triisobutylene Oxide
3709	Triisopropylbenzenesulfonyl Chloride (P)
1650	Triisopropylnaphthalene Sulfonic Acid (C)
1257	Trimellitic Anhydride
4048	Trimeperidine
1763	Trimethacarb
4076	3,4,5-Trimethoxyamphetamine
1493	Trimethoxybenzoic Acid
1258	Trimethyl Benzene (CL)
1821	Trimethylphosphate (P)
3711	Trimethylacetyl Chloride (PA)
1259	Trimethylamine (FL)
1820	2,4,5-Trimethylaniline (P)
1836	2,4,6-Trimethylaniline
2024	Trimethylchlorosilane (FL)
2025	Trimethylolpropane Phosphite (P)
3712	Trimethylpentane (FL)
1260	Trimethyl Phosphite (FL)
2026	Trimethyltin Chloride (P)
3714	1,3,5-Trinitrobenzene (wet) (FS, P)
3715	2,4,6-Trinitrobenzenesulfonic Acid
1822	2,4,7-Trinitrofluorenone (P)
1261	2,4,6-Trinitrotoluene (wet) (E)
3716	Trioctylamine
3717	Triolein
1262	Triorthocresyl Phosphate
3718	Trioxymethylene (OA)
1263	Triphenyl Amine
1264	Triphenyl Phosphate
3719	Triphenyl Phosphite (P)
1494	2,3,5-Triphenyl-2H-tetrazolium Chloride
3720	Triphenylarsine
3721	Triphenylchloromethane
3722	Triphenylene
3723	Triphenylphosphine
3724	Triphenylphosphorous
2027	Triphenyltin Chloride
3726	TRIS (P)
1266	Tris(2,3-Dibromopropyl) Phosphate (P)
2028	Tris(2-Chloroethyl)Amine (P)
1823	Tris(Aziridinyl)-p-Benzoquinone (P)
1267	Tris(Hydroxymethyl)Aminoethane Acetate (P)
1265	Tris-(1-Aziridinyl)phosphine Sulfide Thiotepa (P)
1626	Trithion (P)
1268	Triton (I)
4005	Tropacocaine Hydrochloride
1269	Trypan Blue (P)
3728	Trypsin (*)
3729	Tryptophan (*)
4297	Turcam (P)
3731	Tungsten Disulfide (*)
3730	Tungsten Dust or Metal (FS)
3732	Tungsten Hexafluoride
1270	Tungsten, Other Compounds
3733	Tungsten Telluride
1676	Tungstic Acid
3734	Tungstic Anhydride
1661	Tunicamycin
1272	Turpentine (FL, C)
1537	Tween (P)
3736	Tyrosine (*)

Appendix G. Hazardous Materials Table

3737	Tyrothricin
1513	n-Undecane
1509	1-Undecanol
1273	Uracil Mustard (P)
3738	Uranium
1302	Uranium, Other Compounds
1742	Uranyl Acetate
3739	Uranyl Nitrate
1303	Urea (P)
3740	Urea Nitrate (FS)
3741	Urea Peroxide (OG)
3742	Urethan (P)
1304	Urethane (P)
1731	Uric Acid
3743	Uridine (*)
1305	Valeraldehyde
1496	Valeric Acid (C)
3744	Valeronitrile
3745	Valeryl Chloride (C)
3746	Valine (*)
2029	Valinomycin
1306	Vanadium (FS)
3747	Vanadium (V) Oxide (P)
3748	Vanadium Chloride
3749	Vanadium Dichloride
3750	Vanadium Oxytrichloride (C)
1566	Vanadium Pentoxide (P)
3751	Vanadium Sulfate (P)
3752	Vanadium Tetrachloride (C)
1497	Vancomycin Hydrochloride
3753	Varnish
4298	Vegadex (P)
4299	Vernolate (P)
3754	Versene (I)
1308	Vestal LPH
1365	Vincristine
1310	Vinyl Acetate (FL)
2030	Vinyl Acetate Monomer (FL)
3755	Vinyl Acetic Acid
3756	Vinyl Benzoate
1311	Vinyl Bromide (FG, P)
1312	Vinyl Chloride (FG, P)
3760	Vinylcyclohexene (FL)
1313	Vinyl Cyclohexene Dioxide (P)
1824	Vinyl Fluoride (FG, P)
1315	Vinylidene Chloride, Inhibited (FL, P)
1825	Vinylidine Fluoride Monomer (FG, P)
3757	Vinyl Isobutyl Ether (FL)
4158	Vinyl Methyl Ether (FG)
3758	Vinylpyrrolidone
1314	Vinyl Toluene (CL)
3759	Vinyl Trichlorosilane (FL)
3761	Vitamins (*)
1316	VM & P Naphtha (FL)
1317	Vorlex (FL)
1318	Vydate (P)
1319	Warfarin (P)
2031	Warfarin Sodium (P)
3762	Wax
1320	Weedone 170
3763	Wescodyne
3764	Xanthine
3765	Xylazine
1325	Xylene (FL, P)
1419	Xylene Cyanole FF (P)
1326	m-Xylene-a,a-diamine
3766	Xylenol (P)
1327	2,4-Xylidine (P)
3767	Xylyl Bromide (I)
2032	Xylylene Dichloride (P)
1526	Yohimbine
1328	Yttrium (FS)
3768	Yttrium Nitrate (OX)
3769	Yttrium Oxalate
1329	Zearalenone
3770	Zeolite
3771	Zephiran Chloride (*)
1567	Zinc Acetate (OE)
3773	Zinc Ammonium Chloride (OE)
3774	Zinc Ammonium Nitrate (OX)
3775	Zinc Arsenate (P)
3776	Zinc Arsenite (P)
3777	Zinc Bacitracin
1330	Zinc Beryllium Silicate (P)
3778	Zinc Borate (OE)
3779	Zinc Bromide (OE)
3780	Zinc Carbonate (OE)
3781	Zinc Chlorate (OX)
1331	Zinc Chloride (C)
1332	Zinc Chromate
3782	Zinc Cyanide (P)
1627	Zinc Diethyldithiocarbamate
3783	Zinc Fluoborate
3784	Zinc Fluoride (OE)
3785	Zinc Formate (OE)
3786	Zinc Hydrosulfite (OA)
1334	Zinc Metal (FS)
3787	Zinc Naphthenate
1733	Zinc Nitrate (OX)
3788	Zinc Oxide (I)
3789	Zinc Permanganate (OX)
3790	Zinc Peroxide (OX)
3791	Zinc Phenolsulfonate (OE)
1336	Zinc Phosphate
2033	Zinc Phosphide (P)
1568	Zinc Phthaloganine
3792	Zinc Silicofluoride (OE)
3793	Zinc Stearate (P)
1338	Zinc Sulfate (P)
3794	Zinc Sulfide (P)
3795	Zinc Uranyl Acetate
3796	Ziram (P)
3797	Zirconium Boride
3798	Zirconium Chloride (C)
1734	Zirconium Dioxide
3799	Zirconium Hydride (FS)
3800	Zirconium Metal (FS)
3801	Zirconium Nitrate (OX)
1339	Zirconium, Other Compounds
3802	Zirconium Oxide
3803	Zirconium Oxychloride (P)
3804	Zirconium Phosphate
3805	Zirconium Potassium Fluoride (OE)
3806	Zirconium Silicate
3807	Zirconium Sulfate (OB)
3808	Zirconium Tetrachloride, Solid (C)
3809	Zirconium Tetrafluoride
1735	Zirconyl Chloride (P)

Appendix G. Hazardous Materials Table

This Table is a compilation of lists of hazardous materials from the following sources:

1. Environmental Protection Agency, Title 40 Code of Federal Regulations, Hazardous Waste Regulations
2. Department of Transportation, Title 49 Code of Federal Regulations, Transportation of Hazardous Materials
3. Michigan Act 64, Hazardous Waste Management Act
4. Department of Labor, Occupational Safety & Health Administration, Title 29 Code of Federal Regulations, Subpart Z, Toxic and Hazardous Substances
5. Environmental Protection Agency, Superfund Amendment & Reauthorization Act (SARA)/Title III, Extremely Hazardous Substances
6. American Conference of Governmental Industrial Hygienists, Identification and classification of carcinogens. (1986)
7. Michigan State University, List of Common Laboratory Wastes (includes common nonhaz chemicals)

Key to Hazard Codes

C	Corrosive
CL	Combustible Liquid
E	Explosive
FG	Flammable Gas
FL	Flammable Liquid
FS	Flammable Solid
I	Irritating Material
NFG	Nonflammable Gas
OA	Otherwise Regulated Material Class A
OB	Otherwise Regulated Material Class B
OC	Otherwise Regulated Material Class C
OD	Otherwise Regulated Material Class D
OE	Otherwise Regulated Material Class E
OG	Organic Peroxide
OX	Oxidizer
P	Poison
R	Reactive
*	Nonhazardous Waste by Michigan DEQ and EPA Definition.

Note: Materials without a hazard code have not been classified and may be hazardous.

Appendix H. Toxic Wastes

Material	Concentration (mg/l)
Metals	
Arsenic	5.0
Barium	100.0
Cadmium	1.0
Chromium	5.0
Copper	100.0
Lead	5.0
Mercury	0.2
Selenium	1.0
Silver	5.0
Zinc	500.0
Pesticides	
Endrin	0.02
Lindane	0.4
Methhoxychlor	10.0
Toxaphene	0.5
2,4-D	10.0
2,4,5 TP Silvex	1.0
Organics	
Benzene	0.5
Carbon Tetrachloride	0.5
Chlordane	0.03
Chlorobenzene	100.0
Chloroform	6.0
o-Cresol	200.0
m-Cresol	200.0
p-Cresol	200.0
Cresol	200.0
1,4-Dichlorobenzene	7.5
1,2-Dichloroethane	0.5
1,1-Dichloroethylene	0.7
2,4-Dinitrotoluene	0.13
Heptachlor	0.008
Hexachlorobenzene	0.13
Hexachloro-1,3-butadiene	0.5
Hexachloroethane	3.0
Methyl ethyl ketone	200.0
Nitrobenzene	2.0
Pentachlorophenol	100.0
Pyridine	5.0
Tetrachloroethylene	0.7
Trichloroethylene	0.5
2,4,5-Trichlorophenol	400.0
2,4,6-Trichlorophenol	.2.0
Vinyl chloride	0.2

Appendix I. Severe Toxicity Wastes

Material	Concentration (mg/l)
Aflatoxin	1.0
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1.0
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1.0
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	1.0
1,2,3,6,7,8,-Hexachlorodibenzo-p-dioxin	1.0
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	1.0
2,3,7,8-Tetrachlorodibenzofuran	1.0

Appendix J. Chemotherapy Agents Defined by EPA as Hazardous

Actinomycin D
Chlorambucil
Cyclophosphamide
Daunomycin
Melphalan
Mitomycin C
Streptozotocin
Uracil Mustard

Appendix K. Explosive Materials

Acetylides of heavy metals
Aluminum ophorite explosive
Amatol
Ammonal
Ammonium nitrate
Ammonium perchlorate
Ammonium picrate
Ammonium salt lattice
Butyl tetryl
Calcium nitrate
Copper acetylide
Cyanuric triazide
Cyclotrimethylenetrinitramine
Cyclotetramethylenetetranitramine
Dinitroethyleneurea
Dinitroglycerine
Dinitrophenol
Dinitrophenolates
Dinitrophenyl hydrazine
Dinitroresorcinol
Dinitrotoluene
Dipicryl sulfone
Dipicrylamine
Erythritol tetranitrate
Fulminate of mercury
Fulminate of silver
Fulminating gold
Fulminating mercury
Fulminating platinum
Fulminating silver
Gelatinized nitrocellulose
Guanyl nitrosoamino guanyl tetrazene
Guanyl nitrosoamino guanyliden hydrazine
Heavy metal azides
Hexanite
Hexanitrodiphenylamine
Hexanitrostilbene
Hexogen
Hydrazinium nitrate
Hydrazoic acid
Lead azide
Lead mannite
Lead mononitroresorcinate
Lead picrate
Lead salts
Lead styphnate
Magnesium ophorite
Mannitol hexanitrate
Mercury oxalate
Mercury tartrate
Mononitrotoluene
Nitrated carbohydrate
Nitrated glucoside
Nitrated polyhydric alcohol
Nitrogen trichloride
Nitrogen tri-iodide
Nitroglycerine
Nitroglycide
Nitroglycol
Nitroguanidine
Nitroparaffins
Nitronium perchlorate
Nitrourea
Organic amine nitrates
Organic nitramines
Organic peroxides
Picramic acid
Picramide
Picratol
Picric acid
Picryl chloride
Picryl fluoride
Polynitro aliphatic compounds
Potassium nitroaminotetrazole
Silver acetylide
Silver azide
Silver styphnate
Silver tetrazene
Sodatol
Sodium amatol
Sodium dinitro-ortho-cresolate
Sodium nitrate/potassium nitrate explosive mixture
Sodium picramate
Syphnic acid
Tetrazene
Tetranitrocarbazole
Tetrytol
Trimethylolethane
Trimonite
Trinitroanisole
Trinitrobenzene
Trinitrobenzoic acid
Trinitrocresol
Trinitro-meta-cresol
Trinitronaphthalene
Trinitrophenetol
Trinitrophloroglucinol
Trinitroresorcinol
Tritonal
Urea nitrate

Appendix A10-2

MSU Policies, Procedures, and Guidelines for Radiation, Chemical, and Biological Safety

[illegible] PROCEDURES AND GUIDELINES FOR RADIATION, CHEMICAL AND BIOLOGICAL SAFETY

Michigan State University

MICHIGAN STATE UNIVERSITY

Advisory Committee
To Office of Vice President for Research and Graduate Studies on
Radiation, Chemical and Biological Safety

September 1989

MICHIGAN STATE UNIVERSITY

OFFICE OF VICE PRESIDENT FOR RESEARCH
AND DEAN OF THE GRADUATE SCHOOL

EAST LANSING • MICHIGAN • 48824-1046

November 1, 1989

MEMORANDUM

TO: Deans, Chairpersons, Directors, Faculty and Staff

FROM: John E. Cantlon *John E Cantlon*

SUBJECT: Policies, Procedures and Guidelines for Radiation, Chemical and Biological Safety

The University is required to comply with federal and state safety regulations and guidelines with regard to the acquisition, use, storage, transportation and disposal of regulated materials. Toward that end, faculty and staff committees prepared the document on <u>Policies, Procedures and Guidelines for Radiation, Chemical and Biological Safety</u>.

Individuals and units handling hazardous materials are subject to unannounced inspections by U.S. Environmental Protection Agency staff and by Michigan Department of Natural Resources staff. Repercussions to individuals and the institution from flagrant instances of non-compliance can be severe. All new technicians, faculty and graduate students using hazardous materials must arrange for safety instruction and be familiar with the contents of these policies, procedures and guidelines. The Office of Radiation, Chemical and Biological Safety (call 355-0153), will be happy to answer any questions that you may have.

jv

Enclosure

POLICIES, PROCEDURES AND GUIDELINES FOR RADIATION, CHEMICAL AND BIOLOGICAL SAFETY

Michigan State University

Advisory Committee
To Office of Vice President for Research and Graduate Studies on
Radiation, Chemical and Biological Safety

September 1, 1989

Table of Contents

POLICIES, PROCEDURES FOR RADIATION, CHEMICAL AND BIOLOGICAL SAFETY

Michigan State University

Advisory Committee
To Office of Vice President for Research and Graduate Studies on Radiation, Chemical and Biological Safety

Preamble

As a consequence of its charter and its central position in a complex technological society, the University must utilize in its educational and research activities diverse elements, compounds and organisms that may constitute a risk to man and the ecosystems which sustain him. While the amounts of individual hazardous substances are characteristically small as compared with manufacturing companies the University fully understands its responsibility for the careful containment of hazardous substances.

As the employer of thousands of persons engaged in administrative, clerical, technical, trades, and service functions, the University accepts the responsibility for providing and maintaining a safe working environments. The Department of Public Safety maintains safety inspections and instruction in general worker and student safety while the Office of Radiation, Chemical and Biological Safety maintains similar programs for addressing risks from exposure to radiation and hazardous organisms and substances. However, the responsibility for safety is shared by all. All parties in the University community accept this spirit of shared responsibility and take the initative to be well informed concerning hazardous substances and other risks that are common to their work and study environment.

The University is required to assist its employees and students by providing a set of policies and procedures that define the measures necessary to provide a safe working and learning environment. This document contains the policies and procedures for dealing with radiation, chemical and biological hazards by all units at Michigan State University, including locations throughout the state. Although this document assigns special responsibilities to units and individuals, its underlying theme is that the assurance of safety requires all members of the community to accept a responsible and concerned attitude.

In order to conform with existing federal and state regulations and (see Section IX, References) guidelines and emerging legislation, the University has a continuing Advisory Committee on Radiation, Chemical and Biological Safety (ACRCBS) and has adopted the following policies, procedures, and guidelines:

I. THE ADVISORY COMMITTEES ON RADIATION, CHEMICAL AND BIOLOGICAL SAFETY (ACRCBS)

The charge to the Advisory Committee on Radiation, Chemical and Biological Safety is as follows:

1. Formulate University wide policies, procedures, and guidelines, on radiation, chemical and biological hazards. Recommendations are advisory to the Provost, the Vice President for Research and Graduate Studies and the Office of Radiation, Chemical and Biological Safety. Recommendations will be in accordance with applicable State and Federal regulations (see References (1) a-h).

2. Review periodically all unit level policies, procedures, and guidelines and work with units to assure that practices are in accordance with University, State, and Federal policies.

3. Review periodically the University and unit level education programs for radiation, chemical and biological safety to assure that all personnel in the University community are informed fully of potential dangers, risks involved, and of the procedures required for safe handling and operation.

4. Review periodically the University and unit level inspection practices for radiation, chemical and biological hazards.

Composition of Committees will be as follows:

1. The Director, ORCBS, and the Chemical and Biohazards Safety Officer will serve as ex officio members of the Committees.

2. Composition of the Committees shall be individuals knowledgeable in the various specialties concerned and will conform to applicable Federal and state statutes and guidelines.

3. The Committee members shall be appointed by the Vice President for Research and Graduate Studies from a slate of candidates presented to him by the Radiation, Chemical and Biological Safety Advisory Committees. He may also consult with various advisors and the University Director of Radiation, Chemical and Biological Safety in making these appointments.

4. The Vice President for Research and Graduate Studies will appoint various sub-committees.

   a. The Institutional Biosafety Subcommittee will be responsibl for advising on safety in the use of potentially hazardous biological materials and organisms will serve as the official University committees for recombinant DNA as required by NIH. When meeting to consider matters associated with recombinant DNA, the subcommittee membership will be augmented as required by NIH guidelines.

The Institutional Biosafety Subcommittee will, if necessary, be supplemented by a member knowledgeable in scientific ethics and a member knowledgeable of the pertinent laws and at least two of its members shall be from outside the University. Appointments of committee members will be by the Vice President for Research and Graduate Studies with advice from the MSU Biohazards Committee and other campus experts.

b. The Hazardous Chemical Subcommittee will be responsible for advising on safety in the use of potentially hazardous chemicals and will serve also as the committee for extremely hazardous chemicals (EHC).

c. The Radiation Safety Subcommittee, Non-Medical will be responsible for advising on safety in the nonhuman use of radiation source authorizations issued by the Nuclear Regulatory Commission and the State of Michigan. This covers the use of machine produced radiation.

Membership and Organization: The Committee shall include at least three faculty members who are active in the use of radioactive isotopes. Committee members shall serve three-year terms. Members may serve successive terms, but membership shall be rotated when possible. The Committee shall choose its own chairperson. Mew members may be nominated by the Committee, by concerned departments or by concerned colleges. Appointments are made by the Vice President for Research and Graduate Studies after consultation with the chairperson of the Committee.

Responsibilities: Radiation Safety Subcommittee Non-Medical advisory to the Vice President for Research and Graduate Studies and to the University Radiation Safety Officer . The Committee shall recommend and review policies and procedures required to insure that the University meets State and Federal guidelines for the safe use of radioactive materials.

d. The Medical Radiation Safety, Subcommittee will be responsible for medical, human use of radioisotope materials licenses issued by the Nuclear Regulatory Commission and the State of Michigan. This covers the use of machine produced radiation.

Medical Radiation Safety Subcommittee. Membership and Organization: The Committee shall include at least three faculty members who are experienced in the use of radioactive materials. The Committee may also include representation from affiliated hospitals. Members shall be appointed for three-year terms, but may be reappointed with for additional terms. Composition of the Committee shall be compatible with

State and Federal regulations. The Committee shall choose its own chairperson. New members may be nominated by the Committee, by concerned departments or by concerned colleges. Appointments are made by the Vice President for Research and Graduate Studies after consultation with the Committee Chairperson.

Responsibilities: Medical Radiation Safety Subcommittee shall be advisory to the Vice President for Research and Graduate Studies and to the University Radiation Safety Officer. The Committee shall review and recommend policies and procedures required to insure that the University meets State and Federal guidelines for the safe use of radioactive materials in the treatment of human patients and in research or instruction involving human subjects.

e. The Environmental Oversight Subcommittee will be responsible for the use of pest control and other chemicals or engineering controls which may pose a risk to segments of the university population or to the general environment.

II. Division of Responsibilities

A. University Administration Responsibility

Surveillance of University practices dealing with radiation, chemical and biological hazards will reside with the Office of Radiation, Chemical and Biological Safety (ORCBS). The ORCBS will report directly to the Vice President for Research and Graduate Studies. Protective services, fire safety, accident prevention and general safety will be the responsibility of the Department of Public Safety (DPS). DPS reports to the Vice President for Finance and Operations and Treasurer. The special matter of risk management in the course of delivering treatment in MSU clinics or by MSU physicians, nurses and other licensed clinicians comes under the special risk management procedures of the respective clinic and the All University Risk Management Committee.

The Vice President for Research and Graduate Studies and the Provost are responsible for promoting liaison between the University faculty, students and staff engaged in interaction, research and service, activities involving radiation, chemical and biological hazards including related moral and ethical issues.

The University administration is responsible for ensuring that the Office of Radiation, Chemical and Biological Safety has access to personnel with competencies in radiation, chemical and biological hazards safety procedures.

1. Office of Radiation, Chemical, and Biological Safety Responsibilities

   General Duties

   The establishment and maintenance of a training program of a general nature for all involved personnel in the safe and effective handling and storing of hazardous substances, procedures for dealing with accidents; in the proper use of safety equipment, in packaging and disposing of hazardous wastes and in compliance with right to know regulation for unit supervisors in their obligations to inform employees of the risks when working with hazardous materials.

   Safe transportation and disposal of hazardous wastes. Monitoring for the adequacy of containment facilities, the adequacy of safety procedures, and advising units on the proper numbers, placement, and function of safety equipment related to the Office of Radiation, Chemical and Biological Safety. By performing these functions, the ORCBS shall be responsible for compliance with State and Federal standards and preparing any reports called for.

Specific Duties

Educational and Training Programs

Provides general training programs in radiation, chemical and biological safety to all divisions.

Provides radiation, chemical and biological safety training for those nonacademic personnel whose functions interface with the academic areas (e.g., custodians entering research labs).

Provides safety literature of a general nature (in accordance with Right-To-Know legislation to all University divisions; content will focus on radiation, chemical, and biohazards encountered in academic and nonacademic areas.

Training of unit safety representatives in right to know obligations.

Chemical Waste Disposal

Will provide routine chemical waste disposal service to all University divisions.

Is responsible for approving and coordinating non-routine disposal of high volume or high hazard materials, the cost of which the Unit must arrange.

Emergency Spills

Will provide The Department of Public Safety a 24-hour on-call list of qualified individuals for radiation, chemical or biohazard spill emergencies. Will cooperate with DPS to reduce risk to campus populations.

Will supervise appropriate individuals in the clean-up of radiation/chemical/biohazard spills and determine when the areas are safe to enter.

Will provide monitoring of ambient conditions and record-keeping required in the follow-up of the radiation, chemical, biohazard and/or spill.

Will refer individuals to the appropriate Office for health monitoring who are likely to have been exposed to hazardous materials from the spill.

2. Fiscal Responsibility in Spills and Pollution Incidents

After emergency action has been completed, a review panel (one member of the affected unit, one member of DPS and one member of ORCBS) will review the incident and file a summary report. If it is determined by the panel that carelessness within the unit was responsible, entirely or in part, for the incident, the unit will be responsible for the first $1,000 of the cost of the response and clean-up. The agencies delivering the services will receive their proportional part of the first $1,000 received from the unit.

3. Polluting Incidents of Disaster Proportions

DPS: Maintains and activates the University disaster control plan, consulting with appropriate units.

ORCBS: Will coordinate the compliation and updating of the Pollution Incident Prevention Plan for the campus.

Burning or Smouldering Materials, Explosive Materials or Other Chemical and Biological Materials Which Present a Serious and Immediate Public Safety Concern.

If an immediate response is necessary, ORCBS or the affected unit will notify DPS. DPS will coordinate the response, utilizing all appropriate service agencies as deemed necessary.

If response the same day or following day will be satisfactory, ORCBS will call the professional waste handling emergency service unit.

If the affected unit is unsure of the immediacy of response which is required, the unit shall consult either ORCBS or DPS.

ORCBS will supervise and be responsible for any necessary clean-up of residual materials.

4. Clean-up and/or Maintenance of Equipment or Utility Systems Contaminated with Hazardous Materials.

ORCBS will be responsible for this activity and will, as necessary, work with Physical Plant personnel in the resolution of problems.

5. Emergency Spills

DPS: Will secure the area, utilizing appropriate service agencies as deemed necessary.

Will provide self-contained breathing apparatus for qualified individuals who must remain in the spill area.

Will perform appropriate first-aid response for injured persons, utilizing all appropriate service agencies as deemed necessary and be responsible for insuring tramsportation of injured or exposed individuals to appropriate treatment medical centers.

ORCBS: Will insure that all individuals potentially at risk are informed of the nature of the risks and steps to mitigate the risk.

Will provide DPS a 24-hour on-call list of individuals qualified for service in radiation, chemical or biohazard spill emergencies.

Will supervise appropriate individuals in the clean-up of radiation, chemical, and/or biohazard spills and determine when the areas are safe to enter.

Will provide monitoring of ambient environmental conditions for hazardous substances and record-keeping required in the follow-up of the radiation, chemical, and/or biohazard spill.

Will refer personnel to the appropriate office for arranging health monitoring for those individuals judged by ORCBS to have been exposed to hazardous materials from the spill.

6. Fiscal Responsibility:

After emergency action has been completed, a review panel (one member of the affected unit, one member of DPS and one member of ORCBS) will review the incident and file a summary report. If it is determined by the panel that willful negligence within the unit was responsible, entirely or in part, for the incident, the unit will be responsible for the first $1,000 of the cost of the response and clean-up. The agencies delivering the services will receive, their proportional part of the first $1,000 received from the unit.

B. Unit Responsibility

It will be the responsibility of the units, (departments, institutes, schools, outlying field stations, service groups, and facilities, etc.) to ensure that all individuals working with radiation, chemical and biological hazards are informed of the "extent of risk." Material data sheets will be made readily accessible to students and employees as required by the Right-To-Know legislation and as new hazardous materials are introduced. Further, unit offices will be responsible for maintaining a record of informed consent from individuals whose duties require them to work with hazardous substances. The responsibility for maintaining a unit safety system in compliance with federal and state regulations and University policies for radiation, chemical and biological hazards lies explicitly with the chief administrative officer of the unit.

Therefore, each unit must:

1. Units shall have an identified unit safety officer.

2. Establish and maintain procedures for the acquisition, labeling, storage, use and disposal of radioactive materials and hazardous chemical or biological materials within their units. These procedures must conform to the policies of the University and to appropriate State and Federal laws or guidelines.
3. Provide an effective and periodic inspection system that will ensure continuity and compliance in the safety program.

4. Provide for a unit education program that will inform all staff, students and faculty of the unit's potentially hazardous conditions and the safety systems for radiation, chemical and biological hazards and that will periodically update the unit's safety procedures in the radiation, chemical and biological hazards area. The education program must be provided for students, staff, and faculty. The Units must maintain their policies and procedures in written form and must distribute them to new faculty, staff and students each year prior to their use of stated materials.

5. The Office of Radiation, Chemical and Biological Safety and the Advisory Committees on Radiation, Chemical and Biological Hazards will periodically review each unit's proposed policies and procedures, and when adequate, will certify that the unit practices are in compliance with University policy at least biannually and when appropriate. The unit will complete and forward to ORCBS the unit annual Safety Report.

6. Determine whether health monitoring is required for employees and students working with hazardous materials. ORCBS will assist in this determination and refer those individuals to the appropriate office for arranging the physical examination or treatment.

To help ensure the safe use of Radiological, Chemical, and/or Biological materials (RCBM) those using such substances are required to develop and implement a safety program. Such a program should be designed and instituted in a manner that causes the least amount of administrative constraint yet maximizes it's efficiency.

At a minimum, a unit safety program will contain the following: 1) a designated Safety Representative responsible for administration of the Unit Safety Program 2) a designated Safety Committee or Safety Advisory Group made up of concerned individuals and empowered to implement safety protocols, changes, etc., 3) a mechanism to ensure that the Unit Safety Program conducts Safety Audits, in conjunction with the ORCBS Safety Audit system (SAS), on an annual basis and 4) a mechanism to ensure that the Unit Safety Program files a report of it's activities and inspections with the Office of Radiation, Chemical and Biological Safety on an annual basis.

C. Responsibility of the Project Director

As a consequence of the highly specialized nature and diverse assignments in a university, the legal responsibility for the safety and well-being of all personnel in contact with any university-related activity utilizing radiation, chemical or biological hazards lies with the project director and the administrative officers responsible at the various university levels. The specific responsibilities of the project director are as follows:

1. The project director is responsible for ensuring that all personnel under his/her supervision have been instructed with regard to general safety requirements of laboratory or work area operation, as described in the Chemical and Biological Safety Manual available from ORCBS.

2. The project director is responsible for being aware of the then known radiation, chemical and biological hazards inherent in a proposed activity. If these hazards are not covered by the general program of laboratory or work area safety, the project director is responsible for instructing personnel in the nature of the risks and in safe practices or in directing personnel to sources of information concerning safe practices. The project director is responsible for understanding the risks associated with the acceptance into, or shipping from, his/her designated area all hazardous radioactive, chemical or biological agents. He/She is to be aware of the known dangers in working with each particular hazardous radiation, chemical or biological material and to take the necessary protective and containment measures. Because federal and state regulations control the use and shipping of radioactive materials, certain chemicals, venomous animals, insects, pests, and infectious microorganisms, the project director must be aware of these laws and comply with them.

3. The project director is responsible for informing and the special training of all personnel under his/her supervision of those specific radiation, chemical or biological hazards which are peculiar to his/her activities.

4. The project director must obtain periodically a statement of informed consent from all individuals, both employees and students, working directly under supervision of the project director in a University activity where potentially hazardous radioactive, chemical or biological materials are utilized and are specific to the activities for which the project director is responsible. Each individual must be informed of the "extent of risk" (where known) in utilizing hazardous substances.

5. In order to protect individuals from unwitting and unnecessary exposure, the project director is responsible for posting warnings and restricting entry to areas that contain potentially hazardous radioactive, chemical or biological materials. He/she is also responsible for posting signs as to where information for hazardous materials may be obtained. The principal investigator is therefore also responsible for the safe packaging of waste materials destined to be picked up by Laboratory Animal Care Service (LACS) or ORCBS. Hazardous materials may not be disposed of without approval of ORCBS.

6. The project director is responsible for knowing whether health monitoring for employees or students is appropriate. ORCBS will assist in this determination and direct the individuals to the Office for arranging the physicians appointments.

D. The Individual's Responsibility

The individual lab employee or student is functionally responsible for his or her own safety. (The nature of the responsibilities differ among these individuals.)

All individuals performing work with hazardous substances must accept a shared responsibility for operating in a safe manner once they have been informed about the extent of risk and safe procedures for their activities. Individuals undertaking an activity without direct supervision by a project director become responsible for performing those activities associated with hazardous substances safely. This applies to all students, staff and employees.

III. POLICIES ON CHEMICALS

Materials that constitute a potential "chemical hazard" to individuals encountering them are diverse and present throughout the institution. These hazards include explosiveness, flammability, corrosiveness, and toxicity which ranges from acutely poisonous substances to slower acting carcinogens, mutagens, and teratogens. This section outlines University policies and procedures that should be followed to ensure safe handling of chemical hazards and conformance with federal and state regulations.

A. Chemical Hazard Categories

Hazardous chemicals will be classified as either Extremely Hazardous Chemicals (EHC) whose routine use should be discouraged or as Moderately Hazardous Chemicals (MHC), many which are in common use. EHC and MHC will be used only by personnel whose competence to use them safely has been established. Further, it is recognized that assessment of chemical hazards is a continuing process and that all chemical compounds should be handled as though a hazard may exist. EHC use will be permitted only when additional stringent regulations are met.

B. Extremely Hazardous Chemicals (EHC)

The EHC list will be regularly updated by the Chemical and Biological Safety Officer (CBSO) through continuous review of toxicity and hazard data developed by OSHA, NIOSH, EPA, DHEW, NIH, FDA and other organizations. The CBSO will be assisted by a sub-committee composed of individuals knowledgeable of the physical and chemical properties of chemicals and their physiological and behavioral effects on living organisms. This sub-committee will review and approve all amendments to the EHC list. In addition, the sub-committee will assist the CBSO in the formation and review of regulations and guidelines for acquiring, transporting, storing, using, disposing of, and monitoring specific EHCS.

The Chemical and Biohazards Safety Officer will maintain a current register of EHCs which will contain information describing the hazards associated with each substance, references to its physical and chemical properties, information on antidotes, precautions, clean-up procedures and so forth.

Stocks of EHC must be stored in secured storage facilities to which access is limited to qualified personnel and all movements of EHC substances into and out of each storage facility must be monitored. Units which use or maintain stocks of EHCs should be designated clearly by posted warnings and authorized persons should be kept out of these areas. Individuals in the area must be informed by principal investigators before EHCs are used and such notice should continue in force while EHCs are present. The Office of Radiation, Chemical and Biological Safety will provide signs for University areas.

Personnel using or associated with EHC materials must be informed of the proper handling procedures pertaining to these compounds. They must have singed a consent form indicating they were trained and are fully aware of the hazards involved in EHC use, and are aware of and will abide by the specified safeguards.

Local medical facilities should be notified of specific EHC substances for which use is contemplated They should be provided with a copy of the register of EHC substances and with information concerning antidotes and treatments for each specific subtance.

C. University and Unit Responsibilities for Chemical Hazards

Acquisitioning, disbursement, use, transportation and disposal of EHC materials shall be monitored by the Office of Radiation, Chemical and Biological Safety. Project directors should assist ORCBS in maintaining a current and accurate inventory and useful register. It is not possible to place the responsibility for monitoring, acquisition and distribution of EHC chemicals on the Purchasing Department or other University offices.
Responsibility in this matter lies principally with those individuals using EHC materials.

Arrangements for disposing of all hazardous wastes shall be made with the Office of Radiation, Chemical and Biological Safety upon request of the project director. The procedures to be used will be communicated to all project directors utilizing hazardous substances. Conformity with guidelines and procedures is required and compliance will be subject to inspection.

The unit safety representative shall be responsible for insuring that all individuals in the unit using these materials have been instructed in appropriate safety procedures, that the project director is maintaining appropriate written records and that compliance with safety standards is being enforced, including proper signs, disposal, and storage procedures.

D. Project Director Responsibilities

The project director is a key individual in all efforts to establish and improve safe procedures for handling chemical hazards. The following specific responsibilities lie with the project director. The project director must:

1. Inform ORCBS and unit safety officer that ECH materials will be used and that special precautions have been taken. Determine that all personnel under his/her supervision in an independent mode have received adequate training in the handling of hazardous chemicals, signed a statement of informed consent indicating their awareness of the need for clear labeling, proper storage, safe handling and proper disposal of hazardous chemical substances and have indicated their willingness to perform in the laboratory and workplace in accordance with safe practices. Project directors are also responsible for regular inspection of their areas' operations to ensure that personnel are complying with established guidelines and procedures.

2. Ascertain (with the assistance of the Office of Radiation, Chemical and Biological Safety and Office of Safety Services) that the facility in which EHC materials are used including safety equipment, fumehood, showers, fire extinguishers, transfer chambers, goggles, masks and gloves are adequate for the facility and situation and are in proper locations and in working order. They must ensure that prominent signs call attention to where hazardous materials are used, and that they stipulate appropriate safety procedures.

3. Be certain that all personnel are aware of and capable of using disposal procedures specified by ORCBS. Be cognizant that under certain conditions chemicals can be detoxified before disposal and that detoxification and disposal operations should be mutually acceptable to the project director and ORCBS. Project directors are responsible for good housekeeping practices which includes arranging for the disposal of old, unused chemicals and keeping the quantity of flammable materials below the posted maximum for the laboratory.

4. Have definite and well-described procedures, known and easily accessible to all individuals working in the laboratory, which are to be applied in handling and reporting laboratory accidents.

5. See that all areas under their supervision and all containers in which chemically hazardous materials are used or stored are clearly labeled in accordance with Right-To-Know requirements. Ensure that entry of untrained persons into restricted access areas is strictly controlled or prohibited.

6. Project directors using materials on the EHC list incur the following additional responsibilities:

   a. He/She must demonstrate to ORCBS that the facilities in which hazardous substances are to be used are properly equipped, and constructed so that the work can be performed safely. Ensure that work with the EHCs is undertaken only when the area in which it is to be done has been determined to be adequate by the Office of Radiation, Chemical and Biological Safety. Ensure that EHC containers are clearly marked and that these materials are not left unattended or unsecured.

   b. Each project director must make Material Data Sheets available and inform all involved personnel of known specific hazards in the handling of each hazardous substance before work has begun with that substance. He/ she must ensure that proper techniques of handling and disposing of new EHCs have been reviewed as well as procedures for dealing with possible accidents. He/she must arrange with ORCBS for health monitoring if that is required or deemed by ORCBS to be prudent.

c. Project Director must ensure that each worker signs a statement of informed consent prior to any operation involving these compounds, indicating that they have been informed of the hazards in handling EHCs and will assume responsibility for following established procedures. Copies of these statements will be retained by the head of the unit, the project director, and the consenting research worker. ORCBS shall be provided access to the statements if requested.

d. Each project director will hold periodic meetings (not less than annually) with all involved personnel to review safety matters and provide updates with regard to toxicities, modes of handling and so forth. ORCBS will assist upon request. All new employees will be provided with access to instructions and to safety information.

E. Faculty and Teaching Assistants Responsible for Instructional Laboratories and Demonstration Areas

Each instructor or teaching assistant using such facilities should:

1. Avoid the use of hazardous materials and operations whenever safe alternatives are available without a substantial loss in instructional quality. Extremely hazardous chemicals (EHC) cannot be used in undergraduate instruction. Instruct all students using the laboratory or facility of the location and proper use of all safety equipment before any potentially hazardous work is undertaken.

2. Clearly define safe operating procedures (e.g., use of transfer boxes, wearing safety glasses, gloves, or aprons) and strictly enforce their use.

3. Notify all students of the location of Material Data Sheets and review chemical hazards involved in specific procedures to be used and describe the nature and extent of known risk for these hazards.

4. Obtain from each student working under his/her supervision a statement of informed consent, in which the student acknowledges instruction in safe operating procedures and agrees to follow these procedures. The signed consent statements must be collected before the first experimental exercise is conducted.

5. Be certain that there is a Material Data Sheet for all chemically hazardous materials in the laboratory and that they are clearly labeled and properly stored.

6. Have a definite and well-described procedure for immediate response to and reporting of laboratory accidents.

7. Be certain that ORCBS approved disposal procedures are followed for hazardous wastes and that containers of unused materials are returned to safe storage.

IV. BIOLOGICAL SAFETY

This portion of the document is an outline of procedures which are to be followed in the use of hazardous biological materials in research, teaching, diagnosis, or as clinical specimens on the Michigan State University campus or its outlying facilities. Its purpose is to ensure the safety and well-being of personnel within the University and the community at large as well as the safety of the domesticated and wild plant and animal populations in the surrounding areas. Thus, it is addressed specifically to avoid possible dangers in the handling of, or research with, venomous animals, exotic plants and animals, pathogenic parasites and microorganisms, and recombinant deoxyribonucleic acid (DNA).

Procedures:

In the following descriptive portions of this document, it is an essential assumption that project directors and instructors are well trained and skilled in the manipulation of hazardous biological materials as experimental tools. It is therefore incumbent on unit administrators either directly or through unit safety officers to call these requirements to the attention of their faculty. The following recommendations are common sense reiterations of practical procedures.

Numerous examples of exotic plants, insects or other animals are necessary for education and research programs on the campus. Some of these species if released into the surrounding area could become serious pests. Project directors are responsible for insuring the proper containment of each species.

Venomous Animals

The physical risk and mental turmoil caused to others is too great to warrant the keeping of venomous animals as pets in laboratories, offices, or living quarters. Obviously, in the interest of teaching and research, occasions occur when the housing and maintenance of poisonous animals is necessary and desirable. Venomous species of snakes, lizards, fishes, scorpions, spiders, etc., can be housed easily and handled with minimum risk by following a few routine procedures practiced by experienced personnel.

Infectious Parasites and Microorganisms

Microbiological hazards include infectious agents (bacteria, fungi, parasites, viruses, rickettsiae, and chlamydiae) or their toxins that present risk or potential risk to the well-being of man, native or domestic animals and plants by infection, intoxication, or by disruption of the environment. In order to minimize microbiological hazards in research, clinical and teaching laboratories, common sense and modern technical procedures must be followed both for the protection of the personnel concerned and human and other living populations beyond the lab. The project director is responsible for the safe conduct of all activities employing such hazardous biological agents. The unit director either directly responsible or responsible through the unit safety committee. Pathogenic organisms should never be used in teaching where non-pathogenic organisms or organisms of low pathogenicity will suffice. The following general policies and procedures are to be followed. More detailed procedures may be found in sections III-V of the ORCBS Chemical and Biological Safety Manual.

All cultures isolated from clinical specimens, natural environments, or of unknown orgins must be assumed to be infectious agents until proven otherwise. The utilization of aseptic techniques is essential in the transfer and handling of any microorganism.

Local health facilities under the jurisdiction of the University must be informed prior to the initiation of research with infectious or hazardous biological materials so that proper serums, antibiotics, or other counter agents will be available in case of an accident which leads to an infection or intoxication. The additional precaution of notifying area hospitals may be justified in high risk situations.

The project director should have a definite procedure, available in writing for the immediate handling and reporting of laboratory accidents which may result in infecting personnel under his/her supervision or the release into the environment of potentially viable infectious agents.

V. RESEARCH INVOLVING RECOMBINANT DNA (DEOXYRIBONUCLEIC ACID)

The project director must abide by the latest edition of the National Institutes of Health Guidelines for Recombinant DNA Research. The following is a condensed statement of those guidelines.

Recombinant DNAs are defined as molecules that consist of different segments of natural or synthetic DNA which have been joined together in cell-free systems, and which have the capacity to infect and replicate in some host cell, either autonomously or as an integrated part of the host's genome. There is no apriori way of knowing the nature of possible biohazards generated by replication of such DNAs. For this reason, the National Institutes of Health have established and published "Guidelines for Research Involving Recombinant DNA Molecules" which, when followed, allow the promise of recombinant DNA methodology to be realized while advocating caution in view of potential hazards. Specific topics of importance in the NIH Guidelines include the Level of Containment and the Responsibilities of the Project Director and the University.

Level of Containment:

The Guidelines call for the use of good microbiological technique and for physical and biological barriers to prevent the dissemination of potentially hazardous biological agents. The level of containment, both physcial and biological, in all studies is to match the estimated potential hazard for each of the different classes of recombinant DNA.

Responsibilities

Because risks are present (albeit small), research on recombinant DNA imposes special obligations on both the scientist and the University. The NIH Guidelines are designed to help the project director determine the safeguards to be used in a given situation. However, when a project director's knowledge and evaluation dictate an increase in containment, he has the responsibility to increase that containment. Further, specific obligations of the project director and the University are in the guidelines below.

The University

Since in almost all cases NIH grants are made to institutions rather than individuals, the responsibilities of the project director are also the responsibilities of the institution under the grant. The Office of Radiation, Chemical and Biological Safety acts for the University in this regard to ensure compliance with the guidelines. The Chemical and Biological Safety Officer in the Office of Radiation, Chemical and Biological Safety shall assist the University and the MSU Biohazards Committee in meeting the institution's safety obligations in this area.

Project Director

The project director has the primary responsibility for:

1. Determining the appropriate level of biological and physical containment.

2. Preparing procedures for dealing with accidental spills and overt personnel contamination.

3. Determining the applicability of various precautionary medical practices, serological monitoring, and immuniation when available.

4. Securing approval of the Institutional Biosafety Committee (IBC) for the proposed research. Approval of the IBC must be obtained prior to initiation of regulated activities. Requests for review in the form of a Recombinant DNA Agreement should be sent to ORCBS who will provide general guidelines for the format.

VI. RADIOHAZARDS POLICIES

A. Guidelines

The use of radioisotopes in the State of Michigan is under the control of the U.S. Nuclear Regulatory Commission and the Michigan Department of Public Health. The NRC exclusively controls the use of reactor produced (byproduct) materials. Michigan State University will comply with the regulations as prescribed in the Code of Federal Regulations and Michigan Department of Public Health Rules Governing Ionizing Radiation. In addition, Michigan State University will operate so as to reduce risk of exposure to a minimum commensurate with conducting its necessary research, instructional and public service programs.

B. Approval to Obtain and Use Radioisotopes

Each laboratory is required to obtain from the Isotope Committee approval prior to using radioactive isotopes. The MSU Radioactive Isotopes Committee is in part the sub-committee in radiation safety of the Committee on Radiation, Chemical and Biological Safety. It evaluates the radiological aspects of all proposed investigations. Each project leader shall present, in writing, his/her request to obtain and use radioactive isotopes to the Committee for its evaluation. The Committee's primary concern is radiation safety and thus considers (a) the nature of the isotopes requested, (b) quantity to be used, and (c) overall experimental procedures (d) the facilities and equipment available. Application forms may be obtained from the Office of Radiation, Chemical and Biological Safety Office (phone 355-0153).

C. MSU Ordering Procedures

All requisitions for radioactive isotopes must be approved by the Office of Radiation, Chemical and Biological Safety. Authorization is based on the prior approval by the Radioactive Isotopes Committee for the project leader to obtain and use radioisotopes. All requisitions should be sent by the Project Leader directly to the Purchasing Department.

D. Transfer of Radioactive Isotopes

On-campus transfer of material between investigators on different projects shall be reported to the Office of Radiation, Chemical and Biological Safety. Shipment of any byproduct material off the MSU campus must have the prior consent and approval of the Office of Radiation, Chemical and Biological Safety. Federal and State laws require that the shipper must obtain, through the MSU Office of Radiation, Chemical and Biological Safety the recipient's Nuclear Regulatory Commission or State license number prior to shipment of the material. "Byproduct material" means any radioactive material yielded in or made radioactive by the exposure incident to the process of producing or utilizing special nuclear (fissionable) material. All radioactive shipments, including cyclotron produced material, must be checked through the Office of Radiation, Chemical and Biological Safety for compliance with Nuclear Regulatory Commission and State regulations covering the receipt and transfer of such materials.

E. Radioisotope Inventories

A radioisotope inventory will be mailed routinely to each project leader. The corrected forms must be returned promptly to the Office of Radiation, Chemical and Biological Safety to assure continued authorization for acquisition and use of radioactive materials.

F. Use of Radiation Generating Equipment

All radiation generating equipment shall be operated in accordance with the Michigan Department of Public Health's Ionizing Radiation Rules.

G. Surveys and Inspections

A radiation survey shall be made by the Office of Radiation Chemical and Biological Safety before a new installation is placed in routine operation and whenever changes are made which could affect radiation protection.

ORCBS will make annual inspections of all radiation generating equipment in accordance with Michigan Department of Public Health's Ionizing Radiation Rules.

H. Warning Signs

All radiation producing equipment shall bear a decal with the statement: "CAUTION RADIATION - This equipment produces radiation when energized."

I Registration

All machines producing ionizing radiation must be registered with the State of Michigan through the Office of Radiation, Chemical and Biological Safety.

J. Responsibilities of the Radiation Safety Officer (RSO)

The institution's radiation safety program is conducted under the authority of two radiation safety sub-committees, medical and non-medical, and is implemented by the Radiation Safety Officer (RSO) within the Office of Radiation, Chemical and Biological Safety. The duties of the RSO include preparing regulations, developing training programs, advising on matters of radiation protection, maintaining a system of accountability for all radioactive materials from procurement to disposal, inspecting work spaces, radiation equipment and handling procedures, determining personnel radiation exposures, monitoring environmental radiation levels, and instituting corrective action in the event of accidents or emergencies.

K. Responsibilities of Users of Radionuclides

When a user receives authorization from ORCBS to work with radionuclides, she/he becomes directly responsible for 1) becoming informed of and compliance with all regulations governing the use of radionuclides in his/her possession, and 2) the safe use of his/her radionuclides by other investigators or technicians who work with the material under his/her supervision. She/he has the obligation to:

1. Ensure that individuals working with radionuclides under his/her control are properly supervised and have obtained training and indoctrination required to enable safe working habits and prevention of exposure to others or contamination of the surroundings. (Inadequate supervision and lack of training have been cited in radiation lawsuits as indicative of negligence.)

2. Avoid any unnecessary exposure, either to himself/herself or to others working under him/her.

3. Limit the use of radionuclides charged to him/her to individuals over whom he/she has supervision and to specified locations.

4. Keep current the working records on receipt and dispostion of radionuclides in his/her possession including use in research, transfers to other approved laboratories, storage, waste disposal etc.

5. Notify ORCBS and the appropriate administrative department of any personnel changes and changes in rooms or areas in which radioactive materials may be used or stored.

6. Keep an accurate and up-to-date inventory of the amount of radioactive material possessed and be prepared to submit this inventory to inspectors upon request.

7. Ensure that fully operational survey instrumentation is available to enable personnel to monitor for radiation levels during operations exposure and for surface contamination.

8. Inform the ORCBS when he/she cannot fulfill his/her responsibilities because of absence and designate another qualified individual to supervise the work.

9. Inform the ORCBS when a woman who is or will be working with a source of radiation under his/her supervision is known to be pregnant. This is required by State law.

The importance of proper record keeping by the individual users as well as by the institution under whose auspices the work is being performed cannot be overemphasized. Records of personnel exposure, radiation surveys, instrument calibration, waste disposal, radiation incidents, and all the other radiation activities discussed in this section represent the main proof of compliance with radiation regulations, and are important for legal purposes as well for an effective radiation safety and protection program.

L. Training Required for Working with Radionuclides

Training is required in basic radionuclide handling techniques. If the application is for medical uses of the radionuclides, clinical training in their use is required. Information on training and experience criteria for specific procedures should be obtained from the Office of Radiation, Chemical and Biological Safety.

M. Standards for Radiation Exposure

The basic radiation protection standards formulated by the NRC for radionuclide users are published in the Code of Federal Regulations, Title 10, Parts 19 & 20. Every user of radionuclides should obtain and study these standards, which cover many topics including permissible doses, permissible levels, permissible concentrations, precautionary procedures, waste disposal, and required records. It should be emphasized that regardless of limits that are set for allowable radiation exposures, the general policy is to void all unnecessary exposure to ionizing radiation. Copies of the regulations and other guides may be obtained from the Office of Radiation, Chemical and Biological Safety.

N. Personnel Monitoring

Personnel monitoring devices are required by law, and records must be kept for workers over 18 years of age if they receive or are liable to receive a dose in any calendar quarter in excess of 25 percent of the occupational dose limits.

O. Laboratory Design and Equipment

Successful work with radioisotopes requires the use of laboratories and equipment specially designed for the purpose. Consult ORCBS for assistance.

P. Warning Signs

Areas in which radioactive materials are stored, or are being used, must be posted with appropriate radiation warning signs. Signs may be obtained from the Office of Radiation, Chemical and Biological Safety.

Q. Monitoring Instruments

Every laboratory using radioactive materials must possess or have available for immediate use some type of radiation monitoring instrument approved by the Radiation Safety Officer. Each person in charge of a laboratory using radioactive materials shall be responsible for making surveys or having surveys made of all suspected radiation hazards in the area. It is impossible to assign the frequency at which these surveys should be made, but they should be made at least after every use of the laboratory that could result in fresh contamination. The Office of Radiation, Chemical and Biological Safety is to be immediately informed whenever suspected hazardous conditions exist (e.g., if a serious spill occurs or a potentially hazardous condition exists). The Department of Public Safety must also be informed of serious problems requiring diversion of people from the area.

R. Surveys by the Office of Radiation, Chemical and Biological Safety

The Radiation Safety Officer and his staff will make independent routine surveys and pass pertinent information on to those responsible for keeping the laboratory in a safe condition. Records will be kept by the Office of Radiation, Chemical and Biological Safety showing the results of these surveys. Records are maintained for inspection by the U.S. Nuclear Regulatory Commission and the Michigan Department of Public Health.

VII. PROCEDURES FOR AUTHORIZING MEDICAL MONITORING OF UNIVERSITY STUDENTS, EMPLOYEES OR VISITORS

As a condition of employment by or enrollment in Michigan State University,* individuals who have been exposed to toxic materials at University facilities must agree to obtain competent medical examination and advice relative to possible risks to their health.

It is the responsibility of the project director through his/her administrative unit in which the suspected exposure occurred to arrange for appropriate notification of the Office of Radiation, Chemical and Biological Safety.

1. The Office of Radiation, Chemical and Biological Safety shall make an assessment of the circumstances surrounding the alleged exposure and if there is sufficient reason to suspect that potentially significant exposure has occurred, the ORCBS will formally notify, in writing, University employees, students or visitors who may have sustained a potential exposure to hazardous and/or regulated substances.

2. This notification shall also include a request that the notified individual obtain a qualified medical examination concerning potential health risks.*

3. Copies of this formal notification shall be filed with the appropriate office for all University employees, with the Office of the Registrar for all students, and with the ORCBS for visitors.

Depending on the categories of the individuals requiring medical monitoring or treatment the appropriate University office shall be responsible for arranging for the medical examination and continuing care to the extent indicated by the results of the examination. Such services shall be made available to University employees, students and visitors who have received official notice from ORCBS (see second paragraph above). ORCBS will provide the details of the exposure and any specialized information they have which may be useful to the physician. The appropriate University office will arrange for billing the unit in which the potential exposure occurred for appropriate costs of the medical services arising as a result of the alleged exposure.

---

* This language is recommended by the safety advisory bodies but is still being examined by the University before final approval.

If employees, students or visitors suspect they have been exposed to hazardous or regulated substances in connection with a University activity, they, or their representative, must report the incident to ORCBS in sufficient detail for that unit to make a judgment. If ORCBS concurs that there was probable exposure, the procedures in paragraph 2 and 3 above shall be followed. If ORCBS does not concur that exposure was likely, the employee, or visitor, may seek medical examination at his or her own expense.

VIII. SPECIAL CASES

Suspected Theft of Hazardous Materials.

If project directors, department chairpersons or others in a unit detect or suspect theft or unauthorized removal of hazardous radiation, chemical or biological materials or equipment they should report this immediately to ORCBS and to Public Safety.

Decommissioning, Disposal or Transfer of Hazards.

Project directors, unit chairpersons and directors, faculty and others wishing to take out of service, divert to other uses or otherwise transfer potentially hazardous equipment, facilities and laboratories must first obtain the written approval the Director of ORCBS. The Director of ORCBS shall consult with the Safety Advisory Committee on: (a) whether to transfer responsibility for the unwanted facility, equipment or laboratory to another qualified user or, (b) whether to dispose of it. Arrangements for covering the costs of decommissioning and disposal or transfer shall be negotiated among the units and colleges involved.

IX. REFERENCES

Federal Right-To-Know Legislation CFR Title 29, Chapter XVII, Part 1910, Subpart Z, Section 1910, 1200.

Toxic Substance Control: Public Law 94-469 (S. 3149), October 11, 1976.

Occupational Safety and Health Act of 1970: PL 91-596 (S. 2193), December 29, 1970.

Guidelines for Research Involving Recombinant DNA, National Institute of Health, current issue.

NRC Code of Federal Regulations, Title 10, Parts 19 and 20.

Michigan Occupational Health and Safety, Cat No. 154, P.A. 1974 and Act No. 306, P.A. 1969 as ammended.

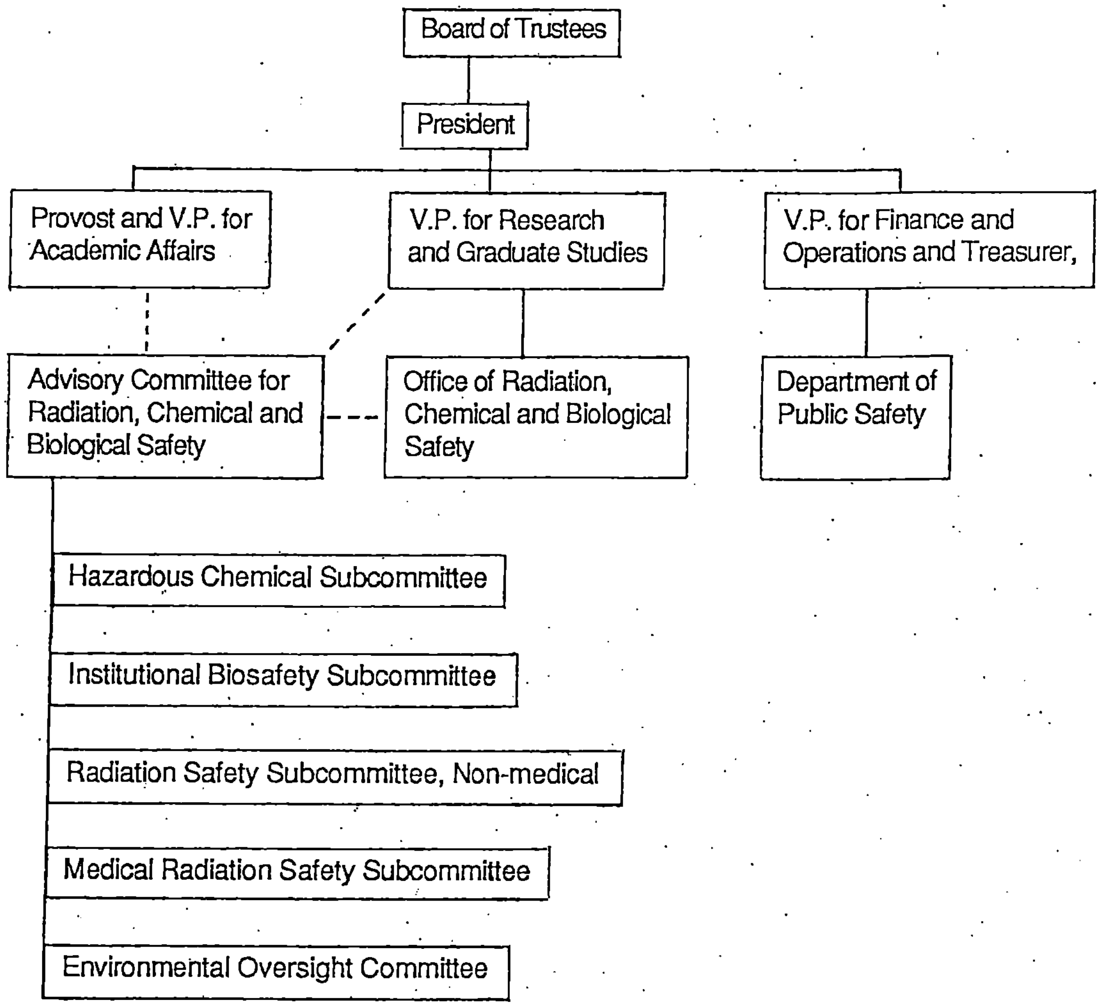
Michigan Ionizing Radiation Rules, Act No. 305, P.A. 1972.

Michigan Department of Natural Resources, Act No. 64, P.A. 1979, Act No. 641, P.A. 1978, Act No. 348, P.A. 1965 and other compiled acts by authority of Act No. 411, P.A. 1965 and Act No. 306, P.A. 1969.

Michigan Right-To-Know Legislation HB 4111, 5250 and 5251.

Chart - see Appendix 1.

Appendix 1 ADMINISTRATIVE ORGANIZATION



ATTACHMENT 4

CONTINGENCY PLAN

FORM EQP 5111 ATTACHMENT TEMPLATE A7
CONTINGENCY PLAN

This document is an attachment to the Michigan Department of Environmental Quality's (DEQ) *Instructions for Completing Form EQP 5111, Operating License Application Form for Hazardous Waste Treatment, Storage, and Disposal Facilities.* See Form EQP 5111 for details on how to use this attachment.

The administrative rules promulgated pursuant to Part 111, Hazardous Waste Management, of Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451), R 299.9501, R 299.9508(1)(b), R 299.9504(1)(c), R 299.9607, and Title 40 of the Code of Federal Regulations (CFR) §§264.50 through 264.56, and 270.14(b)(7), establish requirements for contingency plans at hazardous waste management facilities. All references to 40 CFR citations specified herein are adopted by reference in R 299.11003.
This license application template addresses requirements for a contingency plan at the hazardous waste management facility for the Michigan State University Waste Storage Facility in Lansing, Michigan. It is recommended that the MSU WSF perform annual drill exercises with the local fire department and emergency responders using the contingency plan to make sure all staff are familiar with the plan and determine whether the plan needs any updating.

(Check as appropriate)

☐ Applicant for Operating License for Existing Facility

X Applicant for Operating License for New, Altered, Enlarged, or Expanded Facility

This template is organized as follows:

GUIDANCE/REFERENCES

DEQ, Operational Memo 111-22: "Implementation of a Facility's Hazardous Waste Contingency Plan and Reporting Obligations," May 24, 2000.

INTRODUCTION

The contingency plan contained in this template serves two functions: (1) presenting required application information and demonstrating that the facility meets the performance standards in 40 CFR, Part 264; and (2) serving as the actual Contingency Plan to be used by the facility. All sections of this template must be completed with these functions in mind.

A7.A BACKGROUND INFORMATION

A7.A.1 Purpose of the Contingency Plan

[R 299.9607 and 40 CFR §§264.51and 264.53]

This Contingency Plan has been prepared in accordance with the requirements of 40 CFR, Part 264, Subpart D, and R 299.9607. It is designed to establish the necessary planned procedures to be followed in the event of an emergency situation at the Michigan State University facility in Lansing, Michigan, such as a fire, explosion, or any unplanned sudden or nonsudden release of hazardous waste or hazardous waste constituents to the air, soil, or water.

The provisions of this plan will be carried out immediately whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents that could threaten human health or the environment.

Copies of the Contingency Plan have been provided to emergency response agencies in order to familiarize them with the facility layout, the properties of the material handled, locations of the working areas, access routes into and within the facility, possible evacuation routes from the facility, and types of injuries or illness that could result from releases of materials at the facility. This information has been submitted to:

Michigan Department of Environmental Quality
Michigan State University Police Department
East Lansing Police Department
East Lansing Fire Department
Sparrow Hospital

MSU has and continues to provide state and local agencies with copies and amendments to our contingency plan

A7.A.2 Description of Facility Operations

The Contingency Plan for the Michigan State University (MSU) Waste Storage Facility (WSF) has been designed to minimize hazards to human health and the environment from fires, explosions, or any unplanned release of wastes to the environment. The provisions of this plan will be immediately implemented whenever there is a fire, explosion, or release of any hazardous substance which may threaten human health or the environment.

Michigan State University is a non-profit research and teaching institution generating a diverse hazardous waste stream. The wastes generated by numerous sites across campus are transported to the Waste Storage Facility located at the intersection of Jolly and Collins Road. The identity of the individual wastes is provided by the generators prior to their transport to the storage facility. The waste materials are then stored and containerized at this facility until shipment to licensed hazardous waste disposal facilities. A listing of the types of hazardous wastes handled at the facility is listed in Table A2.A.1.

The Waste Storage Facility consists of an East Storage Building used for consolidation and storage, and a West Storage Building used for storage of 55-gallon drums of waste. The Waste Storage Facility was constructed to safely store different types of wastes in containers of 55-gallons or less and reduce the possibility of reactions between incompatible substances. The structure provides the necessary containment of wastes in separate rooms in the event of accidental releases. Construction safety features of the facility include the presence of explosion proof wiring and lighting, the maintenance of extensive safety equipment, specific protocols for the handling of all wastes, fire suppression and security alarm systems.

The Contingency Plan has been developed to direct the efficient response of personnel in the event of fire, explosion, or the release of hazardous substances. The Plan describes the actions of EHS personnel and how these individuals would coordinate their efforts with local emergency response teams, police departments, fire departments, and hospitals. The Plan includes the names, addresses and phone numbers of personnel serving as emergency coordinators, as well as the location and availability of emergency equipment at the site. Evacuation plans for the storage facility are also included.

A7.A.3 Identification of Potential Situations

The Contingency Plan will be implemented in the event of any of the following incidents:

- Fire at the storage facility necessitating the use of professional firefighters.
- Explosion at the facility resulting in the:
  - loss of the integrity of the containment design of the structure;
  - release, or threatened release of waste materials from the facility;
  - imminent release of hazardous waste from the facility.
- Release or imminent release from the facility of:
  - hazardous waste to the environment;
  - any other material which would impact human health or the environment.
- Vandalism resulting in:
  - the release, or threatened release of hazardous waste from the facility;
  - loss of security at the facility.
- Civil disorder resulting in:
  - the release, or threatened release of hazardous waste from the facility;
  - loss of security at the facility.
- Uncontrolled reactions or spills resulting in:
  - a sustained IDLH condition within the facility necessitating the use of outside resources to intervene and remediate the conditions;
  - a release of toxic vapor into the environment at a volume sufficient to cause extreme annoyance or discomfort to off-site personnel.
- Rupture of the pressurized fire suppressant gas system resulting in the release of hazardous waste into the environment.
- Imminent hazard potential (tornado, war, etc.) will result in the establishment of a standby status of the Contingency Plan at the direction of the Emergency Coordinator.

A7.B EMERGENCY COORDINATORS
[R 299.9607 and 40 CFR §§264.52 and 264.55]

A7.B.1 Identification of Primary and Alternate Emergency Coordinators
[R 299.9607 and 40 CFR §§264.52 and 264.55]

At all times there is at least one employee, either on the facility premises or on call and within reasonable travel distance of the facility, with the responsibility for coordinating all emergency response measures. The list of employees designated as emergency coordinators is contained in Table A7.B.1. The coordinators are listed in the order in which they will assume responsibility.

An Emergency Coordinator will, at all times, be either at the EHS Office (355-0153), the Waste Storage Facility (355-1780), or on call. The individual on call will carry the MSU Hazardous Materials Pager (360-6271), and can arrive on campus within a short period of time following notification. The EHS Hazardous Waste Coordinator has been designated as the Primary Emergency Coordinator.

A7.B.2 Qualifications of the Emergency Coordinators
[R 299.9607 and 40 CFR §264.55]

An Emergency Coordinator will, at all times, be either at the Waste Storage Facility, or on call. The individual on call is available to reach the facility within a short period of time following notification. Each Emergency Coordinator has been familiarized with all aspects of the Contingency Plan, the operation of the storage facility, the physical layout of the facility, and the location of records pertaining to the facility. Each individual has taken a 40-hour HAZWOPER training program and is familiar with environmental regulations and components regarding emergencies at the WSF. Several of the coordinators have over 25 years experience each in the environmental field. Each individual has been delegated the authority to commit the resources necessary to respond appropriately to any emergency at the facility.

Table A7.B.1 contains a list of individuals presently serving as Emergency Coordinators. The EHS Hazardous Waste Coordinator has been designated as the Primary Emergency Coordinator. Other Coordinators are listed in the order in which they will assume responsibility. The names, addresses, and phone numbers of the Emergency Coordinators contained in the Contingency Plan have been provided to the local emergency response units, and are posted on the wall beside all telephones in the facility.

Table A7.B.1 Identification of Primary and Alternate Emergency Coordinators

Michigan State University Waste Storage Facility

Priority	Name	Address	Work Phone	Home Phone
Primary Coordinator	Brian Smith	846 Eagles Nest Ct, Mason, MI	517-432-4454 517-881-7410*	517-676-3912
First Alternate Coordinator	Thomas Grover	3790 Zimmer Rd, Williamston, MI	517-355-6651 517-896-1005*	517-896-1005*
Second Alternate Coordinator	Robert J. Ceru	514 Vanderveen Dr, Mason, MI	517-355-5146 517-881-9502*	517-676-9004
Third Alternate Coordinator	John Parmer	645 Haslett Rd, Williamston, MI	517-432-5646 517-881-9501*	517-655-6809
Alternate Coordinator	Phil Weinstein	8605 Wheatdale, Lansing, MI	517-432-8043 517-230-1722*	517-455-7525
Alternate Coordinator	Genevieve Cottrell	131 Horace Perry, MI	517-432-8715 810-624-3326*	810-624-3326*
Alternate Coordinator	David Erickson	6070 Park Lake Rd, Bath, MI	517-355-6545 517-256-9033*	517-256-9033*
Alternate Coordinator	Pat Thompson	211 Coventry Ln, Mason, MI	517-355-6743 517-285-0520*	517-676-3632
Alternate Coordinator	Jonathan Stieglitz	2301 Hanover Dr, Lansing, MI	517-432-5660 517-256-9001*	517-853-8162
Alternate Coordinator	James Green	4509 Chippewa, Okemos, MI	517-355-4514 517-881-9505*	517-381-1803

*Denotes cell phone number

A7.B.3 Authority to Commit Resources
[R 299.9607 and 40 CFR §264.55]

MSU Administration supports and delegates authority to emergency coordinators to access any necessary resources in the event of an incident at the MSU WSF.

A7.C IMPLEMENTATION OF THE CONTINGENCY PLAN
[R 299.9607 and 40 CFR §§264.51, 264.52, and 264.56]

The emergency coordinator must be contacted immediately in the occurrence of any situation that may result in potential or actual threats to human health or the environment. The emergency coordinator must implement this plan whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents that could threaten human health or the environment.

The following situations are provided as guidance to facility personnel as the conditions or circumstances under which the plan must be implemented:

The Contingency Plan will be implemented in the event of any of the following incidents:

- Fire at the storage facility necessitating the use of professional firefighters.
- Explosion at the facility resulting in the:
  loss of the integrity of the containment design of the structure;
  release, or threatened release of waste materials from the facility;
  imminent release of hazardous waste from the facility.
- Release or imminent release from the facility of:
  hazardous waste to the environment;
  any other material which would impact human health or the environment.
- Vandalism resulting in:
  the release, or threatened release of hazardous waste from the facility;
  loss of security at the facility.
- Civil disorder resulting in:
  the release, or threatened release of hazardous waste from the facility;
  loss of security at the facility.
- Uncontrolled reactions or spills resulting in:
  a sustained IDLH condition within the facility necessitating the use of outside resources to intervene and remediate the conditions;
  a release of toxic vapor into the environment at a volume sufficient to cause extreme annoyance or discomfort to off-site personnel.
- Rupture of the pressurized fire suppressant gas system resulting in the release of hazardous waste into the environment.
- Imminent hazard potential (tornado, war, etc.) will result in the establishment of a standby status of the Contingency Plan at the direction of the Emergency Coordinator.

An Emergency Coordinator will, at all times, be either at the EHS Office (517-355-0153), Chemical Storage Facility (517-355-1780), or on call. The individual on call will carry the MSU Hazardous Materials Pager (517-360-6271), and can arrive on campus within a short period of time following notification.

In the event of an alarm signal being received by the monitoring company's security desk, appropriate alarm information is sent to the East Lansing Dispatch or MSU Police Department desk. These are staffed 24 hours/day, seven days/week. The EHS staff is contacted directly for non-fire alarms during normal business hours. The Emergency Coordinator and the appropriate emergency response unit are notified, depending upon the nature of the alarm.

A7.D EMERGENCY PROCEDURES
[R 299.9607 and 40 CFR §§264.51, 264.52, and 264.56]

The following general procedures have been established for implementation by facility personnel and the emergency coordinator in order to efficiently respond to the release of hazardous waste or hazardous waste constituents that could threaten human health or the environment.

A7.D.1 Immediate Notification Procedures for Facility Personnel and State and Local Agencies with Designated Response Roles

[R 299.9607 and 40 CFR §§264.51, 264.52, and 264.56]

The list of emergency contacts in Table A7.D.1 identifies local emergency response agencies, and state and federal authorities that must be notified in the event of an imminent or actual emergency situation requiring response.

The emergency coordinator will be responsible for ensuring that all appropriate authorities are notified as necessary.

During operational hours, employees at the facility will be made aware of any incident by visual or audible alarms systems. During non-operational hours, the on-call emergency coordinator will make an assessment of the incident and contact necessary resources to minimize any type of release from the facility that may impact the environment. WSF personnel are also accessible via cell phone communication for emergency notification.

A7.D.2 Procedures to Be Used for Identification of Releases

[R 299.9607 and 40 CFR §§264.51, 264.52, and 264.56]

Determination of the type of material released will be based on MSU generator knowledge and documentation accompanying the waste material (manifests, pick-up tags). Visual observations and appropriate instrumentation will be used for source identification as necessary. Whether or not visual observation is possible, the identity and volume of the hazardous wastes present at the storage facility may also be made from records at the EHS office. These records provide the general identity and volume of hazardous wastes presently at the storage facility.

A7.D.3 Procedures to Be Used to Assess Potential Hazards to Human Health and the Environment

[R 299.9607 and 40 CFR §§264.51, 264.52, and 264.56]

The emergency coordinator will use knowledge of chemicals on site as well as manifests and chemical records (including Material Safety Data Sheets) to assess possible hazards, both direct and indirect, to human health or the environment that may result from the release, fire, or explosion.

This assessment will include the following:

- The possibility of further fire, explosion, or release of additional substances.
- The possible presence of toxic, irritating, or asphyxiating gases which may be generated as a result of the release.
- The effect of the contamination and run-off of the water, or other chemical agents used to control fire or explosions at the facility.

- The possibility of any additional chemical and or physical reactions.
- The effect of current weather conditions in spreading hazards.

A7.D.4 Procedures to Determine if Evacuation Is Necessary and Immediate Notification of Michigan Pollution Emergency Alerting System, and the National Response Center

[R 299.9607 and 40 CFR §§264.51, 264.52, and 264.56]

A determination will be made by the emergency coordinator and the local agencies (MSU police and fire), with a consideration of wind direction, if it is necessary to evacuate the local area around the storage facility due to the extent and nature of the release and wind direction. The actually jurisdiction for evacuation of an area will be made by the MSU Police Department.

If the emergency coordinator's assessment indicates that evacuation of facility areas may be advisable, he will implement the evacuation plan for the facility. If the emergency coordinator's assessment indicates that evacuation of the surrounding local areas is also advisable, the appropriate local authorities will be immediately notified (see Table A7.D.1). The National Response Center will also be notified (see Table A7.D.1), and the following information will be provided:

1. Name and telephone number of the reporting individual
2. Name and address of the facility (Michigan State University Waste Storage Facility, 3634 E. Jolly Road, Lansing, MI)
3. Time and type of incident
4. Type and quantity of materials involved
5. Possible hazards to human health or the environment
6. Extent of injuries, if applicable

The facility's evacuation plan and map are included in this Contingency Plan as Attachments A7.2 and A7.3.

A7.D.5 Procedures to Be Used to Ensure that Fires, Explosions, and Releases Do Not Occur, Reoccur, or Spread During the Emergency

[R 299.9607 and 40 CFR §§264.51, 264.52, and 264.56(e), 264.227, and 264.200]

Whenever there is an imminent or actual emergency situation where the potential or actual release of hazardous waste or hazardous waste constituents may threaten human health or the environment, the facility will implement the following procedures:

The Emergency Coordinator will assist the MSU Police and East Lansing Fire Department personnel in determining what measures might be appropriate in attempting to stop additional releases of materials both within and from the facility. If possible, the Emergency Coordinator should determine if pressure buildup has occurred in the storage containers. If materials have been released to the environment, the danger to human health and the environment will be assessed. Resources will be committed initially to contain, and subsequently to decontaminate the affected area.

Once the emergency situation has been managed, the Emergency Coordinator will provide for the treatment, storage, or disposal of recovered wastes, contaminated soil, contaminated water, or other contaminated materials. In addition, non-disposable equipment used in the emergency situation will be decontaminated as well as any structural units which were affected by the release. Typical procedures for these functions are described below.

All of the containers in the storage area will be removed to a non-contaminated portion of the facility. If no portion of the facility remains for appropriate storage, then all containers will be removed to a licensed waste disposal facility. All containers will be moved either by hand or by hand-truck devices. Following the identification of the released substances, materials used for decontamination will be placed into appropriate containers for shipment to a licensed disposal facility.

Table A7.D.1 Federal, State, and Local Response Contacts

Local:	**Phone:**
East Lansing Police Department	517-351-4220
East Lansing Fire Department	517-351-4220
Sparrow Hospital	517-483-2222
MSU Administration Office	517-355-0306
State:	**Phone:**
Michigan State Police	517-332-2521
MDEQ – Waste Management Division	517-353-6010
MDEQ – Pollution Emergency Alert System	800-292-4706
National Response Center:	**Phone:**
National Response Center	800-424-8802

Attachment A7.3 is a detailed description of the type, amount, and location of all emergency equipment at the Michigan State University Waste Storage Facility.

A7.D.6 Procedures to Be Used to Monitor Equipment Should Facility Operations Cease

[R 299.9607 and 40 CFR §§264.51, 264.52, and 264.56(f)]

The MSU WSF is a storage facility only and does not have any valves, pipes, tanks, or other treatment vessels that require monitoring.

A7.D.7 Procedures to Provide Proper Treatment, Storage, and Disposal for Any Released Materials

[R 299.9607 and 40 CFR §§264.51, 264.52, and 264.56(g)]

MSU has the resources available onsite for the proper containment and management of any released material as identified in Template A3 Waste Analysis plan. The established protocol for the clean-up of any unlikely release will be based on quantity and characteristics of the released material and state and Federal regulations dictating the type of disposal options available.

Description of Wastes Stored:
A broad range of chemical wastes are stored at the MSU WSF. The quantities of most of these chemicals are small since they are used for research and teaching purposes rather than industrial production. Because of the diversity, it is estimated that greater than 2,000 separate chemicals are received for storage at the facility. The waste materials have been organized into the following separate waste streams depending on their chemical nature:

<u>MSU I.D. #, Waste Stream and Substance</u>

001. Flammable Liquid, Toxic
002. Mixed Acid Solutions
003. Flammable Liquid, Corrosive
004. Chromic Acid/Sulfuric Acid Solutions
005. Nitric Acid Solutions
006. Formalin Solution
007. Pesticide/Herbicide Rinsate
008. Mercury Contaminated Debris
009. Paint Related Material
010. Chloroform Debris
011. Aflatoxin Debris
012. PCB Debris
013. PCB Ballasts
015. Organic Peroxides Lab Pack
016. Perchloric Acid Lab Pack
017. Pyrophoric Lab Pack
018. Flammable Solids Lab Pack
019. Flammable Liquids Lab Pack
020. Aerosol Lab Pack
021. Poison Lab Pack
022. Corrosive Solids Lab Pack
023. Oxidizer Lab Pack
024. Water Reactive Lab Pack
025. Not Classified Lab Pack
026. Compressed Gas Cylinders
027. Empty Containers

014. Reactive Cyanides and Sulfides Lab Pack
028. Mixed Radioactive/Chemical
029. Aerosol Cans

A7.D.8 Procedures for Cleanup and Decontamination
[R 299.9607 and 40 CFR §§264.51, 264.52, and 264.56(h)]

All of the containers in the storage area will be removed to a non-contaminated portion of the facility. If no portion of the facility remains for appropriate storage, then all containers will be removed to a licensed waste disposal facility. All containers will be moved either by hand or by hand-truck devices. Following the identification of the released substances, materials used for decontamination will be placed into appropriate containers for shipment to a licensed disposal facility.

After the removal of the waste materials, the affected inside walls and floors of the facility will be decontaminated with a high-pressure, hot-water (dilute soap solution) spray, or by hand wiping of the surfaces. If this is deemed insufficient by the Emergency Coordinator, other means of decontamination specific to the material being removed will be incorporated. This work will be supervised and most likely, but not exclusively, performed by EHS personnel. These personnel will be required to wear appropriate personal protective equipment such as chemically resistant suits, head protection, gloves, boots, and respiratory protection. Chemical neutralizers and spill control pillows will be available during this decontamination process. Prior to leaving the site, the protective clothing will be either decontaminated or placed in drums for appropriate disposal. All solutions and materials used in the decontamination process containing hazardous wastes will be containerized in drums and transported to a licensed disposal facility.

The construction of the storage facility has incorporated several precautions which prevent or greatly limit the possibility of a release to the soils around the facility. In the event that soils around the facility have been impacted during the emergency situation, the contaminated portions will be excavated and transported to a licensed hazardous waste disposal facility. Initially, only the soils which are visually observed to be impacted will be excavated. This will be followed by additional sampling and analyses to confirm that the horizontal and vertical extent of the decontamination has been determined. If these efforts identify the continued presence of contamination, additional excavations will be performed until it has been confirmed that all degradation has been removed to acceptable levels.

Following an emergency situation resulting in the release of hazardous waste, the surface water flowing adjacent to the site will be sampled and analyzed for the routine parameter list identified in the surface water monitoring program. Sampling will be collected both upstream and downstream of the facility for the same parameters. The results of these analyses will determine the necessity of remedial action.

The Emergency Coordinator will ensure that no waste materials incompatible with the released material are introduced, or stored, in the affected area until the decontamination process is complete. All equipment used in the response to the emergency situation will be disposed of, or decontaminated, following the completion of the decontamination process. All spent safety equipment will be replaced before the resumption of normal activities at the storage facility.

A7.E NOTIFICATION AND RECORD KEEPING REQUIREMENTS
[R 299.9607 and 40 CFR §§264.51, 264.52, and 264.56(I) and (j)

The following subsections identify procedures that must be followed to meet the notification and record keeping requirements.

A7.E.1 Procedures to Be Used to Notify State and Federal Officials Prior to Commencement of Operations
[R 299.9607 and 40 CFR §§264.51, 264.52, and 264.56]

Before operations are resumed, an inspection of all emergency equipment will be conducted. The emergency coordinator must notify the EPA, MDNRE, and local authorities that post-emergency equipment maintenance has been performed and operations at the facility will be resumed.

Following the completion of the emergency response and decontamination procedures, the following actions will occur:

- A safety inspection will be conducted by the Emergency Coordinator. This inspection will certify that the decontamination process has been completed, and that the proper emergency equipment has been restocked and is on-hand.
- The emergency coordinator will let the agencies listed in Table A7.D.1 know the date that operations will commence at the MSU WSF.

A7.E.2 Record Keeping Requirements
[R 299.9607 and 40 CFR §§264.51, 264.52, and 264.56(j)]

A7.E.2(a) Operating Record

In the event of an emergency situation that requires implementation of the Contingency Plan, the emergency coordinator will record in the facility's operating record the time, date, and description of the event. The operating record is maintained by Michigan State University Environmental Health and Safety and can be found at the following location: EHS Office, 1449 Engineering Research Court, Room C124, East Lansing, MI 48824.

A7.E(2)(b) Written Incident Report

Within 15 days of an incident requiring implementation of the Contingency Plan, the Michigan State University Waste Storage facility will submit a written incident report to the EPA Regional Administrator and the Director of the MDNRE.

The report will contain the following information:

1. Name, address, and telephone number of the facility, and the owner/operator.
2. Date, time, and type of incident.
3. Type and quantity of materials involved.
4. Assessment of actual or potential hazards to human health and the environment.
5. Extent of injuries, if applicable.

6. Estimated quantity and disposition of recovered materials that resulted from the incident.

A7.F PROCEDURES FOR REVIEWING AND AMENDING THE CONTINGENCY PLAN [R 299.9607 and 40 CFR §264.54]

To ensure that the Contingency Plan remains an effective document, the Plan will be reviewed annually for effectiveness. It will be amended whenever the permit is revised, following the failure of an emergency response, or following any substantial structural or operational changes associated with the WSF. In addition, the Plan will be amended whenever there is a change associated with the position of emergency coordinator, or a substantial change in the list of emergency equipment.

Attachment A7.1: Documentation of Arrangements with Local Authorities

Attachment A7.2: Evacuation Plan

Figure A7.2: Evacuation Routes

Attachment A7.3: Emergency Equipment Description

Attachment A7.4: Procedure for Assessing Off-Site Risk During and After a Significant Release

Attachment A7-1

Documentation of Arrangements with Local Authorities

MICHIGAN STATE
UNIVERSITY

March 23, 2010

Sparrow Hospital
Theresa Jenkins
Emergency Department
1215 E. Michigan
Lansing, MI 48912

To Whom this may concern,

The Environmental Health and Safety Department at Michigan State University is updating the Operating License of the Hazardous Waste Facility. As part of the license to handle hazardous waste, agreements have been in place with various emergency response units that would be involved were a response needed. The license renewal requires that we have on file an acknowledgement of receipt of the facility Contingency Plan by the various responding parties.

Please acknowledge receipt of the Plan by signing below.

We have received the Michigan State University Contingency Plan in the event that an emergency would require its implementation.

Teresa O'Neill
Signature

Teresa O'Neill Director, Emergency Service
Printed Name and Title

3/25/10
Date

DEPARTMENT OF
ENVIRONMENTAL HEALTH & SAFETY
Office of Radiation, Chemical, & Biological Safety
Michigan State University
C-125 Research Complex - Engineering
East Lansing, MI
48824-1326
517/355-0153
Fax: 517/353-4871

MICHIGAN STATE
UNIVERSITY

March 23, 2010

Michigan State University
Department of Public Safety
Penny Fischer
Public Safety Building

To Whom this may concern,

The Environmental Health and Safety Department at Michigan State University is updating the Operating License of the Hazardous Waste Facility. As part of the license to handle hazardous waste, agreements have been in place with various emergency response units that would be involved were a response needed. The license renewal requires that we have on file an acknowledgement of receipt of the facility Contingency Plan by the various responding parties.

Please acknowledge receipt of the Plan by signing below.

We have received the Michigan State University Contingency Plan in the event that an emergency would require its implementation.

Signature

Margaret A. Fischer / F/Lt.

Printed Name and Title

3-25-10

Date

DEPARTMENT OF
ENVIRONMENTAL
HEALTH & SAFETY
Office of Radiation,
Chemical, & Biological
Safety
Michigan State University
C-125 Research Complex -
Engineering
East Lansing, MI
48824-1326
517/355-0153
Fax: 517/353-4871

MICHIGAN STATE
UNIVERSITY

March 23, 2010

East Lansing Fire Department
Tim Hull
1700 Abbott road
East Lansing, MI 48823

To Whom this may concern,

The Environmental Health and Safety Department at Michigan State University is updating the Operating License of the Hazardous Waste Facility. As part of the license to handle hazardous waste, agreements have been in place with various emergency response units that would be involved were a response needed. The license renewal requires that we have on file an acknowledgement of receipt of the facility Contingency Plan by the various responding parties.

Please acknowledge receipt of the Plan by signing below.

We have received the Michigan State University Contingency Plan in the event that an emergency would require its implementation.

Signature

ESTEBAN S. ALVARADO, DEPUTY CHIEF
Printed Name and Title

3/25/10
Date

DEPARTMENT OF
ENVIRONMENTAL HEALTH & SAFETY

Office of Radiation, Chemical, & Biological Safety

Michigan State University
C-125 Research Complex - Engineering
East Lansing, MI
48824-1326
517/355-0153
Fax: 517/353-4871

MICHIGAN STATE
UNIVERSITY

March 23, 2010

East Lansing Police Department
Tom Wibert
409 Park Lane
East Lansing, MI 48823

To Whom this may concern,

The Environmental Health and Safety Department at Michigan State University is updating the Operating License of the Hazardous Waste Facility. As part of the license to handle hazardous waste, agreements have been in place with various emergency response units that would be involved were a response needed. The license renewal requires that we have on file an acknowledgement of receipt of the facility Contingency Plan by the various responding parties.

Please acknowledge receipt of the Plan by signing below.

We have received the Michigan State University Contingency Plan in the event that an emergency would require its implementation.

DEPARTMENT OF
ENVIRONMENTAL
HEALTH & SAFETY
Office of Radiation, Chemical, & Biological Safety
Michigan State University
C-125 Research Complex - Engineering
East Lansing, MI
48824-1326
517/355-0153
Fax: 517/353-4871

LT. K— Daly
Signature

LIEUTENANT KEVIN DALEY
Printed Name and Title

3-25-2010
Date

Attachment A7.2: Evacuation Plan

There are several factors which combine to determine that an extensive evacuation plan is not required for the WSF. The facility is relatively small and there are no rooms without direct outside access. The Hazardous Waste Coordinator does spend significant time at the site and no employees have the WSF as their permanent work station.

An evacuation of the facility should be performed in the event of any emergency situation, or when either the Hazardous Materials Professional or the Hazardous Waste Coordinator believes a sufficient threat to safety or the environment exists.

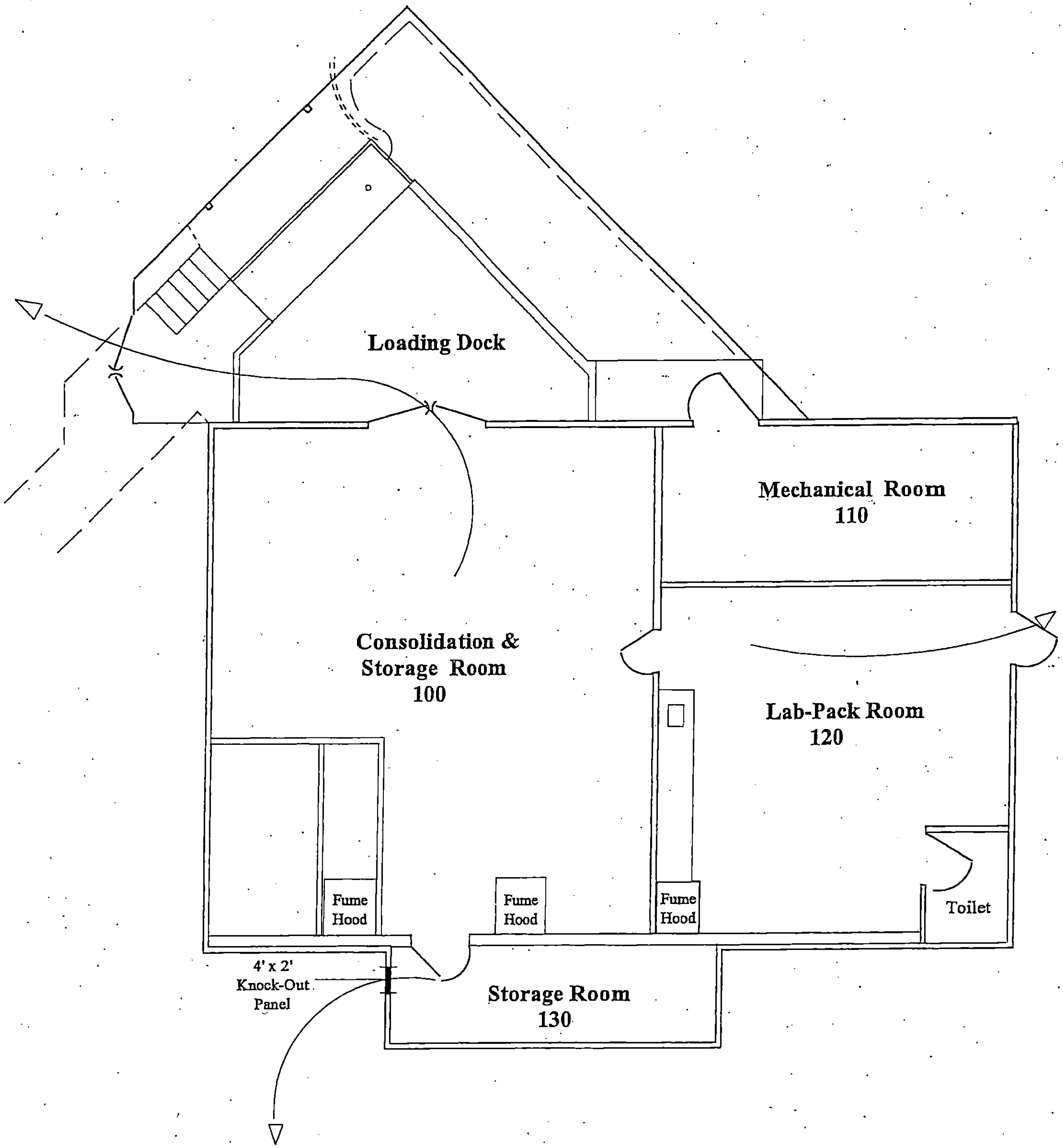
The evacuation route for all areas of the facility is through the closest door providing clear access to the outside. Since each room has a door providing direct outside access the evacuation will usually be directed along the closest route. If the most direct route is blocked then an alternative route through the closest alternative door should be utilized. **Figures A7.2** and **A7.3**, indicating the evacuation routes, are posted in each storage room at the WSF.

Following evacuation of the WSF, all personnel should assemble north of the facility in the area between Jolly Road and the loading dock of the facility. If it is determined that this location is down-wind of the facility, then the personnel should move further to the west along Jolly Road.

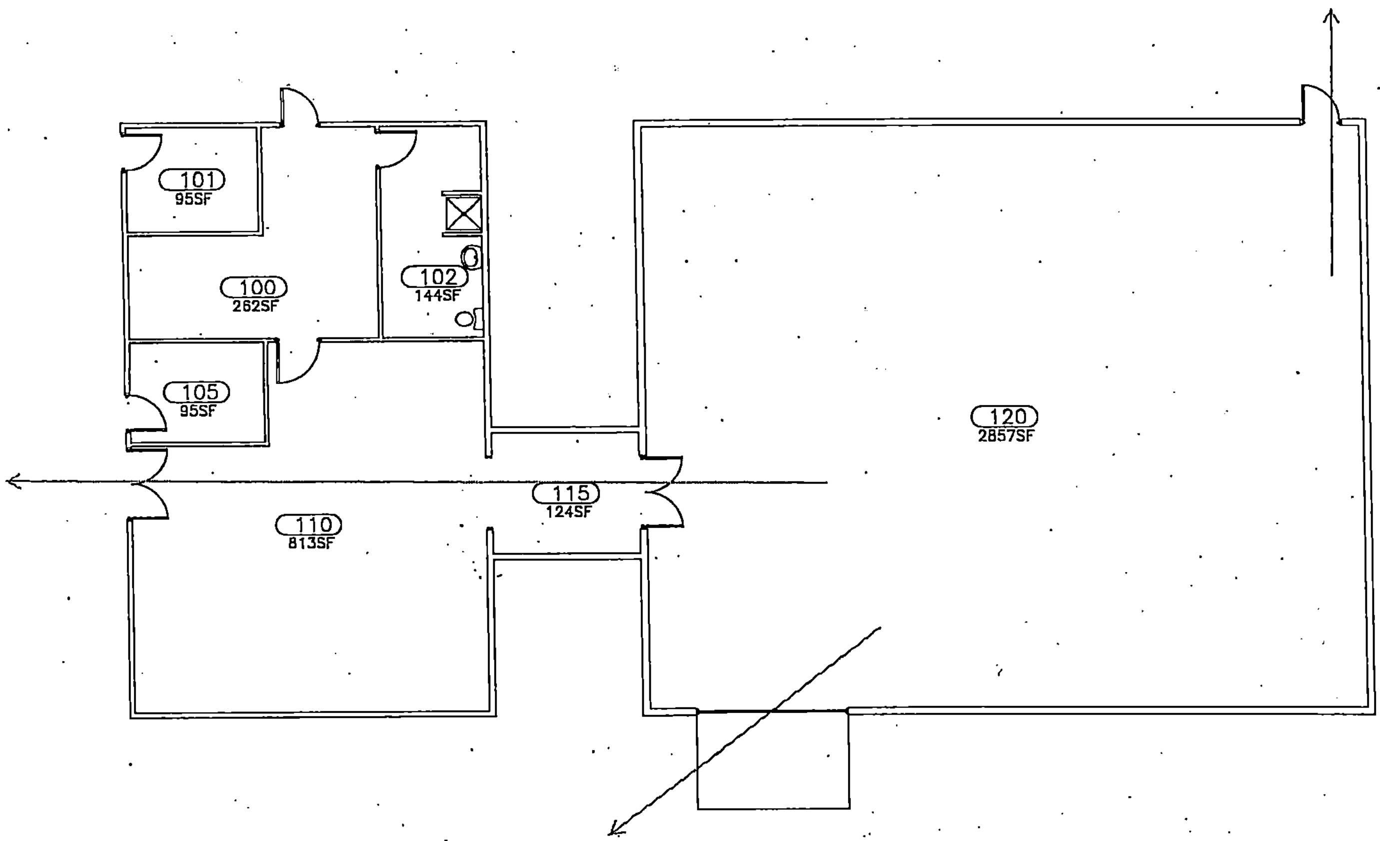
The following emergency precautions are posted along with the excavation routes and safety equipment locations in each room of the facility:

- Remain calm, avoid panic and confusion.
- Do not lock the doors. This provides access to emergency personnel.
- Do not assist in fire control unless trained and requested.
- Following evacuation, assemble in the designated area and await further instruction from the Emergency Coordinator. Do not interfere with emergency operations and do not re-enter the facility unless instructed to do so.

Figure A7-2
Evacuation Routes



Last Update Date: 2/6/2013 Filename: O_0475B_01_BASE.dwg



FIRST FLOOR PLAN

Figure A7.3 West Storage Building - Evacuation Routes

MICHIGAN STATE
UNIVERSITY
PHYSICAL PLANT DIVISION
ENGINEERING AND ARCHITECTURAL SERVICES

CHEMICAL WASTE FACILITY NO. 2

FIRST FLOOR PLAN

ORIG. DRAWN BY CMW
APPROVED BY SOF
DATE 05/16/02
SCALE 1" = 10'

LAST REVISED ON 1-10-13
LAST REVISED BY MMM
LAST EXPORTED

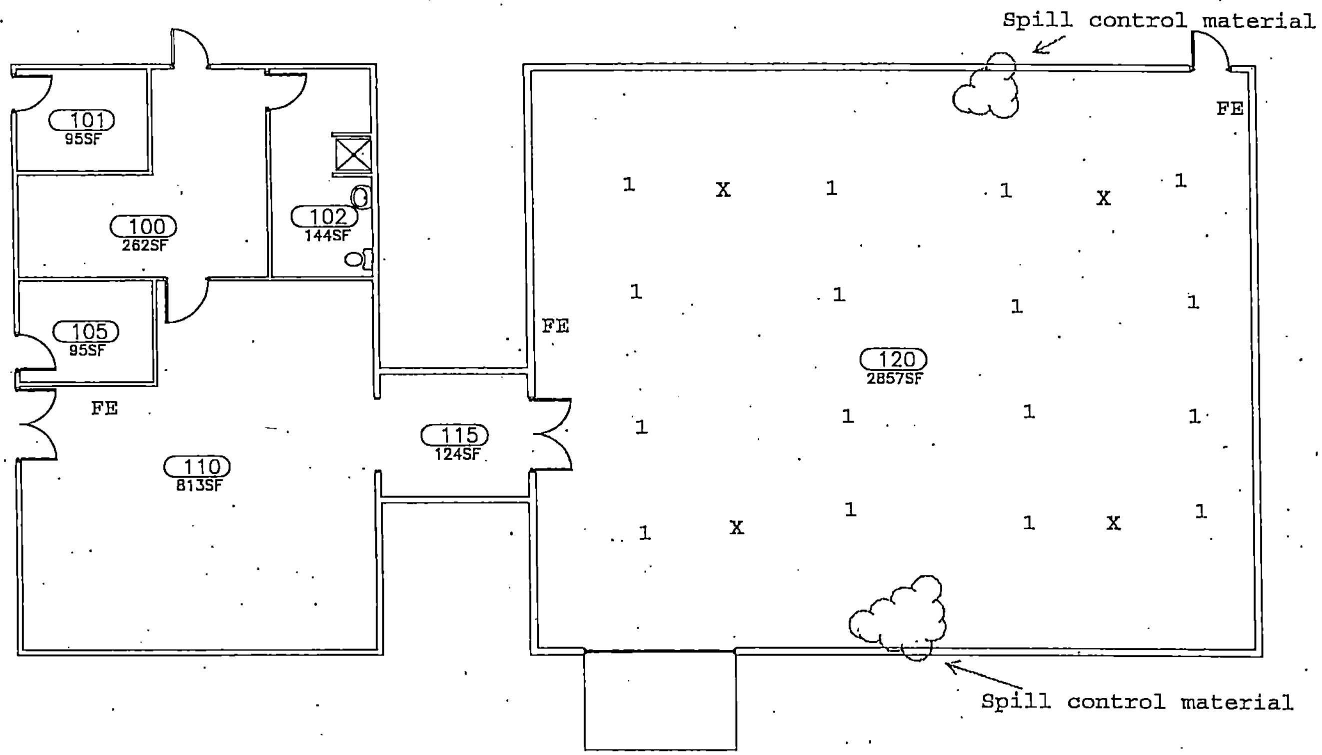
BUILDING NO. 475B

SHEET 1 OF 2

Last Update Date: 2/6/2013 Filename: O_0475B_01_BASE.dwg

X - location of smoke detector (ceiling)
1 - location of heat sensor (ceiling)
FE - location of Fire Extinguisher (wall)

Figure A7-3



FIRST FLOOR PLAN

West Storage Building - Safety Devices

MICHIGAN STATE UNIVERSITY
PHYSICAL PLANT DIVISION
ENGINEERING AND ARCHITECTURAL SERVICES

CHEMICAL WASTE FACILITY NO. 2

FIRST FLOOR PLAN

ORIG. DRAWN BY CMW
APPROVED BY SDF
DATE 05/16/02
SCALE 1" = 10'

LAST REVISED ON 1-18-13
LAST REVISED BY HMM
LAST EXPORTED

BUILDING NO. 475B

SHEET 1 OF 2

WASTE STORAGE FACILITY EMERGENCY EQUIPMENT LIST

FIRE EXTINGUISHING SYSTEMS

(The Inergen Fire Supression System services all the rooms at the Waste Storage Facility)

Quantity	Physical Description and Capability	Location-(Rm#)
1	**Inergen Fire Suppression System**--Ultraviolet detector heads	East 110
1	**Ansul Halon Fire Supression System** - heat/smoke detector head	West
1	**Fire Extinguisher-10-A:80-B:C dry chemical** - rated ABC	East 100
1	**Fire Extinguisher-35 lb. CO2**--rated 6 BC	East 120
1	**Fire Extinguisher-17 lb. CO2**--rated 4 BC	East 110
2	**Fire Extinguishers** - Dry chemical - 10-A:40B:C	West (N & S Walls)

COMMUNICATION AND ALARM SYSTEMS

(Guardian Alarm System monitors all the building alarms including intrusion, fire, organic vapors and low temperature)

Quantity	Physical Description and Capability	Location-(Rm#)
1	**Guardian intrusion alarm and motion detection system**	East 110 and West
1	**Enmet ISA-44-5 multi-channel organic vapor monitoring system**	East 110
1	**Low temperature monitoring system**--variable temperature set	East 110
1	**Explosion-proof telephone**--external communication	East 120
2	**Touch-tone telephones**--external communication	East 110 & West Office area

WASTE STORAGE FACILITY EMERGENCY EQUIPMENT LIST

* MSB = Middle Storage Building **SRV = Special Response Vehicle (available but not on site)

SPILL CONTROL EQUIPMENT

Quantity	Physical Description and Capability	Location-(Rm#)
1	**Hako Minuteman Mercury Vacuum and tools**--cleaning toxic dusts and liquids	**SRV
4	**Plastic chemical scoops**--manipulation of solids and liquids	East 100
1	**Dust pan**--collection of solid floor debris	East 100
1	**Stiff broom and handle**--various sweeping	East 100
1	**Soft broom and handle**--various sweeping	East100
1	**Bench dust brush**--bench-top sweeping	East100
24	**Plastic bus trays**--secondary containment of liquid containers	East 100,120 &130
4	**Large funnels**--transferring liquids	East 100
2	**Small funnels**--transferring liquids	East 100

SPILL CONTROL NEUTRALIZERS

Quantity	Physical Description and Capability	Location-(Rm#)
1	**50 lb. bag of sodium bicarbonate**--for neutralizing acid spills	*MSB

SPILL CONTROL ABSORBENTS

Quantity	Physical Description and Capability	Location-(Rm#)
2	**8 lb. bag of Haz-Mat Pig-up Pulp**--absorbs 5-gal./bag of all liquids	*MSB
1	**Box of 10 Haz-Mat Pig Pillows**--absorbs 1-gal./pillow of all liquids	*MSB
1	**Box of 12 Haz-Mat Pig Socks (3"x10')**--absorbs 100 oz. each of all liquids	*MSB
1	**Roll(38"x144') hydrocarbon selective fabric**--absorbs solvents off water	**SRV
4	**30 lb. bag Super-Fine granular sorbent**--diking and absorbing liquids	*MSB&**SRV
4	**Bags universal absorbent pads**	*MSB
2	**Bags superfine absorbent and universal absorbent pads**	West

WASTE STORAGE FACILITY EMERGENCY EQUIPMENT LIST

* MSB = Middle Storage Building **SRV = Special Response Vehicle (available but not on site)

DRUM HANDLING EQUIPMENT

Quantity	Physical Description and Capability	Location-(Rm#)
2	**1000 pound drum hand trucks**--movement of 30-55 gal. drums	East 100&*MSB
1	**1000 pound aluminum drum dolly**--movement of 30-55 gal. drums	East 100
1	**Drum lifting tool**--up-ending 30-55 gal. drums	**SRV
1	**Collawasa drum sampler and brushes**--sampling 30-55 gal. drums	East 100
1	**Explosion-proof electric drum pump**--transfering waste contents	**SRV
6	**Polyethylene hand drum pump**--transfering waste contents	East 130 & *MSB
2	**Bung wrenches**--opening and closing drum bungs	East 100

MISCELLANEOUS EQUIPMENT

Quantity	Physical Description and Capability	Location-(Rm#)
1	**Honda 3500W electrical generator**--alternate power supply when needed	*MSB
2	**Explosion-proof extension cords**--energize equipment within the building	East 100&120
2	**Non-sparking Crescent wrenches**--many varied uses	East 100
2	**Non-sparking Channel lock pliers**--many varied uses	East100
1	**10 pound sledge hammer**--enforcement where needed	*MSB
1	**Impact wrench - (1/2-inch drive)**--opening & closing open-head drums	East 100

Attachment A7-4

MSU PROCEDURE FOR ASSESSING OFF-SITE RISK DURING AND AFTER A SIGNIFICANT UNPLANNED RELEASE

This procedure applies in the unlikely event of a significant fire and/or explosion or other release of hazardous contaminates to the off site environment. The initial response activites on site will be performed by EHS personnel, MSU Police and E. Lansing Fire Department. However, many of the off-site sampling and monitoring may have to be performed by authorized governmental agency DNRE and or the EPA, as such actives can present a legal issue for MSU. In the event that off-site sampling/monitoring is performed by state and federal agency, MSU EHS department will provide assistance, if requested.

RESPONSIBILTY	ACTION
1.0 Record Incident Parameters	1.1 Document time the incident occurred, identify location, where/how the incident began. 1.2 Identify staff witnesses having direct knowledge of the incident. 1.3 Gather local metrological data form local sources/ National Weather Service and any site information.
2.0 Develop Event Narrative	2.1 Determine the sequence of events and timeline leading up to and throughout the incident by interviewing staff and any outside witnesses. 2.2 Indentify specific location, material/equipment Involved in the incident and the size/scope of the event.
3.0 Develop list of Materials/Substance	3.1 Identify all the materials/substances involved in the event, using the previous steps and verify that up-to date records are used. 3.2 Determine the volume, concentration and weight of of substances identified above and determine how they may have impacted/altered the event. Ensure information critical to response activates is kept in one location.

4.0 Air Monitoring During Incident RESPONSIBILTY	4.1 State or federal agencies may model the dispersion ACTION
	and deposition of release with real time data to determine likely extent of the plume and to assist with evacuation recommendations. EHS will assist in these activities to the extent practicable, if requested.
	4.2 State and federal agencies may establish air Monitoring equipment in locations upwind and down Wind of the incident. It is anticipated that locations Will be assigned as soon as possible, using meteorological data and that monitoring will continue until downwind data is consistent with upwind data.
5.0 Post Incident Sample Collection	5.1 State and federal agencies may develop a sampling Plan for the collection of samples related to the incident (i.e. waste, soil, groundwater). The plan may take into account off-site sampling and will also take into account visual observation, air data and modeling. The samples that may be collected are to identify and characterize concentrations of substances involved in the incident.
	5.2 State and federal agencies may identify and document Substances found to be present in levels the exceed screening levels.
6.0 Evaluate Data for Screening Potential Risk	6.1 Federal and state agencies that collect samples will screen the collected data against relevant screening levels.
	6.2 Federal and state agencies will prepare a risk assessment screening report. MSU will cooperate with these agencies in the screening and report preparation if requested.
7.0 Corrective Action	7.1 Based on the results of the foregoing data Collection, MSU's EHS will perform corrective actions in accordance with its Part 111 hazardous waste facility operating license.

ATTACHMENT 5

CLOSURE PLAN

FORM EQP 5111 ATTACHMENT TEMPLATE A11
CLOSURE AND POSTCLOSURE CARE PLANS

This document is an attachment to the Michigan Department of Environmental Quality's (DEQ) *Instructions for Completing Form EQP 5111, Operating License Application Form for Hazardous Waste Treatment, Storage, and Disposal Facilities.* See Form EQP 5111 for details on how to use this attachment.

The administrative rules promulgated pursuant to Part 111, Hazardous Waste Management, of Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, (Act 451), R 299.9613 and Title 40 of the Code of Federal Regulations (CFR), Part 264, Subpart G, establishes requirements for the closure and, if necessary, postclosure care of hazardous waste management facilities. All references to 40 CFR citations specified herein are adopted by reference in R 299.11003. This license application template addresses requirements for the proper closure and, if necessary, postclosure care of the hazardous waste management units and the hazardous waste management facility for the Michigan State University Waste Storage Facility in Lansing, Michigan. The information provided in this template was used to prepare the closure and postclosure care cost estimate provided in Template A12, "Closure and Postclosure Care Cost Estimates."

Ensure that all samples collected for waste characterization and environmental monitoring during closure and postclosure care activities are collected, transported, analyzed, stored, and disposed by trained and qualified individuals in accordance with the QA/QC Plan. The QA/QC Plan should, at a minimum, include the written procedures outlined in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW-846, Third Edition, Chapter 1 (November 1986), and its Updates.

This template is organized as follows:

A11.A CLOSURE PLAN

A11.A.1 Closure Performance Standard
[R 299.9613 and 40 CFR §264.111]

This Closure Plan is designed to ensure that the facility will be closed in a manner that achieves the following:

a. Minimizes the need for further maintenance; and

b. Controls, minimizes, or eliminates, to the extent necessary to protect human health and the environment, postclosure escape of hazardous wastes, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition byproducts to the groundwater, surface water, or atmosphere; and, as applicable

c. Complies with the unit-specific closure requirements for each of the following units:

(Check as appropriate)

X Use and management of containers	R 299.9614 and 40 CFR §264.178
☐ Tank systems	R 299.9615 and 40 CFR §264.197
☐ Surface impoundments	R 299.9616 and 40 CFR §264.228
☐ Waste piles	R 299.9617 and 40 CFR §264.258
☐ Land treatment[a]	R 299.9618 and 40 CFR §264.280
☐ Landfill	R 299.9619 and 40 CFR §264.310
☐ Incinerators	R 299.9620 and 40 CFR §264.351
☐ Drip pads[b]	R 299.9621 and 40 CFR §264.575
☐ Miscellaneous units	R 299.9623 and 40 CFR §§264.601-603
☐ Hazardous waste munitions and explosive storage[b]	R 299.9637 and 40 CFR §264.1202
☐ Boilers and industrial furnances	R 299.9808 and 40 CFR §266.102(e)(11)

[a] Not included in the template
[b] *Not yet included in 40 CFR §264.111; therefore not considered*

Unit-specific closure procedures are discussed in Section A11.A.5 of this template for each unit type indicated above.

A11.A.2 Unit-Specific Information
[R 299.9613 and 40 CFR §§264.112(b)(3) and (6)]

Table A11.A.1 Hazardous Waste Management Units Information

The following table identifies each hazardous waste management unit at the Michigan State University Waste Storage Facility subject to the closure requirements of this hazardous waste management facility operating license. The table also includes: each unit's maximum licensed hazardous waste inventory, a list of the waste codes managed in the unit, the anticipated date of closure (if known), and the estimated duration of closure activities once closure begins. Unit-specific methods for closure and detailed schedules are discussed in Section 11A.5 of this template.

Unit Designation	Maximum Inventory (Include Units)	Waste Codes of Hazardous Wastes Managed	Scheduled Closure Date	Estimated Duration of Closure
S01	7900 gallons total (see Table C1-2)	See Table A2.A.1	N/A	180 Days

A11.A.3 Schedule of Final Facility Closure

[R 299.9613 and 40 CFR §264.112(b)(6)]

The Michigan State University Waste Storage facility:

(Check as appropriate)

☐ Anticipates completing final closure of the entire facility by *[insert estimated date]*

X Has not determined when the facility will close and does not anticipate completing final closure of the entire facility prior to expiration of the facility's hazardous waste operating license.

Detailed Closure Schedule for Facility Closure:

Closure Activity	Time Completed
Receipt of final load of wastes	Day 1
Disposal of final inventory (excl. chromic acid	Day 1-90
Decontamination of facility	Day 60-150
Salvage of alarm systems, HVAC equip, etc.	Day 120-150
Laboratory washings analysis results time	Day 120-150
Completion of closure	Day 150-180
Certification submittal to EPA and MDEQ	Day 150-180

A11.A.4 Notification and Time Allowed for Closure
[R 299.9613 and 40 CFR §§264.112(d)(2) and 264.113(a) and (b)]

Final closure activities will be initiated within 90 days of receipt of the final volume of hazardous wastes and completed within 180 days of receipt of the final volume of waste. The tasks and estimated time required for closure shall follow the schedule specified in Section 11A.3. The Director will be notified by Michigan State University Waste Storage facility 60 days before final closure begins. Final closure will be certified by both the MSU facility and an independent, qualified, registered professional engineer of the state of Michigan.

A11.A.4(a) Extensions for Closure Time
[R 299.9613 and 40 CFR §264.113(a) and (b)]

In the event that an extension for closure for the facility or any unit is necessary, the MSU WSF will request an extension in accordance with the requirements of 40 CFR §264.113(a).

A11.A.5 Unit-Specific Closure Procedures

Unit-specific closure procedures are provided for each unit identified in Section A11.A.2 of this template.

🕮 GUIDANCE/REFERENCES

- Part 201, Environmental Remediation, of Act 451. September 1996.
- Test Methods for Evaluating Solid Waste: Physical/Chemical Methods SW 846, Update III plus Variations. December 1996. EPA

A11.A.5(a) Closure of Container Storage Areas
[R 299.9614 and 40 CFR §264.178]

This section describes the procedures for closure of MSU WSF. The general closure requirement and specific closure procedures are discussed below.

A. <u>General Closure Requirement</u>

At closure, all hazardous waste and hazardous waste residues will be removed from the containment system. Remaining containers, liners, bases, and soil containing or contaminated with hazardous waste or hazardous waste residues will be decontaminated or removed.

B. <u>Specific Closure Procedures</u>

Specific procedures for inventory management, unit inspection, decontamination, sampling and analysis, and additional waste management are discussed below.

1. Inventory and Remedial Waste Management Procedures

All the containers at the WSF at the time of closure will be transported to a licensed disposal facility. Any containers with any portion of hazardous material will be transported as a hazardous waste.

2. Unit Inspection Procedures

A visual inspection of all areas of the WSF will be conducted to verify that all hazardous materials have been removed and any spills have been cleaned up.

3. Decontamination Procedures

Prior to decontamination procedures, all minor cracks, joints, etc. will be sealed so as to prevent loss of contaminants through structural surfaces. Following the removal of all waste containers from the facility, all inside surfaces (walls, ceilings and floors) will be washed with a dilute solution of trisodium phosphate. The surfaces will then be rinsed using high-pressure steam and water sprays as indicated in 40 CFR 268.45 Table 1.A.1.e. This work will be supervised and/or performed by EHS personnel. Personnel will be equipped with proper personal protective equipment. Full-face respirators with organic vapor and acid filter cartridges will be available during the entire decontamination process. Chemical neutralizers and spill control pillows will also be available.

The rinse water will be collected and analyzed for the parameters found in Table B5-2 EPA Reference Methods and Detection Limits. If the total volatile organic (USEPA Method 8260) content of the wash water is greater than 100 µg/l, it will be transported to a licensed disposal facility. If the total volatile organic content of the wash water is less than 100 µg/l, the water will be discharged into the East Lansing sanitary sewer system. The results of all analyses will be included as part of the final closure report. The results of the rinse water sampling and a visual inspection will be used to determine when the decontamination is complete.

Any spill saturated control pillows or other absorbent materials used in the decontamination process will be placed in 55-gallon drums and transported to a licensed disposal facility. The same process will be followed for any disposable protective clothing used during the decontamination process. Non-disposable protective clothing will be cleaned with the trisodium phosphate solution. Manifests of all containers shipped as part of these closure activities will be obtained.

4. Sampling and Analysis Procedures

At the time of closure, soil sampling will be conducted at the facility. Samples will be collected at the ten locations presented on Figure B5-2. A Sampling and Analysis Plan will be submitted prior to implementing the soil sampling portion of closure. This plan will include sample collection procedures, QA/QC procedures (duplicates, blanks, etc.), analytical methods and detection limits, and soil results evaluation procedures. Specifically, the samples will be analyzed for metals (antimony, arsenic, barium, cadmium, chromium, lead, mercury, nickel, selenium, silver, thallium, and zinc), halogenated and aromatic volatile organic compounds (VOCs), and semi volatile organic compounds (SVOCs) and cyanide. Laboratory analyses of the soil samples (from all sample locations and any duplicates) will be performed as described in Table B5-2 by a qualified laboratory. Sampling parameters will be reviewed and will be reflective of past and current waste streams handled at MSU WSF.

5. Additional Waste Management Procedures

Analytical data from the final soil sampling event will be evaluated for evidence of impact in accordance with the criteria presented in the Sampling and Analysis Plan submitted at that time. The detection of VOCs and/or SVOCs above the reporting limits presented in Table B5-2 will be evidence of impact, being that these reporting limits represent background concentrations at the site.

If the results of these analyses indicate the presence of impacted soils, then additional sampling will be performed to identify the extent of soil degradation at the site. Specific sampling locations are not identified at this time. However, the additional samples will be located in accordance with the 2002 Michigan Department of Natural resources and Environment (MDNRE), Remediation and Redevelopment Division (RRD) guidance document entitled *Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria (S^3TM)*. Excavations will also be performed according to the criteria described in the RRD document.

If, at the time of closure, the concrete floor of any building in the waste storage facility has developed cracks or separations in the construction joints, then sampling will also be performed through the concrete in these areas to determine the possible presence of degradation. Analyses will be performed for the same parameters listed for the soil samples and the same criteria for the determination of impact will be utilized. If impact is detected, then additional sampling will be performed to identify the extent of degradation under the facility. Excavations will be performed as described previously. If any excavation is required, the area will be graded by clean soils which have not been impacted by site activities.

A11.A.6 Certification of Closure
[R 299.9613]

Within 60 days of completion of closure, MSU WSF will submit to the Director, by registered mail, a certification that the hazardous waste management unit or facility, as applicable, has been closed in accordance with the specifications in the approved closure plan. The certification will be signed by the MSU WSF representative and by an independent registered professional engineer. Documentation supporting the independent registered engineer's certification will be furnished to the Director in accordance with R 299.9613(3), including:

1. The results of all sampling and analysis;
2. Sampling and analysis procedures;
3. A map showing the location where samples were obtained;
4. Any statistical evaluations of sampling data;
5. A summary of waste types and quantities removed from the site and the destination of these wastes; and
6. If soil has been excavated, the final depth and elevation of the excavation and a description of the fill material used.

The MSU WSF facility will maintain financial assurance for closure until the Director releases the MSU WSF facility from the financial assurance requirements for closure under R 299.9703.

The certification must be worded as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to be the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A11.B POSTCLOSURE PLAN

[R 299.9613 and 40 CFR §264.118]

A11.B.1 Applicability

(Check as appropriate)

X **Not applicable:** Hazardous waste will not be left behind at closure. A survey plat, postclosure care, postclosure certifications, and other notices are not required.

☐ **Applicable:**

- ☐ Contingent plan
- ☐ Landfill unit

Figure B5-2 Soil Sampling Location

TABLE B5-2

EPA Reference Methods and Detection Limits
Soil Monitoring Parameters
Michigan State University
Waste Storage Facility
Lansing, Michigan

Parameter	EPA Reference Method	Detection Limit (mg/Kg)
SVOCs	EPA Method 8270C	----
Acenapthene		100
Acenaphthylene		100
Aniline		NA
Anthracene		100
Azobenzene		20
Benzo(a)anthracene		100
Benzo(a)pyrene		200
Benzo(b)fluoranthene		200
Benzo(ghi)perylene		200
Benzo(k)fluoranthene		200
Banzyl Alcohol		2,500
Bis(2-chloroethoxy)methane		200
Bis(2-chlorethyl)ether		100
Bis(2-chloroisopropyl)ether		100
Bis(2-ethylhexyl)phthalate		250
4-Bromophenyl Phenylether		200
Butyl Benzyl Phthalate		250
Carbazole		250
4-Chloro-3-methylphenol		200
2-Chloronaphthalene		200
2-Chlorophenol		330
4-Chlorophenyl Phenylether		100
Chrysene		100
Di-n-butyl Phthalate		250
Di-n-octal Phthalate		250
Dibenzo(a,h)anthracene		200
Dibenzofuran		250
2,4-Dicholophenol		330
Diethyl Phthalate		250
Dimethyl Phthalate		250
2,4-Dimethylphenol		330
2,4-Dinitrophenol		830
2,4-Dinitrotoluene		250
2,6-Dinitrotoluene		250
Fluoranthene		100
Fluorene		100
Hexachlorobenzene		200
Hexachlorocyclopentadiene		330

(8/9/13)

TABLE B5-2(cont.)

EPA Reference Methods and Detection Limits
Soil Monitoring Parameters
Michigan State University
Waste Storage Facility
Lansing, Michigan

Parameter	EPA Reference Method	Detection Limit (mg/Kg)
SVOCs	EPA Method 8270C	-----
Hexachlorethane		100
Ideno(1,2,3-cd)pyrene		200
Isophorone		100
2-Methyl-4,6-dinitrophenol		830
2-Methylnaphthalene		250
2-Methylphenol		330
3&4-Methylphenol		660
Naphthalene		100
2-Nitroaniline		500
3-Nitroaniline		500
4-Nitroaniline		500
Nitrobenzene		200
2-Nitrophenol		330
4-Nitrophenol		830
N-Nitrosodimethylamine		250
N-Nitrosodi-n-propylamine		200
N-Nitrosodiphenylamine		200
Pentachlorophenol		800
Phenanthrene		100
Phenol		330
Pyrene		100
Pyridine		NA
1,2,4-Trichlorobenezene		200
2,4,5-Trichlorophenol		330
2,4,6-Trichlorophenol		330

NA: Not Available

(89/13)

Table B5-2

Soil Monitoring Parameters
Metals from 40 CFR Part 261 Appendix VII

Parameter	EPA Reference Method	Detection Limit (ug/kg)
Antimony	EPA 6020A	300
Arsenic	EPA 6020A	100
Barium	EPA 6020A	1000
Cadmium	EPA 6020A	50
Chromium	EPA 6020A	500
Lead	EPA 6020A	1000
Mercury	EPA 7471B	50
Nickel	EPA 6020A	1000
Selenium	EPA 6020A	200
Silver	EPA 6020A	100
Thallium	EPA 6020A	500
Zinc	EPA 6020A	1000
Cyanide	ASTM D7511-09	100

ATTACHMENT 6

ENGINEERING PLANS

B6. ENGINEERING PLANS

Facility Design and Operating Standards: PA 451 R 299.9604

B6.1 Introduction

The Michigan State University Waste Storage Facility (WSF) has been designed and constructed to control run-on, run-off, prevent the release of waste substances from the facility, and provide safe storage for the waste substances received. The storage areas are completely enclosed to prevent any impact from precipitation. The raised grade and raised edges of the floors in all the container storage areas provide additional protection against run-on having an impact on any area of the facility.

Protection of run-off from the site is provided by the complete enclosure of the facility buildings and the design of the storage areas.

The escape of waste substances from the facility is prevented by several features in the construction of the facility. Each container storage area has a minimum 4-inch thick concrete floor reinforced with 6-inch x 6-inch 10/10 wire mesh. The concrete floor is considered impervious and free of any joints and cracks which might allow for the escape of spilled waste substances.

B6.2 Containment Capacities of East Storage Building

Each storage room has a 6-inch concrete containment lip built into every wall. This provides ample containment in the event of an accidental release of waste substances. 264.175(a)(3) indicates that a storage containment system must have a capacity to contain 10 percent of the volume of containers, or 10 percent of the volume of the largest container. Bearing this in mind, the following containment capacities have been established for each storage room:

Room 100: Consolidation Room

A. Existing Containment Capacity:

29 feet x 29.5 feet x 0.5 feet = 427.75 cu. ft. x 7.48 gallons/cu. ft. = 3200 gallons

B. Maximum Storage:

80	1 gallon or less bottles (i.e. 80 x 1 gal or 320 x 1 qt)		80 gallons
100	5 gallon containers		500 gallons
5	30 gallon containers		150 gallons
50	55 gallon metal or polyethylene barrels		2750 gallons
		TOTAL:	3480 gallons

C. Necessary Containment: 348 gallons.

The 3200 gallon capacity is adequate for Room 101.

Room 130: Storage Room

A. Existing Containment Capacity:

16.5 feet x 6.3 feet x 0.5 feet = 51.97 cu. ft. x 7.48 gallons/cu. ft. = 389 gallons

B. Maximum Storage:

150	5 gallon or less containers		750 gallons
3	55 gallon		165 gallons
		TOTAL:	915 gallons

C. Necessary Containment: 92 gallons.

The 389 gallon capacity is in excess of the total volume required.

Room 120 - Lab Pack Room

A. Existing Containment:

20 feet x 16.5 feet x 0.5 feet = 165.0 cu. ft. x 7.48 gallons/cu. ft. = 1234 gallons

B. Maximum Storage:

An assortment of containers being prepared for consolidation as well as items only suitable for lab packing are stored in this room . They range in size from 1 milliliter to 5 gallons. The maximum storage volume for this room is 225 gallons.

C. Necessary Containment: 23 gallons

The 1234 gallon containment capacity is in excess of the required containment.

The containment calculations for each storage room clearly indicate that the necessary containment requirements are achieved for each compartment of the facility. The total containment capacity of the facility is 4823 gallons, while the necessary total capacity for the total facility is only 463 gallons.

Smaller containers may be substituted for larger containers when calculating the storage limit of a particular room. So, for example, if there were 120, 5 gallon containers in room 100, but only 25, 55 gallon containers, the Facility would not be considered out of storage compliance.

In addition to the containment capabilities of the storage areas, other features have been incorporated into the facility to prevent the release of waste substances. These include the absence of floor drains in any of the storage areas, effectively preventing the migration of released substances into the septic field.

Containment Capacity of West Storage Building

The West Storage building contains a 3-inch concrete lip surrounding the storage room. With dimensions of 62' by 50', the containment capacity is calculated as follows:

62 feet x 50 feet x 0.25 feet = 775 cu.feet x 7.48galllons/cubic foot = 5797 gallons

The maximum storage volume for this room is 4500 gallons. The necessary containment is 450 gallons, ten percent of volume. The 5797 gallon containment capacity is in excess of the required containment.

B6.3 Engineering Plans

Engineering plans of the East Storage Building are enclosed as **Appendix B6-2**. Engineering plans of the West Storage Building are enclosed as **Appendix B6-6**. These plans were designed and approved by Professional Engineers on Staff with the Engineering Services Division of the MSU Physical Plant. The plans contain views, elevations, and cross-sections which provide information to facilitate the review of the facility. In addition, the specifications of the building and materials are provided in **Appendix B6-1**.

The building design permits easy, close access to the outside in each of the storage areas. The East Storage Building Consolidation Room (100), the Lab-Pack Room (120), and the Mechanical Room (110) all contain access doors directly to the outside. The Storage Room (130) has a 4-foot by 2-foot emergency knock-out door installed in the west wall as an emergency escape route. The West Storage Building (WSB) consists of a large 62' x 50' room for storage with an overhead door, and an exit door at opposite ends. This storage room also connects to a separate office area with access to the outside.

The basis for the design and construction of the ESB was to enable the separation of different types of wastes into distinct storage areas of the facility and to provide the necessary containment in each storage area. The building has been designed and constructed both to avoid emergency situations and to facilitate the handling of these situations if they should occur. Each of the storage rooms in the ESB has been constructed with containment capabilities which have been discussed. In addition, the electrical controls of the ESB have been placed in the mechanical room (110). This room is completely separate from the storage areas.

Extensive security devices and emergency equipment have been installed at the WSF. The purpose of the security system is to keep unauthorized personnel and livestock out of the active portion of the facility, to provide for the detection of hazardous vapors and flames, and to activate an alarm and fire suppression system to facilitate response to those possible situations. Details of the security and fire suppression system are discussed in section A4 "Security Procedures and Equipment".

The East Storage building is equipped with explosion-proof lighting and wiring. An explosion-proof flashlight is maintained in the Consolidation Room (100). An emergency eye-wash station

specifications for the coating materials, the chemical compatibilities, and the application instructions. The coating prevents any release of waste materials which could compromise containment integrity from contacting the cement floor.
The construction of the loading docks was intended to facilitate the safe handling of wastes both into and out of the facility. Engineering plans for the diking around the loading dock are and for the canopy over the loading dock are included as **Appendix B6-5.**

B6.4 Operation Standards

The East Storage Building is equipped with a dual, independent gas fired, forced air heating system. The independent, dual feature allows for the backup system to compensate following the failure of one unit. These furnaces, along with all electrical controls, are housed in Room 110 which is completely separated from all of the storage rooms. A double throw electrical switch has been installed to permit the use of a portable generator in the event of a power failure.

These precautions have been undertaken to avoid the use of portable generators and space heaters inside the WSF. The use of these units is unacceptable due to the possibility of ignition from sparks, and uneven heat generation.

Flow patterns for the WSF are uncomplicated due to the fact that the facility is limited to only storage of the waste substances, and the simplicity of the structure. The flow pattern for the different types of waste are described in detail in section A2 "Chemical and Physical Analyses." In summary, the materials are all sorted according to the waste stream categories identified in section A3 "Waste Analysis Plan." Following packaging or consolidation, readied containers are stored either in the Lab Pack Room, or in the Consolidation Room.

When unloading, solvents are moved to the Consolidation Room (100), containers with reactive wastes are moved to the Lab Pack Room (120), and corrosive wastes are stored inside the diked area in the Consolidation Room.

The Consolidation Room generally receives all ignitable solvents and corrosive or poisonous liquids in containers greater than 1 gallon capacity. All materials received in containers of less than or equal to 1 gallon capacity are moved to the Lab Pack Room for further segregation and placement into secondary containment. Upon placement into secondary containment, materials appropriate for consolidation are stored in the Consolidation Room. The criteria for determining flammability, corrosivity, and toxicity are included in **Appendix A10-1** "Waste Disposal Guide."

and shower have been installed adjacent to the toilet in the Lab-Pack Room (120). The shower consists of a drench shower head with a "panic-ring-activated, stay-open" valve while the eye-wash has a "panic-bar" operated valve. Should an emergency situation arise, the WSF is equipped with two telephones. One telephone is stationed on the west wall of the Mechanical Room (110) and the other, an explosion-proof telephone, is located on the west wall of the Lab-Pack Room (120). Assistance can be summoned from the appropriate local emergency response units. A list of additional equipment is provided as **Appendix A7-3.** The locations of the equipment maintained in the WSB are shown on **Figure A7-3** (after the list of equipment). The stationary equipment in the chemical waste building includes a toilet, two partial walk in fume hoods, fume hood, a no-drain sink, eye-wash station, shower, as well as many items listed in the table. Items included in the equipment list are on site, but not necessarily stored in the chemical waste building.

The facility has been constructed to provide for adequate storage capacity, adequate containment capability and sufficient aisle space. In order to allow for the unobstructed movement of all personnel within the facility, the aisle spaces in all the storage areas are maintained at a minimum of 2 feet. This spacing allows for the passage of emergency equipment, if necessary, and for effective spill management in the event of a release.

The East Storage Building Storage Room (130) has been equipped with a 4-foot by 2-foot knock-out emergency door on the west wall to provide an emergency escape route. This feature was not installed as part of the original building and as such is not shown on the original engineering plans. In addition, this room is equipped with explosion-proof lights, and blowout designed hinged metal walls.

The floor construction of the storage rooms includes a feature to provide for the raising of some of the 55-gallon containers off the floor surface. This promotes the detection of leaks and prevents the contact of the containers with any standing liquids. To this end, polyethylene pallets will be placed throughout each of the areas where 55-gallon drums are stored. This arrangement will allow for storage of most of the drums and 5-gallon containers awaiting consolidation above floor level. Incompatible corrosive wastes, i.e. acids and bases, which are currently segregated, are separated by the concrete diking within the corrosive consolidation and storage areas of Room 100, as indicated in **Figure C1-1.**

The concrete floor of the storage rooms are coated with the phenolic resin or the acrylic urethane described in **Appendix B6-3.** This appendix contains the manufacturer's

Ignitable materials taken to the Consolidation Room (100) are stored there until either transport or consolidation. Corrosive waste materials are either stored or consolidated; the consolidated corrosive wastes are then transported directly from this room.

Corrosive waste materials are also taken from the loading dock directly into the Consolidation Room where they are either stored or consolidated. The consolidated corrosive wastes are then stored for subsequent removal by the contracted vendor.

The WSB will be used for the storage of 5, 30 and 55 gallon containers for off-site disposal at an approved facility. No consolidation or mixing shall occur at the WSB. Waste stream will be properly segregated and stored in designated areas by trained staff. The structure is design to contain any accidental spill of the largest container stored. Concrete will be lined with a two part epoxy coating resistant to organic and non-organic liquids.

The WSB is designed to allow a truck to back-up into the inside of the canopy for the loading of containers.

MICHIGAN STATE
UNIVERSITY

Michigan State University Waste Storage Facility Alteration and Document Submittal Schedule

West Storage Building

Task	*Timeline (after permit approval)*
Remove existing items stored inside	Day 1 – 30 (upon NRC approval
Repair cracks/gaps in floor	Days 30-40
Coat floor with epoxy coating to make impervious	Days 35-45
Install throw switch for emergency generator	Days 1 - 45
Submit certification of installation of floor coating in West Building	Day 120

East Storage Building

Task	*Timeline (after permit approval)*
Clear out acid/corrosive storage area	Day 1 - 30
Remove acid/corrosive area berm	Day 30 - 60
Install corridor from East to Middle Bulding	Day 40 – 90
Re-coat floor where needed in East Building	Day 90-120
Coat Floors in Middle Building and corridor	Day 90-120
Submit as-built engineering plans of East Building and certification of installation of floor coatings in East and Middle Buildings	Day 150

Vice President for Research and Graduate Studies

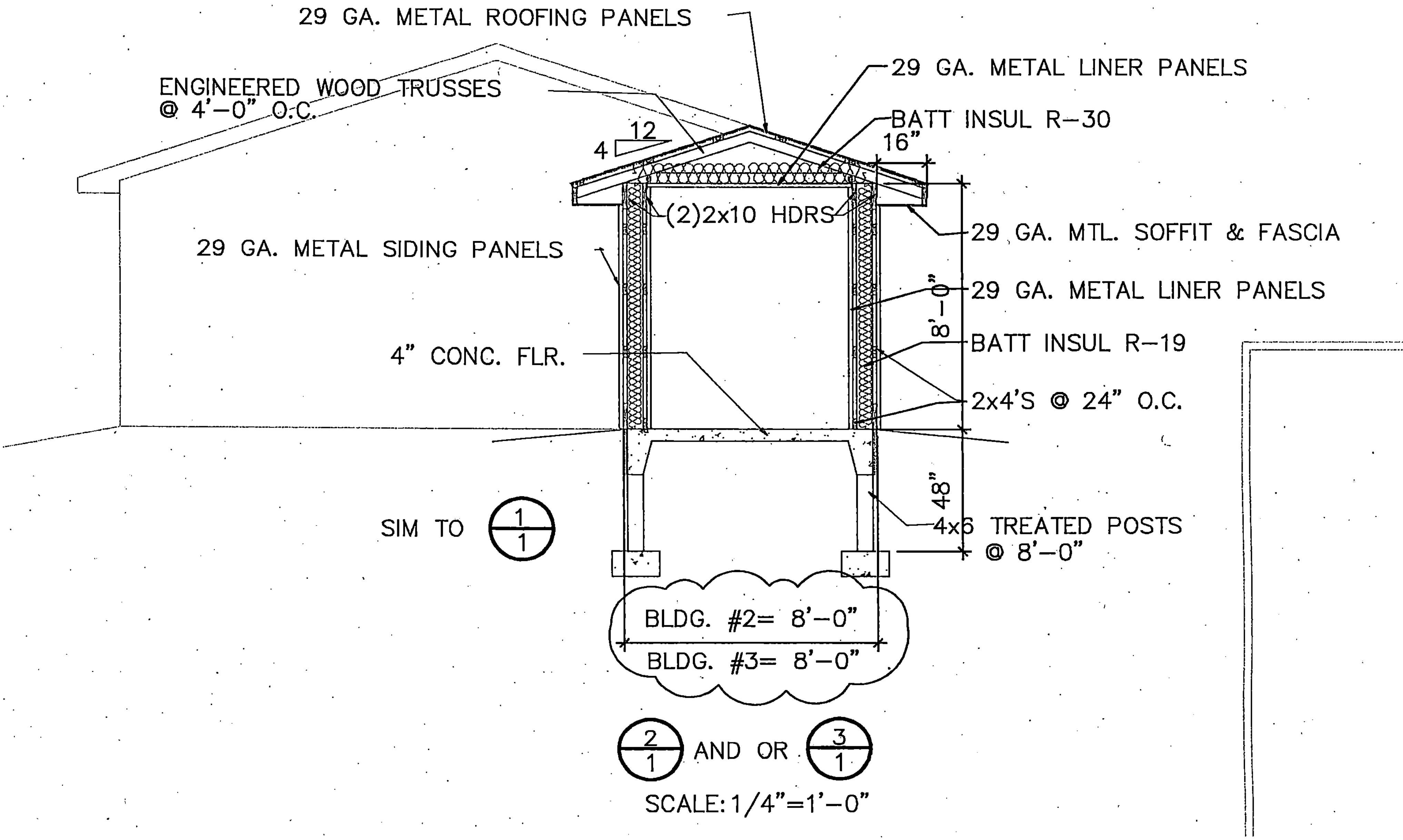
Office of Environmental Health & Safety

Giltner Hall
293 Farm Lane, Room 150
East Lansing, MI 48824

517-355-0153
Fax: 517-432-6686
ehs.msu.edu

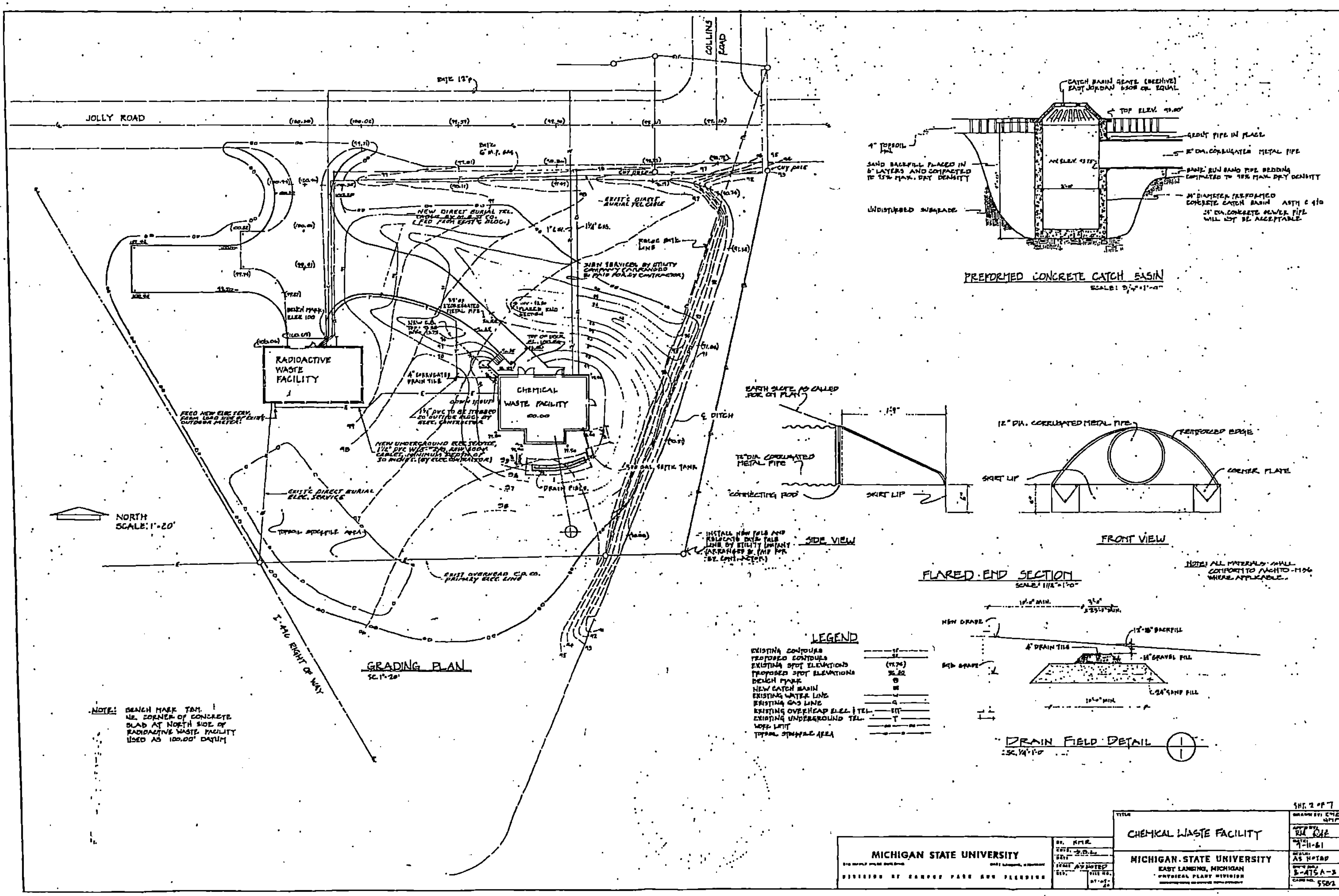
Version 1 (8/7/13)

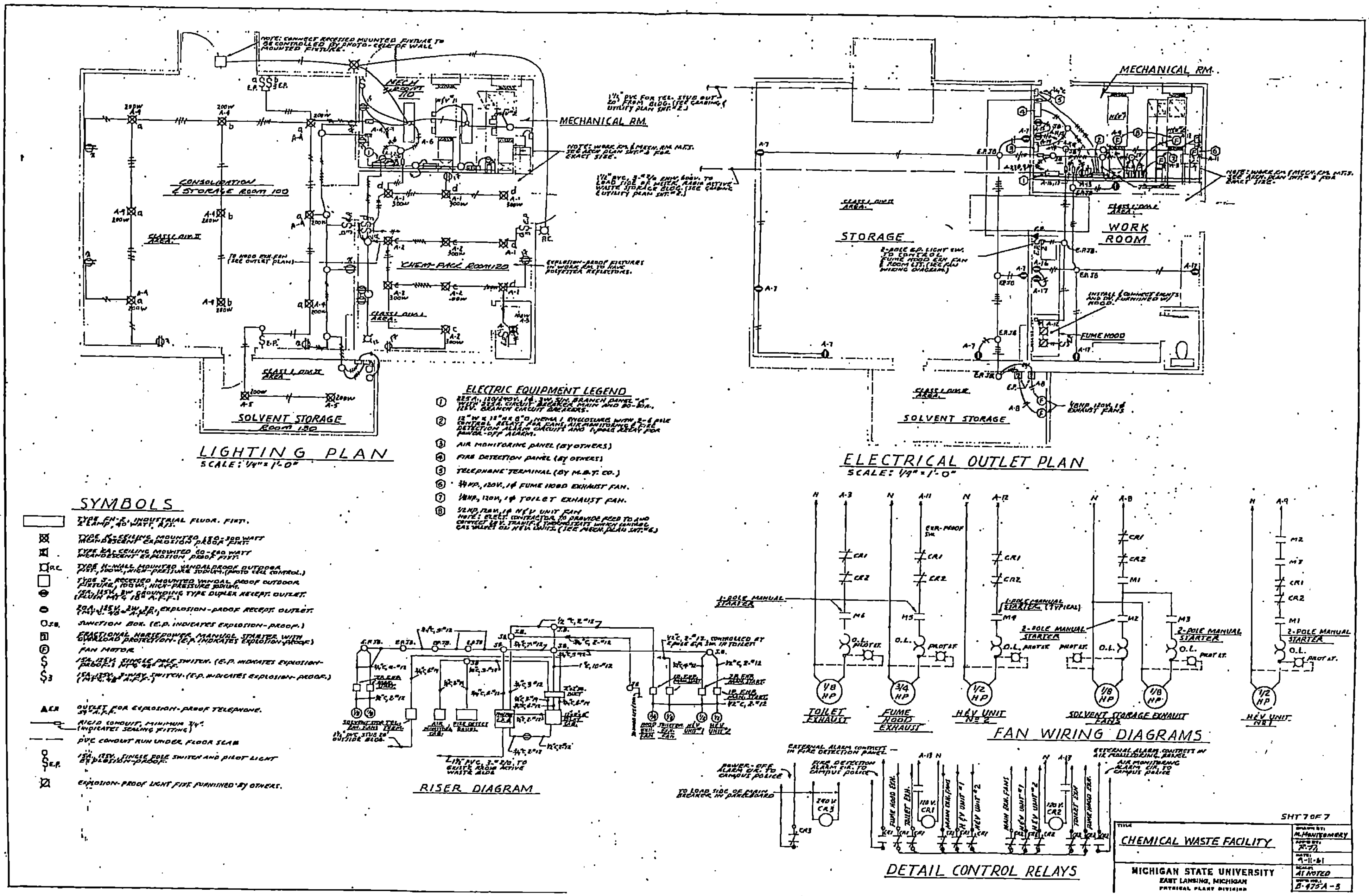
Figur B62-a   Corridor entrance to East St age Building

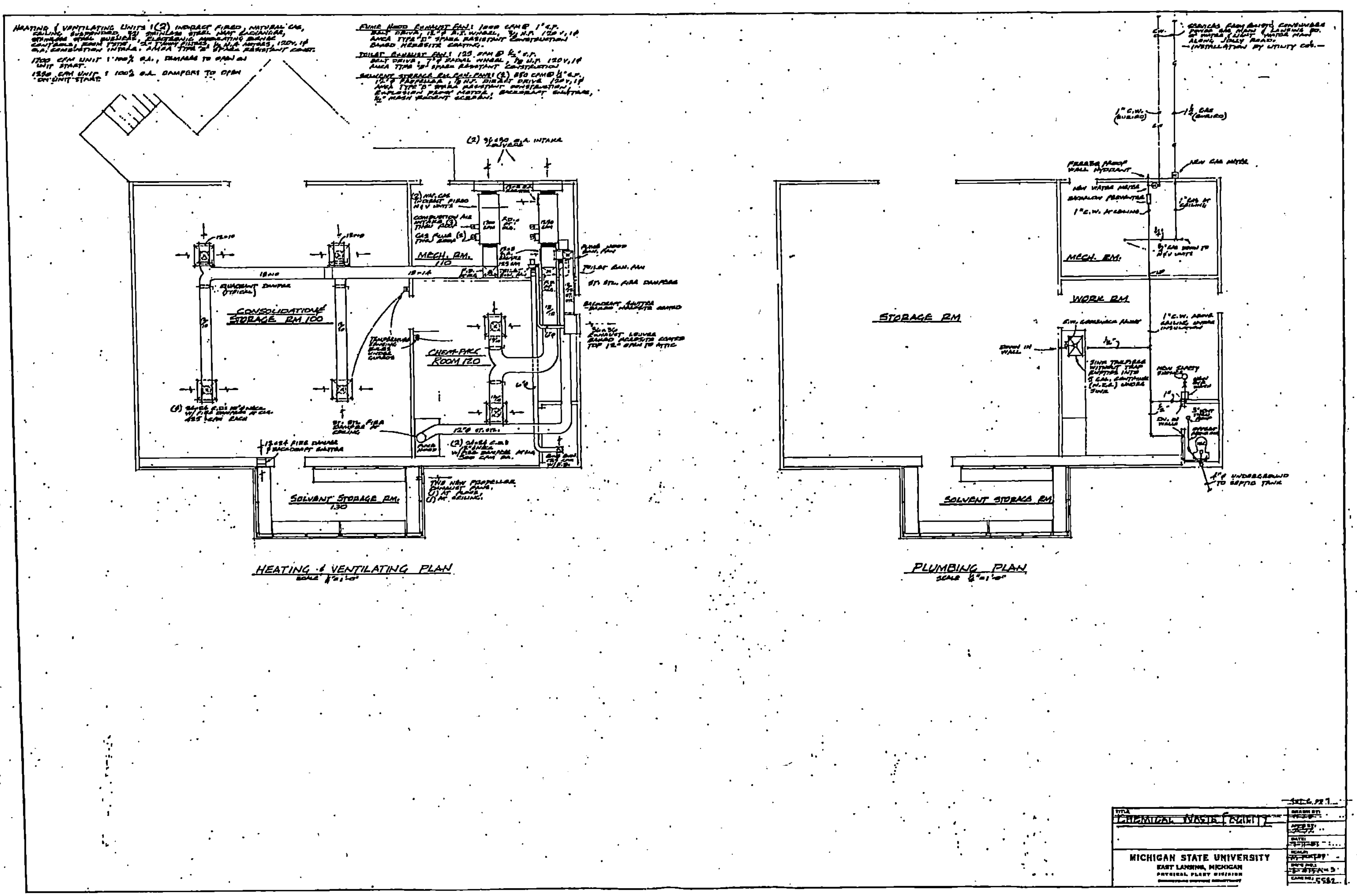


Appendix B6-2

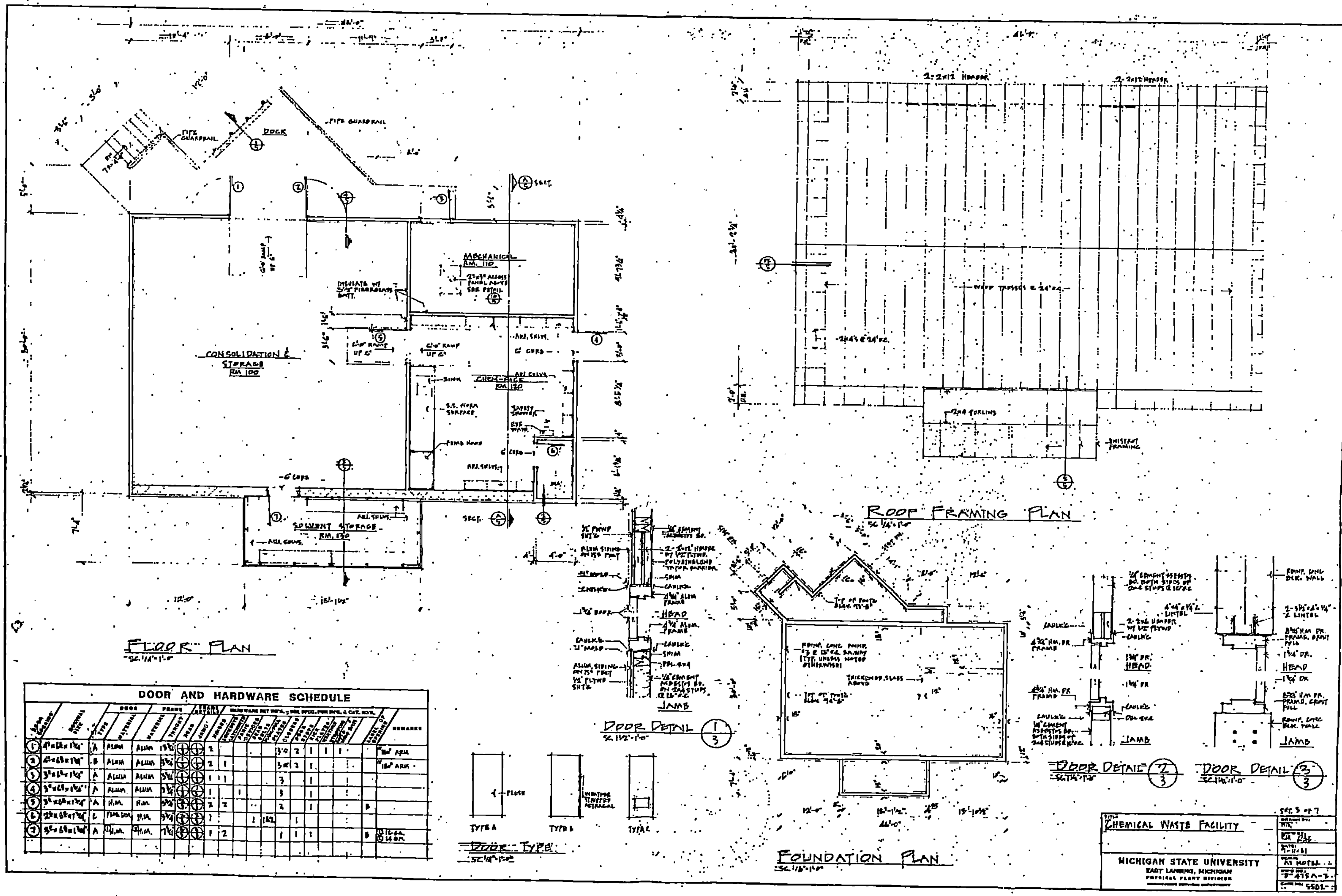
Engineering drawings for East Storage Building


JOLLY ROAD
COLLINS ROAD
RADIOACTIVE WASTE FACILITY
CHEMICAL WASTE FACILITY
100.00
℄ DITCH
550 GAL. SEPTIC TANK
DRAIN FIELD
NORTH
SCALE: 1"=20'
GRADING PLAN
SC. 1"=20'
NOTE: BENCH MARK TBM. NE CORNER OF CONCRETE SLAB AT NORTH SIDE OF RADIOACTIVE WASTE FACILITY USED AS 100.00' DATUM
PREFORMED CONCRETE CATCH BASIN
UNDISTURBED SUBGRADE
4" TOPSOIL
TOP ELEV. 99.50'
GROUT PIPE IN PLACE
SIDE VIEW
FRONT VIEW
SKIRT LIP
CONNECTING ROD
12" DIA. CORRUGATED METAL PIPE
REINFORCED EDGE
CORNER PLATE
FLARED END SECTION
NOTE: ALL MATERIALS SHALL CONFORM TO AASHTO-M36 WHERE APPLICABLE.
LEGEND
EXISTING CONTOURS
PROPOSED CONTOURS
EXISTING SPOT ELEVATIONS
PROPOSED SPOT ELEVATIONS
BENCH MARK
NEW CATCH BASIN
EXISTING WATER LINE
EXISTING GAS LINE
EXISTING OVERHEAD ELEC. & TEL.
EXISTING UNDERGROUND TEL.
LOT LIMIT
TOPSOIL STOCKPILE AREA
NEW GRADE
4" DRAIN TILE
DRAIN FIELD DETAIL
SHT. 2 OF 7
CHEMICAL WASTE FACILITY
MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN
PHYSICAL PLANT DIVISION
MICHIGAN STATE UNIVERSITY
AS NOTED
9-11-61
5582


MECHANICAL RM.
CONSOLIDATION & STORAGE ROOM 100
CHEM-PACK ROOM 120
SOLVENT STORAGE ROOM 150
LIGHTING PLAN
SCALE: 1/4" = 1'-0"
STORAGE
WORK ROOM
FUME HOOD
SOLVENT STORAGE
ELECTRICAL OUTLET PLAN
SCALE: 1/4" = 1'-0"
ELECTRIC EQUIPMENT LEGEND
AIR MONITORING PANEL (BY OTHERS)
FIRE DETECTION PANEL (BY OTHERS)
TELEPHONE TERMINAL (BY M.B.T. CO.)
FUME HOOD EXHAUST FAN.
TOILET EXHAUST FAN.
SYMBOLS
FAN MOTOR
EXPLOSION-PROOF LIGHT FIXT. FURNISHED BY OTHERS.
RISER DIAGRAM
TOILET EXHAUST
FUME HOOD EXHAUST
HEV UNIT
SOLVENT STORAGE EXHAUST FANS
FAN WIRING DIAGRAMS
DETAIL CONTROL RELAYS
SHT 7 OF 7
CHEMICAL WASTE FACILITY
MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN
PHYSICAL PLANT DIVISION
9-11-61
AS NOTED

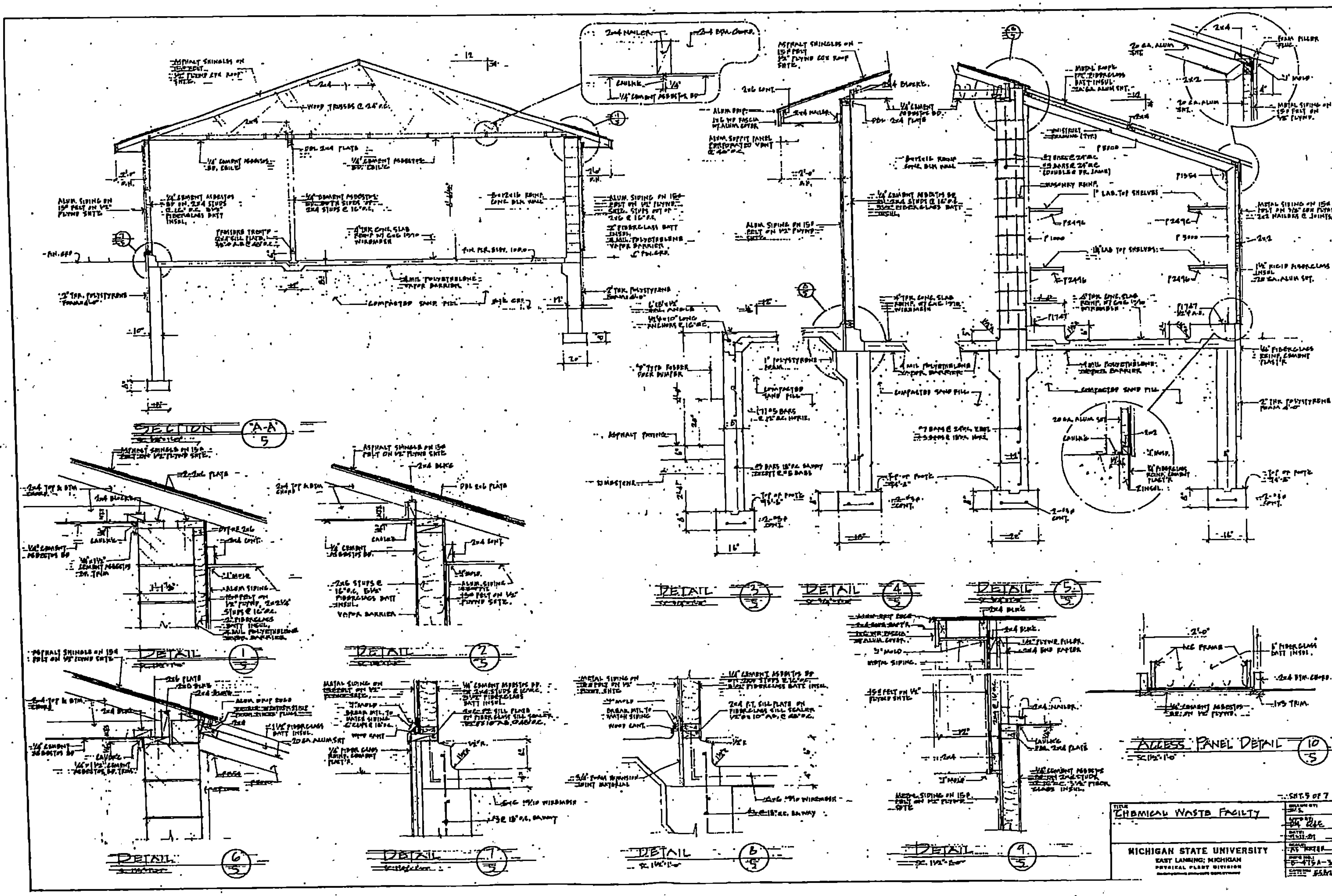


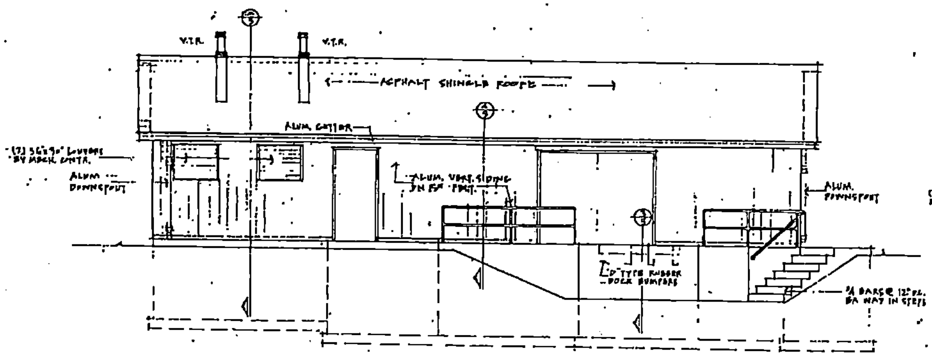
CONSOLIDATION STORAGE RM 100
MECH. RM. 110
CHEM-PAK ROOM 120
SOLVENT STORAGE RM. 130
HEATING & VENTILATING PLAN
STORAGE RM
MECH. RM.
WORK RM
SOLVENT STORAGE RM
PLUMBING PLAN
MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN



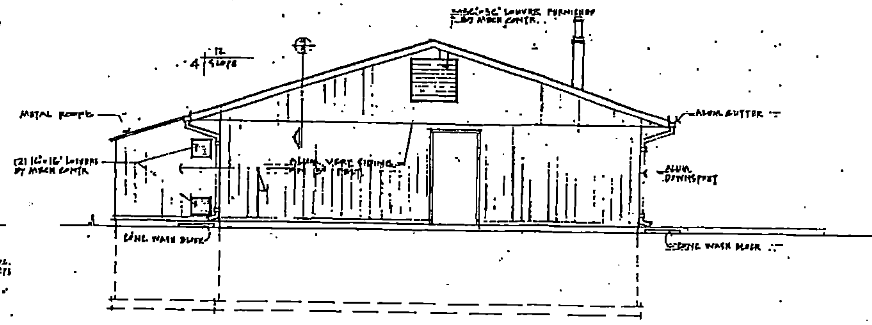
DOOR AND HARDWARE SCHEDULE

Door Number	Nominal Size	Type	Door Material	Frame Material	Throat	Head	Jamb	Hinges	Locksets / Latchsets	Panic Devices	Head Bolts	Push/Pull Plates	Closers	Door Stops	Kick Plates	Weatherstrip	Threshold		Label of Opening	Remarks
1	4'0"x6'8"x1¾"	A	ALUM	ALUM	1¾	⊕	⊕	2					3'0	2	1	1	1			180° ARM
2	4'0"x6'8"x1¾"	B	ALUM	ALUM	5¾	⊕	⊕	2	1				3 or	2	1					180° ARM
3	3'0"x6'8"x1¾"	A	ALUM	ALUM	5¾	⊕	⊕	1	1 1				3		1					
4	3'0"x6'8"x1¾"	A	ALUM	ALUM	5¾	⊕	⊕	1		1			3		1					
5	3'0"x6'8"x1¾"	A	H.M.	H.M.	5¾	⊕	⊕	2	2				2		1				B	
6	2'8"x6'8"x1¾"	C	FLM. ALM.	H.M.	5¾	⊕	⊕	1			1	1&2		1						
7	3'0"x6'8"x1¾"	A	(1) H.M.	(2) H.M.	7¾	⊕	⊕	1	2				1	1	1				B	(1) 16 GA. (2) 14 GA.

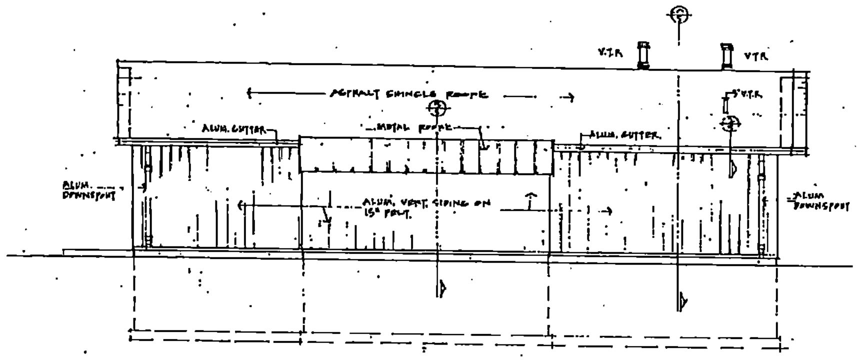

SECTION A-A 5
DETAIL 1 5
DETAIL 2 5
DETAIL 3 5
DETAIL 4 5
DETAIL 5 5
DETAIL 6 5
DETAIL 7 5
DETAIL 8 5
DETAIL 9 5
ACCESS PANEL DETAIL 10 5
SHT. 5 OF 7
CHEMICAL WASTE FACILITY
MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN
PHYSICAL PLANT DIVISION



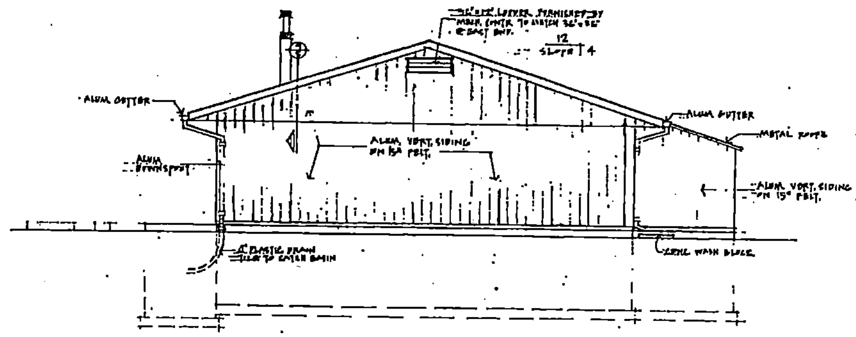
NORTH EXTERIOR ELEVATION



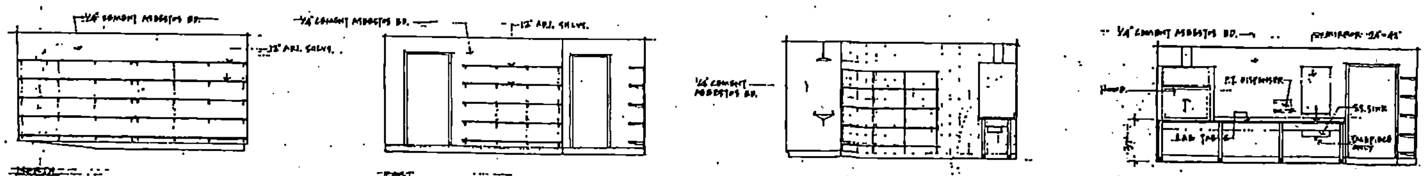
EAST EXTERIOR ELEVATION



SOUTH EXTERIOR ELEVATION



WEST EXTERIOR ELEVATION



INTERIOR ELEVATIONS ROOM 120

SHT. 4 OF 7

TITLE: CHEMICAL WASTE FACILITY	
	APP'D BY: RHC
	DATE: 7-11-81
MICHIGAN STATE UNIVERSITY EAST LANSING, MICHIGAN PHYSICAL PLANT DIVISION	SCALE: AS NOTED
	D-479A-3
	5582

Figure I-2

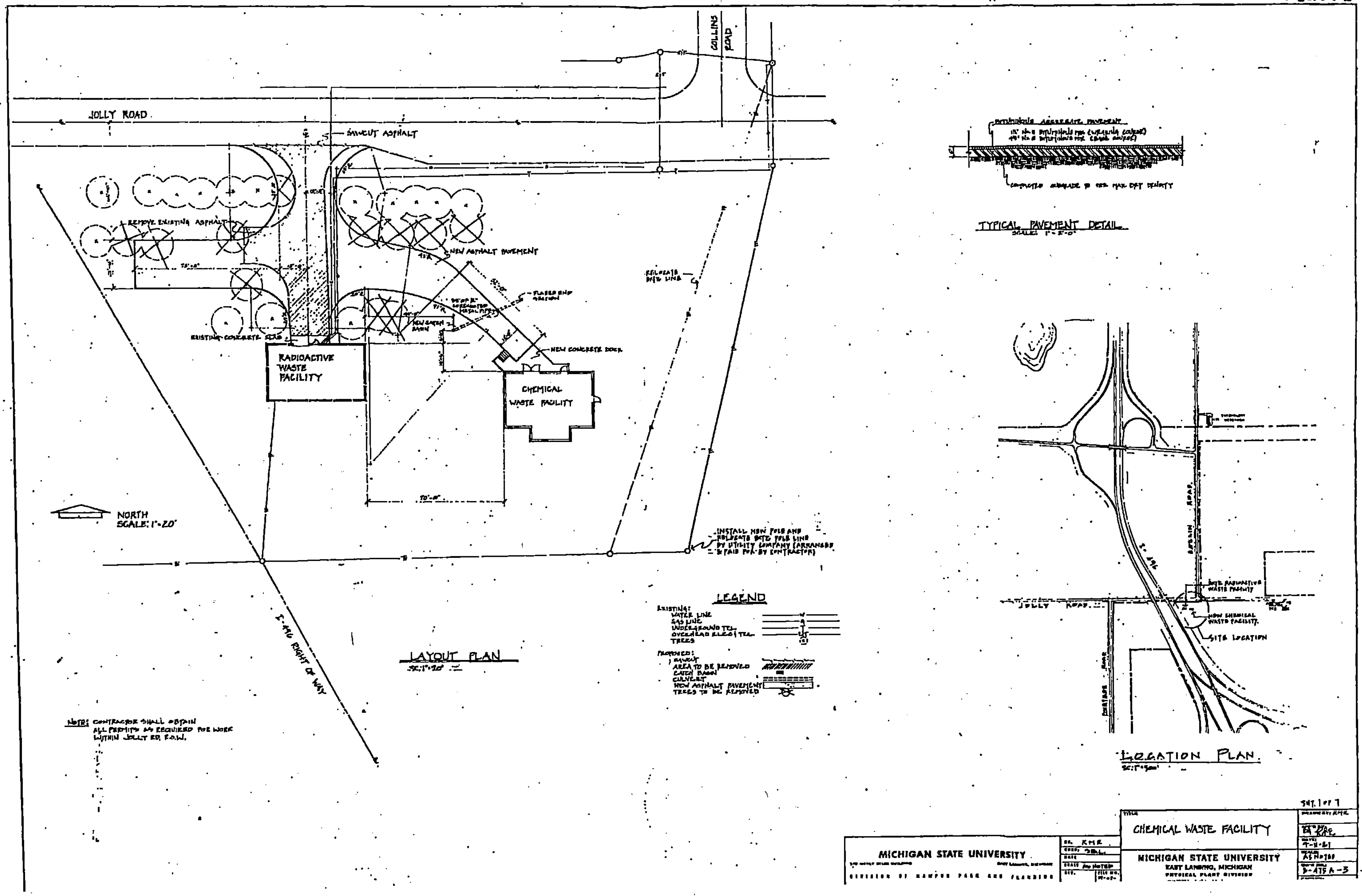
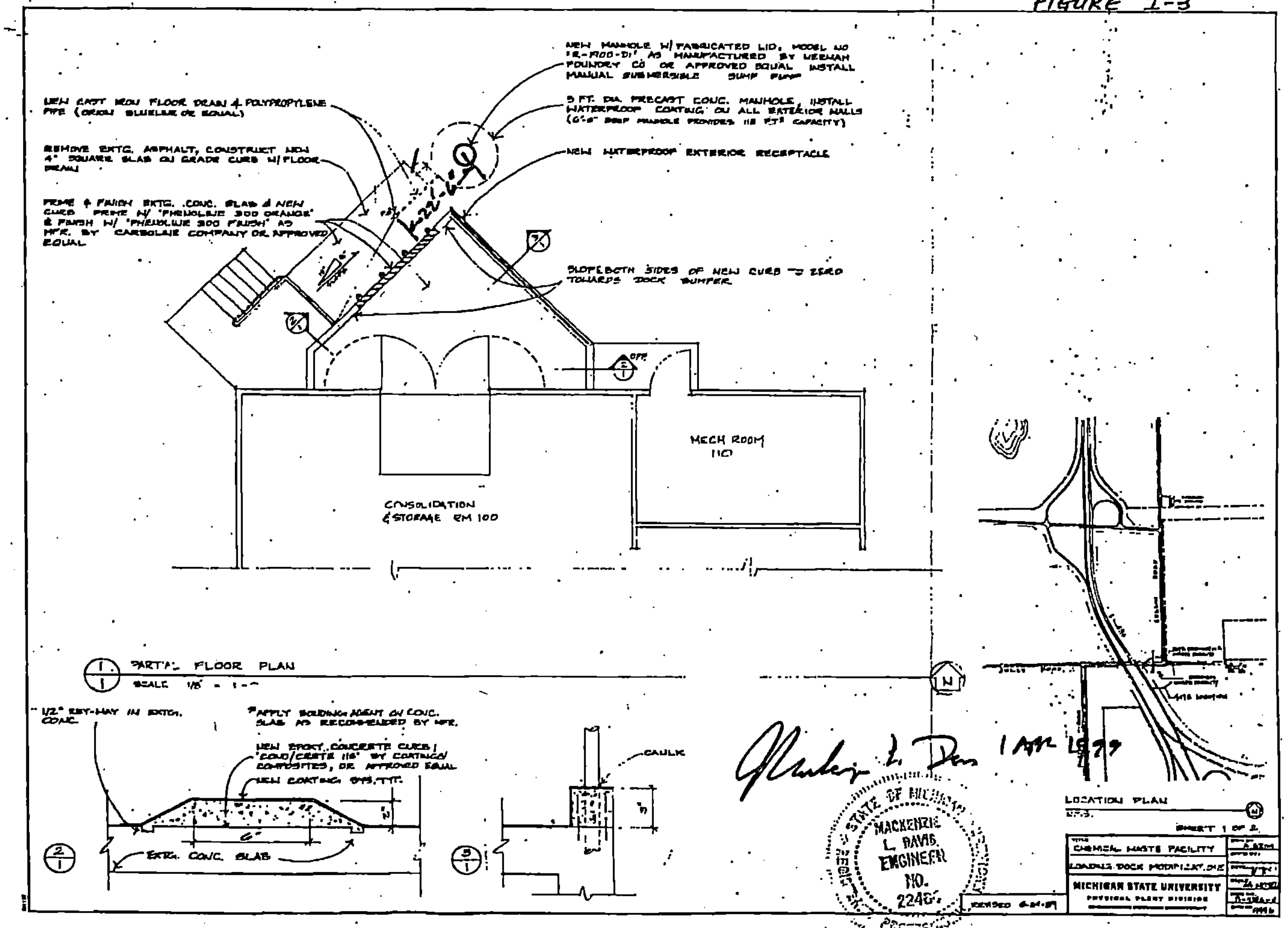
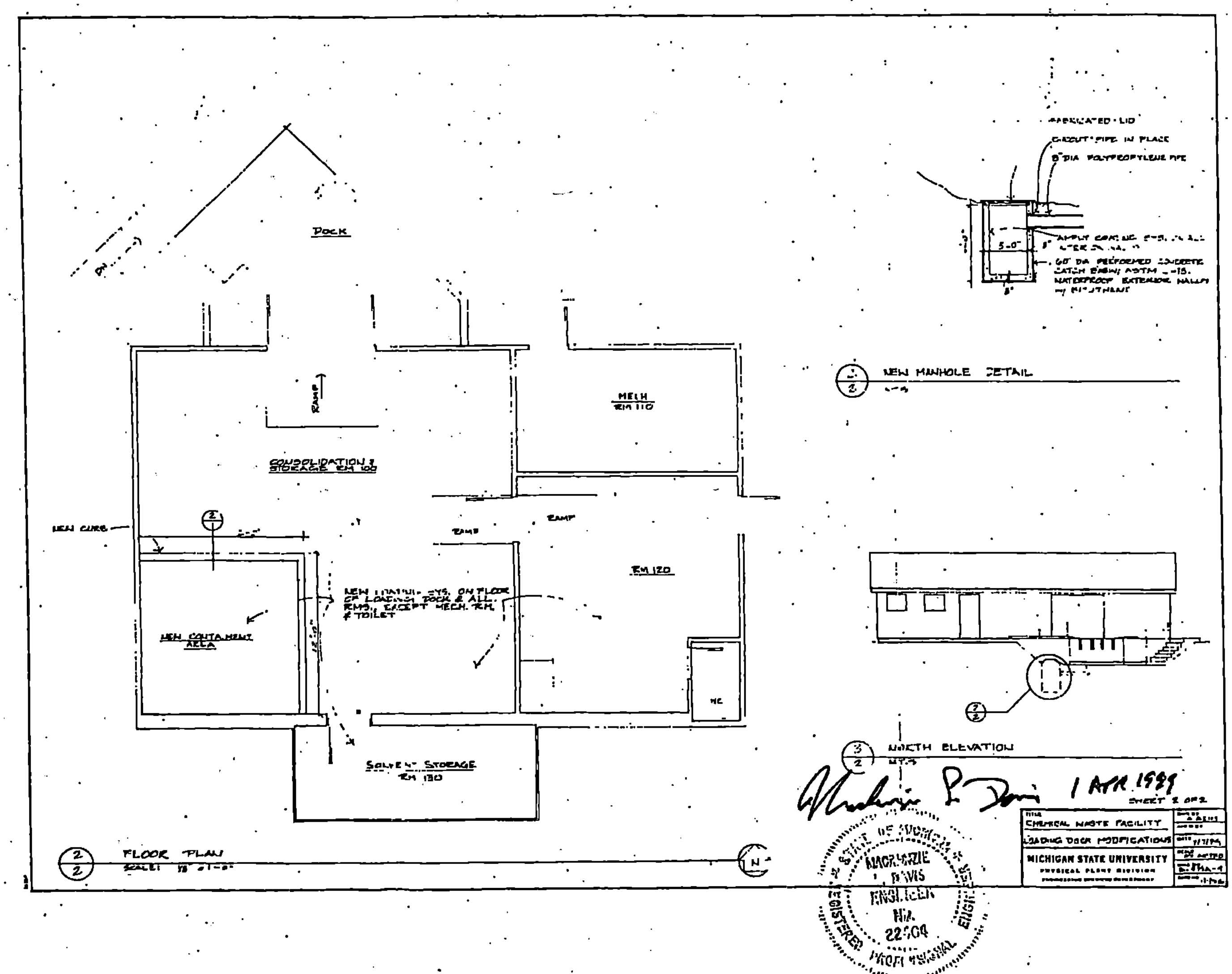

COLLINS ROAD
JOLLY ROAD
SAWCUT ASPHALT
REMOVE EXISTING ASPHALT
NEW ASPHALT PAVEMENT
NEW CONCRETE DOCK
EXISTING CONCRETE SLAB
RADIOACTIVE WASTE FACILITY
CHEMICAL WASTE FACILITY
70'-0"
NORTH
SCALE: 1"=20'
I-496 RIGHT OF WAY
LAYOUT PLAN
NOTE: CONTRACTOR SHALL OBTAIN ALL PERMITS AS REQUIRED FOR WORK WITHIN JOLLY RD. R.O.W.
LEGEND
EXISTING:
WATER LINE
GAS LINE
UNDERGROUND TEL.
OVERHEAD ELEC./TEL.
TREES
PROPOSED:
AREA TO BE REMOVED
CATCH BASIN
CULVERT
NEW ASPHALT PAVEMENT
TREES TO BE REMOVED
TYPICAL PAVEMENT DETAIL
SCALE: 1" = 2'-0"
LOCATION PLAN
JOLLY ROAD
SITE LOCATION
SHT. 1 OF 7
CHEMICAL WASTE FACILITY
MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN
PHYSICAL PLANT DIVISION
MICHIGAN STATE UNIVERSITY
KMR
AS NOTED

FIGURE I-3


NEW MANHOLE W/ FABRICATED LID, MODEL NO 'R-FOOD-DI' AS MANUFACTURED BY NEENAH FOUNDRY CO OR APPROVED EQUAL. INSTALL MANUAL SUBMERSIBLE SUMP PUMP
NEW CAST IRON FLOOR DRAIN & POLYPROPYLENE PIPE (ORION BLUELINE OR EQUAL)
5 FT. DIA. PRECAST CONC. MANHOLE, INSTALL WATERPROOF COATING ON ALL EXTERIOR WALLS (6'-0" DEEP MANHOLE PROVIDES 118 FT³ CAPACITY)
REMOVE EXTG. ASPHALT, CONSTRUCT NEW 4" SQUARE SLAB ON GRADE CURB W/ FLOOR DRAIN
NEW WATERPROOF EXTERIOR RECEPTACLE
PRIME & FINISH EXTG. CONC. SLAB & NEW CURB. PRIME W/ 'PHENOLINE 300 ORANGE' & FINISH W/ 'PHENOLINE 300 FINISH' AS MFR. BY CARBOLINE COMPANY OR APPROVED EQUAL
SLOPE BOTH SIDES OF NEW CURB TO ZERO TOWARDS DOCK BUMPER
MECH ROOM 110
CONSOLIDATION & STORAGE RM 100
PARTIAL FLOOR PLAN
SCALE 1/8" = 1'-0"
1/2" KEY-WAY IN EXTG. CONC.
*APPLY BONDING AGENT ON CONC. SLAB AS RECOMMENDED BY MFR.
NEW EPOXY CONCRETE CURB 'CONO/CRETE 110' BY CONTINCO COMPOSITES, OR APPROVED EQUAL
NEW COATING SYS. TYP.
EXTG. CONC. SLAB
CAULK
LOCATION PLAN
N.T.S.
SHEET 1 OF 2
CHEMICAL WASTE FACILITY
LOADING DOCK MODIFICAT. DWG
MICHIGAN STATE UNIVERSITY
PHYSICAL PLANT DIVISION
REVISED 6-21-89
1 APR 1999
STATE OF MICHIGAN
MACKENZIE L. DAVIS
ENGINEER
NO. 22462
PROFESSIONAL


DOCK
NEW MANHOLE DETAIL
MECH RM 110
CONSOLIDATION & STORAGE RM 100
RAMP
NEW CURB
RM 120
NEW CONTAINMENT AREA
NEW LOADING SYS. ON FLOOR OF LOADING DOCK & ALL RMS, EXCEPT MECH. RM. & TOILET
WC
SOLVENT STORAGE RM 130
NORTH ELEVATION
FLOOR PLAN
1 APR 1999
SHEET 2 OF 2
CHEMICAL WASTE FACILITY
LOADING DOCK MODIFICATIONS
MICHIGAN STATE UNIVERSITY
PHYSICAL PLANT DIVISION
STATE OF MICHIGAN
MACKENZIE DAVIS
ENGINEER
NA
22504
REGISTERED PROFESSIONAL ENGINEER

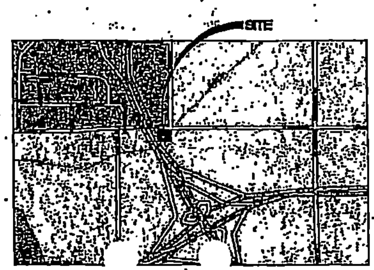
Appendix B6-5

East Storage Building Canopy Drawings

PLANS FOI HE C ISTRUCTION OF

M.S.U. CHEMICAL WASTE FACILITY
INSTALL CANOPY

JOLLY ROAD AT COLLINS ROAD
LANSING, MICHIGAN 48911



LOCATION MAP

INDEX

ARCHITECTURAL

☐	1.	A	COVER
☐	2.	1 OF 1	TOPOGRAPHICAL SURVEY
☐	3.	A0.1	GENERAL NOTES
☐	4.	A1.0	SITE / TOPO PLAN
☐	5.	A1.1	FLOOR PLAN
☐	6.	A2.1	WALL DETAILS
☐	7.	A3.1	ELEVATIONS

STRUCTURAL

☐	1.	S0.1	GENERAL NOTES
☐	2.	S1.1	FOUNDATION PLAN
☐	3.	S3.1	FRAMING PLAN
☐	4.	S4.1	FRAMING DETAILS

AS-BUILT RECORD DRAWING
Date: 9-4-03
Project Rep. F. Navetta
Designer
9/5/03

REVISION 12/4/02

FIGURE I-5

MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN
PHYSICAL PLANT DIVISION
ENGINEERING AND ARCHITECTURAL SERVICES

LIDY DESIGN GROUP

DATE SEPT. 23, 2002
PROJECT NO. 352.00140
SHEET NO. A

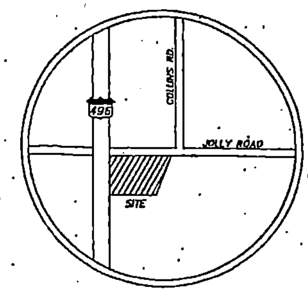
Waste ... Materials Division

JAN 0 ? 2005

GENERAL NOTES:

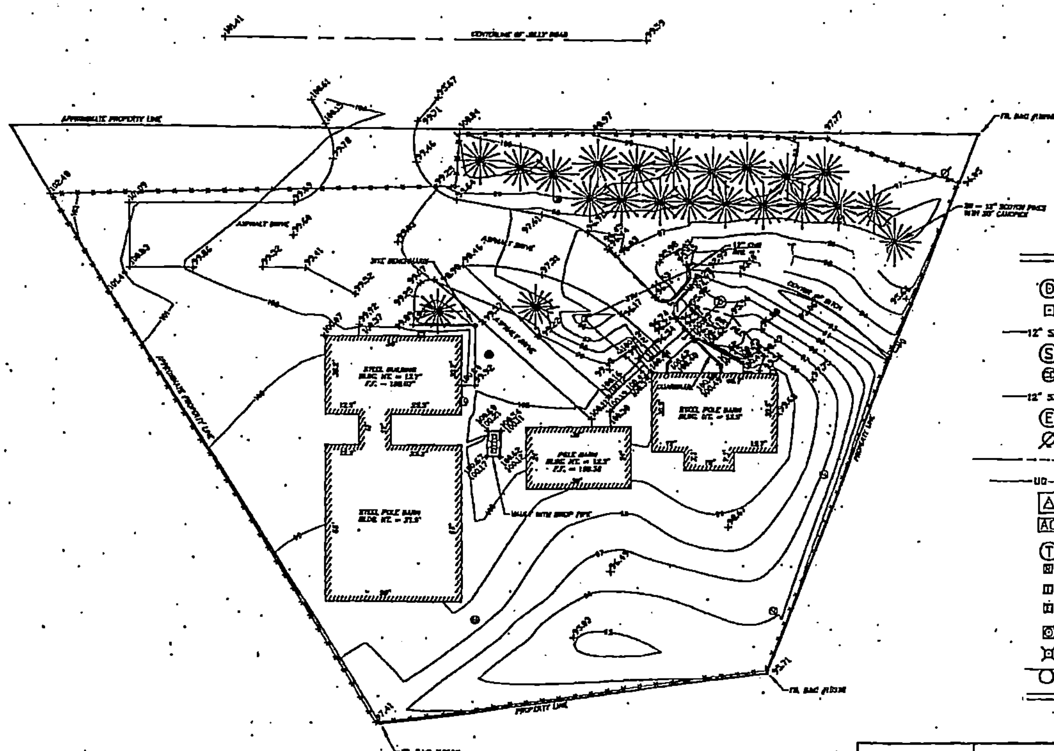
1) A current Title Commitment and Schedule B/Section II Supportive Documentation has not been furnished, the affect of easements upon this parcel, other than indicated, are unknown.

2) Site Benchmark — N.E. corner of concrete slab at north side of radioactive waste facility.
Elevation = 100.00 (MSU plan no. B-475A-3)



SITE LOCATION MAP
NOT TO SCALE

40 0 40 80 120
Scale 1" = 40'



LEGEND:

= STORM MANHOLE	= WATER MANHOLE
= CATCHBASIN	= WATER METER
12" STM = STORM LINE	W = WATER LINE
= SANITARY MANHOLE	= WATER VALVE
= SANITARY CLEANOUT	= FIRE HYDRANT
12" SAN = SANITARY LINE	= MONITORING WELL
= ELECTRIC MANHOLE	= GAS METER
= UTILITY POLE	= GAS VALVE
= OVERHEAD UTILITY LINE	GAS = GAS LINE
UG = UNDERGROUND UTILITY LINE	X = FENCE LINE
= TRANSFORMER	= DECIDUOUS TREE
AC = AC-UNIT	= CONIFEROUS TREE
= TELEPHONE MANHOLE	= CURB AND GUTTER
= ROOF DRAIN	= TREE LINE
= TELEPHONE PEDESTAL	= SET IRON & CAP #31803/41103
= ELECTRIC PEDESTAL	= FOUND IRON AS NOTED
= ELECTRIC METER	= SECTION CORNER
= LIGHT POLE	= DISTANCE NOT TO SCALE
= SIGN	= YARDBASIN
= MONUMENT SIGN	P = POST INDICATOR VALVE
	W = WALL HYDRANT

AS-BUILT RECORD DRAWING

Date: 9-4-03

Project Rep F. Navetta

Designer dw

NOTE: THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEES THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH HE DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES OTHER THAN THE STRUCTURE INVENTORY SHOWN HEREON.

MISS DIG
3 WORKING DAYS
BEFORE YOU DIG OR DRILL CALL
1-800-482-7171
(TOLL FREE)

REVISIONS

LEDY SURVEY GROUP

CHEMICAL WASTE FACILITY
INSTALL CANOPY

MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN

TOPOGRAPHICAL SURVEY
OF
MSU- CHEMICAL WASTE FACILITY
CORNER OF COLLINS ROAD AND JOLLY ROAD
LOCATION

SCALE 1" = 40'

PROJECT NO. 382.00145

SHEET NO. 1 OF 1

GENERAL NOTES:

1. ALL WORK SHALL COMPLY WITH THE APPLICABLE REQUIREMENTS OF DELHI TOWNSHIP, STATE OF MICHIGAN, AND OTHER APPLICABLE GOVERNING CODES AND BUILDING ORDINANCES, AND THE 2000 MICHIGAN BUILDING CODE.
2. PERMITS. THE GENERAL BUILDING PERMIT AND PLAN CHECK FEE SHALL BE SECURED AND PAID FOR BY THE OWNER. ALL OTHER PERMITS SHALL BE TAKEN OUT AND PAID FOR BY THE CONTRACTOR DIRECTLY RESPONSIBLE.
3. SUBSTITUTION. NO SUBSTITUTION SHALL BE MADE WITHOUT THE OWNERS AND ENGINEERS WRITTEN APPROVAL.
4. CHANGES. THE OWNER MAY ORDER EXTRA WORK OR MAKE CHANGES BY ALTERING, ADDING TO, OR DEDUCTING FROM THE WORK, THE CONTRACT SUM BEING ADJUSTED ACCORDINGLY.
5. CUTTING AND PATCHING. ALL TRADES SHALL DO THEIR OWN CUTTING, FILLING, PATCHING, ETC. TO MAKE THE PARTS COME TOGETHER PROPERLY AND FIT TO RECEIVE OR BE RECEIVED BY WORK OF OTHER TRADES.
6. SCOPE. ALL TRADES SHALL FURNISH ALL LABOR, EQUIPMENT, MATERIALS, AND PERFORM ALL WORK NECESSARY, INDICATED, REASONABLE, INFERRED OR REQUIRED BY ANY CODE WITH JURISDICTION TO COMPLETE THEIR SCOPE OF WORK FOR A COMPLETE AND PROPERLY FINISHED JOB.
7. CLEAN-UP. ALL TRADES SHALL, AT ALL TIMES, KEEP THE PREMISES FREE FROM ACCUMULATION OF WASTE MATERIALS OR RUBBISH CAUSED BY THEIR WORK.
8. TEMPORARY TOILETS. THE GENERAL CONTRACTOR SHALL PROVIDE TEMPORARY TOILET FACILITIES FOR ALL TRADES UNTIL COMPLETION OF THE WORK.
9. LINES AND LEVELS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ACCURACY OF THE BUILDING LINES AND LEVELS. THE CONTRACTOR SHALL COMPARE CAREFULLY THE LINES AND LEVELS SHOWN ON THE DRAWINGS WITH EXISTING LEVELS FOR THE LOCATION AND CONSTRUCTION OF THE WORK AND SHALL CALL THE ARCHITECT'S ATTENTION TO ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK.
10. CONTRACTOR SHALL VERIFY ALL CONDITIONS AT THE SITE AND REPORT ANY DISCREPANCIES TO THE ARCHITECT BEFORE PROCEEDING WITH THE WORK.
11. DIMENSIONS SHOWN ON FLOOR PLANS, SECTIONS, AND DETAILS ARE TO COLUMN GRID LINES, FACE OF MASONRY AND CENTERLINE OF STUD WALLS, UNLESS NOTED OTHERWISE OR INDICATED.
12. THE DESIGN, ADEQUACY AND SAFETY OF ERECTION, BRACING, SHORING, TEMPORARY SUPPORTS, ETC., IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR, AND HAS NOT BEEN CONSIDERED BY LEDY DESIGN GROUP. THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE PRIOR TO THE APPLICATION OF ALL SHEER WALLS, ROOF AND FLOOR DIAPHRAGMS AND FINISH MATERIALS. HE SHALL PROVIDE THE NECESSARY BRACING TO PROVIDE STABILITY PRIOR TO THE APPLICATION OF THE AFOREMENTIONED MATERIALS. OBSERVATION VISITS TO THE SITE BY LEDY DESIGN GROUP SHALL NOT INCLUDE INSPECTION OF THE ABOVE ITEMS.
13. CONTRACTOR SHALL VERIFY WITH THE PROPER UTILITY COMPANY THE LOCATION OF ALL EXISTING BELOW GROUND UTILITIES AND THEIR SERVICE CONNECTION.
14. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE ALL EXISTING UTILITIES WHETHER SHOWN HEREON OR NOT TO PROTECT THEM FROM DAMAGE. THE CONTRACTOR SHALL BEAR ALL EXPENSE OF REPAIR OR REPLACEMENT IN CONJUNCTION WITH THE EXECUTION OF THE WORK.
15. THE ENGINEERS APPROVAL OF SHOP DRAWINGS SHALL NOT RELIEVE THE GENERAL CONTRACTOR OR SUBCONTRACTOR FROM RESPONSIBILITY FOR DEVIATIONS FROM THE DRAWINGS OR SPECIFICATIONS UNLESS HE HAS, IN WRITING, CALLED THE ENGINEERS ATTENTION TO SUCH DEVIATIONS AT THE TIME OF SUBMISSIONS, NOR SHALL IT RELIEVE HIM FROM THE RESPONSIBILITY FOR ERRORS OF ANY SORT IN THE SHOP DRAWINGS.
16. FINISH GRADING SHALL BE UNIFORMLY SLOPED AWAY FROM THE BUILDING FOR DRAINAGE.
17. BUILDING STRUCTURE SHALL COMPLY WITH LOCAL, STATE AND FEDERAL HANDICAP ACCESSIBILITY STANDARDS.
18. A "CERTIFICATE OF COMPLIANCE" SIGNED BY THE OWNER, GENERAL CONTRACTOR, ARCHITECT, OR ENGINEER SHALL BE GIVEN TO THE BUILDING DEPARTMENT STATING THAT THE WORK HAS BEEN PERFORMED AND MATERIALS INSTALLED ACCORDING TO THE PLANS AND SPECIFICATIONS.
19. CONTRACTOR SHALL SUBMIT FOR REVIEW AND APPROVAL.
    - SHOP DRAWINGS FOR:
        - STEEL
    - SAMPLES FOR:
        - SIDING AND TRIM GUTTER
        - PAINT
        - ROOFING
        - METAL DECK
        - PERFORATED METAL SOFFIT (ALT #1)

MATERIAL SYMBOLS

- E.I.F.S.
- NEW CONCRETE
- STEEL (LARGE SECTION)
- EARTH
- WOOD BLOCKING (SECTION)
- RIGID INSULATION
- MASONRY
- FACE BRICK
- WOOD-FINISH (ELEV. OR SECTION)
- BATTEN INSULATION
- PLYWOOD SHEATHING
- BRICK PANELS VENEER (SECTION)
- WIRE MESH REINFORCING (WELDED WIRE FABRIC)

PROJECT TEAM

ARCHITECT
LEDY DESIGN GROUP, INC.
3135 PINE TREE RD., STE. "C"
LANSING, MICHIGAN 48911
PH. NO.: (517) 393-3773
FAX NO.: (517) 393-8450

STRUCTURAL ENGINEER
LEDY DESIGN GROUP, INC.
3135 PINE TREE RD., STE. "C"
LANSING, MICHIGAN 48911
PH. NO.: (517) 393-3773
FAX NO.: (517) 393-8450

ARCHITECTURAL ABBREVIATIONS LEGEND

A

ABV.	ABOVE
A.F.F.	ABOVE FINISHED FLOOR
A.T.	ABRASIVE THRESHOLD
A.D.	ACCESS DOOR
A.P.	ACCESS PANEL, ALARM PANEL
ACOUS.	ACOUSTIC
ADDM.	ADDENDUM
ADDN.	ADDITION
ADJAC.	ADJACENT
ADJ.	ADJUSTABLE
AGGR.	AGGREGATE
ALUM.	ALUMINUM
AMT.	AMOUNT
ANCH.	ANCHOR
A.B.	ANCHOR BOLT
APPROX.	APPROXIMATE
ARCH.	ARCHITECTURAL
ASPH.	ASPHALT

B

BM.	BEAM
BRG.	BEARING
B.T.	BENT
BEV.	BEVELED
BIT.	BITUMINOUS
BLK.	BLOCK
BLKG.	BLOCKING
B.S.	BOTH SIDES
BOTT.	BOTTOM
B.O.	BOTTOM OF
B.O.D.	BOTTOM OF DECK
BRKT.	BRACKET
BLDG.	BUILDING
B.L.	BUILDING LINE
B.U.	BUILT-UP
BULLN.	BULLETIN

C

CANT.	CANTILEVER
C.I.P.	CAST IN PLACE
C.B.	CATCH BASIN
CAULK.	CAULKING
CEIL.	CEILING
CEM.	CEMENT
C.L.	CENTER LINE
C.T.	CERAMIC TILE
C.O.	CLEANOUT
C.W.	COLD WATER
COLM.	COLUMN
COMPO.	COMPOSITION
CONC.	CONCRETE
C.M.U.	CONCRETE MASONRY UNIT
COND.	COORDINATE, CONDUCTOR
CONN.	CONNECT, CONNECTION
CONST.	CONSTRUCTION
CONST. JT.	CONSTRUCTION JOINT
CONT.	CONTINUATION, CONTINUE, CONTINUOUS
CONTR.	CONTRACTOR
C.J.	CONTROL JOINT
CTSK.	COUNTERSINK

D

DEG.	DEGREE
DIA.	DIAMETER
DIM.	DIMENSION
D.L.	DOOR LINTEL
D.O.	DOOR OPENING
DN.	DOWN
DWG.	DRAWING

E

EA.	EACH
ELECT.	ELECTRICAL
E.W.C.	ELECTRICAL WATER COOLER
ELEV.	ELEVATION
ENCL.	ENCLOSURE
EQUIP.	EQUIPMENT
EXIST.	EXISTING
EXP.	EXPANSION
EXP. JT.	EXPANSION JOINT
EXT.	EXTERIOR

F

FSTNR.	FASTENER
F.E.	FINAL EFFLUENT
FIN.	FINISH, FINISHED
F.EX.	FIRE EXTINGUISHER
F.P.	FIREPROOFING
FLG.	FLANGE
FLASH.	FLASHING
FLR.	FLOOR
F.D.	FLOOR DRAIN
FT.	FOOT, FEET
FTG.	FOOTING
FND.	FOUNDATION
FRM.	FRAME

G

GALV.	GALVANIZED
GA.	GAUGE
GL.	GLASS

H

HD.	HEAD
HGT.	HEIGHT
H.P.	HIGH POINT
H.M.	HOLLOW METAL
HOR.	HORIZONTAL
H.W.	HOT WATER

I

IN.	INCH, INCHES
INSUL. MET.	INSULATED METAL
INSUL.	INSULATION
INT.	INTERIOR

L

LAB.	LABORATORY
L.	ANGLE
L.P.	LOW POINT

M

M.H.	MANHOLE
MFR.	MANUFACTURER
MAS.	MASONRY
M.O.	MASONRY OPENING
MECH.	MECHANICAL
MET.	METAL
M.T.	METAL THRESHOLD
MIN.	MINIMUM

N

N.T.S.	NOT TO SCALE
NO.	NUMBER
NOM.	NOMINAL

O

OPNG.	OPENING

P

P.E.M.B.	PRE-ENGINEERED METAL BUILDING
PL.	PLATE
P.I.V.	POST INDICATOR VALVE

R

REF.	REFERENCE
REINF.	REINFORCEMENT
REV.	REVERSE
REQD.	REQUIRED
R.I.	RIGID INSULATION
RM.	ROOM
R.S.	ROOF SUMP
R.O.	ROUGH OPENING

S

SHTG.	SHEATHING
SPECS.	SPECIFICATIONS
S.S.	STAINLESS STEEL (300 SERIES)
STRUCT.	STRUCTURAL

T

T.O.	TOP OF
T.O.B.J.	TOP OF BAR JOIST
T.O.F.	TOP OF FOOTING
T.O.F.W.	TOP OF FOUNDATION WALL
T.O.P.	TOP OF PARAPET
T.O.W.	TOP OF WALL
TYP.	TYPICAL

U

U.N.O.	UNLESS NOTED OTHERWISE

V

VERT.	VERTICAL

W

W.P.	WATER POINT
WPM.	WATERPROOF MEMBRANE
W.W.F.	WELDED WIRE FABRIC
W.L.	WINDOW LINTEL
W/	WITH
WD.	WOOD
W.P.	WORK POINT

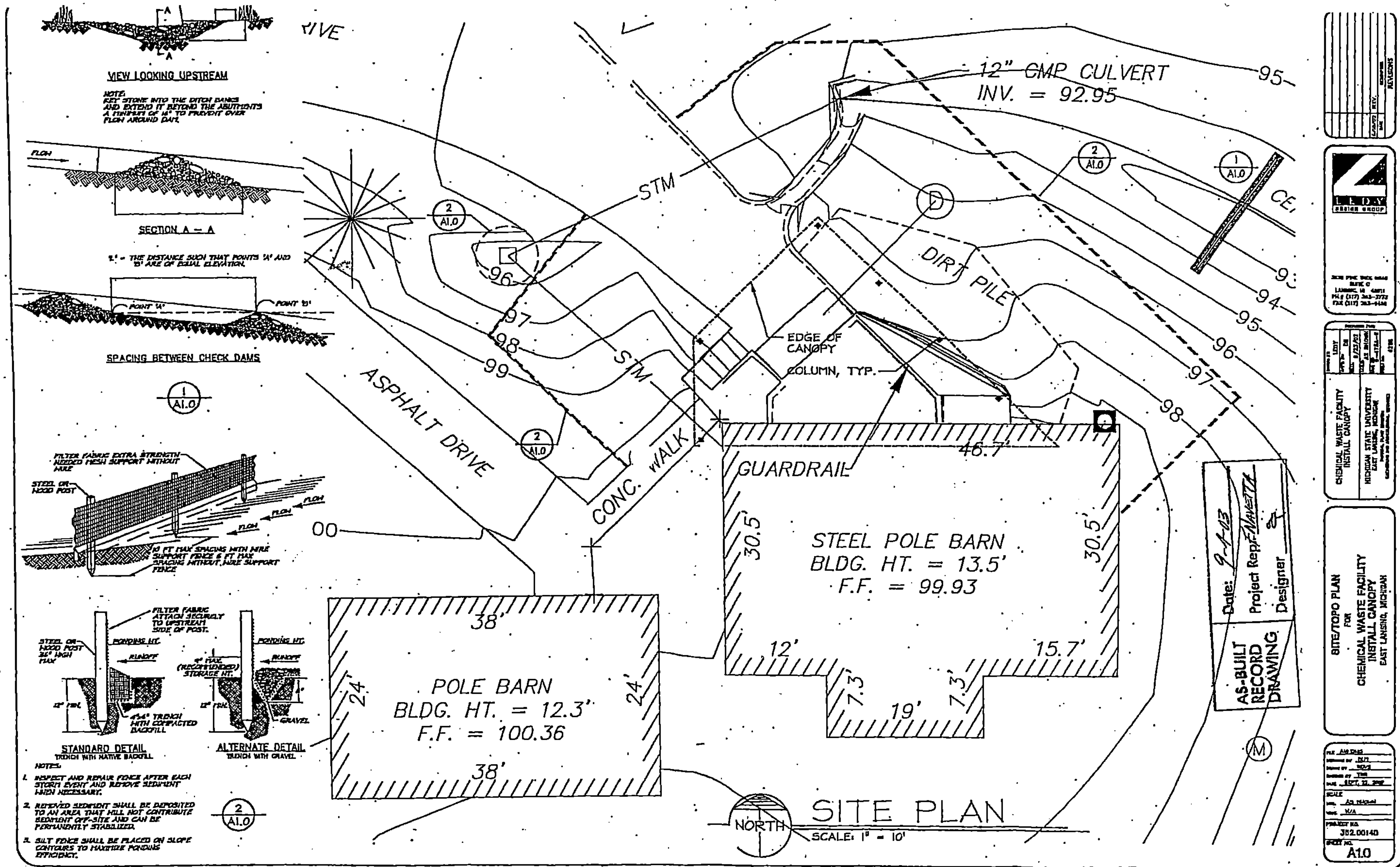
AS-BUILT RECORD DRAWING
Date: 9-4-03
Project Rep: F. NAVETTA
Designer: [illegible]

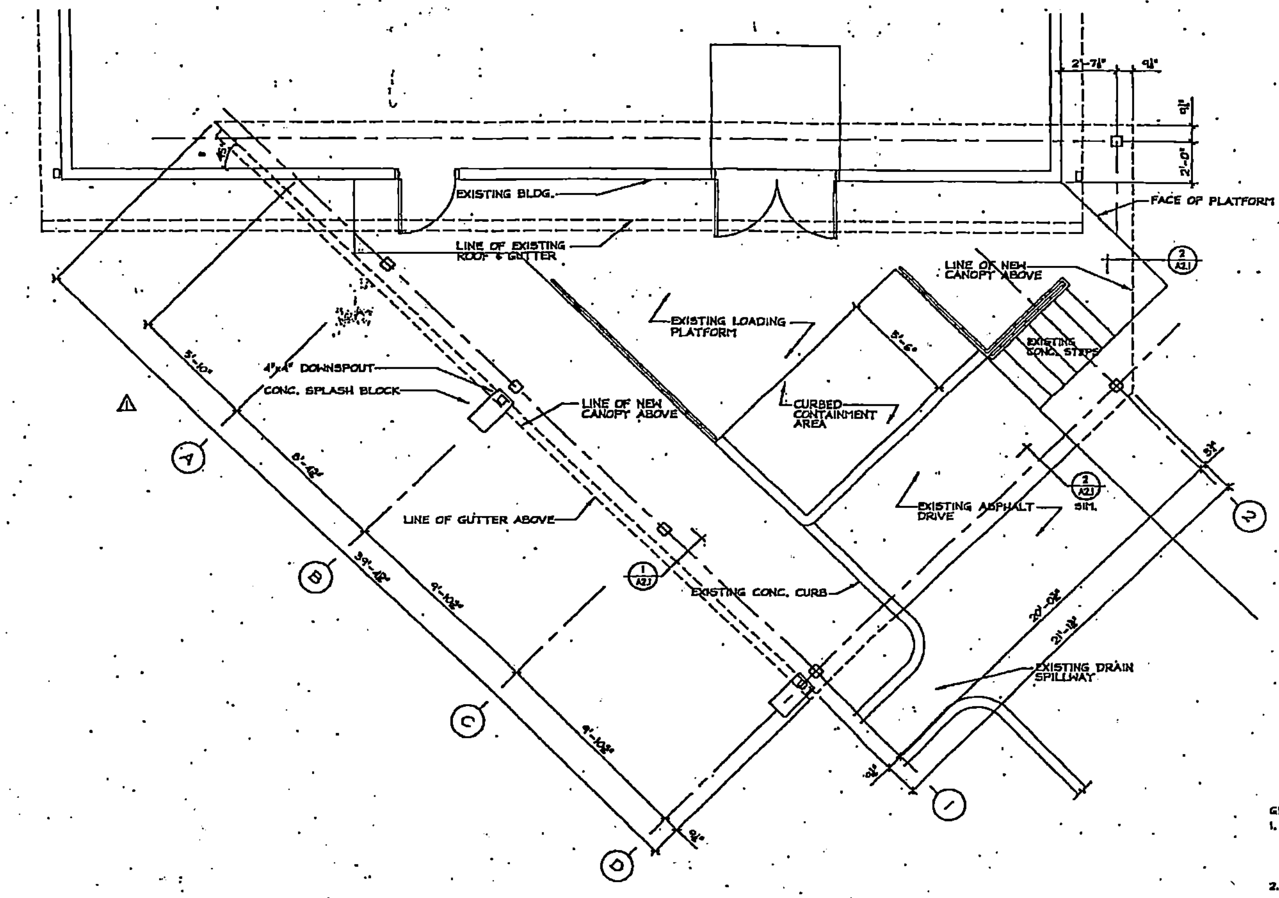
LEDY DESIGN GROUP

CHEMICAL WASTE FACILITY INSTALL CANOPY
MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN

GENERAL NOTES FOR CHEMICAL WASTE FACILITY INSTALL CANOPY
EAST LANSING, MICHIGAN

PROJECT NO. 342.00140
SHEET NO. A0.1


VIEW LOOKING UPSTREAM
NOTE: KEY STONE INTO THE DITCH BANKS AND EXTEND IT BEYOND THE ABUTMENTS A MINIMUM OF 18" TO PREVENT OVER FLOW AROUND DAM.
FLOW
SECTION A – A
POINT 'A'
POINT 'B'
SPACING BETWEEN CHECK DAMS
1 A1.0
FILTER FABRIC EXTRA STRENGTH NEEDED MESH SUPPORT WITHOUT WIRE
STEEL OR WOOD POST
10 FT MAX SPACING WITH WIRE SUPPORT FENCE 6 FT MAX SPACING WITHOUT WIRE SUPPORT FENCE
FILTER FABRIC ATTACH SECURELY TO UPSTREAM SIDE OF POST.
PONDING HT.
RUNOFF
GRAVEL
STANDARD DETAIL
TRENCH WITH NATIVE BACKFILL
ALTERNATE DETAIL
TRENCH WITH GRAVEL
NOTES:
1. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY.
2. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.
3. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.
2 A1.0
12" CMP CULVERT
INV. = 92.95
STM
DIRT PILE
EDGE OF CANOPY
COLUMN, TYP.
ASPHALT DRIVE
CONC. WALK
GUARDRAIL
46.7'
STEEL POLE BARN
BLDG. HT. = 13.5'
F.F. = 99.93
30.5'
12'
15.7'
7.3'
19'
POLE BARN
BLDG. HT. = 12.3'
F.F. = 100.36
38'
24'
AS-BUILT RECORD DRAWING
Date: 9-1-03
Project Rep.
Designer
SITE PLAN
NORTH
SCALE: 1" = 10'
SITE/TOPO PLAN FOR CHEMICAL WASTE FACILITY INSTALL CANOPY
MICHIGAN STATE UNIVERSITY EAST LANSING, MICHIGAN
CHEMICAL WASTE FACILITY INSTALL CANOPY
302.00140
A1.0



GENERAL NOTES:

1. STANDING SEAM ROOFING TO BE "DESIGN LOK" 22GA. GALV. STEEL WITH PRO-FINISH 500 COATING BY CUSTOM PANELS INC. (909) 829.8618 INSTALLED OVER METAL ROOF DECK. COLOR TO BE SELECTED BY OWNER, OR APPROVED ALTERNATE.
2. METAL SIDING TO BE "T-108" 22 GA. GALV. STEEL WITH PRO-FINISH 500 COATING BY CUSTOM PANEL INC. (909) 829-8618, COLOR TO BE SELECTED BY OWNER OR APPROVED ALTERNATE
3. GUTTERS, DOWNSPOUTS, AND ROOF EDGES SHALL BE OF THE SAME MATERIAL AND FINISH AS SIDING.
4. PAINT COLORS TO BE SELECTED BY OWNER. FROM CONTRACTOR PROVIDED STANDARD COLORS. (PEARL WHITE)

AS-BUILT RECORD DRAWING	Date: 9-04-03
	Project Rep: F. Navetta
	Designer: [illegible]

NORTH

FLOOR PLAN

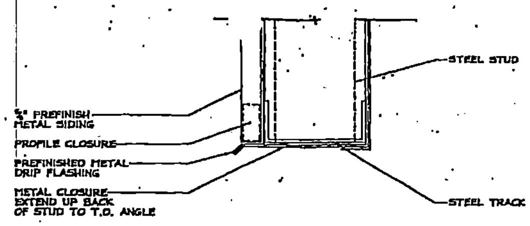
SCALE: 3/16"=1'-0"

FLOOR PLAN FOR CHEMICAL WASTE FACILITY INSTALL CANOPY
EAST LANSING, MICHIGAN

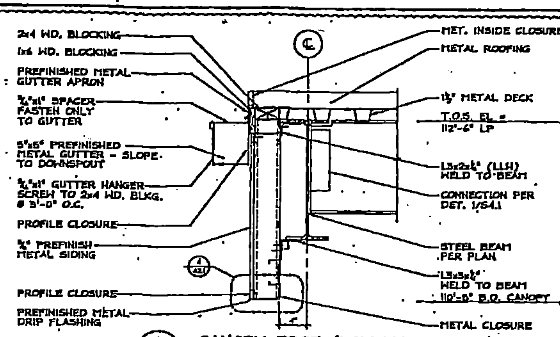
CHEMICAL WASTE FACILITY INSTALL CANOPY
MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN

PROJECT NO. 362.00140

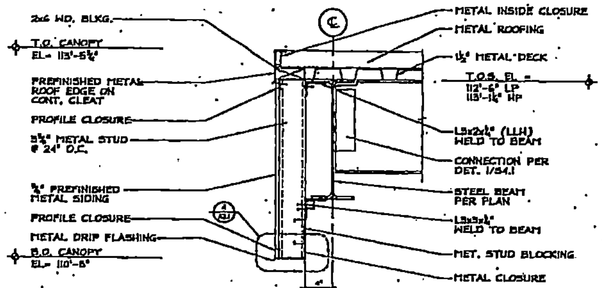
SHEET NO. A1.1



4 / A2.1 DETAIL



1 / A1.1, A3.1 CANOPY EDGE (LOW W/ GUTTER)



2 / A1.1, A3.1 CANOPY EDGE (HIGH)

AS-BUILT RECORD DRAWING	Date: 9-04-03 Project Rep: F. Navetta Designer: Ob

LEDY DESIGN GROUP

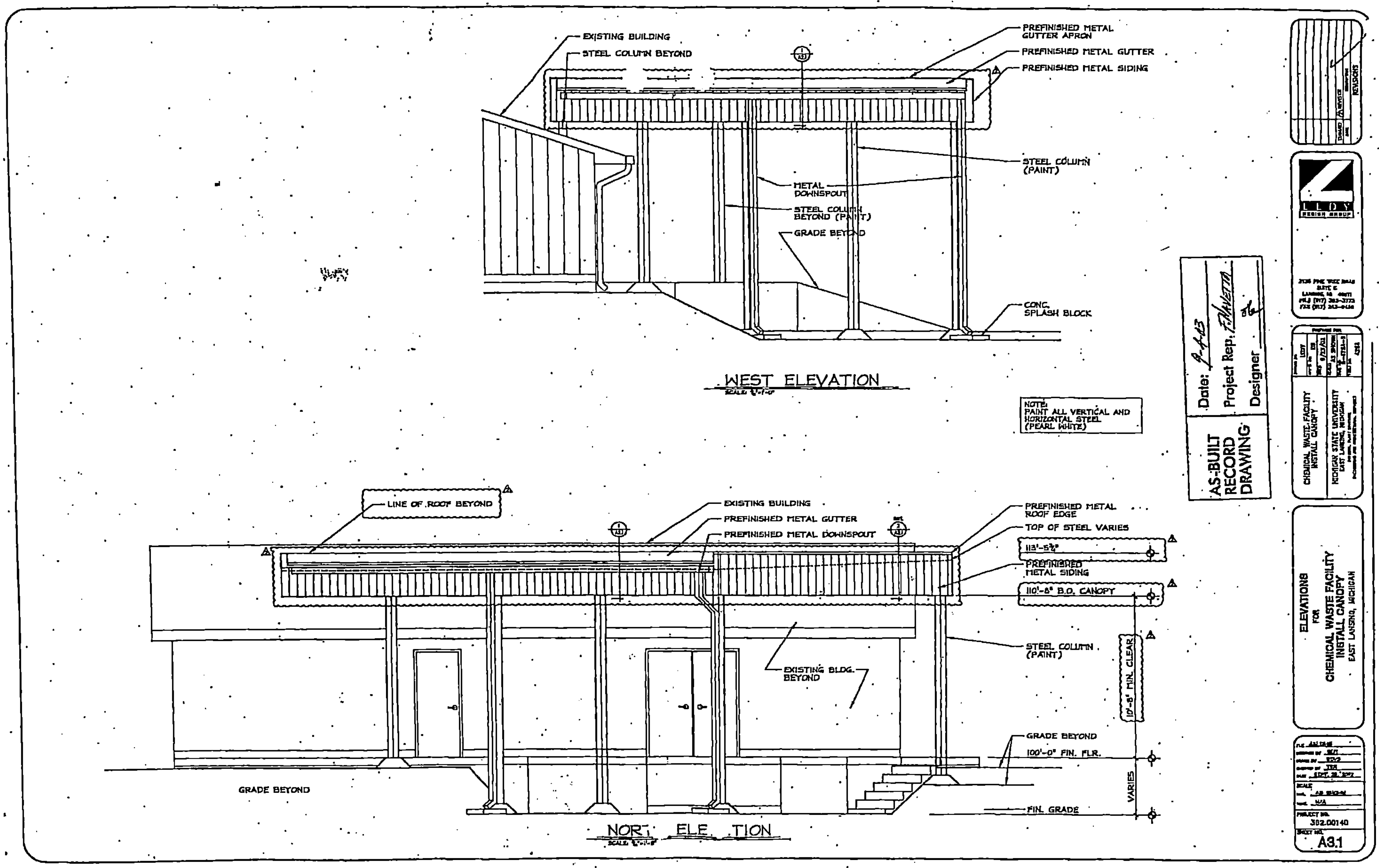
WALL DETAILS FOR CHEMICAL WASTE FACILITY INSTALL CANOPY
EAST LANSING, MICHIGAN

CHEMICAL WASTE FACILITY INSTALL CANOPY
MICHIGAN STATE UNIVERSITY EAST LANSING, MICHIGAN

SCALE AS SHOWN

PROJECT NO. 352.0014D

SHEET NO. A2.1


EXISTING BUILDING
STEEL COLUMN BEYOND
PREFINISHED METAL GUTTER APRON
PREFINISHED METAL GUTTER
PREFINISHED METAL SIDING
STEEL COLUMN (PAINT)
METAL DOWNSPOUT
STEEL COLUMN BEYOND (PAINT)
GRADE BEYOND
CONC. SPLASH BLOCK
WEST ELEVATION
NOTE: PAINT ALL VERTICAL AND HORIZONTAL STEEL (PEARL WHITE)
AS-BUILT RECORD DRAWING
Date:
Project Rep.
Designer
LINE OF ROOF BEYOND
EXISTING BUILDING
PREFINISHED METAL GUTTER
PREFINISHED METAL DOWNSPOUT
PREFINISHED METAL ROOF EDGE
TOP OF STEEL VARIES
113'-5¾"
PREFINISHED METAL SIDING
110'-8" B.O. CANOPY
STEEL COLUMN (PAINT)
EXISTING BLDG. BEYOND
10'-8" MIN. CLEAR
GRADE BEYOND
100'-0" FIN. FLR.
VARIES
FIN. GRADE
GRADE BEYOND
NORTH ELEVATION
LEDY DESIGN GROUP
CHEMICAL WASTE FACILITY INSTALL CANOPY
MICHIGAN STATE UNIVERSITY EAST LANSING, MICHIGAN
ELEVATIONS FOR CHEMICAL WASTE FACILITY INSTALL CANOPY EAST LANSING, MICHIGAN
REVISIONS
302.00140
A3.1

GENERAL

1. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL DIMENSIONS AND CONDITIONS AT THE JOB SITE AND TO CROSS-CHECK DETAILS AND DIMENSIONS ON THE STRUCTURAL DRAWINGS WITH RELATED REQUIREMENTS ON THE ARCHITECTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS. FLOOR AND WALL OPENINGS, SLEEVES, AND OTHER ARCHITECTURAL, MECHANICAL AND ELECTRICAL REQUIREMENTS MUST BE COORDINATED BEFORE THE CONTRACTOR PROCEEDS WITH CONSTRUCTION.
2. REFER TO MOST RECENT APPLICABLE BUILDING CODE AND MATERIAL STANDARDS TYP. U.N.O.
3. DESIGN LOADS: (2000 MICHIGAN BUILDING CODE)

LIVE LOADS:
WIND LOAD (LATERAL - MWFRS):

BASIC WIND SPEED (V)	= 90	M.P.H.
IMPORTANCE FACTOR (I)	= 1.0	
WIND EXPOSURE	= B	
WIND DESIGN PRESSURE (Pv)	= 15.9	P.S.F.

EARTHQUAKE LOAD:

SITE CLASS	D	

SNOW LOADS:

GROUND SNOW LOAD (Pg)	= 35	P.S.F.
ROOF SNOW LOAD (Pf)	= 24.5	P.S.F.
IMPORTANCE FACTOR (I)	= 1.0	

ROOF LEVEL LIVE LOADS:

TRIBUTARY AREA 0-200 SQ. FT.	= 20	P.S.F.
TRIBUTARY AREA 201-600 SQ. FT.	= 16	P.S.F.
TRIBUTARY AREA 601+ SQ. FT.	= 12	P.S.F.

4. DETAILS MARKED TYPICAL SHALL APPLY IN ALL CASES (UNO). WHERE NO DETAIL IS SHOWN, CONSTRUCTION SHALL BE AS SHOWN FOR OTHER SIMILAR WORK.
5. ALL OMISSIONS OR CONFLICTS BETWEEN THE VARIOUS ELEMENTS OF THE WORKING DRAWINGS AND/OR SPECS. SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE PROCEEDING WITH ANY WORK SO INVOLVED.
6. ALL WORKMANSHIP, MATERIAL, AND TESTING SHALL CONFORM TO THE REQUIREMENTS OF 2000 MICHIGAN BUILDING CODE.
7. ALL WORK SHALL COMPLY WITH LOCAL CODES AND ORDINANCES, AND SHALL BE DONE TO THE HIGHEST STANDARDS OF CRAFTSMANSHIP BY WORKMEN OF THE RESPECTIVE TRADES.
8. THESE DOCUMENTS DO NOT INCLUDE THE NECESSARY COMPONENTS FOR CONSTRUCTION SAFETY. SAFETY, CARE OF ADJACENT PROPERTIES DURING CONSTRUCTION, AND COMPLIANCE WITH LOCAL REGULATIONS REGARDING SAFETY IS, AND SHALL BE, THE CONTRACTOR'S RESPONSIBILITY.
9. REFER TO THE ARCHITECTURAL DRAWINGS FOR DIMENSIONS NOT SHOWN ON THE STRUCTURAL DRAWINGS.
10. ALL SHEETING, SHORING, AND BRACING OF TRENCHES, PITS, AND EXCAVATIONS SHOULD BE MADE THE RESPONSIBILITY OF THE CONTRACTOR AND SHOULD COMPLY WITH ALL CURRENT AND APPLICABLE LOCAL, STATE, AND FEDERAL SAFETY CODES, REGULATIONS AND PRACTICES, INCLUDING THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (O.S.H.A.).

FOUNDATION

1. ALL FOOTINGS SHALL BE ESTABLISHED ON PROPERLY UNDISTURBED SOIL OR FILL COMPACTED AS SPECIFIED BELOW.
2. ALL FOUNDATION BEARING AND FILL MATERIALS SHALL BE INSPECTED AND APPROVED BY THE BUILDING INSPECTOR PRIOR TO PLACING CONCRETE.
3. ALL FILL AND BACK FILL MATERIALS SHALL BE NON-COHESIVE SOILS. THE FILL SHOULD BE PLACED IN UNIFORM LAYERS OF NOT MORE THAN 12" IN LOOSE THICKNESS. THE FILL SHOULD BE COMPACTED TO ACHIEVE A DENSITY OF NOT LESS THAN 95 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR COMPACTION TEST (ASTM D-1557).
4. NO SITE SPECIFIC SOILS REPORT WAS AVAILABLE PRIOR TO DESIGN. NOTIFY PROJECT ENGINEER SHOULD ANY CONDITIONS BE ENCOUNTERED THAT ARE UNUSUAL OR DO NOT GIVE ASSUMED BEARING CAPACITIES. THE OWNER SHALL BE NOTIFIED AND WORK SHALL CEASE. WORK SHALL NOT RESUME UNTIL THE OWNER'S ENGINEER EVALUATES THE EXCAVATION AND GIVES WRITTEN NOTICE TO RESUME FOUNDATION WORK.

ASSUMED NET ALLOWABLE SOIL BEARING PRESSURE = 2500 P.S.F.

5. ALL FOOTINGS SHALL BE FORMED TO MEET SIZES INDICATED ON DRAWINGS, DETAILS, AND/OR SCHEDULES.
6. ALL FOOTINGS AND PIERS SHALL BE CENTERED UNDER THE BUILDING COLUMNS (UNO).

CONCRETE

1. ALL CONCRETE SHALL CONTAIN CRUSHED ROCK AGGREGATE CONFORMING TO A.S.T.M. C-33.
2. DRY PACK MIX SHALL BE ONE PART CEMENT AND 1½ PARTS FINE AGGREGATE WITH A MINIMUM OF WATER.
3. MIX DESIGN SHALL BE BASED O[illegible] [illegible]FORMANCE TEST SHALL BE SUBMITTED TO THE [illegible] [illegible]R OF RECORD / GENERAL CONTRACTOR.
4. ALL CONCRETE FORM WORK SHALL BE ADEQUATELY TIED TOGETHER AND BRACED TO FORM TRUE LINES, SQUARE CORNERS, AND PLUMB WALLS.
5. CONCRETE CONSTRUCTION SHALL BE IN ACCORDANCE WITH A.C.I. 301 AND A.C.I. 318.
6. CONCRETE SHALL BE PLACED AND TESTED IN ACCORDANCE WITH A.C.I. 305 "HOT WEATHER CONCRETING" AND A.C.I. 306 "COLD WEATHER CONCRETING."
7. ALL REINFORCING BARS, DOWELS, ANCHOR BOLTS AND OTHER INSERTS SHALL BE SECURED IN POSITION PRIOR TO PLACING OF CONCRETE.
8. LOCATE ALL SLEEVES, OPENINGS, EMBEDDED ITEMS, ETC. WHICH ARE INDICATED ON ALL DESIGN DRAWINGS. CHECK WITH OTHER TRADES TO VERIFY THAT ALL SLEEVES, OPENINGS, AND EMBEDDED ITEMS ARE IN PLACE AND LOCATED CORRECTLY PRIOR TO PLACING OF CONCRETE.
9. STRUCTURAL CONCRETE SHALL DEVELOP THE FOLLOWING COMPRESSIVE STRENGTHS AT 28 DAYS (UNO):

CONCRETE FOUNDATIONS:	4000 P.S.I.
CONCRETE FOOTINGS:	4000 P.S.I.

10. CAST IN PLACE CONCRETE SHALL BE POURED CONTINUOUSLY, WITH NO COLD JOINTS. CONCRETE SHALL BE ADEQUATELY VIBRATED TO PREVENT THE OCCURRENCE OF AIR POCKETS AND HONEYCOMB EFFECTS.
11. AIR-ENTRAINED CONCRETE SHALL BE USED FOR ALL SIDEWALKS, PAVING, PLATFORMS, CURBS, AND OTHER EXTERIOR WORK EXPOSED TO THE WEATHER.

REINFORCING STEEL:

1. ALL REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO A.S.T.M. A-615 GRADE 60 (UNO).
2. TIE WIRE SHALL CONFORM TO A.S.T.M. A-82.
3. WELDED WIRE FABRIC SHALL CONFORM WITH A.S.T.M. A-185.
4. DETAILING, BENDING, AND PLACING OF REINFORCING STEEL SHALL BE IN ACCORDANCE WITH THE PROVISIONS OF ACI 315-95.
5. ALL REINFORCING BARS MARKED "CONTINUOUS" MAY BE SPLICED WITH A LAP OF 24 BAR DIAMETERS IN CONCRETE BUT NOT LESS THAN 24 INCHES, EXCEPT AS NOTED.
6. ALL HORIZONTAL BARS IN CONCRETE, WALLS, AND GRADE BEAMS SHALL BE CONTINUOUS AND [illegible] AT ALL CORNE[RS] AND INTERSECTIONS.
7. WELDED WIRE FABRIC SHALL BE SPL[ICED] WITH A MINIMUM LAP OF TWO MODULES.
8. ALL REINFORCING STEEL SHALL HAVE THE FOLLOWING MINIMUM CONCRETE COVERAGE, (UNO):

-CONCRETE PLACED AGAINST EARTH	= 3"
-CONCRETE WITH FORMED SURFACES IN CONTACT WITH EARTH	= 2"
-CONCRETE EXPOSED TO WEATHER	= 2"
-SLABS, WALLS AND JOISTS NOT EXPOSED TO WEATHER OR IN CONTACT WITH EARTH, (#11 BARS AND SMALLER)	= 1½"
-BEAMS, GIRDERS, AND COLUMNS NOT EXPOSED TO WEATHER OR IN CONTACT WITH EARTH	= 1½"

STRUCTURAL STEEL

1. MATERIAL STANDARDS -
   - WIDE FLANGE, ANGLES, PLATE AND CHANNEL = A.S.T.M. A36
   - STRUCTURAL TUBES = A.S.T.M. A500, GRADE B
   - ERECTION BOLTS = A.S.T.M. A325
   - ANCHOR BOLTS = A.S.T.M. A36
   - GROUT = HIGH STRENGTH, NON-SHRINK
2. ALL STEEL SHALL BE FABRICATED AND ERECTED IN ACCORDANCE WITH THE A.I.S.C. MANUAL OF STEEL CONSTRUCTION, NINTH EDITION. (SPECIFICATIONS FOR DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDING) UNO. THE ERECTOR SHALL MEET ALL O.S.H.A. SAFETY STANDARDS.
3. BOLTED CONNECTIONS TO BE A.S.T.M. A325 BEARING TYPE CONNECTIONS W/ STANDARD ROUND HOLES, U.N.O. TORQUE AS DEFINED BY A.I.S.C. U.N.O.
4. WELDING SHALL BE IN ACCORDANCE WITH "AMERICAN WELDING SOCIETY" (AWS) D1.1, USING E70 ELECTRODES.
5. NO CHANGES SHALL BE MADE IN THE STEEL STRUCTURE NOR ANY MATERIAL CUT IN THE FIELD (UNLESS NOTED "FIELD CUT OR TRIM" ON ERECTION DETAILS) WITHOUT WRITTEN AUTHORIZATION FROM THE ENGINEER OF RECORD.
6. THE ENGINEER OF RECORD SHALL BE IMMEDIATELY NOTIFIED OF ANY DISCREPANCIES BETWEEN THE DESIGN AND ACTUAL CONDITIONS NOTED IN THE FIELD.
7. THE CONTRACTOR IS RESPONSIBLE FOR THE FIT OF ALL STRUCTURAL STEEL AND SHALL VERIFY ALL DIMENSIONS PRIOR TO FABRICATION.
8. CONTRACTOR SHALL PROVIDE NECESSARY LABOR, MATERIALS AND EQUIPMENT TO ERECT ALL MISCELLANEOUS IRON AND STEEL AS DETAILED OR NOTED ON THESE DRAWINGS.
9. STRUCTURAL STEEL SHALL BE PRIME PAINTED.

METAL DECKING

1. METAL DECKING SHALL BE 3 SPAN MINIMUM LENGTH GALVANIZED BY "VULCRAFT" OR APPROVED ALT.
2. METAL DECK AND INSTALLATION SHALL CONFORM TO THE REQUIREMENTS OF THE STEEL DECK INSTITUTE.
3. DECK ERECTION CONTRACTOR SHALL CUT DECK TO SUIT DETAILS AT ALL FRAMED OPENINGS, COLUMNS, COLUMN CONNECTIONS, OR AS INDICATED ON DRAWINGS.
4. THE OPENINGS SHOWN ON THE FRAMING PLANS INDICATE THE GENERAL ARRANGEMENT AND LOCATION ONLY. VERIFY CUTTING LENGTH OF DECK WITH ARCHITECTURAL, ELECTRICAL, AND MECHANICAL DRAWINGS.
5. PIPE SLEEVES AND ALL OTHER REQUIRED OPENINGS SHALL BE FIELD CUT BY THE TRADE WHICH REQUIRES THE OPENING. ADEQUATE DECK SUPPORT, PIPE SLEEVES FILLERS, CLOSURES, FLASHINGS, ETC. SHALL BE PROVIDED AND PROPERLY WELDED IN PLACE BY TRADE CUTTING THE OPENING.
6. ALL LIGHT GAUGE STEEL DECKING AND FLASHING SHALL BE GALVANIZED COATED CONFORMING TO A.S.T.M. A-525 CLASS G60 AND CONFORMING TO A.S.T.M. A-446, GRADE A OR A-611 GRADE C.
7. ALL WELDING, EXCEPT WHEN PERFORMED AT THE SHOP OF AN APPROVED FABRICATOR, SHALL BE DONE BY OPERATORS CERTIFIED BY THE BUILDING DEPARTMENT OF THE TYPE OF OPERATION INVOLVED.
8. ALL WELDS AND ABRASIONS SHALL BE GIVEN A PROTECTIVE COAT OF GALVALLOY, DRI-GALV, GALVICON OR APPROVED ALTERNATE.
9. ROOF DECK SHALL BE CONNECTED TO THE STRUCTURE AS SHOWN IN THE PLAN.
10. DESIGN, FABRICATION, STORAGE, HANDLING AND ERECTION OF METAL DECKING SHALL BE IN ACCORDANCE WITH STANDARD SPECIFICATIONS, CURRENT EDITION, OF THE STEEL DECK INSTITUTE.

SPECIAL INSPECTIONS- 2000 MICHIGAN BUILDING CODE :

1704.3.3.1 INSTALLATION OF HIGH STRENGTH BOLTS:

1. A325 BOLTS USED ARE BEARING TYPE ONLY. INSPECT TO INSURE JOINED PLIES ARE DRAWN TOGETHER.

1704.3 WELDING:

1. SPECIAL INSPECTION NOT REQUIRED

1704.4 CONCRETE CONSTRUCTION:

1. SPECIAL INSPECTION NOT REQUIRED

ABBREVIATIONS

TYPE	DESCRIPTION
A.B.	ANCHOR BOLT
A.F.F.	ABOVE FINISH FLOOR
ALT.	ALTERNATE
ARCH.	ARCHITECTURAL
A.T.W.F.	ABOVE TOP OF FOOTING
A.T.O.P.	ABOVE TOP OF PIER
AVG.	AVERAGE
B.F.F.	BELOW FINISH FLOOR
B.J.	BAR JOIST
BLDG.	BUILDING
BM.	BEAM
B.N.	BOUNDARY NAILING
B.O.	BOTTOM OF
B.O.B.	BOTTOM OF BRICK
BRG.	BEARING
C.J.	CONTROL JOINT
C.M.U.	CONCRETE MASONRY UNIT
CONC.	CONCRETE
CONST. JT.	CONSTRUCTION JOINT
CONT.	CONTINUOUS
D	DEPTH
DET.	DETAIL
DIA.	DIAMETER
E.N.	EDGE NAILING
ELEV.	ELEVATION
EQ.	EQUAL
E.W.	EACH WAY
EXIST.	EXISTING
FIN.	FINISH
FLR.	FLOOR
F.N.	FIELD NAILING
FND.	FOUNDATION
FTG.	FOOTING
F.V.	FIELD VERIFY
Ga.	GAUGE/GAGE
HORIZ.	HORIZONTAL
H.P.	HIGH POINT
INSUL.	INSULATION
L	LENGTH
L.L.H.	LONG LEG HORIZONTAL
L.L.V.	LONG LEG VERTICAL
L.P.	LOW POINT
MAX.	MAXIMUM
MECH.	MECHANICAL
MEZZ.	MEZZANINE
MFR.	MANUFACTURER
MIN.	MINIMUM
MISC.	MISCELLANEOUS
O. to O.	OUT TO OUT
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER
O.H.	OVER HEAD
P.S.F.	POUNDS PER SQUARE FOOT
P.S.I.	POUNDS PER SQUARE INCH
R.	RADIUS
REINF.	REINFORCEMENT
SIM.	SIMILAR
T.B.	TOP AND BOTTOM
T.O.	TOP OF
T.O.B.B.	TOP OF BOND BEAM
T.O.C.	TOP OF COLUMN
T.O.F.	TOP OF FOOTING
T.O.S.	TOP OF STEEL
TYP.	TYPICAL
U.S.M.D.	UNDERSIDE OF METAL DECK
U.N.O.	UNLESS NOTED OTHERWISE
VERT.	VERTICAL
W.W.F.	WELDED WIRE FABRIC
W	WIDTH
W/	WITH

AS-BUILT RECORD DRAWING

Date: 9-04-03
Project Rep: F. Navetta
Designer: ole

REVISIONS

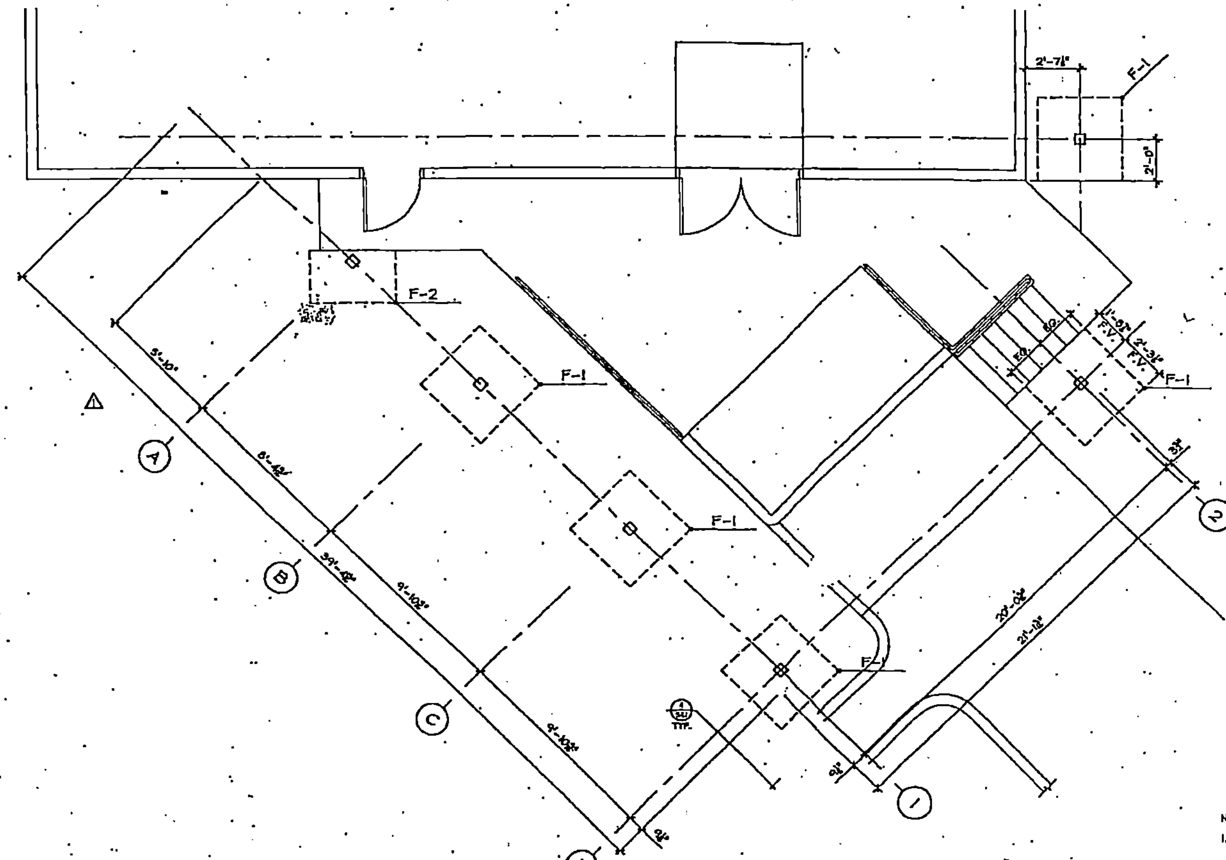
LIDY DESIGN GROUP
2525 PINE TREE ROAD, SUITE C, LANSING, MI 48911
PH: (517) 393-2773
FAX (517) 393-6466

CHEMICAL WASTE FACILITY INSTALL CANOPY

MICHIGAN STATE UNIVERSITY, EAST LANSING, MICHIGAN

GENERAL NOTES FOR CHEMICAL WASTE FACILITY INSTALL CANOPY, EAST LANSING, MICHIGAN

DATE: SEPT. 23, 2002
SCALE: AS SHOWN
PROJECT NO. 352.00140
SHEET NO. S0.1



NOTES:

1. ALL F-1 FOOTINGS TO BE 4'-0" x 4'-0" x 42" DEEP W/ (4) #5 BARS E.W. T.O.F. @ 8" BELOW FIN. GRADE
2. F-2 FOOTING TO BE 3'-0"x5'-0"x42" DEEP W/ (4) #5 BARS E.W. T.O.F. @8" BELOW FIN. GRADE
3. REFER TO ARCH. FOR DIMENSIONS NOT SHOWN
4. ANCHOR RODS TO BE ¾" DIA. HEAVY HEX HEAD RODS PER DETAIL 5/S4.1

AS-BUILT RECORD DRAWING	Date: 9-04-03
	Project Rep. F. Navetti
	Designer [illegible]

NORTH

FOUNDATION PLAN

SCALE: ¼"=1'-0"

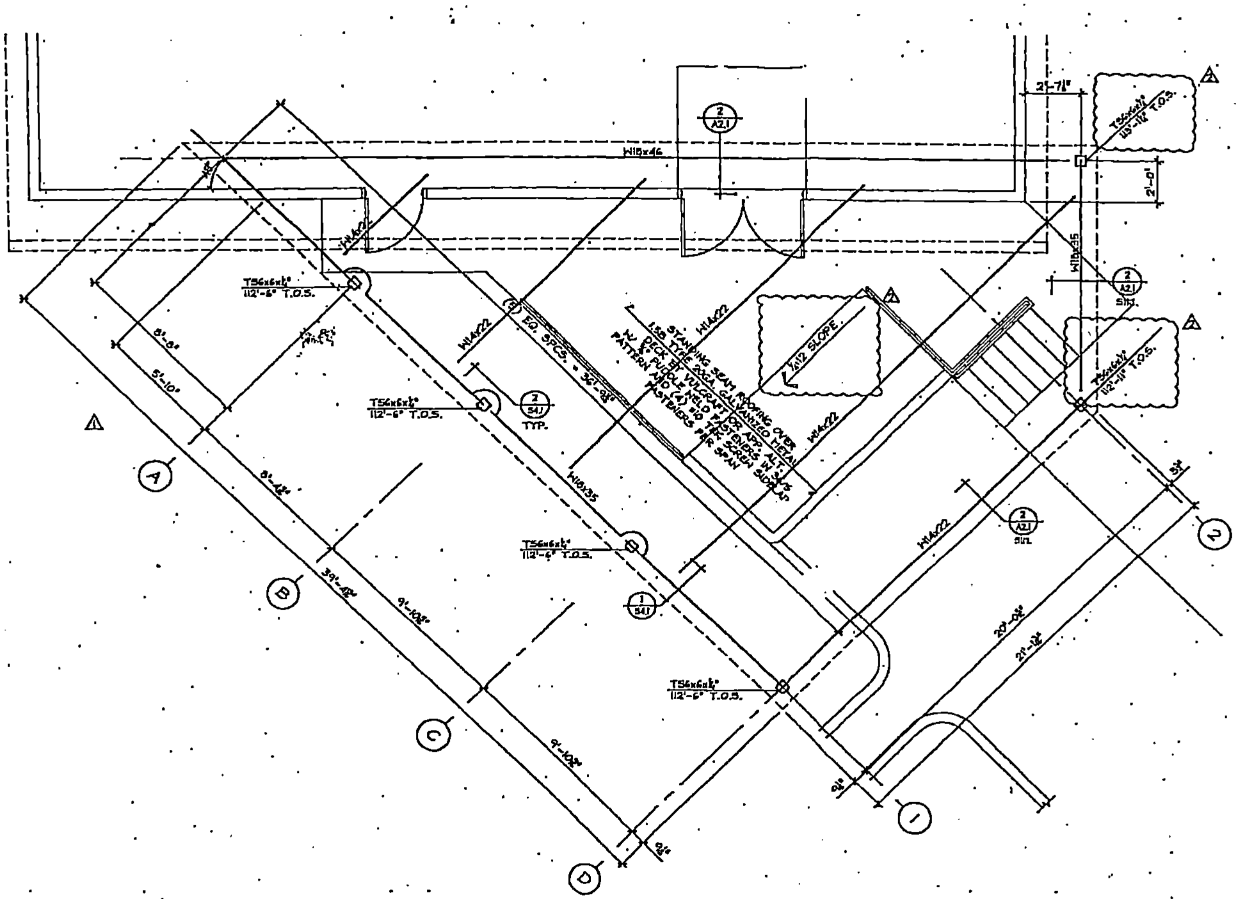
CHEMICAL WASTE FACILITY INSTALL CANOPY

MICHIGAN STATE UNIVERSITY EAST LANSING, MICHIGAN

FOUNDATION PLAN AND DETAILS FOR CHEMICAL WASTE FACILITY INSTALL CANOPY EAST LANSING, MICHIGAN

PROJECT NO. 392.0014D

SHEET NO. S1.1



NOTES:

1. CONTRACTOR SHALL FIELD VERIFY COLUMN LENGTH WITH RESPECT TO THE SLOPING GRADE PRIOR TO ORDERING STEEL.
2. REFER TO ARCH. FOR DIMENSIONS NOT SHOWN
3. CONTRACTOR MAY SPLICE W18x35 BEAM ON COL. LINE 1 OVER COLUMN C OR D, IF DESIRED. SPLICE TO BE PER DETAIL 3/S4.1
4. COLUMN BASE PLATES PER DETAIL 6/S4.1

FRAMING PLAN

SCALE: 3/16"=1'-0"

NORTH

AS-BUILT RECORD DRAWING	Date: 9-04-13
	Project Rep. F. NAVETTA
	Designer [illegible]

FRAMING PLAN AND DETAILS
FOR
CHEMICAL WASTE FACILITY
INSTALL CANOPY
EAST LANSING, MICHIGAN

CHEMICAL WASTE FACILITY
INSTALL CANOPY

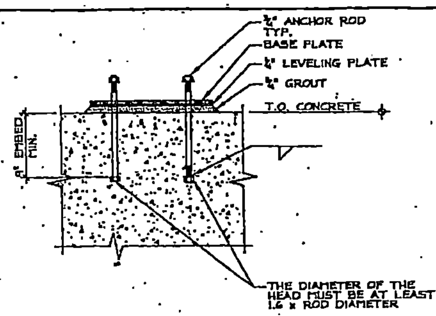
MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN

LIDY DESIGN GROUP

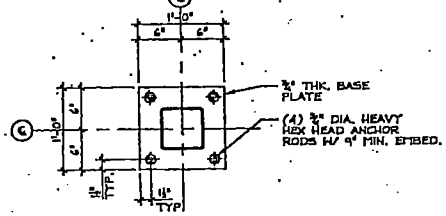
REVISIONS

382.00140

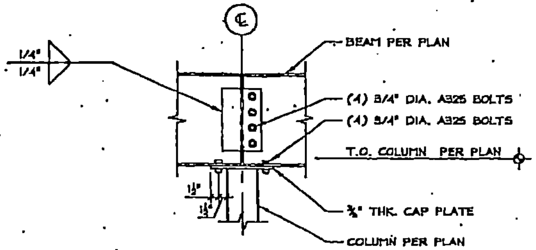
S3.1



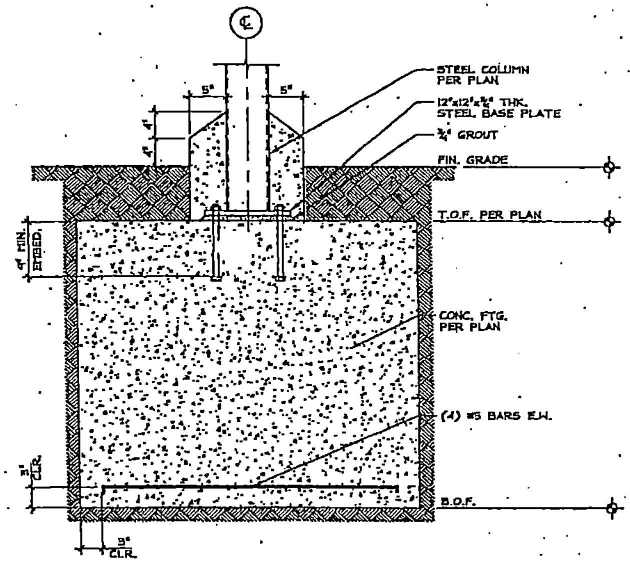
5 ANCHOR DATA



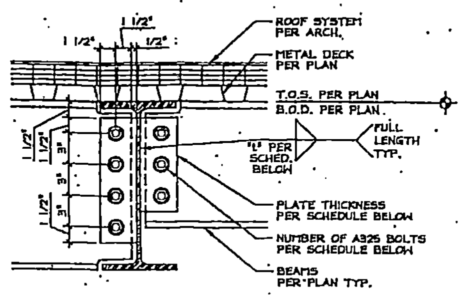
6 BASE PLATE DETAIL



3 SPLICE CONNECTION

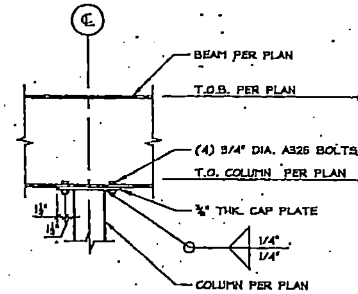


4 COLUMN FOOTING



BEAM TO BEAM CONNECTION			
BEAM SIZE	NUMBER OF BOLTS AND SIZE	CLIP ANGLE OR SHEAR PLATE	FILLET WELD "t" THICKNESS
[illegible]	(3) 3/4" DIA.	1/4"	3/16"
[illegible]	(4) 3/4" DIA.	3/8"	1/4"

1 BEAM TO BEAM



2 CANTILEVER CONNECTION

AS-BUILT RECORD DRAWING

Date: 9-04-03

Project Rep. F.NAVETTA

Designer od

LIDY DESIGN GROUP

CHEMICAL WASTE FACILITY INSTALL CANOPY

MICHIGAN STATE UNIVERSITY EAST LANSING, MICHIGAN

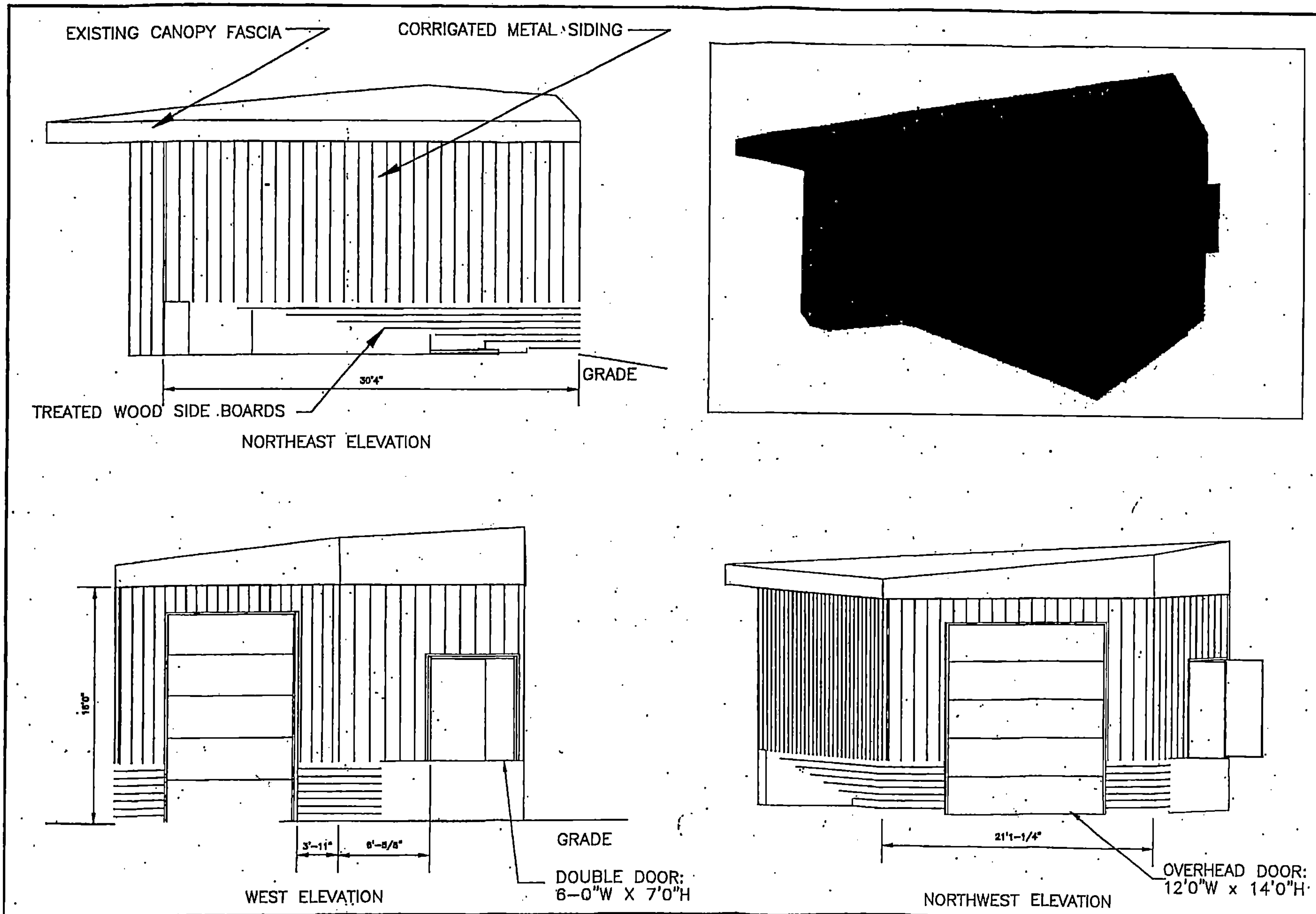
FRAMING DETAILS FOR: CHEMICAL WASTE FACILITY INSTALL CANOPY EAST LANSING, MICHIGAN

DATE SEPT. 23, 2002

SCALE AS SHOWN

PROJECT NO. 382.00140

SHEET NO. S4.1



MICHIGAN STATE UNIVERSITY
PHYSICAL PLANT DIVISION
ENGINEERING AND ARCHITECTURAL SERVICES

TITLE: CHEMICAL WASTE FACILITY
CANOPY ENCLOSURE PROPOSAL

BUILDING NUMBER: I-7

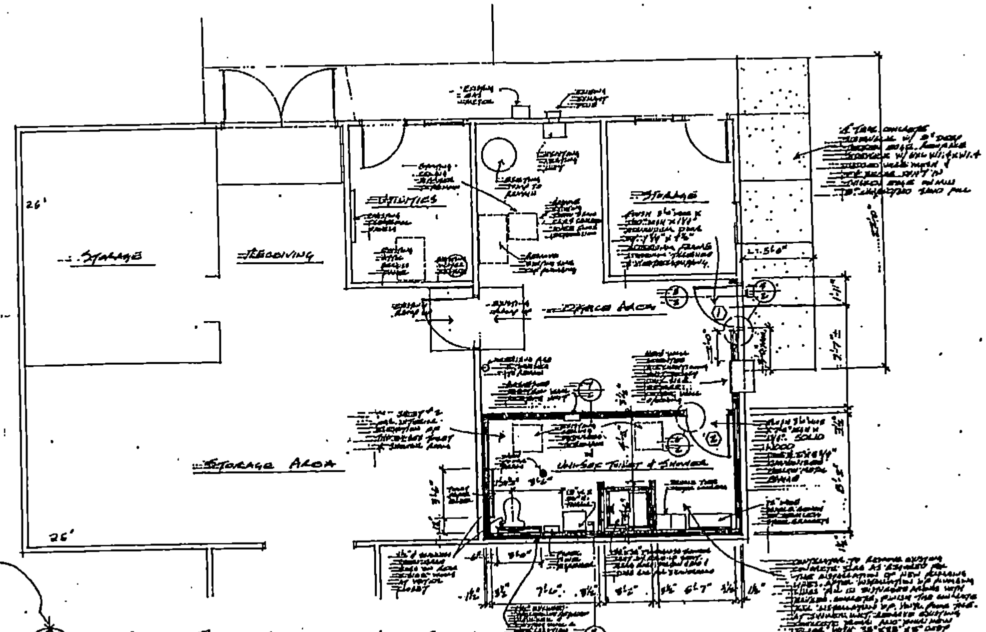
DRAWN BY: RFN

DATE: 9-24-2003

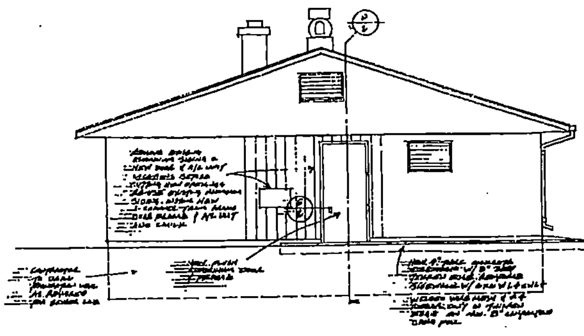
DWG NO.: 1of 1

Appendix B6-6

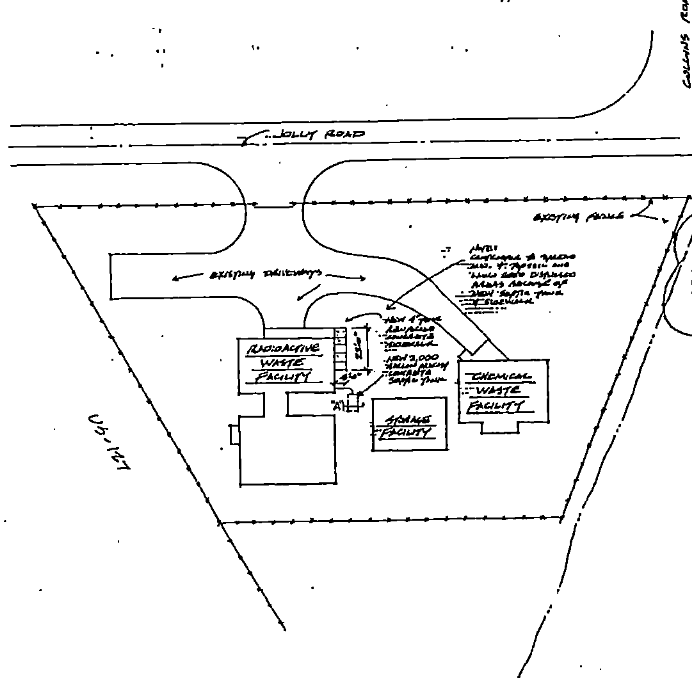
West Storage Building Drawings



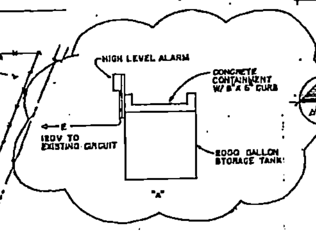
FLOOR PLAN - RADIOACTIVE WASTE FACILITY
SCALE 1/4" = 1'0"

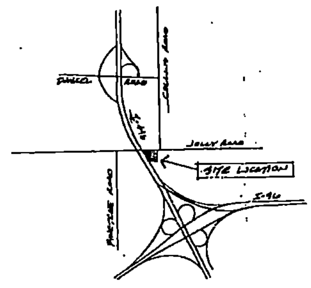


EAST EXTERIOR ELEVATION - RADIOACTIVE WASTE FACILITY
SCALE 1/4" = 1'-0"



SITE PLAN
SCALE 1" = 30'-0"





LOCATION PLAN
NO SCALE

ROOM FINISH NOTES:

OFFICE AREAS: FLOOR - NEW VINYL TILE OVER EXISTING CONCRETE FLOOR
BASE - NONE
WALLS - EXISTING ASBESTOS PANELS TO REMAIN & 1/2" GYPSUM BOARD ON NEW STUD WALLS
CEILING - EXISTING ASBESTOS PANELS TO REMAIN

UNISEX TOILET & SHOWER: FLOOR - NEW VINYL TILE OVER EXISTING CONCRETE FLOOR
BASE - 4" HIGH COVED VINYL BASE
WALLS - 1/2" MOISTURE RESISTANT GYPSUM BOARD ON NEW STUD WALLS
CEILING - EXISTING ASBESTOS PANELS TO REMAIN

REST OF AREAS TO REMAIN AS IS:

GENERAL NOTES:

1. GENERAL CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO PROJECT REPRESENTATIVE.
2. CONTRACTOR(S) SHALL USE CAUTION WHEN WORKING NEAR EXISTING BUILDING STRUCTURE, AND SHALL TAKE PRECAUTIONS TO INSURE THAT ANY NEW CONSTRUCTION DOES NOT DAMAGE EXISTING STRUCTURE.
3. CONTRACTOR TO BE AWARE THAT EXISTING WALLS AND CEILINGS ARE ASBESTOS PANELS. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR REMOVAL AND DISPOSAL OF ASBESTOS MATERIALS AS NECESSARY FOR NEW ARCHITECTURAL, MECHANICAL, AND ELECTRICAL WORK; IN ACCORDANCE WITH ALL APPLICABLE CODES. CONTRACTOR SHALL ALSO ANCHOR NEW STUD WALLS TO ASBESTOS WALLS AND CEILING PER APPLICABLE CODES.

SHEET INDEX

1. SITE PLAN, FLOOR PLAN & EAST EXTERIOR ELEVATION - RADIOACTIVE WASTE FACILITY
2. CONSTRUCTION DETAILS & INTERIOR ELEVATIONS - RADIOACTIVE WASTE FACILITY
3. PLUMBING - RADIOACTIVE WASTE FACILITY
4. DEMOLITION / MECHANICAL - RADIOACTIVE WASTE FACILITY
5. MECHANICAL - CHEMICAL WASTE FACILITY
6. ELECTRICAL - RADIOACTIVE AND CHEMICAL WASTE FACILITIES

AS-BUILT DWG | Date: 3/19/98
Project Rep.
Designer

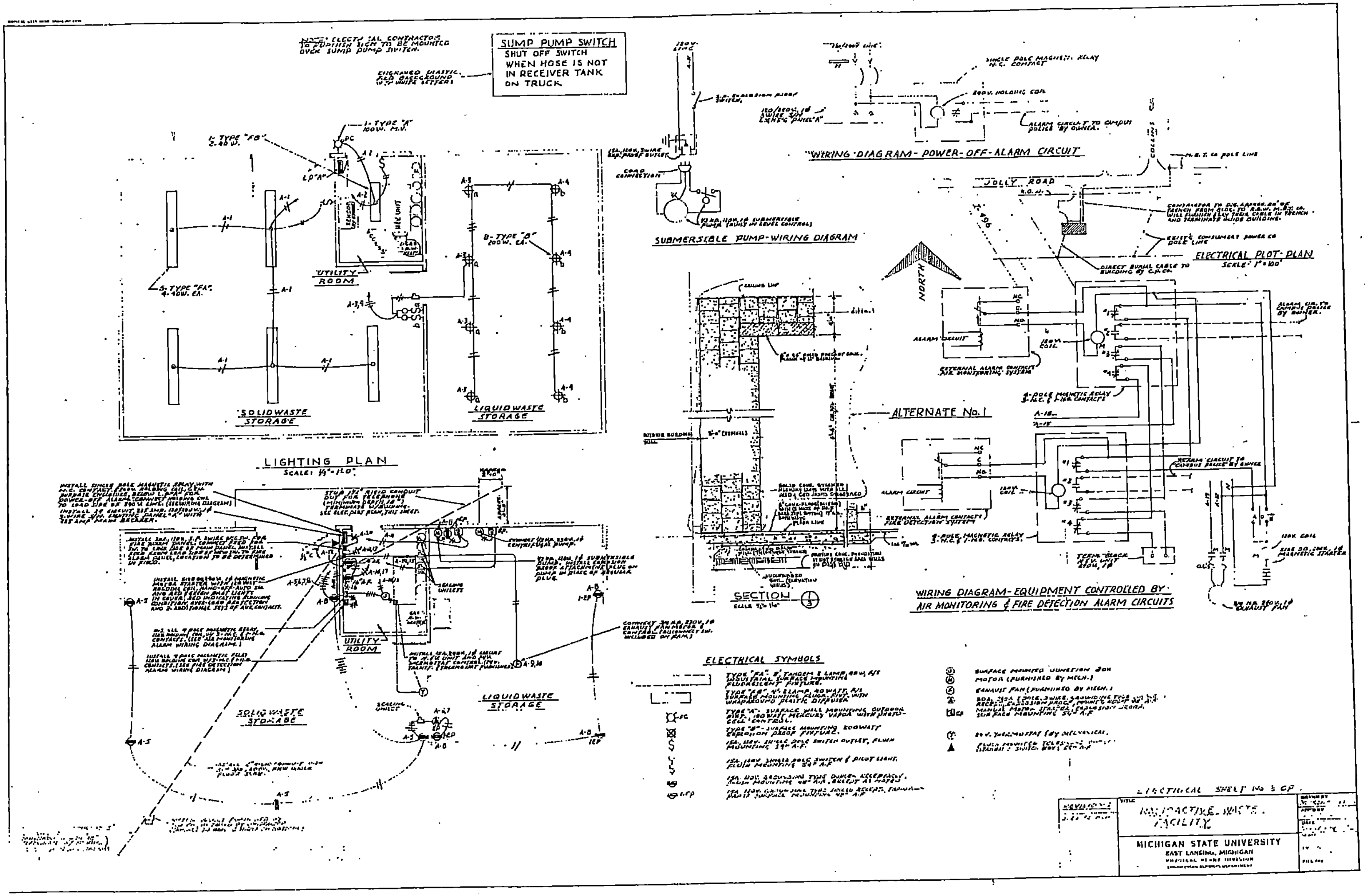
SHEET 1 OF 6

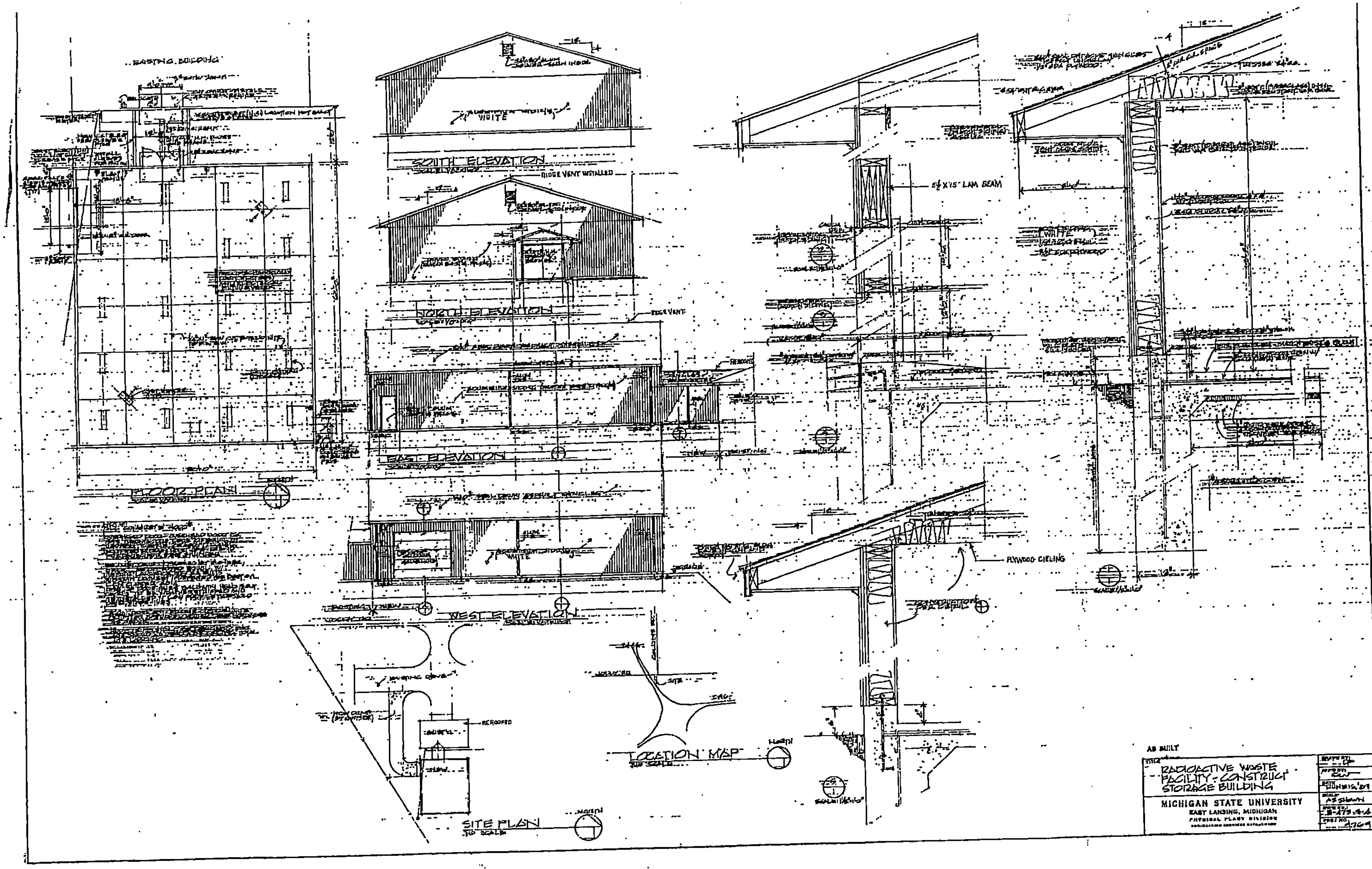
Barnett-Coakley Associates Architects, Inc.
4104 W. St. Joseph Hwy.
Lansing, Michigan 48917

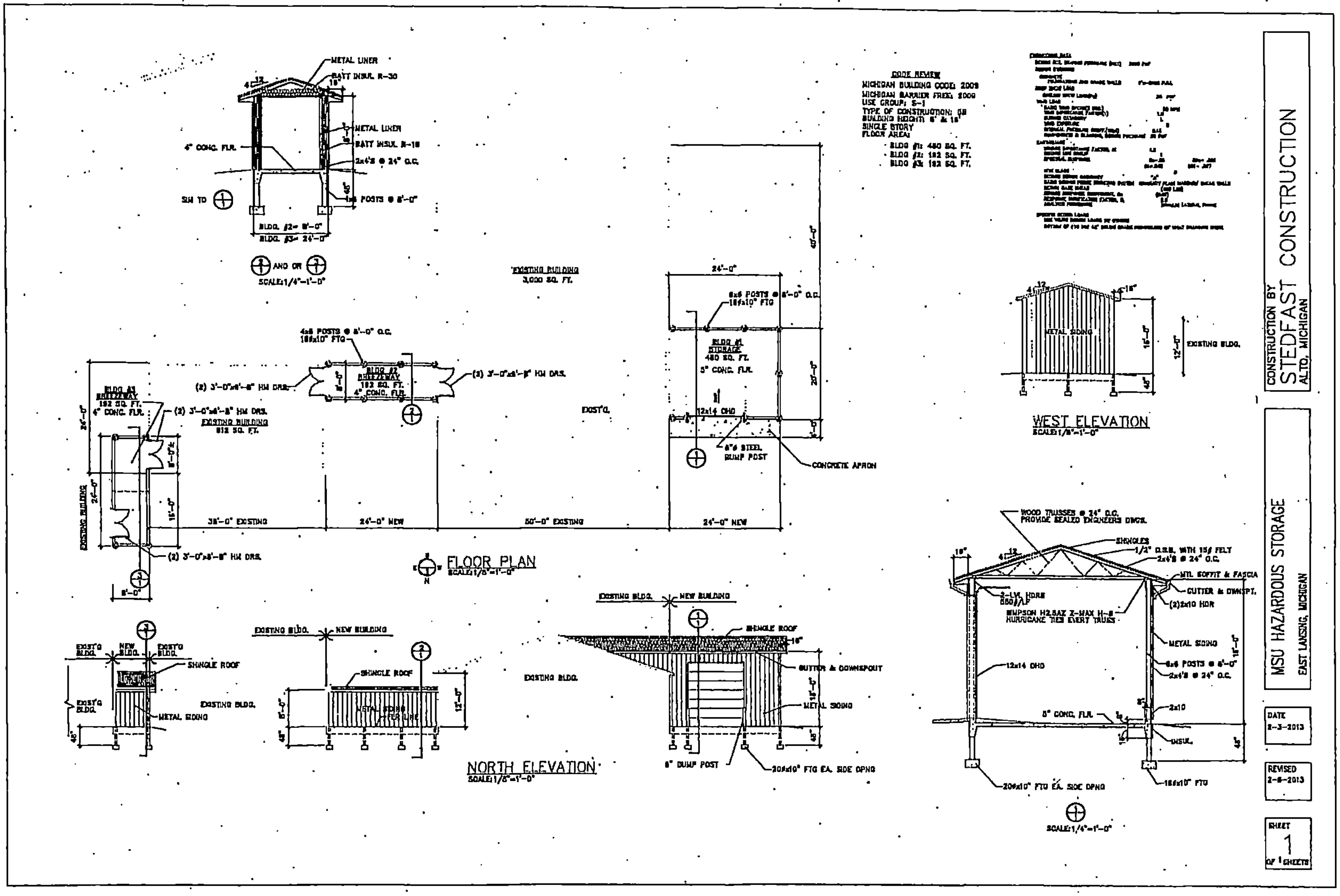
CHEMICAL WASTE FACILITIES
SHOWER FACILITIES & VENTILATION SYSTEMS

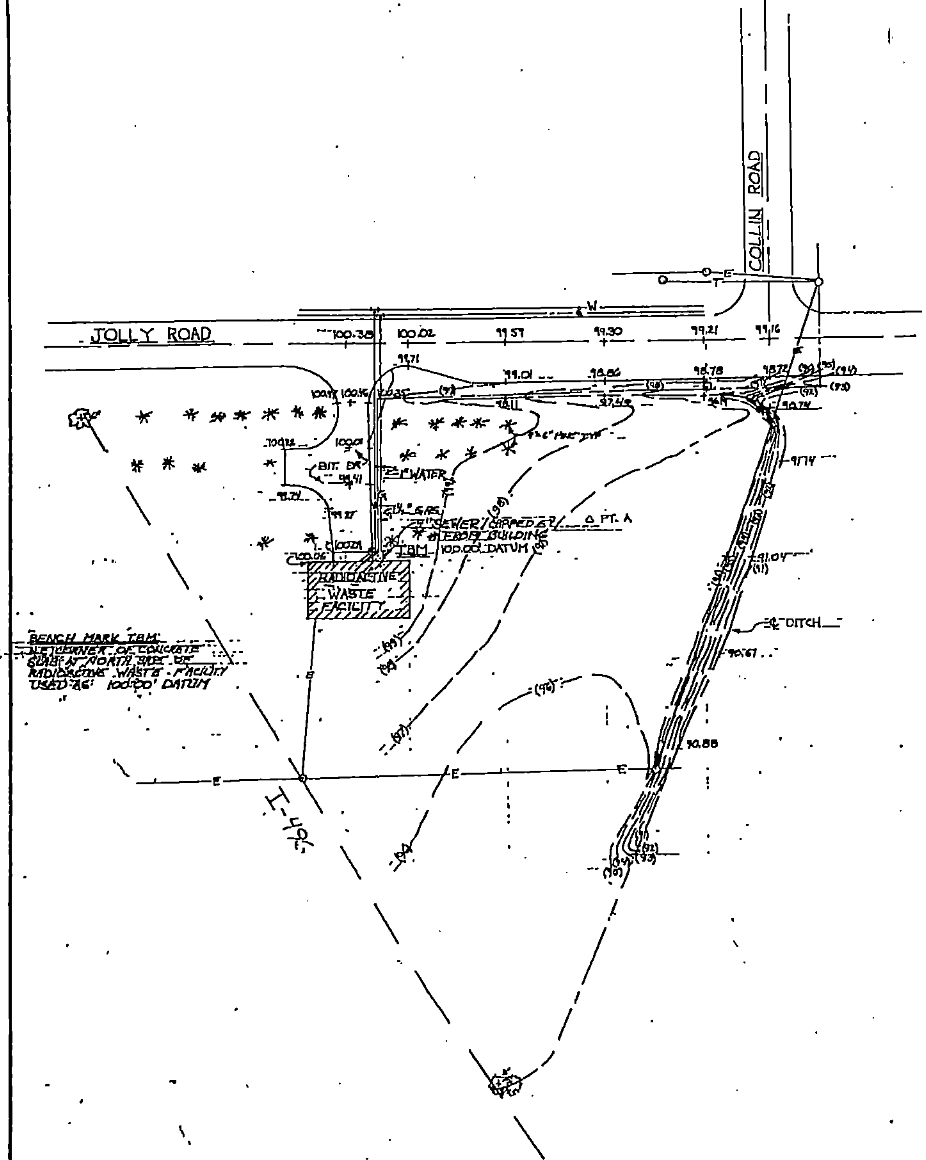
MICHIGAN STATE UNIVERSITY
EAST LANSING MICHIGAN
PHYSICAL PLANT DIVISION

DRAWN BY: JLG
DATE: 10-3-96
SCALE: AS NOTED


SUMP PUMP SWITCH
SHUT OFF SWITCH WHEN HOSE IS NOT IN RECEIVER TANK ON TRUCK
WIRING DIAGRAM - POWER-OFF-ALARM CIRCUIT
JOLLY ROAD
ELECTRICAL PLOT PLAN
NORTH
SUBMERSIBLE PUMP-WIRING DIAGRAM
UTILITY ROOM
SOLIDWASTE STORAGE
LIQUIDWASTE STORAGE
LIGHTING PLAN
ALTERNATE No. 1
SECTION
WIRING DIAGRAM - EQUIPMENT CONTROLLED BY AIR MONITORING & FIRE DETECTION ALARM CIRCUITS
ELECTRICAL SYMBOLS
ALARM CIRCUIT
MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN


SOUTH ELEVATION
RIDGE VENT INSTALLED
WHITE
NORTH ELEVATION
RIDGE VENT
EAST ELEVATION
REROOFED
NEW
EXISTING
WEST ELEVATION
FLOOR PLAN
5¼"X15" LAM BEAM
FLYWOOD CIELING
SITE PLAN
NO SCALE
NORTH
LOCATION MAP
AS BUILT
TITLE
RADIOACTIVE WASTE
FACILITY - CONSTRUCT
STORAGE BUILDING
MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN
PHYSICAL PLANT DIVISION
SCALE
AS SHOWN
PROJ NO.
4764


CODE REVIEW
MICHIGAN BUILDING CODE: 2009
MICHIGAN BARRIER FREE: 2009
USE GROUP: S-1
TYPE OF CONSTRUCTION: 5B
BUILDING HEIGHT: 8' & 18'
SINGLE STORY
FLOOR AREA:
BLDG #1: 480 SQ. FT.
BLDG #2: 192 SQ. FT.
BLDG #3: 192 SQ. FT.
EXISTING BUILDING 3,000 SQ. FT.
FLOOR PLAN
SCALE: 1/8"=1'-0"
WEST ELEVATION
SCALE: 1/8"=1'-0"
NORTH ELEVATION
SCALE: 1/8"=1'-0"
METAL LINER
BATT INSUL. R-30
BATT INSUL. R-19
4" CONC. FLR.
BLDG. #2= 8'-0"
BLDG. #3= 24'-0"
SCALE: 1/4"=1'-0"
4x6 POSTS @ 8'-0" O.C.
BLDG #1 STORAGE 480 SQ. FT.
5" CONC. FLR.
12x14 OHD
CONCRETE APRON
6"Ø STEEL BUMP POST
EXISTING BUILDING 912 SQ. FT.
(2) 3'-0"x6'-8" HM DRS.
38'-0" EXISTING
24'-0" NEW
50'-0" EXISTING
24'-0" NEW
METAL SIDING
EXISTING BLDG.
NEW BUILDING
SHINGLE ROOF
GUTTER & DOWNSPOUT
8" BUMP POST
WOOD TRUSSES @ 24" O.C. PROVIDE SEALED ENGINEERS DWGS.
SHINGLES
1/2" O.S.B. WITH 15# FELT
MTL. SOFFIT & FASCIA
SIMPSON H2.5AZ Z-MAX H-2 HURRICANE TIES EVERY TRUSS
12x14 OHD
5" CONC. FLR.
INSUL.
SCALE: 1/4"=1'-0"
CONSTRUCTION BY
STEDFAST CONSTRUCTION
ALTO, MICHIGAN
MSU HAZARDOUS STORAGE
EAST LANSING, MICHIGAN
DATE
2-3-2013
REVISED
2-6-2013
SHEET
1
OF 1 SHEETS



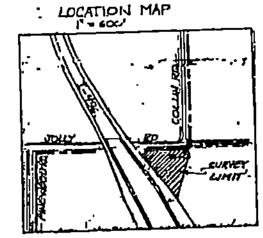
LEGEND

- BENCH MARK
- TRAVERSE POINT
- EXISTING CONTOURS
- WATER LINE
- GAS LINE
- FIRE HYDRANT
- WATER VALVE
- GAS VALVE
- UNDERGROUND TELEPHONE
- DECIDOUS TREES
- SEWER LINE
- CONIFEROUS TREES
- ELECTRIC & TELEPHONE (OVERHEAD)

NORTH
SCALE 1" = 40'

NOTE - CONTOURS ARE AT 1'-0" INTERVALS

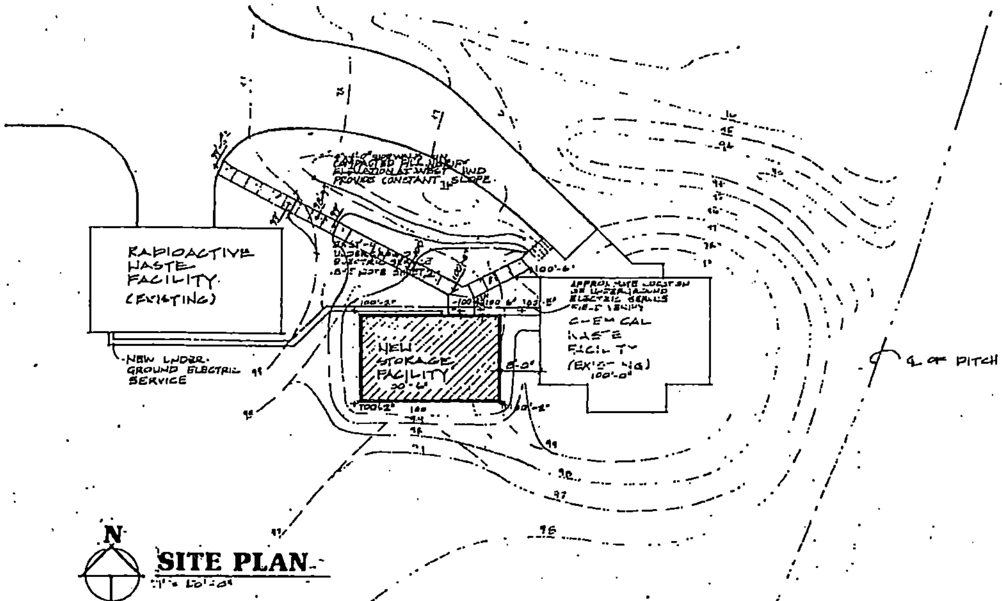
LOCATION MAP
1" = 600'



TITLE: CHEMICAL WASTE FACILITY TOPO SURVEY

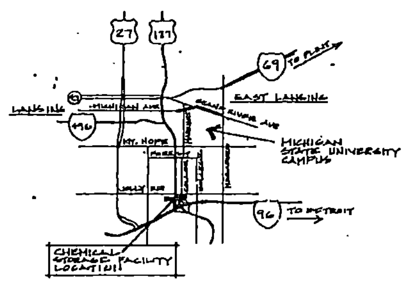
MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN
PHYSICAL PLANT DIVISION
ENGINEERING SERVICES DEPARTMENT

DRAWN BY: E.R. SEABERG
APP'D BY: R.T.L.
DATE: 6-15-81
SCALE: AS SHOWN
DW'G NO.: TO-145
CARD NO



SITE PLAN
1" = 50'-0"

EXISTING CONTOURS
PROPOSED CONTOURS



LOCATION MAP
NOT TO SCALE

BUILDING NO. 475.C.

STORAGE FACILITY
MICHIGAN STATE UNIVERSITY
EAST LANSING MICHIGAN

architectural consortium
incorporated
120 WEST OTTAWA STREET
LANSING, MICHIGAN 48933
TELEPHONE (517) 371-1484

PROJECT:	SHEET NUMBER:
83270	1
DATE: MAY 23, 1985	

ATTACHMENT 7

ACCEPTABLE WASTE CODES

XIV. Description of Hazardous Wastes				
Line	A. Hazardous Waste Code Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D.1. Process Code
1	D001	140057	P	S01
2	D002	24067	P	S01
3	D003	435	P	S01
4	D004	95122	P	S01
5	D005	53265	P	S01
6	D006	83999	P	S01
7	D007	98286	P	S01
8	D008	76770	P	S01
9	D009	54604	P	S01
10	D010	32175	P	S01
11	D011	121644	P	S01
12	D012	<100	P	S01
13	D013	10890	P	S01
14	D014	10890	P	S01
15	D015	<100	P	S01
16	D016	12375	P	S01
17	D017	<100	P	S01
18	D018	106920	P	S01
19	D019	51975	P	S01
20	D020	<100	P	S01
21	D021	8415	P	S01
22	D022	125864	P	S01
23	D023	<100	P	S01
24	D024	<100	P	S01
25	D025	<100	P	S01
26	D026	9405	P	S01
27	D027	5940	P	S01
28	D028	10890	P	S01
29	D029	<100	P	S01
30	D030	5940	P	S01
31	D031	<100	P	S01
32	D032	<100	P	S01
33	D033	<100	P	S01
34	D034	<100	P	S01
35	D035	28449	P	S01
36	D036	25245	P	S01
37	D037	<100	P	S01
38	D038	102465	P	S01
39	D039	1485	P	S01
40	D040	24255	P	S01
41	D041	<100	P	S01
42	D042	<100	P	S01
43	D043	<100	P	S01
44	001S	518	P	S01

XIV. Description of Hazardous Wastes				
Line	A. Hazardous Waste Code Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D.1. Process Code
45	002S	<100	P	S01
46	003S	<100	P	S01
47	004S	<100	P	S01
48	005S	<100	P	S01
49	006S	<100	P	S01
50	007S	<100	P	S01
51	F002	127300	P	S01
52	F003	139671	P	S01
53	F004	<100	P	S01
54	F005	125730	P	S01
55	F025	<100	P	S01
56	F027	<100	P	S01
57	F032	<100	P	S01
58	F035	<100	P	S01
59	F039	<100	P	S01
60	P001	<100	P	S01
61	P002	<100	P	S01
62	P003	<100	P	S01
63	P004	<100	P	S01
64	P005	<100	P	S01
65	P006	<100	P	S01
66	P007	<100	P	S01
67	P008	<100	P	S01
68	P009	<100	P	S01
69	P010	<100	P	S01
70	P011	<100	P	S01
71	P012	<100	P	S01
72	P013	<100	P	S01
73	P014	<100	P	S01
74	P015	<100	P	S01
75	P016	<100	P	S01
76	P017	<100	P	S01
77	P018	<100	P	S01
78	P020	<100	P	S01
79	P021	<100	P	S01
80	P022	<100	P	S01
81	P023	<100	P	S01
82	P024	<100	P	S01
83	P026	<100	P	S01
84	P027	<100	P	S01
85	P028	<100	P	S01
86	P029	<100	P	S01
87	P030	<100	P	S01
88	P031	<100	P	S01

XIV. Description of Hazardous Wastes				
Line	A. Hazardous Waste Code Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D.1. Process Code
89	P033	<100	P	S01
90	P034	<100	P	S01
91	P036	<100	P	S01
92	P037	<100	P	S01
93	P039	<100	P	S01
94	P040	<100	P	S01
95	P041	<100	P	S01
96	P042	<100	P	S01
97	P043	<100	P	S01
98	P044	<100	P	S01
99	P045	<100	P	S01
100	P046	<100	P	S01
101	P047	<100	P	S01
102	P048	<100	P	S01
103	P049	<100	P	S01
104	P050	<100	P	S01
105	P051	<100	P	S01
106	P054	<100	P	S01
107	P056	<100	P	S01
108	P057	<100	P	S01
109	P058	<100	P	S01
110	P059	<100	P	S01
111	P060	<100	P	S01
112	P062	<100	P	S01
113	P063	<100	P	S01
114	P064	<100	P	S01
115	P066	<100	P	S01
116	P067	<100	P	S01
117	P068	<100	P	S01
118	P069	<100	P	S01
119	P070	<100	P	S01
120	P071	<100	P	S01
121	P072	<100	P	S01
122	P073	<100	P	S01
123	P074	<100	P	S01
124	P075	<100	P	S01
125	P076	<100	P	S01
126	P077	<100	P	S01
127	P078	<100	P	S01
128	P082	<100	P	S01
129	P084	<100	P	S01
130	P085	<100	P	S01
131	P087	<100	P	S01
132	P088	<100	P	S01

XIV. Description of Hazardous Wastes				
Line	A. Hazardous Waste Code Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D.1. Process Code
133	P089	<100	P	S01
134	P092	<100	P	S01
135	P093	<100	P	S01
136	P094	<100	P	S01
137	P097	<100	P	S01
138	P098	<100	P	S01
139	P099	<100	P	S01
140	P101	<100	P	S01
141	P102	<100	P	S01
142	P103	<100	P	S01
143	P104	<100	P	S01
144	P105	<100	P	S01
145	P106	<100	P	S01
146	P108	<100	P	S01
147	P109	<100	P	S01
148	P110	<100	P	S01
149	P111	<100	P	S01
150	P112	<100	P	S01
151	P113	<100	P	S01
152	P114	<100	P	S01
153	P115	<100	P	S01
154	P116	<100	P	S01
155	P118	<100	P	S01
156	P119	<100	P	S01
157	P120	<100	P	S01
158	P121	<100	P	S01
159	P122	<100	P	S01
160	P123	<100	P	S01
161	P127	<100	P	S01
162	P128	<100	P	S01
163	P185	<100	P	S01
164	P188	<100	P	S01
165	P189	<100	P	S01
166	P190	<100	P	S01
167	P191	<100	P	S01
168	P192	<100	P	S01
169	P194	<100	P	S01
170	P196	<100	P	S01
171	P197	<100	P	S01
172	P198	<100	P	S01
173	P199	<100	P	S01
174	P201	<100	P	S01
175	P202	<100	P	S01
176	P203	<100	P	S01

XIV. Description of Hazardous Wastes				
Line	A. Hazardous Waste Code Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D.1. Process Code
177	P204	<100	P	S01
178	P205	<100	P	S01
179	U001	<100	P	S01
180	U002	43065	P	S01
181	U003	21780	P	S01
182	U004	<100	P	S01
183	U005	<100	P	S01
184	U006	<100	P	S01
185	U007	990	P	S01
186	U008	495	P	S01
187	U009	1980	P	S01
188	U010	<100	P	S01
189	U011	<100	P	S01
190	U012	<100	P	S01
191	U014	<100	P	S01
192	U015	<100	P	S01
193	U016	<100	P	S01
194	U017	<100	P	S01
195	U018	<100	P	S01
196	U019	12375	P	S01
197	U020	<100	P	S01
198	U021	<100	P	S01
199	U022	<100	P	S01
200	U023	<100	P	S01
201	U024	<100	P	S01
202	U025	<100	P	S01
203	U026	<100	P	S01
204	U027	<100	P	S01
205	U028	<100	P	S01
206	U029	<100	P	S01
207	U030	<100	P	S01
208	U031	31680	P	S01
209	U032	<100	P	S01
210	U033	<100	P	S01
211	U034	<100	P	S01
212	U035	<100	P	S01
213	U036	<100	P	S01
214	U037	<100	P	S01
215	U038	<100	P	S01
216	U039	<100	P	S01
217	U041	7920	P	S01
218	U042	<100	P	S01
219	U043	<100	P	S01
220	U044	48015	P	S01

XIV. Description of Hazardous Wastes				
Line	A. Hazardous Waste Code Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D.1. Process Code
221	U045	<100	P	S01
222	U046	<100	P	S01
223	U047	<100	P	S01
224	U048	<100	P	S01
225	U049	<100	P	S01
226	U050	<100	P	S01
227	U051	<100	P	S01
228	U052	11880	P	S01
229	U053	<100	P	S01
230	U055	<100	P	S01
231	U056	5940	P	S01
232	U057	7920	P	S01
233	U058	<100	P	S01
234	U059	<100	P	S01
235	U060	<100	P	S01
236	U061	<100	P	S01
237	U062	<100	P	S01
238	U063	<100	P	S01
239	U064	<100	P	S01
240	U066	<100	P	S01
241	U067	<100	P	S01
242	U068	<100	P	S01
243	U069	3960	P	S01
244	U070	<100	P	S01
245	U071	<100	P	S01
246	U072	<100	P	S01
247	U073	<100	P	S01
248	U074	<100	P	S01
249	U075	<100	P	S01
250	U076	5940	P	S01
251	U077	7425	P	S01
252	U078	<100	P	S01
253	U079	<100	P	S01
254	U080	27225	P	S01
255	U081	<100	P	S01
256	U082	<100	P	S01
257	U083	<100	P	S01
258	U084	<100	P	S01
259	U085	<100	P	S01
260	U086	<100	P	S01
261	U087	<100	P	S01
262	U088	3960	P	S01
263	U089	<100	P	S01
264	U090	<100	P	S01

XIV. Description of Hazardous Wastes				
Line	A. Hazardous Waste Code Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D.1. Process Code
265	U091	<100	P	S01
266	U092	<100	P	S01
267	U093	<100	P	S01
268	U094	<100	P	S01
269	U095	<100	P	S01
270	U096	<100	P	S01
271	U097	<100	P	S01
272	U098	<100	P	S01
273	U099	<100	P	S01
274	U101	<100	P	S01
275	U102	<100	P	S01
276	U103	<100	P	S01
277	U105	<100	P	S01
278	U106	<100	P	S01
279	U107	<100	P	S01
280	U108	4950	P	S01
281	U109	<100	P	S01
282	U110	<100	P	S01
283	U111	<100	P	S01
284	U112	15345	P	S01
285	U113	<100	P	S01
286	U114	<100	P	S01
287	U115	<100	P	S01
288	U116	<100	P	S01
289	U117	52470	P	S01
290	U118	<100	P	S01
291	U119	<100	P	S01
292	U120	<100	P	S01
293	U121	<100	P	S01
294	U122	88182	P	S01
295	U123	22275	P	S01
296	U124	<100	P	S01
297	U125	<100	P	S01
298	U126	<100	P	S01
299	U127	<100	P	S01
300	U128	<100	P	S01
301	U129	<100	P	S01
302	U130	<100	P	S01
303	U131	<100	P	S01
304	U132	<100	P	S01
305	U133	7920	P	S01
306	U134	495	P	S01
307	U135	<100	P	S01
308	U136	<100	P	S01

XIV. Description of Hazardous Wastes				
Line	A. Hazardous Waste Code Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D.1. Process Code
309	U137	<100	P	S01
310	U138	500	P	S01
311	U140	9405	P	S01
312	U141	<100	P	S01
313	U142	<100	P	S01
314	U143	<100	P	S01
315	U144	<100	P	S01
316	U145	<100	P	S01
317	U146	<100	P	S01
318	U147	<100	P	S01
319	U148	<100	P	S01
320	U149	<100	P	S01
321	U150	<100	P	S01
322	U151	<100	P	S01
323	U152	<100	P	S01
324	U153	<100	P	S01
325	U154	20295	P	S01
326	U155	<100	P	S01
327	U156	<100	P	S01
328	U157	<100	P	S01
329	U158	<100	P	S01
330	U159	<100	P	S01
331	U160	<100	P	S01
332	U161	<100	P	S01
333	U162	2065	P	S01
334	U163	<100	P	S01
335	U164	<100	P	S01
336	U165	133	P	S01
337	U166	<100	P	S01
338	U167	<100	P	S01
339	U168	<100	P	S01
340	U169	<100	P	S01
341	U170	<100	P	S01
342	U171	<100	P	S01
343	U172	<100	P	S01
344	U173	<100	P	S01
345	U174	<100	P	S01
346	U176	<100	P	S01
347	U177	<100	P	S01
348	U178	<100	P	S01
349	U179	<100	P	S01
350	U180	<100	P	S01
351	U181	<100	P	S01
352	U182	<100	P	S01

XIV. Description of Hazardous Wastes				
Line	A. Hazardous Waste Code Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D.1. Process Code
353	U183	<100	P	S01
354	U184	<100	P	S01
355	U185	<100	P	S01
356	U186	<100	P	S01
357	U187	<100	P	S01
358	U188	47124	P	S01
359	U189	<100	P	S01
360	U190	<100	P	S01
361	U191	<100	P	S01
362	U192	<100	P	S01
363	U193	<100	P	S01
364	U194	<100	P	S01
365	U196	34650	P	S01
366	U197	<100	P	S01
367	U200	<100	P	S01
368	U201	<100	P	S01
369	U203	<100	P	S01
370	U204	<100	P	S01
371	U205	<100	P	S01
372	U206	<100	P	S01
373	U207	<100	P	S01
374	U208	<100	P	S01
375	U209	<100	P	S01
376	U210	<100	P	S01
377	U211	13860	P	S01
378	U213	42570	P	S01
379	U214	<100	P	S01
380	U215	<100	P	S01
381	U216	<100	P	S01
382	U217	<100	P	S01
383	U218	<100	P	S01
384	U219	<100	P	S01
385	U220	52470	P	S01
386	U221	<100	P	S01
387	U222	<100	P	S01
388	U223	<100	P	S01
389	U225	<100	P	S01
390	U226	16335	P	S01
391	U227	<100	P	S01
392	U228	1980	P	S01
393	U234	<100	P	S01
394	U235	<100	P	S01
395	U236	<100	P	S01
396	U237	<100	P	S01

XIV. Description of Hazardous Wastes				
Line	A. Hazardous Waste Code Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D.1. Process Code
397	U238	<100	P	S01
398	U239	25245	P	S01
399	U240	15840	P	S01
400	U243	<100	P	S01
401	U244	<100	P	S01
402	U246	<100	P	S01
403	U247	<100	P	S01
404	U248	<100	P	S01
405	U249	<100	P	S01
406	U271	<100	P	S01
407	U278	<100	P	S01
408	U279	<100	P	S01
409	U280	<100	P	S01
410	U328	<100	P	S01
411	U353	<100	P	S01
412	U359	<100	P	S01
413	U364	<100	P	S01
414	U367	<100	P	S01
415	U372	<100	P	S01
416	U373	<100	P	S01
417	U387	<100	P	S01
418	U389	<100	P	S01
419	U394	<100	P	S01
420	U395	<100	P	S01
421	U404	<100	P	S01
422	U409	<100	P	S01
423	U410	<100	P	S01
424	U411	<100	P	S01
425	001U	<100	P	S01
426	002U	<100	P	S01
427	003U	<100	P	S01
428	004U	<100	P	S01
429	005U	<100	P	S01
430	006U	<100	P	S01
431	007U	<100	P	S01
432	008U	<100	P	S01
433	157U	<100	P	S01
434	009U	<100	P	S01
435	158U	<100	P	S01
436	011U	<100	P	S01
437	012U	<100	P	S01
438	014U	<100	P	S01
439	147U	<100	P	S01
440	159U	<100	P	S01

XIV. Description of Hazardous Wastes				
Line	A. Hazardous Waste Code Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D.1. Process Code
441	020U	<100	P	S01
442	160U	<100	P	S01
443	161U	<100	P	S01
444	022U	<100	P	S01
445	023U	<100	P	S01
446	027U	<100	P	S01
447	152U	<100	P	S01
448	029U	<100	P	S01
449	032U	<100	P	S01
450	033U	<100	P	S01
451	034U	<100	P	S01
452	150U	<100	P	S01
453	162U	<100	P	S01
454	036U	<100	P	S01
455	037U	<100	P	S01
456	163U	<100	P	S01
457	151U	<100	P	S01
458	040U	<100	P	S01
459	042U	<100	P	S01
460	043U	<100	P	S01
461	044U	<100	P	S01
462	046U	<100	P	S01
463	164U	<100	P	S01
464	048U	<100	P	S01
465	049U	<100	P	S01
466	050U	<100	P	S01
467	051U	<100	P	S01
468	052U	<100	P	S01
469	054U	<100	P	S01
470	055U	<100	P	S01
471	056U	<100	P	S01
472	165U	<100	P	S01
473	057U	<100	P	S01
474	058U	<100	P	S01
475	059U	<100	P	S01
476	166U	<100	P	S01
477	061U	<100	P	S01
478	063U	<100	P	S01
479	064U	<100	P	S01
480	068U	<100	P	S01
481	070U	<100	P	S01
482	071U	<100	P	S01
483	073U	<100	P	S01
484	167U	<100	P	S01

XIV. Description of Hazardous Wastes				
Line	A. Hazardous Waste Code Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D.1. Process Code
485	075U	<100	P	S01
486	076U	<100	P	S01
487	078U	<100	P	S01
488	079U	<100	P	S01
489	082U	<100	P	S01
490	083U	<100	P	S01
491	086U	<100	P	S01
492	088U	<100	P	S01
493	089U	<100	P	S01
494	090U	<100	P	S01
495	092U	<100	P	S01
496	094U	<100	P	S01
497	095U	<100	P	S01
498	097U	<100	P	S01
499	098U	<100	P	S01
500	099U	<100	P	S01
501	101U	<100	P	S01
502	102U	<100	P	S01
503	103U	<100	P	S01
504	104U	<100	P	S01
505	106U	<100	P	S01
506	108U	<100	P	S01
507	169U	<100	P	S01
508	110U	<100	P	S01
509	111U	<100	P	S01
510	112U	<100	P	S01
511	113U	<100	P	S01
512	115U	<100	P	S01
513	116U	<100	P	S01
514	117U	<100	P	S01
515	118U	<100	P	S01
516	119U	<100	P	S01
517	120U	<100	P	S01
518	121U	<100	P	S01
519	124U	<100	P	S01
520	127U	<100	P	S01
521	128U	<100	P	S01
522	129U	<100	P	S01
523	170U	<100	P	S01
524	131U	<100	P	S01
525	132U	<100	P	S01
526	134U	<100	P	S01
527	136U	<100	P	S01
528	137U	<100	P	S01

XIV. Description of Hazardous Wastes				
Line	A. Hazardous Waste Code Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	D.1. Process Code
529	138U	<100	P	S01
530	139U	<100	P	S01
531	154U	<100	P	S01
532	171U	<100	P	S01
533	172U	<100	P	S01
534	173U	<100	P	S01
535	141U	<100	P	S01
536	142U	<100	P	S01
537	143U	<100	P	S01
538	174U	<100	P	S01
539	175U	<100	P	S01

ATTACHMENT 8

CONTAINER STORAGE PROGRAM

FORM EQP 5111 ATTACHMENT TEMPLATE C1
USE AND MANAGEMENT OF CONTAINERS

This document is an attachment to the Michigan Department of Environmental Quality's *Instructions for Completing Form EQP 5111, Operating License Application Form for Hazardous Waste Treatment, Storage, and Disposal Facilities.* See Form EQP 5111 for details on how to use this attachment.

R 299.9614 of the administrative rules promulgated pursuant to Part 111, Hazardous Waste Management, of Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451); R 29.4101 to R 29.4505 promulgated pursuant to the provisions of the Michigan Fire Protection Act, PA 207, as amended (Act 207); and Title 40 of the Code of Federal Regulations (CFR) §§270.14(d), 270.15, and Part 264, Subpart I, establish requirements for the use and management of containers. All references to 40 CFR citations specified herein are adopted by reference in R 299.11003.

This license application template addresses requirements for the use and management of containers at the Michigan State University Waste Storage Facility in Lansing, Michigan. This template addresses the condition of containers, compatibility of waste with containers, management of containers, inspections, containment, special requirements for ignitable or reactive waste, special requirements for incompatible wastes, and closure.

(Check as appropriate)

Applicant for Operating License for Existing Facility:

☐ R 299.9614 use and management of containers

Applicant for Operating License for New, Altered, Enlarged, or Expanded Facility:

X R 299.9614 use and management of containers

This template is organized as follows:

📖 "Guidance for Permit Writers: Facilities Storing Hazardous Waste in Containers." EPA Publication PB88-105689.

INTRODUCTION

The container standards are performance standards for containers and container storage areas. Completion of this template should result in a demonstration of how your facility will meet these standards.

Please note that Template C11, Subpart CC, Air Emissions from Tanks, Containers, and Surface Impoundments, addresses air emissions for containers. Also note that while specific closure requirements for container storage areas are addressed in this template, you may reference information in Template A11, Closure and Postclosure Care Plans.

C1.A DESCRIPTION OF CONTAINERS
[R 299.9614 and 40 CFR §264.171]

See attached Table C1-1 Description of Containers for a listing of the number, types and specifications for containers used at the WSF.

C1.B CONDITION OF CONTAINERS
[R 299.9614 and 40 CFR §264.171]

Containers are under routine surveillance to ensure that the wastes contained therein are compatible. On most working days, the Waste Storage Facility is entered to place wastes into storage, properly label containers, or prepare waste for shipment. In addition, a regular container inspection program is conducted at the site.

On a frequent basis, the Hazardous Waste Coordinator or his/her designee checks each container for possible leaks and or signs of degradation. If any problems are observed, the contents of the container are immediately transferred to a different, compatible container which inspection has identified as being in proper condition for the storage. At the same time, all caps are checked to ensure that no harmful vapor release can occur, and that a harmful buildup of pressure has not occurred.

If any leaks have occurred, the spill is immediately absorbed with absorbent materials and containerized as a waste itself. Following cleanup, the floor and/or shelving is inspected for signs of deterioration.

C1.C COMPATIBILITY OF WASTE WITH CONTAINERS
[R 299.9614 and 40 CFR §264.172]

Compatibility of containers with wastes is ensured by the careful matching of identified waste materials with the appropriate containers. A listing of the containers which are compatible with each of the waste streams has been provided in **Table C1-1**. Though not listed on the table, glass is considered compatible with all classes of waste except hydrofluoric acid.

C1.D MANAGEMENT OF CONTAINERS
[R 299.9614 and 40 CFR §264.173]

Materials transferred to the Waste Storage Facility are stored by persons trained in the proper handling of hazardous wastes (Section A10 - Personnel Training Program). Each container is placed in the proper area designated as the storage zone for that particular material. All containers are inspected prior to storage for signs of leakage. Containers holding hazardous wastes which are identified as appropriate to store as Lab Pack chemicals are not opened during storage. The category of chemicals designated for storage in the Lab Pack Room is extensive and incorporates thousands of compounds. These include reactive, poisonous, irritating, flammable, corrosive, and oxidizing substances as well as any other substances that are not deemed suitable for consolidation. The Lab Pack chemicals are sorted and placed onto shelving units for subsequent removal. Other containers are only opened for consolidation purposes, to relieve pressure, or as required for acceptance by the licensed facility accepting the materials (i.e. in order to solubilize a substance prior to transport).

In order to control the volume of stored materials, a maximum inventory of containers has been established, as indicated in **Table C1-2**. **Figure C1-1 and C2** provide a detailed exhibit of the storage areas, staging areas and container arrangements.

Before transport to a licensed disposal facility, consolidated materials are assigned a proper DOT shipping name and UN/NA number (if applicable). The required marking and labeling are placed on each container stating the major chemical contents and identifying MSU as the generator of the waste along with the EPA identification number.

C1.E INSPECTIONS
[R 299.9614 and 40 CFR §264.174]

A regular schedule of container inspection has been established for the Waste Storage Facility. Included in this program are daily, weekly and monthly programs of inspection. The weekly program includes an inspection of the floors, safety equipment, security devices, and the operational structural equipment. Details of this program are provided in Section A5 Inspection Schedules.

C1.F CONTAINMENT
[R 299.9614 and 40 CFR §§264.175 and 270.15]

C1.F.1 Secondary Containment System Design and Operation for Containers with Free Liquids

[R 299.9614 and 40 CFR §§264.175(a) and 270.15(a)]

The detailed plans and description of the containment area of the Waste Storage Facility is provided in section B6. Engineering Plans. These plans indicate that all waste materials are enclosed in the Waste Storage Facility and are protected from intrusion, precipitation, run-on and run-off. All containers are stored in rooms having concrete floors and coatings which are certified as sufficiently impervious to contain leaks and spills. Each floor is free of cracks and gaps which might allow the escape of released materials.

The container storage area has a containment system consisting of 4-inch thick concrete floor pads which are reinforced with 6-inch by 6-inch 10/10 wire mesh. The concrete floors are constructed to facilitate the remediation of any accidental releases. No floor drains are present to allow the escape of materials to septic fields or sewer systems.

Each room of the east storage facility is separated by a 6-inch containment lip which allows for segregation of incompatible waste and sufficient containment volume. The containment volumes for each storage area are provided in Section B6 Engineering Plans. This system prevents materials in one room from mixing with materials in another room in the event of an emergency situation. At no time are free standing or uncontained wastes allowed to remain in any part of the facility.

The hazardous waste handling and management procedure utilized at the Waste Storage Facility is designed to prevent the mixing of incompatible wastes into containers stored at the facility. Details of the program which prevent the mixing of incompatible wastes are provided in the Sections A2 Chemical and Physical Analyses and A3 Waste Analysis Plan.

The storage facility design permits the separation of incompatible wastes into distinct areas of the facility. Upon transport to the East Storage Building, the reactive and ignitable wastes are stored in separate rooms each with sufficient containment capacities. The two rooms are divided by a single wall containing a fire door. The reactive wastes or small bottles are stored in the Lab Pack Room (120) and the ignitable and corrosive wastes in the Consolidation Room (100) separated by a 2 inch dike. The containers housing ignitable wastes are not opened at the facility unless the container is leaking or during consolidation with compatible wastes. Reactive wastes are stored in separate areas of the Lab Pack Room, with each waste stream stored in a distinct, separate area.

The concrete floor of the storage rooms in the East Storage Buildng are coated as described in **Appendix B6-3**. This appendix contains the manufacturer's specifications for the coating material, the chemical compatibilities, and the application instructions. This coating will prevent the possibility of the concrete floor reacting with materials which may be accidentally released at the facility.

After consolidation, some hazardous waste, including flammable waste and F-listed wastes, may be transported to the West Storage Building for storage. In addition, the West building will also store Part 121 wastes and used oil and universal waste.

C1.F.1(a) Requirement for Base or Liner
[R 299.9614 and 40 CFR §§264.175(b)(1) and 270.15(a)(1)]

All containers are stored in rooms having concrete floors which are certified as sufficiently impervious to contain leaks and spills. Each floor is free of cracks and gaps which might allow the escape of released materials. The concrete floor of the storage rooms are coated as described in **Appendix B6-3**. This appendix contains the manufacturer's specifications for the coating material, the chemical compatibilities, and the application instructions. This coating will prevent the possibility of the concrete floor reacting with materials which may be accidentally released at the facility

C1.F.1(b) Containment System Drainage
[R 299.9614 and 40 CFR §§264.175(b)(2) and 270.15(a)(2)]

The container storage area has a containment system consisting of 4-inch thick concrete floor pads which are reinforced with 6-inch by 6-inch 10/10 wire mesh. The concrete floors are constructed to facilitate the remediation of any accidental releases. No floor drains are present to allow the escape of materials to septic fields.

C1.F.1(c) Containment System Capacity
[R 299.9614 and 40 CFR §§264.175(b)(3) and 270.15(a)(3)]

The containment system has sufficient capacity to contain 10 percent of the volume of the containers or the volume of the largest container, whichever is greater. This information is described in detail in Section B6 Engineering Plans.

C1.F.1(d) Control of Run-on
[R 299.9614 and 40 CFR §§264.175(b)(4) and 270.15(a)(4)]

Run-on to the containment is prevented by the building elevation, the fact that the area is entirely enclosed, and because a conventional drainage system completely surrounds the building. Precipitation falling in the vicinity is naturally drained into the nearby drainage creek, and the site is well away from the 100-year flood plain.

C1.F.1(e) Removal of Liquids from Containment System
[R 299.9614 and 40 CFR §§264.175(b)(5) and 270.15(a)(5)]

If any leaks have occurred, the spill is immediately absorbed with absorbent materials and containerized as a waste itself. Following cleanup, the floor and/or shelving is inspected for signs of deterioration

C1.F.2 Secondary Containment System Design and Operation for Containers with No Free Liquids
[R 299.9614 and 40 CFR §§264.175 and 270.15(b)(1)]

C1.F.2(a) Containment System Drainage
[R 299.9614 and 40 CFR §§264.175 and 270.15(b)(2)]

As stated previously in this section, all waste materials are enclosed in the Waste Storage Facility and are protected from intrusion, precipitation, run-on and run-off. All containers are stored in rooms having concrete floors which are certified as sufficiently impervious to contain leaks and spills. Each floor is free of cracks and gaps which might allow the escape of released materials.

C1.F.2(b) Container Management
[R 299.9614 and 40 CFR §§264.175 and 270.15(b)(2)]

Any of the small volumes of wastes containing no free liquids are either elevated on shelves in the Lab Pack Room (120) or placed in plastic tubs with other like materials.

C1.G SPECIAL REQUIREMENTS FOR IGNITABLE OR REACTIVE WASTE
[R 299.9614 and 40 CFR §§264.176 and 270.15(b)(2)]

Upon transport to the WSF, the reactive and ignitable wastes are stored in the East Storage Building in separate areas, each with sufficient containment capacities. The two rooms are divided by a single wall containing a fire door. The reactive wastes or small bottles are stored in the Lab Pack Room (120) and the ignitable and corrosive wastes in the Consolidation Room (100) separated by a 2 inch dike. The containers housing ignitable wastes are not opened at the facility unless the container is leaking or during consolidation with compatible wastes. Reactive wastes are stored in separate areas of the Lab Pack Room, with each waste stream stored in a distinct, separate area. As stated in Section A9, Location Standards, the facility is 34 meters from the property line and at least 60 meters from other properties or rights-of-way.

C1.H SPECIAL REQUIREMENTS FOR INCOMPATIBLE WASTES
[R 299.9614 and 40 CFR §§264.177(c) and 270.15(b)(2)]

The hazardous waste handling and management procedure utilized at the Waste Storage Facility is designed to prevent the mixing of incompatible wastes into containers stored at the facility. Details of the program which prevent the mixing of incompatible wastes are provided in the sections A2 Chemical and Physical Analyses and A3 Waste Analysis Plan.

C1.I CLOSURE
[R 299.9614 and 40 CFR §264.178]

Note: This template's closure information is meant to supplement the closure plan that is to be included in the application as Template A11, Closure and Postclosure Plan. Information in Template A11, Closure and Postclosure Plan, may be referenced in this section.

At closure of the facility all the hazardous waste and residues will be removed from the facility. All the hazardous waste materials will be transported to a licensed disposal facility. All used containers will also be transported to a licensed disposal facility and treated as a hazardous waste. All new, unused containers will be removed from the facility. The entire facility will be closed according to the specifications identified in section A11. Closure and Post Closure Plan.

Because neither tanks, surface impoundments, waste piles, land treatment facilities, landfills, nor incinerators are present or utilized at the site, the regulations pertaining to these units do not apply.

Figure C1-1
Storage Areas

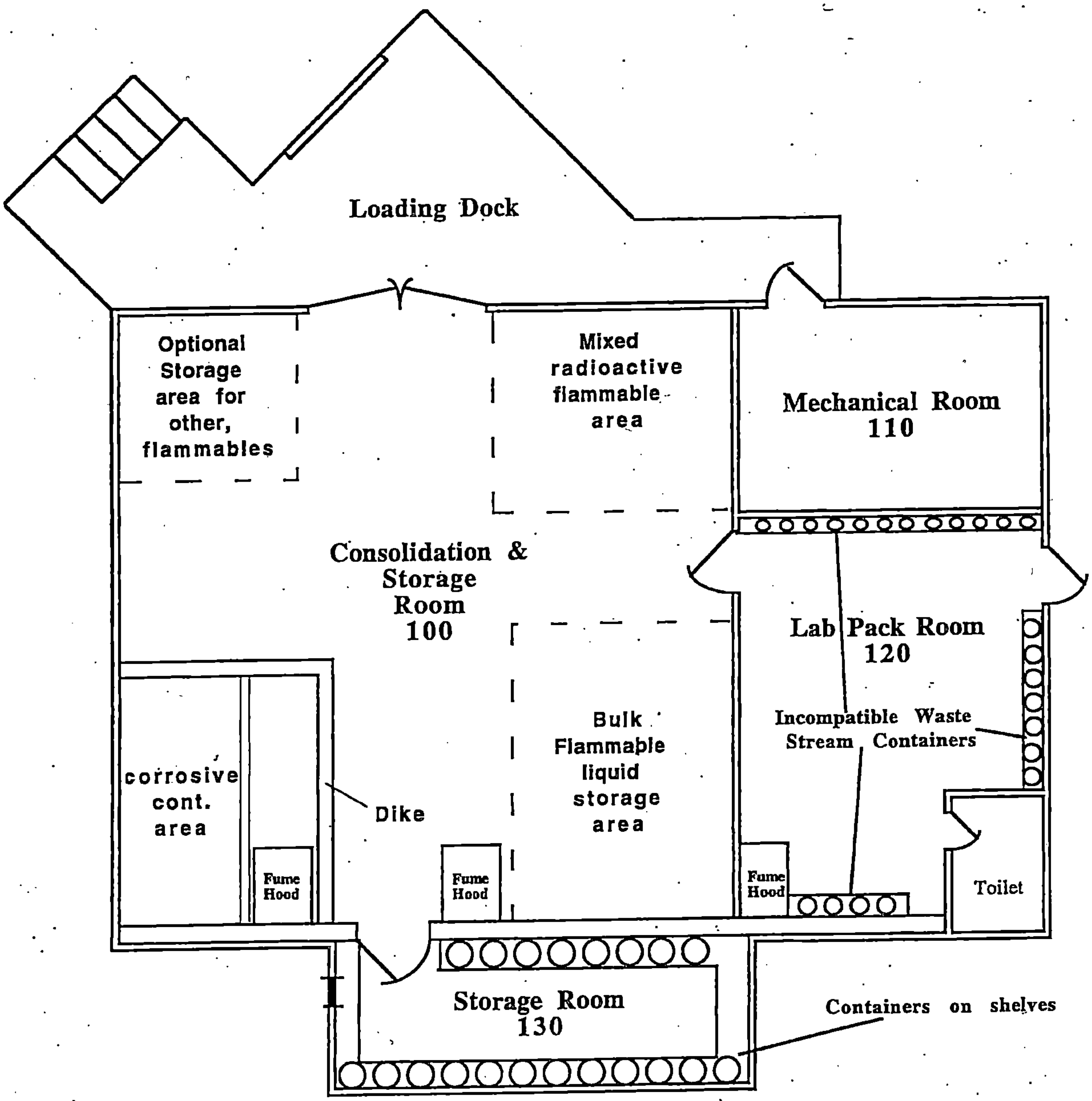
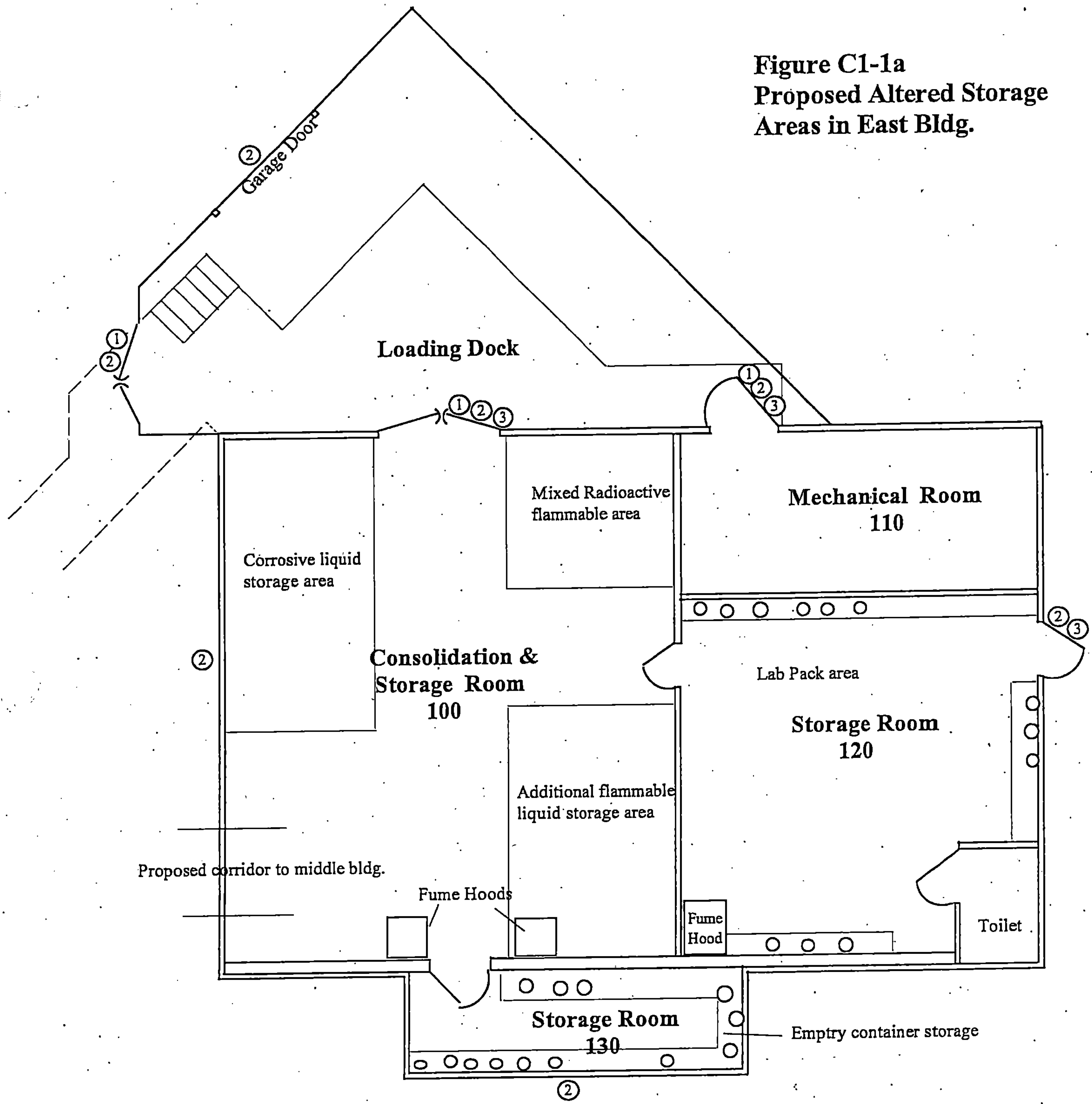


Figure C1-1a
Proposed Altered Storage Areas in East Bldg.



① 7" x 9"

DANGER
NO
SMOKING,
MATCHES
OR
OPEN
FLAMES

② 12" x 12"

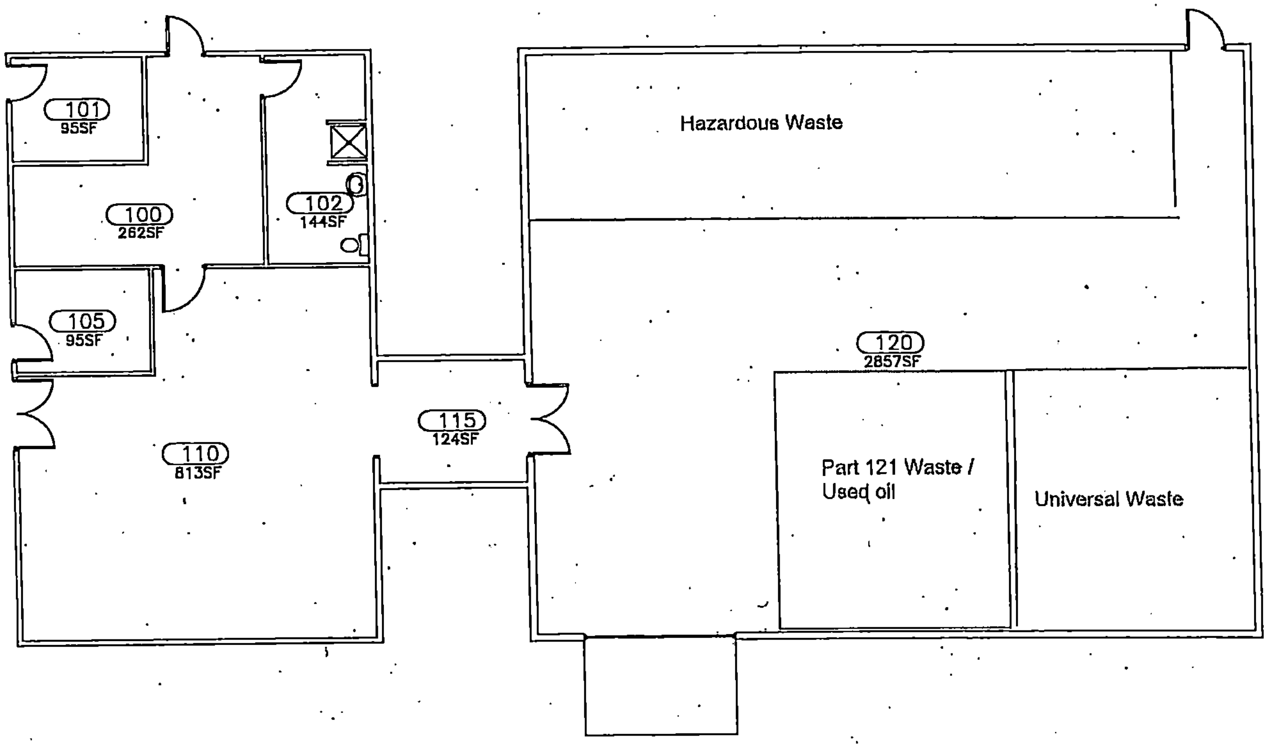
DANGER

UNAUTHORIZED
PERSONNEL
KEEP OUT

③ 4" x 8"

WARNING
TOXIC
ATMOSPHERE
WITHIN
When Alarm
Sounding Enter
Only With
Protective
Clothing and
Breathing
Equipment

Last Update Date: 2/6/2013 Filename: O_0475B_01_BASE.dwg



FIRST FLOOR PLAN

Figure C-2 West Storage Building - Waste Storage Areas

MICHIGAN STATE UNIVERSITY
PHYSICAL PLANT DIVISION
ENGINEERING AND ARCHITECTURAL SERVICES

CHEMICAL WASTE FACILITY NO. 2

FIRST FLOOR PLAN

N

ORIG. DRAWN BY CMW
APPROVED BY SDF
DATE 05/16/02
SCALE 1" = 10'

LAST REVISED ON 1-16-13
LAST REVISED BY MMH
LAST EXPORTED

O_0475B_01_BASE.DWG

BUILDING NO.
475B

SHEET
1
OF 2

Table C1-1

This table identifies which containers are appropriate for storing hazardous materials.

H.W. = hazardous waste markings
N.R. = non-regulated (non RCRA)
PCB = polychlorinated biphenyl
Fiber = fiberboard open head drum
Poly = polyethylene open or tight head drum
Steel = steel open or tight head drum

Waste Stream	Container	Marking & Labels
Flammable liquid, poisonous	steel, poly	H.W., Flammable liquid Poison (subsidiary)
Formaldehyde, solution	steel, poly	N.R., Class 9
Paint related material	steel, poly	H.W., Flammable liquid
Paint (cans)	steel,poly,fiber	H.W., Flammable liquid
Pesticide rinsates	steel,poly	N.R.
Mixed acid	poly	H.W., Corrosive
Chromic acid	poly	H.W., Corrosive
Dilute nitric acid	poly	H.W., Corrosive
Flammable liquid, corrosive	poly	H.W., Flammable Corrosive (subsidiary)
Poisonous solids	steel, poly	H.W., Poison
Class 9 debris	steel,poly,fiber	H.W., Class 9
PCB oil	steel	N.R., PCB, Class 9
Non-RCRA hazardous debris	steel,poly,fiber	N.R.
Lab packs	steel,poly,fiber	H.W., Labels as required in 49 CFR 172.101

Drum Specifications are at minimum as follows:

1H1/Y1.8/100 1A1/Y1.8/100 1A2/Y1.8/100

Table C1-2
Description of Containers

All containers comply with DOT regulations as stated in 49 CFR

Container Type	Usable Volume	Liner Specifications	Status	Container/Max No. Containers
Glass, Plastic	≤1 gal	None	Original	500
HD Polyethylene	5 gal	None	New	225
Metal	5 gal	None	Original/New	29
HD Polyethylene	30 gal	None	New	21
Metal/HD polyethylene	55 gal	None	New	70
Fiberboard	55 gal	6 mil polyethylene	New	15
Metal	55 gal	15 mil polyethylene	New	15

The actual number of individual containers may exceed those listed above. The total volume of all containers may not exceed 7900 gallons (the amount equal to the total volume of all containers, assuming they were full).

ATTACHMENT 9

PREPAREDNESS AND PREVENTION

FORM EQP 5111 ATTACHMENT TEMPLATE A6
PREPAREDNESS AND PREVENTION

This document is an attachment to the Michigan Department of Environmental Quality's *Instructions for Completing Form EQP 5111, Operating License Application Form for Hazardous Waste Treatment, Storage, and Disposal Facilities.* See Form EQP 5111 for details on how to use this attachment.

The administrative rules promulgated pursuant to Part 111, Hazardous Waste Management, of Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451), R 299.9504, R 299.9508, and R 299.9606 and Title 40 of the Code of Federal Regulations (CFR) §§264.30 through 264.37 establish requirements for preparedness for and prevention of releases of hazardous wastes or constituents at hazardous waste management facilities. All references to 40 CFR citations specified herein are adopted by reference in R 299.11003.

This license application template addresses requirements for preparedness for and prevention of releases of hazardous wastes or constituents at the following hazardous waste management facility for the MSU WSF in Lansing, Michigan.

(Check as appropriate)

Applicant for Operating License for Existing Facility:

- ☐ No waiver requested
- ☐ Waiver requested for one or more units for required equipment
- ☐ Waiver requested for one or more units for required aisle space

Applicant for Operating License for New, Altered, Enlarged, or Expanded Facility:

- X No waiver requested
- ☐ Waiver requested for one or more units for required equipment
- ☐ Waiver requested for one or more units for required aisle space

This template is organized as follows:

INTRODUCTION

The preparedness and prevention standards are intended to minimize and prevent emergency situations at hazardous waste management facilities. This is in contrast to the contingency plan standards that are intended to ensure that facilities have instituted plans and procedures to use in response to an emergency situation (See Template A7).

To meet the preparedness and prevention standards, facilities must be operated and maintained in a manner that minimizes the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents. The regulations require maintenance of equipment, alarms, minimum aisle space, and provisions for contacting local authorities (R 299.9606 and 40 CFR §264.31).

A6.A REQUIRED EQUIPMENT

[R 299.9606 and 40 CFR §264.32]

A6.A.1 Internal Communication System

[R 299.9606 and 40 CFR §264.32(a)]

An alarm system is installed in the WSF East and West Buildings to detect the hazards associated with fire, hazardous vapors, unauthorized intrusion, and explosion. The detection of these hazards by independently operating systems results in the initiation of the alarm system which notifies personnel of the hazards and allows time for the evacuation of the facility, if necessary, and the initiation of the Contingency Plan.

The security system is a movement activated intrusion alarm system continuously monitored at the security desk of the company contracted. The system is comprised of three basic parts:

1) Magnetic switches on all doors to storage area detect entrance or departure at the building
2) A control/processor unit connected to the Central Station via a dedicated phone line
3) An adjustable monitor capable of distinguishing alarm conditions.

All external doors to the East and West Building storage areas and the door to the ESB solvent storage area are wired to the alarm system. If an external door is left ajar, the system will not allow the user to code out until the door is closed. The system equipment at the site is wholly owned and operated by MSU.

When authorized personnel enter or leave the building the intrusion system is switched "off" or "on" as appropriate, and the security desk is called by automated system to inform them of which personnel are at the facility. Personal access codes are assigned to EHS personnel only. The MSU Physical Plant personnel have neither keys nor access to the building and are not assigned access codes.

The alarm system codes which alert monitoring personnel to the exact nature of the situation at the Waste Storage Facility are as follows:
- Fire: Horn in affected room, beeps on control unit, lights on fire control panel
- Trouble (power loss): beeps on control unit (A 24-hour battery backup is provided for the detection system)
- Organic Vapor Detection System: horn, beeps on control unit, lights on vapor monitor panel
- Door Intrusion: beeps on control unit
- Motion Detection: warning horn
- Low Temperature (<55 deg. F): beeps on control unit
- Phone Line Failure: beeps on control panel

The alarm system requires no calibration. Tests of the system are conducted daily whenever the monitoring company personnel receive signals from EHS personnel entering or leaving the premises. In addition, the system automatically signals if there is a malfunction in the dedicated phone line and resets automatically after an alarm condition.

Fire Suppression and Alarm System:
The Ansul Inergen fire suppression equipment in the East Storage Building is a total flooding system. The clean agent can achieve and maintain the required concentration for ensuring effective extinguishment of any combustibles. The West Storage Building has an Ansul Halon 1301 system which operates on the same principle of total flooding. An extensive explanation of these systems can be found in section A4.3 of this application.

Organic Vapor Detection System and Testing Procedure:
The Enmet ISA-44-5 multi-channel gas detector system in the East Storage Building is comprised of five similar circuits with associated circuits. One unit is located on the south wall of the Lab-pack Room, three units in the Consolidation Room and one in the Storage Room as shown on **Figure B6-1**. A detailed description of the system can be found in section A4.4 of this application.

A6.A.2 Emergency Response Communication System
[R 299.9606 and 40 CFR §264.32(b)]

Should an emergency situation arise, the ESB is equipped with an explosion-proof telephone on the west wall of the Lab-Pack Room (120) and a regular telephone on the west wall of the Mechanical Room (110). The WSB is equipped with a telephone just outside the storage area in Room 110 and also in the office area in Room 100. These telephones provide the capability of summoning assistance from the appropriate local emergency response units. A listing of the telephone numbers of each of these units is posted beside each telephone as described in the Contingency Plan.

A6.A.3 Fire, Spill, and Decontamination Equipment
[R 299.9606 and 40 CFR §264.32(c)]

A list of the emergency equipment present at the WSF is provided in **Attachment A7-3.** A discussion of this equipment and its use is also included in the sections of this application entitled "Contingency Plan" and "Security."

Fire control is provided in the form of the automatic Ansul Inergen and the Ansul Halon fire suppression equipment described previously, and the placement of portable fire extinguishers throughout the facility. The portable fire extinguishers are positioned at the locations shown in **Figure B6-1**. These fire extinguishers comply with National Fire Code Standards for portable fire extinguishers.

Spill control is provided for in several ways at the WSF. Each container storage area has a containment system consisting of pads of 4-inch concrete, reinforced with 6-inch by 6-inch 10/10 wire mesh. The concrete floor is free of gaps, holes, or cracks to prevent the infiltration of released substances. Each storage room in the ESB is also equipped with a 6-inch containment lip which allows for the containment of released substances, and prevents the spread of releases from one room to another. The total storage area of the WSB consists of a 3-inch lip to prevent spills from migrating outside the building. Details of the construction of the facility have been provided in Section B6 Engineering Plans.

In addition to the physical containment of released substances by the structure of the WSF, there is equipment available at the site to manage and remediate releases. This includes vermiculite, universal absorbent pads and pigs, a corrosive spill kit, absorbent spill pillows, and oversize and regulation size containers for disposal of the absorbed substances.

The super-fine, absorbent spill pads, and corrosive spill kit are located in the Consolidation Room of the ESB (100). The materials in the kit provide for the neutralization of the released substances, facilitating their absorption. Details regarding the use of the equipment are provided in Section A7 Contingency Plan.

A6.A.4 Adequate Water Volume
[R 299.9606 and 40 CFR §264.32(d)]

The Inergen and Ansul fire suppression system has been described previously. Details of the construction/installation of this system are provided in the section of this application entitled "Engineering Plans." The WSF is also supplied by the Lansing Board of Water and Light water supply system. A hydrant is located at the corner of Jolly Road and Collins Road and another at Oakbrook and Jolly Road. The hydrant at the Jolly-Collins intersection has been flow tested at a delivery pressure of 55 to 60 pounds.

A6.B TESTING AND MAINTENANCE OF EQUIPMENT
[R 299.9606 and 40 CFR §264.33]

The procedures for testing and maintenance of the equipment have generally been provided with the description of the equipment. The testing of the alarm systems have all been described in sections A4.3 and A4.4. A complete list of the emergency equipment is provided as **Attachment A7.3** of this section. The portable fire extinguishers are inspected on a monthly basis, as well as all the safety equipment at the facility as described in section A5 "Inspection Schedules."

A6.C ACCESS TO COMMUNICATIONS OR ALARM SYSTEM
[R 299.9606 and 40 CFR §264.34]

A6.C(1) Multiple Employees Present
[R 299.9606 and 40 CFR §264.34(a)]

Should an emergency situation arise, the ESB is equipped with an explosion-proof telephone on the west wall of the Lab-Pack Room (120) and a regular telephone on the west wall of the Mechanical Room (110). The WSB is equipped with a telephones just outside the storage area, in rooms 110 and 100. These telephones provide the capability of summoning assistance from the appropriate local emergency response units. A listing of the telephone numbers of each of these units is posted beside each telephone as described in the Contingency Plan.

Employees will also be alerted to hazards from the audible alarm system at the facility.

A6.C(2) Single Employee Present
[R 299.9606 and 40 CFR §264.34(b)]

The MSU WSF is only operated with a single person during the transfer and storage of waste materials. Therefore, access to the communications and alarm system when a single employee is present is the same as the instance in which two or more employees are working at the facility.

A6.D REQUIRED AISLE SPACE
[R 299.9606 and 40 CFR §264.35]

The facility has been constructed to provide for adequate storage capacity, adequate containment capability and sufficient aisle space. In order to allow for the unobstructed movement of all personnel within the facility, the aisle spaces in all the storage areas are maintained at a minimum of 2 feet. This 2-foot spacing has been determined to meet the requirements of 40 CFR 264.35 by allowing for the passage of emergency equipment, if necessary, and for effective spill management in the event of a release.

A6.E STATE AND LOCAL AUTHORITIES
[R 299.9606 and 40 CFR §264.37]

A6.E.1 Arrangements with State and Local Authorities
[R 299.9606 and 40 CFR §264.37(a)(1)]

Arrangements have been made with local authorities for a coordinated response to emergency situations. These arrangements for emergency response have been documented in the section of this application entitled "Contingency Plan." The Contingency Plan identifies Emergency Coordinators who function to provide a uniform, consistent pattern of response to emergency situations. The Emergency Coordinators are personnel employed by MSU, and can function in close association with the MSUPD and the East Lansing Fire Department. Whenever the alarm system indicates the presence of a hazard at the WSF, the monitoring company informs the MSUPD. The Police Department then notifies the MSU Emergency Coordinator or on call responder. The MSUPD is always informed of any emergency situation which exists at the WSF.

Following notification of an alarm, the Emergency Coordinator, and/or MSUPD personnel, has the authority to notify the appropriate emergency response units. These units include the following:

- Michigan Department of Natural Resources and Environment - Waste Management Division
- East Lansing Fire Department
- East Lansing Police Department
- Sparrow Hospital

Each of these units has been provided with a copy of the Contingency Plan which identifies the general nature of the wastes present at the facility, the floor plan of the facility and the location of all safety equipment, and evacuation routes. The Contingency Plan contains the information required to contact the emergency response teams, and the telephone numbers of each unit is posted beside each emergency telephone in the WSF. It is expected that, in the event of an emergency, the ranking officer of the MSUPD, or the ranking officer of the East Lansing Fire Department will be the incident commander. The EHS Emergency Coordinator will assist in any way possible as defined in the Contingency Plan.

A6.E.2 Refusal of State or Local Authorities to Enter into Emergency Response Agreements

[R 299.9606 and 40 CFR §264.37(b)]

The emergency coordinator will document if state or local authorities decline to enter into emergency response arrangements.

A6.F GENERAL HAZARD PRVENTION

[40 CFR 270.14 (b)(8)]

General hazard prevention includes several factors listed in 40 CFR 270.14. These include a description of procedures, structures, or equipment used at the facility to:

- Prevent hazards in unloading.
- Prevent run-on and run-off from the hazardous waste area.
- Prevent contamination of water supplies.
- Mitigate effects of equipment failure and power outages
- Prevent undue exposure of personnel to hazardous waste.
- Releases to atmosphere
- Ignitable, reactive, or incompatible wastes

Each of these descriptions will be provided separately in the following discussion:

A6.F.1 Loading and Unloading

Loading/Unloading at the WSF is accomplished by the following:

- All loading and unloading operations are conducted indoors.

- EHS Waste Hauling Vehicles enter the private driveway and, using the area paved for this purpose, position themselves so the tailgate faces the loading dock. The driver then backs to the dock.
- Once at the dock, the waste containers are removed. Containers 5 gallons or less are hand carried into the building. This decreases the chance of large loads slipping or falling.
- Due to the difference of elevations between the bed of the some of the Waste Hauling Vehicles and the loading dock, the unloading of containers from these vehicles will be limited to a maximum size of the 5-gallon containers. 55 gallon drums (liquid) will only be transported to the site using a vehicle with a bed or lift gate capable of obtaining the same elevation as the loading dock.
- Each container is carried into the appropriate room depending on the nature of the waste material. 55 gallon drums are moved using a drum dolly.
- Following the removal of all containers the loading dock is inspected for any evidence of leakage from the containers. If any such leakage is detected, it will be immediately remedied with the spill absorbent equipment maintained at the facility.
- The loading of containers into the vehicle of off-site contractors will be supervised by the Hazardous Waste Coordinator or her/his designee. It is anticipated that this will involve only the movement of 55-gallon capacity containers or lab packed materials. These containers will be loaded using either a hand truck, drum truck, or drum dolly.
- Following the movement of all containers into the off-site vehicle, the loading dock will be inspected for any spills. If any spills are observed, they will be remedied using the absorbent materials maintained at the facility.
- Containers will only be transported between the East and West Buildings indoors (through connecting corridors) or from a truck driving from one loading door to the next.

A6.F.2 Prevention of Run-On and Run-Off

Run-off from the facility is eliminated since both the East and West storage buildings and loading/unloading docks are diked and enclosed to prevent the release of chemicals. No floor drains are present to allow for the release of spilled substances within the facility and 150 percent containment capacity is present in every storage room. In addition, the entire loading/unloading area is diked to ensure that any accidental spills will be contained and not allowed to impact the adjoining soils. Any spill which could occur in this vicinity will be removed by means of an explosion proof electric pump, plastic hand pump, or a sponge or remedied by the absorbent equipment maintained at the facility.

Run-on to the facility is prevented since the buildings and canopies are enclosed - except when unloading, as the garage door would be open. Because this area is not contained in a flood plain, and because of the elevation difference from the nearby stream, the facility is not threatened by the possibility of run-on from surface water.

Any incidental release of liquids will be removed by means of an explosion proof electric pump, plastic hand pump, or a sponge and placed in a drum. The liquids will be managed as liquid industrial waste. The diked area of the east building loading dock is shown in the drawings included in Section B6 Engineering Plans.

A6.F.3 Prevention of Contamination of Water Supplies

Drinking water supplies in this area are represented by the groundwater contained in the Saginaw Formation. Groundwater contamination is prevented by the elimination of all potential discharges from the facility onto the surrounding soils. Details of the construction of the facility which relate to this protection are provided in the Section B6 Engineering Plans.

Prevention of groundwater contamination is aided by the presence of significant amounts of clays in the soils underlying the site.

A6.F.4 Equipment Failure and Power Outages

The loss of electrical power and/or equipment failure at the site could pose significant problems if precautions were not taken and backup equipment in place. An alarm system has been installed to indicate when the temperature at the WSF drops below 55°F. When a temperature drop occurs, the monitoring company notifies EHS personnel who then take remedial action.

The East Building is equipped with a dual, independent gas-fired, forced air heating system. The system has the capacity to provide heat for all areas following the failure of one unit. In addition, service to the furnace unit has been obtained on a 24-hour call basis.

In the event of an extended power outage, the monitoring company will maintain surveillance of the facility via the dedicated phone line. Following an outage, EHS will be notified by the monitoring company either directly through the office during working hours, or through the MSU Police Department after working hours. The MSU PD notifies the EHS through the HAZMAT pager worn by designated staff after hours. Remedial action is promptly taken in the following manner:

A 3500W generator is stored on site to provide power to operate the furnace/ventilation systems. In the East Storage Building, a double throw switch wired to the main circuit breaker panel facilitates the operation of the furnace/ventilation circuits without back-feeding power through the entire system. The generator is operated outside the facility on the loading dock. This prevents sparks and exhaust from affecting the building, including the alarm system. For the West Building, a throw switch will be wired to the main circuit breaker panel, to facilitate the use of a generator, after permit approval. In the event of an extended power loss, the MSU Infrastructure, Planning and Facilities (IPF) Department would provide a 5000W generator to power the building The fire suppression systems have battery backup which operates the instruments if a power failure occurs.

A6.F.5 Personnel Exposure

Numerous measures have been incorporated into the design to protect personnel from undue exposure to hazardous wastes. These measures include aspects of the building construction, the training of personnel, the procedures for handling wastes, and the availability of safety equipment.

The construction of the WSF includes numerous features which are designed to facilitate the safe unloading and storage of waste substances. The building also contains alarm systems, fire suppression systems, containment features, and safety equipment, all of which are explained in Section B6 Engineering Plans and A4 Security Procedures and Equipment.

The training of EHS personnel is a vital aspect of maintaining a safe working environment. The training program for each individual has been documented in the section of this application entitled A10 Personnel Training Program. All personnel are instructed in the techniques of handling hazardous wastes to protect themselves and others from undue exposure. In addition, the training periods inform employees of the proper personal protective equipment which should be worn when handling hazardous wastes and the availability of safety equipment at the WSF. The training sessions also identify the proper response to emergency situations. This information is presented in Section A7 Contingency Plan.

Proper procedures for the handling of the hazardous wastes must be utilized at all times. Safety precautions have been incorporated into these procedures and adherence to these protocols is emphasized in the training sessions. These precautions include requirements for protective clothing which must be worn during the handling of waste materials.

Safety equipment has been made available at the WSF and all personnel are instructed during the training sessions concerning its location and usage. Portions of this application relating to the availability and use of safety equipment are contained in several sections of this application including A3 Waste Analysis Plans, A10 Personnel Training, A4 Security Procedures and Equipment, B6 Engineering Plans, and A6 Preparedness and Prevention.

A6.F.6 Unplanned Releases to the Atmosphere

Atmospheric releases are controlled by following specific procedures for waste handling and container management. For example, containers are only opened for consolidation purposes, to relieve pressure, or as required for acceptance by the licensed facility accepting the materials. More details on container management are provided in Section C1 Containers. Additionally, consolidation procedures as described in A6.F.7 below prevent the mixture of incompatible materials and any resultant unplanned reactions.

A6.F.7 Identification of Ignitable, Reactive, and Incompatible Wastes

An involved process has been established to ensure the identification of waste substances received at the WSF. The details of this program are contained in Section A3 Waste Analysis Plan. In summary, this process facilitates tracking the identity and approximate volumes of all compounds that are transported to the site by EHS personnel.

Upon arrival at the WSF, the containers are unloaded according to the protocol described in "Loading and Unloading" description in this section. Each container is then transported to a designated area of the facility (Figure C1-1). Solvents are moved to the Consolidation Room (100), containers with reactive wastes are moved to the Lab Pack Room (120), corrosive wastes are stored inside the diked area in the Consolidation Room.

The Consolidation Room generally receives all ignitable solvents and corrosive or poisonous liquids in containers greater than 1 gallon capacity. All materials received in containers of less than or equal to 1 gallon capacity are moved to the Lab Pack Room for further segregation and placement into secondary containment. Upon placement into secondary containment, materials appropriate for consolidation are stored in the Consolidation Room. The criteria for determining flammability, corrosivity, and toxicity are included in Appendix A10-1 "Waste Disposal Guide." After consolidation, some bulk hazardous waste or Part 121 Industrial Liquid Waste may be transported to the West Storage Building for storage until a vendor is scheduled for a pick-up.

All reactive and ignitable wastes are separated and protected from sources of ignition. The WSF is equipped with many fire safety devices as documented in Section A4 Security Procedures and Equipment. This includes an Inergen fire suppression system, organic vapor monitoring and alarm systems, explosion proof electrical outlets, and explosion proof phones and lights. "Danger -- No Smoking" signs are located on the two main entrance doors of the WSF. Smoking is absolutely forbidden in all areas of the facility. Other "No Smoking" signs are located on external doors as indicated in Figure C1-1 of this section.

Grounding and bonding procedures are also used during the transfer of ignitable materials to prevent static charge buildup. A general exhaust ventilation system serves to minimize vapor and dust buildup while two local exhaust systems are available for vapor removal during consolidation of materials.

Prevention of reactions is achieved by segregation and pre-consolidation testing. Reactive or poisonous chemicals that are not consolidated (Lab Pack chemicals) are segregated into compatible groups before being packed. The Lab Pack Room is separated from the main holding area (Consolidation Room) by means of a fire door, a transfer grill, and a 4 inch floor dike.

The categories of chemicals designated for storage in the Lab Pack Room is extensive and incorporates thousands of compounds. These include reactive, poisonous, irritating, flammable, corrosive, and oxidizing substances as well as any other substances that are not deemed suitable for consolidation. Lab Pack chemicals are sorted and placed, without being opened, onto shelving units for subsequent removal.

Specific waste stream categories are described in Section A4 Waste Analysis Plan.

ATTACHMENT 10

AMBIENT AIR MONITORING PROGRAM

FORM EQP 5111 ATTACHMENT TEMPLATE B5
ENVIRONMENTAL MONITORING PROGRAMS

This document is an attachment to the Michigan Department of Environmental Quality's (DEQ) *Form EQP 5111, Operating License Application Form for Hazardous Waste Treatment, Storage, and Disposal Facilities.* See the instructions for Form EQP 5111 for details on how to use this attachment. All references to Title 40 of the Code of Federal Regulations (40 CFR) citations specified herein are adopted by reference in R 299.11003.

The administrative rules promulgated pursuant to Part 111, Hazardous Waste Management, of Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451), R 299.9611 establishes requirements for the environmental monitoring programs for hazardous waste management facilities. Owners and operators of hazardous waste treatment, storage, or disposal facilities must develop an environmental monitoring program capable of detecting a release of hazardous waste or hazardous waste constituents from the facility to groundwater, air, or soil.

This license application template addresses requirements for an environmental monitoring program for hazardous waste management units and the hazardous waste management facility for the Michigan State University Waste Storage Facility. The template includes either a monitoring program description or a demonstration for a waiver from the monitoring requirements in accordance with R 299.9611(3)(a) and (b) and R 299.9611(4) as indicated below:

Groundwater Monitoring Program *(Check as appropriate)*

☐ R 299.9612 compliance monitoring program and sampling and analysis plan for one or more units

Ξ Waiver for one or more units

If appropriate, both boxes may be checked if different monitoring programs and waivers apply to the units at the facility.

Ambient Air Monitoring Program (Check as appropriate)

Ξ Monitoring program and sampling and analysis plan

Annual Soil Monitoring Program (Check as appropriate)

X Waiver

This template is organized as follows:

B5.A GROUNDWATER MONITORING PROGRAM

[R 299.9611(2)(b) and (3), R 299.9612, and R 299.9629 and 40 CFR, Part 264, Subpart F, except 40 CFR §§264.94(a)(2) and (3), (b), and (c), 264.100, and 264.101]

This section describes the facility's unit-specific groundwater monitoring program as outlined in Table B5.A.1. The basis for determining the groundwater monitoring program for each unit described below is provided in the Template B3, Hydrogeological Report, attached separately to this application, which was prepared in accordance with R 299.9506.

B5.A.1 Unit-Specific Groundwater Monitoring Program

Table B5.A.1 Groundwater Monitoring Program

Unit	Name of Unit Subject to Monitoring[1]	Conditional Non-LDF Waiver[2]	No Migration Waiver[3]	Detection Monitoring[4]	Compliance Monitoring[5]	Corrective Action Monitoring[6]
MSU WSF	WSF – Jolly Rd.	YES				

1. *Please refer to R 299.9612. All treatment, storage, and disposal units are covered unless the groundwater monitoring requirements are waived.*

2. *Please refer to R 299.9611(3)(a). The Director shall waive the groundwater monitoring requirements of R 299.9612 if the facility is not a land disposal facility and the applicant complies with one of the following provisions: (1) All treatment, storage, and waste handling activities take place inside or under a structure that provides protection from precipitation and runoff and the facility is in compliance with the provisions of R 299.9604; (2) the applicant demonstrates, to the director's satisfaction, that monitoring is not required; or (3) the applicant demonstrates, to the director's satisfaction, that a lesser degree of monitoring, or that alternate monitoring conducted in conjunction with a response activity, can be used to demonstrate compliance with the provisions of Part 111.*

3. *Please refer to R 299.9611(3)(b). The Director shall waive the groundwater monitoring requirements of R 299.9612 if the Director finds that there is no potential for migration of liquid from the facility to the uppermost aquifer during the active life of the facility and the postclosure care period specified pursuant to the provisions of 40 CFR §264.117. The demonstration shall be certified by a qualified geologist or geotechnical engineer. The applicant shall base any predictions on assumptions that maximize the rate of liquid migration.*

4. *If an applicant is not required to implement a compliance monitoring program or a corrective action program, in all other cases, the applicant must institute a detection monitoring program under R 299.9612 and 40 CFR §264.98. The applicant must complete Sections B5.A.2 and 3.*

5. *Whenever hazardous constituents, as defined under 40 CFR §264.93, are detected at a compliance point, the applicant must institute a compliance monitoring program under 40 CFR §264.99. Detected is defined as statistically significant evidence of contamination as described in 40 CFR §264.98(f). The applicant must complete Sections B5.A.2 and 4.*

6. *If an unit is undergoing corrective action in accordance with R 299.9629 and 40 CFR Part 264, Subpart F, except for 40 CFR §§264.100 and 264.101, the application should refer to Template B2, Corrective Action Information, that discusses the groundwater monitoring associated with corrective action.*

B5.A.2 Groundwater Monitoring Program Waiver
[R 299.9611(3)]

B5.A.2(a) Other Units
[R 299.9611(3)(a)]

The Michigan State University Waste Storage Facility is not a land disposal unit and complies with one of the following provisions:

All treatment, storage, and waste handling activities at MSU WSF facility take place inside or under a structure that provides protection from precipitation and runoff, and the facility is in compliance with the provisions of R 299.9604.

The Michigan State University, Waste Storage Facility (WSF) has been designed and constructed to control run-on, run-off, prevent the release of waste substances from the facility, and provide safe storage for the waste substances received. The storage areas are completely enclosed to prevent any impact from precipitation. The raised grade and raised edges of the floors in all the container storage areas provide additional protection against run-on having an impact on any area of the facility.

Protection of run-off from the site is provided by the complete enclosure of the facility and the design of the storage areas.

The escape of waste substances from the facility is prevented by several features in the construction of the facility. Each container storage area has a 4-inch thick concrete floor reinforced with 6-inch x 6-inch 10/10 wire mesh. The concrete floor is considered impervious and free of any joints and cracks which might allow for the escape of spilled waste substances. Certification of the integrity of the concrete floor is contained in the letter included as **Appendix B6-2.**

X Groundwater monitoring is not required at Michigan State University Waste Storage facility.

The MSU WSF has been designed and constructed to control run-on and run-off, prevent the release of waste substances from the facility, and provide safe storage for the waste substances received. The facility, including the loading dock, is completely enclosed

B5.B AMBIENT AIR MONITORING PROGRAM
[R 299.9611(2)(c) and (4)]

B5.B.1 Sampling and Analysis Plan
[R 299.9611(2)(a)]

A sampling and analysis plan for ambient air monitoring for MSU WSF is included in the QA/QC Plan. The sampling and analysis plan was prepared in accordance with the requirements specified in R 299.9611(2)(a). All sampling and analysis performed pursuant to this application will be consistent with the QA/QC Plan. All samples for the purpose of environmental monitoring will be collected, transported, stored, and disposed by trained and qualified individuals in accordance with the QA/QC Plan.

The MSU Waste Storage Facility will conduct ambient air monitoring to detect violations of the provisions of Part 55 of Act 451.

MSU will hire a contractor to perform air sampling in accordance with procedures outlined in EPA Method TO-15: Determination of volatile organic compound in air collected canisters and analyzed by GC/MS. The air samples will be collected in pre-cleaned Summa canisters and analyzed for 59 volatile compounds. The samples will be collected up to two times per week during lab pack consolidation and container consolidation for a total of 10 samples. Testing will be conducted in accordance with the current permit which limits consolidation to only one hood at a time. The sampling will be conducted at the northeast end of the property and located eight feet from ground level to compensate for ground slope. Background samples when not consolidating will not be collected, as MSU will reference background samples taken during the December 2010 sampling.

Meteorological data, including wind speed and direction at the time of sampling, will be retrieved from online sources. Print outs will be collected and filed during each air monitoring event.

QUALITY CONTROL/ASSURANCE

The analytical laboratory at Fibertec, Inc 1914 Holloway drive, Holt, Michigan will supply the Summa canisters and perform the sample analysis pursuant to the requirements of EPA Method TO-15. Quality control steps include cleaning each canister, testing each canister and regulator prior to use, evacuation of each canister to desired vacuum pressure, laboratory blank sample and a laboratory control sample with each analysis. The compounds to be tested and detection limits are listed in Table B5-1.

Quality Assurance steps in the field include a check that each sample is under vacuum, (a gauge on each sample allows for initial, periodic and end sample checks of vacuum pressure) at least once during each sample event. The regulator that comes with each canister is pre-calibrated to allow samples to be collected over the desired time frame, in this case four hours. A laboratory blank is also performed as part of the sample analysis.

B5.C ANNUAL SOIL MONITORING PROGRAM
[R 299.9611(2)(d) and (4)]

MSU is requesting a waiver under R299.9611(4). The canopy at both the East and West Waste Storage location provides protective cover and prevents run-on and run-off during rain or snow events.

Table B5-1 - 10/23/12

Air Monitoring Compounds and Detection Limits

Parameter(s)	Reporting limit
1.Acetone	5.30 ppbv
2.Benzene	0.67 ppbv
3.Benzyl Chloride	0.38 ppbv
4.Bromodichloromethane	0.37 ppbv
5.Bromoform	0.38 ppbv
6.Bromomethane	1.10 ppbv
7. 1,3-Butadiene	1.00 ppbv
8. 2-Butanone	1.10 ppbv
9.Carbon Disulfide	0.35 ppbv
10.Carbon Tetrachloride	0.38 ppbv
11.Chlorobenzene	0.50 ppbv
12.Chloroethane	1.00 ppbv
13.Chloroform	0.33 ppbv
14.Chloromethane	1.10 ppbv
15.Cyclohexane	0.34 ppbv
16.Dibromochloromethane	0.50 ppbv
17. 1,2-Dichlorobenzene	0.50 ppbv
18. 1,3-Dichlorobenzene	0.50 ppbv
19. 1,4-Dichlorobenzene	0.50 ppbv
20.Dichlorodifluoromethane	0.35 ppbv
21. 1,1-Dichloroethane	0.37 ppbv
22. 1,2-Dichloroethane	0.37 ppbv
23. 1,1-Dichloroethene	0.36 ppbv
24. cis-1,2-Dichloroethene	0.38 ppbv
25. trans-1,2-Dichloroethene	0.33 ppbv
26. 1,2-Dichloropropane	1.10 ppbv
27. cis-1,3-Dichloropropene	0.36 ppbv
28. trans-1,3-Dichloropropene	0.50 ppbv
29. 1,4-Dioxane	1.00 ppbv
30.Ethyl Acetate	0.99 ppbv
31.Ethylbenzene	0.50 ppbv
32.Ethylene Dibromide	0.36 ppbv
33. 4-Ethyltoluene	0.50 ppbv
34. n-Heptane	0.35 ppbv
35.Hexachlorobutadiene	0.38 ppbv
36. n-Hexane	0.33 ppbv
37. 2-Hexanone	1.10 ppbv
38. Isopropyl Alcohol	12.50 ppbv
39.Methylene Chloride	1.10 ppbv
40. 4-Methyl-2-pentanone	0.50 ppbv
41.MTBE	0.35 ppbv
42.Propylene	2.50 ppbv
43.Styrene	0.50 ppbv
44. 1,1,2,2-Tetrachloroethane	0.38 ppbv
45. Tetrachloroethene	0.37 ppbv
46. Tetrahydrofuran	1.10 ppbv

Table B5-1 - 10/23/12

Air Monitoring Compounds and Detection Limits

Parameter(s)	Reporting limit
47. Toluene	0.48 ppbv
48. 1,2,4-Trichlorobenzene	0.50 ppbv
49. 1,1,1-Trichloroethane	0.50 ppbv
50. 1,1,2-Trichloroethane	0.38 ppbv
51. Trichloroethene	0.37 ppbv
52. Trichlorofluoromethane	0.34 ppbv
53. 1,1,2-Trichloro-1,2,2-trifluoroethane	0.50 ppbv
54. 1,2,4-Trimethylbenzene	0.50 ppbv
55. 1,3,5-Trimethylbenzene	0.50 ppbv
56.Vinyl Acetate	1.10 ppbv
57.Vinyl Chloride	0.50 ppbv
58.m&p-Xylene	1.00 ppbv
59. o-Xylene	0.50 ppbv

ATTACHMENT 11

CORRECTIVE ACTION PROGRAM

FORM EQP 5111 ATTACHMENT TEMPLATE B2
CORRECTIVE ACTION INFORMATION

This document is an attachment to the Michigan Department of Environmental Quality's (DEQ) *Instructions for Completing Form EQP 5111, Operating License Application Form for Hazardous Waste Treatment, Storage, and Disposal Facilities.* See Form EQP 5111 for details on how to use this attachment.

The administrative rules promulgated pursuant to Part 111, Hazardous Waste Management, of Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451) R 299.9504(1)(c), R 299.9508(1)(b), R 299.9525, R 299.9629, R 299.9635, and R 299.9636; §§324.11115a and 324.11115b of Act 451; and Title 40 of the Code of Federal Regulations (CFR) §270.14(d) and Part 264, Subpart F, establish requirements for submitting corrective action information and implementing a corrective action program for hazardous waste management facilities. All references to 40 CFR citations specified herein are adopted by reference in R 299.11003.

This license application template addresses requirements for corrective action information for the waste management units (WMU) at the MSU WSF facility in Lansing, Michigan. This template includes facility background information, current conditions, and release assessment requirements for operating license applications. This template supplies information to support the corrective action program specified in R 299.9629. In this template, applicants must include appropriate justification for the proposed elimination of any WMU from the corrective action program under Part 111 of Act 451.

Ensure that all samples collected for waste characterization and environmental monitoring during corrective action are collected, transported, analyzed, stored, and disposed by trained and qualified individuals in accordance with a QA/QC Plan. The QA/QC Plan should at a minimum include the written procedures outlined in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW-846, Third Edition, Chapter 1 (November 1986), and its Updates.

(Check as appropriate)

Applicant for Operating License for Existing Facility:

☐ R 299.9629 Corrective Action

☐ Elimination from corrective action requirements proposed for one or more units

Applicant for Operating License for New, Altered, Enlarged, or Expanded Operating License:

X R 299.9629 Corrective Action

☐ Elimination from corrective action requirements proposed for one or more units

This template is organized as follows:

B2.A FACILITY BACKGROUND

B2.A.1 History and Description of Ownership and Operation

The MSU WSF originally began operating in 1982. Its first Section 64 permit was issued in October of 1989. The MSU WSF has been operating under its current MDNRE (formerly MDEQ) operating license issued Sept. 29, 2010, and is inspected quarterly by the MDNRE. Results of these inspections have shown no major violations during operation of the WSF. The only previous investigation that occurred was the result of an accidental release of mercury on August 23, 2001. An investigation and remediation work plan was submitted to the MDNRE (formerly MDEQ) on November 5, 2001 and was approved.

B2.A.2 Environmental Setting

B2.A.2(a) Climate

According to, "*The Climatic Atlas of Michigan*", compiled by V.L. Eichenlaub, et al. in 1990, Michigan's climate is considered moderate; primarily controlled by Michigan's mid-latitude (~42 degrees) and continental air masses that originate over the polar regions and the western areas (near the Pacific Ocean) of North America. Michigan's climate is also seasonally augmented by lake effects due to Michigan being surrounded by large lakes. Michigan's prevailing winds, controlled by the Jet Streams, originate in the west and blow across the state toward the east during the summer months and toward the southeast during the winter months. Between 1951 and 1980, the average annual daily mean temperature for the Lansing area was approximately 48 degrees Farenhieght. The warmest average daily mean temperature (71 degrees Farenhieght) occurs in July and the coldest average daily mean temperature (22 degrees Farenhieght) occurs in January. For this same period, the Lansing area received an average annual precipitation of 30 inches. February was typically the driest month (~1 inch of precipitation) and June was typically the wettest month (~3.5 inches of precipitation).

B2.A.2(b) Topography

See maps B3.A-1 through B3.A-3 for topographic map.

B2.A.2(c) Hydrogeology

Prior to 2004, ground-water monitoring was performed semi-annually at the WSF site, provided that sufficient ground-water was present. Review of historical reports prepared for the WSF site by Strata, and others, indicates that sufficient ground-water was rarely present to allow for the collection of ground-water samples from all of the monitoring wells that had been installed at the site. In turn, following approval by Mr. Joe Rogers of the Wastes and Hazardous Materials Division of MDEQ, now known as MDNRE, the monitoring well network was removed from the site during June of 2004.

Ground water was not consistently present in the former site monitoring wells, because, the wells were completed in soils that are predominantly comprised of clay-rich glacial till deposits with interspersed, discontinuous sand lenses. DLZ Michigan Inc. and Braun Intertec, the consulting firms that completed the original hydrogeological investigations of the WSF site, indicated that these discontinuous *"sand deposits are only sporadically saturated during the wettest periods of the year"*.

Given the characteristics of the underlying soil types, ground-water sampling with statistical analyses of the chemical data is not considered an appropriate monitoring technique for the WSF. In addition, the surface soil types that underlie the WSF site are not conducive for rapid infiltration of precipitation that falls over the site. The precipitation that falls over the site would tend to flow overland following the site topography that generally slopes eastward toward the Banta Drain. On the north side of the WSF building, this precipitation would tend to be captured by the two surface drains located on each side of the paved driveway, and eventually discharged to Banta Drain.

B2.A.2(d) Soil

During the spring of 2005, the soil type(s) and background metal concentrations in the immediate vicinity of the WSF were determined. Nine soil samples (assigned BM-series names) were collected from the areas on the east and west sides of the paved driveway that accesses the WSF from the north. Each of the nine background soil samples were comprised of brown sandy loam that were categorized as part of the "B" phase of the Marlette Series (MaB) soil that is associated with the Marletter-Capac-Owosso soil association. This soil type extends around the WSF and grades into Colwood-Brookston soils east of the WSF. Both of these soil types (MaB and Co) have high percentages of clay and considered to be poorly drained.

B2.A.2(e) Surface Water

The WSF is an indoor storage facility constructed with concrete footings and a concrete floor with steel walls and a concrete curb along the base of the walls. Precipitation that falls onto the site is directed northward and eastward by the surface grade of the site toward catch basins located north and east of the indoor storage facility.

No water bodies are located at the WSF site. Banta Drain makes up the southeastern boundary of the triangular-shaped site. The drain emerges from culverts near the northeast corner of the WSF and flows toward the southwest. These culverts extend beneath Jolly Road and the agricultural field north of Jolly Road and east of Collins Road.

According to the Ground-Water Mapping Project jointly complied by United States Geological Survey (USGS), Michigan Department of Natural Resources and Environment (MDNRE), and MSU Institute of Water Research, Banta Drain has an average base flow of 1 to 5 cubic feet per second. During semi-annual monitoring of the surface-water quality flow ranges from a trickle during the summer months to a steady flow of water that is generally less than 2 feet wide and 1 foot deep during the wet months of the year (i.e. spring). Visual observations during the monitoring events indicate that base sediments of the drain are sand and gravel, with silts accumulating along the edges of the drain.

During the last 6 years of monitoring trace metals such as arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, and zinc were generally not detected. The concentrations of the major water constituents have fluctuated over this period. Alkalinity concentrations range from 74 to 580 mg/l, calcium concentrations range 18 to 140 mg/l, magnesium concentrations range from 9.4 to 68 mg/l, chloride concentrations range from 56 to 450 mg/l, sodium concentrations range from 31 to 220 mg/l, iron concentrations range from 0.15 to 4.7 mg/l, nitrate concentrations range from 2.8 to 26 mg/l, and pH ranges from 6.5 to 8.1.

B2.A.2(f) Surrounding Land Uses

See Section B4.A.2(f) for surrounding land use description.

B2.A.2(g) Critical Habitats and Endangered Species

See Section B4.A.2 for descriptions of critical habitats and endangered species.

B2.A.3 Characterization of Potential or Actual Sources of Contamination [R 299.9504(c) and 40 CFR §270.14(d)]

This section describes actual or potential sources of contamination at the MSU WSF that are subject to the corrective action requirements of Part 111 of Act 451. These sources include waste management units that are discernible units at which contaminants have been placed at any time, or at which contaminants have been released, or at which there is a threat of release regardless of the intended use of such unit. These sources also include areas of concern that are those units which do not meet the definition of waste management unit, but which may have released contaminants to the environment on a nonroutine basis, or which may present an unacceptable risk to public health, safety, welfare, or the environment,

B2.A.3(a) MSU WSF

B2.A.3(a)(1) Unit Characteristics

The MSU WSF is an indoor storage facility constructed with concrete footings and a concrete floor with steel walls and a concrete curb along the base of the walls. The WSF was designed to enable the separation of different types of wastes into distinct storage areas of the facility and to provide the necessary containment in each storage area. See Section for a map with the WSF location marked. Complete engineering plans of the facility are presented in Section B6 (Engineering Plans).

B2.A.3(a)(2) Waste Characteristics and Management

Table A2.A.1 lists all hazardous wastes generated and managed at the facility.

B2.A.3(a)(3) History of Releases or Potential to Release

2001: The MSU WSF had an accidental release of mercury on August 23, 2001, during the dismantling of a mercury-containing flow meter, which impacted a small amount of surface soil. Corrective measures to eliminate track-out of the mercury were conducted on August 24-28, 2001. This initial corrective action entailed some limited hand shoveling of impacted soil with the placement of this material in an appropriate sealed container(s).

A follow-up investigation and November 5, 2001 *Mercury Delineation Report and Remediation Work Plan* was submitted to the MDNRE (formerly MDEQ) and was approved. On November 13, 2001, the impacted area was excavated. A total of 26 cubic yards of soil were removed and properly disposed in a Type II Sanitary Landfill. A total of six soil samples were collected from the base and sidewalls of the excavation in accordance with, then, MDEQ's *Verification of Soil Remediation* (VSR) guidance document. The samples were analyzed for total mercury. Results of the analyses showed that mercury was not detected at or above site-specific background concentrations. This information was documented in the December 3, 2001, *Corrective Action Report – Removal of Mercury Impacted Soil* which is included as Attachment B2-1. No other corrective measures were required.

1991: In May of 1991, approximately 20 cubic yards of soil was excavated and removed from the MSU WSF. Analytical testing during the 1990 monitoring period had shown that soil near the facility's dock had elevated mercury levels. The mercury impact was thought to have resulted from an accidental release of metallic mercury from a broken barometer in the summer of 1986. The excavation was backfilled with clean sand on May 15, 1991. Clean excavation closure was acknowledged by the Department of Natural Resources on August 8, 1991. Attachment B2-2 contains the work plan and acknowledgement letter from the MDNR.